Investment Advisers in the Corporate Board and Their Role in Bond Pricing

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by

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Abstract

The paper examines whether relationships between investment advisors and firms' executives and directors formed through working together in executive roles or serving on the board significantly affect underwriting fees proxied by gross spread and debt underpricing. The results show that interlocking leads to more accurate bond pricing and significantly lower excess initial returns on newly issued bonds. The interlocking relationships between bond issuer and investment adviser increases gross spread by 2.5-3.9%, representing $1.33-2.07 million of additional issuer's expenses, and reduces bond underpricing by approximately 6.2-14.2 bps, which represents a 11.9-27.3% reduction. Additional tests show that interlocking helps mitigate bond underpricing for high-yield bonds and the bond IPOs.

Keywords: Investment advisers; Interlocking Connections; Corporate bonds; Underpricing; Gross Spread

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1. Introduction

Debt capital market dominates the equity capital market in the U.S., with 77.5% of total financing. In 2020, corporate bond issuance reached $2.28 trillion (Capital Markets Fact Book, 2022). Since the COVID-19 pandemic, bond issuance has continued to climb, and S&P Global expected nonfinancial U.S. firms would sell more bonds in 2023 than in 2022[2]. Mispricing of financial securities, both equity and debt, got much attention in finance research due to its importance. Mispricing is the violation of the law of one price in financial markets, which states that the price of a security should equal the present value of its future cash flows. Divergence of the security's price from its fundamental value represents the risk for the investors and arbitrage opportunities. According to the efficient market hypothesis, security prices should fully reflect all available information. However, substantial literature documents an underpricing of stock (Stoll & Curley, 1970; Logue, 1973; Reilly, 1973, 1977; Ibbotson, 1975; Ibbotson & Jaffe, 1975; Downes & Henkel, 1982; Ritter, 1984, 1987, 1991, 1998; Beatty & Ritter, 1986; Smith, 1986; Chalk & Peavy, 1987; Manegold, 1987; Ibbotson et al., 1988; Beatty, 1989; Ritter & Welch, 2002). Research on corporate bond issues pricing also documents initial positive abnormal returns as evidence of underpricing (Ederington, 1974; Lindvall, 1977; Weinstein, 1978; Sorenson, 1982; Cai et al., 2007; Hale & Santos, 2007; Dick-Nielsen et al., 2021). Corporate bond mispricing is a severe concern for bond issuers, underwriters, investors, regulators, and market makers.

[2] Rabouin, D. (May 22, 2023). Fed Rate Increases Hit Small Businesses the Hardest. *Wall Street Journal*. Retrieved on 06/07/2023 from https://www.wsj.com/articles/fed-rate-increases-hit-small-businesses-the-hardest-7da7fb8e?page=4

When the firm raises capital by issuing corporate bonds, contractual obligations to pay periodic interest throughout the borrowing and the debt principal in full at maturity, it hires an investment bank. The investment bank advises on the price for the new bond issue and allocates it among investors (Nagler & Ottonello, 2017), and this process is known as underwriting. The corporate bond issuance process is opaque, and underwriters play a special role in this process. They place the bonds by guaranteeing the issuers an offering price minus the commission fee (gross spread). The underwriters may place the bonds to investors or keep them in their inventories to sell them later on the secondary market. The equity initial public offering (IPO) literature recognizes a promise to provide sell-side coverage (Dunbar, 2000), an investment bank's reputation (Corwin & Schultz, 2005), and past lending relationships between the bank and the issuer (Bharath et al., 2007) as primary factors for choosing an investment bank. Recent research also shows that prior interpersonal relationships between investment banks' and security issuers' executives and directors play a significant role in forming underwriting syndicates (Cooney et al., 2015).

This research paper examines whether interpersonal relationships between investment advisors and firms' executives and directors formed through working together in executive roles or serving on the board significantly affect debt issuance underpricing or mispricing in general. A significant strand of literature indicates that social ties facilitate efficient conduits for information flow in many business exchange settings (Hochberg et al., 2007; Cohen et al., 2008, 2010; Engelberg et al., 2012; Renneboog & Zhao, 2014; Cai et al., 2016; Hossain & Javakhadze, 2020). Social ties may also help reduce search costs and act as a channel for familiarity and loyalty (Huberman, 2001; Kuhnen, 2009). This paper examines the role of working connections on underwriters' compensation proxied by gross spread and the excess initial return on newly issued

bonds during the first calendar week of trading after its issuance as a measure of bond underpricing (as in Cai et al., 2007). For robustness, the study also utilizes the relative difference between the average transaction price over the first calendar week of trading and the offering price (as in Dick-Nielsen et al., 2021).

The study uses three proxies for the interpersonal relationship between the investment adviser and the company's executives and directors: (1) whether the individual, either the director or an executive in the investment advising firm, during the year of bond issuance holds any executive or directorship position in the bond issuing corporation (*Interlocking broad*); (2) whether the board member or executive of the investment advising firm sits in the corporate board during the year of bond issuance (*Interlocking cboard*); and (3) whether the director sits in the corporate and the investment advisor's boards, which is called the interlocking boards (*Interlocking both boards*). Interlocking directors and executives form one of the most critical networks in corporate finance. Investment advisers on the firms' boards or in executive positions provide expertise. They may allow better information flow between issuers and underwriters and mitigate information asymmetry, which may significantly affect debt issue pricing. At the same time, this connection may affect the underwriters' compensation.

Following Cooney et al. (2015), this paper examines two sides of the relationship between investment advisors and the firm: an effect on the underwriting fees and bond pricing. First, the study examines if interlocking results in significantly different underwriting fees proxied by gross spread. Cooney et al. (2005) examine the role of social ties in underwriting syndicate formation and find that interpersonal relationships lead to higher investment bank compensation in the stock IPOs. Like Cooney's et al. (2005) conclusions, the study indicates that interlocking relationships

between bond issuers and investment advisers lead to a higher underwriter's compensation proxied by gross spread.

Next, the study examines whether working connections between bond issuing firms and investment advisers significantly affect the pricing of debt issues. Cooney et al.'s (2015) *quid pro quo* hypothesis suggests that connections between the issuer and the underwriters of the stock IPO should be associated with an increase in offer price from the initial filing range, i.e., a higher price revision, which may be due to heightened promotion efforts by underwriters and more accurate initial filing stock price due to the reduced information asymmetry. Like at the stock issuance, the interlocking connections between issuers and investment advisers at the time of corporate issuance led to more accurate bond pricing and significantly lower excess initial returns on newly issued bonds. The interlocking relationships between bond issuer and investment adviser increase gross spread by 2.5-3.9%, representing $1.33-2.07 million of additional issuer's expenses, and reduce bond underpricing by approximately 6.2-14.2 bps, which represents a 11.9-27.3% reduction.

Existing research documents the corporate bond underpricing (Ederington, 1974; Lindvall, 1977; Weinstein, 1978; Sorenson, 1982; Cai et al., 2007; Hale & Santos, 2007; Dick-Nielsen et al., 2021), and the underpricing level is different between investment-grade and high-yield bonds (Datta et al., 1997; Helwege & Kleiman, 1998). This study also examines whether the interlocking relationship affects the pricing of investment-grade and high-yield bonds differently. The effect of interlocking connections on bond underpricing may be significantly different for investment-grade and high-yield bonds due to the different levels of information asymmetry connected bond issuers and advisers can mitigate. However, whether the effect is higher for high-yield bonds is an empirical question. Available literature also documents different levels of underpricing among bond IPOs and seasonal bond offerings (SBOs) due to different levels of information asymmetry

between the firms and the market participants (i.e., Cai et al., 2007). This study investigates whether the effect of connections between bond issuers and investment advisers significantly differs between bond IPOs and SBOs. We expect that interlocking connections significantly reduce underpricing for the bond IPOs. However, it is an empirical question.

The study contributes to the existing literature on bond pricing and the role of social ties in the firm's outcomes, examining the role of interlocking connections between the investment adviser and the bond issuer on bond underpricing. First, in line with available research on bond underpricing, this paper documents a significant positive excess initial bond returns during the first day of trading. However, firms with interlocking connections with investment advisers experience significantly lower underpricing. Datta, Iskandar-Datta, and Patel (1999) find that bond issuers with prior bank debt (a proxy for having bank-issuer relationships) experience a significantly lower bond underpricing (a 68 basis points lower at-issue excess yield compared to a Treasury bond with similar maturity and coupon on the same day) when issuing the bonds for the first time. Dick-Nielsen, Nielsen, and von Rüden (2021) show that existing underwriter relationships are associated with lower bond underpricing. The authors identify existing relationships between the bond issuer and an underwriter if one or more lead underwriters involved in the new bond issuance also participated in issuing currently outstanding bonds. Nam and An (2023) examine whether the cost of debt decreases when the non-financial firm has a banker on the board of directors, as shown in Korean non-financial firms. They find that firms with a banker interlocking director have a lower cost of debt than firms with no banker interlocking directors due to reduced information asymmetry between the firm and a bank.

In line with the available literature on the role of social ties on the company's outcomes, this paper documents a positive effect of interlocking on more accurate pricing of public debt.

Several research papers discuss the effect of social connections on the cost of debt. However, this study differs from the available research on the effect of social connections on bond underpricing. First, the paper examines the role of interlocking relationships identified as working as an executive or a director in industrial firms issuing a bond and an investment adviser on bond underpricing. Second, the paper utilizes the initial return on the bond first trade during the first calendar week after the issuance in excess of the cumulative return on bond index matched by the credit rating and maturity as a proxy for underpricing (Cai et al., 2007).

The study also contributes to the literature on the underwriter-company agency relationships by documenting that interlocking relationships with investment advisers are associated with higher underwriting compensation and significantly lower bond underpricing. The results may have application in other settings that involve multiple agency relationships, such as corporate restructuring, bankruptcy, divestitures, and LBOs.

The rest of the paper is organized as follows. Section 2 discusses (2.1) prior research on security, and specifically bond, mispricing, (2.2) the role of investment advisers in bond issuance, (2.3) the agency problem between the issuing firm and investment banks, and (2.4) the effect of social connections interlocking as a remedy of the agency problem. Section 3 discusses hypotheses development. Section 4 presents the data and describes the control and test variables used in the analysis. Section 5 discusses the methodology. Section 6 provides the empirical findings, while Section 7 concludes.

2. Literature review

2.1. Security Underpricing

Financial securities' pricing got much attention in finance research. The efficient market hypothesis states that security prices should fully reflect all available information, and securities

with similar characteristics should be priced similarly. However, substantial empirical literature documents an underpricing of stock (e.g., Stoll & Curley, 1970; Logue, 1973; Reilly, 1973, 1977; Ibbotson, 1975; Ibbotson & Jaffe, 1975; Downes & Henkel, 1982; Ritter, 1984, 1987, 1991, 1998; Beatty & Ritter, 1986; Smith, 1986; Chalk & Peavy, 1987; Manegold, 1987; Ibbotson et al., 1988; Beatty, 1989; Ritter & Welch, 2002). Theoretical models explain such a phenomenon by the information asymmetry (Baron, 1982; Rock, 1986; Allen & Faulhaber, 1989; Benveniste & Spindt, 1989; Grinblatt & Hwang, 1989; Welch, 1989; Chemmanur, 1993; Benveniste et al., 2002; Sherman & Titman, 2002), monopsony power of investment banks (Ritter, 1984; Chalk & Peavy, 1987), litigation risk due to legal liability (Tinic, 1988; Hughes & Thakor, 1992), incomplete markets (Mauer & Senbet, 1992), and liquidity-based explanations (Booth & Chua, 1996; Ellul & Pagano, 2006).

Existing research on corporate bond issues' pricing also documents initial positive abnormal returns as evidence of underpricing (e.g., Ederington, 1974; Lindvall, 1977; Weinstein, 1978; Sorenson, 1982; Datta et al., 1997, 1999; Cai et al., 2007; Hale & Santos, 2007; Nagler & Ottonello, 2017; Dick-Nielsen et al., 2021). Most theories on equity underpricing are relevant to explaining bond underpricing, specifically the information-asymmetry (Rock, 1986), signaling (Allen & Faulhaber, 1989; Grinblatt & Hwang, 1989; Welch, 1989), book-building (Benveniste & Spindt, 1989; Benveniste et al., 2002; Sherman & Titman, 2002), and liquidity (Booth & Chua, 1996; Ellul & Pagano, 2006) theories. This study focuses on information asymmetry and, as a result, a potential agency problem between intermediaries and bond issuers as an explanation of corporate bond underpricing.

Generally, the theories on security underpricing can be categorized based on the assumption of asymmetric vs. symmetric information. The literature discusses the effect of

information asymmetry on security underpricing, examining different information channels. The theory based on information asymmetry between the issuer and investors builds on a lemons problem (Akerlof, 1970): investors cannot differentiate between good and bad (lemons) firms and value all of them at the average price. Only issuers with worse-than-average quality are willing to sell their shares at the average price. Good-quality firms may attempt to signal their quality and sell shares at a lower price than they are worth, which prevents lower-quality firms from imitating (see theoretical papers by Brealey, Leland & Pyle, 1977; Allen & Faulhaber, 1989; Grinblatt & Hwang, 1989; Welch, 1989; Benveniste et al., 2002; Sherman & Titman, 2002). Good-quality firms may benefit later from receiving a more favorable market response to seasoned equity offerings (Ibbotson, 1975; Welch, 1989; Carter, 1992; Jegadeesh et al., 1993), future dividend announcements (Allen & Faulhaber, 1989), or analyst coverage (Chemmanur, 1993).

Cai, Helwege, and Warga (2007) examine the information asymmetry explanation of the bond underpricing and conclude that the underpricing in non-investment grade bonds can be explained by information asymmetry as the issuing companies compensate investors for the lack of information. The authors find that private firms' corporate bond issues are more underpriced than public firms' due to more severe information asymmetry.

Another strand of literature looks at the information asymmetry between the intermediaries (investment banks) and the security issuers and is more related to the research question discovered in this paper. Baron (1982) builds the model around the assumption of information asymmetry between investment banks and issuers. He argues that investment banks have more information about investors' demand than the issuers, and the issuers are willing to pay for access to this information. Moreover, investment banks play a certification role in the underwriting process, confirming issue's quality, which helps to generate demand for it. Based on Baron's (1982) model,

underwriters can use information about the market demand for securities to their advantage. Underwriters play a significant role in investor bond issue allocation and may keep a portion of it for later trade. Underpricing allows the underwriters to mitigate a placement problem and may allow them to make additional profits on trading the underpriced bond issues at the expense of bond issuers, manifesting the agency problem between the bond issuers and intermediaries (investment banks). Information asymmetry between issuers and investment banks is more profound for the bond than stock issues because most bonds trade in the over-the-counter market, which is opaque and more reliant on the intermediaries for price discovery. However, having interlocking connections between the bond issuer and investment banks can mitigate information asymmetry between the parties and the agency problem by lowering the desire to profit at the expense of the bond issuer.

Investors can thoroughly analyze the bond issuer to reduce the information asymmetry. However, this analysis can be costly, and underpricing is the way to compensate the investors for their efforts (Leite, 2006). This process is called the book-building process (Benveniste & Spindt, 1989; Benveniste et al., 2002; Sherman & Titman, 2002; Cai et al., 2007). The size of compensation (the level of underpricing) depends on how much investors can benefit from hiding this information. Investors do not want to bid too low on issues that have high valuation, as it may negatively affect the stock allocation. The investors who regularly have priority in IPO allocation earn abnormal returns, and bidding too low may remove the investor from the list of the regulars leading to the loss of these profits.

The book-building process allows the investment banks to reward their favorite clients by allocating underpriced issues among them. Ritter (1984) and Chalk and Peavy (1987) argue that underwriters are willing to underprice IPOs and allocate them to favored investors to get more

business and collect more fees in the future. Investment banks expect investors to participate repeatedly in security allocations and, in exchange, benefit them with discounted offerings (Hanley & Wilhelm, 1995). The book-building process applies to corporate bond pricing and allocation. For instance, in the working paper on corporate bond underpricing post-crisis, Nagler and Ottonello (2017) find that investors with close underwriter relations based on past bond holdings issued by underwriters are rewarded through increased underpricing.

Therefore, investment banks may underprice securities to please the investors, solve a placement problem, or earn profits from trading the underpriced bond issues at the expense of bond issuers. However, they are motivated to price the securities accurately to maintain their reputation and attract higher-quality clients (Titman & Trueman, 1986). Huges and Thakor (1992) developed a model with two types of underwriters: myopic and nonmyopic. The nonmyopic underwriters maximize long-run profits, while myopic underwriters maximize short-run profits.

Prioritization of the long-run vs. short-run profits can be seen as the underwriter's reputation. Investors form their beliefs about the relation between the IPO price and the security's intrinsic value based on the underwriter's reputation. If they are convinced that the likelihood that the issue was overpriced is high, they will sue the underwriter, which is costly. The probability of litigation depends on the variance of cash flows, and the greater the risk of litigation (the greater the variance of cash flows), the greater the underpricing. Therefore, the underwriters that prioritize long-term profits (nonmyopic) and maintain their reputation will underprice more, but the level of underpricing will depend on the firm's quality. Specifically, from the developed model of Huges and Thakor (1992), nonmyopic underwriters price good-quality firms at a higher price and low-quality firms at a lower price. Similarly, Tiniç's (1988) paper (initially suggested by Ibbotson, 1975) argues that IPO underpricing serves as an insurance against legal liabilities and the

associated damages to the investment bankers' and issuers' reputation. Investors rely on the information provided by the investment banks. As an issue certifier, the investment bank risks its reputation. The underpricing of the issue reduces the probability of the after-market price falling below the offer price and may protect from possible legal liabilities.

The theories discussed above build on information asymmetry between issuers and investors, issuers and intermediaries (investment banks), or intermediaries and investors, leading to security underpricing at the issuance. This paper focuses on discovering how interpersonal relationships between bond issuers and intermediaries (investment advisers) in the form of working in the same company (either in the firm issuing a bond or an investment adviser) can mitigate the information asymmetry and, as a result, reduce corporate bond underpricing. The investment adviser working in the issuing firm, either in an executive position or sitting on the board, may bring an expertise and knowledge about the bond market, leading to more accurate bond pricing. Also, information asymmetry between bond issuers and intermediaries leads to agency problems. As assumed by book-building theory, investment banks may benefit from more severe issue underpricing as it helps them to allocate the issues and please their favorite clients and profit from selling the portion of the issue held in the future. As examined in this paper, personal relationships between investment advisers and bond issuers help mitigate the agency problem by reducing the desire to benefit from underpricing at the firm's expense. Even though investment banks may be willing to maintain their reputation by more accurately pricing the security issues and certifying the bond issues, research shows that high-yield bonds underwritten by the most reputable underwriters show significantly higher downgrade and default risk (Andres et al., 2014).

The literature on bond underpricing generally uses the term *seasoning process* to describe this phenomenon. The seasoning process refers to a period needed for newly issued bonds to trade at a discount compared to existing bonds to converge to their ideal price. According to this process, new issues have a positive yield spread with seasoned issues, disappearing over time as the new issue becomes seasoned (Lindvall, 1977). The rationale behind the seasoning process is that it requires time for the market to acquire all information about the issuer and a bond issue, which is consistent with the information asymmetry theory.

