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On the Dynamics of Matching between Issuers and Reputable Underwriters in the Chinese International Bond Market

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Abstract:- We analyse employments of reputable underwriters in China of providing services in cross-border international bond offerings. Numerous previous studies have highlighted the important role of underwriter reputation in determining the successes of issuance. Bonds underwritten by reputable underwriters are considered 'trustworthy' or 'safe' by prospective investors, and hence the higher the reputation of the underwriters the more the investors will trust the information disclosed and the quality of the issuance. This study also examines the potential important determinants and will contribute to a better understanding of the Chinese international debt market in particular and the Chinese capital market in general.

Keywords*: China International bonds, underwriter reputation, banks, statistical regression.*

1. Introduction

Equities and bonds are two of the most common methods for a corporation to raise capital. Underwriters or bookrunners, who act as intermediaries between the equities or bond issuer and the buyers, play a significant role in selling the equities or bonds to the public or dealers who sell them to the public.

Thus, a debt issuance offering in the open financial market typically involves three parties: the issuer, the underwriters, and the investors. A large body of research literature has highlighted that the relevance of underwriters as financial intermediaries is their abilities to reduce the asymmetric information problems between issuers and investors. These information asymmetries turn underwriting into a market for external certification services since underwriters provide an enhanced worthwhile external certification ([11]). Therefore, the success of a debt issuance offering depends largely on the underwriter's ability to solve information asymmetries in the placement of the issues among investors. This process comprises issuers, underwriters and investors, and goes further than a selling mechanism. Investment and commercial banks appointed as underwriters have to perform research, information production, marketing and market stabilization activities, among others.

In recent years, with the vigorous development of China's capital market, the bond financing method has gradually become one of the most important methods of raising finance. From the perspective of capital financing structure, China's enterprise financing has gradually shifted from the simple "bank loan" structure to multi-channel financing which includes bonds, stocks, and other financial products. The rapid development of the financing market represented by bonds and stocks has greatly expanded the financing channels for Chinese corporations. By 2019, China had become the second-largest bond market in the world.

While there has been some research, despite not much, done by scholars on the Chinese domestic bond markets (see for example, [28, 29]), the Chinese international market does not seem to have attracted any attention. This study will be considered as one of the firsts to fill the vacuum.

2. Importance of Underwriters as Financial Intermediaries

As financial intermediaries, the relevance of underwriters in reducing information asymmetry between issuers and investors has been fully confirmed in various academic studies. For example, pioneer theoretical papers

have emphasized the role of underwriter reputation on capital and debt raising, arguing that the reputation of financial intermediaries is able to reduce more efficiently the asymmetric information problems between issuers and investors ([2, 4, 7, 8]). Furthermore, it has been shown that a reputation acquisition process is generated when underwriters place deals into primary markets. Neupane and Thapa ([23]) analyze the investor–underwriter relationship and show that prestigious underwriters hold strong relations with institutional investors. Hence issuers aim to match with a reputable underwriter, and underwriters want to place issues from high-quality issuers. A number of studies have agreed on reputation being relevant to the matching for one of the sides ([3, 10, 18, 21, 27]), or for both sides ([15, 16]).

Since matching with a reputable underwriter determines the final conditions and success of the issuance, ability to match with a reputable underwriter is an important issue for issuers. The certification provided by a reputable underwriter can transform the issue into a "high-quality externally certified" one. In this respect, Fang ([14]) empirically found that reputable investment banks can obtain higher prices (lower yields) for their issuers. The conclusion is hence reputable underwriters can provide better and more valuable services for their customers. Similarly, Fernando et al. ([15]) published the argument that the issuer company obtains incremental benefits from high-reputation underwriting.

Researches in China on the Chinese security market generally focused mostly on the stock market and pay less attention to the bond market. The research on bonds mainly focuses on the study of issuance costs and pricings. For example, based on the characteristics of China's bond market segmentation, Gao and Zhou ([17]) postulate that corporate bonds have different pricing mechanisms due to different issuers and different managements. Fang et al [12, 13] proposed that the voluntary disclosure of positive internal control assurance reports by listed companies can release a positive signal of high information quality to the outside world, hence reduce the information risk faced by investors, and enable corporate bonds to obtain a low credit spread, but this effect is not significant in state-owned listed companies. Wang and Gao ([26]) pointed out that underwriters can reduce the bond issuance premium caused by key customer risk. However, there seems little literature on bond pricing from the perspective of underwriters ([29]). Furthermore, there appears that no there has been no research on Chinese companies issuing bonds in the *international bonds markets*. This research would offer additional insight into the overall (domestic and international) Chinese bond market.

3. Research on Whether Banks and Industiral Companies Have Equal Access to Reputable Underwriters in Debt Market

Carbo-Valverde et al [6] investigated the issuer-reputable underwriter matching process in corporate debt issuance by both banks and industrial companies in the European corporate bonds market. Their purpose was to determine whether banks and industrial companies have equal access to external certification through reputable underwriters. This study was important from a public economic policies point of view because the government can then adjust its policies accordingly to help developing a balanced development of the national capital market, which is, of course, an important ingredient in the healthy and balanced development of the national economy (for example, financial vs industrial/manufacturing; see also [6], p200).

