WORKING PAPER

DANMARKS NATIONALBANK

12 FEBRUARY 2021 — NO. 170

The Value of Bond Underwriter Relationships

Stine Louise von Rüden
sld@nationalbanken.dk
DANMARKS NATIONALBANK

Jens Dick-Nielsen
jdn.fi@cbs.dk
COPENHAGEN BUSINESS SCHOOL

Mads Stenbo Nielsen
msn.fi@cbs.dk
COPENHAGEN BUSINESS SCHOOL

The Value of Bond Underwriter Relationships

Abstract
We show that corporate bond issuers benefit from utilizing existing underwriter relationships when rolling over bonds, but at the same time become exposed to underwriter distress. A strong relationship enables the underwriter to credibly certify the issuer resulting in lower direct issuance costs and lower underpricing. However, if the underwriter becomes distressed, this spills over to the issuer's credit risk, because it weakens the relationship and increases the risk of involuntary relationship termination. The credit risk spillover is more pronounced for risky, information-sensitive issuers with high rollover exposure, i.e., those issuers most in need of certification by an underwriter.

Resume
Vi viser, at det er fordelagtigt for udstedere af virksomhedsobligationer at benytte eksisterende underwriter relationer når de ruller deres obligationer, men at de samtidig også er eksponeret over for underwriterens nød. En tæt relation gør, at underwriteren kan afgive en troværdig certificering af udstederen og dermed kan sikre lavere direkte udstedelsesomkostninger og lavere underprisning. Men hvis underwriteresn kommer i nød, så vil det smitte af på udstederens kreditrisiko, da det svækker relationen og øger risikoen for en ufrivillig afslutning på relationen. Kreditrisikoafsmitningen er mest udpræget for risikofyldte, informationssensitive udstedere med en høj refinansieringseksponering, dvs. de udstedere, der har det største behov for en certificering af en underwriter.

Key words
Refinancing Risk; Credit Risk; Financial Stability.

JEL classification
G12; G14; G21; G24.

Acknowledgements
The authors wish to thank colleagues from Danmarks Nationalbank.

The authors alone are responsible for any remaining errors.

The Value of Bond Underwriter Relationships*

Jens Dick-Nielsen
Copenhagen Business School and Danish Finance Institute
E-mail: jdn.fi@cbs.dk

Mads Stenbo Nielsen
Copenhagen Business School and Danish Finance Institute
E-mail: msn.fi@cbs.dk

Stine Louise von Rüden
Danmarks Nationalbank
E-mail: sld@nationalbanken.dk

February 12, 2021

*We thank Björn Imbierowicz, Rohan Ganduri, Kristian Miltersen, Nada Mora, Florian Nagler, Stanislava Nikolova, Lasse Heje Pedersen, Ramona Westermann, Charlotte Østergaard, Dominque C. Badoer, Malte Janzen, and seminar and conference participants at The Federal Board of Governors, Deutsche Bundesbank, Norges Bank, 2015 MFA meeting, 2017 Paris Financial Management Conference, 2017 Paris December Finance Meeting, 2017 Nordic Finance Network workshop, 2018 FMA Applied Finance, 2018 FMA European Conference, 2018 EFA meeting, the FRIC seminar series and the PhD Seminar Days at the CBS for their helpful comments. The authors gratefully acknowledge support from the Center for Financial Frictions (FRIC), grant no. DNRF102. Disclaimer: The views expressed in this paper are those of the authors and do not necessarily reflect the position of Danmarks Nationalbank.

The Value of Bond Underwriter Relationships

Abstract

We show that corporate bond issuers benefit from utilizing existing underwriter relationships when rolling over bonds, but at the same time become exposed to underwriter distress. A strong relationship enables the underwriter to credibly certify the issuer resulting in lower direct issuance costs and lower underpricing. However, if the underwriter becomes distressed, this spills over to the issuer's credit risk, because it weakens the relationship and increases the risk of involuntary relationship termination. The credit risk spillover is more pronounced for risky, information-sensitive issuers with high rollover exposure, i.e., those issuers most in need of certification by an underwriter.

Keywords: Underwriter relationship; Corporate bonds; Rollover risk; Relationship banking

JEL classification: G12; G14; G21; G24

1. Introduction

The value created by the relationship between an issuer of a security and the underwriter can be characterized as relationship capital (Rajan (1992), and James (1992)). Prior studies have shown that for equity offerings the issuer is able to capture part of the relationship capital value (Burch, Nanda, and Warther (2005), and Fernando, May, and Megginson (2012)). However, the same studies do not find any evidence that the issuer of a corporate bond retains value from the underwriter relationship, and loyalty towards the underwriter is therefore not rewarded. Contrary to this, we find that when bond underwriter relationships are weakened it affects corporate bond issuers negatively, implying that corporate bond issuers do derive value from underwriter relationship capital. Specifically, we argue that the value of bond underwriter relationships stems from underwriters' ability to credibly certify bond issuers.

The role of a corporate bond underwriter is to facilitate the sale of newly issued corporate bonds. This includes determining the proper offering price and finding potential investors using the underwriter's investor connections (Nagler and Ottonello (2017)). There is ample evidence in the literature that the choice of bond underwriter will affect the success of the bond issuance on the primary market (Fang (2005), Yasuda (2005), Andres, Betzer, and Limbach (2014), and Carbó-Valverde, Cuadros-Solas, and Rodríguez-Fernández (2017)), as well as on the secondary market (Dick-Nielsen, Feldhütter, and Lando (2012)). Our results suggest that these benefits, at least partly, accrue due to a strong relationship between underwriter and issuer. The strong relationship can be seen in that the credit risk of the lead underwriter spills over to the credit risk of the issuing firm, which is consistent with relationship capital being valuable for the issuer.

When issuers derive value from underwriter relationship capital this suggests that the issuers benefit from certification (Burch, Nanda, and Warther (2005)). In line with this ar-

gument, we show that certification by the lead underwriter is helpful in reducing asymmetric information between the issuer and the investors, ultimately resulting in a higher net price on the primary market (Fang (2005), and Carbó-Valverde, Cuadros-Solas, and Rodríguez-Fernández (2017)). While it is often true that some information such as credit ratings (Fernando, May, and Megginson (2012)) is available to investors, this does not satisfy investors. Certification is instrumental in finding the proper offering price and investor allocation. The Credit Roundtable (2015) reports that new bond issuances are usually announced and priced (sold) within the same day, and usually with only very limited information available to the investors. The books can close as soon as 15 minutes after the announcement and the average is within one to two hours. While there used to be an issuer conference call for the bond investors to ask questions, the standard is now that there is no contact between the bond investor and the issuing firm. Investors may not even have the preliminary prospectus and bond indentures before the books are closed. The situations described by The Credit Roundtable (2015) highlight that bond investors are dependent upon the recommendation (certification) by the underwriter. Thus, it is crucial that the bond underwriter knows and has a strong relationship with the issuing firm in order to be able to credibly certify the bond issuance.

If the underwriter ends up in financial distress this weakens the underwriter's ability to connect the bond issuer with investors. Investors may no longer believe in the underwriter's expertise to provide accurate recommendations if the underwriter itself is in distress. To enhance their own chances of short-term survival, distressed underwriters may even be prone to moral hazard resulting in biased recommendations. Thus, distress of the underwriter increases the risk that the issuers lose their valuable underwriter relationship capital. Consistent with this, we find empirically that underwriter distress affects the financial health

of firms with strong relationships with the underwriter. Our results show that establishing a new relationship with another underwriter with other investor connections is costly and the issuer would therefore, other things being equal, be worse off by switching underwriter. While firms may benefit from switching underwriter (see, e.g., Krigman, Shaw, and Womack (2001), and Fernando, Gatchev, and Spindt (2005)), this switch usually occurs voluntarily and not because of outside pressure. Ultimately, if an underwriter ends up in distress it takes time for the issuer to establish an equally good relationship with a new underwriter. We show that not utilizing an existing underwriter relationship when issuing bonds, in general, increases both the direct issuance costs, and the underpricing in the secondary market. These findings are in contrast to those of Burch, Nanda, and Warther (2005), who find no benefits of underwriter loyalty for corporate bond issuers.

For a given firm, we measure the distress of the issuer-underwriter relationship by first identifying the lead underwriters of all bonds currently outstanding. The credit default swap (CDS) spread of each lead underwriter, as a proxy for their credit risk, is then weighted in proportion to how many of the firm's currently outstanding bonds the underwriter has underwritten. Hence, our firm-specific relationship distress measure will be high if a dominant lead underwriter ends up in financial distress. Using this measure, we show that the firm-specific underwriter credit risk helps explain the CDS spreads of bond issuers, both in levels and in changes, and it helps explain yields on outstanding corporate bonds. Consistent with the certification hypothesis, we find that the sensitivity of firms' credit risk to underwriter distress is larger for speculative-grade issuers, i.e., exactly those who would benefit the most from certification. Furthermore, within our time period from 2004 to 2012, several large underwriters defaulted, most prominently, Bear Stearns, Lehman Brothers, and Wachovia. We show that there is a clear difference in the evolution of the credit risk for firms with a

strong relationship with these underwriters compared to the rest of the market.

If the underwriter relationship capital is valuable, we expect underwriter distress to have a larger impact on firms with an imminent underwriting need. This would be the case for firms with a high fraction of short-term debt. Because firms usually rollover maturing debt, these firms would need to issue bonds again soon (Opler, Saron, and Titman (1997), Hovakimian, Opler, and Titman (2001)). We find support for this hypothesis as our results suggest that underwriter distress matters more for firms with a large amount of debt maturing over the coming year, i.e., firms with a high rollover exposure. Hence, our findings indicate that underwriter distress increases the rollover risk for bond issuers. Furthermore, we verify that the increased rollover risk is not caused by a more illiquid secondary market as in He and Xiong (2012).

The spillover from underwriter distress to the issuer's credit risk is statistically as well as economically significant. While the first order determinants of issuer credit risk continue to be firm fundamentals, we find that variation in underwriter distress has the same explanatory power as variation in, e.g., firm leverage. For a firm with a median distressed underwriter relationship, underwriter distress can explain around 8% of the firm's credit spread. Contrary to this, Chen, Cui, He, and Milbradt (2018) calibrate the impact of rollover risk on the credit spread as defined in He and Xiong (2012). They find that rollover risk in their calibration accounts for 5% of the credit spread.

Our study is closely related to that of Burch, Nanda, and Warther (2005) and Fernando, May, and Megginson (2012). Burch, Nanda, and Warther (2005) find that switching bond underwriter decreases fees on average. However, their result is driven by issuers who voluntarily graduate to higher-quality underwriters while obtaining lower fees. In this study, we arrive at the opposite conclusion, namely, that switching underwriter increases fees and

underpricing. The contrasting conclusion hinges on the distribution of voluntary versus involuntary underwriter changes within the sample. To circumvent this issue, we take an approach similar to Fernando, May, and Megginson (2012) and Kovner (2012), and look at the effect of underwriter distress. In particular, Fernando, May, and Megginson (2012) investigate the impact of the Lehman Brothers default and find, in contrast to us, no significant impact for bond underwriter clients. However, as their paper only looks at the impact over the few days surrounding the default announcement and, hence, ignores any anticipation effect, the effect they find is a lower bound for the total impact of underwriter distress. Consistent with their results we find little incremental effect of the default itself. However, we do find a significant and large anticipation effect for bond issuers. Our underwriter relationship distress measure based on CDS spreads exactly measures the degree to which underwriter defaults are anticipated by the market.

Firms that seek to borrow money can broadly speaking choose between obtaining bank loans or issuing corporate bonds, and our study is therefore indirectly also related to the banking literature. First, firms often choose bond underwriters based on their prior banking relationships (Yasuda (2005), and Drucker and Puri (2005)). A distressed bond underwriter could therefore imply a distressed bank lending relationship. However, we verify empirically that bank loan underwriter distress (see, e.g., Acharya and Mora (2015)) and bond underwriter distress are separate contributors to issuer credit risk. Second, in the banking literature the role of a bank is often emphasized as being able to overcome asymmetric information about the quality and effort of the borrowing firm. In contrast, investors in the corporate bond market are assumed to rely only on public information (see, e.g., Diamond (1991), Rajan (1992), Besanko and Kanatas (1993), and Bolton and Freixas (2000)). Theoretically, firms with higher observable quality therefore turn to the corporate bond

market, while more risky and information-sensitive firms choose to build a relationship with a bank. We show that this distinction is not clear cut and that bond issuers also benefit from certification. Finally, we show that the bond underwriter relationship matters over and above other relationship types the firm might have with investment banks, specifically, equity underwriter relationships.

2. Underwriter Relationships and Issuance Costs

Before we investigate the impact of underwriter distress on relationship capital, we look at the unconditional effect of switching underwriter. Underwriter distress is potentially costly for the bond issuer because it weakens the underwriter's ability to certify the issuer and connect the issuer to investors. To avoid this, the issuer could in principle just switch underwriter and, thereby, prevent any costs associated with having a distressed underwriter. However, this can only be done if bond issuers do not derive value from relationship capital. Burch, Nanda, and Warther (2005) show that it is costly to switch underwriter between equity offerings, whereas Krigman, Shaw, and Womack (2001) and Fernando, Gatchev, and Spindt (2005) show that, under some circumstances, it can be beneficial.[1] We investigate the potential benefits of loyalty for corporate bond issuers by looking at the gross spread paid to the underwriter for providing the underwriter service, as well as the underpricing in the secondary market.

For all corporate bonds with industrial issuers, we collect the *Gross Spread* as a percentage of the offering price and other bond characteristics from the Mergent FISD database. This results in a sample of 19,257 bonds issued over the period from 1955 to 2012. In the spirit

[1]The authors show that firms may obtain additional and influential analyst coverage from the new lead underwriter and typically choose to graduate to higher reputation underwriters.

of Gande, Puri, Saunders, and Walter (1997), we let the gross spread depend upon credit rating, bond type, issuer industry, time to maturity, offering amount, and whether it is an issuance under Rule 144a. Furthermore, we add a dummy for whether the issuer is utilizing an existing lead underwriter relationship. We label the dummy *Existing UW Relation*, and in our definition, the issuer is using an existing relationship if one or more lead underwriters involved in the new issuance have also been used for the issuance of a currently outstanding bond. Summary statistics at the bond-issuance level are for all variables given in Table 1, Panel A. More specifically, we look at the following regression:

$$\begin{aligned}\text{Gross Spread}_i = \alpha &+ \beta_1 \times \text{Existing UW Relation}_i + \beta_2 \times \text{Time to Maturity}_i \\ &+ \beta_3 \times \text{Offering Amount}_i + \beta_4 \times \text{Rule 144a}_i + \beta_5 \times \text{Bond Type}_i \\ &+ \beta_6 \times \text{Credit Rating}_i + \beta_7 \times \text{Industry}_i + \epsilon_i\end{aligned} \tag{1}$$

where i is the i'th bond issue.[2] The estimated regression coefficients can be seen in Table 2. Looking at specifications (a) and (b), we see that a larger issuance size and a shorter time to maturity both lower the gross spread, and that issuing under Rule 144a is more expensive. However, we also see that using an existing relationship lowers the gross spread. In other words, switching underwriter, on average, is costly. In the special case of an initial public bond offering (IPO) the issuer does not, by definition, have any existing bond underwriter relationship. To address this, the third regression specification includes a dummy for IPOs, *IPO dummy*. Consistent with the certification hypothesis, we find that IPOs have higher costs as the issuers in these types of offerings have no existing benchmarks or underwriter relationships. For seasoned issuances it is beneficial for the issuer to utilize existing under-

[2] *Bond Type* and *Industry* are given at the levels available from FISD. *Credit Rating* is an indicator for investment-grade issuer versus speculative-grade issuer.

writer relationship capital, rather than switching underwriter, as it lowers the direct rollover costs for the issuer.

