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ORIGINAL ARTICLE

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Orderbook demand for corporate bonds

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Abstract

We examine the determinants of investor demand for corporate bond offerings using novel data on the primary market orderbook size. We find that credit risk and bond market presence are significant in explaining investor demand. These effects are more pronounced during the crisis periods including the global financial crisis and eurozone crisis as well as during the postcrisis periods. Our results also highlight the size of the bond investor order depends on information asymmetry costs and the benefit of diversifications, as investor demand is lower for new issuers as well as very frequent issuers. The levels of investor demand have important economic consequences for bond issuers as high investor demand shortens the time to subsequent bond issues and potentially reduces the firm's cost of capital at issuance.

KEYWORDS

bond pricing, investor demand, orderbook size, oversubscription

JEL CLASSIFICATION

G11, G12, G24

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1 | INTRODUCTION

Attracting sufficient demand for new security offerings is a key concern for firms seeking to raise new capital. Issuing firms also seek a degree of oversubscription in their new issue orderbook as this offers them a stronger bargaining position in the current and future offerings. For example, studies show that high-security demand can have meaningful economic benefits as firms with higher oversubscribed offerings have greater flexibility in setting the final terms of their offering, most notably its price, which can help reduce their overall cost of capital (Cornelli & Goldreich, 2003; Derrien, 2005). These firms can also benefit from improved capital market access, shortening the time before they can return for subsequent security issuance. In addition, strong investor demand for new offerings supports a firm's creditworthiness by signaling to creditors and credit rating agencies the strength of its access to funding.[1] Therefore understanding the factors that determine the level of demand for a firm's security issue is a key concern for corporate treasury departments and the bookrunners managing their offerings.

The objective of this paper is first, to directly test competing theories of investor demand for financial securities based on credit risk, bond market presence, and the structure of the bookrunner syndicate. Second, we empirically examine two potential areas where high investor demand could benefit issuing firms, namely market access and the final pricing of the issued security. We use investor demand for corporate bonds, as measured by their orderbook size, as the fundraising security.

Prior studies that examine investor demand in the equity initial public offering (IPO) literature typically use small proprietary data sets to show that market conditions and investor sentiment at the time of issue drive investor demand in the primary equity markets (Cornelli & Goldreich, 2001, 2003; Derrien, 2005; Dorn, 2009). However, many issuers and security characteristics that potentially affect demand cannot be measured ex ante in the equity markets and are therefore not examined directly in these studies.[2] We propose that corporate bonds are a richer environment to examine investor demand for security offerings. Unlike the residual, contingent and undated payoffs on equities, bonds have a known payoff profile at the time of issuance. Also, bond issuer and security characteristics are more readily available than for equity issues and can be considered for a wider range of the theoretical determinants of investor demand than market conditions and investor sentiment alone. Finally, there is considerable heterogeneity in investor demand for bond issues in our sample and this helps to motivate our focus on the theoretical determinants and consequences of bond investor demand.[3]

Theories on the investor demand for corporate bonds include arguments relating to the credit risk of securities that suggest investors seek to avoid high-risk bonds due to concerns of inefficient liquidation (Berlin & Loeys, 1988; Myers, 1977). Also, demand is higher for bonds issued by firms with greater bond market presence due to their higher reputation and the reduced need to monitor (Diamond, 1991a, 1991b). However, arguments in the portfolio choice

[1]Fitch ratings notes that the strength of a company's 'funding environment' is a qualitative factor in driving its credit rating (Fitch, 2018). See Kou and Varotto (2008) for a description of credit ratings on Eurobonds.

[2]Before an equity listing, firm-level accounting data are not widely reported in commercial databases and price variables are generally unavailable from the IPO firm. To manage this problem research on determinants of demand in equity IPOs typically uses accounting and price data based on industry peers to make inferences on the characteristics of the firms going public (Lowry, 2003; Pagano et al., 1998).

[3]There has also been significant growth since the late 1990s in this bond market raising the importance of this asset class (Aussenegg et al., 2015; Claes et al., 2002).

literature suggest that a bond's expected return, variance and correlation with other bonds determine its benefit to an investor's portfolio, and should therefore drive security demand (Markowitz, 1952). As returns on bonds with differing credit risk are partially uncorrelated, both low- and high-credit risk bonds are important in obtaining a mean-variance efficient bond portfolio (Blume et al., 1991). In addition, it can be argued that investors pursuing a diversification strategy should also purchase more bonds from less frequent issuers, given the scarcity of opportunities to purchase these bonds in the primary market.

Our focus on bonds also allows us to consider demand surrounding the impact of the 2008 global financial crisis. Arguments on investor demand based on security scarcity are also motivated by flight-to-quality considerations surrounding the crisis, as firms moved out of equities into comparatively safe investment-grade corporate bonds offering high credit spreads. Given the reduction in the liquidity of secondary bond markets following the financial crisis (International Capital Market Association [ICMA], 2018) and the resulting higher cost of trading, we expect that investors moving into the investment-grade corporate bond market will concentrate their purchases in the primary market.

Our research covers a novel data set of 1846 euro-denominated investment-grade public bond tranches issued by 408 Western European firms from 2001 to 2020 for which we are able to collect data on orderbook size and resulting oversubscription rates.[4] We have selected the euro-denominated debt market, as, unlike many other debt markets, there is a well-established practice of recording and distributing high-level orderbook statistics, such as orderbook size.[5] ICMA, the European-focused industry body for capital markets, discusses this practice in its Primary Markets Handbook (ICMA, 2018). It recommends that any disclosure of the investor demand should be agreed by the bookrunners in advance as such disclosure (if done) is 'required by law to be clear, fair and not misleading' and that banks should ensure that it is 'representative of investor demand'.[6] We also confirm the reliability of this data through separate testing using proprietary data from a major European investment bank.

Our results show that credit risk and bond market presence are important drivers of orderbook size. Demand increases with credit spread at final pricing and decreases with the leverage of the issuing firm. Higher credit risk bonds are attractive to investors who seek to optimize the risk-return characteristics of their portfolio (Blume et al., 1991), but investors appear less willing to increase their exposure to companies with higher levels of financial risk. We also find lower demand for both debut and frequent bond issuers. Debut offerings could be unattractive investments due to the risk of adverse selection (Cantillo & Wright, 2000) and higher information asymmetry.[7] On the other hand, new offerings by the most frequent bond issuers should provide fewer portfolio diversification benefits than those from infrequent bond

[4]Western Europe covers Austria, Belgium, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Switzerland, and the United Kingdom and is based on the definition used by Dealogic. There is still a lack of research on European corporate bonds (Aussenegg et al., 2015), but by focusing on these Western European issuers we avoid issues of significant differences in investor protection as Miller and Puthenpurackal (2002) find that investors require significant premiums on bonds issued by firms located in countries with poor investor protection.

[5]In the US debt capital markets orderbook data is typically only shared verbally. Practitioners avoid sharing such data publicly as it would require them to register this information with the financial regulator and included in a bond's offering materials.

[6]Distinctly, bookrunners may also seek to limit disclosure of book size to just whether transactions are subscribed or not, without stating the scale of any oversubscription.

[7]In their study of 260 debt issues by non-US firms in the Yankee bond market, Miller and Puthenpurackal (2002) find that investors demand premiums on debt issuers.

issuers, considering the high cost for investors to diversify their portfolios in illiquid secondary markets. Our results are robust to alternative model specifications, exclusion of bonds linked to financial services, and validation of our publicly available orderbook data. We also find that the structure of the bookrunner syndicate managing the offer can affect bond demand.

Our findings on the importance of credit risk and bond market presence are stronger after the crisis periods affecting this market (including the global financial crisis and eurozone crisis), which we attribute to increased heterogeneity in orderbook sizes as a result of substantial growth in the corporate bond investor base, as well as a more volatile market environment (Krylova, 2016).[8] In comparison in precrisis years the Eurobond market could generally described as having a smaller number of investors and diverse group of bond issuers.

We also find that the structure of the bookrunner syndicate managing the offer can affect bond demand. Larger syndicates of bookrunners and the appointment of bookrunners with experience of lending to the issuing firm are associated with higher levels of demand. The results support the view that these characteristics are measures of the ability of the bookrunner syndicate to certify the quality of the issuing firm and place the bond with a broad range of investors (Corwin & Schultz, 2005; Fang, 2005; Yasuda, 2005).

Finally, we analyze whether the arguments on the economic benefits of high-security demand are applicable to the bond market. We consider the implications of the level of investor demand on market access and the final pricing of the issued security. We find that high demand allows firms to reduce the final credit spread on the bond relative to the secondary market trading price of the firm's existing bonds, which suggests that high demand can reduce the bond issuer's cost of capital. Moreover, high demand for the current bond issue shortens the time to subsequent issues, suggesting that firms increase future supply following high demand for current issues.

Our findings extend the literature on the determinants of investor demand for new security securities. First, through our investment-grade bond sample we arguably conduct a stronger and more relevant test of investor demand behavior than the prior IPO literature, due to the considerable heterogeneity in bond investor demand and the frequency with which firms access the bond market. Second, we incorporate additional variables, which were difficult to incorporate in the prior IPO studies, as we find important roles for firm credit risk and bond market presence as determinants of investor demand.

Our findings also have implications for literature on a firm's access to public debt markets (Cantillo & Wright, 2000; Denis & Mihov, 2003; Rauh & Sufi, 2010). Prior studies show that firms with bond market access tend to be larger, have stronger credit ratings, and higher leverage. For example, Faulkender and Petersen (2006) find that firms with stronger credit ratings have higher leverage ratios, which is driven by improved access to public bond markets. Indirectly, these results suggest higher investor demand for the bonds of firms with stronger credit ratings and other characteristics associated with greater access to public bond markets. However, we find investor demand for corporate bonds is unrelated to credit ratings in the precrisis period and positively related to credit ratings in postcrisis periods. Investor demand is also higher for firms with lower leverage, and those who are infrequent issuers in the bond market. We suggest that these characteristics offer important diversification to investors away from regular issuers, and that such investor diversification benefits should be considered by debt sourcing theories.

[8]Similarly, Liu (2016) finds that the benefits of diversification into foreign corporate bonds for US investors are higher during this financial crisis.

Our study also extends prior research on the benefits to issuing firms from strong investor demand. Brennan and Franks (1997) and Cornelli and Goldreich (2003) find that stronger investor demand gives issuers greater discretion in allocating equities and in setting the final offer price respectively. We confirm these findings for corporate bonds. In addition, by focusing on bonds, for which issuers are more likely to engage in repeat issuance in comparison to equity offers, we extend the equity market literature to show an additional direct benefit from strong investor demand is that it allows issuing firms to issue additional bonds within a shorter period.

We organize the remainder of the paper as follows. Section 2 sets out our description of bookbuilding in the euro-denominated investment-grade corporate bond market. In Section 3, we discuss the determinants of investor demand and in Section 4 we present the sample data, variable definitions. In Section 5, we analyze the determinants of investor demand. Section 6 analyzes the outcomes of investor demand related to time to subsequent bond issuance and underpricing. Robustness tests are outlined in Section 7. Section 8 concludes.

2 | DEMAND FOR CORPORATE BOND SECURITIES IN THE EURO-DENOMINATED MARKET

We examine investor demand for corporate bonds at the primary syndication stage, as this is a uniquely liquid point in a corporate bond's lifecycle. Once a bond has been issued it quickly becomes illiquid (Asquith et al., 2013; Hotchkiss & Ronen, 2002), with low levels of secondary market trading (Lo et al., 2004). The primary market is hence essential for investors seeking to adjust their portfolio. This is especially true as many institutional bond investors trade infrequently and hold their securities in buy and hold portfolios (Choudhry, 2010; Massa et al., 2013).[9] Asquith et al. (2013) consider the costs of borrowing corporate bonds, which is an inverse proxy for liquidity, and find it is positively related to the time since syndication. We expect that investors are cognizant of this and that the volume of securities demanded by investors in the primary market is a reasonably accurate measure of their overall security demand. The issue process for a corporate bond in the investment-grade Euro market typically follows several key stages. The main features of each stage are set out in Panel A of Appendix A.[10] In this study, we focus on the 'bookbuilding' stage of the issue where the bond tranche is priced and the size of the orderbook is determined.