A. Banks in China

Traditionally, banks in China have been perceived as financially strong and infallible (too large or strong to fail). China also has the characteristics of its major banks are generally state-owned enterprises ("SOE"), or at least its major controlling shareholder is the central or regional government. Such "governmental presence" may boost the confidence of the investors in the "infallibility" of the company involved and "preference" of the reputable underwriters (see, for example, [29] which has shown that Chinese SOEs have enjoyed lower interest rates when issuing bonds in the Chinese bond market; this suggests SOEs may enjoy a certain "status" in the Chinese capital and debt markets).

In fact, Ding et at [9] assert that "Furthermore, because the "Big Four" banks (Industrial and Commercial Bank of China, Agricultural Bank of China, Bank of China, and China Construction Bank) are the largest underwriters in the interbank market, these top underwriters face less competition". Therefore, it is worthwhile to study

whether Chinese banks also enjoy greater advantages in matching with reputable underwriters in the international bond issuance market (especially compared with other non-financial state-owned and non-state-owned enterprises).

B. The Determinants of the Reputable Underwriters

Specific characteristics of issuers and bonds in placements may increase or decrease the likelihood of matching with reputable underwriters. For example, some features of the bond design, such as volume of the proceeds raised and time to maturity, may serve as proxies of placement complexity ([14, 15]). Prior studies have found that more complex bonds are more likely to be placed by reputable underwriters ([1, 14]). Especially, as noted in Carbo-Valverde et al [6], the complexities of the marketing, pricing and selling activities increases with bond size.

Hence, for the issuance of very large bonds, it is very natural that the issuers would want and demand to enlist the service and expertise of the "most reputable" underwriters. In addition, the relationship between maturity and risk means that long-term bonds require higher complexity when being offered publicly (IPO). Therefore, bonds with high large proceeds and longer maturities are considered more complex to underwrite. Callability may be another determinant which is related to the complexity of placements ([14]), as bond buyers face reinvestment risks. Signalling theory suggests that in the case of asymmetric information, including a call feature could serve as a signal of issuers' quality.

Some issuer characteristics are also important determinants for matching with reputable underwriters. For example, Chemmanur and Fulghieri [8] find more prestigious underwriters generally engage in underwriting contracts with less risky client firms. This implies that the issuer-firms must have good and robust characteristics (This may include the issuer's leverage ratio, ROA, and total assets to indicate debt levels, profitability, and issuer size). See or example, [5, 14, 15, 16]. Not directly related to a firm's financials, issuers' lack of experience is another determinant that has been found to be negatively related to the probability of a reputable matching ([1, 5, 14, 27]). This apparently is due to reputable underwriters less likely to place a bond of a relatively inexperienced issuer, which they worry that may place their reputation at stake, because lack of experience issuing debt securities increases uncertainty about the bond issuer and the bond performance.

Given the possible differences between banks and non-banks, our baseline hypothesis would be that the determinants of the matching for banks could have a different impact compared to non-banks. To explore the hypothesis, we follow earlier studies (for example, [6]) and make a distinction between bond-level characteristics and issuer-level characteristics. There is probably an endless list of possible explanatory variables, some significant and others minute, that could contribute to the probability of matching. For statistical analysis purpose, especially with limited number of events/data available, we will have to restrict to a few which we suspect would be significant. We are also limited by the information we are able to extract from our samples. When compared with the underwriters we obtained in our samples, we realize that the majority of the highly-ranked underwriters in China, other than "the big-four banks" were not active in the Chinese international bond arena. Furthermore, there are many foreign securities firms and investment banks, such as JP Morgan and Credit Suisse, which were quite actively involved in the underwriting of Chinese international bonds, but were not involved or ranked highly in the Chinese domestic debt market. Obviously, we cannot use the tombstone ranking ([7]) or the market-share method ([22]) because there were also Chinese underwriting firms involved. Some of these Chinese underwriters are known to be reputable ones in the Chinese domestic market and hence cannot be ignored as non-reputable underwriters. A different way of identifying reputable underwriters is certainly needed for the Chinese international bond market case.

Similar comments also apply to other prospective explanatory factors such as callability/call options and whether the issuer is a first-time issuer.

4. Main Results

A. Data Collection and Descriptive Statistics

In this study, we have collected 1400 bond issuance events by companies whose main operations are in China, though some of them may be registered or had their initial public offering ("IPO") in a foreign country, from https://cbonds.com/. From the raw data, we have filtered the sample size to 1,044 deals with which the underwriters are identifiable. Out of these 1,044 events, 211 were issued by banks. When we further matched the 1,044 bonds with issuers' financial information (gathered and extracted from https://gushitong.baidu.com), the number reduces to 521. The omitted issues are generally bonds issued by governments (such as the Asia Infrastructure Investment Bank, "AIIB"), municipal (such as Qingdao City Construction Investment Group) and state-owned enterprises which are not listed publicly on any stock exchange, and hence whose financial information are not readily available in the public domain.

