Systemically Important Bank motivation for bond market choices and the impact on financial stability.

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Abstract:

The Global Financial Crisis of 2007 to 2008 and the failures of Silicon Valley Bank and Credit Suisse Group in 2023 highlighted that a loss of confidence in banks can destabilise the global financial ecosystem. Financial stability is vital to ensure financial institutions and consumers are confident the intermediation of funds between savers and borrowers flows efficiently. A way to support the intermediation process is for banks to issue longer-term bonds in onshore and offshore capital markets. However, in times of market disruption offshore bonds can create financial instability as investors are less inclined to reinvest upon bond maturity. Research to date has focused on private and public market choices for non-financial firms, this paper takes a novel approach to study how Systemically Important Bank (SIB) bond choices can impact financial stability. The concept of a SIB was introduced under Basel III to limit any adverse impacts of large bank failures and reduce the moral hazard of "Too-Big-To-Fail." Using cross-sectional bond choice data from a subset of SIBs the relationship between motivation factors like agency cost, reputation, and flotation cost are tested. The findings suggest increases in asymmetric information and flotation costs can positively impact financial stability as the likelihood of onshore bond issuance increases, and conversely, increases in incentive problems prior to the Global Financial Crisis negatively impact financial stability, as the likelihood of offshore bonds increases. The hypothesis that increases in bank reputation has a greater likelihood of public bond markets than non-public bonds, is mixed in support. The findings have implications for regulation settings in onshore bond markets and for SIBs issuing bonds.

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1. Introduction

A stable financial system is "one in which financial institutions, markets and market infrastructures facilitate the smooth flow of funds between savers and investors. This helps to promote growth in economic activity" (RBA, 2023). Financial instability can result in asset price volatility, investor loss of confidence, and fragility in financial institutions. This impedes or even stops the "flow of funds" within the economy. The Global Financial Crisis (GFC) of 2007 to 2008 was an example of financial instability at its extremity, with the collapse of investment bank Lehman Brothers Holding Inc. and an ensuing global recession. Following the GFC regulators through Basel III developed initiatives to strengthen the financial system against future shocks. One initiative was the identification of large banks as global systemically important banks (G-SIB) and domestic systemically important banks (D-SIB). Instability in these banks could enhance global or domestic systemic risks. Therefore, these banks are subject to greater supervision and are required to hold additional capital. G-SIB and D-SIB drive a large amount of economic activity and regulators are incentivised to limit the moral hazard of institutions that are "Too-Big-To-Fail."

Banks are financial institutions, and crucially act as intermediaries converting short-term deposits from customers into longer-term loans. Any deficit in funds from savers to provide credit to customers can be overcome by issuing bonds in capital markets. Banks, and the bonds issued by banks, have a role to play in financial stability. Bonds are part of the global fixed income markets with debt outstanding in 2022 recorded at US Dollars 129.8 trillion comparable to equity markets with global market capitalisation of US Dollars 101.2 trillion in 2022 (SIFMA, 2024). The entire system relies on confidence that banks will repay their obligations and borrowers will repay their loans. Banks, through bond funding, influence the degree of financial stability, either positively or negatively. Excessive offshore bond funding creates refinance risks if offshore investors do not reinvest upon maturity in times of markets stress, increasing the potential for instability (Bellrose & Norman, 2019). On the other hand, increased onshore funding (where the brand is stronger relative to offshore funding) is positively related to financial stability. In Australia, the shortfall in onshore savings results in higher offshore funding relative to other countries (RBA, 2002). The motivation to choose offshore funding for issuers is aided by the globalisation of financial markets and technological advances in real time information and settlement systems. Turner and Nugent (2015) raise concerns regarding the financial stability of the four largest Australian banks, known as the "Major Banks", due to their large use of offshore bond markets compared to onshore. Offshore bond funding can be important for borrowers as it facilitates access to more investors, currencies, and bond maturity tenor as onshore local markets can have capacity constraints.

Prior to bonds, firms obtained funds through private debt in the form of unsecured loans. Private debt is highly monitored and more costly with fewer investors compared to public debt which has effectively no monitoring with many investors. Although banks can access the loan market, bonds are a more popular funding option in onshore and offshore markets and can provide liquidity to investors. There are a variety of bond markets a bank can fund in, each market presenting distinct levels of regulation and financial disclosures. A Eurobond refers to a bond issued outside the United States market. Eurobonds follow the rules of cross-border markets and are not subject to the rules of the domestic market. Eurobonds are governed by the International Capital Market Association through best market practice and regulatory guidelines. Eurobond issuers "face the lightest regulatory requirements" and sell mostly to institutional/wholesale investors (Fuertes & Serena, 2018, p. 136). Although many Eurobonds are listed on exchanges due to investor requirements, they are low in liquidity and do not trade as readily as public market bonds. Eurobonds are a form of private placement but are not strictly a bank loan nor a registered bond in the local market like a Foreign Bond (Esho et al., 2001). Eurobonds and Foreign Bonds sit between private and public debt offerings, termed non-public bonds in this paper. Alternatively, a Foreign Bond is a registered security and follows the rules of the domestic market. For example, if an Australian bank issues a Yen dominated bond in the Japanese market it is a called Samurai bond. Foreign Bonds are sold internationally except in the United States and avoid registration with the Securities and Exchange Commission (SEC) under Regulation S of the Securities Act 1933.

Non-United States firms issuing US Dollar denominated bonds in the United States market are referred to as Yankee Bonds, for example, when a Canadian bank issues bonds in the United States and registers with the SECYankee Bonds are more liquid than Eurobonds and Foreign Bonds due to the fact they are registered with the SEC and can be sold to institutions and retail individuals. Global Bonds are registered and sold at the same moment in two different markets. Global Bonds are a standardised security and are liquid and traded readily. Global Bonds have the strictest disclosure requirements with one tranche typically issued in the United States market and the other elsewhere, for example the Eurobond market (Fuertes & Serena, 2018). Yankee Bonds and Global Bonds are defined as public markets (Fuertes & Serena, 2018).

The existing literature focuses on funding choices between issuing private and public debt. Onshore and offshore bond markets present different options for bank issuers, and these include funding diversification through access to new investors, increased bond maturity tenor, and greater sophistication of bond products (Black & Munro, 2010). These markets offer choices between non-public debt and public debt. Cost considerations, including cost of funds at issuance impacted by credit rating, market conditions, and flotation costs (Blackwell & Kidwell, 1988) impact the selection of these markets. Borrower issuing costs vary between markets and research

(Arena, 2011; Denis and Mihov, 2003; Esho et al., 2001; Fuertes and Serena, 2018; Johnson, 1997; Krishnaswami et al., 1999; Tawatnuntachai and Yaman, 2008) finds positive relationships with flotation costs and public bond choices. This supports the seminal work of Blackwell and Kidwell (1988) that segregated firms into "switch hitters" that move between private placement and public debt markets verses "nonswitch hitters" who do not move between these two markets. Lower transaction costs are sighted as a contributing factor for market choice.

Mizen et al. (2012) explain the market depth hypothesis as a limited onshore market that can motivate a firm to access offshore markets for greater bond size and bond maturity tenor. The results of Mizen et al. (2012) support the market depth hypothesis based on data from Asian emerging markets from 1995 to 2007 but yield mixed results supporting the pecking order theory of Myers and Majluf (1984), in which onshore markets are preferred to offshore markets. Black and Munro (2010) examine the motivations for firms to use offshore bond markets for non-government Asia-Pacific investors from 1992 to 2009, including Australian banks. Onshore market size restrictions exert a positive and significant relationship on offshore markets for Australia, Hong Kong, Korea, and Singapore, indicating that offshore markets provide increased liquidity and diversity for issuers. A motivating factor to issue offshore relative to onshore is arbitraging cost of funds. This is to be expected for active SIBs, and Black and Munro (2010) discuss the opportunistic nature of foreign currency issuance, whereby the costs of onshore are equal to offshore issuance costs when cross-currency swaps to convert back into the onshore currency are included. This is termed covered interest parity (McBrady & Schill, 2007). This can be difficult to model for SIBs due to the globalisation of their business.

Seminal work on conflict between shareholders and bondholders from Jensen and Meckling (1976) argue the asset substitution problem and Myers (1977) the underinvestment problem in risky projects (growth opportunities) are more prevalent for firms with larger incentive problems. These firms can choose private debt to reduce these problems. Incentive problems can impact funding decisions; however, Diamond (1989) argues borrowers with a shorter history are impacted by larger incentive problems and seek private debt markets which have higher funding costs. Furthermore, Diamond (1989) argues adverse selection lessens over time as a good reputation of the borrower eliminates the conflict. This is confirmed by empirical studies with improvement in reputations found to be positively related with public bond choices (Arena, 2011; Esho et al. 2001; Fuertes and Serena, 2018; Johnson, 1997; Kwan and Carleton, 2010; Tawatnuntachai and Yaman, 2008) and supported Diamond (1991). Myers and Majluf (1984) find that several types of debt funding are impacted by imbalances in information between borrowers and lenders, known as asymmetric information. To reduce these problems, empirical research (Black & Munro, 2010; Denis & Mihov, 2003; Esho et al., 2001; Fuertes & Serena, 2018; Johnson, 1997; Krishnaswami et al., 1999;

Tawatnuntachai & Yaman, 2008) reveals that private debt is preferred to public debt. Rajan (1992) extends the work of Myers (1977) and Diamond (1991) by analysing the relationship between debt type and growth opportunities, indicating that banks perform rent extraction as they exert control over firm investment projects. Banks can have sway over running of the firm and impact the owner(s) incentive to exert effort. This represents a significant cost to debt and lowers project return. Rather than a firm using private bank debt exclusively, firms that fund in both private and public markets reduce this control and can achieve a balanced cost of funds.

However, the literature is yet to examine bond market choices of banks in developed countries. To address this gap in the literature, this paper analyses the relationship between agency costs, reputation, and flotation costs on decisions to issue in onshore and offshore bond markets for Australian, Canadian, European, and United States banks. Specifically, this paper examines the likelihood of four different offshore bond choices (Eurobond, Foreign Bond, Global Bond, and Yankee Bond issuance) compared to an onshore bond issuance option. The net economic outcomes can have material financial stability implications.

There are five hypotheses that are tested. First, in a combined jurisdiction data set, we examine whether Global SIBs have a stronger global reputation and borrow more in public markets (Global or Yankee bond markets), and second, it is expected that banks with larger incentive problems prior to the GFC use fewer public markets. Support for these hypotheses will confirm the findings of Diamond (1989) and empirical studies to date. Third, in segregated jurisdictions, we examine using multiple proxies if bank reputation has a significant positive relationship with public bond market choices. Fourth, we examine whether asymmetric information and growth opportunities increase non-public bond market choices, supporting seminal works of Myers and Majluf (1984), Myers (1977), and Jensen and Meckling (1976). Last, and fifth, we expect flotation costs to have a positive relationship with public bond market choices due to economies of scale (Blackwell and Kidwell, 1988).

The results tell us that there is no statistical difference between a Global SIB (G-SIB) and a Domestic SIB (D-SIB) in terms of market choices. The results suggest increases in asymmetric information and flotation costs are positively related to financial stability as the likelihood of onshore bonds increases. Conversely, increases to bond maturity tenor and incentive problems are negatively related to financial stability as the likelihood of offshore bonds increases. Bank reputation shows mixed results for a positive relationship to public markets and varies with variable proxy and jurisdiction. Advancing the research into the motivating factors for onshore and offshore bond market choices is important because policy regulators and banks as issuers can influence these factors, and in turn their impact on financial stability.

The Australia banks is a jurisdiction of focus, and the findings using the bond characteristics indicate that non-public Eurobond markets and offshore bond choices for longer bond tenor are more likely. This suggests the more monitored private markets accept greater duration risk even though this gives shareholders more time to exploit riskier projects to the detriment of Eurobond holders. Bondholders may take comfort as these bonds tend to be listed. Improvements in reputation for Australian bank issuer ratings increases the likelihood of Foreign Bonds and Global Bonds and increases in onshore bond reputation and bank age increase the likelihood of Global Bonds. Australia had the strongest statistical significance of the jurisdictions with most hypotheses finding support. Excluding flotation cost proxy bond size, economic significance for Australian banks was low in comparison to other jurisdictions. Bond size has a predicted benefit to financial stability with Onshore Bonds more likely.

The rest of the paper is set out as follows. Section 2 outlines the data for the bank selection, dependent variables, independent variables, and model specifications. Section 3 discusses the descriptive statistics and results, and Section 4 has concluding remarks. Section 5 is the Appendix.