While the gross spread measures the direct issuance costs, we can also look at the implicit costs of underpricing in the secondary market (Cai, Helwege, and Warga (2007), and Nagler and Ottonello (2017)). We supplement the bond characteristics data by collecting bond level transaction prices from TRACE. TRACE is fully implemented starting from 2004 and the usage of transaction data thus reduces the sample size to 6,992 bonds. For these bonds, we define the variable *Underpricing* and measure underpricing as the relative difference in prices between the average transaction price from TRACE over the first two weeks of trading and the offering price on the primary market.[3] A positive underpricing return means that the bond is traded at higher prices on the secondary market compared to the primary market, which is an implicit cost for the issuer as known from the IPO literature. The average bond in our sample is underpriced by 40 bps as can be seen in Table 1, Panel A. Using the same regression specifications as for gross spread, we see from Table 2, specification (d) to (f) that utilizing an existing relationship also lowers the indirect issuance costs in the form of lower underpricing.[4]

Looking at the marginal regressions (a) and (d), the effect of having an underwriter relationship is quite significant. It lowers direct issuance costs by almost 20 basis points, i.e., from 103 bps to 84 bps, and it lowers underpricing from an average of 75 bps to 24 bps. For seasoned bond issuers approximately 60% of the bonds are issued using an existing underwriter relationship. In general, bond issuers switch underwriters either because they are forced to do so or because they choose to do so. A forced shift of underwriter is most

[3]Transaction prices from TRACE are cleaned as in Dick-Nielsen (2009).

[4]The results are robust to alternative specifications of the underpricing measure where we use shorter time windows of the trading period.

likely costly whereas a voluntary switch may be an advantage. The disadvantage we find from switching underwriter should therefore be interpreted as a lower bound for the costs of a forced new underwriter relationship across all bond issuers. Our findings contrast those of Burch, Nanda, and Warther (2005) but the difference hinges on the distribution of forced versus voluntary underwriter changes in the bond sample. In order to overcome this issue we next look at the impact of underwriter distress. This approach gives a more direct identification of the risk of being forced into a new relationship (see, e.g., Fernando, May, and Megginson (2012), and Kovner (2012)).

3. Underwriter Distress and Issuer Credit Risk

An involuntary switch of underwriter is most likely costly for the bond issuer, especially if there is an imminent need for the underwriting service. In this section, we test to what extent underwriter distress can help explain issuer credit risk. We expect the sensitivity towards underwriter distress to be most pronounced for firms with high rollover exposure, as well as for information-sensitive firms (see, e.g., Dang, Gorton, and Holmstrom (2015)) which stand to gain the most from certification. We first define an underwriter distress measure and then use this measure to test several hypotheses relating underwriter distress to the distress of their client firms.

3.1 Underwriter Distress Measure

Each corporate bond issuer has underwriter relationships with one or more banks.[5] When measuring how distressed a firm's underwriters are, it is important to differentiate between

[5]When referring to underwriter, we mean the lead underwriter(s) of the bond issuance in question. Most bonds are issued using only a single lead underwriter.

whether a given underwriter is at the core or periphery of the firm. We therefore count the firm's number of bonds currently outstanding that are underwritten by a particular underwriter. Based on this, we calculate the average CDS spread of all of the firm's underwriters weighted by the number of bonds each underwriter has underwritten. In this way, we get an issuer-specific underwriter distress measure, *UW Risk*. The measure is defined as:

$$\text{UW Risk}_{it} = \frac{\sum_{k=1}^{N_{it}} \sum_{j=1}^{M_{ki}} \text{UW CDS}_{jkit} \times \frac{1}{M_{ki}}}{N_{it}} \tag{2}$$

where N_{it} is the number of bonds outstanding at time t for issuer i. UW CDS_{jkit} is the five-year log CDS spread for the j'th underwriter of bond k. Bond k had a total of M_{ki} underwriters.[6] If several of a firm's bonds have been issued using a single underwriter, which is typically the case, then that underwriter's CDS spread will be given a higher weight in the distress measure. An underwriter may be close to default, but if that underwriter has only been used for the issuance of a tiny fraction of the bonds outstanding, then it should not matter much for the issuing firm. On the other hand, if the firm's main underwriter is in distress, this will have a large impact on the issuer-specific underwriter distress measure. In order to determine the lead underwriter relationships for each U.S.-corporate bond we use the Mergent FISD database. Table 3 shows the 20 most active underwriter banks for bonds outstanding at some point during the period 2004-2012. As shown in Column (b), the most active underwriters are JP Morgan, Citibank, and Goldman Sachs. Hence, these are the banks with the most corporate bond client firms during our sample period. We restrict our underwriter sample to the list of the 20 most active underwriter banks so that our empirical results do not get distorted by atypical underwriters which have only been

[6]The main regression in Equation 3 from Section 3.3 is robust to alternative definitions of the UW Risk measure. In Section IA1 of the Internet Appendix we define and test several alternative definitions.

used by very few issuers. As seen in Column (c) of Table 3 the variation across bond underwriters in terms of number of clients within our firm sample is similar to the total number of clients the underwriters have. For each of the top-20 underwriters that have an underwriter relationship with a firm in our sample, we collect CDS spread data from Markit. The CDS data is available from 2004 to 2012 and therefore determines our sample period. Demanding that there are traded CDS contracts on the bond issuer reduces the sample to mainly including the large industrial issuers. Still, these issuers account for around 30% of the total number of industrial fixed rate bullet bonds and more than 50% of the total transaction volume. Excluding smaller firms from the sample likely creates a bias against finding any effect of underwriter risk because it reduces the cross-sectional variation in the UW risk measure. Smaller firms usually have fewer underwriter connections compared to large firms and more diversification among underwriters dampens the evolution of the UW risk measure.

3.2 Firm Fundamentals and Market Data

For all firms with a CDS spread in the Markit database, we collect quarterly firm fundamentals from Compustat (North America). As financial and utility firms typically have special capital structures we exclude these from the analysis (SIC codes 4900 to 4999 and 6000 to 6999), as well as firms with no SIC code. The remaining firms constitute our sample of corporate bond issuers. Table 3, Column (c), shows the number of client firms in the final sample for each of the top-20 underwriters. The distribution of underwriter relationships is almost the same as in the full sample except with fewer issuers. The reduction in client firms is mainly driven by the availability of CDS spreads. All CDS spreads are for the five-year CDS contract recorded at the beginning of the month. Therefore, our sample is naturally

biased towards larger firms, i.e., firms with access to financing through corporate bonds and, furthermore, bond issuers with a CDS spread. This selection bias helps differentiate our sample from the typical banking relationship firm sample which usually consists of medium and smaller sized firms.

For the choice of potential determinants of issuer credit risk we largely follow Blanco, Brennan, and Marsh (2005), Collin-Dufresne, Goldstein, and Martin (2001), and Longstaff, Mithal, and Neis (2005) and collect a standard set of firm fundamentals from Compustat.[7] *Leverage* is measured as the book value of long-term debt plus debt in current liabilities, divided by total assets. *Equity Volatility* is calculated using total stock returns for the preceding 90 days. Following Bates, Kahle, and Stulz (2009) and Subrahmanyam, Tang, and Wang (2017), we measure *Cash* as the corporations' cash holdings and cash equivalents, scaled by total assets. *Firm Size* is measured by the natural logarithm of total assets.[8] *Profitability* is measured as operating income to total revenue. Furthermore, we collect market wide variables to proxy for the business cycle. These are the one-year swap rate from the Federal Reserve Bank, *1yr Swap*, and the CDX index (CDX.NA.IG), *CDS Index*, provided by Markit. The CDX index is an average of the top industrial investment-grade CDS spreads and controls for general time-varying market conditions. Finally, we collect bond rating data from FISD and stock price information from CRSP. Table 1, Panels B and C, provide summary statistics for all variables.

3.3 The Impact of Underwriter Distress

If a financial institution, acting as an underwriter, is in distress it may not be able to assist client firms in issuing new bonds. This could impair future investment decisions in these

[7] All quarterly data are interpolated to obtain monthly data.

[8] The median log firm size is 8.99, which corresponds to around 8 billion dollars.

firms and make it costly for the firms to roll over maturing debt. The firms could potentially switch to a new underwriter, but this would also be costly as shown in the previous section. Furthermore, the firms may have other relationship ties to the underwriter which could amplify the effect of underwriter distress (we return to this issue in Section 4). The expected implication for the issuing firm is that when the underwriter is in distress, this will have a negative effect on the financial health of the issuing firm. Hence, the credit risk of the underwriter spills over to that of the issuing firm.

As a first rough indication of the impact of underwriter distress, we investigate the impact of the loss of an underwriter relationship, caused by the default of the underwriter. Figure 1 shows the time series of the bond issuing firms' average CDS spread based upon their existing underwriter relationships. We split the sample of issuers into two groups; those with a relationship with a defaulting underwriter, i.e., Bear Stearns, Lehman Brothers, or Wachovia, and those without. Figure 1 indicates that the group of bond-issuers with a connection to an underwriter which defaults is more credit risky than the other group. The difference in the credit risk of bond issuers is not only present following the default of an underwriter, but also before the actual default of the bond underwriters which suggest that not only actual defaults, but also higher levels of bond underwriter distress may spill over to bond issuers.

In order to test this hypothesis more formally, we use the underwriter distress measure,

UW Risk, defined above. We look at several versions of the following regression:

$$\begin{aligned}\text{CDS Spread}_{it} &= \alpha + \beta \times \text{UW Risk}_{it} + \text{Controls}_{it} + \epsilon_{it} \qquad (3)\\ &= \alpha + \beta \times \text{UW Risk}_{it} + \gamma_1 \times \text{Leverage}_{it} + \gamma_2 \times \text{Equity Volatility}_{it}\\ &\quad + \gamma_3 \times \text{Profitability}_{it} + \gamma_4 \times \text{Cash}_{it} + \gamma_5 \times \text{Firm Size}_{it}\\ &\quad + \gamma_6 \times \text{1yr Swap}_t + \gamma_7 \times \text{CDS Index}_t + \epsilon_{it}\end{aligned}$$

where i is the i'th issuing firm and t is the month. As a proxy for firms' credit risk we use *CDS Spread* which is the natural logarithm of the CDS spreads consistent with the approaches in both Ericsson, Jacobs, and Oviedo (2009) and Bai and Wu (2016). To mitigate the effect of potential outliers, we winsorize all variables at the 1st and 99th percentiles. Since we have panel data of underwriter distress with one observation for each firm at any point in time, we use cluster robust standard errors clustered by time and firm levels (see Petersen (2009)).

The results of the regressions are listed in Table 4 and the full sample refers to the sample that includes all available data from 2004 to 2012. In the first regression (specification (a)), we include underwriter distress as the only regressor. Our underwriter distress measure is highly significant in this marginal specification, and the size of the coefficient on *UW Risk* is robust to including firm characteristics (specification (b)). The firm characteristics used here are leverage and equity volatility, which are known to be important predictors of credit risk (Merton (1974)) and have been shown to be the main predictors of CDS spreads (Ericsson, Jacobs, and Oviedo (2009) and Bai and Wu (2016)). We also add cash holdings, firm size, and profitability. In Table IA1 of the Internet Appendix, we show that the regressions are robust to including additional rating dummies as in Galil, Shapir, Amiram, and Ben-Zion (2014).

We expect that higher leverage and higher equity volatility imply higher credit risk, which is also what we see in Table 4. Furthermore, the results show that larger and more profitable firms are less credit risky, while firms with higher cash holdings are more credit risky. The latter finding is consistent with Harford, Klasa, and Maxwell (2014), who show that cash holdings are used as a buffer for risky firms when rolling over their debt.

While there is cross-sectional variation in the underwriter distress measure, there is also a strong time series correlation with general market conditions. During the 2008 financial crisis both bond-issuing and bond-underwriting firms were constrained, independently of them having an underwriter relationship. Hence, when *UW Risk* is significant in the regression we could just be picking up this time series correlation. In order to control for this, we include *1yr Swap* and *CDS Index* to take account of general market movements. This limits the sample to 2006 to 2014 because the CDX index data is not available before 2006. In Table 4, we see that including the market variables reduces the influence of the underwriter distress measure. However, the measure is still highly significant even after controlling for general market movements.

Since CDS spreads are not defined after a default, underwriters naturally exit our underwriter distress measure calculation upon their default. However, excluding the relationship with a defaulted underwriter is counter-intuitive because we expect issuing firms to be affected the most by underwriter distress at the exact point when the underwriter defaults. Instead, the measure *UW Risk* will by construction experience a drop after an underwriter defaults, as the remaining underwriter relationships are less credit risky. We explicitly investigate the effect of an underwriter default in Section 3.7, but, at this point, we merely exclude firms from the regression in the six months following the default of an underwriter. In Table 4, specification (d), we see that excluding these firm observations has very little

impact on the estimated coefficients and, for now, we therefore continue to work with the sample where relationships with a defaulted underwriter are excluded. Overall, the results in Table 4 support the hypothesis that underwriter distress spills over to the credit risk of the bond issuer.

In Table 5, we run the same set of regressions, but this time we use changes instead of levels in order to capture time-invariant firm-specific effects. Again, we see that the UW Risk measures is highly significant. Finally, in specifications (c) and (d), we also include as a robustness test monthly time, as well as time x rating fixed effects. The sensitivity towards the underwriter distress measure is robust to including the fixed effects. Going forward we use the specification with the interest rate variable and the CDX index in order to get an identification of the time effects which can be interpreted. This specification is also the weakest based on the size and significance of the underwriter distress coefficient, so it should bias us against finding evidence for a distress spillover.

We can refine the connection between underwriter distress and bond issuer distress even further: To the extent that the underwriter certifies the quality of the bonds, a strong relationship should matter most for risky, information-sensitive firms (Dang, Gorton, and Holmstrom, 2015). These are the type of bond issuers who would benefit the most from certification, and also the type of issuer for whom we expect it to be most costly to build a new underwriter relationship. We therefore split the sample into investment-grade and speculative-grade rated bond issuers. Table 6 shows that the UW Risk measure is highly significant for both investment-grade and speculative-grade rated issuers. However, the coefficient for issuers with a speculative-grade rating is larger, both for the regression in levels and in changes. Hence, the results in Table 6 indicate that the underwriter relationship, consistent with the certification hypothesis, is more important for riskier firms. This effect is

actually monotonically increasing in the rating letter-category (see Table IA2 of the Internet Appendix).

3.4 Reverse Causality

While we argue that the causality is a spillover from underwriter to bond issuer, one could also consider the reverse causality. If causality was reversed it could imply that firms with excessive risk would choose more credit risky underwriters.[9] However, we do not find evidence for such an effect in the data. The reverse causality is most easily investigated by considering the time series dimension. Before the crisis, Lehman Brothers was not significantly more risky than other underwriters. As Lehman Brothers' CDS spread rose during the crisis, reverse causality should then have implied that excessively credit risky firms established new underwriter relationships with Lehman Brothers. However, rather than finding this to be a dominant behavior, we find that relationships are very sticky. In particular, we observe that in the 12 months leading up to the default only 11 firms established new underwriter relationships to Lehman Brothers out of a total of 63 firms with a connection to Lehman Brothers. Furthermore, we find that these new firms are not excessively credit risky at the inception of the relationship.[10] In other words, the vast majority of firms which experienced an increase in credit risk because of a connection to Lehman Brothers already had a connection to Lehman Brothers before it became more credit risky than other underwriters. Hence, we do not find evidence for the presence of this type of reverse causality in our results.

[9]By excessively risky we here mean that the firm's CDS spread could not be explained by the other controls in the regression, i.e., firm fundamentals and business cycle proxies.

[10]Specifically, we investigate whether firms with a connection to, respectively, Bear Stearns, Lehman Brothers, and Wachovia, at the time of their default, already two years prior to the default had higher CDS spreads than the average firm in our sample. We do not find significant differences.

Reverse causality could also happen if the firms that Lehman underwrote were concentrated within certain industries or rating categories. If these firms were particularly sensitive towards a crisis then the firm composition could have forced Lehman into distress. In Figure 2 we show the industry distribution of each underwriter before the crisis. Within our sample, there is not a lot of variation in the distribution among underwriters. We find a similar pattern during and after the crisis, and, furthermore, we find the same pattern for issuer ratings.[11] These findings suggest that Lehman's industry issuer portfolio distribution was not the cause of a distress spillover.

3.5 Rollover Risk

Firms often aim at maintaining a target leverage ratio (Opler, Saron, and Titman (1997), and Hovakimian, Opler, and Titman (2001)) and, hence, often roll over maturing debt by replacing maturing bonds with newly issued bonds. In order to roll over bonds, firms need to make use of their underwriter relationship. If the underwriter is distressed, then the bond-issuing firms are exposed to higher costs when rolling over their debt, which may further translate into higher credit risk (He and Xiong (2012)). It is therefore interesting to investigate to what extent the underwriter distress measure is specifically connected to rollover risk.