B. Identification of Reputable Underwriters for Chinese International Bond Market

When compared with the underwriters we obtained in our samples, we realize that the majority of the highly-ranked underwriters in China were not active in the Chinese international bond arena. Furthermore, there are many foreign securities firms and investment banks, such as JP Morgan and Credit Suisse, which were quite actively involved in the underwriting of Chinese international bonds, but were not involved or ranked highly in the Chinese domestic debt market. Obviously, we cannot use the tombstone ranking ([7]) or the market-share method ([22]) because there were also Chinese underwriting firms involved. Some of these Chinese underwriters are known to be reputable ones in the Chinese domestic bond market and hence cannot be ignored as non-reputable underwriters. A different way of identifying reputable underwriters is certainly needed for the Chinese international bond market case.

Since issue sizes have been identified as an important factor impacting the probabilities of matching with reputable underwriters ([1, 5, 6]), we organized our samples in descending order according to the issued sizes (all converted to USD equivalent) and examine their pattern. This revealed that the "watershed" figure of issue size 2 billion appears to be a natural split between "extremely large bonds" and the rest. Specifically, we discovered that the smallest bond with issue size above US$ 2 billion was US$ 2,293,200,000 while the largest bond with issue size smaller than US$ 2 billion was US$ 997,542,000.

We then extract their underwriters and summarized in Table 4.1 and Table 4.2.

Table 4.1：Underwriters involved in bond issue sizes of at least US$ 3 billion:

Names of Underwriters	Number of occurrences
Bank of America Merill Lynch	4
Bank of China	3
CITIC Securities International	2
Credit Suisse	2
BNP Paribas	2
Agricultural Bank of China	1
BofA Securities	1
China Minsheng Bank	1
Citigroup	1
Credit Agricole CIB	1
Haitong International	1
JP Morgan	1
Nomura International	1

Table 4.2: Underwriters with at least two issues with bond sizes between US$2 billion to 3 billion

Table 4.2：Underwriters involved in bond issue sizes of at least US$ 2 to 3 billion:

Names of Underwriters	Number of occurrences
Bank of China	11
Goldman Sachs	5
ANZ	4
Bank of America Merrill Lynch	4
Credit Suisse	4
BNP Paribas	3
Citigroup	3
Agricultural Bank of China	2
Barclays	2
CCB International	2
Deutsche Bank	2
JP Morgan	2
Morgan Stanley	2

From tables 4.1 and 4.2, we compile our list of reputable underwriters in Table 4.3.

Table 4.3：Combined list of "reputable underwriters"

Where underwriters are from	Underwriters
USA	Goldman Sachs* Bank of America Merrill Lynch*, Citigroup*, JP Morgan*, Morgan Stanley* BofA Securities
Europe	Credit Suisse*, BNP Paribas Deutsche Bank*, Barclays* Credit Agricole CIB
Australia	ANZ
China	Bank of China, CCB International Agricultural Bank of China CITIC Securities International China Minsheng Bank Haitong International
Japan	Nomura International

We note that the underwriters which are listed with * in the table are generally considered among the top 10 and largest "Bulge Bracket" firms in the USA. (In the USA, the "Bulge Bracket" refers to the "most reputable banks"— the name comes from the way investment banks are listed on the "tombstone"). We also see that three of the "big four Chinese banks" (Bank of China, CCB, Agricultural Bank) and the arguably No.1 underwriting

company of China, namely CITIC Securities[1], have also been included. We believe this, in a way, validates our list of "reputable underwriters". We also point out that, unlike Carbo-Valverde et al. [6], we do not exclude events where banks served as underwriters for themselves. The reason is we believe if the bank itself is a reputable underwriter, it would have to ensure that the bonds it undertakes are also of sufficient qualities so as not to jeopardize its reputation. This is especially true if the underwriting business and debt-issuing business are handled by different departments or subsidiaries. Furthermore, it would appear that Chinese banks tend to be one of the parties in the consortium underwriting their own bonds. So ruling them out would have eliminated a large portion of the samples involving bank-issuers.

C. Null and Alternative Hypotheses

The null and alternative hypotheses are stipulated in Table 4.4.

Table 4.4 : Hypotheses

Null Hypothesis (H_0)	Involvements of reputable underwriters are independent of the type of the issuing firm (banks vs non-banks).
Alternative Hypothesis (H_1)	Banks have *different* probabilities of matching with reputable underwriters, compared with non-banks bond issuers.

D. Analyses via Logistic Regression

D.1 Methodology

We do logistic regression comparing banks' debt issuances and non-banks' in similar fashion as Carbo-Valverde et al. [6].