2. Data and models

2.1 Bank sample

The focus of this paper is long-term bond market choices of SIBs in developed countries over the sample period 1 January 1999 to 31 December 2019. Banks from developed countries are selected from a list of the largest one hundred banks by total assets in US Dollars. Banks must be active issuers in the global bond markets over the observation period, and publicly listed, have a long-term credit rating, and have financial statements for the observation period that demonstrate a record of performance. Each bank must be a D-SIB or G-SIB entity. This reduces the sample to twenty-one banks as Japanese, South Korean, and Singapore banks do not qualify due to inactivity issuing in Global Bond and Yankee Bond markets. Australian and New Zealand Banking Group, the fourth Major Bank headquartered in Australia did not qualify due to inactivity in certain offshore bond markets. *Table 1* outlines the sample of twenty-one banks selected by ticker, country, jurisdiction, total assets, and systemic importance.

Table 1 – Sample of Largest Banks by Total Assets.

Bank name	Ticker	Country	Jurisdiction	Total assets (US Dollars billion)	Systemic Importance
BNP Paribas	BNP	France	Europe	2,429.26	G-SIB
Societe Generale SA	SG	France	Europe	1,522.05	G-SIB
Deutsche Bank	DEUT	Germany	Europe	1,456.26	G-SIB
Banco Santander	SANT	Spain	Europe	1,702.61	G-SIB
Credit Suisse Group AG	CREDS	Switzerland	Europe	812.91	G-SIB
Svenska Handelsbanken AB	SHB	Sweden	Europe	328.59	D-SIB
Barclays PLC	BAR	United Kingdom	Europe	1,510.14	G-SIB
Lloyds Banking Group PLC	LLOYDS	United Kingdom	Europe	1,104.42	D-SIB
Natwest PLC	NATW	United Kingdom	Europe	957.60	D-SIB
JP Morgan Chase	JP	United States	United States	2,687.38	G-SIB
Citigroup Inc.	CITI	United States	United States	1,951.16	G-SIB
Wells Fargo	WF	United States	United States	1,927.26	G-SIB
Morgan Stanley	MS	United States	United States	895.43	G-SIB
Goldman Sachs	GS	United States	United States	992.97	G-SIB
Royal Bank of Canada	RY	Canada	Canada	1,116.31	G-SIB
Scotiabank	BNS	Canada	Canada	872.62	D-SIB
Toronto-Dominion Bank	TD	Canada	Canada	1,102.04	G-SIB
Canadian Imperial Bank of Commerce	CIBC	Canada	Canada	495.99	D-SIB
Commonwealth Bank	CBA	Australia	Australia	688.4	D-SIB
National Australia Bank	NAB	Australia	Australia	571.34	D-SIB
Westpac Banking Corp	WBC	Australia	Australia	611.47	D-SIB

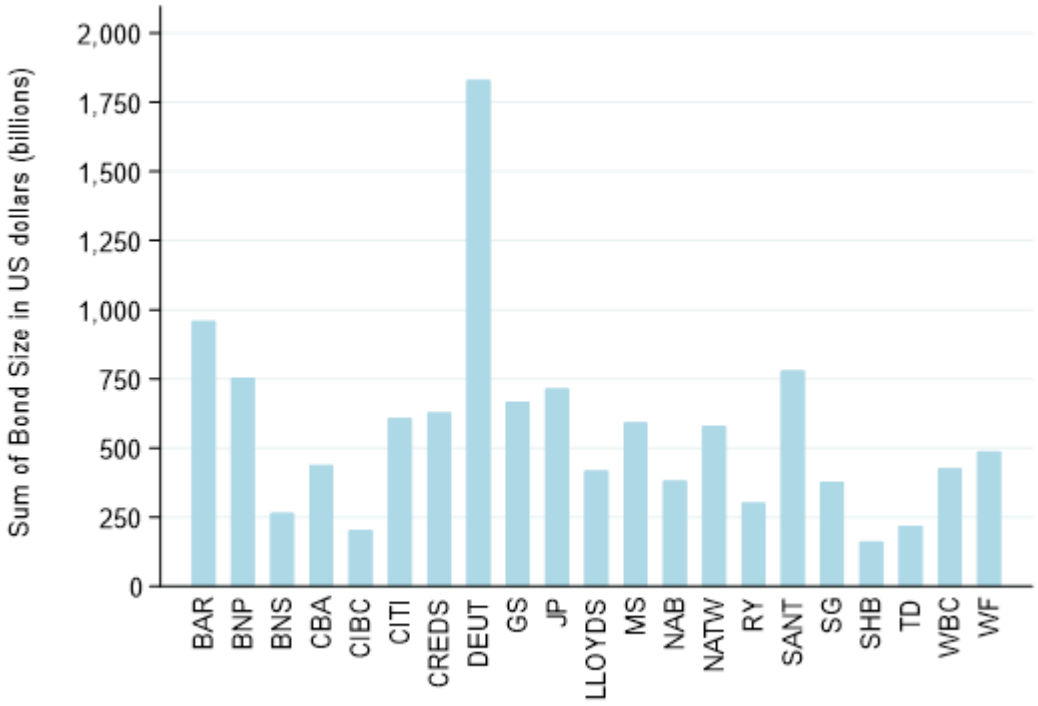
The table lists the sample of Systemically Important Banks (SIBs) selected, including the bank name, ticker, country of the parent company, jurisdiction, book value of total assets (in US Dollars as at 2020), and whether the bank is a domestic or global SIB. Sources: S&P Global Market Intelligence, FSB, and local regulators.

2.2 Dependent variable bond market choices

Cross-sections of matured and outstanding primary market bond choices from the twenty-one banks are sourced from Refinitiv from 1 January 1999 to 31 December 2019. The year 2020 was excluded due to global pandemic COVID-19 which significantly impacted bond choices for these global banks.

The raw data from Refinitiv excludes bond sizes less than US Dollars 5 million to limit non-wholesale market parcels and exclude "blank" bonds. *Figure 1* charts the total bond size of each of the banks in the sample. Any bonds issued with a bond maturity tenor of less than 1 year (Gomes and Phillips, 2012; Arena, 2011) are considered short-term and thus excluded and only the sectors Banking and Mortgage Banking are included. The parent issuer and subsidiaries are included to capture bonds on a consolidated basis.

Figure 1 – Sum of Bond Size (US Dollars reported by Refinitiv) by Individual Banks in the sample. Source: Stata, Refinitiv.



The figure charts the total issuance of bond size amounts in US Dollars for each of the twenty-one Systemically Important Banks (SIBs) selected. The SIBs are Barclays PLC (BAR), BNP Paribas (BNP), Scotiabank (BNS), Commonwealth Bank (CBA), Canadian Imperial Bank of Commerce (CIBC), Citigroup Inc. (CITI), Credit Suisse Group AG (CREDS), Deutsche Bank (DEUT), Goldman Sachs (GS), JP Morgan Chase (JP), Lloyds Banking Group PLC (LLOYDS), Morgan Stanley (MS), National Australia Bank (NAB), Natwest PLC (NATW), Royal Bank of Canada (RY), Banco Santander (SANT), Societe Generale SA (SG), Svenska Handelsbanken AB (SHB), Toronto-Dominion Bank (TD), Westpac Banking Corp (WBC), and Wells Fargo (WF). Source: Refinitiv, and Stata.

The Market Choice (MC) is defined by the Refinitiv field Market of Issue and comprises five bond market choices: 1) Eurobond; 2) Foreign Bond; 3) Global Bond; 4) Onshore Bond; and 5) Yankee Bond. Domestic bonds are termed Onshore Bonds, and all other non-domestic bonds are termed Offshore Bonds. The base category is Onshore Bonds. The current research, to the best of the authors' knowledge, is the first paper of five discrete choices for SIBs, before and following the GFC. Eurobonds are non-public bonds and not strictly private debt, Foreign Bonds and Onshore Bonds are mostly registered and

rank between Eurobond and public debt, and Yankee and Global Bonds are classified as public debt. For United States banks there is no Yankee Bond choice because this refers to their Onshore Bond, which is public debt. Refinitiv Market of Issue Foreign Bonds are an amalgamation of all bond market choices equal to foreign currency issuing in the local currency of the country market. An example could be the Royal Bank of Canada issuing a Yen denominated bond in the Japanese market. This is known as a Samurai Bond. In Australia, a non-Australian firm issuing an Australian Dollar denominated bond in the Australian market is known as a Kangaroo Bond.

2.3 Independent variables to proxy for agency conflicts, reputation, and flotation costs

Bond or bank issuer credit ratings for bonds can proxy for credit quality and therefore, reputation. There are limitations on retrieving long-term credit ratings at the bond transaction level and hence bond credit ratings are "patchy at best" (Black & Munro, 2010, p. 11). This is partly due to historical data collection issues as many bonds have matured when the data was collected, and the bond rating has been withdrawn. In addition, many bank bonds are not rated at issue date, and investors rely on the issuer's reputation and/or underlying issuer credit rating (IRATING). The issuer and bond credit ratings are sourced from Refinitiv and matched to the bond choice through the unique International Securities Identification Number (ISIN) code. The selection of developed country global banks in the sample are highly rated investment grade companies. The use of a dummy investment grade and sub-investment grade for credit ratings (Black & Munro, 2010; Denis & Mihov, 2003; Fuertes & Serena, 2018; Gao, 2011; Tawatnuntachai & Yaman, 2008) is not required in this paper. Instead of credit rating proxying for reputation, some research uses credit rating as a proxy for asymmetric information (Fuertes & Serena 2018; Tawatnuntachai & Yaman, 2008). Gao (2011) allocates credit rating categories of high, medium, and none for below investment grade. Kwan and Carleton (2010) do not use credit rating agencies but rather the National Association of Insurance Commissioners scale from 1 for Aaa to 5 for Caa. Issuer and bond credit ratings (BRATING) for this paper are sourced from Moody's long-term credit ratings at the time of the bond choice issue date, and allocated a numeric score based on the long-term credit rating (Arena, 2011).

This paper utilises a similar approach to Mizen et al. (2012) to proxy for bond reputation. Rather than rely on financial characteristics from statements reported each year (Esho et al., 2001), or the ratio of the onshore market to onshore and offshore markets (Mizen et al., 2012), this paper utilises a dynamic reflection of bond issuance activity. A database of the outstanding bonds issued at the bank and bond seniority transaction level from Refinitiv are computed as per *Equation 2*. The outcome for each month was then divided by FitchConnect (Fitch) Total Liabilities excluding Preference Shares and Debt Hybrid Capital (TL) for the preceding year to ascertain the outstanding onshore bond reputation (ONSBOND). This is like the ratio of foreign currency bonds to total liabilities employed by Mizen et

al. (2012), although it is hard to determine the frequency or the source of the bonds from this study. The ONSBOND variable is outstanding bonds in the market reported each month. A larger ratio indicates a greater reputation in bond markets. The variable incorporates a timely frequency of market bond funding.

Reputation can also be measured by the age of a firm. Hale and Santos (2008) calculate age from the time of issue and the time the firm first lists. Alternatively, studies measure age based on the time the firm has been listed on a stock exchange (Arena, 2011; Esho et al., 2001; Mizen et al., 2012). For banks age based on listing date can be problematic as banks can grow by acquisition, and therefore it can be hard to understand definitively when banks as a consolidated entity existed, and therefore reputation began. This paper follows Johnson (1997) and calculates bank age (AGE) as the issue date of the bond choice less the incorporation date of the bank legal parent entity. The incorporation date for each bank is sourced from Fitch. A higher bank age indicates a stronger reputation.

For asymmetric information, this paper follows Krishnaswami et al. (1999) and Esho et al. (2001) for unexpected future earnings (UFE) for earnings surprise to confirm managers have better quality of information than bondholders. UFE as per *Equation 2* is calculated as earnings per share (EPS) for the next period less forward EPS for the next period divided by the results of the bank's share market price in the current period. Data is sourced from Refinitiv and Datastream.

To proxy for callable bonds (CALL) this paper assigns a binary dummy variable of one for callable bonds, and zero otherwise. Callability of bonds can be used to evaluate the level of asymmetric information. Higher quality banks are less likely to issue bonds with these features. For investment or growth opportunities the market value to book value (MVBV) is employed as per *Equation 2* to quantify project quality to replicate other empirical studies (Esho et al., 2001; Johnson, 1997; Krishnaswami et al., 1999). The metric is calculated as the book value of total assets as at the yearly reporting date less the book value of total equity plus the market value of equity divided by the book value of total assets, in US Dollars. Total assets are sourced from Fitch, and the market value of equity sourced from Datastream.