In Panel B of Appendix A, we provide an illustrative example of bond pricing on the issue date during a bookbuilding stage. When the issue is announced at the start of trade, the announcement includes details of the envisaged credit spread of the bond, commonly referred to as the initial price guidance (IPT). It is the bookrunners role to build an excess demand for the issue to provide the issuer a greater flexibility in setting the price and size, as well as determining the allocation split across investors.[11]

[9]Massa et al. (2013) note that on average USD15 bn worth of US corporate bonds are traded each day, which is equal to around 10% of the average daily trading volume of US equities. This is despite the size of the bond market in comparison to equites (there were USD 6.3 trillion of US corporate bonds in comparison to USD 5.3 trillion of US equities outstanding in 2008).

[10]Descriptions that are more detailed can be found in Choudhry (2010) and ICMA (2012).

[11]Press coverage emphasizes the tendency for firms to deliberately set IPT spreads over a wide range to generate higher demand: 'The technique—offering a lot at first to lure the buyside and then using investor momentum to tighten pricing sharply...', *Reuters*, March 18, 2016.

Bookrunners collect orders from investors and record these in a joint orderbook. While this orderbook remains open investor orders can be amended. This typically happens in response to new announcements relating to the expected pricing of the bond, such as the revised price guidance and the final pricing terms. Once the orderbook has closed the orders are considered firm. Any reneging by the bond investor would be considered a contractual breach by the bookrunner, and also ostracize the investor from future primary bond business (ICMA, 2018).

Bookrunners typically provide a best-efforts service and so are not obliged to take up any unsold proportion of the tranche. However, reputational commitments to ensure the success of the issue might lead them to do so if demand is otherwise weak. In practice, this means that very few tranches are sold with demand levels of 1x issue size (1x) or less, relative to the bond tranche size.

The final orderbook size at the closing price of the issue is disclosed shortly after pricing by the entire bookrunner syndicate. Such disclosure is market practice in Europe and is hence expected by both regular capital markets investors and financial journalists. As shown in our robustness tests in Section 5, orderbook data is available for over 90% of the tranches in our target market. We, therefore, view this as reliably reported.

3 | DETERMINANTS OF INVESTOR DEMAND

In this section, we discuss the determinants of investor demand for corporate bonds used in our analysis. We classify our explanatory variables based on theories of credit risk and the bond market presence of the issuing firm. These factors can influence demand for an individual security held in isolation. However, we note that the effect can vary when the security is comparatively scarce and/or is held as part of a diversified portfolio.

3.1 | Credit risk

The credit risk of the issuing firm has been linked to the demand for their securities in the inefficient liquidation, underinvestment and portfolio choice theories. Berlin and Loeys (1988) find that bond issues from higher risk firms are associated with greater probability of inefficient liquidation due to the difficulties of renegotiation with multiple creditors in the event of default. Given this, we propose that there could be lower demand from bond investors for these higher-risk bond issues. The underinvestment theory also predicts that bond investors purchase fewer securities from companies with a higher risk of default (Myers, 1977). Underinvestment is more likely to occur in riskier firms as their payoffs in default are less likely to be sufficient to fully repay their bondholders. As Denis and Mihov (2003) point out, this is more challenging to establish with bond investors than with private debt investors, as their holdings are less concentrated and more transient. The implication of Myers' (1977) model for bond investors is therefore that they invest less in riskier firms because of the increased probability of underinvestment. Cantillo and Wright (2000) and Denis and Mihov (2003) find that frequent public bond issuers are better rated, more profitable and larger than less frequent issuers, all inverse proxies for the risk of default. A large share of corporate bond offerings is hence issued by lower-risk companies.

The portfolio choice literature argues that investors should seek a mean-variance efficient portfolio of securities (Markowitz, 1952). A bond's expected returns, variance and correlation with

other bonds determines its benefit towards achieving this portfolio and should therefore drive investor demand for corporate bond issues. In contrast to the inefficient liquidation and underinvestment views of credit risk, and given the substantial heterogeneity among bond investors, the portfolio choice view predicts that investors will demand both lower and higher-risk bonds depending on their availability and the risk-return profile of their existing investments.

3.2 | Bond market presence

There are two conflicting views with regard to the investor response to the bond market presence of the issuer. Arguments based on information asymmetry predict that bond investors purchase a higher amount of securities from firms with greater bond market presence. Cantillo and Wright (2000) suggest that firms with existing bond are more likely to re-issue in the bond markets than other similarly levered nonbond issuers. They argue that this is driven by the greater amount of information available on existing bond issuers, reducing bond investors' adverse selection concerns. This suggests new bond issuers need to have relatively stronger attributes to encourage investors to buy their debt. Bond market regulators require issuers to publish an extensive amount of information, both in the initial bond prospectus and on an ongoing basis. In addition, there is clearly valuable information inherent in the prices of the tranches a company has outstanding. As such, information asymmetry predicts that bond investors purchase more bonds from companies with greater bond market presence. Several studies support the notion that having existing exposure to the debt markets makes it easier to sell a new bond offering. Datta et al. (1999) find that having an existing bank relation lowers the at-issue yield spread. Hale and Santos (2008) find that firms that have already issued a privately placed bond or syndicated loan are able to issue their initial public bond offering earlier than firms without proven access to these markets. Taken together these studies suggest that having a presence in other types of debt markets can reduce information asymmetries in bond markets and, we propose, potentially increase bond investor demand.

On the other hand, portfolio choice theory predicts that bond investors purchase a lower number of securities from firms with greater bond market presence (Wibaut & Wilford, 2012). Portfolios concentrated towards the bonds of a small number of issuing firms are unlikely to be mean-variance efficient.[12] The greater the company's bond market presence, the higher the probability that an investor already holds some of the company's equity and bonds (Kwan, 1996). This reduces the diversification benefits from investing in a new security offering from the company. Bond investors actively consider how diversified their portfolios are across industry and issuers and monitor their concentration risk.

Thus, in this study, we argue that investors demand for a bond depends on information asymmetry costs and the benefits of diversification. The costs of information asymmetry would be higher in bonds issued by recent issuers (such as debut issuer) and the benefit of investor's diversification would be lower in bonds issued by frequent issuers. We also suggest that investors' demand for bonds issued by firms that have greater market presence will be lower due to reduced benefits of diversification. Similarly, the demand for bonds issued by new firms (such as debut issuer) would also be lower due to increased information asymmetry costs.

[12]A small proportion of the bond investors may be regulated investors such as banks and insurance companies (Krebbers et al., 2021a).

4 | DATA, VARIABLES, AND SUMMARY STATISTICS

4.1 | Data and sample construction

Our sample of corporate bond issues is derived from a Dealogic Debt Capital Markets Analytics search of all euro-denominated senior unsecured bond tranches issued by Western European firms from January 2001 to December 2020. Western Europe covers Austria, Belgium, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Switzerland, and the United Kingdom. We present definitions of variables used in our empirical analysis in Appendix B.

Our objective is to analyze demand from the full population of bond market investors and therefore we filter bonds that are likely to be marketed to only a subset of these investors. We exclude high yield tranches and tranches issued before 2001, given the limited reporting of orderbook data for these tranches.[13] We also exclude secured tranches due to their distinct credit risk profile, bond issues by financial institutions, and tranches placed only with domestic investors. Finally, we remove tranches that are privately placed, single bookrunner-led,[14] retail-targeted,[15] smaller than EUR 200 m, fungible, and with a tenor of less than 1 year.[16] All of these bonds are likely to have been marketed to only a subset of investors, with limited orderbook demand.

We treat multitranche offers as separate observations. For such transactions, each tranche is sold through a separate orderbook and bookrunners typically report the individual orderbook size for each tranche.[17] These filters produce an initial sample of 3168 bond tranches.

For these tranches, we collect investor demand data from news coverage in International Financing Review and GlobalCapital, who obtain this information through postpricing interviews with bookrunners on the transaction. While collecting the investor demand data, we focus on the final orderbook demand to overcome endogeneity concerns whereby investors can

[13]Disclosure of orderbook information for high yield bonds is sparse because it gives competing bookrunners knowledge about which investors are currently active in this segment of the market. Investors purchasing high yield tranches tend to be distinct from those purchasing investment grade issues. High yield bonds are also likely to require alternatives to credit spreads to understand an issuer's objective function, such as total yield and the presence of covenants in the bond indenture (Krylova, 2016). Moreover, in Europe the high yield bond market is still relatively small.

[14]We argue that in studies of investor demand and firm-bank relationship it is suitable to use tranches led by multi-bookrunners We do not include single bookrunners for two reasons. First, single bookrunner-led tranches are typically referred to by practitioners as 'club deals' as they are placed with a small number of investors, resulting in an homogenous groups of investors. Second, Carbó-Valverde et al. (2021) highlights that in more recent years European capital markets have shifted from the use of a sole bank as bookrunner to multiple bookrunning. Dunbara and King (2019) also argue that the rise in the multiple-bookrunning phenomenon after the global financial crisis is mainly due to the inclusion of bookrunners who play a more passive role.

[15]In this study, we focus on analysing the distribution process inherent in tranches that have been marketed to a wide range of European investors. Selling purely to retail investors typically involves multiple week-long book building processes, which are distinct from the intra-day norm for regular European distributions. Retail tranches also tend to be executed by a subset of investment banks that have sizeable in-house private banking networks.

[16]Fungibles are known as taps. They have the same terms and conditions as an existing bond and effectively result in an increase in the outstanding amount of this bond. Taps tend to be sold to a small number of existing holders of the bond. Bonds with a tenor of less than 1 year are typically sold only to a small number of money market funds.

[17]Where this is not reported, we split the orderbook size for the entire transaction across each tranche, proportionate to the individual tranche size. We conduct a separate robustness test in which we group all the tranches of multitranche transactions as a single observation. The results are qualitatively unchanged from our main findings.

alter their demand in response to and based on the terms offered by the bond. As discussed in Section 2, until the final bond terms are set immediately before issuance, the orderbook remains open for investors, and hence, investors can adjust their orders in response to changes to the offer terms, such as pricing and size of the tranche, in the intraday market before issuance. Hence, the orderbook size cannot be considered fully exogenous as the size of the orderbook at pre-closing impacts the bookrunners' flexibility to adjust tranche characteristics such as credit spread and issue size. However, investors are required to reconfirm their orders towards the end of the bookbuilding process when tranches variables are fixed and communicated to the market in a 'final terms' message. At this stage, the final orderbook size is determined only once all investors reconfirm their orders. Our data, therefore, capture the single direction of the relation whereby the final terms drive the reported orderbook size. Thus, focusing on final orderbook demand reduces endogeneity concerns relating to the impact of initial demand on the final orderbook terms. These criteria produce a final sample of 1846 tranches issued by 408 firms, which represents around 60.0% of the initial sample (or around 62% by tranche value).