In order to test this rollover exposure hypothesis, we identify all firms with an imminent need for rolling over maturing debt. Specifically, we follow He, Wang, and Qi (2014), and Harford, Klasa, and Maxwell (2014) and use $Debt \leq 1yr / Assets$, which is defined as the amount of long-term debt maturing within one year relative to total assets. When the rollover

[11] In Table IA3 of the Internet Appendix, we make a formal test for independence between underwriter and issuer industry, and underwriter and issuer rating. Using Fisher's Exact Test we cannot reject the hypothesis of independence. These findings indicate that underwriters within our sample were not specialized within certain issuers or within certain rating classes.

exposure is high, we would expect underwriter distress to have a larger impact.[12] We test the hypothesis by including the interaction between rollover exposure and the underwriter distress measure into the regression from before:

$$\begin{aligned}\text{CDS Spread}_{it} = \alpha + \beta_1 \times \text{UW Risk}_{it} + \beta_2 \times \frac{\text{Debt} \leq 1\text{yr}_{it}}{\text{Assets}_{it}} \\ + \beta_3 \times \frac{\text{Debt} \leq 1\text{yr}_{it}}{\text{Assets}_{it}} \times \text{UW Risk}_{it} + \text{Controls}_{it} + \epsilon_{it} \end{aligned} \tag{4}$$

where i is the i'th issuing firm and t is the month. The controls are the same as in our base regression model from Equation (3). The coefficients are shown in Table 7. For brevity, and as all control variables are significant with the expected signs, we have excluded the coefficients for the control variables.

In Table 7, Panel A, specifications (a) and (d), we see that when underwriter distress increases, the credit risk of bond issuers increases more for firms with higher rollover exposure. The coefficient is not significant for investment-grade firms but is significant for speculative-grade firms. When *UW Risk* is high enough, i.e., slightly above the median for speculative-grade firms, credit risk is also an increasing function of rollover exposure. In other words, as the amount of short-term debt increases so does the CDS spread as long as the underwriter distress measure is above a certain threshold. Related studies have shown that firms roll over part of their debt already two to three years before maturity (Xu (2018)). Therefore, we also investigate firms' holdings of long-term debt maturing within two and three years. For the two-year horizon the effect is still present (although the coefficients are smaller), whereas for the three-year horizon the results are insignificant. Hence, there seems to be an amplifying effect of higher rollover exposure, but when we increase the debt maturity

[12] Again, one could consider the reverse causality. However, the capital structure and, thus, rollover exposure is chosen at a point before there are any significant differences between underwriters' credit risk.

horizon the effect gradually vanishes, intuitively, because the rollover exposure approaches total debt. It is interesting to note that the explanatory power of the regressions does not increase by much when we include the rollover risk variables. This indicates that there much unexplained idiosyncratic variation remains in the credit spreads. Still, the new variables are both statistically and economically significant (as we will show in the next section). This means that the regression helps refine the understanding of credit risk determinants. Without the UW risk measure some of the other explanatory variables wrongly picked up what was actually caused by underwriter distress.

As a robustness check we look at an alternative definition of firms' rollover exposure calculated as maturing long-term debt scaled by total long-term debt instead of by total assets. The results are shown in Table 7, Panel B, and are very similar. In robustness tests we also replace the five-year bond-issuer CDS spread with a one-year CDS spread. The results show that long-term debt due within one year remains significant for speculative-grade issuers, but that debt due within two or three years is not significant. This again supports the hypothesis that higher rollover exposure increases the sensitivity towards underwriter distress.[13]

3.6 Economic Significance

So far, we have shown that underwriter distress contributes significantly to explaining the credit risk of bond issuers. In this section we further investigate whether the effect is also economically significant. We evaluate the economic impact by investigating how much of the variation in issuer credit risk that can be explained by variation in underwriter distress. If

[13]Rollover risk could also impact issuer credit risk through the illiquidity of the secondary market as in He and Xiong (2012), Valenzuela (2015), and Nagler (2017). In Section IA2 of the Internet Appendix, we rule out that our results are driven by this effect.

large differences in underwriter distress also lead to large differences in CDS spreads of bond issuers, then we will conclude that the effect is economically significant.

Using the regression specification from Table 7, specification (a) and (d), we calculate the contribution of our underwriter distress measure for each issuer, i, and each month, t, as follows:

$$\begin{aligned} \text{UW Risk contribution}_{it} &= \hat{\beta}_1 \times \text{UW Risk}_{it} + \hat{\beta}_3 \times \frac{\text{Debt}{\leq}1\text{yr}_{it}}{\text{Assets}_{it}} \times \text{UW Risk}_{it} \qquad (5) \\ &= \text{CDS Spread}_{it} - \text{Non-UW Risk variables}_{it} \end{aligned}$$

After having calculated the underwriter distress contribution for each CDS spread observation we calculate the distribution of this contribution across time and issuers. Following the approach in Dick-Nielsen, Feldhütter, and Lando (2012), we then calculate the width of the distribution by looking at the difference between the 50% percentile and the 5% percentile:

$$\text{UW Risk contribution}^{50\%} - \text{UW Risk contribution}^{5\%}$$

This difference can be interpreted as the part of the variation in the CDS spread, between an issuer with a median distressed underwriter and an issuer with a minimum distressed underwriter, which can be explained by the difference in underwriter distress.[14] We split the sample into issuers with an investment-grade rating versus a speculative-grade rating and form separate distributions for each of these rating classes.

Table 8, Panel A, shows the estimates of economic significance (distribution widths) of the underwriter distress measure, as well as of some of the other control variables. Relative

[14]This approach is essentially equivalent to evaluating the impact of, for example, a one standard deviation shock to UW Risk. However, it should be more robust as it controls for possible covariation between UW Risk and other independent variables.

to each of the other variables, the impact from underwriter distress is rather large. However, the combined effect of all firm fundamentals is still larger than the underwriter distress effect (although adding up the individual effects of fundamental variables ignores possible correlation). Since the log difference can be interpreted as a relative difference, we can see that the underwriter distress impact is approximately 35% larger for an investment-grade rated median underwriter-distressed bond issuer compared to an issuer with a minimum distressed underwriter. The effect for speculative-grade firms is larger at 45%.

Another way to evaluate this impact, also following Dick-Nielsen, Feldhütter, and Lando (2012), is to measure the underwriter distress contribution relative to the size of the total issuer CDS spread. We therefore calculate the relative spread contribution as follows:

$$\frac{\text{UW Risk contribution}_{it} - \text{UW Risk contribution}^{5\%}}{\text{CDS Spread}_{it}}$$

where i is the ith issuer and t is the month. Finally, we form the distribution of this ratio and look at the median of the distribution. Table 8, Panel B, shows the median numbers for investment-grade and speculative-grade rated firms. Using this approach we see that underwriter distress explains around 7.5% of the total credit risk for both investment-grade and speculative-grade firms. This fraction is again comparable to the best single firm fundamentals factor. It can also be compared to the credit spread contribution of 5% from rollover risk in Chen, Cui, He, and Milbradt (2018).

3.7 Default of an Underwriter

The identification of underwriter distress impact is dependent upon there being some variation in underwriter credit risk. Specifically, the identification rests on the 2008 financial crisis

to create cross-sectional variation in underwriter credit risk similar to Fernando, May, and Megginson (2012) but the analysis is robust to excluding defaulting underwriters.[15] Some of our previous tests have excluded the CDS spread of an issuing firm if it had an underwriter default within the past six months (Tables 6 and 7). This was done because an underwriter default distorts the UW Risk measure when the CDS of the defaulted underwriter cease to exist. In this section, we revisit the effect of having an underwriter defaulting.

The underwriter distress measure at all times consists of the CDS spreads of underwriters 1) who are currently alive, i.e., not in default, and 2) with whom the firm currently has bonds outstanding. Hence, the measure has the counter-intuitive behavior that right after an underwriter defaults the underwriter distress measure will most likely improve because the riskiest underwriter is eliminated. This is counter-intuitive as we would think that the loss of an underwriter is the ultimately worst case of underwriter distress. Given the default of an underwriter relationship the firm is forced to build a new relationship (or tighten its relationships with other existing underwriters). Furthermore, the default of an underwriter is likely to happen when the market and other underwriters are distressed as well.

We consider three specific cases where an underwriter defaulted or experienced a situation similar to a default. First, we consider the default and takeover of Bear Stearns in March 2008. Second, we consider the default of Lehman Brothers. After some turmoil starting in August 2008, Lehman Brothers defaulted in September 2008. Third, we look at Wachovia. In April 2008, Wachovia reported large losses and ended up being acquired by Wells Fargo in September 2008.[16]

[15]For completeness, we repeat the regressions from Table 4 without issuers related to defaulted underwriters in Table IA4 of the Internet Appendix and without the crisis in Table IA5 of the Internet Appendix. UW risk continues to be significant without the defaulted underwriters.

[16]The most important dates and events for each of these underwriter defaults are listed in Internet Appendix Table IA6.

Figure 3 shows the time series of the average CDS spread for firms with an underwriter relationship with Bear Stearns, Lehman Brothers, and Wachovia, respectively.[17] In each sub-figure, the sample of firms is split into two types of bond-issuers; those with an underwriter relationship with Bear Stearns, Lehman Brothers, or Wachovia, respectively, at the point of their defaults, and those without a relationship with any of these underwriters (control group). After normalizing the average CDS spread of the sub-samples to the same starting point, we see from Figure 3 that the group with a defaulted underwriter becomes more credit risky than the control group.

Similar to the former regressions, we tease out the effect of a defaulting underwriter by looking at the regression specification from Equation (4). Now we also include firms that have had an underwriter defaulting within the last six months, but control for this by adding a time-dependent dummy to the regression in the following way. For the default of Lehman Brothers, we add a dummy variable which is equal to one only in the first month after the default of Lehman Brothers, and only if the issuer had an underwriter relationship with Lehman Brothers. We subsequently replace this variable with another dummy which is equal to one in the two months following the default, all the way up to six months after the default. These dummies account for the special circumstances of losing an underwriter relationship after a default over different time horizons. We produce the same dummies for the default of Bear Stearns and the default of Wachovia. Table 9 shows the estimates from these regressions. The table only reports the coefficient for the default dummy for each of the regressions.

The defaulting underwriter coefficient is significant for the first three to five months after the default. This indicates that the credit risk of the issuer is at an elevated level right after

[17] In order to provide a clearer study, we exclude in this analysis all firms that had a relationship with more than one of the three defaulted underwriters.

the elimination of an underwriter relationship. As we extend the time horizon of the default dummy the issuing firm has time to build new relationships. The combined effect of the increase in CDS spread from the dummy and the drop in UW Risk from eliminating the riskiest underwriter almost cancels out in the sense that the drop in the UW Risk measure is offset by the increase in the dummy. Thus, the resulting issuer credit spread is fairly constant at the level from when the underwriter defaulted. The credit spread then improves after four to six months at which point the underwriter distress measure for the issuer's remaining underwriters is no longer affected by the default event.

It is difficult to extrapolate too much from these three default events. First, defaults are rare. Second, the types of default differ significantly from each other. Both Bear Stearns and Wachovia were effectively taken over immediately by other firms. The issuing firms then needed to rebuild their relationship with the new owners. On the other hand, in the case of Lehman Brothers no one who took over their responsibilities. Therefore, it would be natural to expect that this default had a larger impact on issuer credit risk than the other two events, but this does not seem to be the case. Figure 3 reveals that the elevated level of credit risk maybe lasts slightly longer, but it is not materially different.

4. Underwriter Distress and Issuer Bond Yields

In the above section, we found that underwriter distress spilled over to the credit risk of the issuer. This means that underwriter distress should also have an impact on observed yields of outstanding bonds as these depend upon issuer credit risk. In this section we directly investigate this hypothesis. For each issuer for which we have a CDS spread and an underwriter distress measure, we find all outstanding non-convertible fixed rate bullet bonds between 2004 and 2012 from Mergent FISD. For each of these bonds we then collect

transaction data from TRACE and calculate the bond yield spread at the beginning of each month. The bond yield is the volume weighted average yield on that day. If there are no trades on the first day of the month, we use the weighted yield from the next day and so forth, but not going further ahead than five trading days. Once we have a bond yield, we calculate the spread by subtracting a maturity matched (interpolated) Treasury bond rate. Then, we match the latest known accounting variable from Compustat to the bond yield spread. Furthermore, we calculate an average bid-ask spread at the bond level for the previous month. This is done by calculating a volume weighted average buy price and sell price, and then finding the relative difference. Daily bid-ask spreads are then transformed to a monthly measure by taking the median observation within the month. Finally, we add bond level characteristics from Mergent FISD.

In Table 10 we run the regression from Equation (3) but using the yield spread as the left-hand side and adding bond level variables on the right-hand side. In specification (a) we use the issuer CDS spread to proxy for credit risk, the bid-ask spread as a liquidity proxy, as well as bond level variables. This specification is close to that used in, e.g., Dick-Nielsen, Feldhütter, and Lando (2012). Not surprisingly, issuer credit risk is highly significant. In the following specifications, we substitute the issuer CDS spread with the models used in the prior analysis. In all of the specifications UW risk becomes significant. Note that this is also the case when we introduce issuer and time fixed effects which gives a higher R^2 than when the issuer CDS spread is used directly. Hence, UW risk also contributes to the bond yield spreads consistent with UW risk having an impact on issuer credit risk. One thing to be aware of is that UW risk both impacts issuer credit risk as shown above but also impacts bond level liquidity as shown in Dick-Nielsen, Feldhütter, and Lando (2012). These two effects have not been disentangled in Table 10. However, from the analysis in Section 3. of

this paper, we know that underwriter distress does have a significant impact through credit risk alone.

5. Bond Underwriter versus Other Banking Relationships

A bond issuer-underwriter relationship is different from a traditional banking relationship. The syndicate members in a bank loan directly contribute funds to finance the loan whereas the bond underwriter primarily acts as an intermediary. However, it is common for the bond issuer to find its underwriter among existing banking relationships (Yasuda (2005)). The underwriter distress effect we find could therefore be a proxy for a distressed banking relationship. As robustness tests and, in order to separate the two effects, we investigate the effect of other potential banking relationships, i.e., firms' bank loan and equity underwriter relationships.

Similar to the underwriter distress measure, we construct a bank loan relationship distress measure, *Bank Risk*. For each firm we collect information on syndicated loans from SDC Dealscan and the bank loan distress measure is then the weighted average of the syndicate members' five-year log CDS spread for all loans currently outstanding. We limit the banks to the same list of top-20 underwriter banks that we used for the underwriter distress measure, but we add any top-20 syndicate bank which was not part of the bond underwriter sample (see Table 3). In order to distinguish between a firm's dependence on its bank loan connection and its bond underwriter connection, we multiply the underwriter distress measure by the ratio of outstanding corporate bond debt to the sum of bond and bank loan debt, *Bond Debt / Total Debt*, and, similarly, multiply the bank distress measure with the fraction of outstanding bank loan debt, *Bank Debt / Total Debt*. The idea is that if corporate bond debt only accounts for a small fraction of the overall debt, then it is unlikely that the underwriter

relationship should be important compared to the bank loan relationship, and vice versa. As not all firms in our main sample are covered in SDC Dealscan we end up having a sub-sample of 188 firms with bank loan relationship information. Table 1, Panel D, reports summary statistics for the sample and shows that the dependence upon bank loan debt is rather evenly distributed between firms with low and high dependence, respectively.

We add the two distress measures along with the bond debt fraction to the base regression from Equation (3). The results are reported in Table 11. The coefficient of the bond debt fraction is negative, indicating that firms financed with more corporate bond debt than bank debt are less risky. This is consistent with the idea that more information-sensitive firms seek out a banking relationship (see, e.g., Rajan (1992)). However, for the firms with a high bond debt fraction, we see that underwriter risk is equally important. Both the underwriter risk and the bank risk coefficients are significant, i.e., both types of relationships impact the credit risk of the firms. Which of the two types of relationships is ultimately most important in the end then depends on the primary debt financing source of the specific firm.

Another type of relationship which could overlap with the bond underwriter relationship is an equity underwriter relationship. Following Fernando, May, and Megginson (2012), the risk of equity underwriters may also be positively related to the CDS spread of the issuing firm. In order to separate the bond underwriter and equity underwriter effects, we construct an equity-related underwriter distress measure, *Equity Risk*, using the CDS spread of the lead underwriter for equity issuances.[18]

In Table 11, specification (b), we first run a regression of *Equity Risk* on *UW Risk* to determine to what extent equity underwriter distress explains bond underwriter distress. Next,

[18]As this measure does not account for the time since the equity issuance, we run several robustness tests where we use alternative equity underwriter distress measures and where the equity relationship is weakening in the time since issuance. Overall, the results are robust to alternative definitions. The definition used in Table 11 provides the strongest dependence on the equity underwriter relationship.

we include Equity Risk and the residual obtained from specification (b), i.e., the part of our bond UW Risk measure that is independent of the issuer's equity underwriters, into the base regression along with the previously used controls. This approach gives maximal explanatory power to Equity Risk over UW Risk. In specification (c) of Table 11 both underwriter distress measures becomes significant. Thus, the significance of the relationship between bond underwriter and issuer is robust to controlling for an equity underwriter relationship as well.