Access to flotation costs is determined through bank characteristics and bond characteristics. SIBs report financial statements in different currencies, which constrains meaningful comparison. SIBs make bond choices in multiple currencies to access a diverse range of investors and arbitrage foreign exchange differentials when swapped back into local currency. To overcome currency mismatches, Fitch converts each financial statement characteristic and Refinitiv each bond size into US Dollars. As expected, there is material variability in total assets and bond size in the banks selected for the sample. In US Dollars, the total assets of the three Australian banks as of 2019 averaged 624 billion, the four Canadian banks averaged 897 billion, the nine European banks averaged 1,314 billion, and the five United States banks averaged 1,691 billion (S&P, 2020). To overcome the variability this paper

employs the logarithm of bank total assets (TA) following previous studies (Arena, 2011; Blackwell & Kidwell, 1988, Denis & Mihov, 2003; Fuertes & Serena, 2018; Gao, 2011; Gomes & Phillips, 2012; Krishnaswami et al., 1999; Kwan & Carlton, 2010; Tawatnuntachai & Yaman, 2008) and the logarithm of bond issue size (SIZE) (Arena, 2011; Black & Munro, 2010; Blackwell & Kidwell, 1988; Fuertes & Serena, 2018; Gao, 2011; Gomes & Phillips, 2012; Krishnaswami et al., 1999; Kwan & Carlton, 2010; Tawatnuntachai & Yaman, 2008).

2.4 Control variables

The first control variable in the models is bond maturity tenor (TENOR) in years from issue date and follows Fuertes and Serena (2018) and Tawatnuntachai and Yaman (2008). Bond maturity tenor can serve as a measure of financial stability, and a greater bond maturity tenor reduces refinance risk (Bellrose & Norman, 2019). The characteristics of the individual banks are sourced from Fitch on a consolidated basis. This aligns with the Refinitiv bond bank legal name search for the dependent variable. Financial data is retrieved on a yearly basis from 1998 to 2019 in US Dollars.

As the sample period covers more than 20 years, the paper requires an indicator of market conditions through time. This paper follows Gomes and Phillips (2012) and employs the Chicago Board Options Exchange's CBOE Volatility Index (VIX) to determine global market conditions. Serena and Moreno (2016) find a positive relationship between emerging market economies' offshore bond issuance and "abnormally" lower VIX, and the opposite when VIX increases. For this paper, daily VIX prices are sourced from Refinitiv and matched to the issue date of each MC. The Merrill Lynch Option Volatility Estimate (MOVE) as a bond volatility measure is employed by Fuertes and Serena (2018) with an average MOVE 20 business days before issue date. Serena and Moreno (2016) replace VIX with MOVE for a robustness test to reflect global bond conditions, something this paper adopts.

A motivating factor to issue offshore relative to onshore is arbitraging cost of funds. This is to be expected for active SIBs, and Black and Munro (2010) discuss the opportunistic nature of foreign currency issuance, whereby the costs of onshore are equal to offshore issuance costs when cross-currency swaps to convert back into the onshore currency are included. Data in this paper has sixty-six currencies of issuance which makes it unfeasible to find historical interest rate differentials and basis swaps. Further, historical basis swaps data can be limited in Datastream. Studies with onshore and offshore bond issuance use different cost of funds proxies (Black & Munro, 2010; Gao, 2011; Mizen et al., 2012; Serena & Moreno, 2016; Tawatnuntachai & Yaman, 2008), whilst other studies of international securities such as Esho et al. (2001) and Fuertes and Serena (2018) do not use a cost of fund proxy.

Esho et al. (2001) use country dummy variables to control for country macro-economic conditions. This paper employs macro-economic conditions from the parent domicile of the bank issuer to control for country variability in the samples. For the combined jurisdictions, gross domestic product per capita (GDPPC) is used, which is the economic output of each bank's country divided by its population, sourced from the World Bank on a yearly basis. Unfortunately, this variable is strongly correlated with financial characteristic independent variables in the jurisdiction models. Therefore, the consumer price index (CPI) on a quarterly basis for each bank's parent domiciled country is used as a substitute. CPI is sourced from the Organisation for Economic Co-operation and Development (OECD). A pre GFC binary dummy (GFC) prior to 1 January 2009 proxies for a regulatory environment before Dodd-Frank and Basel III. A binary dummy variable of one was created to reflect G-SIB, otherwise D-SIB was zero. For the continuous independent variables winsorizing is performed at the lower 1 percent and upper 99 percent (Fuertes and Serena, 2018) to limit influential outliers. For this data set this is important, for example, callable bonds with no legal tenor are negative 121 years because they are missing the maturity date and would otherwise be included. Also, extremities in market volatility proxied by VIX can cause bond markets to be illquid severly impacting MC.

2.5 Methodology

Bond market choices of global banks are discrete in nature and logistic methodologies are required to determine the likelihood and predictive probabilities of these choices. The primary methodology used in this paper is multinomial logistic regression to model viable alternative categorical market choices. In the models $MC_{i,t}$ is the individual bank bond market choice *i* for the issue date of the bond at time *t*. β_0 represents the constant, there are vectors for bond characteristics, bank characteristics proxy for agency costs, reputation, and flotation costs, and controls for macro-economic and market conditions to ensure business cycles and market impacts do not change the results. Epsilon $\varepsilon_{i,t}$ is the error term.

Econometric software defaults the bond choices in alphabetical order as follows: Eurobond (1), Foreign Bond (2), Global Bond, (3), Onshore Bond (4), and Yankee Bond (5). Onshore Bond is the nominated base choice, and the other four choices are the alternative choices. The log odds of the alternative bond MC are generated as separate binary regressions with parameter estimates and error terms. The log odd results are converted to predictive probabilities at the independent variables for the base Onshore Bond MC and alternative bond MC. Predictive probabilities are employed as per other studies (Arena, 2011; Denis & Mihov, 2003; Fuertes & Serena, 2018; Gomes & Phillips, 2012). A key assumption in a multinomial logistic model is the independence of irrelevant alternatives (IIA), and

Long & Freese (2014) urge caution when running these assumption tests because their use is a statistical test and are not necessarily a reflection of the real world.

Equation 1 uses bond characteristics and control variables to model SIBs from various jurisdictions. The United States banks are excluded in the combined sample because their Onshore Bond is the Yankee Bond public market. Bond characteristics use the logarithms of bond issue size (SIZE) and bond maturity tenor (TENOR) and dummy variables for callable bonds (CALL), listed bonds (LIST), and underwritten bonds (UNDERW) from *Equation 1*. Control variables include market conditions (VIX) and macro-economic conditions (GDPPC). A binary dummy variable is used for G-SIB and D-SIB, and the period prior to the GFC (GFC). *Equation 1* combines all jurisdictions, except the United States, and excludes financial characteristics. Financial characteristics and the United States are included in *Equation 2*.

Equation 1 tests Hypothesis 1 (positive relationship between G-SIB and public markets) and Hypothesis 2 (SIBs with larger incentive problems prior to the GFC use non-public over public markets). Furthermore, it is expected that increases in underwriters to proxy for decreases in asymmetric information will have a positive relationship with Yankee and Global Bond public markets, and increased market volatility will have negative relationships with these public market choices. The direction relationship of non-public Eurobonds is expected to be the opposite. The relationship direction of Foreign Bonds and Onshore Bonds is uncertain.

$$\textbf{Equation 1:}\quad MC_{i,t} = \beta_{0i} + \beta_1 SIZE_{i,t} + \beta_2 TENOR_{i,t} + \beta_3 CALL_{i,t} + \beta_4 LIST_{i,t} + \beta_5 UNDERW_{i,t} + \beta_6 GSIB_{i,t} + \beta_7 GFC_t + \beta_8 VIX_{i,t} + \beta_9 GDPPC_{i,t-1} + \varepsilon_{0i,t}$$

Equation 2 includes financial characteristic variables to proxy for agency costs, reputation, and flotation costs. There are many types of reputation proxies in the empirical research, so this paper uses an assortment of proxies for banks. Bank issuer credit rating (IRATING), onshore bond reputation (ONSBOND) lagged for one period to fully incorporate current issues, and bank age (AGE) are all added to represent reputation. Unexpected future earnings (UFE) proxies for information asymmetries, and bank market value to book value (MVBV) proxies for investment and growth opportunities. Macro-economic variable (CPI) replaces GDPPC, and total assets of each bank (TA) and liquid assets as a percentage of deposits and borrowings (LIQDB) are added.

Equation 2 for each jurisdiction tests hypotheses 3 to 5 for banks across the developed countries to understand the relationship of agency costs, reputation, and flotation costs to the MC for SIBs. It is expected that reputation proxies will have positive relationships with public markets (Diamond, 1984,

1989); increases in asymmetric information (Myers & Majluf, 1984) and investment and growth opportunities (Myers, 1977) will have negative relationships with public markets; and increases in flotation costs (Blackwell & Kidwell, 1988) will have positive relationships with public markets. The direction relationship of non-public Eurobonds is expected to be the opposite. The relationship direction of Foreign Bonds and Onshore Bonds is uncertain.

Equation 2: $$MC_{i,t} = \beta_{0i} + \beta_1 SIZE_{i,t} + \beta_2 TENOR_{i,t} + \beta_3 CALL_{i,t} + \beta_4 LIST_{i,t} + \beta_5 IRATING_{i,t-1} + \beta_6 ONSBOND_{i,t-1} + \beta_7 AGE_{i,t-1} + \beta_8 UFE_{i,t-1} + \beta_9 MVBV_{i,t-1} + \beta_{10} TA_{i,t-1} + \beta_{11} VIX_{i,t} + +\beta_{12} LIQDB_{i,t-1} + \beta_{13} CPI_{i,t-1} + \varepsilon_{0i,t}$$

3. Results and discussion

3.1 Descriptive statistics

Bond choices in the sample were made up of 44 percent prior to the GFC, and 56 percent following the GFC. As per *Table 2* offshore bond choices accounted for 85,965 (89 percent), and onshore 10,729 (11 percent). Eurobond was the largest offshore choice with 67 percent, and Yankee Bonds the smallest offshore with 4 percent. On a bank jurisdcition basis Europe accounted for 67 percent, United States 20 percent, Australia 8 percent, and Canada 5 percent. D-SIB banks account for 22 percent and G-SIB 78 percent of choice outcomes.

Table 2 - Market Choices for all Systemically Important Banks. Source: Stata and Refinitiv.

Market Choice	**AU**	**CA**	**EU**	**US**	**Total**
Eurobond	6,012	1,916	48,395	8,468	64,791
Foreign Bond	706	180	4,000	384	5,270
Global Bond	76	1,550	4,848	5,814	12,288
Onshore Bond	478	500	5,290	4,461	10,729
Yankee Bond	85	868	2,663	0	3,616
Total	**7,357**	**5,014**	**65,196**	**19,127**	**96,694**

The table reports the market choices (MC) for the twenty-one Systemically Important Banks by jurisdiction. Eurobonds follow the rules of cross-border markets and are not specific to the rules of the domestic market. Eurobonds are not able to be sold in the United States. Eurobonds have the lightest regulatory requirements of bonds and are sold mostly to wholesale institutions. Eurobonds are non-public debt and are a form of private placement; however, they are not strictly a bank loan nor a Foreign Bond. Foreign Bonds are registered securities and follow the rules of the domestic market, also non-public debt. Foreign Bonds are sold internationally except in the United States and avoid registration with the SEC under Regulation S of the Securities Act 1933, and like Eurobonds can only be sold to wholesale institutions. Non-United States banks issuing US Dollars denominated bonds in the United States market are Yankee Bonds. Yankee Bonds are more liquid due to the fact they are registered with the SEC and can be sold to institutions and retail individuals. Global Bonds are registered and sold at the same moment in two different markets, are a standardised security, and are liquid and traded readily. Global Bonds have the strictest disclosure requirements with one tranche issued in the United States market and the other elsewhere. Yankee and Global Bonds are public markets.

Onshore and offshore bond market choices in different jurisdictions vary in part due to the onshore structural environment. For example, the depth of the bond market in the United States is greater than other jurisdictions. The United States banks fund 23 percent in Onshore Bonds and compares to a range of 7 to 10 percent for Australia, Canada, and Europe. Australia and Europe fund 82 percent and 74 percent, respectively, in the Eurobond markets. Australia funds only 2 percent in Global and Yankee Bond markets. Canadian banks are more evenly spread over offshore bond choices with 38 percent in Eurobonds, 31 percent in Global Bonds, and 17 percent in Yankee Bonds.

Table 3 below outlines the descriptive statistics for the independent variables used in the empirical tests.

Table 3 - Descriptive Statistics for Combined Independent Variables of Australia, Canada, Europe, and the United States. Sources: Multiple Sources.