4.2 | Variable and summary statistics

4.2.1 | Investor demand variables

We measure investor demand as (i) Orderbook_Size: the natural logarithm of the total euro value of all orders placed, and (ii) Oversubscription: Orderbook_Size divided by Issue_Size. Variable definitions are set out in Appendix B. Table 1 reports orderbook data availability for each year from 2001 to 2020. Bond issuance is most frequent in 2009, the year of global financial crisis, and in 2012 which covers the European sovereign debt crisis. We also find substantial increases in both Orderbook_Size and Oversubscription surrounding these events, which we expect is due in part to investors moving out of risky sovereign bonds and equity markets and into investment grade corporate bonds (Krylova, 2016). Although we have a single year covering the Covid-19 period, we can see that both Orderbook_Size and the Oversubscription has increased during 2020 which is consistent with investors seeking yield from safer, investment grade assets as well as the effects of government quantitative stimulus.[18] The decline in Euribor during the global financial crisis and associated increase in corporate bond issuance can also be linked to a reduction in verification costs and an increase in the rents available to bond investors when matching bank lending rates (Cantillo & Wright, 2000), which increased the demand for corporate bonds during the crises period.

We present summary statistics for investor demand and explanatory variables in Table 2. Orderbook_Size has a mean value of EUR 2.854 bn and the median is EUR 2.300 bn. Hereafter, to provide scale in our analysis, we focus our discussion of summary statistics on the Oversubscription measure of investor demand. If the issue is exactly fully subscribed, then Oversubscription has a value of 1x. For our sample, the mean (median) value is 3.835x (3.200x). Mean Oversubscription is notably higher than 1x, highlighting that issuing firms and their bookrunners do not select at-issue credit spreads at the intersection of supply and demand

[18]Such as the ECB's pandemic emergency purchase programme https://www.ecb.europa.eu/mopo/implement/pepp/html/index.en.html

TABLE 1 Investor demand across sample period

The table reports the number of observations by year and mean (median) values for Orderbook Size and Oversubscription for 1846 euro-denominated investment grade public bond issues made by Western European firms during 2001–2020.

		Orderbook_Size (€bn.)		
Year	**Number**	**€ billion**	**Ln**	**Oversubscription (times)**
2001	62	2.888 (1.900)	0.697 (0.640)	2.297 (2.000)
2002	45	2.345 (1.800)	0.545 (0.588)	2.176 (2.000)
2003	99	1.790 (1.500)	0.344 (0.405)	2.328 (1.800)
2004	53	1.720 (1.500)	0.348 (0.405)	2.553 (2.000)
2005	48	1.498 (1.250)	0.246 (0.223)	2.289 (2.000)
2006	81	1.881 (1.500)	0.435 (0.405)	2.543 (2.200)
2007	57	2.554 (2.000)	0.689 (0.693)	3.032 (2.500)
2008	79	2.784 (2.500)	0.887 (0.916)	2.941 (2.670)
2009	186	4.870 (4.500)	1.415 (1.504)	5.480 (5.000)
2010	111	2.687 (2.500)	0.799 (0.833)	4.147 (3.400)
2011	98	2.632 (2.135)	0.749 (0.758)	4.065 (3.365)
2012	182	3.336 (3.000)	1.051 (1.099)	4.795 (4.155)
2013	90	2.427 (2.000)	0.748 (0.788)	3.972 (3.333)
2014	87	3.179 (2.500)	0.935 (0.916)	4.602 (4.000)
2015	65	2.535 (2.400)	0.816 (0.875)	3.951 (3.333)
2016	120	3.427 (2.700)	1.006 (0.993)	4.705 (4.200)
2017	96	2.819 (2.300)	0.821 (0.833)	3.975 (3.367)
2018	97	2.050 (1.750)	0.573 (0.560)	2.818 (2.400)
2019	114	2.383 (2.100)	0.730 (0.742)	3.453 (2.886)
2020	76	3.226 (2.875)	1.043 (1.056)	4.924 (4.000)
Total	1846	2.854 (2.300)	0.819 (0.833)	3.835 (3.200)

(Cornelli & Goldreich, 2003) and do not automatically respond to larger orderbook size by increasing the issue amount (ICMA, 2012). The large range of 0.670x–22.000x for Oversubscription highlights the heterogeneity in investor demand for bond issues in our sample and motivates our focus on the determinants and consequences of this demand variable.

4.2.2 | Credit risk

We measure the credit risk of a bond issuer in three ways: the S&P credit rating of the tranche, the credit spread of the offering, and the leverage ratio of the issuer. Rating is the numerical value of the S&P rating assigned to the bond; ascending from 1 for AAA up to 11 for the

TABLE 2 Summary statistics

The table reports summary statistics for 1846 euro-denominated investment grade public bond issues made by Western European firms during 2001–2020. All variables are defined in Appendix B.

	Number	Mean	Median	SD	Min.	Max.
Investor demand						
Orderbook_Size (€bn.)	1846	2.854	2.300	2.041	0.190	14.000
Orderbook_Size (Ln)	1846	0.819	0.833	0.696	−1.661	2.639
Oversubscription	1846	3.835	3.200	2.456	0.670	22.000
Credit risk						
Rating	1846	7.607	8.000	2.164	1.000	11.000
Spread	1782	1.231	0.900	1.033	−0.160	6.310
Leverage	1635	0.331	0.330	0.150	0.000	1.013
Bond market presence						
Frequency	1846	18.390	14.000	15.729	1.000	74.000
Debut	1846	0.166	0.000	0.372	0.000	1.000
Control factors						
Assets (€bn.)	1635	65.927	36.438	97.875	0.620	2004.611
Ln(Assets)	1635	3.586	3.596	1.163	−0.478	7.603
Gov_Owned	1846	0.086	0.000	0.281	0.000	1.000
Intangibles	1626	0.677	0.708	0.210	0.020	1.000
MTB	1589	1.647	1.471	0.718	0.682	8.120
Flight to safety	1846	1.355	1.215	1.217	−1.682	7.274
Flight to quality	1846	−0.324	−0.243	1.246	−3.690	6.720
CSPP (€bn.)	446	1399.131	1665.370	617.312	63.980	2483.400
Ln (CSPP)	446	7.057	7.418	0.752	4.159	7.817
Major_Econ	1846	0.670	1.000	0.471	0.000	1.000
Euribor	1846	1.316	0.996	1.544	−0.513	5.405
Issue_Size (€m.)	1846	785.449	750.000	433.138	165.000	5250.000
Ln(Issue_Size)	1846	20.372	20.436	0.449	18.921	22.381
FRN	1846	0.059	0.000	0.236	0.000	1.000
Tenor	1846	7.594	7.000	3.783	1.000	40.000
Consumer	1846	0.358	0.000	0.480	0.000	1.000
Industrial	1846	0.271	0.000	0.445	0.000	1.000
Telecom	1846	0.109	0.000	0.312	0.000	1.000
Transportation	1846	0.063	0.000	0.244	0.000	1.000
Utilities	1846	0.198	0.000	0.399	0.000	1.000

unrated tranches (Bongaerts et al., 2012; Krylova, 2016).[19] Table 2 shows the mean (median) rating of the sample is 7.607 (8.000), that is, between an A− and a BBB+. Spread is defined as the at-issue yield minus the euro midswap rate on the issuance day.[20] The sample average (median) credit spread is 1.231% (0.900%), which is comparable to Datta et al. (1997) for US initial public bond offerings. Leverage has a mean (median) of 0.331 (0.330).

4.2.3 | Bond market presence

We measure an issuer's bond market presence using issue frequency and a debut issue dummy. Frequency is a forward-looking measure that counts the total number of tranches issued by a firm during the sample period. This provides an indication of the capital market access a firm has throughout the sample period and we expect that information relevant to pricing is more readily available for regular issuers (Cai et al., 2007). The mean (median) tranche frequency is 18.390 (14.000). We use a dummy variable to identify Debut tranches specifically in the euro-denominated segment of the corporate bond market, which we define as a company's first appearance in the euro-denominated bond market from January 1999 to the end of our sample period. 16.6% of the sample are debut issues.

4.2.4 | Firm, market, and tranche controls

We control for a range of firm-specific variables that largely follow previous bond market studies (Denis & Mihov, 2003). Firm variables include company size, intangible assets ratio, market to book ratio and dummies for majority government ownership of the firm's equity as well as firms with headquarters in Germany, France or the United Kingdom (major economy) as it represents 67% of our sample. Krebbers et al. (2021b) show that Germany, France, and the United Kingdom are the top-debt-market economies in terms of the size of the debt market as well as the number of issues. We also control the effect of flight to safety and flight to quality that might impact investors participation on bond issue. Following Costantini and Sousa (2022), we proxy flight to safety using a spread between long-term interest rates (corresponding to 10-year government bond yields) and short-term interest rates (corresponding to government treasury bill yields) of the issuer country. Likewise, we proxy flight to quality using a spread between long-term interest rates of the issuer country and long-term interest rates of US government bond.

Summary statistics highlight the large size of sample firms with mean total assets of EUR 65.927 bn, which is consistent with the general findings of debt market studies reporting that firms with access to public bond markets are notably larger (Denis & Mihov, 2003). One hundred and fifty nine firms in our sample have majority government ownership stakes and approximately two-thirds our sample bonds are issued by firms

[19]A small number of unrated tranches remains in our sample despite our focus on investment grade tranches. Dealogic classifies these tranches as investment-grade where the issuer is unrated and no covenants are identified for the tranche. These tranches have the characteristics of investment grade securities even though the issuer and security are unrated. Excluding these tranches from our analysis does not affect our empirical results.

[20]To calculate an equivalent figure for floating rate note/bond (FRN) tranches, which are typically priced off 3-month Euribor, we deduct the applicable 6v3 basis from their credit spread.

headquartered in Germany, France, and the United Kingdom. These firms represent 62% of our sample firms as well. The average flight to safety is around 1.355% whereas average flight to quality is −0.324% during our sample period.

We also control for a number of structural features of the bond market and the issued tranches using 6-month Euribor at the time of issue, *Issue_Size*, a floating rate note (FRN) dummy, and a series of bond Tenor dummies (Guibaud et al., 2013; Massa et al., 2013). Our summary statistics indicate that the bond issues are larger in size, but for shorter maturity than found in prior US literature (Cai et al., 2007; Denis & Mihov, 2003). Given that our sample is comprised of investment grade bonds, this could reflect Diamond's (1991a, 1991b) model in which high-quality issuers prefer to borrow in shorter tenors. It could also reflect that US capital markets are relatively more developed for long-dated tranches over this period. We also control for the issuer industrial sector. The most frequent issuers are consumer products and industrials, accounting for 35.8% and 27.1% of tranches respectively.

5 | EMPIRICAL ANALYSES

5.1 | Univariate analysis

Table 3 presents univariate comparisons of investor demand across the ranges of our main explanatory variables for the Oversubscription measure of demand. The results for the proxies for Rating and Spread suggest greater demand for higher-risk bonds. We find large differences in mean and median Oversubscription across the S&P rating bracket and credit spread tertiles, both significant at the 1% level. Mean Oversubscriptions for low, medium and high credit spread tranches are 3.155x, 3.758x and 4.602x, respectively. This highlights that lower-rated bonds, although potentially unattractive in isolation, can contribute to an investor's mean-variance efficient portfolio, leading to higher demand for these securities. This suggests that investors with a sufficiently high target return will invest in higher credit spread offerings, which are less common in the investment grade corporate bond market. Oversubscription for low, medium and high leverage tertiles suggests a preference for bonds with lower financial risk.[21]

For bond market presence variables, we obtain average Oversubscription of 4.255x, 3.886x and 3.300x for low, medium and high issue frequency issuers, significantly different at the 1% level. This supports our argument that the bonds of infrequent issuer firms are a scarce commodity for investors and are therefore attractive from the concept of diversifying holdings across multiple issuers. Given the transaction costs associated with purchasing bonds in the secondary market and the reduction in secondary market liquidity surrounding the crisis (ICMA, 2014), placing larger primary market orders for the bonds of infrequent issuers is the optimum time for investors to achieve this diversification strategy. We find no relation between debut tranche issue and Oversubscription in our univariate analysis.

[21]Although financial risk is a component of overall credit risk, it can be assessed separately by bond investors. From discussion with practitioners, it is suggested that bond investors will look at (trends in) leverage ratios to assess a potential bond issuer's policy towards debt management, relationships and reputation.