Various papers investigate the nature and level of corporate bond underpricing and seasoning process by using different bond indices from the same rating class of newly issued bonds as benchmarks or matching newly issued bonds with seasoned bonds based on relevant characteristics (Conard & Frankena, 1969; Ederington, 1974; Lindvall, 1977; Weinstein, 1978; Sorenson, 1982; Wasserfallen & Wydler, 1988; Helwege & Kleiman, 1998; Cai et al., 2007). The difference in pricing between newly issued and seasoned bonds may be explained by the heterogeneity of the new and seasoned bonds (the difference in the contractual features) whose performance is compared, the relative illiquidity of the seasoned issues, issue costs arising from the alternative methods of security allocation (Fung & Rudd, 1986), and call provision (Conard & Frankena, 1969; Ederington, 1974).

Security underpricing is also present in Seasoned Equity Offerings (SEOs) (both equity and corporate bonds), although less severe (Smith, 1977; Bhagat & Frost, 1986; Loderer et al., 1991; Eckbo & Masulis, 1992; Datta et al., 1997; Helwege & Kleiman, 1998; Mola & Loughran, 2001; Altınkılıç & Hansen, 2003; Corwin, 2003; Cai et al., 2007). For instance, Mola and Loughran (2001) found an average 3% discount for SEOs during 1986-1999, and the discount increases over time. Altınkılıç and Hansen (2003) document the increasing discounting after

releasing more negative information about the issuers, consistent with the issuer value uncertainty and placement cost explanation of underpricing of SEOs. Many papers argue that higher expected returns on seasoned securities compensate investors for the more significant trading costs and liquidity risk (Amihud & Mendelson, 1986; Brennan & Subrahmanyam, 1996; Datar et al., 1998; Chordia et al., 2000; Chordia et al., 2001; Pastor & Stambaugh, 2003). The public corporate bond issues examined in this study are more similar to equity SEO than the IPO market. The information asymmetry between the private firms going public and potential investors and intermediaries is significantly higher than during additional security (both equity and bond) issues.

The bond underpricing also differs among bond IPOs and SBOs (seasoned bond offerings), as in equity IPOs and SEOs. Some empirical studies focus exclusively on bond IPOs. Datta, Iskandar-Datta, and Patel (1997) find positive initial returns for non-investment-grade bond IPOs and negative returns for investment-grade IPOs. Similarly, Helwege and Kleiman (1998) report underpricing on speculative-grade bond IPOs. Cai, Helwege, and Warga (2007) also compare the bond underpricing in IPOs and seasoned offerings and find that bond IPOs are underpriced more than the seasonal bond issues, with the highest level among riskier and unknown firms, consistent with information asymmetry theory and book-building process. The authors argue that the analysis made before for the first bond issuance (bond IPO) is partially transferable to the subsequent issues, and compensation in the form of bond underpricing should be higher for bond IPOs.

2.2. The role of investment advisers in the bond issuance process

When the firm raises its capital by issuing corporate bonds, it hires an investment adviser. Investment advisers determine the offering price of the bond issue and find potential investors to allocate the issue (Nagler & Ottonello, 2017). This process is called an underwriting process. The underwriters set the price based on the assessment of the bond issuer, as well as supply and demand

for the new security. The issuers dictate supply, while demand contains two components: new demand (from the flow of savings) and the demand from existing clients willing to reallocate the funds in their portfolios. Bond literature shows evidence that the choice of the underwriter affects the success of the bond issue on the primary (Fang, 2005; Yasuda, 2005; Andres et al., 2014; Carbo-Valverde et al., 2017) and secondary markets (Dick-Nielsen et al., 2012). Dick-Nielsen, Nielsen, and von Rüden (2021) argue that a strong relationship between underwriters and issuing firms is at least partly related to the success of the bond issue.

Available literature characterizes the value created by the relationship between a security issuer and underwriter as relationship capital and shows evidence of capturing part of this value by the issuers (James, 1992; Rajan, 1992; Burch et al., 2005; Fernando, 2012) in the form of reducing the cost or improving the services provided. The success of the debt issue primarily relates to intermediary's (underwriters) ability to reduce information asymmetry between the issuing firm and the investors. In the corporate bond market, the value of the relationships between the issuer and underwriter is in the underwriter's ability to credibly certify bond issues (Duarte-Silva, 2010; Dick-Nielsen et al., 2021).

The primary role of financial intermediaries is to certify the true value of the underwritten securities and confirm the issue price consistency with the future earnings projected by the firm (Beatty & Ritter, 1986; Booth & Smith, 1986; Smith, 1986; Chemmanur & Fulghieri, 1994; Puri, 1999; Fang, 2005). The underwriters' certification role relies on their reputation built up over time due to the willingness of the underwriters to incur high costs to obtain information about the firm. Reputable underwriters can credibly certify issuer quality to less informed investors because they put their reputations at stake when acting as certifiers and reducing issuers' informational costs (*certification hypothesis*) (Gilson & Kraakman, 1984; Booth & Smith, 1986; Titman & Trueman,

1986; Allen, 1990; Fang, 2005). The certification mechanism works because reputable investment banks set stricter evaluation standards and incur higher costs to become insiders of the firms they certify. High-quality issuers aim to match with reputable underwriters (Kanatas & Qi, 2003; Drucker & Puri, 2005; Ljungqvist et al., 2006; Hoberg, 2007; Yasuda, 2007; Fernando et al., 2012, 2015). Certification results in a higher price (lower yields) on the primary market (Fang, 2005; Carbo-Valverde et al., 2017), suggesting that the issuers benefit from the certification role of investment banks (Burch et al., 2005).

Existing relationships between underwriters and security issuers allow the former access to private information, which may help certify the firm's true value more accurately. For instance, Megginson and Weiss (1991) find that venture capital-backed firms' securities are less underpriced than securities by other firms. Similarly, available literature finds evidence that the security underpricing is lower if the venture capitalist as the underwriter also has a prior financial stake in debt or equity (Gompers & Lerner, 1998; Packer, 1996; Hamao et al., 1998). Puri (1999) provides a theoretical framework showing that financial intermediaries holding financial claims in the firm before the security issuance, obtain better pricing for the issued securities. This paper analyzes the role of interlocking relationships between financial intermediaries and the issuers on corporate bond underpricing.

In the corporate bond market, the certification role of financial intermediaries is essential in mitigating information asymmetry between issuing firms and investors: most bonds trade in the opaque over-the-counter market, and the investors rely more on the intermediaries for price discovery. When an investment-grade firm issues a new bond, underwriters often price the deal within hours of its announcement. According to the Investor Advocate's report from the Securities and Exchange Commission (SEC), fund managers' deadline for entering orders can be as short as

fifteen minutes, and the managers do not have enough time to evaluate the bond issue fully. While some information about the bond issuer, such as credit ratings (Fernando et al., 2012), is available to the investors, more information might be needed to evaluate the bond issue properly. Bond investors do not have contact with the issuing firm. They may not even have the preliminary prospectus and bond indentures before the books are closed within two hours after the issue announcement. Bond contracts are not standardized and sometimes include provisions that can lead to unexpected investor losses; therefore, the information received from the underwriters is critical to allocating their investments[3]. Investment banks know about this need and maintain strong relationships with the issuing firm to be able to certify the bond issuance credibly.

However, available research recognizes another explanation for a lower level of underpricing. For instance, Chemmanur and Krishnan (2012) argue that significant and reputable underwriters may have incentives to shift their role from certifying quality to maximizing the issuer's valuation (*market-power hypothesis),* which allows them to reduce their cost of becoming information insiders (Mathis et al., 2009; Chemmanur & Krishnan, 2012). Andres, Betzer, and Limbach (2014) find support for the market-power hypothesis, in contrast to the certification hypothesis, in a high-yield bond market for the bonds underwritten by the most reputable (Top 3) investment banks. They document that these bonds experience significantly more downgrades. Recent literature on equity IPOs supports for the market-power hypothesis (Cooney et al., 2001; Logue et al., 2002). Bouvard and Levy (2009) and Mathis et al. (2009) create theoretical models showing that reputable underwriters have incentives to lower their evaluation standards to attract future clients in the competitive environment. These theoretical models find empirical support in

[3] Scaggs, A. (February 24, 2021). Bond Fund Managers Often Get Rushed into Deals. The SEC's Investor Advocate Is Worried. Barron's Retrieved on 09/18/2023 from https://www.barrons.com/articles/bond-fund-managers-often-get-rushed-into-deals-the-secs-investor-advocate-is-worried-51614198657

the literature (Michaely & Womack, 1999; Ljungqvist et al., 2006; Becker & Milbourn, 2011). The interlocking relationships between the investment banks and bond issuers may lead to the mitigation of information asymmetry and, as a result, more accurate bond pricing and reduced underpricing (support for the certification hypothesis). At the same time, interpersonal relationships may lead to a higher incentive for the investment bank to set a higher price for the bond issue (the market-power hypothesis), which may also result in a lower underpricing or even overpricing of the bond at issuance. This paper does not try to test either certification or market-power hypotheses and examines the role of interlocking relationships between the investment bank and bond issuer on bond pricing. However, the paper documents the reduced underpricing (but not overpricing) at the issuance, which aligns with the certification hypothesis.

2.3. Agency problem between the issuing firm and investment banks

Security underpricing at issuance, even though common in practice, reduces the capital received by the company and the resources available for investing in positive NPV projects (Platt, 1995). The relationship between the issuing firm and the underwriters is valuable for both parties due to the certification role of the investment bank, its monitoring, investment in institutional investor networks, and optimal firm-underwriter matching. Both the management of the issuing firm and the intermediary (underwriter) in the bond issuance process represent the agents of the company's owners, and conflicts of interest between these parties can be a major problem.

Traditional agency theory examines the conflict of interests between a principal and agent. The agency relationship occurs when the principal contracts with an agent to perform service on their behalf and delegates some decision-making authority. Due to the separation of ownership and control in the corporation and, as a result, an information asymmetry between the principals and the agents, their relationship is associated with the agency problem: the parties are utility

maximizers, and the agent may not always act at the best interest of the principal. Jensen and Meckling (1976) developed an ownership structure theory from the theories of agency, property rights, and finance to explain the concept of agency costs and possible ways to mitigate the agency problem in the corporation.

In the presence of debt, the agency relationship exists not only between the managers and the owners of the company but also between the creditors and the owners and the managers and creditors. The agency costs associated with the corporate debt include the opportunity wealth loss from the impact of debt on the investment decisions of the corporation, the monitoring and bonding expenditures of the bondholders (inclusion of various covenants in the indenture), and the bankruptcy and reorganization costs (Jensen & Meckling, 1976).

While traditional agency theory examines the relationship between a principal and an agent, multiple agency theory describes the conflicts of interests among multiple agents, where at least one agent is connected to the principal. When the company issues public debt, various participants are involved in the process, and the agency relationships occur on multiple levels: the traditional manager-owner relationship, owner-creditor, manager-investment bank, investment bank-creditor, and investment bank-owner relationships. This study examines the mitigation mechanism of the possible conflict of interest between the managers of the issuing firm (and the shareholders) and the intermediary (investment advisors).

Firms often have a long-lasting relationship with a primary investment bank and use it regularly for underwriting new issues, which may emerge as a valuable asset, lower the underwriting costs, and improve service quality (Burch et al., 2005). Available literature documents that loyalty to a primary investment bank lowers underwriting fees for common stock offerings due to closer firm-bank relationships and a deeper understanding of each other's

operations and prospects, reducing information asymmetry and an agency problem between the firm and a bank. However, for debt offerings, underwriting fees tend to increase for the issues with loyal firm-bank relationships (Burch et al., 2005).

In general, reputable underwriters credibly certify bond issuer quality, which results in lower underpricing (Fang, 2005; Carbo-Valverde et al., 2017). However, the research literature establishes the essential role of the relationship between the investment banks and the potential investors in the public debt in the successful bond allocation. Investment banks have long-term relationships with institutional investors (Benveniste & Spindt, 2002) and benefit the investors who repeatedly participate in the security allocations with discounted offerings (Hanley & Wilhelm, 1995; Pollock et al., 2004), which may result in increased underpricing of bond issues. Information asymmetry between the issuing firm and the underwriter about the investors' demand allows the underwriter to act in the interests of investors at the expense of the bond issuer (Baron, 1982). Also, underpricing reduces the likelihood of undersubscription of the new bonds and allows underwriters to enjoy significant gains when selling the bonds at a higher price in the aftermarket.

This paper discovers how the agency relationship of executives, board insiders, board outsiders, and intermediaries affects bond issue outcomes. The paper focuses on the investment bank–issuing firm relationships (including both investment bank-owner and investment bank-management relationships) and associated with these relationships' agency problem. The study examines the role of interlocking connections in the bond pricing. In this setting, the board insider can be a principal, an agent, and an intermediary. Similarly, the agent can be an intermediary representing another agent in the bond issuance process. All this creates multiple layers of agency relationships that can influence the bond issuance process and be beneficial or detrimental to the company (i.e., principals) and is worth investigating.

The dual identity of the investment advisers as intermediaries and executives or principals of bond issuers allows them to bring expertise and become better monitors in the bond issuance process that, in turn, leads to reduced underpricing of bond issues (Pratt & Foreman, 2000). Arthurs et al. (2008) demonstrate that the agents with longer time horizons (underwriters with long-term relationships with institutional investors) are better monitors in the IPO process than principals with shorter time horizons (venture capitalists). Similarly, underwriters with interlocking connections with the issuing firm (a.k.a. long-term horizon agents) are effective monitors protecting the issuer from severe bond underpricing. Like other insiders, the connected investment advisers prefer less bond underpricing to increase the probability of the company's survival and preserve their employment. Also, investment advisers connected to the firm may feel psychological ownership toward the company and incentives to make decisions beneficial to the firm (less underpricing), reducing the agency problem.

2.4. The role of social connections and interlocking boards in corporate bond pricing

A significant strand of literature discusses the importance of social networks in various company's decisions. Social networks are network structures of nodes (usually people or institutions) connected through various social relationships ranging from casual to close affiliations. Social networks improve information flow along the network and, as a result, mitigate information asymmetry (Hochberg et al., 2007; Cohen et al., 2008, 2010; Engelberg et al., 2012; Cai et al., 2016). Timely access to new information benefits recipients. Hochberg, Ljungqvist, and Lu (2007) examine the role of venture capital (VC) networks in fund performance and find that better-networked VC firms perform better. Cohen, Frazzini, and Malloy (2008) examine the role of education ties between mutual fund portfolio managers and senior executives of public firms and find that portfolio managers place larger bets on connected firms and perform significantly

better on these holdings than on unconnected bets. In return, mutual fund managers connected with the firms' CEOs tend to vote against shareholder proposals to limit executive compensation (Butler & Gurun, 2012). Cohen, Frazzini, and Malloy (2010) examine the social networks between sell-side analysts and senior executives based on educational background. They find that analysts connected with the company outperform their unconnected peers on their stock recommendations. The authors conclude that social connections may serve as channels for the inside information flow. Also, borrower-lender personal relationships through school and third-party past professional connections markedly reduce borrowing costs (Engelberg et al., 2012).

Corporate insiders have access to material non-public information about the company necessary to make decisions and monitor and advise management. Board connections are essential role in the exchange of information and various company outcomes. Communication among the directors is critical for proper board functioning (Malenko, 2014), and social networks help transmit information (Burt, 1992). The interlocking directors' network analysis provides evidence of the outside directors' connection among firms, which leads to circulating trustworthy information, such as corporate strategies, sector trends, and (macro-)economic evolutions, as well as managerial vacancies in other companies, at a low cost (Reneboog & Zhao, 2014) and leads to better decision-making (Omer et al., 2012). Social ties developed through directors' networks may lead to a more significant influence in boardroom discussions (Reneboog & Zhao, 2014).

Interlocking directors affect corporate decisions and governance by sharing knowledge and experiences (Shi et al., 2013; Shropshire, 2010). Board connections may improve information flow and communication between the firms, which increases each firm's understanding of the other firm's corporate culture and operations (Cai & Sevilir, 2012). At the same time, social connections may be detrimental if they result in a conflict of interest. The significant strand of literature

examines the potential effects of interlocking boards and overall board connections on firm value (Nam & An, 2018; Fan et al., 2019) and stock performance (Ren et al., 2009; Geletkanycz & Boyd, 2011; Larcker et al., 2013), earnings management (Hwang & Kim, 2012; Chiu et al., 2013; Cunha & Piccoli, 2017), corporate financial and investing policy making (Cohen et al., 2008; Bizjak et al., 2009; Stuart & Yim, 2010; Cai & Sevilir, 2012; Chuluun et al., 2014; Han et al., 2015), board monitoring (Fracassi & Tate, 2012), the CEO compensation practices and turnover-to-performance sensitivity (Hallock, 1997; Fich & White, 2003; Larcker et al., 2005; Hwang & Kim, 2009; Nguyen, 2012; Engelberg et al., 2013; Renneboog & Zhao, 2011; Wong et al., 2015), quality of financial reporting (Dey & Liu, 2011), independent directors' insider trading (Cao et al., 2014), a higher probability of financial frauds (Chidambaran et al., 2012), and accounting method choice (Cai et al., 2014, Han et al. 2017, 2018).

A few studies specifically investigate the role of banker directors in increasing firm value (Choi et al., 2014), solving funding difficulties (Dittmann et al., 2010), and reducing the cost of debt (Engelberg et al., 2012; Nam & An, 2023). For instance, Engelberg, Gao, and Parson (2012) show that firms socially connected with their banks enjoy lower interest rates and fewer covenants on the loans by reducing information asymmetry between the firms and the banks. The role of connections between investment banks and companies is examined in the setting of M&A deals by Huang et al. (2014). The authors find that bidders whose directors have ties to investment banks earn higher merger announcement returns. If the bond issuer has a bank loan, it lowers the at-issue yield spreads for public bond IPO (Datta et al., 1997). The authors argue that if the existence of bank loans at the time of public debt issuance reduces the bank-monitoring costs. Monitoring by one type of creditor reduces the monitoring and bonding costs of other debtholders, which aligns

with our argument that connections with investment advisers bring expertise to the issuing firm, help mitigate information asymmetry, and reduce agency problem.

Substantial equity IPO literature examines the impact of social connections on IPO outcomes. For instance, the research on the equity IPO process shows that firms usually choose underwriters using existing banking relationships (Drucker & Puri, 2005; Yasuda, 2005; Bharath et al., 2007), the investment bank reputation (Corwin & Schultz, 2005), and interpersonal social connections (Cooney et al., 2015). Social connections help mitigate moral hazard problems in the underwriting syndicate (Corwin & Schultz, 2005). Investment banks use their strong relationships with institutional investors to price and distribute securities (Cornelli & Goldreich, 2001). Cooney et al. (2015) examine the role of social ties between investment banks and IPO companies on the likelihood of these investment banks being included in the underwriting syndicate and better IPO outcomes. They find that social connections matter in selecting the IPO underwriters: the odds of becoming the book manager of an IPO syndicate increase by 42% for the investment bank with social connections with the IPO firm. The authors find that the social ties with the IPO firm move the underwriter to a more senior position in the syndicate, which can translate to more significant income and reputational capital for an underwriter. Even more critical for underwriters is that the number of shares allocated to them significantly increases if they have social connections with the issuer. Finally, compensation to underwriters with social ties with the IPO issuer is also higher by 7-9% compared to underwriters without social ties. IPO issuers also benefit from social ties with investment banks. Pre-issue shareholders capture a net wealth gain from the IPO.