Variable	Obs.	Mean	Std. dev.	Min	Max
SIZE	96,701	16.867660	1.425017	15.424950	21.416410
TENOR	96,646	6.058697	5.742838	1.000000	30.021920
IRATING	96,701	18.835140	1.668387	14.000000	22.000000
BRATING	8,269	18.960210	1.877988	13.000000	22.000000
ONSBOND	96,305	0.037865	0.056008	0.000639	0.355871
OFFBOND	96,305	0.156004	0.081232	0.044907	0.494036
AGE	96,701	104.295600	51.086440	3.408219	168.887700
ROAE	96,690	11.122860	8.309963	-11.230000	32.870000
UFE	96,533	-0.276911	1.166897	-4.916944	4.649256
FAE	96,392	-0.093431	1.529716	-9.365012	3.749407
MVBV	96,541	1.016770	0.036693	0.958906	1.158731
TA	96,690	13.886650	0.703897	11.677430	14.935590
TE	96,690	10.808840	0.691071	8.733570	12.309840
VIX	95,489	23.718180	11.488190	12.194420	72.217040
MOVE	89,194	84.919540	28.964730	46.596200	190.000000
LIQDB	96,690	73.749880	53.286830	9.620000	294.200000
LIQTA	96,690	35.319210	17.595740	6.660000	82.300000
CPI	96,701	0.442518	0.540832	-0.852040	1.893491
GDPPC	96,701	41,135.93	10,168.50	23,359.01	67,139.05
GLIQ	94,421	17.827150	2.367603	10.745670	21.409000

The table reports descriptive statistics for the independent variables for the sample of 96,694 market choices. SIZE is the logarithm of bond size in US Dollars, TENOR is the bond maturity tenor in years, IRATING is a dummy variable for Moody's long-term issuer credit rating, BRATING is a dummy variable for Moody's long-term bond credit rating, ONSBOND is the bond onshore reputation, OFFBOND is the bond offshore reputation, AGE is the bank age in years, ROAE is the return of average equity, UFE is unexpected future earnings, FAE is the future abnormal earnings, MVBV is market value to book value, TA is the logarithm of the book value of total assets, TE is the logarithm of the book value of total equity, VIX is the Chicago Board Options Exchange's Volatility Index, MOVE is the Merrill Lynch Option Volatility Estimate, LIQDB is a bank's liquid assets divided by book value of total deposits and borrowings, LIQTA is a bank's liquid assets divided by book value of total assets, CPI is the consumer price index for each parent country of the bank, GDPPC is the gross domestic product per capita for each parent country of the bank, and GLIQ is the global liquidity indicator. Dummy binary variables have been excluded. For a full description and calculation of the independent variables refer to Table 21 in the appendix. The independent variables are winsorised at 1 percent and 99 percent levels.

3.2 Combined jurisdictions with bond market choices testing systematic importance and the GFC.

Table 4 reports the results of a combined regression for Australia, Canada, and Europe given five market choices, namely the log likelihood of Eurobond, Foreign Bond, Global Bond, and Yankee Bond to the base Onshore Bond. The combined regression tests Hypotheses 1 to 2 as per *Equation 1*. The model fits the data with a pseudo R2 of 0.19. The results indicate there is no support for Hypothesis 1, namely that G-SIB issuers are more likely than D-SIB issuers to use public markets over more non-public markets like Eurobonds, because all alternative choices are insignificant. There

is support for Hypothesis 2 as the period prior to the GFC exhibits increased likelihood of Eurobond choices and a decreased likelihood of public market Global Bond issuance. The results of other variables in *Equation 1* indicate significant relationships. As underwritten bonds increase the likelihood of Yankee Bond and Global Bond choices increases, and decreases in non-public Eurobond and Foreign Bond choices, supporting the empirical results of Gomes and Phillips (2012). The underwritten bonds by arranging and syndicating banks decreases asymmetric information as public bonds are issued, and overcomes the problem identified by Myers and Majluf (1984). Support is also found for Serena and Moreno (2016), as increases in market volatility proxied by VIX decrease the likelihood of a Foreign Bond and Global Bond. Intuitively, this makes sense as funding costs comparively increase in less known offshore markets compared to the onshore market.

Table 5 reports the predicted probabilites of the *Table 4* regressions. Prior to the GFC there is predicted probability increase of +22 percent of a Eurobond (non-public) issue versus decreases in Global Bonds of -14 percent. Notably the largest economic impact to Onshore Bonds is a +19 percent increase as flotation cost proxy bond size increases (versus -27 percent for Eurobond). There is also a -10 percent decrease in Onshore Bonds as GDPPC increases (versus +5 percent Eurobond and +5 percent Foreign Bond) indicating improvement in economic conditions results in higher probability of offshore issuance for SIBs.

Table 4 - Market Choice Results for Australian, Canadian, and European Systemically Important Banks Log Pseudolikelihood Regression (Equation 1 – Hypotheses 1 to 2)

Dependent variables	**Eurobond**	**Foreign Bond**	**Global Bond**	**Yankee Bond**
Independent variables				
SIZE	-0.5130***	-0.2041*	-0.3141**	-0.4047***
	(0.1085)	(0.1191)	(0.1361)	(0.1397)
TENOR	0.0560**	-0.0190	-0.0833**	-0.0615*
	(0.0225)	(0.0199)	(0.0336)	(0.0361)
CALL	0.4928**	-0.2261	1.4411***	1.1339***
	(0.1977)	(0.3754)	(0.3356)	(0.3328)
LIST	-0.2415	0.4217	-0.7819	-2.1691***
	(0.4151)	(0.5487)	(0.5053)	(0.4963)
UNDERW	-0.7069*	-1.0503**	3.2428***	2.8997***
	(0.3981)	(0.4704)	(0.6408)	(0.8307)
GSIB	-0.5279	-0.9391	0.6680	-1.1363
	(0.6012)	(0.7154)	(0.7639)	(0.8469)
GFC	0.8500***	0.5976	-1.9040***	-0.8053
	(0.2120)	(0.6209)	(0.3935)	(0.5541)
VIX	-0.0082	-0.0088*	-0.0230***	-0.0049
	(0.0060)	(0.0049)	(0.0068)	(0.0085)
GDPPC	0.0001**	0.0001*	0.0000	0.0001***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Constant	9.5207***	1.9518	3.0009	0.7318
	(1.7871)	(3.0308)	(2.7617)	(2.6093)
Log pseudolikelihood	-59,063.54	-59,063.54	-59,063.54	-59,063.54
Pseudo R2	0.1944	0.1944	0.1944	0.1944
Observations	76,417	76,417	76,417	76,417

This table reports multinomial logistic regressions for the combined Australian, Canadian, and European banks. The dependent variables are the bond market choices. The offshore market choices are Eurobond, Foreign Bond, Global Bond, and Yankee Bond. These are alternative choices to an Onshore Bond (base choice). Onshore Bonds are not reported in the table. United States banks are excluded as the Yankee bond choice is their Onshore Bond and therefore only contain four choices. SIZE is the logarithm of bond size in US Dollars and TENOR is the bond maturity tenor in years. CALL is a binary dummy variable for callable bonds, LIST is a binary dummy variable for listed bonds, UNDERW is a binary dummy variable for underwritten bonds, GSIB is a binary dummy variable for Global Systemically Important Banks, GFC is a binary dummy variable for the period before 1 January 2009, VIX is the Chicago Board Options Exchange's Volatility Index, and GDPPC is gross domestic product per capita of the banks' parent domiciled country. For a more detailed explanation of the variables refer to Table 21 in the appendix. Robust standard errors are clustered at the bank level in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 5 – Market Choice Predictive Probabilities for Australian, Canadian, and European Systemically Important Banks (from Table 4)

	Eurobond	**Foreign Bond**	**Global Bond**	**Onshore Bond**	**Yankee Bond**
SIZE	-28%	6%	3%	19%	0%
TENOR	20%	-4%	-9%	-3%	-4%
CALL	-3%	-3%	7%	-3%	2%
LIST	1%	4%	-3%	2%	-5%
UNDERW	-16%	-4%	11%	3%	6%
GSIB	-3%	-3%	6%	3%	-4%
GFC	22%	0%	-14%	-4%	-4%
VIX	0%	0%	-3%	2%	1%
GDPPC	5%	5%	-10%	-10%	10%

This table reports the predictive probabilities at a confidence interval of 95 percent for the market choices Eurobond, Foreign Bond, Global Bond, Yankee Bond, and Onshore Bond implied by the multinomial logistic regression from Table 4. The change in probability is calculated from the 5th to the 95th percentile of the independent variables. The sum of each of the independent variables' predicted probabilities in each row equals zero, subject to rounding. SIZE is the logarithm of bond size in US Dollars, TENOR is the bond maturity tenor in years, CALL is a binary dummy variable for callable bonds, LIST is a binary dummy variable for listed bonds, UNDERW is a binary dummy variable for underwritten bonds, GSIB is a binary dummy variable for Global Systemically Important Banks, GFC is a binary dummy variable for the period before 1 January 2009, VIX is the Chicago Board Options Exchange's Volatility Index, and GDPPC is gross domestic product per capita of the banks' parent domiciled country. For a more detailed explanation of the variables refer to Table 21 in the appendix.

3.3 Segregated jurisdictions with bond market choices testing agency conflicts, reputation, and flotations costs.

The jurisdictional regressions from *Equation 2* test the proxies for agency costs, reputation, and flotation costs. *Tables 6, 7, 8, and 9* report results for discrete bond MC for Australia, Canada, Europe, and the United States, respectively. Overall, the regressions fit quite well, with pseudo R2 ranging from 0.15 to 0.27 at an average of 0.21. This is comparable to Denis and Mihov (2003) who find an average of 0.23 across 4 models. The IIA assumptions are mostly violated and provide evidence against the null hypothesis that the choices are independent of other alternatives. Long and Freese (2014) argue that multinomial logistic regression is fine to use when the alternative choices compared to the base are dissimilar. This is the case as the market choices are distinctly different and not substitutes. A bond may share a similar coupon structure, but the market choices are distinctly dissimilar. For example, the flotation costs due to the disclosures and legal requirements of a Eurobond versus a Yankee Bond are significantly less, as is the liquidity of the bonds (Esho et al., 2011; Gao, 2011). The results of multinomial probit regressions relaxing the IIA assumption are discussed in Section 3.4 as a robustness check, validating the use of multinomial logistic modelling.

The first set of variables analysed are the reputation proxies, namely issuer rating, onshore bond reputation, and bank age. Hypothesis 3 is not supported in terms of issuer rating, namely that issuer credit rating across the jurisdictions exhibits positive relationships with public markets Yankee and

Global Bonds. Therefore, the results do not support the findings of Arena (2011), Esho et al. (2001), Fuertes and Serena (2018), Kwan and Carleton (2010), and Tawatnuntachai and Yaman (2008). Australia does not exhibit any statistical significance for market choices and issuer credit rating. Canada exhibits a negative relationship between issuer credit rating and Eurobonds, Foreign Bonds, and Yankee Bonds, preferring to issue in onshore markets where brand name is strong and there are no offshore hedging costs. Europe has negative relationships with issuer credit rating and Global and Yankee Bonds. This indicates that improvements in credit quality result in greater likelihood of accessing Onshore Bond markets where funding costs are lower and brand recognition is stronger. SIBs are listed and have continuous disclosure rules on stock exchanges and are prudentially regulated. Banks issuing in offshore bond markets and not in local currency incur hedging costs to convert foreign currency bond issue proceeds back into local currency. This would impact Australian and Canadian banks who issue more in offshore markets and in foreign currencies. It could also impact European jurisdictions like United Kingdom banks and Swiss banks where they have not adopted the Euro currency.

As the onshore bond reputation increases Australia and Canada reduces the likelihood of non-public Eurobonds supporting Hypothesis 3, and Europe had reductions in both likelihoods of non-public and public offshore markets, not supporting Hypothesis 3. Bank age as a proxy for reputation is not significant for Europe. Australian bank age displays a significant negative relationship with Eurobonds and Foreign Bonds, and a significant positive relationship with public markets Yankee and Global Bonds. The Canadian bank relationships are positive with Yankee Bonds but negative for Global Bonds. The age findings for Australian banks support Hypothesis 3 and align with Diamond's (1984, 1989, 1991) notion that adverse selection lessens over time in line with a borrower's good reputation and the empirical findings of Arena (2011) and Johnson (1997).