TABLE 3 Univariate analysis of orderbook oversubscription levels

The table reports univariate analysis of the level of Oversubscription for 1846 euro-denominated investment grade public bond issues made by Western European firms during 2001–2020. The final two columns show *p* values for an ANOVA test of equality of means and Kruskal–Wallis test of equality of medians across subsamples. All variables are defined in Appendix B.

	Number	Mean	Median	ANOVA	Kruskal–Wallis	
Credit risk						
Rating	AAA	16	1.694	1.385	0.000	0.000
	AA+, AA, AA-	135	3.218	2.670		
	A+, A, A-	697	3.616	3.000		
	BBB+, BBB, BBB-	775	4.049	3.330		
	unrated	223	4.303	3.650		
Spread	Low	604	3.155	2.571	0.000	0.000
	Medium	585	3.758	3.100		
	High	593	4.602	4.000		
Leverage	Low	545	4.037	3.330	0.003	0.006
	Medium	545	3.800	3.200		
	High	545	3.602	2.930		
Bond market presence						
Frequency	Low	691	4.255	3.500	0.000	0.000
	Medium	561	3.886	3.273		
	High	594	3.300	2.667		
Debut	Yes	305	3.695	3.000	0.747	0.066
	No	1541	3.835	3.200		

5.2 | Multivariate analysis

We examine the determinants of investor demand using following ordinary least squares (OLS) regression specification:

$$Investor\ \ Demand_{it} = \beta_0 + \beta_1 Rating + \beta_2 Spread + \beta_3 Leverage + \beta_4 Frequency + \beta_5 Debut + X_{it} + \gamma_j + \varepsilon, \tag{1}$$

where $Investor\ Demand_{it}$ is proxied using Oversubscription and Log of Orderbook Size for each bond tranche i issued in year t by each firm. $Rating$, $Spread$ and $Leverage$ captures the bond's (firm's) credit risk and $Frequency$ and $Debut$ captures the presence of the firm in the bond market. We also include firm and bond level control variables. γ_j is a dummy variable for each

industry that captures the industry fixed effects. We cluster standard errors at the firm level.[22] Following the empirical literature, we do not include year dummies because our explanatory variables exhibit significant time-series variation that we believe drives investor demand (Derrien, 2005; Dorn, 2009). The results are presented in Tables 4A and 4B based on Oversubscription and Orderbook Size, respectively. The results are generally consistent and, unless we directly refer to one measure of demand, our discussion holds for both.

Column (1) of Tables 4A and 4B shows results for Oversubscription (Orderbook Size) regressed on control variables only. We find that bond demand is negatively related to firm size for both measures (Ln (Assets) at the 1% level) and positively related to the size of the issue (Ln (Issue Size at the 1% level) for orderbook size. The latter relation is consistent with the expectation that the larger the issue size, the smaller would be the orderbook size, all else equal. Bond demand is also higher for both measures for majority government owned firms. Likewise, flight to quality is a significantly positively related (at the 1% level) to the investor demand suggesting that higher interest rates in US reduces investor demand in the euro due to flight of capital. On the other hand, flight to safety is significantly negatively related to Orderbook Size, at the 1% level, suggesting that reduction in long-term interest rates increases the size of the orderbook of the investment grade corporate bonds.

In terms of bond market and tranche variables, Euribor is negatively related to investor demand, significant at the 1% level. This could be driven by investors moving out of sovereign bonds and equity markets and into higher-yielding investment grade corporate bonds in the Postcrisis period (Krylova, 2016). The result is consistent with yield chasing investment behaviour of investors (Acharya & Staffen, 2015; Becker & Ivashina, 2015). We find a significant and negative coefficient on the FRN dummy, at the 1% level. This is noteworthy as, in an efficient and frictionless market, investors should be indifferent between purchasing a fixed rate bond or a FRN with a floating to fixed swap. We attribute this finding to investor portfolio restrictions, which set out the extent to which a fund manager can purchase floating rate tranches. Finally, the coefficients on our 9–12 and >12-year tenor dummies are significant and negatively related to investor demand, at the 1% level. Although there are considerable differences between the investment horizons of different bond investors (Massa et al., 2013), our result here shows that the longest tenor bonds are only attractive to a smaller group of bond investors, most likely consisting predominantly of insurance companies and pension funds (Guibaud et al., 2013). The only notable difference between Tables 4A and 4B is the significant and positive coefficient for Issue Size in Table 4B. The Orderbook Size is greater for larger bond issues, which shows that the size of the orderbook is not explained by the issue size and is more likely due to the investor demand for the issue.

Column (2) of Tables 4A and 4B examines the impact of credit risk on investor demand measured by Oversubscription and Orderbook Size, respectively. We find that credit spread is positively related to demand, significant at the 1% level. This supports the portfolio choice view that investors require higher-risk bonds to enhance the risk-adjusted return of their portfolio. In addition, we also find that the coefficient for leverage has a significant negative relation with Oversubscription and Orderbook Size, at the 1% level. This result is consistent with Myers' (1977) underinvestment theory. Holding constant a firm's business profile, higher leverage will reduce management's incentives to invest in profitable projects. Although the credit spread and

[22]To address concerns surrounding multicollinearity, we run single-variable regressions for each explanatory variable. Moreover, in all regressions we confirm that multicollinearity is a not significant concern by estimating variance inflation factors (VIFs) and find that no individual VIF is above 3.50.

TABLE 4A OLS regressions predicting orderbook oversubscription

The table reports regressions of Oversubscription of 1846 euro-denominated investment grade public bond issues by Western European firms during 2001–2020. Standard errors clustered at the firm level are in parenthesis. Variables are defined in Appendix B. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

	(1)	(2)	(3)	(4)
Credit risk				
Rating		−0.031		−0.041
		(0.039)		(0.039)
Spread		0.354***		0.347***
		(0.082)		(0.079)
Leverage		−1.985***		−1.891***
		(0.552)		(0.532)
Bond market presence				
Frequency			−0.015***	−0.012**
			(0.004)	(0.005)
Debut			−0.437**	−0.469**
			(0.189)	(0.191)
Control factors				
Ln (Assets)	−0.351***	−0.320***	−0.299***	−0.299***
	(0.066)	(0.076)	(0.074)	(0.086)
Gov_Owned	0.573**	0.267	0.602***	0.287
	(0.222)	(0.231)	(0.211)	(0.219)
Intangibles	0.352	−0.002	0.332	0.008
	(0.348)	(0.361)	(0.345)	(0.358)
MTB	0.300*	0.295**	0.287*	0.271*
	(0.155)	(0.139)	(0.154)	(0.139)
Flight to safety	−0.099	0.011	−0.072	0.039
	(0.092)	(0.095)	(0.091)	(0.093)
Flight to quality	0.647***	0.459***	0.600***	0.415***
	(0.086)	(0.104)	(0.084)	(0.099)
Major_Econ	0.058	0.044	0.073	0.058
	(0.180)	(0.173)	(0.175)	(0.169)
Euribor	−0.489***	−0.418***	−0.467***	−0.393***
	(0.053)	(0.056)	(0.054)	(0.057)
Ln (Issue size)	−0.262	−0.362*	−0.216	−0.325*

TABLE 4A (Continued)

	(1)	(2)	(3)	(4)
	(0.189)	(0.197)	(0.190)	(0.195)
FRN	−0.611**	−0.528**	−0.643**	−0.649***
	(0.258)	(0.233)	(0.257)	(0.238)
<3.0 year	0.241	−0.340	0.197	−0.370
	(0.503)	(0.409)	(0.500)	(0.403)
3.0–5.9 year	0.117	0.045	0.138	0.064
	(0.150)	(0.149)	(0.150)	(0.149)
9.0–11.9 year	−0.368**	−0.297**	−0.382***	−0.316**
	(0.146)	(0.147)	(0.147)	(0.149)
≥12.0 year	−0.181	−0.198	−0.200	−0.221
	(0.165)	(0.166)	(0.164)	(0.165)
Constant	4.017***	4.630***	4.406***	5.129***
	(0.555)	(0.813)	(0.575)	(0.814)
Sector dummies	Yes	Yes	Yes	Yes
No. of observations	1580	1525	1580	1525
χ^2 model fit against (1)		47.24***	15.65***	59.77***
Adjusted R^2	0.166	0.194	0.173	0.200
F-statistic	15.601***	16.192***	14.344***	14.770***

leverage variables are correlated, the degree of correlation is limited (0.129) and does not therefore have a material bearing on the significant and counter-directional nature of the results for these proxies for credit risk. However, credit rating is insignificant in our multivariate analysis, suggesting that in this case the univariate effect documented in Table 3 is driven by the correlation between spread and rating.[23][24]

Column (3) of Tables 4A and 4B presents results for regressions of investor demand against bond market presence variables. The issue frequency coefficient is negative and significant at the 1% level, consistent with our scarcity argument where investors seek to diversify their holdings away from the frequent issuers.[25] This finding does not support reputation-based

[23]Our results are also unchanged if we replace the continuous measure for credit rating with a series of dummies for individual rating groups or broader rating bandings. We find some evidence of lower demand for AAA rated corporate bonds, but the small number of observations restricts our ability to state generalizations for this result.
[24]It could also be partly captured by the asset effect (control factor), as smaller companies tend to have weaker ratings.
[25]An alternative interpretation of this result is that bookrunners are more familiar with regular issuers, have better knowledge of the pricing curve, and therefore there is a better consensus around the fair value of the issue. This can allow the bookrunner to more accurately set the IPT to limit underpricing of the bond and therefore resulting in less oversubscription. We cannot explicitly rule this argument out but note that it is inconsistent with description of the pricing process by market participants in Section 2. We examine bookrunner relationships with the issuing firm in more detail in Section 5.4.

TABLE 4B OLS regressions predicting orderbook size

The table reports regressions of Ln (Orderbook_Size) of 1846 euro-denominated investment grade public bond issues by Western European firms during 2001–2020. Standard errors clustered at the firm level are in parenthesis. Variables are defined in Appendix B. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

	(1)	(2)	(3)	(4)
Credit risk				
Rating		0.000		−0.002
		(0.009)		(0.009)
Spread		0.089***		0.087***
		(0.021)		(0.020)
Leverage		−0.518***		−0.500***
		(0.135)		(0.131)
Bond market presence				
Frequency			−0.003***	−0.003**
			(0.001)	(0.001)
Debut			−0.121***	−0.122***
			(0.046)	(0.046)
Control factors				
Ln (Assets)	−0.096***	−0.082***	−0.088***	−0.079***
	(0.017)	(0.019)	(0.018)	(0.021)
Gov_Owned	0.180***	0.113*	0.187***	0.117*
	(0.064)	(0.064)	(0.060)	(0.060)
Intangibles	0.123	0.024	0.119	0.026
	(0.088)	(0.089)	(0.087)	(0.088)
MTB	0.043	0.060*	0.040	0.054*
	(0.031)	(0.031)	(0.030)	(0.030)
Flight to safety	−0.075***	−0.045**	−0.069***	−0.038*
	(0.022)	(0.022)	(0.021)	(0.022)
Flight to quality	0.191***	0.143***	0.180***	0.132***
	(0.020)	(0.025)	(0.020)	(0.024)
Major_Econ	−0.011	−0.014	−0.007	−0.011
	(0.041)	(0.039)	(0.040)	(0.038)
Euribor	−0.157***	−0.132***	−0.150***	−0.126***
	(0.014)	(0.014)	(0.014)	(0.014)
Ln (Issue_Size)	1.001***	0.975***	1.011***	0.983***

TABLE 4B (Continued)

	(1)	(2)	(3)	(4)
	(0.045)	(0.043)	(0.045)	(0.043)
FRN	−0.171***	−0.185***	−0.180***	−0.214***
	(0.059)	(0.069)	(0.058)	(0.069)
<3.0 year	−0.038	−0.141	−0.048	−0.149
	(0.100)	(0.107)	(0.100)	(0.106)
3.0–5.9 year	0.013	−0.004	0.018	0.000
	(0.033)	(0.033)	(0.033)	(0.033)
9.0–11.9 year	−0.076**	−0.060*	−0.080**	−0.064*
	(0.034)	(0.034)	(0.034)	(0.034)
≥12.0 year	−0.036	−0.038	−0.041	−0.043
	(0.040)	(0.040)	(0.040)	(0.040)
Constant	−18.991***	−18.495***	−19.164***	−18.601***
	(0.897)	(0.869)	(0.906)	(0.861)
Sector dummies	Yes	Yes	Yes	Yes
No. of observations	1581	1526	1581	1526
χ^2 model fit against (1)		57.20***	16.77***	70.30***
Adjusted R^2	0.432	0.445	0.437	0.449
F-statistic	54.73***	55.70***	49.03***	50.35***

arguments that stronger bond market presence can lead to higher investor demand (Diamond, 1991a). Our findings show that oversubscription steadily diminishes as a firm's issuance activity increases. However, we also find that the debut dummy is negative and statistically significant at the 1% level for the Oversubscription and Orderbook Size. This is consistent with the argument that the information asymmetry costs in new issuance such as debut firms are higher which discourages investor participation. This provides some support to Cantillo and Wright's (2000) findings of an asymmetric threshold between existing bond issuers and other similar levered nonbond issuers. This can also explain our result of no difference between debut and nondebut tranches in the univariate analysis if the average demand for nondebut tranches is reduced by the unpopularity of the more frequent issuers.