The interlocking connections, when an individual holds an executive or directorship position in both the firm and an investment bank, may reduce the investigative costs and make certification of the issues less costly for the bank and an issuer, which may be associated with

reduced information asymmetry and agency problem between the parties and lead to a more accurate pricing of securities and affect the gross spread that represents the compensation for the underwriting business. Indeed, some empirical literature provides evidence that the existing relationship[4] between the bond issuer and underwriters is associated with a significantly lower underwriting fee (Dick-Nielsen et al., 2021).

At the same time, social connections between the companies and investment banks increase the dollar compensation paid to the underwriters in stock IPOs, in line with the *quid pro quo* hypothesis tested in Cooney et al. (2015), which can be explained by the benefits provided by the issuer to the socially tied investment bank. In return, the investment bank provides a more accurate initial offering pricing of the security, which leads to lower underpricing. Investor advisers having working connections with the firm bring expertise to the company and reduce information asymmetry, allowing material non-public information about the quality of the company and the bond issue to flow from the company to the underwriters and leading to reduction in bond underpricing. More accurate bond pricing positively affects the investment bank's reputation and benefits the issuer by allowing them to raise more capital through bond issuance. Therefore, social connections, including interlocking relationships, can be an effective mechanism in mitigating information asymmetry and, as a result, agency problems and benefit both parties through higher underwriting fees paid to the investment bank and a lower underpricing at the bond issuance.

In summary, current literature argues that social connections can be beneficial as they improve information flow between the parties and potentially reduce agency costs. This paper contributes to the existing literature by examining the role of connections between investment

[4] The authors identify the existing relationships between the underwriter and the bond issuer if the firm uses the same (one or more) investment banks to underwrite the new bond issuance as they used for the issuance of a currently outstanding bond.

advisers and bond issuers on the bond issue pricing and underwriters' compensation (gross spread). The results show that these connections lower the level of bond underpricing as issuance, which is in line with the reducing cost of debt for the firm, as the company leaves less money on the table when the security price is more accurate. However, the results do not indicate that underwriters receive significantly different compensation in the bond issuance process with interlocked boards. This paper contributes to this strand of literature by arguing that connections between the investment advisers and the companies benefit for the bond issuing firm and underwriters.

3. Hypotheses Development

3.1. The effect of interlocking on underwriter's compensation

This section defines the hypotheses tested in the study. When the company issues public debt, it hires an investment bank. The investment bank determines the initial offering price and allocates the issue among the investors. The firms and intermediaries (underwriters) form the agency relationship during the bond issuance. The value created by this relationship at least partly explains the success of the bond issue in terms of accurate pricing and proper allocation of the issue (Nagler & Ottonello, 2017; Dick-Nielsen et al., 2021). The success of the bond issue broadly relates to the underwriter's ability to reduce information asymmetry between the issuing firm and investors and credibly certify bond issues (Duarte-Silva, 2010; Dick-Nielsen et al., 2021). To certify the issuer's quality, the underwriters incur high costs to obtain information about the firm.

The available literature on stock issuance documents a significant reduction of underwriting fees for the common stock issuance if the firm has long-lasting relationships with its primary investment bank (Burch et al., 2005), explained by the reduction in information asymmetry between the firms and a deeper understanding of each other's operations. The results for underwriting fees for bond issues are mixed. Dick-Nielsen, Nielsen, and von Rüden (2021)

find a similar negative effect of the existing relationship between the bond issuers and investment bank on the underwriting fees, while Burch, Nanda, and Warther (2005) find a positive effect of the loyal relationships (both short-term and long-term) on the fees. The literature also documents that the social ties between the company conducting a stock IPO and the investment banks in the underwriting syndicate increase the compensation paid to the underwriters (Cooney et al., 2015).

This study examines whether interlocking connections between the firm and investment adviser significantly affect the underwriting fees for bond issues. As discussed above, the literature provides mixed results on the effect of existing relationships between the security issuers and the investment banks, either through prior underwriting business or social connections of executives of both entities, on the fees paid for underwriting the issues. Interlocking connections may lead to higher dollar compensation for the investment banks underwriting the bond issue due to the bond issuer benefitting the connected investment advisor, which in turn may provide more accurate pricing of a bond issue or a lower dollar compensation due to better information flow between connected parties and a deeper understanding of each other's business and reduced information asymmetry. Therefore, I test the first hypothesis as a two-sided hypothesis stated in the null form:

$H1_0$: *The interlocking between the bond issuer and investment adviser does not significantly affect the underwriter's compensation in the form of gross spread.*

$H1_a$: *The interlocking between the bond issuer and investment adviser significantly reduces the underwriter's compensation*.

$H1_b$: *The interlocking between the bond issuer and investment adviser significantly increases the underwriter's compensation*.

3.2. The effect of interlocking on bond underpricing

The big strand of literature documents the bond underpricing (Ederington, 1974; Lindvall, 1977; Weinstein, 1978; Sorenson, 1982; Cai et al., 2007; Hale & Santos, 2007; Dick-Nielsen et al., 2021). The main theories explaining this phenomenon come from the equity underpricing literature and include the information-asymmetry (Rock, 1986), signaling (Allen & Faulhaber, 1989; Grinblatt & Hwang, 1989; Welch, 1989), book-building (Benveniste & Spindt, 1989; Benveniste et al., 2002; Sherman & Titman, 2002), and liquidity (Booth & Chua, 1996; Ellul & Pagano, 2006) theories. This study focuses on the information asymmetry explanation of underpricing and examines whether interlocking connections between the bond issuer and investment adviser help mitigate information asymmetry and lead to reduced bond underpricing.

In the bond issuance process, the underwriter helps reduce information asymmetry between the issuers and investors by credibly certifying bond issues (Duarte-Silva, 2010; Dick-Nielsen et al., 2021). Research shows that certification results in a higher price on the primary market (Fang, 2005; Carbo-Valverde et al., 2017), suggesting that the issuers benefit from the certification role of investment banks (Burch et al., 2005).

However, information asymmetry exists not only between the issuers and investors but also between issuers and investment banks. Investment banks have access to information about investors' demand that issuers do not have. The research establishes the essential role of the underwriter-investor relationship for successful bond allocation. Investment banks have long-term relationships with institutional investors (Benveniste & Spindt, 2002) and benefit the investors who participate repeatedly in security allocations with discounted offerings (Hanley & Wilhelm, 1995; Pollock et al., 2004). Therefore, investment banks have an incentive to underprice the bond issues to secure the bond allocation among the investors, acting in the interests of investors at the

expense of the bond issuers (Baron, 1982). Additionally, bond underpricing allows investment banks to make additional profits by trading the issues kept in their portfolios, manifesting the agency problem between the bond issuers and intermediaries (investment banks).

Existing literature shows evidence that social connections between security issuers and investment banks help mitigate the information asymmetry and agency problem between the parties, leading to significant reduction in security underpricing as issuance. For instance, Cooney et al. (2015) find that social connections among executives and directors of IPO firms and investment banks through prior employment, education backgrounds, and current association with social organizations leads to more accurate initial filing price and a smaller absolute revision in the offer price. The bond literature shows that the existing relationships between the bond issuer and the investment banks significantly lower bond underpricing from an average of 75 bps to 24 bps (Dick-Nielsen et al., 2021).

This study examines whether the interlocking relationship between the bond issuer and the investment adviser is associated with significantly lower bond underpricing. Investor advisers with interlocking connections with the bond issuer bring expertise to the firm and reduce information asymmetry, allowing material non-public information about the quality of the company and the bond issue to flow from the company to the underwriters.

However, investment banks also have long-lasting relationships with institutional investors and are their agents. Investors are interested in the short-term gains associated with bond underpricing at issuance, and investment banks may underprice the bond issues to please institutional investors, secure bond allocation among them, and create loyalty and demand for future deals (Ritter, 1987; Tinic, 1988). Holding an executive or directorship position in the issuing firm may lower the incentive of the investment adviser to act in the interests of the investors at the

expense of the bond issuer, mitigating the agency problem between the issuer and the investment bank. As a result, the investment bank may provide a more accurate initial offering pricing of the security, which leads to lower underpricing. Therefore, I test the following hypothesis:

H2a: *The interlocking between the bond issuer and investment adviser significantly reduces the bond underpricing.*

4. Sample Selection and Variable Measurement

The data used in this paper combine information from various sources. The data on bond issues are from the Fixed Investment Securities Database (FISD) from Mergent Inc. The Mergent FISD for academia is a comprehensive database of publicly offered U.S. bonds that contains issue details on over 480,000 corporate, corporate MTN (medium-term note), supranational, U.S. Agency, and U.S. Treasury debt securities. Some variables in the FISD dataset used in the analysis have missing values. I use the Thomson/Refinitiv SDC New Issues database as a complimentary source to gather the data missing in our main bond issues dataset. Refinitiv SDC New Issues dataset provides information on corporate debt and other securities, such as common and preferred stock, for over 900,000 global transactions starting in 1962.

I obtain a sample of bond issues from the FISD database. This database maintains the bond issuance information on all fixed-income securities that have a CUSIP or are likely to receive it soon (Rule 144A securities)[5]. The initial sample contains 480,057 bond securities issued by 19,566

[5] Rule 144A of a Securities Exchange Commission (SEC) was introduced in 1990 to promote foreign participation in the US debt market. The rule enables purchasers of securities in a private placement to resell their securities under the following conditions: (1) if the sale is to qualified institutional buyers (QIBs); (2) the seller informs the buyer that the sale relies on Rule 144A; (3) the securities are not of the same class as securities traded on a national securities exchange; and (4) the purchaser has the right to request information from the original issuer of the security. Rule 144A makes securities under private placement more attractive as it increases their liquidity, compared to traditional private placement bonds ("Rule 144A." Legal Information Institute, Legal Information Institute, Jan. 2022, www.law.cornell.edu/wex/rule_144a#:~:text=Rule%20144A%20(formally%2017%20CFR,(QIBs)%20under%20certain%20conditions). Rule 144A bond issues can be registered after 60 days from the issuance to be publicly traded

companies (bond issuers) between 1950 and September 2020. I exclude the bonds issued by U.S. and foreign agencies and governments[6] and bonds issued by financial firms and regulated utility companies from the sample (e.g., Gande et al., 1997; Dick-Nielsen et al., 2021). These firms are highly regulated, which may affect their capital structure and other financing decisions[7].

Moreover, in this paper, I investigate if the expertise brought by the investment advisers sitting in the company's board helps to reduce the corporate bond underpricing at the time of the issuance. Keeping financial firms in the sample will not allow us to examine the effect of the investment adviser's expertise, as the board members of financial firms are assumed to have such an expertise because of the nature of financial firms' business. The corporate bond issue sample used in this study contains only U.S. bond issuers and excludes all bonds with unusual features that might affect underpricing, such as issues in foreign currency, private placements[8], perpetual and preferred securities, pass-through securities, and payment-in-kind bonds[9] for the period of

(Arena, 2011). Chaplinsky and Ramchand (2000) discuss Rule 144A securities in detail and state that these securities often receive a CUSIP within three months after the issuance.

[6] I exclude from the sample the issues with the following bond type: ARNT, ASPZ, CTBD, CTBL, FGOV, FGS, USBD, USBL, and USNT.

[7] Financial firms are identified by SIC codes of 6000-6799, and utilities are identified by SIC codes 4800-4999. Some observations in the FISD dataset have missing SIC codes. To fix the issue, we obtain the missing SIC codes from CRSP, Compustat using the six-digit CUSIP to identify the company issuing the bond, and the Thomson/Refinitiv SDC New Issues dataset using the nine-digit CUSIP of the bond issue. The sample of bond issues reduces to 39,956 observations.

[8] As in Arena (2011), the study refers to Rule 506 and regulation D private placements to identify private placements in the dataset. Under these rules, firms issue securities and place them among unlimited number of accredited investors with net worth of at least $2.5 million or annual income at least $250,000 and up to 35 sophisticated investors that have adequate knowledge and experience in financial and business matters. The investors have a restriction not to sell an issue for at least a year after a purchase. The sample contained only 16 traditional private placement bond issues before I deleted them.

[9] A pass-through security is a pool of fixed-income securities backed by a package of assets and held by a servicing intermediary that collects coupon payments for the issuers and distributes among the investor after deducting a fee. The most common example of pass-through security is a mortgage-backed security. (Segal, T. (May 29, 2020), *Understanding Pass-Through Securities and Their Risks*, Investopedia. Retrieved on 02/20/2024 from https://www.investopedia.com/terms/p/passthroughsecurity.asp#:~:text=A%20pass%2Dthrough%20security%20is,who%20have%20invested%20in%20it)

Payment-in-kind (PIK) bonds are a type of deferred coupon bonds that pay coupon in additional bonds, notes, or preferred stock instead of cash during the initial period (until the redemption or maturity). PIK tend to have higher risk and are usually issued by financially distressed firms. (Chen, J. (September 21, 2020). *Payment-in-Kind (PIK)*

2005 – 2020. The sample contains Rule 144A private placement bond issues (as in Dick-Nielsen et al., 2021). Rule 144A eases the bond issuance procedure for firms that do not meet the SEC requirements for shelf registration (usually high-yield issuers) and provides similar benefits to shelf registration. Therefore, the privately issued bonds under rule 144A are like public security, but the firm characteristics differ. The model includes a dummy identifier for these issues[10].

The sample is restricted to bond issuers presented in the BoardEx database during the year of the bond issuance. The restricted sample contains 8,512 bond issues from 1,428 unique companies (according to the issuer ID in the FISD database). After adding all control variables discussed below and restricting the sample to bond issues with available information for the gross spread or trading data for the first calendar week after the issuance, the sample is reduced to 6,559 issues from 1,046 issuers. Appendix A provides the table with detailed information about the sample construction.

4.1 Bond Underpricing Variables

The study utilizes the gross spread as the percentage of the offering price as the main dependent variable (*Gross Spread*) for testing the first hypothesis. The FISD database provides the gross spread for the bond issue as the difference between the price the investors pay for bond securities and the price the issuer receives for them. The study uses the relative measure of gross spread as a percentage of offering price at which the issue was initially sold to investors[11]. Some information about the gross spread or offering price was missing in the main sample and was

Bonds: Definition and How Interest Works. Investopedia. Retrieved on 02/20/2024 from https://www.investopedia.com/terms/p/pikbond.asp)

[10] Rule 144A bond issues represent 27.8% of the sample and cannot be removed without significant loss in the number of observations. For a robustness, the analysis is repeated excluding the 144A rule bond issues.

[11] For robustness, I also run the tests with raw gross spread measure, as it is provided in the FISD database. The results are quantitatively similar and are not reported for brevity.

obtained from the Thomson/Refinitiv SDC New Issues database using the nine-digit CUSIP of the bond issue as a security identifier.

To test the second hypothesis, I calculate the variables *Underpricing*. In the equity IPO literature, underpricing is calculated as the percentage difference between the offering and the first-day closing prices. However, corporate bonds do not trade as frequently as stocks, and using the first-day initial returns may limit our sample. Available literature uses various approaches to examine bond underpricing. Earlier research compares yield to maturity on new and outstanding issues (Brimmer, 1960; Conard & Frankena, 1969; Lindvall, 1977).More recent research by Cai, Helwege, and Warga (2007) calculates the initial bond returns within seven calendar days of the offering date and uses the bond indices as benchmarks. The latest research by Dick-Nielsen, Nielsen, and von Ruden (2021) utilizes the relative difference between the average transaction price from TRACE over the first two weeks of trading and the offering price as a measure of underpricing.

I follow Cai, Helwege, and Warga[12] (2007) to calculate the bond underpricing variables. Trading data on corporate bonds is obtained from the Trade Reporting and Compliance Engine (TRACE) database[13]. The trading data for 99% of corporate bonds has been available through the TRACE system since 2005; therefore, the bond issue sample used in this study covers the 2005 –

[12] A more recent study of Dick-Nielsen, Nielsen, and von Ruden's (2021) uses the relative difference between the average transaction price from TRACE over the first two calendar weeks of trading and the offering price as a proxy for underpricing. I check my results using this measure for a robustness.

[13] The TRACE system was launched in July 2002, after the SEC approved the rules that required the National Association of Securities Dealers (NASD), now the Financial Industry Regulatory Authority (FINRA), members to report all over the counter (OTC) secondary market transactions in corporate bonds in January 2001. FINRA Rule 6700 requires all FINRA member firms to report trades for eligible US corporate bonds into the system. Since July 1, 2002, TRACE system started reporting trading information on all investment-grade issues with initial issuance above $1 billion and high-yield bonds included previously in the fixed-income pricing system (FIPS) (Phase I of bond transaction reporting). On April 14, 2003, the system began Phase II of reporting and added information about investment-grade issues with initial issuance of above $100 million that have at least an A-rating and speculative-grade bonds with a BBB rating. Finally, starting October 2004, the NASD began Phase III that resulted in trades in almost all bonds (99%) disseminated in the TRACE system by February 7, 2005.

2020 period. I start with cleaning the data in the TRACE system using Dick-Nielsen's (2009) technique. The TRACE system is a one-day system, with reporting available only through the system. The reporting errors in the TRACE system can be corrected within the same day or in the upcoming days (up to 19 calendar days after the transaction). When the brokers correct the report with an error, they submit either the cancellation of the original report or a correct report with reference to the original report. I identify the original reports for which the corrections were submitted. When the new report's purpose was to cancel the original report, these reports were deleted from the dataset. When the new report corrects the original report, it replaces the original report in the sample. In the initial TRACE dataset of daily bond trading reports, approximately 2.6 % of the reports were errors that were later corrected or canceled[14].

To calculate the bond underpricing, I use the trading transactions for the first seven calendar days after the bond offering date stated in the FISD database. Out of 8,512 bond issues in the sample, 6,446 bond issues from 1,055 firms have trading data for the first seven calendar days after the offering date[15]. For issues with more than one transaction in a day, a daily bond price represents a weighted average price for that day, using the fraction of the day's transactions accounted for by each trade as the weights. The database does not provide the actual par value of bonds traded for high-yield and non-rated issues with a volume over $1 million and investment-grade issues with a volume over $5 million. Therefore, for these bonds, the price represents the average daily price with equal weights for each transaction.

[14] Dick-Nielsen (2009) reports that 7.7% of the reports are errors. However, the study uses only one year of transactions data straight from the TRACE database for 2007. The TRACE dataproviders informed WRDS that starting 2012, the column that reports transaction status (*trc_st*) was eliminated, and the reports were corrected. Therefore, it is reasonable that in the dataset covering the trading period from 2005 to 2020, the percentage of errors should be smaller.

[15] When I use a 14-day (30-day) window, 6,509 (6,568) issues from 1,059 (1,071) bond issuers have trading history two calendar weeks (30 calendar days) after the offering date.

The TRACE dataset provides the quoted transaction prices (flat prices) that do not include accrued interest. I calculate accrued interest for each bond issue on each available trading day within the trading window of interest (seven calendar days for our main results and 14 and 30 days for a robustness check) as follows. The FISD and TRACE databases provide all the necessary information to compute accrued interest.