Australian banks' unexpected future earnings are not significant, a result consistent with the cross-sectional OLS regressions of Krishnaswami et al. (1999) and logit regressions of Esho et al. (2001). Canadian banks display a negative significant relationship between unexpected future earnings and Global Bonds, consistent with Johnson (1997) who uses earnings growth volatility. European banks provide mixed support for Hypothesis 4 regarding a negative relationship between public bond markets and unexpected future earnings, as all offshore bond market choices are negatively significant. Australia and Canada report lower unexpected future earnings than European banks, which may explain some of the inconsistency in the results.

For increases in investment and growth opportunities measured by market value to book value under Hypothesis 4, expectations are for a negative relationship with public debt. Australian and Canadian banks support Hypothesis 4 with positive significant relationships between market value to book value and non-public Eurobonds. European banks also provide support for Hypothesis 4 with a negative

significant relationship with public Yankee Bonds. This supports the empirical evidence of Krishnaswami et al. (1999) and Johnson (1997).

The flotation cost hypothesis, namely that increases in flotation costs have a positive relationship with public bond markets, is proxied by two variables. The bond size proxy displays a negative relationship with non-public Eurobonds for Australia, Canada, and Europe; however, these jurisdictions also exhibit negative relationships with public Global and Yankee Bonds. This provides mixed support for Hypothesis 5 and previous research (Blackwell & Kidwell, 1988; Denis & Mihov, 2003; Esho et al., 2001; Johnson, 1997; Tawatnuntachai & Yaman, 2008). Fuertes and Serena (2018) find positive relationships for Global Bonds to Eurobonds for bond size and total assets; however, their findings are based on emerging market issuers. These types of issuers typically have lower credit ratings and higher asymmetric information than SIBs, which may help explain the inconsistency. The second proxy, total assets, yields mixed results for Australian and European banks regarding Hypothesis 5. However, Canada exhibits a decrease in likelihood of non-public Eurobonds and increases in public Yankee and Global Bonds, which supports Hypothesis 5 and the literature.

The United States bank regressions in *Table 9* are treated separately as there is no Yankee Bond choice. The United States Onshore Bond market is the SEC registered public market. An increase in bond tenor has a positive relationship with Eurobonds and supports the findings for both Australia and Europe. Although not explicitly tested it supports the market depth hypothesis that limits in onshore markets can motivate banks to issue in offshore markets to access greater bond maturity tenor (Mizen et al., 2012). Eurobonds, Foreign Bonds, and Global Bonds are more likely choices as United States issuer credit rating improves, while Foreign Bonds and Global Bonds are more likely choices when onshore bond reputation increases. This evidence tends to contradict Black and Munro (2010) but may support Serena and Munro (2016) and Hypothesis 3 if United States banks are constrained in their local market. It is possible that investors, particularly wholesale investors, are full or near full on credit limit as United States banks' credit rating data indicates a deterioration on average of over two notches since the GFC. Investment and growth opportunities proxied by market to book value indicate the likelihood of decreases in Global Bond and increases in Foreign Bond and provide mixed support for Hypothesis 4. Market volatility decreases the likelihood of all offshore choices, and United States banks prefer then to issue in the deep and liquid local United States public market. There could be other factors that motivate the United States banks. A potential motive could be arbitraging the cost of funds, and therefore maximising private and public market use (Rajan, 1992).

Considering the notable impacts to financial stability from bond market choices, it is simpler to analyse the net effect to the predicted probabilities for Onshore Bonds from the results in *Table 10*. Increases in bond sizes as part of the flotation cost hypothesis are positively related to financial stability with

predicted probabilities on Onshore Bonds for Australia of +30 percent, Canada +39 percent, Europe +12 percent, and decreases in Eurobonds of -51 percent, -26 percent, and -20 percent, respectively.

For increases in reputation, the economic impacts to financial stability are small: -1 to +3 percent for Australia with only age significant and meaningful and +12 percent for Canada explained by improvement in issuer credit rating. The United States improvements in reputation (including issuer credit rating and onshore bond reputation) are negative regarding financial stability, experiencing -15 percent and -18 percent predicted probability of issuing an Onshore Bond. Increases in bond tenor have a negative impact on financial stability for all jurisdictions, except Canada, as SIBs access the offshore Eurobond investor base. The United States exhibits a decreased predicted probability of Onshore Bonds selection of -19 percent.

Table 6 – Market Choice Results for Australian Systemically Important Banks Log Pseudolikelihood Regression (Equation 2 – Hypotheses 3 to 5)

Dependent variables Independent variables	**Eurobond**	**Foreign Bond**	**Global Bond**	**Yankee Bond**
SIZE	-0.9477***	-0.3982***	0.3513	-0.3428***
	(0.0640)	(0.0388)	(0.3370)	(0.1317)
TENOR	0.0807***	-0.0144	0.0557**	-0.1051*
	(0.0092)	(0.0247)	(0.0255)	(0.0628)
CALL	-0.9220***	-1.3190**	-1.1951	-0.8643***
	(0.3543)	(0.5705)	(0.8425)	(0.1656)
LIST	1.2849**	0.5265	2.1374***	0.8721***
	(0.5418)	(0.5000)	(0.2964)	(0.3297)
IRATING	0.0218	0.1975	0.5528	0.6097
	(0.1571)	(0.1707)	(0.3606)	(0.8329)
ONSBOND	-17.1502*	2.2691	12.0778	-2.7769
	(10.3943)	(11.1601)	(20.2832)	(22.3244)
AGE	-0.0079***	-0.0141***	0.0210*	0.0251***
	(0.0030)	(0.0042)	(0.0113)	(0.0036)
UFE	-9.9084	-6.8192	-7.1940	8.0215
	(8.0492)	(6.4878)	(21.5388)	(7.2480)
MVBV	3.8425***	12.6611***	-5.2064	-11.3073*
	(1.1785)	(2.0709)	(14.1954)	(5.9766)
TA	-0.6300*	0.8804***	-0.9108	-2.5536***
	(0.3589)	(0.2551)	(0.9324)	(0.3818)
VIX	-0.0007	-0.0073	-0.0998*	-0.0114
	(0.0020)	(0.0077)	(0.0543)	(0.0142)
LIQDB	-0.0107	0.0068	-0.1370***	-0.0147
	(0.0328)	(0.0303)	(0.0443)	(0.0757)
CPI	0.1486	-0.2239	0.0574	-0.1534
	(0.2289)	(0.1437)	(0.5599)	(0.6613)
Constant	24.2290***	-19.1055***	-3.6166	34.9057*
	(2.5557)	(1.4868)	(30.2778)	(18.4313)
Log pseudolikelihood	-3,624.51	-3,624.51	-3,624.51	-3,624.51
Pseudo R2	0.2473	0.2473	0.2473	0.2473
Observations	7,292	7,292	7,292	7,292

This table reports multinomial logistic regressions for Australian Systemically Important Banks. The dependent variables are bond market choices. The offshore market choices are Eurobond, Foreign Bond, Global Bond, and Yankee Bond. These are alternative choices to an Onshore Bond (base choice). Onshore Bonds are not reported in the table. SIZE is the logarithm of bond size in US Dollars, TENOR is the bond maturity tenor in years, CALL is a binary dummy variable for callable bonds, LIST is a binary dummy variable for listed bonds, IRATING is a dummy variable for Moody's long-term issuer credit rating, ONSBOND is the bond onshore reputation, AGE is the bank age in years from issue date of the market choice to the incorporation date of the bank issuer, UFE is unexpected future earnings calculated as bank forward earnings per share for next period less earnings per share for next period divided by current bank market share price, MVBV is the book value of banks' total assets less book value of total equity plus market value of total equity divided by total assets, TA is the logarithm of the book value of total assets, VIX is the Chicago Board Options Exchange's Volatility Index, LIQDB is a bank's liquid assets divided by book value of total deposits and borrowings, and CPI is the consumer price index of the bank's parent domiciled country. For a more detailed explanation of the variables refer to Table 21 in the appendix. Robust standard errors are clustered at the bank level in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 7 - Market Choice Results for Canadian Systemically Important Banks Log Pseudolikelihood Regression (Equation 2 – Hypotheses 3 to 5)

Dependent variables Independent variables	**Eurobond**	**Foreign Bond**	**Global Bond**	**Yankee Bond**
SIZE	-0.7157***	-0.1677	-0.6191***	-0.7564***
	(0.0539)	(0.2001)	(0.1304)	(0.2269)
TENOR	-0.0424	-0.0259	-0.0656***	-0.0994*
	(0.0523)	(0.0410)	(0.0201)	(0.0532)
CALL	-0.9156	-1.4632	0.1381	-0.7832
	(0.5886)	(1.2351)	(0.3350)	(0.7069)
LIST	2.2951***	2.0451**	1.2961*	-1.2294*
	(0.7257)	(0.8325)	(0.7468)	(0.6691)
IRATING	-0.4123***	-0.1094**	-0.0444	-0.7558***
	(0.1258)	(0.0439)	(0.1415)	(0.1916)
ONSBOND	-13.4209**	8.0000	-3.9539	10.0174
	(5.6301)	(8.6541)	(10.4926)	(18.8239)
AGE	0.0031	-0.0008	-0.0065***	0.0263***
	(0.0021)	(0.0026)	(0.0013)	(0.0031)
UFE	8.9248	-0.2706	-24.1983**	39.8302
	(15.2235)	(17.3693)	(10.1886)	(27.6514)
MVBV	10.7724*	13.1037***	8.9783***	-10.3344
	(5.7816)	(3.2165)	(1.8080)	(20.8225)
TA	-0.4928***	0.4833	2.5493***	2.6329***
	(0.1618)	(0.4662)	(0.4457)	(0.5673)
VIX	0.0280***	0.0151	0.0029	0.0172
	(0.0101)	(0.0160)	(0.0188)	(0.0266)
LIQDB	0.0237	0.0344	0.0190	-0.2070***
	(0.0151)	(0.0216)	(0.0157)	(0.0246)
CPI	-0.1308	0.2567*	-0.1794***	0.0699
	(0.1926)	(0.1324)	(0.0622)	(0.1158)
Constant	15.8130***	-18.4535***	-30.6099***	8.4771
	(5.2193)	(6.5484)	(7.4347)	(21.7836)
Log pseudolikelihood	-5,053.08	-5,053.08	-5,053.08	-5,053.08
Pseudo R2	0.2689	0.2689	0.2689	0.2689
Observations	4,998	4,998	4,998	4,998

This table reports multinomial logistic regressions for Canadian Systemically Important Banks. The dependent variables are bond market choices. The offshore market choices are Eurobond, Foreign Bond, Global Bond, and Yankee Bond. These are alternative choices to an Onshore Bond (base choice). Onshore Bonds are not reported in the table. SIZE is the logarithm of bond size in US Dollars, TENOR is the bond maturity tenor in years, CALL is a binary dummy variable for callable bonds, LIST is a binary dummy variable for listed bonds, IRATING is a dummy variable for Moody's long-term issuer credit rating, ONSBOND is the bond onshore reputation, AGE is the bank age in years from issue date of the market choice to the incorporation date of the bank issuer, UFE is unexpected future earnings calculated as bank forward earnings per share for next period less earnings per share for next period divided by current bank market share price, MVBV is the book value of banks' total assets less book value of total equity plus market value of total equity divided by total assets, TA is the logarithm of the book value of total assets, VIX is the Chicago Board Options Exchange's Volatility Index, LIQDB is a bank's liquid assets divided by book value of total deposits and borrowings, and CPI is the consumer price index of the bank's parent domiciled country. For a more detailed explanation of the variables refer to Table 21 in the appendix. Robust standard errors are clustered at the bank level in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 8 - Market Choice Results for European Systemically Important Banks
Log Pseudolikelihood Regression (Equation 2 – Hypotheses 3 to 5)