Column (4) of Tables 4A and 4B combines our proxies for credit risk and bond market presence in a single regression.[26] The coefficients for credit spread, leverage, issue frequency, and debut issuers retain their significance similar to Columns (1)–(3), and only one out of eight variables in Tables 4A and 4B loses their explanatory power.[27] We interpret these results as

[26]The results are similar when we replace Rating with Rating dummies.
[27]We also report the Chi-squared (χ^2) for a likelihood ratio test of the joint significance of each set of empirical variables. The test compares Column (1) against the relevant regression. All χ^2 tests are significant at the 1% level or better and are notably highest for credit risk proxies.

showing that there is greater investor demand for higher credit risk and relatively scarce issues in their attempt to achieve a mean-variance efficient bond portfolio.[28]

In addition to being statistically significant, credit risk proxies are also significant in economic terms. Focusing on Column (4) of Table 4A, a one standard deviation increase in credit spreads is associated with a 0.141 standard deviation increase in orderbook oversubscription, equivalent to $(0.347 \times 2.456) = 0.852$x issue size. For leverage, a one standard deviation increase is equivalent to a decline in oversubscription of 0.284x. Focusing on Column (4) of Table 4B, a one percentage point increase in spread is associated with 8.70% increase in the orderbook size. This complements our findings of higher investor demand for high credit risk issuers, given their expected contribution to a mean-variance efficient bond portfolio. We find comparable levels of economic significance for bond market presence. For example, a one standard deviation increase in issuance frequency (debut) is associated with a 0.189x (0.175x) decline in oversubscription.

Overall, our findings contribute to the primary bond market literature by identifying credit risk and market presence to be important determinants of investor demand. More specifically, we show that lower levered, infrequent issuers (but not debut issuers) and those offering higher credit spreads receive higher demand for their bond offerings. This contrasts with the implications of research proposing that firms with stronger credit market reputation have easier access to bond markets (Diamond, 1991a, 1991b).

5.3 | Impact of the crises

In this section, we analyze changes in bond investor demand surrounding the global financial crises occurring during the sample period. Analysis of crisis periods will provide important insights on demand behaviour of investors as they structurally change the bond market landscape. For instance, Krylova (2016) shows that postfinancial crisis, demand for corporate bonds has increased as investors reallocated their assets from equities into investment-grade corporate debt. This also increased the heterogeneity in investor demand in the market. The value of outstanding bonds issued in the euro-denominated investment-grade market has grown from EUR 90 bn in 1997 to EUR 1400 bn by 2010 (Krylova, 2016). This is largely due to a structural reduction in the availability of bank lending as a result of the global financial crisis and more stringent bank regulatory requirements (Adrian et al., 2012). Further, Han et al. (2012), Liang et al. (2016) and DeHaan (2017) argue that credit rating of bonds was important before the crisis and (more) important post the financial crisis but less informative during the crisis. Likewise, Krebbers et al. (2021a) show that the number of investment-grade bonds as well as at-issue credit spreads in Western Europe has increased significantly in the post-financial crisis. Thus, we view the financial crises as the exogenous shocks to the debt market that affected (i) the investors demand of corporate bonds (Krylova, 2016), (ii) the firm creditworthiness due to the impact on credit ratings (Han et al., 2012), leverage and spread (Krebbers et al., 2021a).

Following the existing literature (Krebbers et al., 2021a; Petmezas & Santamaria, 2014), we divide our sample period into three subperiods (i) precrisis period (January 2001–November 2006),

[28]A direct test of such portfolio diversification benefits is outside of the scope of this paper and hence requires further research. We, therefore, leave open the possibility that there are other financial or economic drivers for the observed patterns in orderbook oversubscription.

(ii) Crisis period (December 2006–September 2012), and (iii) postcrisis period (October 2012–December 2020). The crisis period includes both Financial Crisis (December 2006–October 2009) and the Eurozone Crisis (November 2009–September 2012). Our summary statistics in Table 1 highlight an increase in Orderbook Size and Oversubscription surrounding the financial and euro crisis. Hence, we expect the Oversubscription to be higher during the crisis periods. Likewise, we expect that the predictive power of investor demand variables is stronger during the postcrisis period.

We present our regression analysis of changes in Oversubscription surrounding the crisis in Table 5.[29] Column (1) adds a dummy variable for precrisis periods to Column (4) in Table 4A. The precrisis dummy is negative and statistically significant at the 1% level, indicating that Oversubscription during the precrisis periods is lower compared to crisis and postcrisis periods. Inclusion of the precrisis dummy does not change our main results for credit risk and bond market presence variable, except for our variable for Debut. Column (2) adds a dummy variable for crisis periods to the regression in Column (4) in Table 4A. Consistent with our argument, we find that the Oversubscription is positive and significant at the 1% level, indicating the investor demand was significantly higher during the crisis period compared to precrisis and postcrisis periods. Similar to Column (1), inclusion of a crisis dummy does not change our main results for credit risk and bond market presence variable except for Debut. Column (3) adds a dummy variable for postcrisis period. postcrisis dummy variable is positive but insignificant suggesting the Oversubscription did not change significantly compared to precrisis and postcrisis periods. Importantly, inclusion of postcrisis dummy does not change our main results for credit risk and bond market presence, including the Debut issue variable.

The subsample results for the precrisis, crisis, and postcrisis periods are shown in Columns (4), (5) and (6), respectively. In Column (4), we find that our main credit risk variables and bond market presence variables do not impact the investor demand in the precrisis periods. In Column (5), we find that the leverage and the debut negatively impact Oversubscription, significant at the 1% level. We find that the magnitude of the Debut variable is higher compared to our main results. It suggests that the information asymmetry of new issuer coupled with increased information asymmetry during crisis period could further dampen investor demand. In Column (6), consistent with argument of Liang et al. (2016) and DeHaan (2017) that ratings are more important in the postcrisis periods, we find the investor demand is significantly lower for low-graded bonds in postcrisis periods. We also find that oversubscription is positively related to the spread, at the 5% level. The Debut variables loses its significance in postcrisis periods. Frequency is significantly negative in the postcrisis periods, albeit at the 10% level, suggesting that frequent issuers see lower investor demand consistent with our argument of lower diversification benefit of bonds issued by frequent issuers. In Column (7), we add additional variable to control for the impact of quantitative easing (QE) program by European Central Bank (ECB). Todorov (2020) shows that the QE program by ECB significantly affected the liquidity, prices, yields, and bid-ask spread of bonds in Europe. We take the log value of Corporate Sector Purchase Program (CSPP) beginning June 2016. The results are consistent with Column (6). Overall, we find that the importance of credit risk and the market presence variables is significant in the crisis and the postcrisis periods.

[29]The results are unchanged when we examine Orderbook Size.

TABLE 5 OLS regressions predicting orderbook oversubscription surrounding the financial crisis

The table reports regressions predicting orderbook oversubscription for 1846 euro-denominated investment grade public bond issues made by Western European firms surrounding the Financial and Euro crisis. Models (1)–(3) uses crises dummy. Pre-Crisis is a dummy variable that takes value of 1 for periods between January 2001–November 2006 and 0 otherwise, Crisis is a dummy variable that takes value of 1 for periods between December 2006–September 2012 and 0 otherwise, and Post-Crisis is a dummy variable that takes value of 1 for periods between October 2012–December 2020 and 0 otherwise. Models (4)–(6) uses the time-period when crises dummy variable is equal to 1. Standard errors clustered at the firm level are in parenthesis. All variables are defined in Appendix B. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

	Crisis dummy			**Pre-Crisis**	**Crisis**	**Post-Crisis**	**Post-Crisis with QE**	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**χ2 difference (4) vs. (6)**
Pre-Crisis	−1.431***							
	(0.197)							
Crisis		1.007***						
		(0.173)						
Post-Crisis			−0.368					
			(0.253)					
Credit risk								
Rating	−0.045	−0.015	−0.031	0.076	−0.037	−0.131**	−0.272***	0.37
	(0.040)	(0.039)	(0.039)	(0.055)	(0.092)	(0.065)	(0.094)	
Spread	0.221***	0.224***	0.336***	−0.180	0.158	0.480**	0.638*	2.65
	(0.082)	(0.078)	(0.078)	(0.231)	(0.102)	(0.202)	(0.340)	
Leverage	−1.578***	−1.638***	−1.875***	−0.351	−2.476***	−1.072	−0.732	1.10
	(0.489)	(0.504)	(0.533)	(0.622)	(0.916)	(0.930)	(1.321)	
Bond market presence								
Frequency	−0.014***	−0.011**	−0.011**	−0.006	−0.002	−0.013*	−0.015*	0.20
	(0.004)	(0.005)	(0.005)	(0.007)	(0.008)	(0.008)	(0.008)	

TABLE 5 (Continued)

	Crisis dummy			Pre-Crisis	Crisis	Post-Crisis	Post-Crisis with QE	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	$\chi 2$ difference (4) vs. (6)
Debut	−0.148	−0.210	−0.402**	0.308*	−0.959***	0.613	0.628	3.53**
	(0.183)	(0.185)	(0.195)	(0.165)	(0.360)	(0.579)	(0.974)	
Quantitative easing								
Ln(CSPP)							−0.200	
							(0.207)	
Control factors								
Ln (Assets)	−0.322***	−0.258***	−0.271***	−0.104	−0.745***	−0.144	−0.062	6.33**
	(0.089)	(0.087)	(0.089)	(0.116)	(0.170)	(0.143)	(0.157)	
Gov_Owned	0.111	0.109	0.267	1.317***	−0.414	0.253	0.751	0.56
	(0.225)	(0.231)	(0.220)	(0.385)	(0.389)	(0.422)	(0.621)	
Intangibles	−0.112	−0.076	0.009	−0.635	0.827	−0.070	−0.056	0.22
	(0.367)	(0.369)	(0.361)	(0.799)	(0.656)	(0.501)	(0.600)	
MTB	0.203	0.398***	0.338**	0.024	0.013	0.443**	0.515*	3.68**
	(0.132)	(0.140)	(0.151)	(0.158)	(0.268)	(0.219)	(0.292)	
Flight to safety	0.217**	0.045	−0.007	−0.164	0.417**	−0.237	−0.106	4.69**
	(0.100)	(0.091)	(0.099)	(0.160)	(0.160)	(0.247)	(0.330)	
Flight to quality	0.237**	0.315***	0.426***	−0.016	−0.034	0.659***	0.626**	6.38**
	(0.105)	(0.102)	(0.099)	(0.203)	(0.170)	(0.190)	(0.288)	
Major_Econ	0.108	0.040	0.038	−0.211	0.107	0.181	0.046	0.00
	(0.171)	(0.167)	(0.169)	(0.225)	(0.303)	(0.294)	(0.441)	