The equity IPO literature uses the underpricing calculated as the percentage difference between the offer price and the first-day closing price. Figure 1 shows the frequency of bond trading on each trading day during the first seven calendar days after the offering for the bond issues in the sample. Figure 1a provides information on the number of bond issues traded during the first calendar week after the issuance, while Figure 1b shows the aggregated dollar volume in billions traded during the same period. Over 60% of the bonds in our sample (5,524 out of 8,512 bond issues or 64.90% of our sample) start trading on the issue date. The percentage of the bonds traded for the first time on the second (third) day after the issue date decreases dramatically and represents 8.22% (1.41%) of our sample. Overall, 75.35% of the bond issues in the sample were traded for the first time during the first calendar week after the issuance. The issues that started trading on the issue date continued trading on the following days, but the number of bond issues, as well as the dollar volume, traded decreases in the following days. The figure shows that corporate bonds trade relatively less frequently than the stock after the issuance, but still trading in the first week is higher than later in the life of the bond, consistent with Alexander, Edwards, and Ferris (2000) and Cai, Helwege, and Warga (2007).

Over the entire 2005-2020 period, the median (mean) number of trading days per bond issue is 523 (674.15). Given that the median (mean) time to maturity of the bond issues in our

sample is 8.05 (10.43) years, trading happens approximately 26% of the available trading days[16]. The bond issues are traded more frequently during their first year after the issuance. The median (mean) number of trading days during the first year after the bond issuance is 179 (161.74), which accounts for over 70% (64%) of the available trading days in a year. The reported numbers reported here are higher than in the available research, which can be explained by the availability of the data. This paper utilizes the TRACE trading data and includes 99% of the trades starting in 2005, compared to the UH-NAIC database that includes trades of bonds by insurance companies used by Cai, Helwege, and Warga (2007) or the FIPS system with information on frequently traded high-yield bonds used by Alexander, Edwards, and Ferris (2000).

This study uses Cai, Helwege, and Warga's (2007) and Nagler and Ottonello's (2017) approach to calculate the main dependent variable, *Underpricing*. The proxy for underpricing is the market-adjusted bond return for the period between the offering date and the first recorded trade. As a proxy for a market return, the study uses Bloomberg Barclays U.S. Corporate Indices as benchmarks. The indices differ in investment-grade vs. high-yield indices and maturity. Precisely, for investment-grade corporate bond issues, I differentiate them between 1-5, 5-7, 7-10, and over 10-year maturity and use the Bloomberg US Corporate 1-5 years, 5-7 years, 7-10 years, and 10+ years Total Return Index[17], respectively. For non-investment-grade corporate bonds[18], I use the Bloomberg US Corporate High Yield Bond Index (ticker LF98TRUU) as a benchmark. The index measures the USD-denominated, high-yield, fixed-rate corporate bond market.

[16] An average number of trading days per year is 252, according to trading days on NYSE and NASDAQ. (Trading Day. (December 16, 2023). Wikipedia. Retrieved on 04/15/2024 from https://en.wikipedia.org/wiki/Trading_day#:~:text=The%20NYSE%20and%20NASDAQ%20average,Day%2C%20Martin%20Luther%20King%20Jr.

[17] Tickers are BUC1TRUU, I13282US, I13283US, and I13284US, respectively, in a Bloomberg Terminal.

[18] High yield corporate bonds are securities with the middle rating of Moody's, Fitch and S&P of Ba1/BB+/BB+ or below.

Securities are classified as high yield if the middle rating of Moody's, Fitch, and S&P is Ba1/BB+/BB+ or below. I use Bloomberg Barclays U.S. Universal Index (ticker LC07TRUU) as a benchmark if any index price is missing on an offering or trading dates. This index is composed of U.S. dollar-denominated bonds rated either investment-grade or high-yield. To calculate the excess return for the individual bonds, I first calculate the raw bond return over seven calendar days for each bond issue using equation (2):

$$Bond\ Return_i = \frac{Bond\ Price_{i,t+n} + AI_{t+n} - Bond\ Price_{i,t}}{Bond\ Price_{i,t}}, \quad (1)$$

where *i* corresponds to each bond issue, *n* is the number of days after the offering date *t*, and *Bond Price* is the bond price on the first trading day after the issuance weighted by the trade volume.

Next, I calculate the holding period return for the benchmark index period as follows:

$$Index\ Return_i^* = \prod_{j=1}^{n} \left(1 + \frac{Index\ Price_j - Index\ price_{j-1}}{Index\ price_{j-1}}\right) - 1, \quad (2)$$

where n is the number of days from the offering date to the trading day of the bond, and j is the next day after the offering date. The excess return (*Underpricing*) is then calculated as follows:

$$Underpricing_i = R_i - R_i^* \quad (3)$$

For robustness, the study utilizes the measure of underpricing from the recently published paper by Dick-Nielsen, Nielsen, and von Ruden (2021). The measure is the relative difference between the average transaction price from TRACE over the first seven calendar days of trading and the offering price, calculated as follows:

$$Underpricing\_DN_i = \frac{P_{i,t+n} + AI_{t+n} - Offering\ Price_{i,t}}{Offering\ Price_{i,t}} \quad (4)$$

where *i* corresponds to each bond issue, *n* is the number of days after the offering date *t* (7 days for my main analysis and 14 and 30 days for a robustness check). *P* is the weighted average price for a given bond over the n days of trading, *AI* is the accrued interest, and $Offering\ Price_{i,t}$ is the price offered by the issuing firm to the investors (from the FISD). The results are provided in the internet Appendix.

To justify using the excess return between the first trading bond day one calendar week after the issuance and the offering date as a legitimate measure of bond underpricing, I investigate trading patterns during the four calendar weeks after the offering date. Figure 2 illustrates the excess returns during the first twenty days of trading after the bond issuance. The excess returns are calculated as follows:

$$Excess\ Return_{i,n} = \frac{Bond\ Price_{i,n} - Bond\ Price_{i,n-1}}{Bond\ Price_{i,n-1}} - \frac{Index\ Price_{i,n} - Index\ Price_{i,n-1}}{Index\ Price_{i,n-1}}, \quad (5)$$

where *i* represents the bond issue and n and n-1 represent the current and the previous trading days, respectively. For the first day of trading, $Bond\ Price_{i,n-1}$ is the offering price and $Index\ Price_{i,n-1}$ is the index price in the offering date. All excess returns are positive and significantly different from zero (except for day 19). The figure shows that the excess return is the highest on the first day of trading and drastically decreases in the following days. Table 1 Panel A provides the number of trades and the mean excess returns during the first five trading days of the bond issue. Table 1 Panel B provides the mean excess return for the subsample of bond issues that started trading the first week after the issuance. The excess returns are positive and significantly different from zero; however, the magnitude is the highest on the first day of trading. Table 1 Panel C shows the mean excess bond returns on the first trading day for the bonds trading the first calendar week after the issuance. Figure 3 illustrates the excess first-day return for the corporate

bonds that started trading seven calendar days after the issuance. All mean excess returns are positive and significantly different from zero (except for the bonds that started trading four days after the issuance), indicating that the sample's bond issues experience the seasoning process.

As indicated in Figures 2 and 3 and Table 1 Panels A-C, most bonds in the sample start trading during the first week of the sample (6,414 out of 8,512 bond issues) and, precisely, at the issuance date (5,524 bond issues). Also, the seasoning process is present for the bonds in the sample. To separate the pure bond underpricing from the seasoning process, I analyze the bond underpricing using the issues that first traded at the issuance date, representing the same underpricing measure as for the stock IPO and SEO underpricing. The subsample of the bond issues traded at the issuance date represents 85.70% of the sample of bonds that started trading during the first week after the issuance.

<Table 1 is around here>

It is also possible that the initial trade's underpricing might be reversed. To investigate it, I look at cumulative excess bond returns traded over the first calendar week after the issuance. If they are not significantly different from zero, the reversal in pricing occurs during this period. Cumulative excess returns are calculated as follows:

$$Excess\ Cumulative\ Return_{i,n} = \prod_{n=1}^{6}(1 + Excess\ Return_{i,n}) - 1 \quad (6)$$

Cumulative excess returns over the first trading week are positive (0.008, significant at 1%). Therefore, no reversal of underpricing occurs in the sample over the first week after the issuance.

4.2. Interlocking

To test the hypotheses of whether the expertise of the investment adviser on the company's board significantly affects the gross spread and bond underpricing, I constructed the interlocking

indicator equal to one if the bond issuer has interlocking with the investment adviser company in the year of the bond issuance and zero if not. The information about investment advisers is obtained from various sources. I start with the companies with the NAICS code 523110 (Investment Banking and Securities Dealing) available in Compustat between 1985 and 2022. Compustat contains 82 unique firms with the NAICS code 523110. I added the M&A (mergers and acquisitions) and IPO advisers to the list from the Thompson/Refinitiv SDC database. Additionally, I searched for online lists of investment banks. The final list with unique names of investment advisers contains 20,677 firms.

Information about the interlocking boards is obtained from the BoardEx database. The BoardEx database contains the employment history, educational backgrounds, and current affiliation with social organizations for the senior executives and board members of over 20,000 companies starting in 1999. First, I identify the investment advisers in the BoardEx database using the following procedure. I match the list of investment advisers with the companies' full names available in the BoardEx database covering North America using the fuzzy matching technique in Stata. Prior to fuzzy matching, I remove unnecessary spaces in the names, capitalize all letters, remove special characters, such as exclamation mark, periods, commas, percentage and dollar signs, parentheses, plus and minus signs, and specific words in the names, such as LTD, INC, CO, CORP, GMBH, and LLC. Fuzzy matching created over 48 million matched combinations between the company names in BoardEx and the investment advisers' list. I removed all combinations with a similarity score of less than 0.75 and got 679,104 combinations. After a manual check of the quality of matching, the final sample contains 4,864 unique companies in BoardEx identified as

investment advisers. Some companies identified by the name matching as investment advisers, work in unrelated sectors and were removed from the sample.[19]

Next, I identify the interlocking board using the BoardEx database. The BoardEx individual profile employment data contains information about the executives' employment in the BoardEx universe and covers the period from 1920 to 2023. In the initial file, I keep only firms identified as investment advisers and bond issuers[20]. I create a panel using the start- and end-role date for each member in the sample of investment advisers and bond issuers. The observation is dropped if both start and end-role dates are unavailable. If the end-role date is identified as ".n" in the BoardEx database, I replace the end-role date with the last calendar date of the year of the start-role date. If the end-role date is identified as ".c," I replace it with the 12/31/2020[21].

I identify three different types of interlocking for the analysis: *Interlock_broad*, *Interlock_cboard*, and *Interlock_both_boards*. First, I identify if each individual holds positions in bond issuing firm and an investment advising firm in the same year. Next, I assign to every bond issuer a dummy of *Interlock_broad* equal to one if at least one individual in the bond issuing firm has employment experience in the investment advising firm in a particular year. Next, I identify

[19] I removed the identification of investment adviser if the firm's sector is Aerospace & Defence, Automobiles & Parts, Beverages, Chemicals, Clothing & Personal Products, Construction & Building Materials, Containers & Packaging, Diversified Industrials, Education, Electricity, Electronic & Electrical Equipment, Engineering & Machinery, Food & Drug Retailers, Food Producers & Processors, Forestry & Paper, General Retailers, Health, Household Products, Information Technology Hardware, Insurance, Legal, Leisure & Hotels, Leisure Goods, Life Assurance, Media & Entertainment, Mining, Oil & Gas, Pharmaceuticals and Biotechnology, Publishing, Real Estate, Renewable Energy, Software & Computer Services, Sovereign Wealth Fund, Steel & Other Metals, Telecommunication Services, Tobacco, Transport, Utilities – Other, Wholesale Trade.
For a robustness check, I also removed the firms working in the following sectors: Consumer Services and Private Equity.

[20] The FISD database provides a 6-digit CUSIP as a company identifier. I use the TRACE and CRSP linking table to obtain an 8-digit CUSIP for each bond issuer. Next, I use the CRSP-Compustat linking table generously provided by Sara Khaled to obtain company's TICKER and CIK to merge the list of the bond issuing firms with the BoardEx file. BoardEx provides the ISIN for most of public companies in the list. I truncated the ISIN to obtain company's CUSIP. Next, I utilized a similar procedure as explained in the document for the BoardEx-CRSP-Compustat company link provided in WRDS: I matched the BoardEx list and CRSP-Compustat linking table using CUSIP, CIK, and Ticker, CUSIP and CIK, CUSIP and Ticker, and CIK and Ticker to identify each bond issuer's BoardID.

[21] As the sample covers the period of 2005 – 2020.

the board members. BoardEx provides a variable BRDPOSITION with values 1, 3, and 4, where value 1 represents the insiders, value 2 represents outside directors, and value 4 generally identifies the board position. *Interlock_cboard* for each bond issuing firm in a particular year is equal one if the individual who works in the investment advising company sits on the company's board during the same year and zero otherwise. Finally, *Interlock_both_boards* is a dummy variable that equals one if at least one board member in the bond-issuing firm sits on the investment adviser's board in the same year.

After constructing three interlocking dummies, I add them to the bond issue sample using the year of the bond issue. Due to the nature of the research questions, it is necessary to restrict the sample of bond issues used in the analysis to the bonds issued by the companies covered by BoardEx during the year of bond issuance, as I can identify the interlocking boards only for these firms. This restriction reduces the sample to 10,930 bond issues from 1,724 firms. Finally, I remove bonds issued in foreign currency and perpetual bonds from the sample, which reduces the final sample for 7,916 bond issues from 1,212 firms.

4.3. Control Variables

4.3.1. Bond issue-level controls

Various control variables used in the analysis aim to isolate the effect of the explanatory variables. The control variables include various bond issues and firm characteristics. Bond issue characteristics include bond issue size (*Offering Size*), time to maturity (*TTM*), identifier of a bond IPO (*IPO*), credit rating (*Rating*), identifiers for bond types (convertible (*Conv*), callable (*Call*), and global issue (*Global*)) and whether the bond is issued under Rule 144a (*Rule_144a*), and the benchmark yield spread over a U.S. Treasury security (*Treasury_Spread*).

Larger bond offerings are more likely to be associated with less uncertainty and be more liquid than smaller offerings, and the issuer is more likely to provide more public information about the issue. Therefore, the offering size may affect the bond pricing. I follow prior literature (e.g., Carter & Manaster, 1990; Michaely & Shaw, 1994; Gandi et al.,1997) and use the natural logarithm of the offering amount as a measure of offering size (*Offering Size*). For robustness, I use the relative issue size measured as the size of the bond issue divided by the sum of the market value of equity and the book value of debt (as in Datta et al., 1997), the inverse of the offering amount of the issue, and the issue size standardized by the market value of equity.

The time to maturity (*TTM*) is calculated as the number of days between the maturity date and the offering date converted to the number of years (as in Dick-Nielsen et al., 2021). Alternatively, I follow Gandi, Puri, and Walter (1997) and create three dummy variables for time to maturity, classifying maturity as low for bonds with maturity of less than five years (*LowMat*), medium for bonds with maturity between five and fifteen years (*MedMat*), and high for bonds with maturity of longer than fifteen years (*HighMat*).

Institutional investors are the primary holders of U.S. corporate bonds, with insurers (38%), mutual funds (30%), and pension funds (16%) accounting for the three largest shares of institutional ownership (Koijen & Yogo, 2023). These investor groups' investment in corporate bonds is strictly regulated. The bond issue credit ratings play an essential role in the bond allocation and contain relevant information about the operating performance (Ederington & Goh, 1998) and credit risk (Kao & Wu, 1990) of bond issuers that is important for bond pricing. The FISD database contains alphanumerical Fitch, Moody's, Duff and Phelps', and Standard and Poor's credit ratings assigned to each security throughout its life. I obtained the ratings assigned to each bond issue by

each agency during the first 30 calendar days after the offering date[22]. Alphanumerical credit ratings are then transformed into numerical form, from 1 to 22, where 1 is the highest rating (Aaa by Moody's and AAA by other agencies), and 21 is the lowest rating (C), as in Dimitrov, Palia, and Tang (2015). If the bond issue had different numeric rating levels provided by different agencies, the highest numerical value is assigned to the issue. If the bond issue does not have a credit rating at the time of the issuance (NR), I assign a numerical value of 23 for non-rated bond issues and create a dummy variable equal to 1 for non-rated issues and 0 otherwise (*NR*)[23]. Missing ratings can indicate a higher information asymmetry between the issuers and market participants about the creditworthiness of the issuer to meet its financial obligations and can affect the bond pricing. I also create a variable *High-Yield* equal to one if the bond issue has a credit rating below Baa and zero otherwise and use this variable in additional tests described in the Multivariate analysis section.

A debt IPO is more likely to be associated with higher uncertainty and more information asymmetry than a seasoned bond issue, which can affect mispricing. We identify the bond IPOs (*IPO*) as equal to 1 if the company appears in the FISD database for the first time at the bond issue offering date. The paper also controls for the bond's initial benchmark spread calculated as the at-issue yield spread over a U.S. Treasury security with similar maturity on the same day (Livingston & Miller, 2000; Guedhami & Pittman, 2008; Andres et al., 2014) to measure firms' borrowing costs at issuance.

[22] Bond issues' credit ratings can be assigned by different agencies at the issuance date or a few days after the issuance. I keep the earliest assigned credit rating for each bond issue.

[23] In a robustness tests, I follow Gandi, Puri, and Walter (1997) and create seven credit rating identifiers: for Caa-C, B1-B3, Ba1-Ba3, Baa1-Baa3, A1-A3, Aa1-Aa3, and Aaa (dummies *Moody1* to *Moody7*). Similarly, I create seven dummy variables for the S&P credit rating at the time of the bond issuance provided by the FISD database: for CCC+ - C; B+, B, and B-; BB+, BB, and BB-; BBB+, BBB, and BBB-; A+, A, and A-; AA+, AA, and AA-; and AAA (dummies *SP1* to *SP7*).

The study also controls for different types of bonds using the dummy identifiers. Specifically, the paper identifies convertible and callable bonds and global and rule 144A issues. All these types of bonds represent a significant portion of the sample and cannot be removed from it without significantly reducing the number of observations[24].These types of bonds differ in characteristics that may affect their pricing. Therefore, it is important to add their dummies in the analysis. Arena (2011) examines the determinants of the corporate choice between issuing traditional private placements, private placements under Rule 144A, bank loans, and public debt and finds that firms using different types of financing significantly differ in characteristics. For instance, firms that issue bonds under rule 144A have lower credit quality and higher information asymmetry than firms issuing traditional private placement bonds. It might be explained by the difference in Rule 506 and Regulation D and rule 144A. The investors in traditional private placement bonds issued under Rule 506 and Regulation D cannot freely trade the debt securities for at least one year from the purchasing date and require the issuer to be a high-quality firm with a low default risk. This study excludes traditional private placement corporate bonds as I require the bond issuer to be a publicly traded company to get financial statement data from COMPUSTAT and CRSP.

Finally, the study includes the indicators of whether the bond is a senior, senior subordinated, or subordinated issue of the bond issuer. The difference between the bond levels is in the priority in which a firm in bankruptcy or liquidation pays the debt claims. The subordinated debt is paid after the senior debt is paid, which is associated with a higher risk to the investors. The FISD database provides information on different security levels.

[24] Dick-Nielsen, Nielsen, and von Ruden (2021) use bond type dummies in their analysis but do not clarify which bond types they refer to.