Dependent variables Independent variables	**Eurobond**	**Foreign Bond**	**Global Bond**	**Yankee Bond**
SIZE	-0.4218***	-0.0405	-0.3440**	-0.4492***
	(0.1177)	(0.1167)	(0.1654)	(0.1568)
TENOR	0.0463*	-0.0216	-0.0832**	-0.0573
	(0.0261)	(0.0291)	(0.0410)	(0.0487)
CALL	0.9027***	0.1537	1.7767***	1.5838***
	(0.1948)	(0.2682)	(0.3998)	(0.3180)
LIST	-0.4233	0.4295	-1.7491***	-2.6781***
	(0.4956)	(0.5613)	(0.6063)	(0.5479)
IRATING	-0.1204	0.1182	-0.3512***	-0.5720***
	(0.1296)	(0.1085)	(0.1324)	(0.1483)
ONSBOND	-2.7990	-14.8350*	-10.3270*	-10.6959***
	(2.1605)	(8.3156)	(5.4440)	(1910)
AGE	-0.0074	-0.0012	0.0097	-0.0005
	(0.0066)	(0.0108)	(0.0116)	(0.0057)
UFE	-0.1378***	-0.1773***	-0.3107***	-0.3485***
	(0.0412)	(0.0575)	(0.1083)	(0.0544)
MVBV	5.8120	-10.3262	-6.9610	-25.6806**
	(8.1972)	(6.8378)	(12.1628)	(10.2451)
TA	0.1808	0.1783	2.2010***	-1.1508*
	(0.6115)	(0.5586)	(0.5925)	(0.5872)
VIX	-0.0073	-0.0130	-0.0201**	-0.0091
	(0.0101)	(0.0088)	(0.0098)	(0.0162)
LIQDB	0.0060	0.0025	-0.0048	0.0089
	(0.0074)	(0.0147)	(0.0125)	(0.0084)
CPI	0.1255	0.0283	0.0226	0.2366
	(0.1029)	(0.1922)	(0.3320)	(0.1618)
Constant	3.7897	6.6477	-11.6041	59.5856***
	(16.6341)	(12.7783)	(16.6389)	(16.9437)
Log pseudolikelihood	-47,898.06	-47,898.06	-47,898.06	-47,898.06
Pseudo R2	0.1791	0.1791	0.1791	0.1791
Observations	63,730	63,730	63,730	63,730

This table reports multinomial logistic regressions for European Systemically Important Banks. The dependent variables are bond market choices. The offshore market choices are Eurobond, Foreign Bond, Global Bond, and Yankee Bond. These are alternative choices to an Onshore Bond (base choice). Onshore Bonds are not reported in the table. SIZE is the logarithm of bond size in US Dollars, TENOR is the bond maturity tenor in years, CALL is a binary dummy variable for callable bonds, LIST is a binary dummy variable for listed bonds, IRATING is a dummy variable for Moody's long-term issuer credit rating, ONSBOND is the bond onshore reputation, AGE is the bank age in years from issue date of the market choice to the incorporation date of the bank issuer, UFE is unexpected future earnings calculated as bank forward earnings per share for next period less earnings per share for next period divided by current bank market share price, MVBV is the book value of banks' total assets less book value of total equity plus market value of total equity divided by total assets, TA is the logarithm of the book value of total assets, VIX is the Chicago Board Options Exchange's Volatility Index, LIQDB is a bank's liquid assets divided by book value of total deposits and borrowings, and CPI is the consumer price index of the bank's parent domiciled country. For a more detailed explanation of the variables refer to Table 21 in the appendix. Robust standard errors are clustered at the bank level in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 9 - Market Choice Results for United States Systemically Important Banks Log Pseudolikelihood Regression (Equation 2 – Hypotheses 3 to 5)

Dependent variables Independent variables	**Eurobond**	**Foreign Bond**	**Global Bond**
SIZE	-0.0746	0.4053**	0.0531
	(0.0702)	(0.1613)	(0.0606)
TENOR	0.1196***	0.0270	0.0166
	(0.0080)	(0.0215)	(0.0248)
CALL	-1.8616***	-2.4194***	-0.5831*
	(0.3863)	(0.3090)	(0.3335)
LIST	0.6384*	1.2682**	0.3577
	(0.3718)	(0.5686)	(0.2469)
IRATING	0.2213**	0.3639***	0.3427***
	(0.0970)	(0.0670)	(0.0803)
ONSBOND	9.5336	20.4729***	25.4361**
	(8.5680)	(6.6319)	(12.2337)
AGE	-0.0080	-0.0115	-0.0098
	(0.0117)	(0.0127)	(0.0110)
UFE	-3.8696	-12.6940*	-3.9759
	(6.6957)	(6.7147)	(4.6310)
MVBV	-7.7082	6.2943**	-13.7310***
	(6.3875)	(2.9377)	(3.3556)
TA	1.1457	1.8707***	1.6624
	(0.7900)	(0.5781)	(1.0608)
VIX	-0.0124***	-0.0360**	-0.0220***
	(0.0028)	(0.0173)	(0.0076)
LIQDB	-0.0023	0.0026	-0.0014
	(0.0034)	(0.0026)	(0.0011)
CPI	-0.0399	0.2392	-0.2623**
	(0.1021)	(0.1953)	(0.1171)
Constant	-9.7676	-48.4982***	-15.2454
	(16.5080)	(12.2300)	(12.5825)
Log pseudolikelihood	-18,305.19	-18,305.19	-18,305.19
Pseudo R2	0.1461	0.1461	0.1461
Observations	18,825	18,825	18,825

This table reports multinomial logistic regressions for United States Systemically Important Banks. The dependent variables are bond market choices. The offshore market choices are Eurobond, Foreign Bond, and Global Bond. These are alternative choices to an Onshore Bond (base choice). Onshore Bonds are not reported in the table. SIZE is the logarithm of bond size in US Dollars, TENOR is the bond maturity tenor in years, CALL is a binary dummy variable for callable bonds, LIST is a binary dummy variable for listed bonds, IRATING is a dummy variable for Moody's long-term issuer credit rating, ONSBOND is the bond onshore reputation, AGE is the bank age in years from issue date of the market choice to the incorporation date of the bank issuer, UFE is unexpected future earnings calculated as bank forward earnings per share for next period less earnings per share for next period divided by current bank market share price, MVBV is the book value of banks' total assets less book value of total equity plus market value of total equity divided by total assets, TA is the logarithm of the book value of total assets, VIX is the Chicago Board Options Exchange's Volatility Index, LIQDB is a bank's liquid assets divided by book value of total deposits and borrowings, and CPI is the consumer price index of the bank's parent domiciled country. For a more detailed explanation of the variables refer to Table 21 in the appendix. Robust standard errors are clustered at the bank level in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 10 – Market Choice Predictive Probabilities for Australia (from Table 6), Canada (from Table 7), Europe (from Table 8), and the United States (from Table 9)

		Eurobond	Foreign Bond	Global Bond	Onshore Bond	Yankee Bond
Australia	IRATING	-4%	2%	1%	-1%	2%
	ONSBOND	-10%	6%	1%	3%	0%
	AGE	-2%	-5%	1%	3%	3%
	UFE	-3%	1%	0%	2%	1%
	TENOR	16%	-10%	0%	-5%	-2%
	MVBV	-2%	7%	-1%	-2%	-2%
	SIZE	-51%	16%	3%	30%	3%
	TA	-11%	16%	0%	4%	-9%
Canada	IRATING	-22%	2%	30%	12%	-22%
	ONSBOND	-10%	2%	1%	2%	6%
	AGE	5%	0%	-26%	-2%	23%
	UFE	8%	0%	-18%	0%	10%
	TENOR	3%	1%	-4%	5%	-5%
	MVBV	7%	1%	3%	-3%	-8%
	SIZE	-26%	8%	-10%	39%	-11%
	TA	-62%	1%	45%	-7%	23%
Europe	IRATING	5%	6%	-7%	4%	-8%
	ONSBOND	10%	-6%	-5%	5%	-3%
	AGE	-21%	3%	11%	5%	2%
	UFE	5%	-1%	-4%	4%	-3%
	TENOR	17%	-4%	-8%	-3%	-3%
	MVBV	19%	-6%	-5%	-2%	-7%
	SIZE	-20%	8%	0%	12%	-1%
	TA	0%	0%	19%	-3%	-16%
United States	IRATING	0%	1%	14%	-15%	
	ONSBOND	-13%	1%	30%	-18%	
	AGE	-4%	-1%	-10%	15%	
	UFE	-2%	-3%	-2%	7%	
	TENOR	44%	-1%	-23%	-19%	
	MVBV	-1%	4%	-22%	19%	
	SIZE	-14%	6%	9%	0%	
	TA	8%	3%	30%	-40%	

These tables report the predictive probabilities of bond market choices Eurobond, Foreign Bond, Global Bond, Yankee Bond, and Onshore Bond implied by the multinomial logistic regressions from Tables 6, 7, 8, and 9, respectively. The change in probability is calculated from the 5th to the 95th percentile of the independent variables. The sum of each of the independent variables' predicted probabilities in each row equals zero, subject to rounding. IRATING is a dummy variable for Moody's long-term issuer credit rating, ONSBOND is the bond onshore reputation, AGE is the bank age in years from issue date of the market choice to the incorporation date of the bank issuer, UFE is unexpected future earnings calculated as bank forward earnings per share for next period less earnings per share for next period divided by current bank market share price, TENOR is the bond maturity tenor calculated in years, MVBV is the book value of banks' total assets less book value of total equity plus market value of total equity divided by total assets, SIZE is the logarithm of bond size in US Dollars, and TA is the logarithm of the book value of total assets. For a more detailed explanation of the variables refer to Table 21 in the appendix.

3.4 Robustness checks

The first robustness check utilises multinomial probit regressions that relax the IIA assumption. Multinomial probit regressions and predictive probability results in *Tables 12 to 18* in the appendix indicate no material differences to the results in *Tables 4 to 10* regarding multinomial logistic regressions and predictive probabilities. Gomes and Phillips (2012) note that for practical purposes multinomial probit is not possible due to its computational intensity, something this paper is able to overcome.

The second robustness check in *Tables 19 to 20* substitutes independent variables to reinforce the stability of the models. The Australian banks are used because this jurisdiction has the highest retrieval of bond credit rating, and Black and Munro (2010) identify bond rating as promblematic. Bond credit rating (BRATING) substitutes for issuer credit rating, with a significant decrease in the sample size to 2,339 from the original 7,292 market choices. Offshore bond reputation (OFFBOND) substitutes for onshore bond reputation, and the results support Tawatnuntachai and Yaman (2008) with increased predicted probability in Global Bonds due to an increase in offshore bond reputation and bond size. Return on average equity (ROAE), calculated as a bank's net income divided by average total equity, replaces reputation proxy bank age in the expectation that older firms will have a more established business and higher profitability, reflects a stronger credit rating. SIBs' return on average equity reduces significantly following the GFC. Australian return on average equity appears to tell us more than bank age, as an increase in return on average equity decreases the likelihood of Eurobonds and Foreign Bond choices and increases the likelihood of a Yankee Bond choice, all at the one percent significance level, and are supportive of the reputation hypothesis. Future abnormal earnings (FAE) substitutes for unexpected future earnings (Barclay & Smith, 1995; Krishnaswami et al., 1999). The logarithm of the book value of total equity (TE) replaces book value of total assets. MOVE replaces VIX as per Serena and Moreno (2016).

A binary dummy variable for underwritten agent bonds (UNDERWA) is substituted for callable bonds. Underwriting costs are considered a flotation cost, with underwritten bonds requiring more fixed costs than a direct or private placement bond and reducing asymmetric information between issuers and investors. The global liquidity indicator (GLIQ) from the Bank of International Settlements replaces the consumer price index. Lastly, to control for the cost of capital in the second robustness check between onshore and offshore markets, an interest rate differential variable (INTDIFF) is added to the regression. It calculates the spread between Australian dollar and US Dollar markets. US Dollar yields are selected because US Dollar denominated bonds are the dominant offshore currency of issue and two of the offshore choices are United States markets. A higher spread indicates a lower cost of credit in US Dollar denominated issue markets relative to the onshore Australian dollar market. The results are statistically significant and negative for non-public

Eurobonds and positive for public Global Bonds, which is consistent with expectations that SIBs access public bond markets more than non-public bond markets when credit spread is lower. This does not alter the results of the model. The results in *Tables 19 and 20* are consistent with the original results in *Tables 6 and 10*. Overall, these robustness checks indicates validity in the original models.

4. Concluding remarks

There is a vast literature on corporate finance decisions regarding private bank loans, non-private debt, and public debt (including Yankee and Global Bonds), focusing on emerging markets and United States non-financial firms. To the best of the author's knowledge, no research to date examines the bond market choices for SIBs from developed economies. This paper attempts to fill this research gap. The sample for this paper is based on a selection of active debt capital market borrowers that are global and domestic SIBs. The final sample comprises twenty-one banks covering nine countries including France, Germany, Spain, Switzerland, Sweden, United Kingdom, United States, Canada, and Australia with a total sample size of 96,694. The sample period covers 1999–2019, spanning eight years before the GFC and eleven years after the GFC (excluding the COVID-19 pandemic). Multinomial logistic regression is employed to determine the log likelihood of statistical relationships between bond market choices and agency costs, reputation, and flotation costs. From the results, the predicted probabilities are computed from the 5th to 95th percentiles.