The general logit model employed may be expressed as follow:

$$E(Y|X=x) = \text{Probability(Reputable UW} = 1|X)$$

$$= \Lambda^{-1}(\beta_0+\beta_{Bond}X_{bond\_features}+\beta_{Issuer}X_{issuer\_features}+\beta_1 x_I+\epsilon) \quad (4.1)$$

where Λ^{-1} denotes the reverse-logit function, β_0 denote the constant intercept, $X_{bond\_features}$ is a vector of variables reflecting the bond's features, $X_{issuer\_features}$ is a vector of variables containing the characteristics of the issuer firm, β_{Bond} and β_{Issuer} are row matrices of appropriate dimensions. The main explanatory variable is the variable x_1 which is a dummy variable signifying *the type of issuer* ("Industrial"), being 1 if the issuer is a *bank* and 0 otherwise.

Bond features are important factors that may carry important information on the bond risk and which thus affects the placement in the primary market. For our study here, we have selected the following factors, namely issue sizes, investment grades (whether it is an investment-grade bond?), bond maturity period and bond interests (coupon rates) to be included in $X_{bond\_features}$. For $X_{issuer\_features}$, the elements being considered will be issuer firm size ("firm size"), return on asset ("Return on assets"), and leverage (debt ratio).

We use $\log_{10}$ for the issue and firm sizes because while it is easy to envisage one unit increase in $\log_{10}$ is a ten-fold increase in magnitude and we find it not intuitive to think in $\log_e$. However, for log likelihood we still use the *natural log* ($\log_e$) as this is the general accepted definition, and is the default setting of the statistical package *Stata*. Regarding issuer characteristics, we took the figures of company's quarterly results just before if the end of the quarter was at least one month away. Otherwise, we took the quarter preceding that. The reason is we envisaged there would be time lag between a company's closing of its books and its publishing of financial results. Hence, if a bond is issued very close to the book-closing date, then it is quite likely that the results for that quarter had not been published yet.

[1] "Last year, the number of 'Billion Dollar Net Profit Club' of listed securities firms reduced to three". https://www.cnfin.com/gs-lb/detail/20230501/3855695_1.html#: ~: text=2021% E5% B9% B4% E5% B9% B4% E6% 8A% A5% E6% 98% BE% E7% A4% BA% EF% BC% 8C% E8% 90% A5,% E4% B8% AD% E5% 8D% A0% E6% AF% 94% E8% BE% BE47.06% 25% E3% 80% 82

D.2 Investment grades and their bumericalization

One of the explanatory variables we consider is *investment grades*. Investment grades are generally categorical, varying from AAA to C for example. One may use numerical variables to represent each of the classes (See [19], Table 3.3, page 203, for example) but we have decided to follow the approach of [6] which considers only whether a bond is 'investment grade'. Hence, we numericalize the investment grades, as depicted in the following Table 4.5 ([25], p28):

Table 4.5：Numericalization of bond grades

Bond Grades	Numerical values	Interpretations
AAA	1	Gilt edged. If everything that can go wrong, goes wrong, they can still service debt.
AA	1	Very high quality by all standards.
A	1	Investment grade; good quality.
BBB	1	Lowest investment grade rating; satisfactory; But needs to be monitored.
BB	0	Somewhat speculative; low grade
B	0	Very speculative
CCC	0	Even more speculative. Substantial risk.
CC	0	Wildly speculative. May be in default.
C	0	In default. Junk

D.4 Significance of Determinants

D.4.1. Determinats/Explanatory variables of regression

The determinants/explanatory variables of the regressions are tabulated in Table 4.6:

Table 4.6：Determinants for regression

Explanatory variables	Descriptions
Callable	Whether the issue came with a call option; assign 1 if yes 0 otherwise
Finance vehicle	Whether a special-purpose vehicle has been used; 1 if yes 0 otherwise
Industrial	Assigned 1 if the issuer was a bank and 0 otherwise
Years to maturity	Maturity period of the issued bond
Issue size	Base-10 logarithm value of the bond issue size (in 100 million USD)
Investment grade	Whether the bond is investment-grade bond BBB and better (1 if yes and 0 otherwise)
Firm size	Base-10 logarithm value of the size of the bond issuing company (in 100 million USD)
Return on assets	Return on Asset of the issuing company
Leverage	Debt ratio of the issuing firm at placement time
Coupon rate	Yield of the bond at placement time

Table 4.7 summarizes their descriptive statistics. It gives basic descriptive information for each variable, including sample size (observations), mean, median, and standard deviation. This helps to understand the central

tendency and dispersion of the data. For the "Reputable underwriters" variable, the mean is 0.78 while the median is 1.00 indicating a positively skewed distribution. "Callable", "Finance vehicle" and Industrial" exhibit means of 0.36, 0.31 and 0.23, respectively, with medians 0.00 signifying a significant presence of 0 and negatively skewed distributions. Other positively-skewed distributed variables are "issue size", "investment grade", and "leverage", and negatively-skewed distributions are "Year to maturity", "return on assets" and "coupon rate". "Firm size", with a mean of 3.71 and a median of 3.48, appears to exhibit a roughly normal distribution.