(Continues)

TABLE 5 (Continued)

	Crisis dummy			Pre-Crisis	Crisis	Post-Crisis	Post-Crisis with QE	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	$\chi 2$ difference (4) vs. (6)
Euribor	−0.146**	−0.456***	−0.483***	0.006	−0.091	−0.466	−1.490	0.35
	(0.073)	(0.060)	(0.082)	(0.131)	(0.130)	(0.639)	(2.389)	
Ln (Issue_Size)	−0.262	−0.328*	−0.349*	−0.004	0.066	−0.963**	−1.636**	4.04**
	(0.198)	(0.199)	(0.198)	(0.210)	(0.317)	(0.463)	(0.651)	
FRN	−0.338	−0.439*	−0.645***	0.030	−1.169***	−0.246	0.287	0.80
	(0.236)	(0.228)	(0.239)	(0.323)	(0.389)	(0.941)	(0.518)	
<3.0 year	−0.490	−0.581	−0.414	−0.173	−1.211**	0.115	0.278	2.19
	(0.403)	(0.402)	(0.401)	(0.283)	(0.607)	(0.389)	(0.370)	
3.0–5.9 year	0.023	0.022	0.056	−0.250	−0.409	0.417	0.790**	3.66*
	(0.149)	(0.149)	(0.149)	(0.164)	(0.253)	(0.254)	(0.361)	
9.0–11.9 year	−0.282*	−0.297**	−0.321**	0.103	−1.106***	0.047	−0.245	9.39***
	(0.147)	(0.149)	(0.149)	(0.190)	(0.260)	(0.218)	(0.251)	
≥12.0 year	−0.060	−0.150	−0.238	0.517	−0.650	0.097	0.054	1.74
	(0.169)	(0.166)	(0.165)	(0.331)	(0.415)	(0.197)	(0.266)	
Constant	11.321***	11.849***	13.117***	3.171	6.132	25.167***	40.256***	
	(3.987)	(4.016)	(4.002)	(4.268)	(6.717)	(9.355)	(12.507)	
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
No. of observations	1525	1525	1525	318	580	627	356	
Adjusted R^2	0.228	0.223	0.200	0.103	0.209	0.162	0.215	
F-statistic	15.365***	14.470***	14.062***	2.937***	11.768***	4.721***	92.330***	

5.4 | Impact of bookrunner characteristics

Bookrunner characteristics related to the number of syndicate members, reputation, existing relations and geographical proximity to issuing firms has been shown to influence quality of service. For example, Shivdasani and Song (2011) find that bond issues by coled bookrunner syndicates are more likely to be associated with financial misrepresentation. Corwin and Schultz (2005) and Yasuda (2005) show that prior relationships are a key determinant of underwriter selection decisions. Fang (2005) and Butler (2008) find that high reputation and geographically proximate bookrunners, respectively achieve lower yield spreads for bond issues. An existing lending relation with the bookrunner could also affect the cost of debt capital for borrowing firms (López-Espinosa et al., 2017; Yasuda, 2005).

To examine the impact of the quality of bookrunner service on investor demand, and whether these factors affect our previous results, we add additional controls for the number of bookrunners, number of active bookrunners, the proportion of bookrunners that have acted as a mandated lead arranger on a loan to the issuing firm in the previous 3 years, the average league table ranking of syndicate bookrunners, and the proportion of nondomestic bookrunners in the issuing syndicate. We report these results in Table 6.

We find that having a higher number of bookrunners in the syndicate significantly increases the demand for the issue (Column 1) especially for active bookrunners who are responsible for placing the issue (Column 2), both at the 5% level. This suggests that firms can use larger active bookrunner syndicates to generate additional demand for primary market offerings. Demand also increases with the proportion of bookrunners with a prior lending relationship to the firm (Column 3, significant at the 1% level). This highlights the benefit of using bookrunners with prior experience of the issuing firm (Fang, 2005; Yasuda, 2005). However, we find no relation between demand and the average league table ranking of syndicate bookrunners as well as the proportion of nondomestic bookrunners in the syndicate (Columns 4 and 5). The inclusion of these additional controls does not otherwise impact on our results in Tables 4A and 4B.[30]

The positive relation between measures of bookrunner syndicate structure and investor demand is inconsistent with an experience-based argument, where one objective for a high-quality bookrunner syndicate could be to set the credit spread sufficiently low to minimize underpricing and the resulting orderbook oversubscription. The positive relation we observe provides evidence that bookrunners seek to maximize demand for an issue, and we suggest that maximizing demand allows bookrunners greater flexibility in negotiations of price and other issue terms, determining final bond allocations, and protecting the issue against unexpectedly weak market conditions.

[30]One issue with this test in Table 6 is that bookrunner syndicate size and credit spreads have increased in parallel surrounding the financial crisis. Shivdasani and Song (2011) and Carbó-Valverde et al. (2017) document an increase in the size bookrunner syndicates over time for US and European bond issues, respectively. This could lead to a spurious relation between syndicate size and investor demand, given the increase in demand surrounding the crisis documented previously. To examine this issue, we add the precrisis, Crisis and postcrisis dummy to this test. Adding this does not affect the significant relation between active bookrunners, prior lenders, and investor demand for bond issues.

TABLE 6 OLS regressions predicting orderbook oversubscription with additional bookrunner controls

The table reports regressions of Oversubscription with additional controls for bookrunner syndicate structure for 1846 euro-denominated investment grade public bond issues by Western European firms during 2001–2020. Standard errors clustered at the firm level are in parenthesis. All variables are defined in Appendix B. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
Bookrunner syndicate					
Ln (Bookrunners)	0.504** (0.198)				
Ln (Active_Bookrunners)		0.505** (0.221)			
% of Bookrunners prior lender			0.648*** (0.160)		
Average_Bookrunner_Rank				−0.016 (0.012)	
% of Nondomestic Bookrunners					0.258 (0.288)
Credit risk					
Rating	−0.053 (0.039)	−0.057 (0.040)	−0.050 (0.038)	−0.039 (0.039)	−0.037 (0.040)
Spread	0.335*** (0.079)	0.342*** (0.079)	0.352*** (0.077)	0.343*** (0.079)	0.349*** (0.080)
Leverage	−1.842*** (0.524)	−1.948*** (0.531)	−1.738*** (0.536)	−1.832*** (0.538)	−1.867*** (0.534)
Bond market presence					
Frequency	−0.010** (0.005)	−0.012** (0.005)	−0.012** (0.005)	−0.012** (0.005)	−0.012** (0.005)
Debut	−0.348* (0.193)	−0.358* (0.195)	−0.340* (0.192)	−0.408** (0.196)	−0.403** (0.196)
Constant	14.128*** (3.976)	13.745*** (3.967)	12.990*** (3.881)	12.968*** (3.926)	12.571*** (3.931)
Firm and tranche controls	Yes	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes	Yes
No. of observations	1525	1525	1525	1525	1525
Adjusted R^2	0.204	0.202	0.209	0.199	0.199
F-statistic	14.193***	14.552***	14.257***	14.042***	13.985***

6 | BENEFITS TO BOND ISSUER OF HIGH INVESTOR DEMAND

Two important and uniform objectives of corporate bond issuers are to maintain strong access to sources of funding and to minimize their cost of debt funding.[31] In this section, we test whether higher bond investor demand can support these treasury objectives, with Section 6.1 focusing on the time to subsequent issuance and 6.2 on bond market underpricing.

6.1 | Time to subsequent issuance

The impact of investor demand on time to subsequent bond issuance is largely unexplored in the empirical literature. Jegadeesh et al. (1993) find a positive relation between equity IPO underpricing and the likelihood of undertaking a seasoned equity offer in the following 3 years. They attribute this to market feedback whereby firm upscale investment projects in response to the positive investor response to earlier capital issues where underpricing provides an indirect measure of investor demand for the issue. We extend this literature to directly examine the link between demand and time to subsequent security offerings. We propose that higher demand for today's security issuance shortens the time to the next issue by the same firm.

Following a firm's first bond issue during the sample period, we measure time to subsequent bond issuance as the time, in months, from one issue to the next. We treat multitranche offerings as a single bond issue and base the issue characteristics on the largest tranche of the issue. Since first issues do not have time to subsequent issuance data and we combine multitranche offers, our sample size is reduced to 1582 observations. To analyze the determinants of time to issuance we use a Cox (1972) hazard model where the dependent variable is the time, in months, to the next bond issue. Using time to subsequent issuance avoids bias in arbitrarily defining a cut-off point to the firm's next bond issue. In setting up the hazard model, we correct for potential bias in the estimation of survival probability due to right censoring at the end of our sample period in 2020 (Ongena & Smith, 2001). For ease of interpretation, we report regression coefficients rather than hazard rates. The coefficients present the partial impact of the explanatory variable on the probability of the issuing firm proceeding with a subsequent bond issue (Ongena & Smith, 2001). In estimating the hazard model, the regression coefficients inform of the relationship between the relevant explanatory variable and the duration to the hazard event. In the setup of the model, duration is inversely related to the hazard rate, and therefore a positive (negative) coefficient implies a shorter (longer) duration. As time to subsequent bond issuance is inversely related to the hazard rate, we predict a positive coefficient for investor demand, which implies a shorter time to the next bond issue.

Panel A of Table 7 presents summary statistics for this subsample. Mean (median) time to the subsequent issue is 30.91 months (13.00 months) and the right skew in the data reflects a small number of firms that issue infrequently.

We regress time to subsequent issuance against our two measures of investor demand for the current bond issue, and the issuer and tranche characteristics discussed previously.

[31]Other funding objectives are likely to differ between companies. For instance, some companies are expected to prefer short-dated funding while others target longer tenors (Diamond, 1991a).

However, we adjust some of these variables to reflect this test. Following the method of Jegadeesh et al. (1993) for underpricing, we add measures of unexpected demand to complement the basic measures presented in earlier testing. We define *Unex_Oversubscription* and *Unex_Ln (Orderbook_Size)* as the residuals from Column (4) in Tables 4A and 4B, respectively. We also replace Frequency, which is significantly correlated with our dependent variable, with the natural logarithm of one plus the cumulative value (in million dollar) of all past bond issues in the euro-denominated corporate bond market by the sample firm before the current issue.[32] We redefine *Issue_Size* as the capital raised across all tranches issued by the firm on the issue date. We expect that firms making larger issues today wait longer to issue in the future because they already have sufficient capital. Finally, we replace tenor dummies with a single Tenor variable for years to maturity on the bond issue.

Panel B of Table 7 shows the estimates for the impact of investor demand on time to subsequent issuance. We present results for Oversubscription in the odd numbered columns and Orderbook Size in the even numbered columns. In Columns (1) and (2), we regress time to subsequent issue against investor demand and control variables only. Our findings show that time to subsequent bond issuance is shorter when investor demand is higher, significant at the 10% level for Oversubscription and 1% level for Orderbook Size. This supports our expectation that strong investor demand for current bond issues benefits issuing firms by allowing them easier access to capital in subsequent bond issues. In Columns (3) and (4), we add controls for credit risk and bond market presence. The results remain significant for Orderbook_Size, at the 5% level, but Oversubscription is now insignificant. This implies that the absolute value of investor demand is a stronger driver of time to subsequent issuance than relative demand.