6. Conclusions

We show that corporate bond issuers derive value from bond underwriter relationship capital. When a bond issuer utilizes an existing underwriter relationship, this lowers both the indirect and direct issuance costs. Furthermore, issuers are adversely affected by underwriter distress and the credit risk of the underwriter spills over to the credit risk of the issuer. We show this by constructing an issuer-specific measure of underwriter distress. This measure captures the average weighted stress of the issuer's underwriter connections. Our findings suggest that bond underwriters benefit from certification by the underwriter. Consistent with this hypothesis, we show that the effect of underwriter distress is stronger for speculative-grade rated firms, which are usually also more information-sensitive and, therefore, more dependent upon certification. The impact of underwriter distress is also stronger for firms with a high fraction of short-term debt, i.e., firms with an imminent need for underwriter services for rolling over maturing bonds. Thus, underwriter distress can be characterized as a rollover risk for the issuer.

References

Acharya, Viral, and Nada Mora, 2015, "A crisis of banks as liquidity providers," *Journal of Finance* 70, 1–43.

Andres, Christian, André Betzer, and Peter Limbach, 2014, "Underwriter reputation and the quality of certification: Evidence from high-yield bonds," *Journal of Banking and Finance* 40, 97–115.

Bai, Jennie, and Liuren Wu, 2016, "Anchoring credit default swap spreads to firm fundamental," *Journal of Financial and Quantitative Analysis* 51, 1521–1543.

Bates, Thomas W., Kathleen M. Kahle, and Rene M. Stulz, 2009, "Why do US firms hold so much more cash than they used to?," *Journal of Finance* 64, 1985–2021.

Besanko, David, and George Kanatas, 1993, "Credit market equilibrium with bank monitoring and moral hazard," *Review of Financial Studies* 6, 212–232.

Bessembinder, Hendrik, Kathleen Kahle, William Maxwell, and Danielle Xu, 2009, "Measuring abnormal bond performance," *Review of Financial Studies* 22, 4219–4258.

Blanco, Roberto, Simon Brennan, and Ian W. Marsh, 2005, "An empirical analysis of the dynamic relation between investment-grade bonds and credit default swaps," *Journal of Finance* 60, 2255–2281.

Bolton, Patrik, and Xavier Freixas, 2000, "Equity, bonds, and bank debt: Capital structure and financial market equilibrium under asymmetric information," *Journal of Political Economy* 108, 324–351.

Burch, Timothy, Vikram Nanda, and Vincent Warther, 2005, "Does it pay to be loyal? An empirical analysis of underwriting relationships and fees," *Journal of Financial Economics* 77, 673–699.

Cai, Kelly, Jean Helwege, and Arthur Warga, 2007, "Underpricing in the corporate bond market," *Review of Financial Studies* 20, 2012–2046.

Carbó-Valverde, Santiago, Pedro Cuadros-Solas, and Francisco Rodríguez-Fernández, 2017, "Do banks and industrial companies have equal access to reputable underwriters in debt markets?," *Journal of Corporate Finance* 45, 176–202.

Chen, Hui, Rui Cui, Zhiguo He, and Konstantin Milbradt, 2018, "Quantifying liquidity and default risks of corporate bonds over the business cycle," *Review of Financial Studies* 31, 852–897.

Collin-Dufresne, Pierre, Robert S. Goldstein, and J. Spencer Martin, 2001, "The determinants of credit spread changes," *Journal of Finance* 56, 2177–2207.

Dang, Tri, Gary Gorton, and Bengt Holmstrom, 2015, "The Information Sensitivity of a Security," *Working Paper*.

Diamond, Douglas, 1991, "Monitoring and reputation: The choice between bank loans and directly placed debt," *Journal of Political Economy* 99, 689–721.

Dick-Nielsen, Jens, 2009, "Liquidity biases in TRACE," *Journal of Fixed Income* 19, 43–55.

——— , Peter Feldhütter, and David Lando, 2012, "Corporate bond liquidity before and after the onset of the subprime crisis," *Journal of Financial Economics* 103, 471–492.

Drucker, Steven, and Manju Puri, 2005, "On the benefits of concurrent lending and underwriting," *Journal of Political Economy* 60, 2763–2799.

Ericsson, Jan, Kris Jacobs, and Rodolfo Oviedo, 2009, "The determinants of credit default swap premia," *Journal of Financial and Quantitative Analysis* 44, 109–132.

Fang, Lily Hua, 2005, "Investment bank reputation and the price and quality of underwriting services," *Journal of Finance* 60, 2729–2761.

Fernando, Chitru, Vladimir Gatchev, and Paul Spindt, 2005, "Wanna dance? How firms and underwriters choose each other," *Journal of Finance* 60, 2437–2469.

Fernando, Chitru, Anthony May, and William Megginson, 2012, "The value of investment banking relationships: Evidence from the collapse of Lehman Brothers," *Journal of Finance* 67, 235–270.

Galil, Koresh, Offer Moshe Shapir, Dan Amiram, and Uri Ben-Zion, 2014, "The determinants of CDS spreads," *Journal of Banking and Finance* 41, 271–282.

Gande, Amar, Manju Puri, Anthony Saunders, and Ingo Walter, 1997, "Bank underwriter of debt securities: Modern evidence," *Review of Financial Studies* 10, 1175–1200.

Harford, Jarrad, Sandy Klasa, and William Maxwell, 2014, "Refinancing risk and cash holdings," *Journal of Finance* 69, 975–1012.

He, Zhiguo, Yuan Wang, and Yaxuan Qi, 2014, "Does bond liquidity affect financial contracts?," *Working Paper*.

He, Zhiguo, and Wei Xiong, 2012, "Rollover risk and credit risk," *Journal of Finance* 68, 391–429.

Hovakimian, A., T. Opler, and S. Titman, 2001, "The debt-equity choice: An analysis of issuing firms," *Journal of Financial and Quantitative Analysis* 36, 1–24.

James, Christopher, 1992, "Relationship-Specific Assets and the Pricing of Underwriter Services," *Journal of Finance* 47, 1865–1885.

Kovner, Anna, 2012, "Do underwriters matter? The impact of the near failure of an equity underwriter," *Journal of Financial Intermediation* 21, 507–529.

Krigman, Laurie, Wayne Shaw, and Kent Womack, 2001, "Why do firms switch underwriters?," *Journal of Financial Economics* 60, 245–284.

Longstaff, Francis A., Sanjay Mithal, and Eric Neis, 2005, "Corporate Yield Spreads: Default

risk or liquidity? New evidence from the credit default swap market," *Journal of Finance* 60, 2212–2253.

Merton, Robert, 1974, "On the pricing of corporate debt: The risk structure of interest rates," *Journal of Finance* 29, 449–470.

Nagler, Florian, 2017, "Yield Spreads and the Corporate Bond Rollover Channel," *Working Paper*.

——— , and Giorgio Ottonello, 2017, "Structural changes in corporate bond underpricing," *Working Paper*.

Opler, Tim, Michael Saron, and Sheridan Titman, 1997, "Designing capital structure to create shareholder value," *Applied Corporate Finance* 64, 21–32.

Petersen, Mitchell A, 2009, "Estimating standard errors in finance panel data sets: Comparing approaches," *Review of financial studies* 22, 435–480.

Rajan, Raghuram, 1992, "Insiders and Outsiders: The Choice between Informed and Arm's-Length Debt," *Journal of Finance* 47, 1367–1400.

Roundtable, The Credit, 2015, "Corporate bond underwriting and distribution practices," *Presentation to the U.S. Securities and Exchange Commission*.

Subrahmanyam, Marti G., Dragon Y. Tang, and Sarah Q. Wang, 2017, "Credit default swaps, exacting creditors and corporate liquidity management," *Journal of Financial Economics* 124, 395–414.

Valenzuela, Patricio, 2015, "Rollover risk and credit spreads: Evidence from international corporate bonds," *Review of Finance* 20, 631–661.

Xu, Qiping, 2018, "Kicking maturity down the road: Early refinancing and debt maturity management in the corporate bond market," *Review of Financial Studies* 31, 3061–3097.

Yasuda, Ayako, 2005, "Do bank relationships affect the firm's underwriter choice in the corporate-bond underwriting market?," *Journal of Finance* 60, 1259–1292.

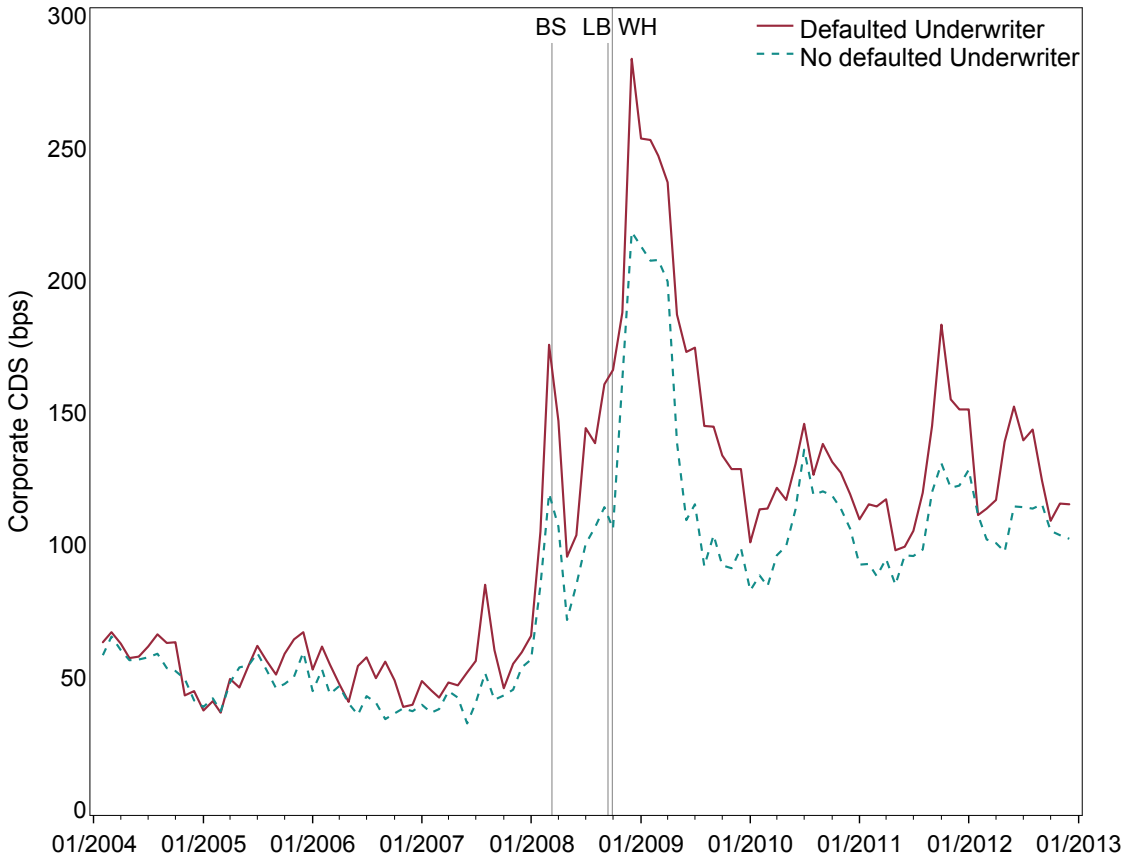

Figure 1
CDS spreads of corporate bond issuers
The figure shows the development in the CDS spreads of U.S.-based firms for the period 2004 to 2012. The CDS spread is the average (median) of beginning-of-month observations of five-year CDS spreads, given in basis points. Issuers are separated into *Defaulted Underwriter* and *No Defaulted Underwriter* samples based upon whether the firm had a relationship with an underwriter that defaulted within the sample period. Specifically, the figure includes the issuer relationships with top-20 underwriters within the sample period, where the sub-sample of defaulted underwriters includes the default of Bear Stearns (BS) on March 14, 2008, Lehman Brothers (LB) on September 15, 2008, and Wachovia (WH) on September 29, 2008.

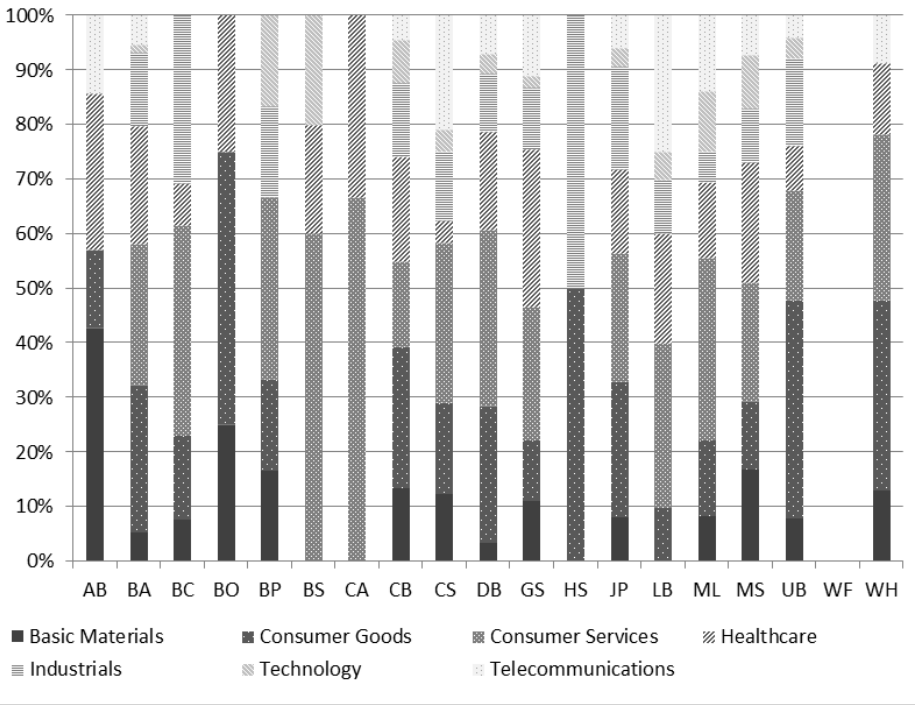

Figure 2
Industry distribution among bond underwriters before the crisis
The figure shows the industry distribution among bond issuers of each underwriter before the crisis. Specifically, the figure reflects the industry distribution of corporate bond issuers that issued a bond in the period 2004 for 2006 with one of the top-20 underwriters. The underwriter information is obtained from Mergent FISD. The industry classification is obtained from Markit and consists of the sectors 'Basic Materials', 'Consumer Goods', 'Consumer Services', 'Healthcare', 'Industrials', 'Technology', and 'Telecommunication'.