4.3.2. Bond issuer-level controls

Firm-level characteristics used in the analysis include the issuer's industry (two-digit SIC code) dummies, the firm size proxied as a natural logarithm of the issuer's total assets, recent bond and equity issuance indicators, and various financial ratios calculated using the information obtained from the COMPUSTAT and CRSP databases. Smaller firms tend to have more information asymmetry as they are less known, followed by fewer analysts, may suffer from competition, and are more likely to default. Controlling for the firm size helps address the possible effect of these characteristics on bond pricing.

Cai, Helwege, and Warga (2007) find that a recent equity issuance increases bond underpricing. The authors explain this finding by the pecking order theory (Myers & Majluf, 1984): by this theory, the company should finance the projects first through internal resources, then debt, and then equity issuance. The equity issuance may signal to the market that the firm could not finance investments using internal resources or debt. The study uses the recent equity issuance indicator (*Recent equity issue*) in the analysis to control for the financial constraints to finance the projects. The recent equity issuance indicator equals one if the firm issued the equity within one year before the bond issue and zero otherwise. The study also controls for the recent bond issuance (*Recent bond issue*), which can indicate the reduced information asymmetry between the firm and the market. If the company issued the bonds within one year before this bond issue, the investors and underwriters already obtained information about the firm and issue quality, which is also helpful in pricing the current bond issue.

I follow Dick-Nielsen, Nielsen, and von Ruden (2021) and other related studies and include financial ratios to control for the issuer's leverage (*Leverage*) and liquidity (*Cash*) levels, profitability (*Profitability)*, asset turnover (*Sales*), and the ability to pay interest (*Coverage)*.

Leverage is the book value of long-term debt plus debt in current liabilities divided by total assets. *Cash* is the ratio of cash and short-term investments to total assets. *Profitability* is operating income divided by total assets[25]. *Sales* (asset turnover) are calculated as sales divided by total assets. *Coverage* is the ratio of operating income to interest expense. The issuer's accounting and financial information can predict around two-thirds of the variability of credit ratings (Kaplan & Urwitz, 1979; Ziebart & Reiter, 1992). One-third of credit rating variability relates to private information received by the credit agencies from the issuers (Fairchild et al., 2009). Around 7% of bond issues in the final sample do not have credit rating. Financial ratios included as controls in this study address the variability of bond issuers in default risk and help control for essential firm characteristics affecting bond pricing. All ratios are calculated on the year preceding the bond issuance date using the COMPUSTAT annual data. Where the annual data is missing, I used the COMPUSTAT quarterly data and annualized it as described in the WRDS Financial Ratios SAS code[26].

The study also controls for cash flow (*CF Vol*), leverage (*Lev_Vol*), sales (*Sale Vol*), and retained earnings volatilities (*RE Vol*), as in Bao and Pan (2013), to address different levels of company's risk that may affect the accuracy of bond pricing. The higher risk likely increases bond underpricing. Finally, the study utilizes the equity volatility (*Return Vol*) calculated as the volatility of total stock returns in the preceding 90 days to the bond issuance (as in Dick-Nielsen, Nielsen, & von Ruden, 2021) as an additional control for information asymmetry between the firm and the market. All variables are described in Appendix B.

[25] In the robustness check, I replace this ratio with ROA (net income divided by total assets). The results are quantitatively the same and are not reported for brevity.
[26] https://wrds-www.wharton.upenn.edu/pages/support/manuals-and-overviews/wrds-financial-ratios/financial-ratios-sas-code/

5. Methodology

The study uses the univariate and multivariate analysis to test the hypotheses. The analysis starts with the univariate tests to confirm that the bond underpricing is present in the sample of bond issues used in the study, consistent with prior research. Next, I split the sample into the bond issues issued by the firms with and without interlocking boards at the issuance to see if the gross spread and underpricing, among other firm and bond characteristics, significantly differ between these subsamples. The multivariate tests follow the univariate results. I use the OLS regression model to test the hypotheses:

$$Y_i = \alpha + \beta_1 Interlock_j + \beta X_i + \beta Z_j + \varepsilon_i, \quad (7)$$

where Y_i represents gross spread (to test H1) and underpricing (to test H2), $Interlock_j$ represents three different proxies for interlocking relationships between the bond issuer and investment adviser (*Interlock broad*, *Interlock cboard*, or *Interlock both boards*), X_i are bond-level controls, and Z_j are bond issuer's level controls. The study provides hierarchical regression analysis using three proxies for the interlocking relationships. I run an OLS regression with only bond issue controls and then add firm-level controls. Each regression uses credit rating and security level dummies. I also include industry and year dummies or industry-year dummies to control for heterogeneity of the bond issuers that operate in different industries and the time trends. In additional tests described below, the study also uses the interaction terms of the $Interlock_j$ and various bond issue characteristics (investment-grade vs. high-yield, bond IPO vs. SBO) as the main variables of interest.

6. Empirical Tests and Results

6.1. Univariate Analysis

The empirical analysis starts by providing summary statistics of the final sample for 6,559 corporate bonds issued in 2005 – 2020. Table 2 reports statistics for the whole sample and subsamples of bonds issued by firms interlocked and non-interlocked with investment advisers proxied by the *Interlocking cboard* indicator. Overall, 52.6% of the sample are the bonds issued by the interlocked firms. Panel A reports statistics on credit ratings. Bonds issued by the companies interlocked with investment advisers have on average higher credit ratings than bonds issued by non-interlocked companies. For instance, 84.3% of bonds issued by interlocked first are investment-grade bond issues, compared to 68.1% of investment-grade bonds issued by non-interlocked firms. Panel B reports the number of bond IPOs vs. seasonal issues (non-IPOs) for interlocked vs. non-interlocked firms. In the whole sample, 508 (7.7%) of bond issues represent bond IPOs: 193 (315) bonds are issued by interlocked (non-interlocked) firms. Cai, Helwege, and Warga's (2007) sample contains 14.8% of bond IPOs, while Dick-Nielsen, Nielsen, and von Ruden (2021) report the mean of bond IPO indicator to be 19%. The sample used in this study starts in 2005, which organically lowers the number of bond IPOs issued before 2005.

Panel C of Table 2 reports the distribution of the bond issues by maturity. Most of the bonds have a maturity between 5 and 15 years (66.8%). The interlocked firms in the sample issue 61.1% of bonds with medium maturity, 20.2% bonds with low maturity, and 18.7% of bonds with high maturity, compared to 73.1%, 11.3%, and 15.6% of bonds with medium, low, and high maturity, respectfully, issued by non-interlocked firms. Panel D reports the number of bond issues by types. The whole sample contains 86.5% of callable bonds, 56.1% of global issues, 12.1% of bond issues under Rule 144A, and 7.7% of convertible bonds. Similarly, most bonds issued by

interlocked and non-interlocked firms are callable (84.2% and 89.2%, respectively) and global (59.9% and 51.8%, respectively) issues. Only 3.6% of bonds issued by interlocked firms are convertible, compared to 12.2% of convertible bonds issued by non-interlocked firms. It is important to note that some bonds may have characteristics that put them in various categories by the bond type. Therefore, the total percentage of all bond types in the sample is above 100%.

<Table 2 is around here>

Table 3 reports descriptive statistics for all the variables used in the analysis. Panel A reports the descriptive statistics for the main variables of interest. The average (median) gross spread is 0.785% (0.651%) of the offering price, with the minimum of 0.1% and maximum of 3.15%. The mean (median) underpricing as the excess bond return on the first trade during the first calendar week after the issuance is 0.521% or 52 basis points (0.233 or 23 basis points), with the minimum value of -0.97% and a maximum of 4.8%. On average, 62.4% of bond issues in the sample are issued by interlocked firms where at least one individual (an executive or a director) works in bond issuing firm and an investment adviser. On average, 52.6% of bond issues in the sample are issued by companies which have at least one director is an executive working in the investment advisory firm, and 34.6% of the bonds are issued by the companies with directors sitting in both the company's and investment adviser's board.

Panel B of Table 3 reports descriptive statistics of the bond characteristics of the sample. The bonds have a mean (median) maturity of 10.883 (8.512) years and offering amount of $675.866 ($500) million. The median rating of the bond issues in the sample is 8, corresponding to Moody's Baa1 and Standard & Poor's (Fitch) BBB+ credit rating. Panel C reports descriptive statistics of firm characteristics, and Panel D reports additional variables used in the robustness checks. The average (median) size of the company is $74.459 ($20.497) billion in book value and

$57.124 ($20.954) billion in market value. Operating income to assets is, on average, 9.4%, while ROA is, on average, 4.8%. The mean (median) leverage is 34.8% (31.7%), and operating income covers, on average, 11.722 times the interest expense (coverage ratio). The average cash ratio is 13.4%. Approximately 66% (7.2%) of the bond issues are issued by the companies that issued bonds (equity) in the last 365 days. All continuous variables are winsorized by 1% and 99% level.

<Table 3 is around here>

Appendix C reports the correlation matrix between the main variables of interest and controls that will be used as the independent variables in the regression. Highlighted values correspond to significance at a 5% level. Three proxies for interlocking are highly correlated (at least 0.56), indicating that they are similar in nature. It should not be an issue for the analysis, as the study does not utilize three proxies for interlocking simultaneously. Most of the values are below 0.5, with a few exceptions. For instance, the correlation between the coverage ratio and profitability proxied by the ratio of operating income to total assets is 0.55, which can be explained by the commonality of these ratios (both use operating income). To mitigate the possible multicollinearity issues, the main OLS regression model in the study includes the *Profitability* control. For a robustness check, I run the models with *Coverage* and find similar results not reported for brevity. I also examine the variance inflation factors (VIF) for each model in the study. The VIF shows high values (above 10) for the *Firm Size*, *Offering Size*, and *TTM*. Therefore, I orthogonalized these variables and used transformed values in the regression analysis (as in Baker & Wurgler, 2006). The analysis does not show VIF values over 10, which suggests that multicollinearity is not an issue in the analysis.

Before moving to the analysis of the role of interlocked connections on corporate bond underpricing, I compare underpricing among investment-grade vs. high-yield issues, bond IPOs

and SBOs, and issues under Rule 144A and other issues. Table 4 presents univariate comparisons of gross spread and underpricing for these subsamples. Panel A reports the comparison of the underpricing proxies for investment-grade vs. non-investment-grade bond issues. Gross spread is significantly higher for high-yield bond issues than investment-grade bonds (1.752% vs. 0.610%, significant at a 1% level). Underpricing is also higher for high-yield bonds at 1.072%, compared to 0.351% for investment-grade bonds, which is significant at a 1% level. These results align with the results of Cai, Helwege, and Warga (2007). However, their univariate table shows that the initial returns on investment-grade bonds are not significantly different from zero, possibly due to a much smaller sample of bonds purchased by insurance companies in 1995-1999.

Panel B compares our main variables of interest for bond IPOs vs. SBOs. The results show that gross spread and excess initial return are much higher for IPO bond issues (1.378% and 1.030% vs. 0.748% and 0.478%, respectively), significant at a 1% level. The results are consistent with previous studies (Cai et al., 2007; Dick-Nielsen et al., 2021) and can be explained by a higher level of information asymmetry and book-building theories. Panel C provides the univariate comparison of bonds issued under Rule 144A and other issues. The results indicate that bonds issued under this rule have significantly higher gross spreads and initial returns than other issues, which is consistent with the findings of Arena (2011) that poor credit quality and higher information asymmetry firms preferentially issue 144A rule bonds. Fenn (2000) also states that Rule 144A encouraged high-yield issuers to participate in issuing the bonds.

<Table 4 is around here>

The study first starts with a univariate analysis of the role of interlocking on corporate bond pricing. Table 5 provides the univariate analysis of the gross spreads and excess initial returns on bonds issued by interlocked vs. non-interlocked firms. The study utilizes three proxies of

interlocking connections between the bond issuer and the investment advisers. Panel A reports the univariate results for interlocked bond issuers using the broad definition of interlocking connections (*Interlocking_broad*). Panel B reports the univariate comparison of gross spread and underpricing using the second proxy for the interlocking connections (*Interlocking_cboard*). Panel C reports the univariate results using the third proxy for interlocking connections between the bond issuer and investment adviser (*Interlocking_both_boards*). The results in Table 5 indicate that interlocking relationships between bond issuers and investment advisers help significantly lower the level of underpricing and underwriter's compensation. For instance, Panel A shows that gross spread on bonds issued by interlocked firms is lower by 24.1 bps, significant at a 1% level. Similarly, the excess initial return on bonds issued by interlocked firms is lower by 34.6 bps, significant at a 1% level. The results in all panels are consistent with the assumption that investment advisers bring expertise to the company issuing bonds, help mitigate information asymmetry, and, as a result, help reduce agency problems between firms and underwriters.

<Table 5 is around here>

6.2. Multivariate analysis

The univariate analysis provides evidence of a significant reduction of gross spreads and excess initial returns on bonds issued by the firms interlocked with investment advisers. However, the reduction in the underpricing and gross spreads may be driven by various factors, such as bond and bond issuer characteristics that are not considered in the univariate setting. Next, the study presents a multivariate analysis of the role of interlocking connections in corporate bond pricing. The results on testing H1 are in Table 6. The table presents the estimates of the effect of interlocking connections between bond issuers and investment advisers on gross spread. Panel A reports baseline regressions with three proxies of interlocking connections as main explanatory

variables in columns (1), (3), and (5), respectively, and various bond characteristics. Unlike in the univariate analysis, the coefficients for interlocking proxies are positive but insignificant from zero when I control only for bond issue characteristics. However, after adding firm-level characteristics and controlling for time variations across different industries (adding year * industry dummies), interlocking relationship shows a positive association with underwriter's compensation proxied by gross spread, significant at a 10 or 5% level. When the bond issuer has an interlocking relationship with an investment advising firm, the gross spread increases by 2.0-3.1 bps (Models (2), (4), and (6) in Panel B), which represents approximately a 2.5-3.9% increase in the average gross spread. Given that the average offering amount of the bond issue is $675.87 million, this increase represents around $1.33-2.07 million of additional issuer's expenses, which is a substantial amount.

Bond IPOs and convertible bond issues have gross spreads higher by 7.1-8.9 and 142.2 – 148.2 bps, respectively, significant at a 1% level. These findings can be explained by the information asymmetry and risk associated with these bond issues. Offering size has a significant negative relation with gross spread, meaning that firms pay less compensation to underwriters in terms of percentage to the offering price when issuing larger issues. The time to maturity is positively associated with the gross spread, meaning that the investment banks get higher compensation for the bond issues with a longer maturity, which is also explained by a higher risk of allocation of such issues. Most firm-level characteristics, except firm size and earnings volatility, are not statistically significant. The larger the bond issuer, the less the gross spread is, and the larger the earnings volatility in the last five years before the bond issue, the larger the gross spread is. Again, these results can be explained by the information asymmetry and associated risk for the investors.

<Table 6 is around here>

Table 7 presents the estimates of the effect of interlocking connections of bond issuers with investment advisers on bond underpricing proxied by excess initial bond returns on the first trades the first calendar week after the bond issuance. Panel A reports baseline regressions with three proxies of interlocking connections as main explanatory variables in columns (1), (3), and (5), respectively, and various bond characteristics. Consistent with the univariate analysis, the coefficients for interlocking proxies are negative and statistically significant, at a 1% level, from zero in all models. Interlocking relationships shows a negative association with bond underpricing proxied by initial excess return on the first trade during the first calendar week after the issuance. When the bond issuer has interlocking relationship with investment advising firm, bond underpricing reduces by approximately 6.2-14.2 bps (the min-max range of the coefficients in Panels A and B), which represents a lower by 11.9 to 27.3% underpricing than average in the study's sample.

Bond IPOs and convertible bond issues have significantly higher underpricing, by 13-16 and 153 – 171 bps, respectively, at a 5 and 1% level. Bond IPOs and convertible issues are riskier as they are associated with higher information asymmetry between the issuers and investors. Similar to findings in the available literature, if the firm issued the bonds within one year before the current issue, the underpricing is lower. However, bond issuers issuing equity within one year before the current bond issue experience a higher level of underpricing, significant at a 1% level. Offering size has significant positive relation with bond underpricing: larger bond issues have higher levels of underpricing, which can be explained by the higher risk of undersubscription among the investors. The time to maturity is positively associated with the underpricing, significant at a 1% level, which also can be explained by the higher risk of undersubscription.

Firm-level characteristics are not statistically significant[27]. The larger the bond issuer, the lower the bond underpricing is.

6.3. Additional tests

The study also examines if the effect of interlocking relationships between the bond issuer and investment adviser differs for investment-grade vs. high-yield bonds and bond IPOs and SBOs. Available empirical bond literature shows evidence of significantly different levels of bond underpricing of investment-grade and high-yield bonds, while the results are not conclusive. For instance, Datta, Iskandar-Datta, and Patel (1997) examine the pricing of fixed-rate bond IPOs and document the overpricing of investment-grade bonds and underpricing of high-yield bonds. Helwege and Kleiman (1998) report significant positive underpricing of high-yield bond IPOs, while Cai, Helwege, and Warga (2007) report significant underpricing on non-investment-grade IPOs but no significant underpricing on investment-grade bond IPOs.

Investment grade vs. non-investment grade bonds differ in perceived risk and target different groups of investors, leading the investment houses to employ different labor forces to market them. Investors buying investment grade issues primarily seek safety of the principal and not an appreciation in price. However, investors buying junk grade issues seek price appreciation. Investment banks employ different teams to market bond issues based on their investment grade. Riskier bonds are seen as having a larger portion of equity which is more severely affected by information asymmetry, leading to larger underpricing. Goldstein and Hotchkiss (2007) provide additional empirical evidence for the difference in underpricing of investment-grade vs. non-investment-grade issues when investigating the relationship between bond underpricing and

[27] When I run the models without credit rating dummies and treasury yield, they are all statistically significant. It means that credit rating explains most of the differences in observable firm-level characteristics among bond issuers. Similarly, treasury yield proxies the risk of the bond issuers due to their heterogeneity.

trading activity in the aftermarket. The authors conclude that underpricing is related to both an ex-ante decision to underprice and aftermarket price dispersion and is lower for investment-grade issues because of increased trading transparency.

The study tests whether interlocking relationships between the bond issuer and investment adviser affects the underwriter's compensation and underpricing differently for investment-grade and high-yield bond issues. Instead of using numerical credit rating, the study utilizes the *High-Yield* dummy and the interaction term between the *Interlocking* and *High-Yield* as the main variable of interest. I run the analysis using the full model, with bond issue and firm-level characteristics. Table 8 reports the results. Columns (1)-(3) report results for gross spread. Consistent with main results, interlocked firms pay a higher underwriter's compensation. As expected, high-yield bond issues have significantly higher gross spread than investment-grade issues. However, interlocking does not show significantly different impact on bond issues with different credit ratings.

Columns (4)-(6) provide results for bond underpricing. Consistent with the previous results, bond underpricing is significantly lower for the bond issuers with interlocking relationships with investment advisers. Also, as expected, high-yield bond issues have significantly higher bond underpricing than investment-grade bonds. However, high-yield bonds issued by the firms with interlocking connections have significantly lower bond underpricing. The interlocking connections significantly reduce bond underpricing when an executive or director from the bond issuing firm holds executive but not board position in the investment adviser. After combing the values of coefficients for *Interlocking*, *High-Yield*, and their interaction term, the bond underpricing is reduced by 6.4 to 8.8 bps.