In Columns (5) and (6) we replace our basic measures of demand with proxies for unexpected demand. We find a significant positive coefficient on both measures of unexpected demand. The results are statistically stronger for the unexpected demand measure, significant at the 1% level in Column 6, suggesting that after controlling for known determinants of demand, it is excess demand for current bond issues that allows companies to shorten the time to subsequent issuance Table 4A.[33] This supports the theory developed in Jegadeesh et al. (1993) for IPO underpricing and provides direct evidence that firms respond to unexpectedly high investor demand for bond issues by returning to the market more quickly in subsequent offering decisions.

[32]The variable Frequency that is used to predict investor demand in Tables 4 and 5 is defined as the total number of tranches issued during sample period by the issuing firm, and includes issues made before and after the current bond issue. So, it is both a forward- and backward-looking measure of bond market presence of the issuing firm. When we switch our focus to the hazard models identifying time to subsequent bond issuance, the Frequency variable, which includes this forward-looking component, is no longer appropriate because firms that issue more frequently during the sample period will naturally have shorter time until subsequent bond issuance. Past_Debt variable is defined as the cumulative amount of euro-denominated public debt issued in EUR millions by each firm during the sample period before the current issue, and therefore measures bond market presence focusing only on past issues made by the firm during the sample period.

[33]Our results are unchanged if we use a parametric model (Accelerated Failure Time) assuming an Exponential or Weibull specification, or if we add year dummies to the first stage demand regressions in Table 4A and 4B. We also estimate Tobit regressions of the time between issues and find a negative and significant (at the 1% level) relation between both Oversubscription and Ln (Orderbook_Size) and time between issues, supporting the hazard model findings. We find no relation between investor demand or unexpected demand for the current issue and the value of capital raised in the subsequent issue.

TABLE 7 The impact of investor demand on the time to a firm's next bond issuance

In this table Panel A presents summary statistics and Panel B presents Cox (1972) semi-parametric hazard models predicting time, in months, to the next bond issue for 1,846 euro-denominated investment grade public bond issues made by Western European firms during 2001-2020. Unex_Oversubscription and Unex_Ln (Orderbook_Size) are the residuals from Column (4) in Tables 4A and 4B respectively. Past_Debt is the euro value of debt capital raised during the sample period and prior to the current bond issue. Standard errors are in parenthesis. All remaining variables are defined in Appendix B. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

Panel A: Summary statistics

	Number	Mean	Median	SD
Time to subsequent issue	1582	30.91	13.00	44.393

Panel B: Cox hazard models of time to next issue

	(1)	(2)	(3)	(4)	(5)	(6)
Oversubscription	0.025* (0.014)		0.015 (0.015)			
Ln (Orderbook_Size)		0.180*** (0.059)		0.133** (0.061)		
Unex_Oversubscription					0.026* (0.015)	
Unex_Ln (Orderbook_Size)						0.167*** (0.064)
Rating			0.025 (0.021)	0.025 (0.021)	0.025 (0.021)	0.024 (0.021)
Spread			0.064 (0.040)	0.055 (0.040)	0.069* (0.039)	0.068* (0.039)
Leverage			0.608** (0.267)	0.658** (0.267)	0.583** (0.264)	0.604** (0.264)
Ln (1+Past_Debt)			0.062 (0.042)	0.054 (0.043)	0.059 (0.042)	0.052 (0.043)
Debut			0.106 (0.322)	0.055 (0.323)	0.080 (0.322)	0.038 (0.323)
Ln (Assets)	0.465*** (0.037)	0.470*** (0.036)	0.433*** (0.050)	0.442*** (0.050)	0.432*** (0.050)	0.439*** (0.050)
Gov_Owned	−0.302* (0.164)	−0.314* (0.164)	−0.186 (0.170)	−0.193 (0.170)	−0.180 (0.170)	−0.175 (0.170)
Intangibles	−0.219 (0.176)	−0.248 (0.176)	−0.188 (0.184)	−0.202 (0.184)	−0.191 (0.184)	−0.201 (0.184)
MTB	0.154*** (0.053)	0.150*** (0.054)	0.220*** (0.058)	0.215*** (0.059)	0.227*** (0.058)	0.227*** (0.059)

(Continues)

TABLE 7 (Continued)

Panel B: Cox hazard models of time to next issue	(1)	(2)	(3)	(4)	(5)	(6)
Flight to safety	−0.067 (0.044)	−0.056 (0.044)	−0.029 (0.046)	−0.023 (0.046)	−0.030 (0.046)	−0.031 (0.046)
Flight to quality	0.007 (0.043)	−0.012 (0.043)	−0.048 (0.048)	−0.060 (0.048)	−0.041 (0.047)	−0.041 (0.047)
Major_Econ	−0.034 (0.077)	−0.031 (0.077)	−0.012 (0.079)	−0.009 (0.079)	−0.011 (0.079)	−0.010 (0.079)
Euribor	−0.084*** (0.033)	−0.067** (0.033)	0.003 (0.037)	0.012 (0.037)	−0.005 (0.037)	−0.006 (0.037)
Ln (Issue_Size)	−0.131* (0.069)	−0.271*** (0.083)	−0.149** (0.072)	−0.251*** (0.086)	−0.154** (0.073)	−0.160** (0.073)
FRN	0.056 (0.143)	0.126 (0.145)	−0.063 (0.176)	−0.015 (0.178)	−0.069 (0.176)	−0.065 (0.176)
Tenor	−0.008 (0.010)	−0.008 (0.010)	−0.006 (0.010)	−0.006 (0.010)	−0.006 (0.010)	−0.007 (0.010)
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	1209	1210	1177	1178	1177	1178
LR χ^2	287.81***	285.34***	300.88***	304.96***	302.95***	306.94***

6.2 | Underpricing

The financial press regularly highlights examples of instances where investor demand has an impact on final bond pricing.[34] The literature notes that orderbook information can be used by bookrunners to set the issue price more accurately (Cornelli & Goldreich, 2003). In the context of the bond market, de Jong et al. (2013) finds some evidence of the impact of various proxies of investor demand on bond pricing. Similarly, Sorensen (1980) argue that the underwriters can react to investor demand by changing the bond yields. In equity markets, studies find a positive relation between orderbook demand and pricing revisions against IPT (Cornelli & Goldreich, 2003; Derrien, 2005). Hence, we also analyze the impact of investor demand on the pricing of bonds against the issuer's outstanding bonds.

Our measure of pricing revision is the New Issue Premium variable. To encourage bond investors to purchase in the primary market, a company can offer a higher spread than an equivalent bond trading in the secondary market (Ederington, 1974). New Issue Premium is defined as the spread on a newly issued bond minus the fair value spread for existing bonds with a similar tenor. Fair value is determined by data providers using linear interpolation on the outstanding bonds of the issuer, applying bid spread to midswap quotes from active market makers, before the announcement of the new bond issue. We scale this by the midpoint of the IPT. The lower the New Issue Premium, the lower the cost of capital for the issuing firm. The new issue premium is available for 1005 tranches in our sample and has a mean (standard deviation) value of 8.798 (10.012) bps, confirming that the average newly issued bond offers a higher spread than the firm's existing bonds trading in the secondary market. Given the inverse relation between pricing and yields, we predict that increased demand will reduce the new issue premium, and therefore, an increased price received by the issuing firm for their bond offering.

Table 8 reports regressions of new issue premium against investor demand. In both regressions, Columns 1 and 2, the coefficients for investor demand are significantly negative, at the 1% level. A stronger demand from investors results in a higher final price the firm receives (lower at issue spread due to higher investor demand and lower new issue premium), resulting in a lower yield of the issued bond (for investors), and correspondingly a lower cost of capital for the firm. Therefore, our results here demonstrate that strong investor demand during the bookbuilding phase of the offering allows the firm to lower its cost of capital through setting a lower at-issue spread.[35]

Based on the mean pricing range of 8.628 bps, a one standard-deviation increase in Oversubscription (2.456) is associated with a decrease in new issue premium of 1.474 bps. Likewise, a 10% increase in Orderbook Size is associated with 0.34 bps decrease in new issue

[34]For example, 'Germany's dominant telecommunications group Deutsche Telekom AG (DT) tightly priced EUR1.5 billion in seven-year bonds Thursday in its last euro-denominated issue of this year solid investor demand for the issue and an order book of over EUR4 billion meant that Deutsche Telekom could issue the deal three basis points cheaper than initial guidance', *Dow Jones Newswire*, October 19, 2006.

[35]The median value for the dependent variable in this regression is zero. Therefore, we confirm the robustness of our findings using a logit regression where the dependent variable is set equal to one if there is underpricing, and zero otherwise. We also examine recalculate the dependent variable as final price divided by either the high or low point of the pricing range, rather than the mid-point. Our results are robust to the change in estimation method and variable measurement.

TABLE 8 Analysis of bond pricing (new issue premium) against existing bonds

This table reports the OLS regressions of at-issue credit spread relative to credit spread on the firm's existing bonds (new issue premium) for euro-denominated investment grade public bond issues made by Western European firms during 2009-2012. Standard errors clustered at the firm level are in parenthesis. All variables are defined in Appendix B. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

	(1)	(2)
Oversubscription	−0.006*** (0.002)	
Ln (Orderbook_Size)		−0.034*** (0.008)
Rating	−0.012*** (0.004)	−0.011*** (0.004)
Spread	0.028*** (0.005)	0.029*** (0.005)
Leverage	−0.044 (0.039)	−0.042 (0.040)
Frequency	0.000 (0.000)	0.000 (0.000)
Debut	−0.006 (0.012)	−0.005 (0.012)
Ln (Assets)	0.005 (0.005)	0.005 (0.005)
Gov_Owned	−0.035** (0.015)	−0.034** (0.016)
Intangibles	0.014 (0.018)	0.012 (0.018)
Flight to safety	−0.014** (0.007)	−0.016** (0.007)
Flight to quality	−0.005 (0.007)	−0.003 (0.006)
MTB	0.020** (0.008)	0.021** (0.009)
Major_Econ	0.008 (0.013)	0.008 (0.013)
Euribor	0.022*** (0.007)	0.021*** (0.007)
Ln (Issue_Size)	−0.011 (0.016)	0.024 (0.019)
Tenor	−0.005*** (0.001)	−0.005*** (0.001)
Constant	0.373 (0.333)	−0.335 (0.401)
Sector dummies	Yes	Yes
No. of observations	868	869
Adjusted R^2	0.202	0.209
F-statistic	12.021***	12.510***

premium. Given the average issue size of approximately EUR 785.45 m for our sample, we argue that these figures are economically large for issuing firms. These results support research that shows orderbook bids provide information to bookrunners that is pertinent to the final pricing of the issue (Cornelli & Goldreich, 2003; Derrien, 2005).

For control variables, we find that final pricing relative to IPT is higher for riskier securities, based on Spread and Rating, and the pricing adjustment is higher in Major Economies. New Issue Premium is increasing with the Euribor and MTB and is negatively related to Tenor and Flight to Safety.

7 | ROBUSTNESS TESTING

In this section, we summarize the robustness tests of our main multivariate regression results.[36]

7.1 | Alternative model specification and sample exclusions

Bookrunners typically manage bond issues on a best-efforts basis in the euro-denominated investment grade market. Despite this, bookrunners of poorly subscribed tranches can place proprietary orders to increase orderbook size and avoid the reputational costs associated with failed tranches. To address concerns that our results are biased by the inclusion of these tranches, we conduct Tobit regressions by dropping all tranches with Oversubscription below 1.0 (and 1.25) to restrict our sample to fully subscribed issues. The number of observations drop by 18 (58). These results are qualitatively in line with the main results in Tables 4A and 4B.

As we define frequency using the number of tranches during our sample, we also replace the issue frequency with two alternative measures. First, we count the number of tranches issued before the current issuance and second, we restrict the count to the previous 3 years. Our results are robust and similar to the main results.