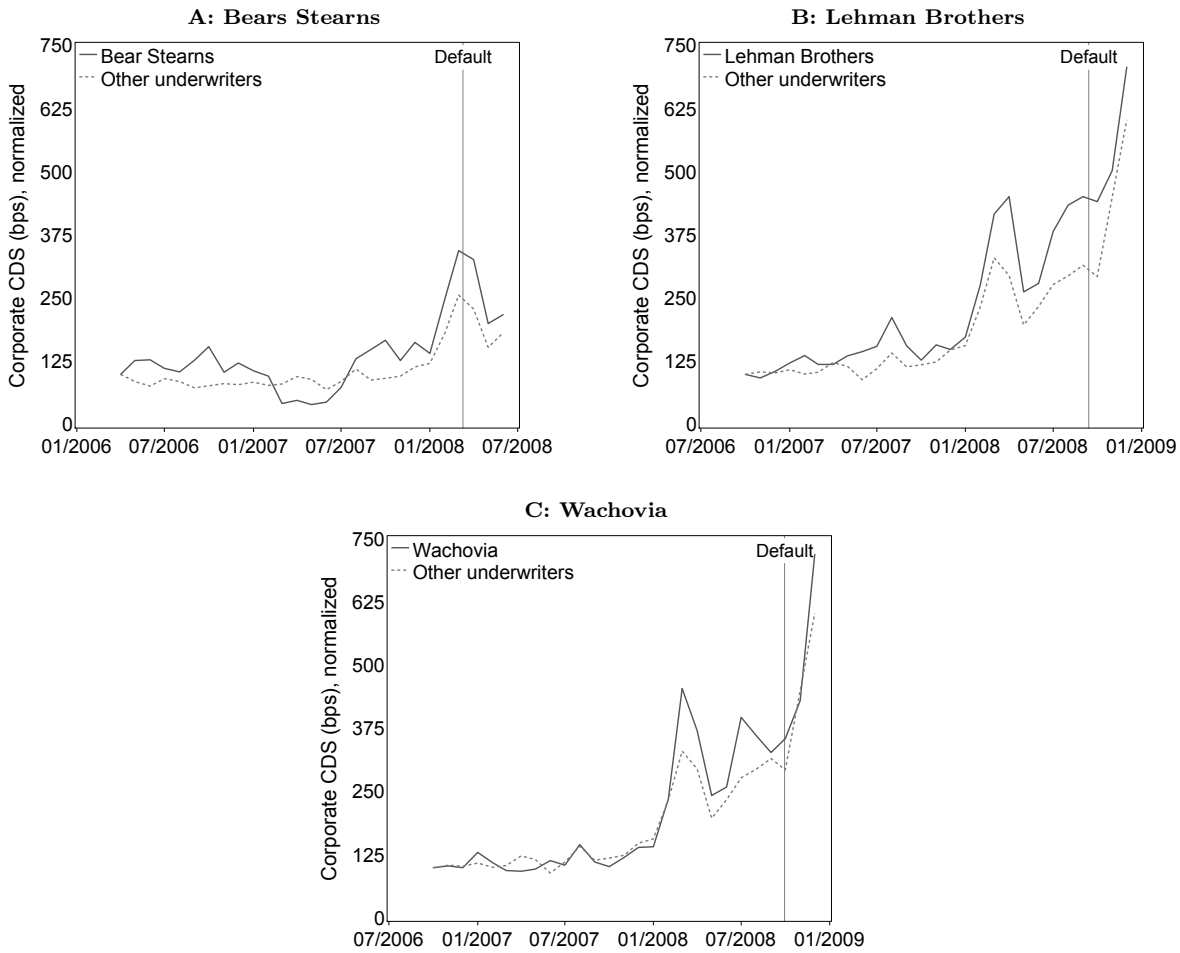

Figure 3
The impact of underwriter default on issuer CDS spreads
The figures show the development in CDS spreads of firms that have an underwriter relationship with Bear Stearns, Lehman Brothers or Wachovia, as well as of firms that do not have an underwriter relationship with these underwriters. Bear Stearns defaulted on March 14, 2008, Lehman Brothers defaulted on September 13, 2008, while Wachovia defaulted on September 29, 2008. The CDS spread is the median beginning of month five-year CDS spread in bps across issuers in the sample. The average CDS spread of each sub-sample is normalized to the same starting point two years before the default of the respective underwriter. The sample of firms is based on Compustat and Mergent Fisd. The CDS data is taken from Markit.

Table 1
Summary statistics

Panel A: Gross Spread and Underpricing

	Gross Spread	Under-pricing	Existing UW Relation	IPO	Time to Maturity	Offering Amt. ($bn)	Rule 144a
Mean	0.93	0.40	0.47	0.19	11.20	0.36	0.25
SD	0.95	1.05	0.50	0.39	9.07	2.25	0.43
Q1	0.35	-0.00	0.00	0.00	6.00	0.08	0.00
Q2	0.65	0.14	0.00	0.00	9.64	0.20	0.00
Q3	1.00	0.71	1.00	0.00	10.30	0.40	1.00
Bonds	19,257	6,992	19,257	19,257	19,257	19,257	19,257

Panel B: Firm Characteristics and Market Measures

	CDS Spread	CDS (bps)	UW Risk	Lev.	Eq. Vol	Firm Size	Pro-fit.	Cash	UW Rel.	Bonds Outst.	Equity Risk	1yr Swap	CDX Index	CDX (bps)
Mean	4.63	177.1	4.28	0.31	0.11	9.09	0.12	0.09	2.75	5.48	1.05	2.42	4.27	100.4
SD	0.89	190.1	1.03	0.16	0.15	1.11	0.09	0.09	1.79	4.70	1.94	1.91	0.50	20.2
Q1	3.96	57.8	3.25	0.20	0.06	8.24	0.06	0.03	1.50	2.00	0.00	0.54	3.88	101.2
Q2	4.53	106.0	4.67	0.27	0.08	8.99	0.10	0.06	2.00	4.00	0.00	2.07	4.32	103.0
Q3	5.26	222.0	5.09	0.39	0.10	9.83	0.18	0.12	4.00	7.00	0.00	4.28	4.50	111.0
Firms	329	329	329	329	329	329	329	329	329	329	329			

Panel C: Firm Characteristics by Credit Rating Group

	Investment-grade							Speculative-grade						
	CDS Spread	UW Risk	Lev.	Eq. Vol.	Firm Size	Pro-fit.	Cash	CDS Spread	UW Risk	Lev.	Eq. Vol.	Firm Size	Pro-fit.	Cash
Mean	4.22	4.32	0.26	0.10	9.42	0.15	0.09	5.47	4.13	0.41	0.14	8.41	0.08	0.09
SD	0.63	1.01	0.12	0.16	1.05	0.08	0.09	0.73	1.07	0.18	0.15	0.90	0.07	0.08
Q1	3.79	3.29	0.18	0.06	8.62	0.08	0.03	5.12	3.14	0.26	0.08	7.73	0.03	0.03
Q2	4.24	4.70	0.24	0.07	9.38	0.13	0.06	5.49	4.46	0.40	0.10	8.25	0.07	0.06
Q3	4.62	5.11	0.32	0.09	10.1	0.20	0.13	5.99	5.02	0.51	0.13	8.97	0.13	0.12
Firms	221	221	221	221	221	221	221	109	109	109	109	109	109	109

Panel D: Firm Characteristics and Bank Risk Measures for Sub-sample

	CDS Spread	UW Risk	Lev.	Eq. Vol.	Firm Size	Pro-fit.	Cash	Bond Ratio	Bank Risk
Mean	4.81	4.25	0.36	0.11	9.08	0.13	0.07	0.61	4.06
SD	0.92	1.02	0.17	0.14	1.20	0.09	0.07	0.23	0.93
Q1	4.24	3.23	0.24	0.06	8.12	0.07	0.02	0.44	3.08
Q2	4.77	4.65	0.31	0.09	8.95	0.11	0.05	0.61	4.45
Q3	5.44	5.05	0.45	0.11	9.88	0.18	0.09	0.80	4.82
Firms	188	188	188	188	188	188	188	188	188

The table provides summary statistics for all regression variables. *Gross spread* is the bond issuance costs as a fraction of offering price. *Underpricing* is the relative price difference between the offering price and the average transaction price of a bond over the two weeks after issuance. *Existing UW Relation* is a dummy which is one if one or more lead underwriters for the new issuance have also been used for a currently outstanding bond. *IPO* is a dummy which is one if it is the first bond issuance by the firm. *Time to Maturity* is measured in years. *Offering Amt. (log)* is the natural logarithm of the offering amount (*Offering Amt. (USD)*) in millions. *Rule 144a* is a dummy which is one if the bond was issued under Rule 144a. *CDS Spread* is the natural logarithm of the CDS spread on the five-year contract (*CDS (bps)*) of the issuing firm. *UW Risk* is the natural logarithm of related underwriters' average CDS spreads weighted by the number of outstanding bonds underwritten for each issuer. *Leverage* is the book value of long-term debt plus debt in current liabilities divided by total assets. *Equity Volatility* is calculated using total stock returns for the preceding 90 days. *Firm Size* is the natural logarithm of total assets. *Profitability* is operating income to total revenue. *Cash* is the ratio of cash and cash equivalents to total assets. *UW Relations* is the number of underwriter relationships of the average firm across time. *Bonds Outstanding* is the number of bonds held by the average firm across time. *Equity Risk* is the natural logarithm of the average related equity underwriters' CDS spreads. *1yr Swap* is the one year swap rate from the Federal Reserve Bank. *CDX Index* is the natural logarithm of the 'CDX.NA.IG'-index spread (*CDX (bps)*) provided by Markit. *Bond Ratio* is the ratio of bonds to bank debt. *Bank Risk* is the natural logarithm of the average related bank syndicate members' CDS spreads weighted by loan size. *Investment-grade* (*Speculative-grade*) refers to a firm with a S&P credit rating that is equal to 'BBB' or higher ('BB' or lower). The sample period is 2004-2012, and the variables are based on monthly observations and obtained from Compustat N.A., CRSP, Mergent FISD, TRACE, Markit, and SDC Dealscan.

Table 2
Underwriter relationship effect on gross spread and underpricing

	Gross Spread			Underpricing		
	(a)	(b)	(c)	(d)	(e)	(f)
Intercept	1.030***			0.747***		
	(106.39)			(34.49)		
Existing UW Relation	-0.194***	-0.237***	-0.077***	-0.509***	-0.167***	-0.079***
	(-14.14)	(-17.26)	(-5.54)	(-19.32)	(-6.39)	(-2.88)
Time To Maturity		0.004***	0.007***		0.003**	0.004***
		(6.39)	(10.88)		(2.43)	(2.86)
Offering Amount		-0.004*	-0.003		0.115***	0.130***
		(-1.91)	(-1.22)		(4.93)	(5.61)
Rule 144a		0.194***	0.036		0.405***	0.312***
		(5.77)	(1.09)		(12.38)	(9.14)
IPO Dummy			0.699***			0.408***
			(38.50)			(9.14)
Bond Type Dummy	N	Y	Y	N	Y	Y
Credit Rating Dummy	N	Y	Y	N	Y	Y
Industry Dummy	N	Y	Y	N	Y	Y
R-square	0.010	0.310	0.360	0.051	0.296	0.304
N	19257	19107	19107	6992	6990	6990

The table presents estimates of the effect of utilizing an existing underwriter relationship on the gross spread and underpricing. *Gross Spread* is the fees paid to the underwriter as a fraction of the offering price. *Underpricing* is defined as the return between the offering price and the average price of the bond over the first two weeks of trading on the secondary market. *Existing UW Relation* is a dummy which is equal to one if the bond is issued using an underwriter which has also been used for another currently outstanding bond from the same firm. *IPO Dummy* is a dummy equal to one if the respective bond issue is the first bond issuance for the firm. For gross spread (in percentage points), we use all bonds from FISD and for underpricing (in percentage points) we use all bonds available in TRACE. (*** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level. The numbers in parentheses are cluster robust t-statistics.)

Table 3
Top-20 bond underwriters (2004-2012)

Financial institution (Lead underwriter)	Country of origin (a)	Number of clients within sample period (b)	Number of clients within firm sample (c)
ABN Amro Bank	NLD	60	6
Banc of America	USA	1419	109
Barclays	GBR	633	32
Bank One	USA	71	7
BNP Paribas	FRA	170	10
Bear Stearns	USA	239	9
Canadian Imperial Bank of Commerce	CAN	34	1
Citibank	USA	1743	123
Credit Suisse	CHE	884	57
Deutsche Bank	GER	909	61
Goldman Sachs	USA	1605	68
HSBC Bank	GBR	200	7
JP Morgan	USA	2610	143
Lehman Brothers	USA	910	42
Merrill Lynch	USA	1270	59
Morgan Stanley	USA	1324	66
Salomon Brothers	USA	563	
Union Bank of Switzerland	CHE	615	
Wachovia	USA	433	28
Wells Fargo	USA	365	23

The table presents the 20 most active banks serving as underwriters of corporate bonds outstanding in the period from 2004 to 2012. The list counts the number of U.S. corporate bond issuances where the respective financial institution acted as the lead underwriter. The number of clients in column (b) refers to the number of non-financial firms that issued bonds using the given underwriter, while the number of clients in column (c) refers to the number of non-financial firms within our sample.

Table 4
Issuer credit risk and underwriter distress

	CDS Spread			
	Full sample	Full sample	Full sample	Sample without default
	(a)	(b)	(c)	(d)
UW Risk	0.4068***	0.4112***	0.1510***	0.1462***
	(13.93)	(18.32)	(3.678)	(3.524)
Leverage		2.2125***	2.0905***	2.0623***
		(8.977)	(8.177)	(8.284)
Equity Sigma		1.3981***	1.9658***	1.9488***
		(5.474)	(5.723)	(5.890)
Cash to Assets		0.7201**	0.5410	0.5296
		(2.224)	(1.625)	(1.610)
Size		-0.279***	-0.248***	-0.255***
		(-7.67)	(-6.45)	(-6.93)
Profitability		-2.565***	-2.430***	-2.400***
		(-5.93)	(-5.88)	(-5.83)
Swap 1 yr			-0.042***	-0.049***
			(-2.70)	(-3.19)
CDS Index			0.4155***	0.3918***
			(5.700)	(5.265)
Adj. R-Square	0.1485	0.5605	0.5809	0.5783
No. obs.	18751	18716	15156	14896

The table presents estimates of the effect of underwriter distress on issuer credit risk. *CDS Spread* is the natural logarithm of the CDS spread on the five-year contract of the issuing firm. *UW Risk* is the natural logarithm of related underwriters' average CDS spreads, weighted by the number of underwritten bonds outstanding. Specification (d) excludes observations for firms where one of the related underwriters has defaulted within the last six months. The main sample period is 2004-2012, based on monthly observations. When using market measures, the sample period is reduced to 2006-2012 due to lack of data availability. (*** denotes significance at the 1% level, ** significance at the 5% level, and * significance at the 10% level. The numbers in parentheses are cluster robust t-statistics.)

Table 5
Changes in issuer credit risk and underwriter distress

	Δ CDS Spread					
	Full sample (a)	Full sample (b)	Full sample (c)	Full sample (d)	Full sample (e)	Sample without default (f)
Δ UW Risk	0.2815***	0.2672***	0.2574***	0.2567***	0.1784***	0.1767***
	(4.691)	(4.590)	(4.421)	(4.410)	(2.840)	(2.775)
Δ Leverage		0.2506***	0.2290***	0.2210***	0.1778***	0.1879***
		(3.420)	(3.125)	(3.016)	(2.933)	(3.094)
Δ Equity Sigma		0.1414***	0.1038**	0.1062**	0.0793***	0.0796***
		(3.180)	(2.333)	(2.388)	(2.699)	(2.697)
Δ Cash to Assets		0.0005***	0.0008***	0.0010***	0.0007***	0.0007***
		(3.374)	(4.901)	(6.215)	(3.619)	(3.730)
Δ Size		-4.873**	-4.616**	-4.643**	-3.241	-3.532
		(-2.50)	(-2.36)	(-2.38)	(-1.59)	(-1.67)
Δ Profitability		-0.000	0.0001	0.0002	-0.000	-0.000
		(-0.74)	(0.502)	(0.950)	(-0.47)	(-0.43)
Δ Swap 1 yr					-0.159**	-0.179**
					(-2.43)	(-2.73)
Δ CDS Index					0.6257***	0.6352***
					(13.05)	(12.18)
Time FE	N	N	Y	N	N	N
Time x Rating FE	N	N	N	Y	N	N
Adj. R-square	0.1051	0.1404	0.277	0.2772	0.3343	0.3338
N	18332	17782	17782	17782	14615	14364

The table presents estimates of the effect of changes in underwriter distress on issuer credit risk. Δ *CDS Spread* is the relative change in the natural logarithm of the CDS spread on the five-year contract of the issuing firm from month *t-1* to month *t*, given in percentages. Δ *UW Risk* is the relative change in the natural logarithm of related underwriters' average CDS spreads from month *t-1* to month *t*, weighted by the number of underwritten bonds outstanding. The regressions exclude observations for firms where one of the related underwriters has defaulted within the last six months. The main sample period is 2004-2012, based on monthly observations. We use monthly time fixed effects and rating fixed effects that are based on the firms' S&P credit rating (ranging from 'AAA' to 'CCC') in a given month. When using market measures, the sample period is reduced to 2006-2012 due to lack of data availability. (*** denotes significance at the 1% level, ** significance at the 5% level, and * significance at the 10% level. The numbers in parentheses are cluster robust t-statistics.)