The bond underpricing also differs among bond IPOs and SBOs (seasoned bond offerings), as in equity IPOs and SEOs. For instance, Cai, Helwege, and Warga (2007) compare the bond underpricing in IPOs and seasoned offerings and find that bond IPOs are underpriced more than the seasonal bond issues, with the highest level among riskier and unknown firms, explained by a higher compensation for the analysis of the first-time bond issuers made by the investors and consistent with information asymmetry theory and book-building process. The authors argue that the analysis made before for the first bond issuance (bond IPO) is partially transferable to the subsequent issues, and compensation in the form of bond underpricing should be higher for bond IPOs. The bond literature partially explains the bond underpricing by information asymmetry between the bond issuers and investors. Firms first time issuing bonds should experience more information asymmetry as the market is less familiar with the company compared with subsequent issues.

The study tests whether interlocking relationships between the bond issuer and investment adviser affects the underwriter's compensation and underpricing differently for bond IPO and SBO issues. Since the interlocking boards can mitigate the information asymmetry and provide an expertise of the investment adviser in pricing the bond, the first-time bond issuers with interlocking connections may experience less severe underpricing than the first-time bond issuers without interlocking connections. Table 9 provides the results for the full model with bond issue and firm-level characteristics and year*industry dummies. Columns (1)-(3) report results for gross spread. As expected, bond IPOs have significantly higher gross spread than SBOs, and interlocking connections do not show significantly impact bond IPOs. Columns (4)-(6) provide results for bond underpricing. Also, as expected, bond IPOs experience significantly more severe bond underpricing than SBOs (by 20-28 bps). Interlocking connections help mitigate bond underpricing

for the bond IPOs. After combing the values of coefficients for *Interlocking*, *IPO*, and their interaction term, the bond underpricing is reduced by 7.4 to 7.6 bps.

7. Conclusion

Corporate bond mispricing is a severe concern for bond issuers, underwriters, investors, regulators, and market makers. This paper examines whether interpersonal relationships between investment advisors and firms' executives and directors formed through working together in executive roles or serving on the board significantly reduce debt issuance underpricing. Precisely, I investigate the role of working connections on underwriters' compensation proxied by gross spread and the excess initial return on newly issued bonds during the first calendar week of trading after its issuance as a measure of bond underpricing (as in Cai et al., 2007). The results show that interlocking leads to more accurate bond pricing and significantly lower excess initial returns on newly issued bonds. The interlocking relationships between bond issuer and investment adviser increases gross spread by 2.5-3.9%, representing $1.33-2.07 million of additional issuer's expenses, and reduces bond underpricing by approximately 6.2-14.2 bps, which represents a 11.9-27.3% reduction.

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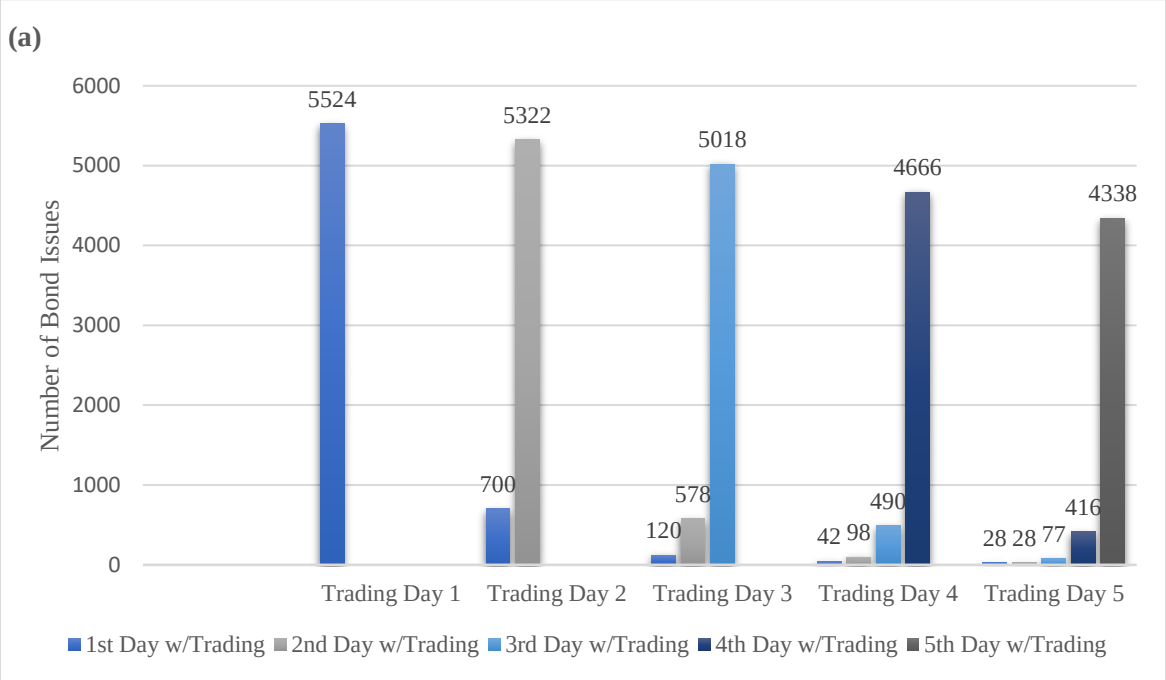
Figure 1. Bond Trade Frequency during the First Calendar Week after the Issuance

(a) The number of bond issues traded during the first calendar week after the issuance; (b) The $ volume in billions traded during the first calendar week after the issuance.



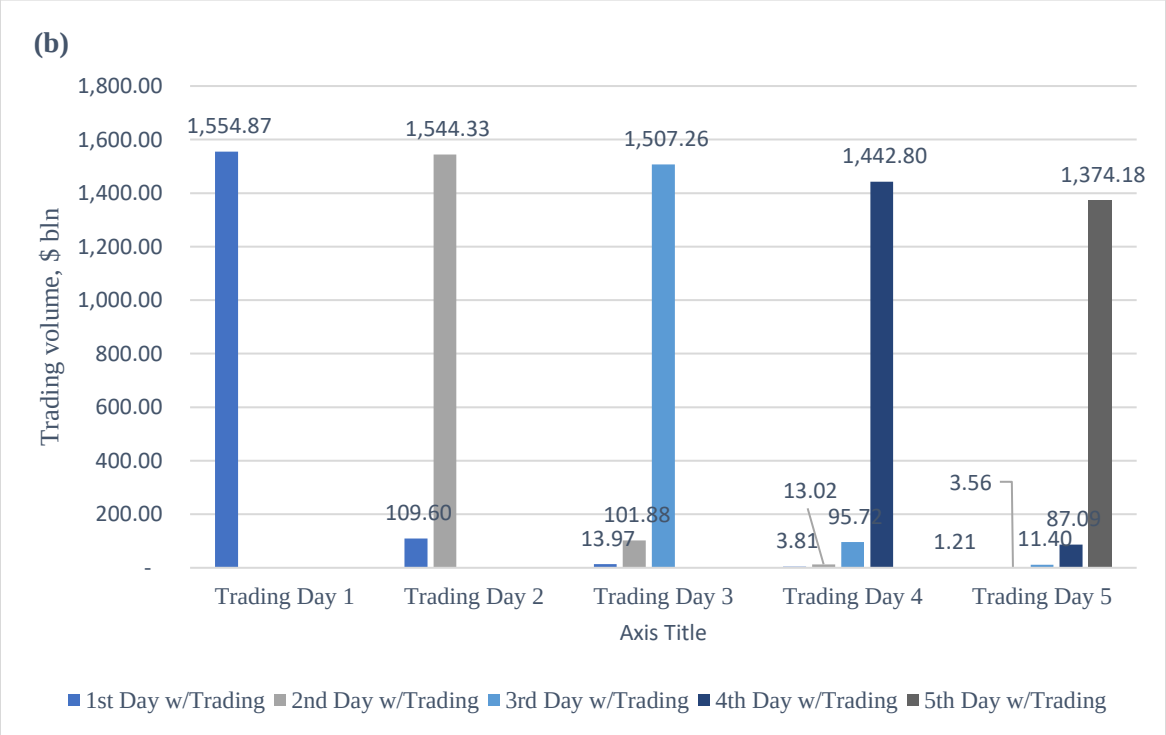


Figure 2. Excess return during the first 20 days of trading after the bond issuance

The excess return is the difference between the bond return and the return on the Bloomberg Barclays U.S. Universal Index used as a benchmark. Bond return is calculated as the percentage difference between weighted average bond price on a day of transaction and the previous-day bond price. The index return is calculated as a percentage difference between the index price on the day of the transaction and the previous-day index price. For the first-day return, the offering price and the index price at the issue date are used as a starting point to calculate the bond and index return, respectively. Excess returns are expressed in basis points.

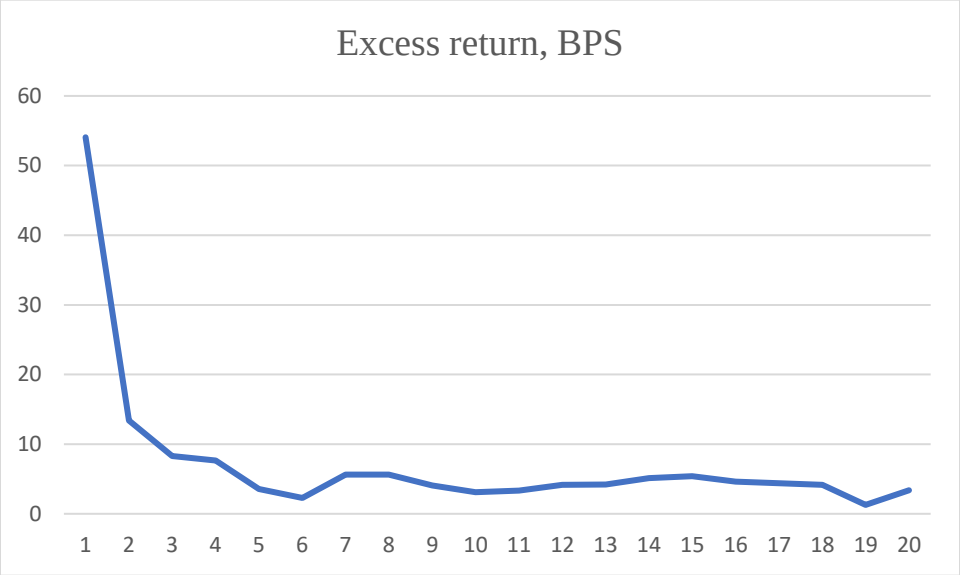


Figure 3. A first-day excess return

The figure shows the excess return on the first trading day after the issuance. The excess return is calculated as the difference between the raw bond return and the benchmark holding-period index return. The study uses the Bloomberg U.S. Corporate Total Return Indices with different maturities matched with maturities of the bonds for the investment-grade issued and the Bloomberg US Corporate High Yield Bond Index for high yield bonds. If an index price on an offering or trading date is missing, the study uses the Bloomberg Barclays U.S. Universal Index as a benchmark. Bond return is calculated as the percentage difference between weighted average bond price on a day of transaction and the previous-day bond price. The holding index return is calculated as:

$$Index\ Return_i^* = \prod_{j=1}^{n}\left(1 + \frac{Index\ Price_j - Index\ price_{j-1}}{Index\ price_{j-1}}\right) - 1$$

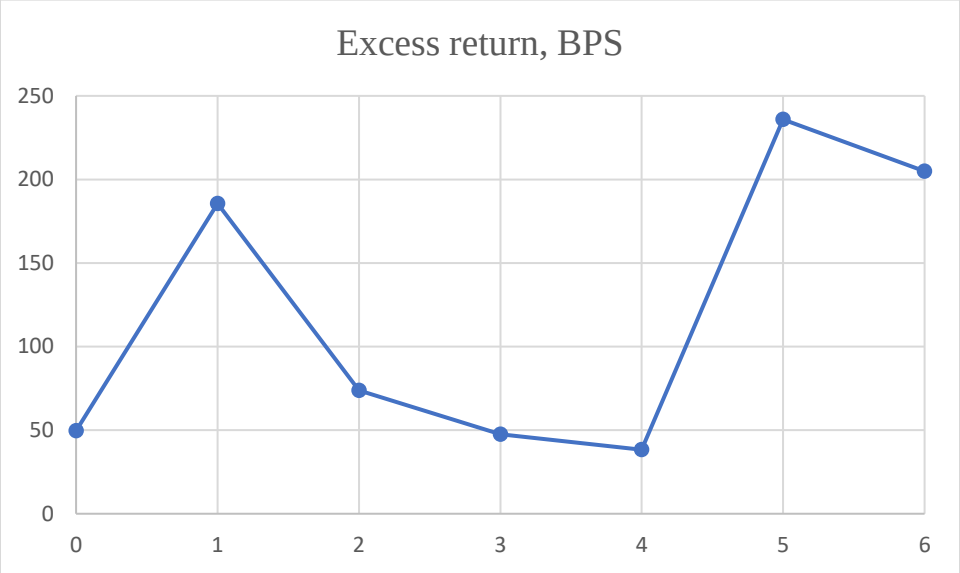


Table 1. Excess returns during the first calendar week of trading

Panel A reports the mean excess returns on bonds during the first five trading days after the issuance for the sample of corporate bonds that started trading during 30 calendar days after the issuance. Panel B reports the mean excess return for the sample of bond issues that started trading during the first calendar week after the issuance (the main sample for the analysis in the study). Panel C reports the mean excess bond returns on the first day of trading for the bonds trading during the first calendar week after the issuance. The excess return is calculated using equation (3) in the paper. Statistical significance at the 0.01, 0.05, and 0.1 levels are denoted by ***, **, and *, respectively.

Panel A

Order of trade	Number of trades	Mean Excess Return	t-stat
1st day of trading	6,559	0.0054***	6.1415
2nd day of trading	6,395	0.0013***	5.7678
3rd day of trading	6,295	0.0008***	6.6737
4th day of trading	6,234	0.0008***	7.6536
5th day of trading	6,191	0.0004***	3.7963

Panel B

Order of trade	Number of trades	Mean Excess Return	t-stat
1st day of trading	6,413	0.0061***	6.9899
2nd day of trading	6,180	0.0011***	5.5721
3rd day of trading	5,956	0.0009***	9.8943
4th day of trading	5,557	0.0007***	8.1761
5th day of trading	4,335	0.0002***	2.7211

Panel C

First Trading	Number of trades	Mean Excess Return	t-stat
At the issuance date	5,524	0.0050***	8.4166
The next day after the issuance	672	0.0186***	2.7737
Two days after the issuance	88	0.0074***	2.6184
Three days after the issuance	46	0.0048**	2.6465
Four days after the issuance	38	0.0038	0.8563
Five days after the issuance	25	0.0236**	2.2310
Six days after the issuance	21	0.0205**	2.3339

Table 2. Summary statistics of credit rating, bond IPO issues, and issue maturity for interlocked vs. non-interlocked firms.

Table reports summary statistics for bond issues of interlocked firms (3,515 issues), non-interlocked firms (3,146 issues), and the whole sample (6,559 issues). Panel A reports numerical credit rating transformed from alphabetical credit rating obtained from the FISD database. Panel B reports the distribution of bond IPOs. Panel C reports bond maturity. Panel D reports the representation of bond issues by type. The bond issuers are identified as interlocked if at least one individual working in the advising firm sits in the board of directors of the bond issuers (*Interlock_cboard* variable in Appendix B) during the year of bond issue All variables are described in Appendix B.

Panel A. Bond Rating

Credit rating	Numerical Rating	Interlocked issuers		Non-Interlocked issuers		The whole sample	
		Number	Percent	Number	Percent	Number	Percent
Highest grade	1-2	143	4.1%	79	2.5%	222	3.4%
High grade	3-5	879	25.5%	298	9.6%	1177	17.9%
Upper medium grade	6-10	1887	54.7%	1741	56.0%	3628	55.3%
Non-investment grade	11-14	307	8.9%	515	16.6%	822	12.5%
Low grade	15-21	109	3.2%	176	5.7%	285	4.3%
Non-rated	23	127	3.7%	298	9.6%	425	6.5%
Total		3,452	52.6%	3,107	47.4%	6,559	100.0%

Panel B. IPO vs. non-IPO issues

IPO issues	Interlocked issuers		Non-Interlocked issuers		The whole sample	
	Number	Percent	Number	Percent	Number	Percent
IPO	193	5.6%	315	10.1%	508	7.7%
non-IPO	3259	94.4%	2792	89.9%	6051	92.3%

Panel C. Bond maturity

Maturity	Interlocked issuers		Non-Interlocked issuers		The whole sample	
	Number	Percent	Number	Percent	Number	Percent
Low maturity (less than 5 years)	696	20.2%	351	11.3%	1047	16.0%
Medium maturity (5 - 15 years)	2109	61.1%	2272	73.1%	4381	66.8%
High maturity (15+ years)	647	18.7%	484	15.6%	1131	17.2%

Panel D. Summary by different bond types

Bond types	Interlocked issuers		Non-Interlocked issuers		The whole sample	
	Number	Percent	Number	Percent	Number	Percent
Convertible	124	3.6%	380	12.2%	504	7.7%
Callable	2905	84.2%	2771	89.2%	5676	86.5%
Global	2068	59.9%	1610	51.8%	3678	56.1%
144A	299	8.7%	496	16.0%	795	12.1%

Table 3. Descriptive statistics

Table reports descriptive statistics for all variables used in the main analysis and robustness checks. All continuous variables are winsorized at a 1% and 99% level. The table also provides descriptive statistics for transformed variables as they are used in the univariate and multivariate analysis. All variables are described in Appendix B.