Table 4.7 : Descriptive statistics of variables

Variable	Obs	Mean	Median	Standard Deviation
Reputable underwriters	491	0.78	1.00	0.41
Callable	491	0.36	0.00	0.48
Finance vehicle	491	0.31	0.00	0.46
Industrial	491	0.23	0.00	0.42
Years to maturity	474	5.18	4.00	5.13
Issue size	491	0.57	0.64	0.40
Investment grade	491	0.86	1.00	0.35
Firm size	491	3.71	3.48	1.05
Return on assets	491	1.90	1.23	3.82
Leverage	491	75.85	81.29	16.92
Coupon rate	491	4.48	3.60	3.56

D.3.2. Pearson pairwise correlations

Table 4.8 presents Pearson pairwise correlations between the determinants. I find strong correlation between Industrial and firm size (0.81), Industrial and leverage (0.51), Industrial and coupon rate (-0.55), Years to maturity and leverage (-0.40), firm sizes and leverage (0.54), and firm sizes and coupon rate (-0.46).

The problem with collinearity is that the coefficients of regression may not be uniquely determined. In turn, it may hurt the interpretability of the model as then the regression coefficients may not be unique and have influences from other features. Hence one should pay more attention to collinearity and avoid features that have a very high correlation (~R^2>0.8, [23]), which is in our case for between the determinants Industrial and Firm size

D.3.3 Means and medians of data and their differences

In Table 4.9, we compare the means and medians of various firm and issue characteristics for the issues underwritten by the reputable and non-reputable underwriters. As suggested by *t*-statistics and *Wilcoxon rank-sum (Mann-Whitney)* tests the means of these two groups differ remarkably in years to maturity, issue sizes, firm sizes, return on assets and coupon rates, while the differences in medians are significant in Industrial, years to maturity, issue sizes, firm sizes and coupon rates.

Combining the two, we would make the preliminary suggestion that the reputable underwriters are likely to underwrite bonds which are longer in years to maturity, larger in issue sizes, firm sizes and higher in return on assets, but lower in debt ratios.

E. Regression Results and Discussions

In this section, the determining factors of reputable underwriters are examined by logit regression analysis and probit regression analysis for robustness check. The dependent variable, unless otherwise specified, is the probability of being matched with at least one identified reputable underwriter. The determining factors for the

selection of reputable underwriters include callable, finance vehicle, industrial, maturity, issue size, investment grade, firm size, ROA, leverage and coupon rate. In these models, we include year dummy of the issuing company and the clustered standard error to obtain more robust and reliable results.

E.1. Empirical results of the determining factors reputable underwriters

The logit regression results of the determinants of reputable underwriter selection are presented in Table 4.10. In Model 1, we present the results of the determinant reputable underwriters in a full sample comprising of both industrial and bank issuers. In Model 2, the focus is on the bonds issued by banks only. In Model 3, the presented empirical results are obtained from logit regressions with bonds offered by industrial issuers. In Model 4, we exclude the industrial variable to examine its effect on the overall specification. In Model 5, I use Top-4 Chinese banks as a different measure of reputable underwriters. In Model 6, the reputable underwriters are proxy by the top foreign banks.

From Model 1, callable is reported statistically significant at 1% significance level. The associated coefficient is positive at 0.48 and this implies that this determinant has a positive effect on the matching probabilities with reputable underwriters. Thus, callable bonds are considered complex which require reputable underwriter that has better capacity and experience to underwrite. However, this evidence is in contrast with [6] which finds that callability is not a significant determinant throughout the period of their study.

In addition, the industrial variable is also found significantly associated with reputable underwriter. This indicates this determinant is significant when we consider the full sample size. Furthermore, the associated coefficient is positive at 1.382. This implies that this determinant has a positive effect on the matching probabilities with reputable underwriters. In other words, banks are more likely to be linked with reputable underwriter in their cross-border bond offerings. This finding, again, is not in line with the findings of [6] which reports that the type of issuer is not a significant determinant in the pre-crisis period (but significant during the entire 2002-2013 and crisis periods).

Additionally, we find that the size of offering is positively and significantly associated with the reputable underwriters. This implies that this determinant has a positive effect on the matching probabilities with reputable underwriters. The result is consistent with Carbo-Valverde et al., ([6]).

The return on asset (ROA) is reported positively associated with reputable underwriter in Model 1. This implies that this determinant has a positive effect on the matching probabilities with reputable underwriters: bond issued by an issuer with a higher Return on assets is more likely to be underwritten by reputable underwriters. The finding is inconsistent with that of Carbo-Valverde et al.'s ([6]) where they found that Return on assets is not significant during all 2003-2013, pre-crisis and crisis periods.