Table 6
Credit ratings and underwriter distress effect

	CDS Spread			Δ CDS Spread	
	Investment-grade (a)	Speculative-grade (b)		Investment-grade (c)	Speculative-grade (d)
UW Risk	0.1468***	0.2021***	Δ UW Risk	0.0948**	0.3738**
	(3.998)	(3.364)		(2.340)	(2.417)
Leverage	0.5893**	1.4718***	Δ Leverage	0.1991***	-0.059
	(2.144)	(6.628)		(3.356)	(-0.30)
Equity Sigma	1.4638***	1.4512***	Δ Equity Sigma	0.0705**	0.1096**
	(3.785)	(5.275)		(2.036)	(2.351)
Cash to Assets	-0.075	0.6985	Δ Cash to Assets	0.0008***	-0.008*
	(-0.25)	(1.228)		(5.164)	(-1.90)
Size	-0.188***	-0.059	Δ Size	-2.719	-4.587
	(-5.79)	(-1.04)		(-1.02)	(-1.58)
Profitability	-1.181***	-1.583***	Δ Profitability	-0.001***	0.0011*
	(-2.60)	(-3.35)		(-2.59)	(1.904)
Swap 1 yr	-0.071***	0.0094	Δ Swap 1 yr	-0.184***	-0.131
	(-4.68)	(0.382)		(-2.91)	(-1.26)
CDS Index	0.5551***	0.2768***	Δ CDS Index	0.7266***	0.3753***
	(8.128)	(2.720)		(13.84)	(4.093)
Adj. R-Square	0.5326	0.4458	*Adj. R*-Square	0.3655	0.3321
N	10816	4041	N	10475	3853

The table presents estimates of the effect of underwriter distress on issuer credit risk conditional on firms' credit rating. *CDS Spread* is the natural logarithm of the CDS spread on the five-year contracts of the issuing firm. *UW Risk* is the natural logarithm of related underwriters' average CDS spreads, weighted by the number of underwritten bonds outstanding. We distinguish between issuers that are investment-grade rated and speculative-grade rated firms. *Investment-grade* (*Speculative-grade*) refers to a firm with a S&P credit rating that is equal to 'BBB' or higher ('BB' or lower). Specifications (a) and (b) show the effect in levels, while specifications (c) and (d) show the effect in changes. The regressions exclude observations for firms where one of the related underwriters has defaulted within the last six months. The sample period is 2006-2012, based on monthly observations. (*** denotes significance at the 1% level, ** significance at the 5% level, and * significance at the 10% level. The numbers in parentheses are cluster robust t-statistics.)

Table 7
Rollover risk and underwriter distress effect

Panel A: Maturing Debt to Total Assets

	CDS Spread			CDS Spread		
	Investment-grade			Speculative-grade		
	(a)	(b)	(c)	(d)	(e)	(f)
UW Risk	0.1418***	0.1215***	0.1147***	0.1751***	0.1729***	0.2009***
	(3.443)	(2.793)	(2.594)	(2.920)	(2.794)	(3.161)
UW Risk × $\frac{\text{Debt}\leq 1\text{yr}}{\text{Assets}}$	0.3060			1.0786**		
	(0.396)			(2.077)		
$\frac{\text{Debt}\leq 1\text{yr}}{\text{Assets}}$	-0.180			-5.137**		
	(-0.05)			(-2.25)		
UW Risk × $\frac{\text{Debt}\leq 2\text{yr}}{\text{Assets}}$		0.7382			0.6437*	
		(1.334)			(1.903)	
$\frac{\text{Debt}\leq 2\text{yr}}{\text{Assets}}$		-2.847			-2.906*	
		(-1.12)			(-1.93)	
UW Risk × $\frac{\text{Debt}\leq 3\text{yr}}{\text{Assets}}$			0.6135			0.1153
			(1.516)			(0.379)
$\frac{\text{Debt}\leq 3\text{yr}}{\text{Assets}}$			-2.348			-0.297
			(-1.25)			(-0.22)
Controls	Y	Y	Y	Y	Y	Y
Adj. R-Square	0.5333	0.5335	0.5337	0.4471	0.4469	0.4444
N	10742	10682	10677	4050	4050	4050

Panel B: Maturing Debt to Total Long-term debt

	CDS Spread			CDS Spread		
	Investment-grade			Speculative-grade		
	(a)	(b)	(c)	(d)	(e)	(f)
UW Risk	0.1466***	0.1211***	0.0915*	0.1667***	0.1388**	0.1604**
	(3.608)	(2.656)	(1.849)	(2.825)	(2.279)	(2.545)
UW Risk × $\frac{\text{Debt}\leq 1\text{yr}}{\text{Debt}}$	-0.001			0.4412**		
	(-0.00)			(2.256)		
$\frac{\text{Debt}\leq 1\text{yr}}{\text{Debt}}$	0.0105			-2.282***		
	(0.015)			(-2.97)		
UW Risk × $\frac{\text{Debt}\leq 2\text{yr}}{\text{Debt}}$		0.1515			0.4557***	
		(1.033)			(2.994)	
$\frac{\text{Debt}\leq 2\text{yr}}{\text{Debt}}$		-0.706			-2.261***	
		(-1.10)			(-3.50)	
UW Risk × $\frac{\text{Debt}\leq 3\text{yr}}{\text{Debt}}$			0.2086*			0.1937
			(1.722)			(1.621)
$\frac{\text{Debt}\leq 3\text{yr}}{\text{Debt}}$			-0.937*			-0.964*
			(-1.72)			(-1.86)
Controls	Y	Y	Y	Y	Y	Y
Adj. R-Square	0.532	0.5319	0.533	0.4522	0.455	0.4471
N	10742	10651	10646	4050	4048	4048

The table presents estimates of the effect of rollover exposure and underwriter distress on issuer credit risk. *CDS Spread* is the natural logarithm of the CDS spread on the five-year contract of the issuing firm. *UW Risk* is the natural logarithm of related underwriters' average CDS spreads, weighted by the number of underwritten bonds outstanding. In Panel A the rollover exposure is proxied by the outstanding debt due in one, two, and three years, scaled by total assets. In Panel B the rollover exposure is proxied by the outstanding debt due in one, two, and three years, scaled by total long-term debt. We distinguish between issuers that are investment-grade rated and speculative-grade rated firms. Investment-grade (Speculative-grade) refers to a firm with a S&P credit rating that is equal to 'BBB' or higher ('BB' or lower). The regressions exclude observations for firms where one of the related underwriters has defaulted within the last six months. The sample period is 2006-2012, based on monthly observations. (*** denotes significance at the 1% level, ** significance at the 5% level, and * significance at the 10% level. The numbers in parentheses are cluster robust t-statistics.)

Table 8
Economic significance of underwriter distress

Panel A: Absolute CDS Spread Contribution

	UW Risk	Leverage	Equity Volatility	Firm Size	Profitability
	(a)	(b)	(c)	(d)	(e)
Investment-grade	0.352	0.065	0.054	0.405	0.212
Speculative-grade	0.448	0.335	0.074	0.086	0.216

Panel B: Relative CDS Spread Contribution

	UW Risk	Leverage	Equity Volatility	Firm Size	Profitability
	(a)	(b)	(c)	(d)	(e)
Investment-grade	7.332%	1.571%	1.239%	9.332%	4.959%
Speculative-grade	7.585%	6.319%	1.298%	1.556%	3.906%

The table presents estimates of the economic significance of underwriter distress. The estimation is based upon the results obtained in Table 7, Panel A, specification (a) and (d). The absolute credit risk contribution is estimated as the difference between the 50% and 5% percentile in the distribution of the respective component. The relative credit risk contribution is estimated as the difference between issuer specific components and the 5% percentile, scaled by the size of the CDS spread (bps). Column (a) presents the contribution of *UW Risk* and is defined as

$$\text{UW Risk contribution}_{it} = \hat{\beta}_1 \times \text{UW Risk}_{it} + \hat{\beta}_3 \times \frac{\text{Debt} \leq 1\text{yr}_{it}}{\text{Assets}_{it}} \times \text{UW Risk}_{it}$$

The contributions of factors presented in the table are estimated following the same approach. Column (b) shows the contribution of *Bid-Ask Residual* and refers to the bond illiquidity effect that is unrelated to the underwriter distress effect. Columns (c) to (f) show the contributions of *Leverage*, *Equity Volatility*, *Firm Size* and *Profitability*. We distinguish between issuers that are investment-grade rated and speculative-grade rated firms. Investment-grade (Speculative-grade) refers to a firm with a S&P credit rating that is equal to 'BBB' or higher ('BB' or lower). The sample period is 2006-2012, based on monthly observations.

Table 9
Underwriter default and issuer credit risk

Panel A: Bear Stearns

	CDS Spread					
	1 mth. (a)	1-2 mth. (b)	1-3 mth. (c)	1-4 mth. (d)	1-5 mth. (e)	1-6 mth. (f)
Default Dummy	0.182***	0.153***	0.125*	0.120	0.125*	0.119
	(8.36)	(3.74)	(1.75)	(1.64)	(1.69)	(1.54)
Controls	Y	Y	Y	Y	Y	Y
Adj. R-square	0.842	0.842	0.842	0.842	0.842	0.842
N	396	396	396	396	396	396

Panel B: Lehman Brothers

	CDS Spread					
	1 mth. (a)	1-2 mth. (b)	1-3 mth. (c)	1-4 mth. (d)	1-5 mth. (e)	1-6 mth. (f)
Default Dummy	0.049	0.112**	0.159***	0.123**	0.046	-0.010
	(1.40)	(1.98)	(2.58)	(2.15)	(0.72)	(-0.11)
Controls	Y	Y	Y	Y	Y	Y
Adj. R-square	0.651	0.652	0.652	0.652	0.651	0.651
N	1813	1813	1813	1813	1813	1813

Panel C: Wachovia

	CDS Spread					
	1 mth. (a)	1-2 mth. (b)	1-3 mth. (c)	1-4 mth. (d)	1-5 mth. (e)	1-6 mth. (f)
Default Dummy	0.217***	0.248***	0.227***	0.138	0.047	-0.108
	(2.99)	(3.35)	(3.00)	(1.34)	(0.34)	(-0.65)
Controls	Y	Y	Y	Y	Y	Y
Adj. R-square	0.581	0.582	0.582	0.581	0.580	0.580
N	1208	1208	1208	1208	1208	1208

The table presents estimates of the effect of underwriter default on issuer credit risk for the sub-samples of firms that have a underwriter relationship with Bear Stearns, Lehman Brothers and Wachovia, respectively. *CDS Spread* is the natural logarithm of the CDS spread on the five-year contract of the issuing firm. *Default Dummy* is a dummy variable that is equal to one for the months after the underwriter defaults, and zero otherwise. Panel A shows the results where we analyze the impact of the default of Bear Stearns (March 14, 2008). Panel B shows the results where we analyze the impact of the default of Lehman Brothers (September 15, 2008). Likewise, Panel C shows the results where we analyze the impact of the default of Wachovia (September 29, 2008). In specifications (a), the dummy is only equal to one in the month following the underwriter default. In specifications (b), (c), (d), (e), and (f), the dummy is equal to one in the month following the underwriter default, as well as respectively two, three, four, five, and six months after. In all model specifications, we use the sub-sample of firms that have a relationship with the underwriter and perform the regression on firms' CDS spread using the baseline model specification, Equation (3). (*** denotes significance at the 1% level, ** significance at the 5% level, and * significance at the 10% level. The numbers in parentheses are cluster robust t-statistics.)

Table 10
Yield spreads and underwriter distress effect

	Yield Spread			
	(a)	(b)	(c)	(d)
Issuer CDS	1.6834***			
	(5.786)			
Bid-Ask spread	0.2443*	0.3134*	0.8390***	0.1019
	(1.715)	(1.698)	(3.019)	(1.492)
Bond coupon	0.1880***	0.4105***	0.4051***	0.1166***
	(4.926)	(9.130)	(9.514)	(6.116)
Time-to-Maturity	0.0014	-0.010*	-0.014**	0.0127***
	(0.332)	(-1.78)	(-2.35)	(4.983)
Bond Age	0.0257	-0.015	-0.017	0.0301***
	(1.075)	(-1.04)	(-1.21)	(2.578)
Bond Size	-0.063	-0.112	-0.124	-0.057
	(-0.52)	(-1.20)	(-1.51)	(-1.58)
UW Risk		0.7806***	0.5018***	0.4414***
		(7.409)	(3.390)	(4.143)
Equity Sigma		6.5146***	7.9350***	3.2064*
		(2.992)	(3.412)	(1.822)
Cash to Assets		2.9437***	3.4121***	0.4544
		(2.811)	(3.064)	(0.442)
Leverage		4.3998***	4.4890***	4.9383**
		(3.261)	(3.302)	(2.239)
Size		-0.068	-0.069	-0.135
		(-0.37)	(-0.38)	(-0.91)
Profitability		-5.620***	-5.365***	-6.531***
		(-4.16)	(-4.31)	(-4.05)
SWAP 1YR			0.4877***	
			(5.346)	
CDS Index			2.3731***	
			(4.490)	
Issuer FE	No	No	No	Yes
Time FE	No	No	No	Yes
Adj R-Sq	0.4253	0.3799	0.4604	0.5814
No. obs.	77296	77452	63237	77452

The table presents estimates of how bond yields and underwriter distress interacts. The dependent variable is the monthly bond yield spread. The sample includes all non-convertible fixed rate bullet bonds for which there is an underwriter distress measure. Bid-ask spread is bond specific and calculated using transactions for the month leading up to the yield spread date. Bond yield spreads are volume weighted average yields on the first day of the month. If there are no available transactions on this date then the yield spread on the next date is used and so on for a maximum of five trading days from the beginning of the month. (*** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level. The numbers in parentheses are cluster robust t-statistics.)

Table 11
Bond underwriter versus other bank relationships

	Robustness: Bank Debt Relation	Robustness: Equity Underwriter Relation	
	CDS Spread (a)	UW Risk (b)	CDS Spread (c)
$\frac{\text{Bond Debt}}{\text{Total Debt}}$	-1.038*		
	(-1.74)		
Bank Risk $\times$ $\frac{\text{Bank Debt}}{\text{Total Debt}}$	0.196**		
	(2.52)		
UW Risk $\times$ $\frac{\text{Bond Debt}}{\text{Total Debt}}$	0.227***		
	(3.17)		
Equity Risk		0.085 ***	0.0304**
		(6.753)	(1.970)
UW Risk Residual			0.1411***
			(3.362)
Leverage	1.641***		2.089***
	(6.17)		(8.39)
Equity Volatility	2.233***		1.937***
	(5.24)		(5.89)
Firm Size	-0.15***		-0.25***
	(-3.36)		(-6.80)
Profitability	-2.59***		-2.39***
	(-4.90)		(-5.80)
Cash	0.501		0.529
	(0.97)		(1.62)
1yr Swap	-0.05***		-0.04***
	(-2.61)		(-3.14)
CDS Index	0.152*		0.395***
	(1.69)		(5.31)
Adj. R-square	0.614	0.0254	0.579
N	5183	19104	14896

The table presents estimates of the effect of bond underwriter distress versus the distress related to other banking relationships. *CDS Spread* is the natural logarithm of the CDS spread on the five-year contract of the issuing firm. *UW Risk* is the natural logarithm of related underwriters' average CDS spreads, weighted by the number of underwritten bonds outstanding. In specification (a), we test the effect of firms' bank loan relationships using a bank loan provider distress measure, *Bank Risk*. *Bank Risk* is determined as the natural logarithm of the average related bank syndicate members' CDS spreads weighted by loan size. *Bond Debt to Total Debt* is the outstanding corporate bond debt, scaled by the sum of bond and bank loan debt. Likewise, *Bank Debt to Total Debt* is the outstanding bank debt, scaled by the sum of bond and bank loan debt. In specifications (b) and (c) we test the effect of firms' bank loan relationships using an equity-related underwriter distress measure, *Equity Risk*. *Equity Risk* is determined as the CDS spread of the lead underwriter for equity issuances. *UW Risk Residual* in specification (c) is the residual value of UW Risk obtained from specification (b), i.e., the fraction of UW Risk which is not explained by *Equity Risk*. The regressions exclude observations for firms where one of the related underwriters has defaulted within the last six months. Further, only firms for which we have lender information from SDC Dealscan are included. The sample period is 2006-2012, based on monthly observations. (*** denotes significance at the 1% level, ** significance at the 5% level, and * significance at the 10% level. The numbers in parentheses are cluster robust t-statistics.)

Internet Appendix

for

The Value of Bond Underwriter Relationships

Jens Dick-Nielsen

Mads Stenbo Nielsen

Stine Louise von Rüden

IA1 Alternative UW risk definitions

In this section we present several alternative underwriter distress measures and provide evidence that our results are robust to other specifications.