Variable	N	Mean	Median	Std Dev	Min	Q1	Q3	Max
Panel A: Main variables of interest								
Gross Spread, %	5,676	0.785	0.651	0.619	0.100	0.450	0.879	3.150
Underpircing, %	6,272	0.521	0.233	0.866	-0.970	0.067	0.662	4.800
Interlock Broad	6,559	0.624	1.000	0.484	0.000	0.000	1.000	1.000
Interlock _Corporate Board	6,559	0.526	1.000	0.499	0.000	0.000	1.000	1.000
Interlock_Both Boards	6,559	0.346	0.000	0.476	0.000	0.000	1.000	1.000
Interlock_Corporate Board ratio	6,559	0.072	0.071	0.089	0.000	0.000	0.118	1.000
Interlock_Both Boards ratio	6,559	0.041	0.000	0.071	0.000	0.000	0.077	1.000
Panel B: Bond Characteristics								
Time to maturity, years	6,559	10.883	8.512	8.910	1.995	5.027	10.077	40.041
log of Time to maturity	*6,559*	*2.119*	*2.142*	*0.712*	*0.690*	*1.615*	*2.310*	*3.690*
Offering amount, $ mm	6,559	675.866	500.000	593.103	0.375	300.000	850.000	3000.000
log of Offering amount	*6,559*	*6.017*	*6.215*	*1.496*	*-0.981*	*5.704*	*6.745*	*8.006*
Rating numeric	6,559	9.063	8.000	4.890	1.000	6.000	10.000	23.000
High-Yield								
Issue 144a	6,559	0.121	0.000	0.326	0.000	0.000	0.000	1.000
Convertible	6,559	0.077	0.000	0.266	0.000	0.000	0.000	1.000
Global Issue	6,559	0.561	1.000	0.496	0.000	0.000	1.000	1.000
IPO	6,559	0.077	0.000	0.267	0.000	0.000	0.000	1.000
Treasury Yield	6,175	1.543	1.188	1.585	-1.930	0.530	2.205	7.485
Panel C: Firm Characteristics								
Total assets, $ bln	6,559	74.459	20.497	173.576	0.317	6.928	59.462	979.414
log of Total assets (in mln)	6,559	*9.791*	*9.809*	*1.679*	*5.360*	*8.712*	*10.881*	*13.795*
EBIT/Total Assets	6,559	0.094	0.096	0.093	-0.324	0.054	0.141	0.331
Operating CF/Total Assets	6,559	0.104	0.102	0.075	-0.168	0.067	0.144	0.310
Assets Turnover	6,541	0.842	0.660	0.666	0.067	0.413	1.038	3.610
Retained Earnings/Total Assets	6,367	0.238	0.268	0.428	-1.741	0.081	0.462	1.156
ROA	6,559	0.048	0.055	0.081	-0.367	0.020	0.088	0.222
Cash Ratio	6,559	0.134	0.080	0.149	0.001	0.035	0.172	0.714
Coverage Ratio	6,515	11.722	7.894	15.964	-14.435	4.200	13.822	98.176
Leverage	6,559	0.348	0.317	0.168	0.058	0.226	0.440	0.929
Cash Flow volatility	6,558	0.046	0.042	0.022	0.011	0.031	0.055	0.141
Leverage volatility	6,548	0.053	0.041	0.043	0.008	0.025	0.067	0.247
Sales volatility	6,538	0.033	0.023	0.032	0.002	0.012	0.041	0.181
Equity volatility	6,537	0.035	0.028	0.023	0.007	0.020	0.020	0.196
Earnings volatility	6,368	0.080	0.050	0.111	0.003	0.029	0.083	0.764
Recent bond issue	6,559	0.661	1.000	0.661	0.000	0.000	1.000	1.000
Recent equity issue	6,559	0.072	0.000	0.258	0.000	0.000	0.000	1.000

Table 4. Univariate analysis of gross spreads and excess initial returns of bonds by rating, IPO, and bond type

The table reports univariate comparison of gross spreads and excess initial returns on bonds by credit rating, IPO, and bond type. Panel A reports the univariate results for investment-grade vs. high-yield bond issues. Panel B reports the results for bond IPOs vs. SBOs. Panel C reports the results for bonds issued under Rule 144A versus other issues. Statistical significance at the 0.01, 0.05, and 0.1 levels are denoted by ***, **, and *, respectively.

Panel A: Investment-grade vs. non-investment-grade bond issues

	Non-investment grade	Investment grade	Diff.	t-stat	# of obs.
Gross Spread	1.752***	0.610***	1.142	67.133***	872/4,804
Underpricing	1.072***	0.351***	0.721	29.959***	1,483/4,789

Panel B: Bond IPOs vs. SBOs

	IPO	SBO	Diff.	t-stat	# of obs.
Gross Spread	1.378***	0.748***	0.630	18.727***	339/5,337
Underpricing	1.030***	0.478***	0.552	13.692***	486/5,786

Panel C: Bonds issued under Rule 144A vs. other issues

	Rule 144a	Other issues	Diff.	t-stat	# of obs.
Gross Spread	2.117***	0.775***	1.342	14.586***	44/5,632
Underpricing	0.911***	0.467***	0.444	13.466***	765/5,507

Table 5. Univariate analysis of gross spreads and excess initial returns on bonds issued by interlocked and non-interlocked firms.

The table reports univariate comparison of gross spreads and excess initial returns on bonds issued by interlocked vs. non-interlocked firms. Panel A uses the broad definition of interlocking connections (Interlocking_broad). Panel B uses the second proxy for the interlocking connections (Interlocking_cboard). Panel C the third proxy for interlocking connections between the bond issuer and investment adviser (Interlocking_both_boards). Statistical significance at the 0.01, 0.05, and 0.1 levels are denoted by ***, **, and *, respectively.

Panel A: Interlocking using *Interlock_broad* definition

	No Interlock	Interlock	Diff.	t-stat	# of obs.
Gross Spread	0.941***	0.700***	0.241	14.303***	2,011/3,665
Underpricing	0.735***	0.389***	0.346	15.657***	2,399/3,873

Panel B: Interlocking using *Interlock_cboard* definition

	No Interlock	Interlock	Diff.	t-stat	# of obs.
Gross Spread	0.878***	0.708***	0.170	10.389***	2,592/3084
Underpricing	0.677***	0.376***	0.302	13.997***	3,027/3245

Panel C: Interlocking using *Interlock_both_boards* definition

	No Interlock	Interlock	Diff.	t-stat	# of obs.
Gross Spread	0.833***	0.701***	0.132	7.761***	3,618/2,058
Underpricing	0.620***	0.322***	0.298	12.981***	4,192/2,080

Table 6. The effect of interlocking connections on gross spread

The table reports the estimates of the effect of interlocking connections between bond issuers and investment advisers on bond issue gross spread. Panel A presents the results for the OLS regressions with interlocking proxies as main explanatory variables and various bond characteristics as controls. Panel B presents the results for the OLS regressions with interlocking proxies as main explanatory variables and various bond and firm-level characteristics as controls. Models (1) and (2) in both panels use *Interlocking broad* as a proxy for interlocking relationship. Models (3) and (4) use *Interlocking cboard*, and Models (5) and (6) use *Interlocking both boards*. Credit rating and security level dummies are included in all models in Panels A and B. Models (2), (4), and (6) in Panel A and Models (1), (3), and (5) in Panel B also include year- and industry (2-digit SIC code) dummies. Models (2), (4), and (6) in Panel B include year * industry dummies. All variables are described in Appendix B. Standard errors are clustered by the bond issuer level. t-statistics is presented in the parentheses. ***, **, and * signify statistical significance at the 1%, 5%, and 10% levels.

Panel A: Baseline with various bond characteristics

Gross Spread	*Interlock broad*		*Interlock cboard*		*Interlock both boards*	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Interlocking*	0.019	0.013	0.018	0.011	0.012	0.008
	(0.852)	(0.741)	(0.870)	(0.715)	(0.507)	(0.457)
IPO	0.072***	0.089***	0.071***	0.089***	0.071***	0.088***
	(2.831)	(3.507)	(2.821)	(3.505)	(2.812)	(3.501)
Issue 144A	-0.020	-0.010	-0.021	-0.011	-0.022	-0.011
	(-0.209)	(-0.122)	(-0.215)	(-0.131)	(-0.225)	(-0.132)
Convertible	1.475***	1.482***	1.474***	1.482***	1.474***	1.481***
	(21.914)	(21.691)	(21.942)	(21.662)	(21.933)	(21.713)
Global	-0.008	-0.057*	-0.008	-0.057*	-0.008	-0.057*
	(-0.438)	(-1.916)	(-0.457)	(-1.905)	(-0.430)	(-1.930)
Treasury Yield	0.058***	0.060***	0.058***	0.060***	0.058***	0.060***
	(10.337)	(9.723)	(10.345)	(9.702)	(10.333)	(9.707)
Recent bond issue	-0.011	-0.005	-0.011	-0.005	-0.010	-0.005
	(-0.507)	(-0.376)	(-0.493)	(-0.355)	(-0.454)	(-0.344)
Recent equity issue	0.017	0.025	0.016	0.024	0.016	0.025
	(0.491)	(0.924)	(0.464)	(0.910)	(0.461)	(0.925)
ln Offering amount	-0.159***	-0.161***	-0.158***	-0.160***	-0.158***	-0.160***
	(-3.044)	(-4.527)	(-3.054)	(-4.541)	(-3.104)	(-4.592)
ln TTM	0.161***	0.155***	0.161***	0.155***	0.161***	0.155***
	(6.502)	(7.588)	(6.494)	(7.551)	(6.489)	(7.546)
Constant	0.397***	0.490***	0.401***	0.492***	0.405***	0.495***
	(4.027)	(3.605)	(4.035)	(3.615)	(4.068)	(3.616)
Credit rating dummies	YES	YES	YES	YES	YES	YES
Security level dummies	YES	YES	YES	YES	YES	YES
Year dummies	NO	YES	NO	YES	NO	YES
Industry dummies	NO	YES	NO	YES	NO	YES
Year * industry dummies	NO	NO	NO	NO	NO	NO
Observations	5320	5320	5320	5320	5320	5320
Adjusted R-squared	0.8023	0.8249	0.8023	0.8249	0.8022	0.8248

Panel B: with firm-level characteristics

	Interlock broad		*Interlock cboard*		*Interlock both boards*	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Interlocking*	0.027	0.020*	0.026*	0.028**	0.022	0.031**
	(1.558)	(1.657)	(1.674)	(2.194)	(1.251)	(1.966)
IPO	0.073***	0.083***	0.072***	0.081***	0.072***	0.081***
	(2.888)	(2.850)	(2.848)	(2.796)	(2.848)	(2.778)
Issue 144A	-0.016	-0.056	-0.017	-0.057	-0.017	-0.058
	(-0.206)	(-0.705)	(-0.225)	(-0.721)	(-0.224)	(-0.729)
Convertible	1.443***	1.421***	1.443***	1.421***	1.442***	1.422***
	(20.675)	(18.126)	(20.629)	(18.093)	(20.685)	(18.114)
Global	-0.061**	-0.045*	-0.062**	-0.046*	-0.061**	-0.044*
	(-1.967)	(-1.841)	(-1.969)	(-1.879)	(-1.968)	(-1.846)
Treasury Yield	0.057***	0.062***	0.057***	0.062***	0.057***	0.062***
	(7.496)	(7.354)	(7.494)	(7.365)	(7.499)	(7.352)
Recent bond issue	0.017	0.011	0.017	0.011	0.017	0.011
	(1.453)	(1.210)	(1.463)	(1.224)	(1.458)	(1.239)
Recent equity issue	0.025	0.044	0.024	0.043	0.025	0.045
	(0.885)	(1.476)	(0.864)	(1.452)	(0.891)	(1.504)
ln Offering amount	-0.159***	-0.153***	-0.158***	-0.152***	-0.157***	-0.151***
	(-4.699)	(-5.357)	(-4.679)	(-5.344)	(-4.716)	(-5.352)
ln TTM	0.159***	0.154***	0.159***	0.154***	0.159***	0.154***
	(7.709)	(8.312)	(7.685)	(8.319)	(7.674)	(8.318)
ln Total Assets	-0.051***	-0.043**	-0.051***	-0.044***	-0.050***	-0.044***
	(-3.367)	(-2.515)	(-3.271)	(-2.596)	(-3.294)	(-2.672)
Leverage	-0.035	-0.030	-0.041	-0.038	-0.041	-0.039
	(-0.689)	(-0.582)	(-0.781)	(-0.717)	(-0.766)	(-0.734)
EBIT/TA	-0.117	-0.180	-0.116	-0.182	-0.115	-0.179
	(-1.085)	(-1.524)	(-1.081)	(-1.542)	(-1.071)	(-1.516)
Sales	0.016	0.010	0.016	0.009	0.016	0.009
	(1.186)	(0.784)	(1.182)	(0.743)	(1.199)	(0.734)
Cash	0.028	0.063	0.032	0.070	0.025	0.065
	(0.398)	(1.064)	(0.447)	(1.170)	(0.351)	(1.085)
CF Vol	-0.616	-0.476	-0.626	-0.502	-0.593	-0.488
	(-1.413)	(-1.027)	(-1.436)	(-1.083)	(-1.374)	(-1.058)
Leverage Vol	-0.178	-0.170	-0.181	-0.175	-0.175	-0.167
	(-0.892)	(-0.850)	(-0.907)	(-0.878)	(-0.874)	(-0.835)
RE Vol	0.211**	0.212**	0.210**	0.208**	0.214**	0.209**
	(2.364)	(2.225)	(2.349)	(2.183)	(2.394)	(2.192)
Return Vol	0.515	0.308	0.522	0.311	0.512	0.299
	(1.198)	(0.691)	(1.211)	(0.697)	(1.188)	(0.669)
Constant	0.569***	0.680***	0.569***	0.672***	0.572***	0.670***
	(3.836)	(4.840)	(3.826)	(4.756)	(3.821)	(4.672)
Credit rating dummies	YES	YES	YES	YES	YES	YES
Security level dummies	YES	YES	YES	YES	YES	YES
Year dummies	YES	NO	YES	NO	YES	NO
Industry dummies	YES	NO	YES	NO	YES	NO
Year * industry dummies	NO	YES	NO	YES	NO	YES
Observations	5132	5132	5132	5132	5132	5132
Adjusted R-squared	0.8279	0.8442	0.8279	0.8444	0.8277	0.8444

Table 7. The effect of interlocking connections on bond underpricing

The table reports the estimates of the effect of interlocking connections between bond issuers and investment advisers on bond issue underpricing. Panel A presents the results for the OLS regressions with interlocking proxies as main explanatory variables and various bond characteristics as controls. Panel B presents the results for the OLS regressions with interlocking proxies as main explanatory variables and various bond and firm-level characteristics as controls. Models (1) and (2) in both panels use *Interlocking broad* as a proxy for interlocking relationship. Models (3) and (4) use *Interlocking cboard*, and Models (5) and (6) use *Interlocking both boards*. Credit rating and security level dummies are included in all models in Panels A and B. Models (2), (4), and (6) in Panel A and Models (1), (3), and (5) in Panel B also include year- and industry (2-digit SIC code) dummies. Models (2), (4), and (6) in Panel B include year * industry dummies. All variables are described in Appendix B. Standard errors are clustered by the bond issuer level. t-statistics is presented in the parentheses. ***, **, and * signify statistical significance at the 1%, 5%, and 10% levels.

Panel A: Baseline with various bond characteristics

Underpricing	*Interlock broad*		*Interlock cboard*		*Interlock both boards*	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Interlocking*	-0.133***	-0.142***	-0.122***	-0.130***	-0.105***	-0.103***
	(-4.558)	(-4.833)	(-4.704)	(-4.879)	(-3.943)	(-3.837)
IPO	0.137**	0.157**	0.136**	0.158***	0.138**	0.159***
	(2.233)	(2.576)	(2.220)	(2.598)	(2.231)	(2.606)
Issue 144A	-0.133**	-0.051	-0.130**	-0.047	-0.133**	-0.051
	(-2.477)	(-0.914)	(-2.437)	(-0.842)	(-2.498)	(-0.913)
Convertible	1.706***	1.534***	1.714***	1.536***	1.719***	1.545***
	(11.950)	(9.355)	(12.035)	(9.399)	(12.050)	(9.433)
Global	0.055**	0.044	0.057**	0.046	0.053**	0.041
	(2.127)	(1.449)	(2.207)	(1.490)	(2.041)	(1.339)
Treasury Yield	0.213***	0.180***	0.213***	0.181***	0.213***	0.181***
	(11.877)	(9.663)	(11.924)	(9.675)	(11.894)	(9.706)
Recent bond issue	-0.086***	-0.062***	-0.088***	-0.064***	-0.093***	-0.067***
	(-3.795)	(-2.839)	(-3.860)	(-2.903)	(-4.099)	(-3.037)
Recent equity issue	0.179***	0.198***	0.182***	0.200***	0.183***	0.198***
	(2.973)	(3.269)	(3.032)	(3.300)	(3.034)	(3.250)
ln Offering amount	0.098***	0.089***	0.093***	0.083***	0.090***	0.082***
	(4.192)	(3.799)	(3.962)	(3.416)	(3.838)	(3.382)
ln TTM	0.070***	0.084***	0.070***	0.083***	0.070***	0.083***
	(4.652)	(5.499)	(4.630)	(5.406)	(4.617)	(5.378)
Constant	-0.801***	-0.782*	-0.824***	-0.793*	-0.826***	-0.792*
	(-2.618)	(-1.896)	(-2.696)	(-1.918)	(-2.703)	(-1.903)
Credit rating dummies	YES	YES	YES	YES	YES	YES
Security level dummies	YES	YES	YES	YES	YES	YES
Year dummies	NO	YES	NO	YES	NO	YES
Industry dummies	NO	YES	NO	YES	NO	YES
Year * industry dummies	NO	NO	NO	NO	NO	NO
Observations	5944	5944	5944	5944	5944	5944
Adjusted R-squared	0.3201	0.3437	0.3197	0.3431	0.3181	0.3410

Panel B: with firm-level characteristics

	Interlock broad		*Interlock cboard*		*Interlock both boards*	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Interlocking*	-0.113***	-0.131***	-0.098***	-0.117***	-0.062**	-0.079**
	(-3.686)	(-4.005)	(-3.425)	(-3.733)	(-2.193)	(-2.431)
IPO	0.136**	0.160**	0.138**	0.165**	0.138**	0.164**
	(2.195)	(2.441)	(2.239)	(2.519)	(2.219)	(2.491)
Issue 144A	-0.097*	-0.126*	-0.093	-0.117*	-0.096*	-0.122*
	(-1.680)	(-1.894)	(-1.609)	(-1.762)	(-1.657)	(-1.832)
Convertible	1.525***	1.466***	1.529***	1.473***	1.536***	1.480***
	(8.797)	(7.699)	(8.849)	(7.768)	(8.875)	(7.778)
Global	0.033	0.014	0.036	0.018	0.032	0.012
	(1.044)	(0.401)	(1.111)	(0.504)	(0.994)	(0.330)
Treasury Yield	0.188***	0.170***	0.188***	0.170***	0.188***	0.170***
	(9.167)	(7.512)	(9.161)	(7.508)	(9.161)	(7.505)
Recent bond issue	-0.014	-0.020	-0.015	-0.020	-0.016	-0.021
	(-0.628)	(-0.863)	(-0.694)	(-0.891)	(-0.713)	(-0.922)
Recent equity issue	0.219***	0.248***	0.221***	0.251***	0.219***	0.246***
	(3.398)	(3.509)	(3.418)	(3.527)	(3.380)	(3.447)
ln Offering amount	0.098***	0.086***	0.094***	0.083***	0.095***	0.085***
	(3.935)	(4.135)	(3.614)	(4.035)	(3.653)	(4.138)
ln TTM	0.087***	0.095***	0.086***	0.095***	0.086***	0.095***
	(5.380)	(6.002)	(5.307)	(6.010)	(5.279)	(5.997)
ln Total Assets	-0.129***	-0.138***	-0.131***	-0.142***	-0.140***	-0.151***
	(-4.734)	(-4.956)	(-4.663)	(-5.075)	(-5.012)	(-5.397)
Leverage	-0.093	-0.064	-0.073	-0.035	-0.082	-0.043
	(-0.854)	(-0.522)	(-0.670)	(-0.289)	(-0.742)	(-0.349)
EBIT/TA	0.046	0.023	0.046	0.023	0.051	0.019
	(0.176)	(0.075)	(0.174)	(0.074)	(0.192)	(0.061)
Sales	0.019	0.024	0.019	0.024	0.017	0.023
	(0.674)	(0.764)	(0.644)	(0.764)	(0.590)	(0.714)
Cash	0.011	-0.032	0.004	-0.046	0.030	-0.018
	(0.070)	(-0.187)	(0.022)	(-0.270)	(0.188)	(-0.108)
CF Vol	-0.053	-0.187	-0.015	-0.105	-0.145	-0.206
	(-0.056)	(-0.169)	(-0.016)	(-0.094)	(-0.151)	(-0.185)
Leverage Vol	-0.211	-0.255	-0.219	-0.264	-0.234	-0.302
	(-0.447)	(-0.485)	(-0.466)	(-0.503)	(-0.495)	(-0.573)
RE Vol	-0.241	-0.354	-0.242	-0.359	-0.255	-0.370
	(-1.157)	(-1.529)	(-1.155)	(-1.545)	(-1.209)	(-1.579)
Return Vol	0.659	1.419	0.640	1.419	0.646	1.407
	(0.553)	(1.085)	(0.537)	(1.086)	(0.541)	(1.076)
Constant	-0.689*	-0.864**	-0.700*	-0.870**	-0.693*	-0.878**
	(-1.665)	(-2.446)	(-1.691)	(-2.448)	(-1.674)	(-2.474)
Credit rating dummies	YES	YES	YES	YES	YES	YES
Security level dummies	YES	YES	YES	YES	YES	YES
Year dummies	YES	NO	YES	NO	YES	NO
Industry dummies	YES	NO	YES	NO	YES	NO
Year * industry dummies	NO	YES	NO	YES	NO	YES
Observations	5716	5716	5716	5716	5716	5716
Adjusted R-squared	0.3548	0.3760	0.3542	0.3755	0.3526	0.3736

Table 8. The sensitivity of the effect of interlocking connections on gross spread and bond underpricing for investment-grade vs. high-yield bond issues

The table reports the estimates of the effect of interlocking connections between bond issuers and investment advisers on gross spread and bond underpricing for investment-grade vs. high-yield bonds. The table presents the results for the OLS regressions with interlocking proxies as main explanatory variables and various bond and firm-level characteristics as controls. Models (1) and (4) use *Interlocking broad* as a proxy for interlocking relationship. Models (2) and (5) use *Interlocking cboard*, and Models (3) and (6) use *Interlocking both boards*. Columns (1)-(3) report results for gross spread, while columns (4)-(6) report results for bond underpricing. Security level and year * industry dummies are included in all models. All variables are described in Appendix B. Standard errors are clustered by the bond issuer level. t-statistics is presented in the parentheses. ***, **, and * signify statistical significance at the 1%, 5%, and 10% levels.