It is also possible that captive finance and real estate investment trusts (REITs), both of which are in our overall sample, require a distinct set of explanatory firm variables in comparison to other industry groups, given the restricted focus of their activities and resulting implications for credit risk. Our results again remain qualitatively unchanged when we exclude these issues from the sample.

Furthermore, one could argue that some of our results are influenced by conducting the analysis at tranche level rather than at bond level. A total of 38% of our sample tranches are part of multitranche offerings. In these cases, there is likely to be a degree of cannibalization whereby the orders placed are distributed across different tranches and hence not purely driven by the drivers of that tranche specifically. We conduct two robustness tests, first, we group all the tranches of multitranche transactions as a single observation and second, we rerun our main analysis excluding multiple tranche bonds. We find results to be similar to our main results.

7.2 | Reliability and selection bias in orderbook oversubscription data

We conduct two tests to validate the reliability of using our publicly reported orderbook data. For the first test, we are able to obtain a proprietary sample of orderbook statistics from a leading European investment bank and we match this to our sample of bond tranches. This data set is broadly similar in terms of issuer and tranche characteristics. The Pearson correlation coefficient between the figures for orderbook size in the investment bank sample and our own data is 0.994, suggesting limited misreporting in our measure of bond investor demand. Bookrunner groups change regularly during the sample: 49 different banks are involved in the transactions in the investment bank subsample, with an average of 4.54 bookrunners per transaction. These 49 banks were involved in 99.9% of the

[36]The detailed results of these tests are available from authors on request.

remaining transactions in our sample, increasing the likelihood that their orderbook sizes are also reported accurately.

Second, we examine the issue of selection bias for tranches that report orderbook data and those that do not. As noted previously, orderbook data are available for 1846 from 3169 tranches or 60.0% of the potential sample. To examine this in more detail we estimate a logit regression of the determinants of orderbook availability. We find that unreported tranches are more highly rated by S&P, have smaller issue sizes, and are less frequent in the earlier years of our sample period. Since we find no relation between Rating and investor demand we suggest that any selection bias has had a minimal effect on our reported results.

7.3 | Control variables

In addition to the control variables presented in our main testing, we add a number of additional variables and variations to our existing variables. We add controls for firm profitability, a dummy identifying whether the issuing firm (rather than the tranche) is rated by any of the three major rating agencies, and tranche controls for whether the bond was issued through a Euro Medium Term Note (EMTN) program, was issued as part of a multitranche offering, and whether the bond is a benchmark size issue. We also add a control for the 3-month moving average spread between AA and BBB rated corporate bonds to account for time variation in the premium between the highest rated and lowest rated bonds in the investment grade market. The inclusion of these variables does not affect the general sign and significance levels of the coefficients reported in Tables 4A and 4B.

In further testing, we replace the at-issue spread with the total yield to assess whether the preference for high credit spread bonds is driven by the higher absolute yield these bonds tend to offer. This alternative variable is insignificant, confirming that investors focus on credit risk based on the spread over the relevant benchmark rather than absolute yields when placing orders for newly issued bonds.

We test whether the observed relation for leverage holds when using net debt to proxy for a firm's indebtedness. Results are qualitatively unchanged from the main results in Tables 4A and 4B. In addition, we replace the major economy dummy with country fixed effects for the sample and we replace the natural log of tranche size with a relative tranche size variable scaled by book value of assets for the issuing firm. In some of these alternative specifications, the significance of the Frequency variable weakens, but our findings for Spread, Leverage and Debut are unaffected. Finally, we add squared terms for intangible assets and growth opportunities, given the apparent variation in demand around the median highlighted in Table 3. The inclusion of these variables does not affect the remaining explanatory variables.

8 | CONCLUSION

In this paper, we analyze the factors that influence the demand for corporate bonds by examining the determinants of orderbook oversubscription for a sample of 1846 euro-denominated public bond tranches issued by 408 Western European firms between 2001 and 2020. We directly test theories of investor demand for financial securities based on credit risk and bond market presence. In addition, we examine two areas where high demand benefits issuing firms, namely the time to subsequent bond issuance and the final pricing of the bond issue.

Our results highlight that demand for corporate bonds is closely linked to factors associated with the credit risk and bond market presence of the issuing firm. Demand for bond securities increases with the at-issue credit spread. This is consistent with a portfolio choice view of such higher-risk bonds being a scarce resource in the European bond markets and are therefore required by investors to optimize the risk-return characteristics of their bond portfolio. Bond demand is lower for highly leveraged firms, debut issuers, and the most frequent issuers. Our results suggest that investors consider the marginal contribution that a security makes to their portfolio when deciding how large an order to place for the newly issued security.

The drivers of bond investor demand are strongest during the crisis periods (the period encompassing the global financial crisis and eurozone crisis) and after crisis periods, which we attribute to the rapid expansion of the euro-denominated bond market in this period resulting in greater heterogeneity of investor demand. Bond demand increases with the number of active bookrunners in the sponsoring syndicate, bookrunner reputation, and for bookrunners with prior experience as lenders to the issuing firm.

We find that high investor demand significantly benefits the issuing firm in two important ways. High demand for today's issue shortens the time to subsequent bond issues in the same segment of security issuance markets. It also reduces its cost of capital by lowering the underpricing of a new issue vis-à-vis a firm's outstanding bonds.

Our results are robust to alternative and additional control variables, model specifications, and verification tests on the publicly reported orderbook data. We show that bond orderbook data, while a relatively new variable in the context of academic literature, is both widely and accurately reported.

Our research has implications for corporate treasury departments. Firms seeking to maintain strong bond market access should diversify across several bond markets, for instance the European and American markets, to avoid becoming a frequent issuer in one market. This applies particularly to firms seeking to use the bond markets to establish or maintain a highly levered balance sheet. Such companies may be required to also rely on private debt sources which include more restrictive covenants. In addition, the bond market should not be seen as a 'closed club' only accessible for large, utility-like firms. Companies with more volatile business profiles, such as BBB category firms, should still consider themselves viable bond market candidates. Finally, firms should not delay a debut offering for fear of a weak reception, as their subsequent offering is likely to garner more traction.

Our study does have limitations. We do not directly test the magnitude of portfolio diversification benefits for individual investors, which appear to drive our results. Further research into investors' bond portfolio compositions is therefore warranted to explore the quantum of orders placed in the primary market.

DATA AVAILABILITY STATEMENT

Data is from subscription sources.

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APPENDIX A

See Table A1.

TABLE A1 Corporate bond issuance and pricing steps

Panel A: Key stages		
Stage	**Activities and events**	
Prospecting	Issuer identification	
	Competition among investment banks	
	Mandate of bookrunners and other parties	
Preparation	Bond contract and supporting documentation written	
	Regulatory approval	
	Due diligence by bookrunners	
Marketing	Investor roadshow and/or conference calls	
Bookbuilding	Bookbuilding	
	Determination of size and price	
	Allocation	
Closing	Documentation signed	
	Settlement	
Panel B: Illustrative example of typical bond pricing on issue date		
07:45	Go/NoGo call, If a 'Go', Bringdown due diligence is conducted	Joint Lead Managers (JLMs)/ Bookrunners, Bond issuer
08:15	Announcement of transaction, including initial price guidance (IPT)	JLMs
10:30	Update call on status of orderbook; discussion around revised price guidance	JLMs, Bond issuer
10:40	Revised price guidance announced	JLMs
11:10	Update call on status of orderbook; discussion around final pricing	JLMs, Bond issuer
11:20	Final pricing announced to the market	JLMs
11:30	Orderbook closed	JLMs
11.30–11:45	Orderbook reconciliation between the bookrunners. Final orderbook size determined	JLMs
11:45–13:30	Syndicates determine allocations	JLMs
13:30–13:45	Allocations discussed with issuing firm	JLMs, Bond issuer
13:45	Allocations released to investors	JLMs
13:45–14:15	Investors provide hedge instructions	JLMs
14.30	Transaction pricing call	JLMs, Bond issuer
14:45	Final pricing circulated. New bonds free to trade	JLMs
15:00	Final term sheet circulated	JLMs, Bond issuer

Source: Choudhry (2010) and ICMA (2012).

APPENDIX B

See Table B1.

TABLE B1 Sources and calculations for variables

Proxy	Calculation	Source
Investor demand		
Orderbook_Size	Natural logarithm of EUR billions value of bond orderbook.	GlobalCapital, IFR
Oversubscription	Orderbook size/issue size.	GlobalCapital, IFR
Credit risk		
Rating	Numeric value of S&P rating for the bond tranche, descending from 1 for AAA down to 10 for BBB- and 11 for unrated tranches.	Dealogic, S&P
Spread	Re-offer spread over euro midswap rate.	Dealogic, IFR, GlobalCapital
Leverage	Total debt divided by total assets.	Datastream
Bond market presence		
Frequency	Number of tranches issued during sample period.	Dealogic
Past_Debt	Cumulative amount of euro-denominated public debt issued in EUR millions by each firm during the sample period prior to the current issue.	Dealogic
Debut	First euro-denominated tranche in extended sample dating back to 1999 (dummy).	Dealogic
Control factors		
Assets	Total assets, measured in EUR billions	Datastream
Gov_Owned	Majority publicly owned (dummy).	S&P, Moody's, Fitch, company reports
Intangibles	1 – (net plant, property and equipment/total assets).	Datastream
Flight to safety	Spread between long-term interest rates (correspond to 10-year government bond yields) and short-term interest rates (correspond to government treasury bill yields) of the issuer country	OECD
Flight to quality	Spread between long-term interest rates of the issuer country and long-term interest rates of US government bond.	OECD
Ln (CCP)	Log of value of Corporate Sector Purchase Program.	ECB
MTB	(total assets + market value of equity – book value of equity)/(total assets).	Datastream
Major_Econ	Company nationality of operations is Germany, U.K. or France (dummy).	Dealogic, company reports
Euribor	Six-month Euribor rate i.e. level of short-term risk-free rate measured on the first trading day of the calendar month of bond issue.	Dealogic

TABLE B1 (Continued)

Proxy	Calculation	Source
Issue_Size	Amount issued in tranche in EUR millions. In hazard models we aggregate issue size to include all bond tranches issued on that date.	Dealogic
FRN	Coupon has a floating rate (dummy).	Dealogic
Tenor	Years to maturity of bond issue.	Dealogic
Crisis	Issue takes place on or after September 1, 2008 (dummy).	Dealogic
Sector	Industry classification: consumer, industrial, telecom, transportation or utility (dummies).	Datastream, company reports
Bookrunner syndicate		
Bookrunners	Total number of bookrunners in the sponsoring syndicate.	Dealogic
Active_Bookrunners	Total number of active bookrunners in the sponsoring syndicate.	Dealogic, GlobalCapital, IFR
% of Bookrunners prior lender	The proportion of the bookrunner syndicate that acted as a mandated lead arranger on a loan to the issuing firm in the three years prior to the current bond issue.	Dealogic, GlobalCapital, IFR
Average_Bookrunner_Rank	The average league table rank of sponsoring bookrunners based on total deal values managed over the sample period.	Dealogic, GlobalCapital, IFR
Bond pricing		
Spread/MidPoint	The at-issue Spread divided by the midpoint of the initial price range. If no range is specified, the initial spread is taken as the midpoint	GlobalCapital, IFR, IGM Deal Navigator
Spread/range	(At-issue Spread – Low Spread)/(High Spread – Low Spread). Available only for bonds where an initial spread range is explicitly identified.	GlobalCapital, IFR, IGM Deal Navigator
New issue premium	The spread on the newly issued bond minus the secondary market interpolated spread on the issuer's outstanding bonds with the same maturity divided by the midpoint of the initial pricing range.	GlobalCapital, IFR, IGM Deal Navigator