The ability to choose offshore compared to onshore markets can have financial stability implications. Most notable is a benefit to financial stability due to the positive relationship with bond size and onshore funding for Australia and Canada. However, this must be tempered with a tendency of some jurisdictions (including Australia) to access longer bond maturity tenors in offshore markets, which is positive for funding and liquidity risk, but negative for financial stability. For United States banks, stronger issuer credit rating and onshore bond reputation results in a negative outcome for financial stability.

Regulators could consider initiatives to improve onshore markets for Australia and Canada to better align with Europe and the United States. In Australia there are impediments to the development of the onshore bond market. For the Australian fixed income asset class there is an overallocation in superannuation and portfolios to equities that receive favourable tax treatment for investors. There is not a deep retail corporate bond market. Regulation changes to make it easier and less costly for issuers to access the retail market and tax incentives for resident investors to hold fixed income assets in their portfolios would be beneficial. Changes in Australia could also attract offshore capital into the Australian bond market. These initiatives would benefit market participants (including banks) with greater product and market liquidity, and in turn financial stability.

A limitation of this paper is that Asian developed countries, specifically China, South Korea, Singapore, and Japan are not included. China has the four largest banks in the world by total assets. Japan has four SIBs in the top twenty largest banks. For future research there are two ways these excluded countries and their respective SIBs can be included. Researchers could wait until these excluded banks become active issuers in all five bond markets; however, this is not a certainty. Alternatively, the five bond market choices could be reduced to three: Eurobond, Foreign Bond, and Onshore Bond. The alternative option however does not include public markets but rather non-public markets. A second limitation is the paper does not consider other factors that can impact offshore market choices. This could include risk management where banks issue in offshore currencies as a natural hedge to offshore branch asset exposures.

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5. Appendix

Table 11 – Correlation Matrix of the Sample Bank Independent Variables

	SIZE	TENOR	CALL	LIST	IRATING	ONSREP	AGE	UFE	MVBV	TA	VIX	LIQDB	CPI
SIZE	1.0000												
TENOR	0.0438	1.0000											
CALL	-0.0212	0.3751	1.0000										
LIST	0.3377	0.2263	0.0513	1.0000									
IRATING	-0.0004	-0.0140	-0.0234	-0.1256	1.0000								
ONSBOND	0.0954	0.0085	-0.0207	0.0360	-0.4581	1.0000							
AGE	0.0606	-0.1005	-0.0170	0.0596	-0.2770	0.1356	1.0000						
UFE	0.0423	0.0201	-0.0080	-0.0140	0.1208	0.1203	-0.0594	1.0000					
MVBV	0.0924	0.0597	0.0484	-0.1684	0.4769	-0.1287	-0.1229	0.1707	1.0000				
TA	-0.0406	-0.0254	-0.0382	0.1946	-0.2113	-0.0087	-0.0352	-0.1337	-0.6842	1.0000			
VIX	0.0313	-0.0296	-0.0795	-0.0765	0.2592	-0.0005	-0.1248	0.0763	0.2076	-0.2213	1.0000		
LIQDB	-0.1002	0.0049	-0.0184	0.0055	-0.3061	0.0858	0.2535	0.0250	-0.3411	0.1651	-0.0966	1.0000	
CPI	0.0209	0.0099	0.0018	-0.0029	0.1611	-0.0618	-0.1085	0.0096	0.1281	-0.0058	0.0387	-0.0759	1.0000

This table reports the correlation matrix of independent variables for the twenty-one Systemically Important Banks selected. Observations total 94,852. SIZE is the logarithm of bond size in US Dollars, TENOR is the bond tenor from issue date to maturity date in years. CALL is a binary dummy variable for callable bonds, LIST is a binary dummy variable for listed bonds, IRATING is a dummy variable for Moody's long-term issuer credit rating, ONSBOND is the bond onshore reputation, AGE is the bank age in years from incorporation date of the bank issuer to the bond market choice issue date, UFE is unexpected future earnings calculated as bank forward earnings per share for next period less earnings per share for next period divided by current bank market share price, MVBV is the book value of banks' total assets less book value of total equity plus market value of total equity divided by total assets, TA is the logarithm of the book value of total assets, VIX is the Chicago Board Options Exchange's Volatility Index, LIQDB is a bank's liquid assets divided by book value of total deposits and borrowings, and CPI is the consumer price index of each country of parent bank. For a more detailed explanation of the variables refer to Table 21 in the appendix. The independent variables are winsorised at 1 percent and 99 percent levels.

Table 12 - Market Choice Results for Australian, Canadian, and European Systemically Important Banks Log Pseudolikelihood Regression (Robustness Check #1)

Regression 6

Dependent variable	**Eurobond**	**Foreign Bond**	**Global Bond**	**Yankee Bond**
Independent variables				
SIZE	-0.3733***	-0.1217*	-0.1935**	-0.2525***
	(0.0717)	(0.0677)	(0.0828)	(0.0866)
TENOR	0.0449***	-0.0109	-0.0557***	-0.0304
	(0.0143)	(0.0117)	(0.0210)	(0.0195)
CALL	0.3033**	-0.0912	0.9493***	0.7382***
	(0.1247)	(0.2214)	(0.2290)	(0.1839)
LIST	-0.1664	0.2389	-0.5596*	-1.2815***
	(0.2767)	(0.3014)	(0.3112)	(0.2948)
UNDERW	-0.5282**	-0.6511**	1.7197***	1.3986***
	(0.2415)	(0.2611)	(0.3798)	(0.3818)
GSIB	-0.3331	-0.5557	0.4330	-0.6019
	(0.3880)	(0.4342)	(0.4761)	(0.4757)
GFC	0.6872***	0.3516	-1.1660***	-0.3538
	(0.1349)	(0.3587)	(0.3147)	(0.2979)
VIX	-0.0056	-0.0057*	-0.0141***	-0.0021
	(0.0045)	(0.0033)	(0.0048)	(0.0059)
GDPPC	0.0000**	0.0000*	0.0000	0.0001***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Constant	7.0210***	1.0101	2.2083	0.6392
	(1.1398)	(1.7787)	(1.7509)	(1.5624)
Log pseudolikelihood	-59,059.37	-59,059.37	-59,059.37	-59,059.37
Observations	76,417	76,417	76,417	76,417

This table reports multinomial probit regression and relaxes the independence of irrelevant alternatives (IIA) assumption for the combined Australian, Canadian, and European Systemically Important Banks as a robustness check. The dependent variables are bond market choices. The offshore market choices are Eurobond, Foreign Bond, Global Bond, and Yankee Bond. These are alternative choices to an Onshore Bond (base choice). Onshore Bonds are not reported in the table. United States banks are excluded as the Yankee Bond choice is their Onshore Bond and therefore only contain four choices. SIZE is the logarithm of bond size in US Dollars, TENOR is the bond maturity tenor in years, CALL is a binary dummy variable for callable bonds, LIST is a binary dummy variable for listed bonds, UNDERW is a binary dummy variable for underwritten bonds, GSIB is a binary dummy variable for global systemically important banks, GFC is a binary dummy variable for the period before 1 January 2009, VIX is the Chicago Board Options Exchange's Volatility Index, GDPPC is gross domestic product per capita of the bank's parent domiciled country. For a more detailed explanation of the variables refer to Table 21 in the appendix. Robust standard errors are clustered at bank level in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 13 - Market Choice Predictive Probabilities Results for Australian, Canadian, and European Systemically Important Banks – from Table 12 (Robustness Check #1)

	Eurobond	**Foreign Bond**	**Global Bond**	**Onshore Bond**	**Yankee Bond**
SIZE	-29%	7%	3%	19%	0%
TENOR	19%	-4%	-9%	-3%	-4%
CALL	-3%	-3%	7%	-3%	2%
LIST	1%	5%	-3%	2%	-5%
UNDERW	-15%	-4%	11%	3%	5%
GSIB	-3%	-3%	6%	3%	-3%
GFC	22%	0%	-14%	-4%	-4%
VIX	0%	0%	-3%	2%	1%
GDPPC	4%	5%	-10%	-10%	11%

This table reports the predictive probabilities at a confidence interval of 95 percent for the bond market choices Eurobond, Foreign Bond, Global Bond, Onshore Bond, and Yankee Bond implied by the multinomial probit regression from Table 12. The change in probability is calculated from the 5th to the 95th percentile of the independent variables. The sum of each of the independent variables' predicted probabilities in each row equals zero, subject to rounding. SIZE is the logarithm of bond size in US Dollars, TENOR is the bond maturity tenor in years, CALL is a binary dummy variable for callable bonds, LIST is a binary dummy variable for listed bonds, UNDERW is a binary dummy variable for underwritten bonds, GSIB is a binary dummy variable for global systemically important banks, GFC is a binary dummy variable for the period before 1 January 2009, VIX is the Chicago Board Options Exchange's Volatility Index, and GDPPC is gross domestic product per capita of the bank's parent domiciled country. For a more detailed explanation of the variables refer to Table 21 in the appendix.

Table 14 - Market Choice Regression Results for Australian Systemically Important Banks Log Pseudolikelihood Regression (Robustness Check #1)

Regression 7

Dependent variables Independent variables	**Eurobond**	**Foreign Bond**	**Global Bond**	**Yankee Bond**
SIZE	-0.6621***	-0.2349***	0.1255	-0.2789***
	(0.0330)	(0.0107)	(0.2167)	(0.0779)
TENOR	0.0578***	-0.0121	0.0300	-0.0339
	(0.0082)	(0.0151)	(0.0247)	(0.0278)
CALL	-0.5386**	-0.7194*	-0.6388	-0.5209***
	(0.2660)	(0.3785)	(0.6234)	(0.1375)
LIST	0.8819**	0.3704	1.1429***	0.6409***
	(0.3575)	(0.3253)	(0.1409)	(0.1937)
IRATING	0.0091	0.0867	0.3030	0.4081
	(0.1177)	(0.1149)	(0.2110)	(0.3838)
ONSBOND	-11.9491*	1.6898	3.9904	-3.0184
	(6.3399)	(6.4403)	(11.3064)	(9.7790)
AGE	-0.0057***	-0.0089***	0.0093	0.0115***
	(0.0013)	(0.0022)	(0.0061)	(0.0030)
UFE	-6.3965	-4.8468	-0.3884	4.7837
	(6.3050)	(4.2342)	(11.7398)	(6.0933)
MVBV	2.2530***	9.2834***	-4.9056	-7.3437*
	(0.4418)	(1.6286)	(5.0685)	(4.2087)
TA	-0.4983**	0.5809***	-0.5733	-1.4333***
	(0.2409)	(0.1400)	(0.3512)	(0.1799)
VIX	0.0004	-0.0025	-0.0447	-0.0068
	(0.0010)	(0.0041)	(0.0326)	(0.0076)
LIQDB	-0.0071	0.0058	-0.0726**	-0.0133
	(0.0249)	(0.0218)	(0.0307)	(0.0211)
CPI	0.0805	-0.1579*	0.0822	-0.1548
	(0.1699)	(0.0892)	(0.2574)	(0.3889)
Constant	18.3431***	-13.4085***	2.7600	21.3976**
	(0.8027)	(2.2029)	(12.1039)	(10.8830)
Log pseudolikelihood	-3,624.99	-3,624.99	-3,624.99	-3,624.99
Observations	7,292	7,292	7,292	7,292

This table reports multinomial probit regression and relaxes the independence of irrelevant alternatives (IIA) assumption for Australian Systemically Important Banks as a robustness check. The dependent variables are bond market choices. The offshore market choices are Eurobond, Foreign Bond, Global Bond, and Yankee Bond. These are alternative choices to an Onshore Bond (base choice). Onshore Bonds are not reported in the table. SIZE is the logarithm of bond size in US Dollars, TENOR is the bond maturity tenor in years, CALL is a binary dummy variable for callable bonds, LIST is a binary dummy variable for listed bonds, IRATING is a dummy variable for Moody's long-term issuer credit rating, ONSBOND is the bond onshore reputation, AGE is the bank age in years from issue date of the market choice to the incorporation date of the bank issuer, UFE is unexpected future earnings calculated as bank forward earnings per share for next period less earnings per share for next period divided by current bank market share price, MVBV is the book value of banks' total assets less book value of total equity plus market value of total equity divided by total assets, TA is the logarithm of the book value of total assets, VIX is the Chicago Board Options Exchange's Volatility Index, LIQDB is a bank's liquid assets divided by book value of total deposits and borrowings, LIQDB is a bank's liquid assets divided by book value of total deposits and borrowings, and CPI is the consumer price index of the bank's parent domiciled country. For a more detailed explanation of the variables refer to Table 21 in the appendix. Robust standard errors are clustered at the bank level in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 15 - Market Choice Regression Results for Canadian Systemically Important Banks
Log Pseudolikelihood Regression (Robustness Check #1)