Turning to the samples focusing on bonds issued by banks only (Model 2), issue size is the only variable found statistically significant and it is positively associated with reputable underwriter. This implies that the determinant has a positive effect on the matching probabilities with reputable underwriters when we consider the only samples of bank issued bonds and model with the full set of identified/selected determinants ("full model"). This validates that reputable underwriter has a better capacity and networking of handling larger size of offerings particularly taking into account of the Chinese cross-border bond offerings. Nevertheless, Carbo-Valverde et al ([6]) reported that not only issue size but other variables for example maturity, callability, investment grade, firm size and finance vehicle are also potential determinants of reputable underwriter. Obviously, the determining factors of hiring reputable underwriters in Chinese international bond market are different from that of the European bond market.

Focusing on the industrial sample as presented in Model 3, the significant determinants turn out to be Callable ($p<0.10$), issue size ($p<0.01$), and return on assets ($p<0.10$). This compares with [6] where the significant determinants for non-financial corporate-issued bonds are issue size, maturity, firm size, leverage and finance vehicle. The significance of callability implies that this determinant has a positive effect on the matching probabilities with reputable underwriters for bonds which are issued by industrial companies. Another significant determinant for this model is *issue size* ($p<0.01$). In other words, the larger is the size of the bond

issue, the more likely it is to be underwritten by at least one reputable underwriter. This agrees with the finding of [6]. Furthermore, for bonds issued by industrial companies, bond issued by an issuer with a higher return on assets is more likely to be underwritten by reputable underwriters than one with a lower return on assets. This contrasts with the European bond market where Carbo-Valverde et al [6] have found that ROA is not a significant determinant for non-financial corporate bonds.

In Model 4, we perform another regression for the full sample with all the determinants excluding Industrial. The purpose is to examine whether firm size as an independent variable free from interference from the determinant *Industrial* would be a significant determinant (Recall we have earlier determined there is a high correlation between firm size and Industrial). It turns out that the significant determinants are still issue size which is the only determinant with $p<0.05$, and return on assets ($p<0.10$).

In Model 5, the reputable underwriter is proxy by the top-four Chinese investment bank and the results reveal that the significant determinants are Finance vehicle, Industrial, issue sizes, and return on assets. This implies that the finance vehicle has been actively employed by issuing firms to get reputational certification of top-four bank underwriters. Industrial variable is significant and implies that this determinant has a positive effect on the matching probabilities with at least one of the Top-four banks as underwriters. The issue size is reported to have significant positive effect on the matching probabilities of having at least one of the Top-four banks as underwriters. In other words, the larger is the size of the bond issue, the more likely it will be underwritten Top-four banks as underwriters. Return on assets is also a significant determinant. This implies that the issuing company with higher profitability ratio is more likely to be underwritten by the Top-four banks.

In Model 6, this study considers only foreign banks as the reputable underwriters. The results show that the foreign reputable underwriters are less likely to provide underwriting services to banks, and issuing firms using finance vehicles. Furthermore, the issue underwritten by the foreign underwriters has a longer maturity period.

F. Robustness checks

In this section we use probit regression to provide robustness checking on the results presented in Table 4.10. The results are presented in Table 4.11. The results turn out to be very similar with Logit regression in that the significant determinants are practically the same across all six models. The most contradictory result appears to be *investment grade* for banks' issued bonds, where the determinant is insignificant with logit regression but is significant with probit regression. When digging deeper into the regression results, we find that the logit p value for *investment grade* is 0.102 which is very close to being significant. This suggests that reputable underwriters tend to underwrite bonds with investment grade.

We also note that firm size is not a significant determinant in models 2, 3 and 4, in the absence of industrial as an independent variable. This confirms that its insignificance is not due to its collinearity with the determinant industrial.

5. Conclusion

In this paper, we have investigated, as far as we know for the first time, the issuer-reputable underwriter matching process in the Chinese international bond market for bonds issued by both banks and non-bank enterprises.

The data set employed consists of corporate bonds issued internationally over the three-year period 2019-2021 by banks and corporate firms. We find that banks had significantly higher probabilities of matching with reputable underwriters compared to non-bank issuing companies over the sampled period.

A. Summary of Key Results

This study finds that issue size is the most important determinant for determining the probabilities of matching with a reputable underwriter. In other words, bonds with large proceeds issued by banks are most likely to be placed by reputable underwriters. However, when restricted to matching with reputable foreign underwriters, we find that issue size has become not a significant determinant.

Another surprising finding is that bond maturity period does not appear to be a significant determinant, except when matched with reputable foreign underwriters. This is contrasted with the European bond market where it is a very significant determinant at $p<0.01$. However, it is interesting to note that, since it is a significant determinant when only reputable foreign underwriters are considered, that the western phenomenon of reputable underwriters tends to underwrite longer maturity bond appears to also have extended into the Chinese international bond market for these underwriters.