Firstly, we use the unweighted average of related underwriters' five-year log CDS spread. That is,

$$\text{UW Risk}_{\text{unweighted},it} = \frac{1}{M_i} \sum_{j=1}^{M_i} \text{UW CDS}_{jit} \tag{6}$$

where UW CDS_{jit} is the five-year log CDS spread for the j'th underwriter of bonds by issuer i at time t. Issuer i has a total of M_i underwriters. Thus, this measure has an equal weight of all underwriters. The disadvantage of this measure is that it does not specify the strength of the relationship between the issuer and underwriter that could potentially be very different from issuer to issuer.

Secondly, we use the average of related underwriters' five-year log CDS spread, weighted by bond size (instead of the number of bonds). That is,

$$\text{UW Risk}_{\text{w. Bond Size},it} = \frac{\sum_{k=1}^{N_{it}} \text{Bond Size}_{kit} \sum_{j=1}^{M_{ki}} \text{UW CDS}_{jkit} \times \frac{1}{M_{ki}}}{\sum_{k=1}^{N_{it}} \text{Bond Size}_{kit}} \tag{7}$$

where $BondSize_{kit}$ is the offering amount (size) of bond k outstanding at time t for issuer i. UW CDS_{jkit} is the five-year CDS spread for the j'th underwriter of bond k, given in natural logarithm. Bond k had a total of M_{ki} underwriters and its dollar value is given by Bond Size_{kit}. By weighting the underwriter distress measure by bond size, this measure emphasizes on the value of the issued bonds underwritten by each underwriter. In other words, if the same underwriter has been used for the issuance of bonds with collectively high

value (compared to the issuer's other bonds) it will also be given more weight in the overall measure.

Thirdly, we define two underwriter distress measures where we account for when the issuer has used the respective underwriter. If the issuer has used an underwriter in a recent issuance, then the relation is strong and the credit risk of the underwriter should matter more to the issuing firm (compared to when the issuing firm has not been in contact with and used the underwriter for a long time). In order to account for the time since the issuer has been using the underwriter in our underwriter distress measure, we use the average of related underwriters' five-year log CDS spread, weighted by the inverse time since issuance (bond age). That is,

$$\text{UW Risk}_{\text{w. time-since-issuance},it} = \frac{\sum_{k=1}^{N_{it}} \text{Inv}(\text{Age}_{kit}) \sum_{j=1}^{M_{ki}} \text{UW CDS}_{jkit} \times \frac{1}{M_{ki}}}{\sum_{k=1}^{N_{it}} \text{Inv}(\text{Age}_{kit})} \tag{8}$$

where N_{it} is the number of bonds outstanding at time t for issuer i. UW CDS_{jkit} is the five-year log CDS spread for the j'th underwriter of bond k. Bond k had a total of M_{ki} underwriters. $\text{Inverse(Age)}_{kit}$ presents the bond specific weight for which we use both the negative exponential and a linear depreciation of the time since issuance relative to time t. Underwriters involved in a very recent bond issuance will be given more weight than underwriters involved in a bond issuance from a long time ago.

Fourthly, we define two underwriter distress measures accounting for when the issuer will most likely need the service of an underwriter again, i.e., when bonds are maturing. If the issuer has a bond outstanding that will mature soon, then the issuer probably needs to replace the bond by issuing a new bond. One could imagine that the issuer would choose to replace the bond by using the same underwriters for the new bond issuance that he/she

used for the maturing bond. If this is true, the distress of underwriters that were involved in the maturing issuance should be given more weight in the overall measure. That is,

$$\text{UW Risk}_{\text{w. time-to-maturity},it} = \frac{\sum_{k=1}^{N_{it}} \text{Inv}(\text{TTM}_{kit}) \sum_{j=1}^{M_{ki}} \text{UW CDS}_{jkit} \times \frac{1}{M_{ki}}}{\sum_{k=1}^{N_{it}} \text{Inv}(\text{TTM}_{kit})} \tag{9}$$

where N_{it} is the number of bonds outstanding at time t for issuer i. UW CDS_{jkit} is the five-year log CDS spread for the j'th underwriter of bond k. Bond k had a total of M_{ki} underwriters. $\text{Inverse}(\text{TTM})_{kit}$ is the bond specific weight for which we use both the negative exponential and a linear depreciation of the time to maturity (TTM) relative to time t. Underwriters involved in soon-to-mature bonds will therefore receive the highest weight in the distress measure.

Fifthly, we reconsider our definition of underwriter relationship. For our main measure and the previously presented alternative underwriter distress measures, we define related underwriters at time t to be those underwriters that were involved in the issuance of outstanding bonds at time t. However, one may argue, that only underwriters involved in the most recent bond issuance are underwriters that are important for the issuer. If an underwriter is used in the most recent bond issuance this signals an active relation, while underwriter relationships that have not been (re-)used for a long time may indicate a rather weak or no relationship. In order to take this into account, we specify an underwriter distress measure using only underwriter relationships for the most recent bond issuances. Specifically, we define one measure using the unweighted average of most recent bond issuance related underwriters' five-year log CDS spread, as well as using the average of most recently bond issuance related

underwriters' five-year log CDS spread weighted by underwriter loyalty. That is,

$$\text{Latest UW Risk}_{\text{unweighted},it} = \frac{1}{M_{li}} \sum_{j=1}^{M_{li}} \text{UW CDS}_{jlit} \tag{10}$$

where UW CDS_{jlit} is the five-year log CDS spread for the j'th underwriter of bond l, where bond l is the most recently issued bond. Bond l has a total of M_{li} underwriters. The same measure weighted by loyalty:

$$\text{Latest UW Risk}_{\text{w. loyalty},it} = \frac{\sum_{j=1}^{M_{li}} \text{Underwriter loyalty}_{jlit} \times \text{UW CDS}_{jlit}}{\sum_{j=1}^{M_{li}} \text{Underwriter loyalty}_{jlit}} \tag{11}$$

where UW CDS_{jlit} is the five-year log CDS spread for the j'th underwriter of bond l. Bond l is the most recently issued bond and it had a total of M_{li} underwriters. The average is weighted by $\text{Underwriter loyalty}_{jlit}$, which measures the relative number of bond issuances where underwriter j has been involved in the past (across all issuances in the lifetime of the issuer). Compared to the unweighted measure, weighting by underwriter loyalty implies that the measure also accounts for the strengths of the underwriter relationship.

In Appendix Table IA7, Panel A, we provide summary statistics for all the alternative underwriter risk measures. In Appendix Table IA7, Panel B, we present estimates of the baseline regression using each of the alternative UW Risk measures. As can be seen from the table, we find that all alternative specifications have a positive and significant impact on issuer credit risk. Thus, the results are rather robust. Comparing the size of the coefficient estimates for the alternative measures, we see that the underwriter risk measure weighted by bond size has the lowest explanatory power, while the measures accounting for time since issuance show the highest coefficient estimates. This suggests that the strength of the relationship is important, but we also see that the economic difference in explanatory power

is not very large across the alternative measure. Empirically, the relationships are sticky and the same relationships therefore become important in all the UW Risk specifications.

IA2 Bond illiquidity and rollover risk

Both theoretical (He and Xiong (2012)) and empirical (Valenzuela (2015), and Nagler (2017)) findings suggest that secondary market illiquidity could spill over to the primary market and induce rollover risk because of depressed offering prices. Hypothetically, this effect could be attributed to underwriter distress as well. Dick-Nielsen, Feldhütter, and Lando (2012) show that when the lead underwriter of a bond goes into distress, the bond becomes less liquid in the secondary market. This is because the underwriter often also acts as market maker in the secondary market. Since underwriter distress leads to a less liquid secondary market this would indirectly spill over to a price discount for new bonds on the primary market. This price discount is what is defined as rollover risk in He and Xiong (2012). Note that this market making hypothesis is complementary to the certification hypothesis, i.e., these are two different ways in which underwriter distress might impact issuer credit risk.

To test the market making hypothesis, we first verify that underwriter distress leads to a less liquid market (Dick-Nielsen, Feldhütter, and Lando (2012)) by estimating the following regression:

$$\text{Bid-Ask Spread}_{it} = \alpha + \beta \times \text{UW Risk}_{it} + \epsilon_{it} \tag{12}$$

where i is the i'th issuing firm and t is the month. *Bid-Ask Spread* is the average effective bid-ask spread across all outstanding bonds from the same issuer. The bond specific bid-ask spread is calculated as the monthly average across the daily difference between volume weighted bid and ask transaction prices.[19] From Table IA8, Panel A, we see that the UW Risk measure is significant in explaining the bid-ask spread so that higher underwriter distress

[19]We only use institutional size transactions above \$100,000 as in Bessembinder, Kahle, Maxwell, and Xu (2009).

leads to more illiquid bonds for the client firms. This suggests that part of the underwriter distress effect could be due to a spillover from a less liquid secondary market. To test the possible existence of a bond liquidity effect on corporate credit risk that is independent of underwriter distress, we first calculate the *Bid-Ask Spread Residual* as the residual from the bid-ask spread regression specified in Equation (12) and then include this bid-ask spread residual in the base regression from Equation (4).

Table IA8, Panel B, first of all shows that bond issuers' bid-ask spreads on their own are significant in explaining issuer credit risk (specification (a)). That is, when the market becomes more illiquid, the issuer credit risk is higher consistent with the findings in Valenzuela (2015) and Nagler (2017). However, the impact from illiquidity is not economically significant when evaluated as in Table 8, despite being statistically significant. Thus, while we do find evidence for positive correlation between bond liquidity and corporate credit risk, we do not find strong support for the market making hypothesis in our sample.

In the remaining specifications in Panel B we include the bid-ask spread residual instead of the bid-ask spread directly. The results show that in all specifications, underwriter distress remains significant. In some of the specifications the bid-ask spread residual also comes out as significant, while the interaction between the firm's rollover exposure and the bid-ask spread residual never comes out significant. It is mainly this latter interaction which has been taken as evidence that rollover risk (in the sense of He and Xiong (2012)) matters for issuer credit risk. Thus, in contrast to the related literature our results suggest that the market maker effect is small in our sample and, furthermore, to a large extent is due to underwriter distress causing the bonds to be less liquid in the secondary market.

Table IA1
Underwriter distress effect on credit risk: Controlling for firm credit rating

	CDS Spread			
	Full sample	Full sample	Full sample	Sample without default
	(a)	(b)	(c)	(d)
UW Risk	0.4537***	0.4334***	0.1749***	0.1749***
	(19.16)	(20.51)	(5.481)	(5.481)
D(RatingAAA)	-2.931***	-1.934***	-1.872***	-1.872***
	(-62.1)	(-13.2)	(-13.7)	(-13.7)
D(RatingAA)	-2.482***	-1.632***	-1.525***	-1.525***
	(-22.6)	(-9.87)	(-8.93)	(-8.93)
D(RatingA)	-2.113***	-1.440***	-1.419***	-1.419***
	(-36.2)	(-12.4)	(-13.2)	(-13.2)
D(RatingBBB)	-1.413***	-0.860***	-0.847***	-0.847***
	(-25.5)	(-8.13)	(-8.53)	(-8.53)
D(RatingBB)	-0.439***	-0.143	-0.083	-0.083
	(-5.23)	(-1.42)	(-0.89)	(-0.89)
D(RatingB)	0.1761*	0.3055***	0.3556***	0.3556***
	(1.913)	(2.633)	(3.227)	(3.227)
Leverage		0.9555***	0.7897***	0.7897***
		(5.039)	(4.284)	(4.284)
Equity Sigma		0.8640***	1.3121***	1.3121***
		(4.474)	(5.782)	(5.782)
Cash to Assets		0.6364***	0.5628**	0.5628**
		(2.878)	(2.524)	(2.524)
Size		-0.078***	-0.054*	-0.054*
		(-2.66)	(-1.82)	(-1.82)
Profitability		-1.147***	-1.000***	-1.000***
		(-3.60)	(-3.36)	(-3.36)
Swap 1 yr			-0.033***	-0.033***
			(-2.61)	(-2.61)
CDS Index			0.4964***	0.4964***
			(8.476)	(8.476)
Adj R-Sq	0.6661	0.7057	0.7333	0.7333
No. obs.	18412	18377	14847	14847

The table presents estimates of the effect of underwriter distress on issuer credit risk after controlling for the credit rating of the issuer. *CDS Spread* is the natural logarithm of the CDS spread on the five-year contract of the issuing firm. *UW Risk* is the natural logarithm of related underwriters' average CDS spreads, weighted by the number of underwritten bonds outstanding. *Dummy (RatingAAA)* is a dummy variable equal to one if the issuer has a 'AAA' credit rating, and zero otherwise. The other dummy variables are specified likewise. Specification (d) excludes observations for firms where one of the related underwriters has defaulted within the last six months. The main sample period is 2004-2012, based on monthly observations. When using market measures, the sample period is reduced to 2006-2012 due to lack of data availability. (*** denotes significance at the 1% level, ** significance at the 5% level, and * significance at the 10% level. The numbers in parentheses are cluster robust t-statistics.)

Table IA2
Underwriter distress effect on credit risk: Credit rating differences

	CDS Spread			
	Full sample (a)	Full sample (b)	Full sample (c)	Sample without default (d)
UW Risk	0.7288***	0.5803***	0.3012***	0.3012***
	(24.01)	(16.43)	(7.071)	(7.071)
UW Risk x Dummy(Rating AAA)	-0.632***	-0.358***	-0.335***	-0.335***
	(-40.8)	(-9.91)	(-10.6)	(-10.6)
UW Risk x Dummy(Rating AA)	-0.533***	-0.297***	-0.266***	-0.266***
	(-16.4)	(-6.83)	(-6.40)	(-6.40)
UW Risk x Dummy(Rating A)	-0.462***	-0.282***	-0.270***	-0.270***
	(-27.8)	(-9.98)	(-10.9)	(-10.9)
UW Risk x Dummy(Rating BBB)	-0.313***	-0.169***	-0.164***	-0.164***
	(-22.7)	(-6.63)	(-7.28)	(-7.28)
UW Risk x Dummy(Rating BB)	-0.100***	-0.025	-0.017	-0.017
	(-5.54)	(-1.13)	(-0.90)	(-0.90)
UW Risk x Dummy(Rating B)	0.0457**	0.0673**	0.0681***	0.0681***
	(2.299)	(2.364)	(2.638)	(2.638)
Leverage		1.1336***	0.9648***	0.9648***
		(5.687)	(4.931)	(4.931)
Equity Sigma		0.9467***	1.3903***	1.3903***
		(4.756)	(5.697)	(5.697)
Cash to Assets		0.6151***	0.5053**	0.5053**
		(2.592)	(2.118)	(2.118)
Size		-0.118***	-0.092***	-0.092***
		(-3.83)	(-2.89)	(-2.89)
Profitability		-1.326***	-1.202***	-1.202***
		(-3.81)	(-3.72)	(-3.72)
Swap 1 yr			-0.037***	-0.037***
			(-2.84)	(-2.84)
CDS Index			0.5016***	0.5016***
			(8.343)	(8.343)
Adj R-Sq	0.6129	0.6705	0.6994	0.6994
No. obs.	18412	18377	14847	14847

The table presents estimates of the effect of underwriter distress on issuer credit risk given the credit rating of the issuer. *CDS Spread* is the natural logarithm of the CDS spread on the five-year contract of the issuing firm. *UW Risk* is the natural logarithm of related underwriters' average CDS spreads, weighted by the number of underwritten bonds outstanding. *Dummy(RatingAAA)* is a dummy variable equal to one if the issuer has an 'AAA' credit rating, and zero otherwise. Thereby, *UW Risk x Dummy(RatingAAA)* is equal to *UW Risk* for observations where the issuer has an 'AAA' credit rating, and zero otherwise. The interaction terms are specified similarly. Specification (d) excludes observations for firms where one of the related underwriters has defaulted within the last six months. The main sample period is 2004-2012, based on monthly observations. When market measures are used, the sample period is reduced to 2006-2012 due to lack of data availability. (*** denotes significance at the 1% level, ** significance at the 5% level, and * significance at the 10% level. The numbers in parentheses are cluster robust t-statistics.)