	Gross spread			*Underpricing*		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Interlocking*	0.033**	0.033**	0.038**	-0.079**	-0.059*	-0.057*
	(2.469)	(2.435)	(2.086)	(-2.485)	(-1.890)	(-1.688)
High-Yield	0.424***	0.415***	0.425***	0.187***	0.186***	0.122**
	(8.813)	(8.895)	(10.051)	(2.745)	(2.813)	(2.003)
Interlocking*High-Yield	-0.026	-0.008	-0.058	-0.172**	-0.215***	-0.105
	(-0.602)	(-0.184)	(-1.261)	(-2.255)	(-2.855)	(-1.201)
IPO	0.076**	0.074**	0.075**	0.157**	0.164**	0.159**
	(2.579)	(2.510)	(2.537)	(2.417)	(2.520)	(2.437)
Issue 144A	-0.064	-0.065	-0.071	-0.127*	-0.123*	-0.131**
	(-0.788)	(-0.806)	(-0.868)	(-1.937)	(-1.880)	(-2.002)
Convertible	1.410***	1.413***	1.407***	1.388***	1.392***	1.410***
	(20.689)	(20.902)	(20.785)	(9.658)	(9.695)	(9.862)
Global	-0.059**	-0.060**	-0.059**	0.014	0.014	0.014
	(-2.359)	(-2.379)	(-2.357)	(0.401)	(0.388)	(0.397)
Treasury Yield	0.081***	0.081***	0.081***	0.156***	0.157***	0.156***
	(8.221)	(8.263)	(8.142)	(7.550)	(7.598)	(7.588)
Recent bond issue	0.004	0.005	0.004	-0.022	-0.023	-0.024
	(0.432)	(0.462)	(0.445)	(-0.958)	(-1.004)	(-1.049)
Recent equity issue	0.070**	0.069**	0.070**	0.215***	0.209***	0.208***
	(2.204)	(2.176)	(2.239)	(3.026)	(2.934)	(2.895)
ln Offering amount	-0.148***	-0.147***	-0.146***	0.097***	0.096***	0.094***
	(-4.858)	(-4.848)	(-4.870)	(4.216)	(4.210)	(4.182)
ln TTM	0.152***	0.152***	0.152***	0.095***	0.096***	0.096***
	(8.137)	(8.143)	(8.132)	(5.950)	(5.972)	(5.946)
Constant	0.637***	0.635***	0.628***	-1.203***	-1.209***	-1.198***
	(5.060)	(5.034)	(4.874)	(-3.436)	(-3.411)	(-3.357)
Firm-level controls	YES	YES	YES	YES	YES	YES
Security level dummies	YES	YES	YES	YES	YES	YES
Year * industry dummies	YES	YES	YES	YES	YES	YES
Observations	5132	5132	5132	5716	5716	5716
Adjusted R-squared	0.8333	0.8334	0.8335	0.3708	0.3711	0.3672

Table 9. The sensitivity of the effect of interlocking connections on gross spread and bond underpricing for IPO vs. SBO issues

The table reports the estimates of the effect of interlocking connections between bond issuers and investment advisers on gross spread and bond underpricing for bond IPOs and SBOs. The table presents the results for the OLS regressions with interlocking proxies as main explanatory variables and various bond and firm-level characteristics as controls. Models (1) and (4) use *Interlocking broad* as a proxy for interlocking relationship. Models (2) and (5) use *Interlocking cboard*, and Models (3) and (6) use *Interlocking both boards*. Columns (1)-(3) report results for gross spread, while columns (4)-(6) report results for bond underpricing. Security level and year * industry dummies are included in all models. All variables are described in Appendix B. Standard errors are clustered by the bond issuer level. t-statistics is presented in the parentheses. ***, **, and * signify statistical significance at the 1%, 5%, and 10% levels.

	Gross spread			*Underpricing*		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Interlocking*	0.022*	0.030**	0.034**	-0.112***	-0.099***	-0.069**
	(1.821)	(2.264)	(2.123)	(-3.355)	(-3.086)	(-2.128)
IPO	0.099**	0.091**	0.095***	0.284***	0.263***	0.201***
	(2.229)	(2.292)	(2.760)	(2.884)	(3.025)	(2.699)
Interlocking*IPO	-0.033	-0.023	-0.060	-0.246**	-0.240*	-0.156
	(-0.645)	(-0.470)	(-1.348)	(-1.989)	(-1.917)	(-1.137)
Issue 144A	-0.055	-0.057	-0.061	-0.119*	-0.116*	-0.121*
	(-0.692)	(-0.717)	(-0.769)	(-1.773)	(-1.733)	(-1.814)
Convertible	1.420***	1.420***	1.422***	1.467***	1.474***	1.483***
	(18.079)	(18.063)	(18.117)	(7.705)	(7.766)	(7.792)
Global	-0.044*	-0.045*	-0.044*	0.014	0.018	0.013
	(-1.838)	(-1.875)	(-1.827)	(0.393)	(0.498)	(0.358)
Treasury Yield	0.061***	0.062***	0.062***	0.169***	0.169***	0.170***
	(7.332)	(7.364)	(7.353)	(7.461)	(7.503)	(7.498)
Recent bond issue	0.011	0.011	0.011	-0.021	-0.021	-0.022
	(1.205)	(1.225)	(1.214)	(-0.903)	(-0.913)	(-0.955)
Recent equity issue	0.045	0.044	0.046	0.254***	0.255***	0.249***
	(1.498)	(1.469)	(1.542)	(3.597)	(3.599)	(3.495)
ln Offering amount	-0.152***	-0.151***	-0.150***	0.087***	0.085***	0.085***
	(-5.332)	(-5.319)	(-5.338)	(4.173)	(4.102)	(4.161)
ln TTM	0.154***	0.154***	0.154***	0.095***	0.095***	0.095***
	(8.309)	(8.319)	(8.319)	(6.000)	(6.016)	(6.003)
Constant	0.684***	0.675***	0.674***	-0.867**	-0.864**	-0.875**
	(4.826)	(4.753)	(4.678)	(-2.498)	(-2.470)	(-2.485)
Credit rating dummies	YES	YES	YES	YES	YES	YES
Security level dummies	YES	YES	YES	YES	YES	YES
Firm-level controls	YES	YES	YES	YES	YES	YES
Year * industry dummies	YES	YES	YES	YES	YES	YES
Observations	5132	5132	5132	5716	5716	5716
Adjusted R-squared	0.8442	0.8443	0.8444	0.3771	0.3765	0.3738

Appendix A: Sample Construction

Sample	# of obs	Distinct bond issuers
Initial sample in Mergent FISD database, 1950 - 2020	492,895	
Sample with non-missing and non-zero offering date, offering price, and SIC code	470,266	
after removing government bonds (bond types are ARNT, ASPZ, CTBD, CTBL, FGOV, FGS, USBD, USBL, and USNT)	465,954	
after removing financial firms (SIC code 6000 - 6799)	58,878	
after removing utilities (SIC code 4800 - 4999)	39,956	
Sample with only US bond issuers	33,089	
Sample restricted to 2005 - 2020 due to trading data availability in TRACE	13,549	
Sample after removing securities with unusual features	12,817	
A sample with bond issues of the companies presented in the BoardEx database during the year of the bond issuance	8,512	1,428
A sample containing only observations with available information on gross spread or trading data for the first calendar week after the issuance	6,701	1,074
A final sample with all controls available	6,559	1,046

Appendix B: Variable Definition

Variable name	Description and the source of data
Gross Spread	The difference between the price the investors pay for bond securities and the price the issuer receives for them as a percentage of offering price, FISD.
Underpricing	The difference between the raw bond return on the first trading day during the first calendar week after the issuance and the cumulative return on Bloomberg US Corporate Total Return Index matched by maturity for investment-grade bonds or Bloomberg High Yield Bond Index, FISD, TRACE, and Bloomberg.
*Underpricing_DN_2weeks**[28]	The relative difference between the average transaction price from TRACE over the first two calendar weeks of trading and the offering price, FISD and TRACE.
*Underpricing_DN_1week**	The relative difference between the average transaction price from TRACE over the first one calendar week of trading and the offering price, FISD and TRACE.
*Underpricing_DN_30days**	The relative difference between the average transaction price from TRACE over the first 30 calendar days of trading and the offering price, FISD and TRACE.
Interlock_broad	A dummy variable equal to 1 if at least one individual in the bond issuing firm has employment experience in the investment advising firm in the year of bond issuance, BoardEx.
Interlock_cboard	A dummy variable equal to 1 if the individual with experience in the investment advising company sits in the company's board in the year of bond issuance and zero otherwise, BoardEx.
Interlock_both_boards	A dummy variable equal to 1 if at least one board member in the bond issuing firm sits in the investment adviser's board in the year of bond issuance, BoardEx.
<u>*Bond Characteristics:*</u>	
Offering Size	The natural logarithm of the offering amount, FISD
TTM	The number of days between the maturity date and offering date converted into the number of years, FISD.
*LowMat**	A dummy variable equal to 1 if the bond issue has a maturity of less than five years and zero otherwise, as in Gandi, Puri, and Walter (1997), FISD.
*MedMat**	A dummy variable equal to 1 if the bond issue has a maturity of between five and fifteen years and zero otherwise, as in Gandi, Puri, and Walter (1997), FISD.
*HighMat**	A dummy variable equal to 1 if the bond issue has a maturity of more than fifteen years and zero otherwise, as in Gandi, Puri, and Walter (1997), FISD.
Rating	A numerical transformation of the alphanumerical rating codes issued by credit rating agencies (CRAs), from 1 to 21, as in Dimitrov, Palia, and Tang (2015), FISD, SDC New Issues.
High-Yield	A dummy variable equal to 1 if the bond issue rating is below Baa and zero otherwise, FISD.
NR	A dummy variable equal to 1 for non-rated issues and 0 otherwise, FISD, SDC New Issues.
IPO	A dummy variable equal to 1 if the company appears in the FISD database for the first time at the bond issue offering date and zero otherwise, FISD.
Treasury yield	The at-issue yield spread over a U.S. Treasury security with similar maturity on the day of the issuance, FISD, FRED
Convertible	A dummy variable equal to 1 if the bond issue is convertible and zero otherwise, FISD.
Callable	A dummy variable equal to 1 if the bond issue is callable and zero otherwise, FISD.
Global	A dummy variable equal to 1 if the bond issue is a global issue and zero otherwise, FISD.
144A	A dummy variable equal to 1 if the bond issue is a private placement issued under Rule 144A and zero otherwise, FISD

[28] Variables indicated by asterisk (*) are used in a robustness check.

Security level	Indicator of whether the bond is a senior, senior subordinated, or subordinated issue of the issuer, FISD
Firm characteristics:	
Firm size	The natural logarithm of total assets of firm *i* at the end of quarter *t*, COMPUSTAT.
Leverage	The book value of long-term debt plus debt in current liabilities divided by total assets, COMPUSTAT.
Profitability	The ratio of operating income to total assets, COMPUSTAT, CRSP.
*ROA**	The ratio of net income to total assets, COMPUSTAT
Asset Turnover	The ratio of sales to total assets, COMPUSTAT
Cash	The ratio of cash and short-term investments to total assets, COMPUSTAT.
Coverage	The ratio of operating income to interest expense, COSMUSTAT
Cash Flow Vol	The volatility of the ratio of operating cash flows to total assets for the last five years using the quarterly data, COMPUSTAT
Earnings Vol	The volatility of the ratio of retained earnings to total assets for the last five years using the quarterly data, COMPUSTAT
Leverage Vol	The volatility of firm leverage for the last five years using the quarterly data, COMPUSTAT
Sales Vol	The volatility of the ratio of sales to total assets for the last five years using the quarterly data, COMPUSTAT
Equity Vol	The volatility of total stock return for the preceding 90 days to the bond issuance date, CRSP
Recent bond issue	A dummy variable equal to 1 if the firm issued bonds within one year before this bond issue and zero otherwise, FISD.
Recent equity issue	A dummy variable equal to 1 if the firm issued equity within one year before this bond issue and zero otherwise, FISD.

Appendix C. Correlation matrix

Table reports a pairwise correlation matrix for independent variables used in the analysis. Highlighted values are significant at a 5% level.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
Interlock broad	(1)	1																							
Interlock cboard	(2)	**0.82**	1																						
Interlock both boards	(3)	**0.56**	**0.69**	1																					
IPO	(4)	**-0.10**	**-0.09**	**-0.07**	1																				
Issue 144a	(5)	**-0.14**	**-0.11**	**-0.13**	**0.18**	1																			
Callable	(6)	**-0.05**	**-0.07**	**-0.14**	**-0.11**	**-0.07**	1																		
Convertible	(7)	**-0.19**	**-0.16**	**-0.14**	**0.33**	**0.30**	**-0.40**	1																	
Global Issue	(8)	**0.10**	**0.08**	**0.03**	**-0.12**	**-0.40**	**0.23**	**-0.31**	1																
Treasury Yield	(9)	**-0.11**	**-0.08**	**-0.10**	**-0.05**	**0.23**	**0.19**	**-0.25**	**-0.14**	1															
Recent bond issue	(10)	**0.21**	**0.19**	**0.17**	**-0.23**	**-0.18**	-0.01	**-0.27**	**0.14**	**-0.13**	1														
Recent equity issue	(11)	**-0.13**	**-0.11**	**-0.11**	**0.09**	**0.06**	**-0.04**	**0.21**	**-0.14**	**0.08**	**-0.06**	1													
log offer amt	(12)	**-0.05**	**-0.10**	**-0.20**	**-0.03**	**0.04**	**0.43**	**-0.09**	**0.36**	**0.06**	-0.02	0.01	1												
log TTM	(13)	**-0.03**	**-0.04**	**-0.06**	**-0.04**	**-0.08**	**0.37**	**-0.07**	**0.07**	**0.09**	**-0.02**	0.00	**0.17**	1											
log TA	(14)	**0.41**	**0.38**	**0.39**	**-0.27**	**0.33**	**-0.10**	**-0.46**	**0.26**	**-0.21**	**0.48**	**-0.20**	**-0.08**	**-0.07**	1										
EBIT/TA	(15)	**0.08**	**0.05**	0.01	**-0.15**	**-0.21**	**0.21**	**-0.34**	**0.25**	**-0.19**	**0.11**	**-0.24**	**0.26**	**0.12**	**0.13**	1									
Sales/TA	(16)	-0.02	-0.02	**-0.03**	**-0.04**	**-0.05**	**0.14**	**-0.06**	**0.09**	-0.01	**-0.09**	**-0.11**	**0.15**	**0.07**	**-0.12**	**0.25**	1								
Cash	(17)	**-0.05**	**-0.10**	**-0.09**	**0.22**	**0.15**	**-0.14**	**0.38**	0.00	**-0.19**	**-0.08**	**0.08**	**0.11**	**-0.05**	**-0.21**	**-0.11**	**-0.13**	1							
Coverage	(18)	**0.10**	0.02	0.01	**0.05**	**-0.16**	**0.08**	**-0.17**	**0.22**	**-0.24**	**0.07**	**-0.15**	**0.20**	**0.03**	**0.17**	**0.55**	**0.13**	**0.17**	1						
Leverage	(19)	**-0.12**	**-0.07**	**-0.13**	**-0.05**	**0.25**	**0.09**	**0.07**	**-0.18**	**0.30**	0.00	**0.08**	**0.11**	0.01	**-0.27**	0.02	**-0.08**	**-0.03**	**-0.35**	1					
CF Vol	(20)	**-0.09**	**-0.09**	**-0.13**	**0.15**	**0.03**	**0.03**	**0.20**	**0.05**	**-0.04**	**-0.11**	**0.05**	**0.21**	**0.03**	**-0.32**	**0.15**	**0.09**	**0.43**	**0.23**	**0.10**	1				
Lev Vol	(21)	**-0.14**	**-0.12**	**-0.14**	**0.14**	**0.28**	**-0.05**	**0.33**	**-0.15**	**0.15**	**-0.16**	**0.14**	**0.09**	-0.02	**-0.42**	**-0.07**	**-0.05**	**0.29**	**-0.12**	**0.42**	**0.41**	1			
Sales Vol	(22)	**-0.06**	**-0.04**	**-0.08**	**0.10**	**0.11**	**0.04**	**0.12**	0.01	**0.12**	**-0.12**	**0.03**	**0.14**	0.00	**-0.21**	-0.02	**0.54**	**0.03**	0.00	0.00	**0.30**	**0.22**	1		
RE Vol	(23)	**-0.13**	**-0.10**	**-0.11**	**0.21**	**0.20**	**-0.09**	**0.42**	**-0.14**	0.02	**-0.17**	**0.17**	**0.03**	-0.01	**-0.40**	**-0.24**	**-0.07**	**0.41**	**-0.08**	**0.19**	**0.46**	**0.52**	**0.22**	1	
Return Vol	(24)	**-0.11**	**-0.06**	**-0.08**	**0.08**	**0.20**	-0.02	**0.25**	**-0.13**	**0.49**	**-0.14**	**0.13**	-0.01	-0.02	**-0.22**	**-0.34**	**-0.08**	**0.10**	**-0.19**	**0.15**	**0.11**	**0.20**	**0.11**	**0.21**	1