As for investment grade, the Chinese international market and the pre-crisis European bond market appears to be quite similar where it is only somewhat significant for bonds issued by banks (Chinese international bond turns out to be insignificant but with $p=0.102$ with logit regression which is quite close to the European market with $p<0.10$; for probit regression it is significant with $p<0.05$).

In regards to issuer characteristics, firm size appears to be a nonsignificant determinant. This is true for both bank and non-bank issuers, and is different from the finding of [6] for the European bond market, where they found that "while issue size has a greater effect on the matching probability for non-financial companies, bank size is relatively more decisive for banks" (p199).

Another difference between the Chinese international bond market and the European bond market is the emphasis on companies' performances (Return on assets) for non-bank issuers. For bonds issued by banks, this determinant is insignificant for both the European market and the Chinese international bond market. But for industrial firms, it is a significant determinant for the Chinese international bond market while for the European market it is not.

A difference we would like to highlight is leverage. While this determinant is a very significant for the European market at $p<0.01$, it is an insignificant determinant for the Chinese international bond market. In view of the recently exposed debt crisis experienced by the large Chinese real estate developers, this insignificance could perhaps be taken as pre-signal or prelude.

We have also performed regression for matching probabilities with the Chinese big four banks as underwriters. For matching with the big four banks, the significant determinants are whether finance vehicle is used, whether the issuer is a bank, issue size and return on assets.

Compared with the big-4 banks, regression done with reputable foreign underwriters as dependent variable returns finance vehicle, industrial, and years to maturity as significant determinants. Finance vehicle is a significant determinant but the associated coefficient is negative. This implies that if a finance vehicle has been used the probability of having reputable foreign underwriters as underwriters actually decreases.

B. Implications of the Research Results

Our results here suggests that the Chinese bond market is operating quite differently from the western (such as the European) bond market. We posit that a truly efficient market should be one that allows every enterprise to compete for resources based on merits, rather than whether it is a bank. Hence our analyses and results have policy implications, and are of academic interest.

C. Limitation

This study has some limitations. Firstly, in our sample, we have focused on deals published in https://cbonds.com/. Though our search and research suggest that we have included the vast majority of the bonds issued in the period of our research interest, there is still a slim probability that this may not be true. Furthermore, because this is a retrospective study, it is hard to ensure randomness, although we believe this does not detrimentally affect the conclusions of our study because our samples have included a representative portion of the population and hence should be quite representative.

Lastly, we acknowledge that the sample size of our study is relatively small. The important implication of this is that while a determinant that has been established to be significant is *indeed* significant statistically with the pre-set level of α; a determinant which has failed the significance test may *not necessarily* be insignificant, especially if its p value is very close to being significant. This is because the statistical power of the regressions

would be low due to the small sample size (Recall that statistical power is a measure of the likelihood that a researcher will find statistical significance in a sample if the effect indeed exists in the full population).

Table 4.8: Pearson correlation matrix between the determinants of underwriters and control variables of firm and issue

	Reputable underwriters	Callable bonds	Finance vehicle	Industrial	Maturity	Issue size	Investment grade	Firm size	Return on assets	Leverage	Coupon rate
Reputable underwriters	1.00										
Callable bonds	0.05	1.00									
Finance vehicle	-0.04	0.00	1.00								
Industrial	0.08	-0.27	-0.32	1.00							
Maturity	0.10	0.12	0.08	-0.16	1.00						
Issue size	0.35	0.08	0.02	-0.13	0.22	1.00					
Investment grade	0.06	0.06	-0.02	-0.02	0.08	0.11	1.00				
Firm Size	0.11	-0.16	-0.23	0.81	-0.00	0.01	0.23	1.00			
Return on assets	0.08	0.13	0.08	-0.19	0.25	0.05	0.17	-0.09	1.00		
Leverage	-0.07	-0.20	-0.22	0.51	-0.40	-0.16	0.17	0.54	-0.28	1.00	
Coupon rate	-0.17	0.11	0.01	-0.55	-0.11	-0.07	0.18	-0.46	0.05	0.10	1.00

Notes: ***, ** and * indicates statistically significant at 1%, 5% and 10% significance level, respectively.

Table 4.9: Firm and issue characteristics by underwriter reputation

	Reputable underwriters			Non-Reputable underwriters			t-statistics	Wilcoxon test
	Obs	Mean	Medium	Obs	Mean	Medium		
Callable	384	0.38	0.00	107	0.32	0.00	-1.18	-1.18
Finance vehicle	384	0.30	0.00	107	0.35	0.00	0.92	0.92
Industrial	384	0.24	0.00	107	0.16	0.00	-1.88	-1.88*
Years to maturity	370	5.45	4.13	104	4.22	3.25	-2.16**	-2.22**
Issue size	384	0.64	0.70	107	0.30	0.48	-8.36***	-7.12***
Investment grade	384	0.87	1.00	107	0.82	1.00	-1.32	-1.32
Firm size	384	3.77	3.52	107	3.49	3.36	-2.45**	-2.52**
Return on assets	384	2.07	1.31	107	1.33	1.11	-1.78*	-0.60
Leverage	384	75.2	81.34	107	78.04	81.08	1.52	0.41
Coupon rate	384	4.17	3.25	107	5.61	5.70	3.74***	3.83***

Notes: The detailed definition of variables can be obtained in Table 4.6. ***, ** and * indicates statistically significant at 1%, 5% and 10%, respectively.