Table IA3
Underwriter Specialization: Test for Independence

Panel A: Industry Distribution of Bond Issuer

	Outstanding Bonds			Newly Issued Bonds		
Period:	2004 - 2006	2007 - 2009	2010 - 2012	2004 - 2006	2007 - 2009	2010 - 2012
Pr<=P	0.4154	0.4377	0.7074	0.1350	0.2188	0.2762
No. Samples	30000	30000	30000	30000	30000	30000

Panel B: Rating Distribution of Bond Issuer

	Outstanding Bonds			Newly Issued Bonds		
Period:	2004 - 2006	2007 - 2009	2010 - 2012	2004 - 2006	2007 - 2009	2010 - 2012
Pr<=P	0.8193	0.9773	0.9504	0.6850	0.6838	0.3006
No. Samples	30000	30000	30000	30000	30000	30000

The table presents estimates of the Fisher's exact test of independence for underwriter specialization in our sample of top-20 underwriters. For each underwriter we obtain information of its client firms from Mergent FISD. Panel A shows the estimates for the test of independence based on the issuing firm's industry. The industry classification is obtained from Markit and consists of the sectors 'Basic Materials', 'Consumer Goods', 'Consumer Services', 'Healthcare', 'Industrials', 'Technology', and 'Telecommunication'. Panel B shows the estimates for the test of independence based on the issuing firm's rating. The rating classification is based on the S&P credit rating obtained from Markit and consists of the ratings 'AAA', 'AA', 'A', 'BBB', 'BB', and 'B'. Fisher's exact test for independence is run using Monte Carlo simulations.

Table IA4
Underwriter distress effect on credit risk: Without defaulted underwriters

	CDS Spread		
	Full sample	Full sample	Full sample
	(a)	(b)	(c)
UW Risk	0.3811***	0.4071***	0.1045**
	(11.11)	(16.04)	(2.259)
Leverage		2.2578***	2.0521***
		(7.878)	(6.973)
Equity Sigma		1.3845***	1.9533***
		(6.064)	(5.738)
Cash to Assets		0.5835	0.2838
		(1.579)	(0.757)
Size		-0.318***	-0.288***
		(-8.67)	(-7.96)
Profitability		-2.351***	-2.175***
		(-4.55)	(-4.54)
Swap 1 yr			-0.060***
			(-3.54)
CDS Index			0.4450***
			(5.823)
Adj R-Sq	0.1346	0.569	0.5922
No. obs.	13576	13541	10887

The table presents estimates of the effect of underwriter distress on issuer credit risk in a sample where underwriters that default are excluded. *CDS Spread* is the natural logarithm of the CDS spread on the five-year contract of the issuing firm. *UW Risk* is the natural logarithm of related underwriters' average CDS spreads, weighted by the number of underwritten bonds outstanding. The main sample period is 2004-2012, based on monthly observations. When market measures are used, the sample period is reduced to 2006-2012 due to lack of data availability. (*** denotes significance at the 1% level, ** significance at the 5% level, and * significance at the 10% level. The numbers in parentheses are cluster robust t-statistics.)

Table IA5
Underwriter distress effect on credit risk: Without crisis period (2007-2009)

	CDS Spread		
	Full sample	Full sample	Full sample
	(a)	(b)	(c)
UW Risk	0.3424***	0.3952***	-0.063
	(12.22)	(16.86)	(-0.96)
Leverage		2.2018***	1.9729***
		(9.354)	(8.781)
Equity Sigma		1.1020***	2.6147***
		(4.468)	(5.381)
Cash to Assets		0.9000***	0.6311**
		(3.002)	(2.283)
Size		-0.305***	-0.258***
		(-9.09)	(-7.68)
Profitability		-2.450***	-2.192***
		(-4.91)	(-4.89)
Swap 1 yr			-0.116***
			(-5.33)
CDS Index			0.5953***
			(6.133)
Adj R-Sq	0.1249	0.5511	0.5898
No. obs.	12308	12273	8713

The table presents estimates of the effect of underwriter distress on issuer credit risk for periods outside the 07-08 financial crisis. *CDS Spread* is the natural logarithm of the CDS spread on the five-year contract of the issuing firm. *UW Risk* is the natural logarithm of related underwriters' average CDS spreads, weighted by the number of underwritten bonds outstanding. The sample period includes the years 2004-2006, as well as 2010-2012, based on monthly observations. When market measures are used, the sample period does not include 2004-2005 due to lack of data availability. (*** denotes significance at the 1% level, ** significance at the 5% level, and * significance at the 10% level. The numbers in parentheses are cluster robust t-statistics.)

Table IA6
Key credit events for defaulted underwriters

Panel A: Bear Stearns	
Jun-2007	Bear Stearns commits $1.6bn in secured loans to bail out its hedge Bear Stearns High-Grade Structured Credit Fund.
Jul-2007	The Bear Stearns High-Grade Structured Credit Fund has lost more than 90% of its value, while another hedge fund, Bear Stearns High-Grade Structured Credit Enhanced Leveraged Fund, loses all of its value. Ultimately, both hedge funds filed for Chapter 15 bankruptcy.
Dec-2007	The bank reports its first ever quarterly loss, which is nearly four times the analysts' forecasts.
Mar-2008	Carlyle Capital Corporation (CCC), a hedge fund partly owned by Bear Stearns, collapses due to large losses in mortgage backed securities arising from the severely weakened housing market. Consequently, and due to its exposure to the hedge fund and investors growning anxiousness, Bear Stearns shares fall by 17%. On March 14, 2008, JP Morgan and the New York Federal Reserve rush to the rescue of Bear Stearns, while its shares crash by almost 50%. JP Morgan agrees to buy Bear Stearns in a deal that values Bear Stearns shares at $2 each, with JP Morgan exchanging 0.05473 of each of its shares for one Bear share. Due to legal challenges against the low share price offer claimed by some of Bear Stearns' shareholders, JP Morgan raises its offer for Bear Stearns to $10 a share for the takeover.
Panel B: Lehman Brothers	
Dec-2007	Lehman Brothers bypasses Bear Stearns as the largest underwriter of mortgage-backed securities. However, at the same time, it closes one of its subprime-lending units which eliminates approximately 1,200 jobs.
Mar-2008	Due to the concern that Lehman Brothers would be the next Wall Street financial institution to collapse after Bear Stearns, the shares fall as much as 48%. However, most of Lehman Brothers' stock losses recover in the following weeks.
Jun-2008	Lehman Brothers announces its first quarterly loss since going public and sells $6 billion of stock to bolster capital.
Aug-2008	Shares drop 13% due to the announcement that Lehman Brothers solicited buyers for its investment-management division.
Sep-2008	Lehman Brothers shares plunge by additionally 45% after a dismissed capital infusion and the company reports a $3.9 billion third-quarter loss, the largest in its history. Accordingly, it announces plans to sell a majority stake in its asset-management unit and to spin off commercial real-estate holdings. In collaboration with the U.S. Treasury and Federal Reserve, Bank of America Corp. emerges as potential buyer. On September 12, 2008, Moody's announces a potential credit downgrade and outlines the need for a "stronger financial partner" which lead to an immediate drop in Lehman Brothers' shares of 42%. Government agencies react by urging Wall Street chiefs to find a solution. In an effort to prevent the liquidation of Lehman Brothers, finance leaders meet at the Federal Reserve Bank of New York on September 13, 2008, and Bank of America and Barclays emerge as bidders. However, due to failure to secure guarantees against losses, both bidders withdraws from their offer the following day. On September 15, 2008, Lehman Brothers petitions for Chapter 11 bankruptcy and lists $639 billion of assets in the largest filing in U.S. history.
Panel C: Wachovia	
Apr-2008	Wachovia announces its first quarterly loss in seven years.
Sep-2008	Wachovia experiences large outflows of deposits and drops in the stock price due to the collapse of Washington Mutual, the largest U.S. savings and loan association. As a reaction to the FDIC's declaration that Wachovia is "systemically important" to the health of the economy, and thus can not be allowed to fail, Citigroup agrees to take over Wachovia's banking operations for $1 per share.
Oct-2008	Though the liquidity provision by Citigroup would have allowed Wachovia to continue its operations, Wells Fargo and Wachovia announces on October 3, 2008, their merger in an all-stock transaction requiring no government involvement. The agreement includes the purchase of Wachovia in entirety for $15.1 billion (approximately $7 per share) and Wells Fargo's purchase of Wachovia is closed on December 31, 2008. In the meantime, Citigroup files a $60 billion lawsuit against Wachovia and Wells Fargo for interfering with Citigroup's takeover of Wachovia's banking operations.

The table lists the key events leading up to the default of underwriters that are included in our sample of the 20 most active lead underwriters, i.e., Bear Stearns (Panel A), Lehman Brothers (Panel B) and Wachovia (Panel C).

Table IA7
Robustness of underwriter distress measure using alternative definitions

Panel A: Sample Statistics for alternative UW Risk Measures

	UW Risk weighted by:						Latest UW Risk	
	Un-weighted	Bond Size	Time since issuance (t_i)		Time to maturity (t_m)		Un-weighted	W. by Loyalty
			Exp(-t_i)	($1/t_i$)	Exp(-t_m)	($1/t_m$)		
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
Mean	4.279	4.284	4.265	4.279	4.277	4.278	4.246	4.235
SD	1.039	1.034	1.049	1.041	1.038	1.038	1.056	1.051
Q1	3.218	3.253	3.217	3.217	3.219	3.219	3.228	3.225
Q2	4.682	4.670	4.658	4.683	4.681	4.681	4.613	4.582
Q3	5.090	5.092	5.080	5.093	5.089	5.090	5.067	5.052
Firms	329	329	329	329	329	329	329	329

Panel B: Underwriter Distress effect on Credit Risk using alternative UW Risk Measures

	CDS Spread							
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
UW Risk $_{\text{unweighted}}$	0.173***							
	(4.250)							
UW Risk $_{\text{w. Bond Size}}$		0.149***						
		(3.697)						
UW Risk $_{\text{w. Exp}(-t_i)}$			0.191***					
			(5.014)					
UW Risk $_{\text{w. }(1/t_i)}$				0.208***				
				(5.243)				
UW Risk $_{\text{w. Exp}(-t_m)}$					0.176***			
					(4.331)			
UW Risk $_{\text{w. }(1/t_m)}$						0.175***		
						(4.318)		
Latest UW Risk $_{\text{unweighted}}$							0.179***	
							(5.097)	
Latest UW Risk $_{\text{w. loyalty}}$								0.178***
								(5.017)
Firm Controls	Y	Y	Y	Y	Y	Y	Y	Y
Time Controls	Y	Y	Y	Y	Y	Y	Y	Y
Adj. R-square	0.5796	0.5787	0.5827	0.5832	0.5798	0.5798	0.5813	0.5813
N	14896	14892	14835	14835	14896	14896	14937	14937

The table presents estimates of the effect of underwriter distress on issuer credit risk for several versions of the UW Risk measure. *CDS Spread* is the natural logarithm of the CDS spread on the five-year contract of the issuing firm. In model specification (a) we determine *UW Risk* as the unweighted average of related underwriters' average CDS spreads. In model specification (b) to (f) we use a weighted average of related underwriters' average CDS spreads where we weight by bond size (specification b), the relationship that is weakening in the time since last issuance with a negative exponential (specification c), respectively, linear (specification d) depreciation, as well as the relationship that is weakening in the time until maturity with a negative exponential (specification e), respectively, linear (specification f) depreciation. In model specification (g) and (h) we only use underwriter relationships related to the most recent bond issued when calculating the UW Risk measure, and use a simple average (specification (g)) and average weighted by underwriter loyalty (specification (h)). Underwriter loyalty is measured as the relative number of bond issuances where the underwriter has been involved. For all alternative measures we run specification (d) of Table 4 and, thus, we exclude observations for firms where one of the related underwriters has defaulted within the last six months. The sample period is 2006-2012, based on monthly observations. (*** denotes significance at the 1% level, ** significance at the 5% level, and * significance at the 10% level. The numbers in parentheses are cluster robust t-statistics.)

Table IA8
Bond illiquidity and underwriter distress effect

Panel A: Underwriter Distress Effect on Bond Illiquidity

	Bid-Ask Spread	Bid-Ask Spread
	Investment-grade	Speculative-grade
	(a)	(b)
Intercept	-15.188***	-1.402
	(-3.45)	(-0.28)
UW Risk	11.308***	8.472***
	(9.12)	(6.21)
Controls	N	N
Adj. R-square	0.111	0.082
N	12228	4885

Panel B: Bond Illiquidity and Underwriter Distress Effect on Corporate Credit Risk

	CDS Spread				CDS Spread			
	Investment-grade				Speculative-grade			
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
Bid-Ask Spread	0.002***				0.002**			
	(3.03)				(2.46)			
UW Risk		0.1709***	0.1683***	0.1673***		0.2498***	0.2185***	0.2109***
		(4.751)	(4.286)	(4.270)		(4.164)	(3.644)	(3.583)
Bid-Ask Residual		0.001***	0.001*	0.001		0.0022***	0.0018*	0.0021**
		(2.80)	(1.71)	(1.61)		(2.588)	(1.733)	(2.025)
$\frac{\text{Debt}<1\text{yr}}{\text{Assets}}$			0.1580				-5.151**	
			(0.044)				(-2.15)	
UW Risk $\times \frac{\text{Debt}\leq 1\text{yr}}{\text{Assets}}$			0.2616				1.0868**	
			(0.335)				(2.037)	
Bid-Ask Residual $\times \frac{\text{Debt}\leq 1\text{yr}}{\text{Assets}}$			0.0197				0.0134	
			(1.408)				(1.262)	
$\frac{\text{Debt}<1\text{yr}}{\text{Debt}}$				-0.128				-2.325***
				(-0.18)				(-3.10)
UW Risk $\times \frac{\text{Debt}\leq 1\text{yr}}{\text{Debt}}$				0.0505				0.4479**
				(0.316)				(2.280)
Bid-Ask Residual $\times \frac{\text{Debt}\leq 1\text{yr}}{\text{Debt}}$				0.006				0.001
				(1.55)				(0.21)
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Adj. R-square	0.5306	0.5362	0.5358	0.5345	0.428	0.4474	0.4504	0.4557
N	10021	9875	9856	9856	3821	3790	3760	3760

The table presents estimates of the effect of bond illiquidity and underwriters distress on issuer credit risk. Panel A shows the estimates of the regression of firms' bond illiquidity on our measure for underwriter distress. Bond illiquidity is proxied by *Bid-Ask Spread* which is calculated as the average effective bid-ask spread across outstanding bonds from the issuer. *UW Risk* is the natural logarithm of related underwriters' average CDS spreads, weighted by the number of underwritten bonds outstanding. In Panel B we use the bid-ask spread residual obtained from the regressions in Panel A and regress *CDS Spread* on Bid-Ask Residual, proxies for firms' rollover exposures, as well as other controls from our baseline model specification. *CDS Spread* is the natural logarithm of the CDS spread on the five-year contract of the issuing firm. Firms' rollover exposures are proxied by the ratio of debt maturing within one year, scaled by total assets and total debt, respectively. We distinguish between issuers that are investment-grade rated and speculative-grade rated firms. Investment-grade (Speculative-grade) refers to a firm with a S&P credit rating that is equal to 'BBB' or higher ('BB' or lower). The regressions exclude observations for firms where one of the related underwriters has defaulted within the last six months. The sample period is 2006-2012, based on monthly observations. (*** denotes significance at the 1% level, ** significance at the 5% level, and * significance at the 10% level. The numbers in parentheses are cluster robust t-statistics.)

PUBLICATIONS

NEWS

News offers a quick and accessible insight into an Analysis, an Economic Memo, a Working Paper or a Report from Danmarks Nationalbank. News is published continuously.

ANALYSIS

Analysis from Danmarks Nationalbank focuses on economic and financial matter. Some of the analyses are published with a regular frequency e.g. *Outlook for the Danish economy and Financial stability*. Other analyses are published continuously.

REPORT

Report comprises recurring reports and reviews of the functioning of Danmarks Nationalbank. For instance Report includes the *Annual report* and the annual publication *Danish government borrowing and debt*.

ECONOMIC MEMO

Economic Memo is a cross between Analysis and Working Paper and it often shows the ongoing study of the authors. The publication series is primarily targeted at professionals. Economic Memo is published continuously.

WORKING PAPER

Working Paper presents research projects by economists in Danmarks Nationalbank and their associates. The series is primarily targeted at professionals and people with an interest for academia. Working Paper is published continuously.

DANMARKS NATIONALBANK
LANGELINIE ALLÉ 47
DK-2100 COPENHAGEN Ø
WWW.NATIONALBANKEN.DK

DANMARKS NATIONALBANK