Table 4.10: Determinants of reputable underwriter selection

Logit regression analysis of choosing a reputable underwriter with i.yr, cluster (companyID)						
	Reputable underwriters	Bank	Industrial	Reputable underwriters	Big4bank	Reputable foreign underwriters
Model	1	2	3	4	5	6
Callable	0.489*** （0.278）	-0.191 (0.730)	0.494* （0.286）	0.419 (0.299)	0.107 （0.270）	0.219 （0.230）
Finance vehicle	-0.083 (0.355)		-0.140 (0.352)	-0.236 (0.345)	1.241*** （0.362）	-1.741*** (0.344)
Industrial	1.382* （0.816）				2.197*** （0.989）	-1.872*** (0.896)
Years to maturity	-0.004 (0.039)	-0.240 (0.243)	0.004 （0.039）	-0.013 (0.037)	0.001 （0.027）	0.082*** （0.030）
Issue size	2.476*** （0.431）	2.884*** （1.076）	1.811*** （0.669）	2.243*** (0.390)	2.050*** （0.549）	0.676 （0.462）
Investment grade	0.279 （0.486）	2.785 （1.704）	-0.244 (0.487)	0.091 (0.463)	0.102 （0。428）	-0.111 (0.432)
Firm size	-0.016 (0.378)	-1.912 (2.860)	0.237 （0.396）	0.292 (0.308)	0.181 （0.333）	0.107 （0.302）
ROA	0.061** （0.030）	1.302 （1.915）	0.056** （0.028）	0.056* (0.031)	0.095** （0.043）	-0.000 (0.034)
Leverage	-0.012 (0.020)	-0.656 (0.805)	-0.014 (0.018)	-0.010 (0.019)	0.010 （0.017）	-0.008 (0.015)
Coupon rate	-0.064 (0.068)	-0.501 (0.638)	-0.051 (0.065)	-0.096 (0.064)	0.071 （0.076）	-0.085 (0.068)
Constant	1.405 （1.004）	70.216 （76.700）	0.123 (0.909)	0.876 (0.961)	-4.639*** (1.467)	-0.526 (1.560)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Firm clusters	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R^2	0.190	0.539	0.129	0.182	0.173	0.179
Observations	473	102	365	473	473	473

Notes: ***, ** and * indicates statistically significant at 1%, 5% and 10%, respectively.

Table 4.11: Determinants of reputable underwriter selection

Probit regression analysis of choosing a reputable underwriter with i.yr, cluster (companyID)						
	Reputable	Bank	Industrial	Reputable	Big4bank	Reputable foreign

	underwriters			underwriters		underwriters
Model	1	2	3	4	5	6
Callable	0.282* （0.155）	-0.028 (0.382)	0.275* (0.162)	0.23 （0.168）	0.062 （0.161）	0.143 (0.135)
Finance vehicle	-0.048 (0.200)		-0.092 (0.202)	-0.138 (0.195)	0.739*** （0.213）	-1.034*** (0.195)
Industrial	0.789* （0.465）				1.300*** （0.587）	-1.074*** (0.524)
Years to maturity	-0.001 (0.022)	-0.124 (0.114)	0.004 (0.022)	-0.006 (0.021)	0.000 （0.017）	0.051*** (0.018)
Issue size	1.390*** （0.256）	1.719*** (0.465)	1.023*** (0.374)	1.270*** （0.236）	1.213*** (0.303)	0.415 (0.257)
Investment grade	0.180 （0.276）	1.418** (0.713)	-0.147 (0.279)	0.067 （0.264）	0.063 (0.249)	-0.085 (0.261)
Firm size	-0.022 (0.207)	-0.743 (1.052)	0.127 (0.220)	0.157 （0.169）	0.111 (0.200)	0.060 (0.177)
Return on assets	0.034* （0.018）	0.613 (0.802)	0.032* (0.017)	0.032* （0.018）	0.057** (0.025)	-0.001 (0.021)
Leverage	-0.007 (0.010)	-0.454 (0.427)	-0.008 (0.010)	-0.005 (0.010)	0.006 (0.010)	-0.005 (0.009)
Coupon rate	-0.038 (0.039)	-0.252 (0.333)	-0.032 (0.038)	-0.058 (0.036)	0.039 (0.044)	-0.048 (0.038)
Constant	0.838 （0.583）	45.593 (41.349)	0.097 (0.531)	0.514 （0.559）	-2.777*** (0.)	-0.308 (0.880)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Firm clusters	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R^2	0.188	0.546	0.128	0.180	0.173	0.179
Observations	473	102	365	473	473	473

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