Regression 8

Dependent variables	**Eurobond**	**Foreign Bond**	**Global Bond**	**Yankee Bond**
Independent variables				
SIZE	-0.4539***	-0.0950	-0.3737***	-0.4607***
	(0.0545)	(0.1227)	(0.0967)	(0.1577)
TENOR	-0.0292	-0.0275	-0.0512***	-0.0528*
	(0.0358)	(0.0204)	(0.0164)	(0.0280)
CALL	-0.6109*	-0.7523	0.2060	-0.4964
	(0.3679)	(0.5514)	(0.2090)	(0.4749)
LIST	1.5595***	1.1947**	0.7485	-0.6621
	(0.5827)	(0.5137)	(0.6131)	(0.4694)
IRATING	-0.2718***	-0.0934***	-0.0038	-0.4782***
	(0.0907)	(0.0308)	(0.1006)	(0.1285)
ONSBOND	-6.9890*	6.2722	1.8182	5.6565
	(4.1753)	(5.5535)	(7.7639)	(11.8272)
AGE	0.0014	0.0001	-0.0059***	0.0153***
	(0.0019)	(0.0021)	(0.0008)	(0.0017)
UFE	5.4041	-2.1923	-21.1785***	21.3606
	(10.2840)	(10.9836)	(6.1938)	(18.8075)
MVBV	9.6415**	7.7013***	8.2288***	-6.5776
	(4.2729)	(1.7188)	(1.2721)	(13.4936)
TA	-0.4439***	0.3746	1.8132***	1.5341***
	(0.1332)	(0.2722)	(0.2908)	(0.3345)
VIX	0.0198***	0.0093	-0.0028	0.0094
	(0.0074)	(0.0111)	(0.0127)	(0.0176)
LIQDB	0.0183**	0.0180	0.0138	-0.1236***
	(0.0086)	(0.0114)	(0.0107)	(0.0103)
CPI	-0.1341	0.1038	-0.1817***	0.0411
	(0.1350)	(0.0661)	(0.0484)	(0.0801)
Constant	8.8932**	-11.5559***	-25.3908***	6.8022
	(3.6686)	(4.2725)	(4.5248)	(13.5110)
Log pseudolikelihood	-5,113.27	-5,113.27	-5,113.27	-5,113.27
Observations	4,998	4,998	4,998	4,998

This table reports multinomial probit regression and relaxes the independence of irrelevant alternatives (IIA) assumption for Canadian Systemically Important Banks as a robustness check. The dependent variables are market choices. The offshore market choices are Eurobond, Foreign Bond, Global Bond, and Yankee Bond. These are alternative choices to an Onshore Bond (base choice). Onshore Bonds are not reported in the table. SIZE is the logarithm of bond size in US Dollars, TENOR is the bond maturity tenor in years, CALL is a binary dummy variable for callable bonds, LIST is a binary dummy variable for listed bonds, IRATING is a dummy variable for Moody's long-term issuer credit rating, ONSBOND is the bond onshore reputation, AGE is the bank age in years from issue date of the market choice to the incorporation date of the bank issuer, UFE is unexpected future earnings calculated as bank forward earnings per share for next period less earnings per share for next period divided by current bank market share price, MVBV is the book value of banks' total assets less book value of total equity plus market value of total equity divided by total assets, TA is the logarithm of the book value of total assets, VIX is the Chicago Board Options Exchange's Volatility Index, LIQDB is a bank's liquid assets divided by book value of total deposits and borrowings, and CPI is the consumer price index of the bank's parent domiciled country. For a more detailed explanation of the variables refer to Table 21 in the appendix. Robust standard errors are clustered at the bank level in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 16 - Market Choice Results for European Systemically Important Banks Log Pseudolikelihood Regression (Robustness Check #1)

	Regression 9			
Dependent variables	**Eurobond**	**Foreign Bond**	**Global Bond**	**Yankee Bond**
Independent variables				
SIZE	-0.3126***	-0.0280	-0.1898**	-0.2901***
	(0.0776)	(0.0633)	(0.0964)	(0.0916)
TENOR	0.0370**	-0.0152	-0.0514**	-0.0290
	(0.0155)	(0.0159)	(0.0216)	(0.0275)
CALL	0.5528***	0.1336	1.1198***	1.0234***
	(0.1032)	(0.1560)	(0.2589)	(0.1590)
LIST	-0.2550	0.2333	-1.0560***	-1.4136***
	(0.3041)	(0.3127)	(0.3786)	(0.2761)
IRATING	-0.0679	0.0685	-0.2178**	-0.3387***
	(0.0907)	(0.0717)	(0.0849)	(0.0840)
ONSBOND	-1.5363	-7.4127**	-6.3505*	-6.6737***
	(1.4677)	(3.6647)	(3.3620)	(1.7168)
AGE	-0.0051	-0.0002	0.0056	-0.0008
	(0.0038)	(0.0064)	(0.0069)	(0.0034)
UFE	-0.0793***	-0.1300***	-0.2101***	-0.2161***
	(0.0278)	(0.0405)	(0.0719)	(0.0340)
MVBV	4.8870	-6.0638	-3.0249	-14.1216**
	(5.9556)	(4.0573)	(7.0395)	(7.0393)
TA	0.0558	0.1021	1.1591***	-0.6783*
	(0.3944)	(0.3403)	(0.4295)	(0.3539)
VIX	-0.0052	-0.0075	-0.0107	-0.0060
	(0.0067)	(0.0061)	(0.0068)	(0.0092)
LIQDB	0.0040	0.0014	-0.0051	0.0054
	(0.0045)	(0.0087)	(0.0078)	(0.0049)
CPI	0.0868	0.0216	0.0293	0.1307
	(0.0695)	(0.1275)	(0.1981)	(0.0991)
Constant	2.8884	3.9701	-5.7380	34.6743***
	(11.4507)	(8.1801)	(9.9385)	(11.1817)
Log pseudolikelihood	-48,161.96	-48,161.96	-48,161.96	-48,161.96
Observations	63,730	63,730	63,730	63,730

This table reports multinomial probit regression and relaxes the independence of irrelevant alternatives (IIA) assumption for European Systemically Important Banks as a robustness check. The dependent variables are bond market choices. The offshore market choices are Eurobond, Foreign Bond, Global Bond, and Yankee Bond. These are alternative choices to an Onshore Bond (base choice). Onshore Bonds are not reported in the table. SIZE is the logarithm of bond size in US Dollars, TENOR is the bond maturity tenor in years, CALL is a binary dummy variable for callable bonds, LIST is a binary dummy variable for listed bonds, IRATING is a dummy variable for Moody's long-term issuer credit rating, ONSBOND is the bond onshore reputation, AGE is the bank age in years from issue date of the market choice to the incorporation date of the bank issuer, UFE is unexpected future earnings calculated as bank forward earnings per share for next period less earnings per share for next period divided by current bank market share price, MVBV is the book value of banks' total assets less book value of total equity plus market value of total equity divided by total assets, TA is the logarithm of the book value of total assets, VIX is the Chicago Board Options Exchange's Volatility Index, LIQDB is a bank's liquid assets divided by book value of total deposits and borrowings, and CPI is the consumer price index of the bank's parent domiciled country. For a more detailed explanation of the variables refer to Table 21 in the appendix. Robust standard errors are clustered at the bank level in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 17 - Market Choice Results for United States Systemically Important Banks Log Pseudolikelihood Regression (Robustness Check #1)

	Regression 10		
Dependent variables	**Eurobond**	**Foreign Bond**	**Global Bond**
Independent variables			
SIZE	-0.0643	0.2366***	0.0476
	(0.0526)	(0.0841)	(0.0392)
TENOR	0.0840***	0.0121	0.0028
	(0.0074)	(0.0102)	(0.0164)
CALL	-1.3656***	-1.3832***	-0.3788*
	(0.2397)	(0.1906)	(0.2109)
LIST	0.4758**	0.7963***	0.2526*
	(0.2376)	(0.2716)	(0.1458)
IRATING	0.1508**	0.2334***	0.2439***
	(0.0752)	(0.0456)	(0.0593)
ONSBOND	8.2229	15.1993***	19.5596**
	(6.2771)	(5.2281)	(9.4122)
AGE	-0.0052	-0.0066	-0.0061
	(0.0081)	(0.0074)	(0.0071)
UFE	-2.9579	-7.7345**	-3.3329
	(4.3560)	(3.6683)	(2.6496)
MVBV	-6.0839	2.1046	-10.0746***
	(4.9446)	(1.8774)	(2.0900)
TA	0.9255	1.3165***	1.2429*
	(0.5830)	(0.4230)	(0.7236)
VIX	-0.0088***	-0.0215**	-0.0163***
	(0.0029)	(0.0086)	(0.0057)
LIQDB	-0.0019	0.0011	-0.0014**
	(0.0026)	(0.0014)	(0.0007)
CPI	-0.0153	0.0985	-0.1926**
	(0.0772)	(0.1040)	(0.0845)
Constant	-7.6373	-30.2723***	-11.5760
	(12.3229)	(8.0290)	(8.8617)
Log pseudolikelihood	-18,327.44	-18,327.44	-18,327.44
Observations	18,825	18,825	18,825

This table reports multinomial probit regression and relaxes the independence of irrelevant alternatives (IIA) assumption for United States Systemically Important Banks as a robustness check. The dependent variables are bond market choices. The offshore market choices are Eurobond, Foreign Bond, and Global Bond. These are alternative choices to an Onshore Bond (base choice). Onshore Bonds are not reported in the table. SIZE is the logarithm of bond size in US Dollars, TENOR is the bond maturity tenor in years, CALL is a binary dummy variable for callable bonds, LIST is a binary dummy variable for listed bonds, IRATING is a dummy variable for Moody's long-term issuer credit rating, ONSBOND is the bond onshore reputation, AGE is the bank age in years from issue date of the market choice to the incorporation date of the bank issuer, UFE is unexpected future earnings calculated as bank forward earnings per share for next period less earnings per share for next period divided by current bank market share price, MVBV is the book value of banks' total assets less book value of total equity plus market value of total equity divided by total assets, TA is the logarithm of the book value of total assets, VIX is the Chicago Board Options Exchange's Volatility Index, LIQDB is a bank's liquid assets divided by book value of total deposits and borrowings, and CPI is the consumer price index of the bank's parent domiciled country. For a more detailed explanation of the variables refer to Table 21 in the appendix. Robust standard errors are clustered at the bank level in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 18 - Market Choice Predictive Probabilities Results for Australian, Canadian, European, and United States Systemically Important Banks – from Tables 14, 15, 16, and 17 (Robustness Check #1)

		Eurobond	Foreign Bond	Global Bond	Onshore Bond	Yankee Bond
Australia	IRATING	-3%	1%	1%	-1%	2%
	ONSBOND	-9%	6%	1%	3%	0%
	AGE	-3%	-4%	1%	3%	2%
	UFE	-3%	0%	0%	2%	1%
	TENOR	16%	-10%	0%	-5%	-2%
	MVBV	-3%	7%	-1%	-2%	-2%
	SIZE	-50%	17%	3%	28%	2%
	TA	-13%	17%	-1%	4%	-8%
Canada	IRATING	-20%	2%	28%	12%	-21%
	ONSBOND	-9%	2%	3%	0%	4%
	AGE	4%	0%	-25%	-1%	22%
	UFE	9%	0%	-18%	1%	9%
	TENOR	3%	0%	-5%	5%	-3%
	MVBV	8%	1%	4%	-4%	-9%
	SIZE	-25%	9%	-8%	34%	-10%
	TA	-60%	1%	46%	-8%	21%
Europe	IRATING	5%	6%	-7%	4%	-8%
	ONSBOND	8%	-5%	-5%	5%	-3%
	AGE	-20%	3%	10%	5%	2%
	UFE	6%	-1%	-5%	4%	-3%
	TENOR	17%	-4%	-8%	-3%	-3%
	MVBV	18%	-6%	-4%	-2%	-7%
	SIZE	-22%	9%	2%	13%	-2%
	TA	-2%	0%	17%	-2%	-14%
United States	IRATING	0%	1%	14%	-14%	
	ONSBOND	-10%	1%	29%	-20%	
	AGE	-4%	-1%	-8%	13%	
	UFE	-1%	-3%	-3%	7%	
	TENOR	42%	-2%	-24%	-17%	
	MVBV	-3%	4%	-21%	19%	
	SIZE	-15%	6%	9%	0%	
	TA	11%	3%	28%	-42%	

These tables report the predictive probabilities of bond market choices Eurobond, Foreign Bond, Global Bond, Yankee Bond, and Onshore Bond implied by the multinomial probit regressions from Tables 14, 15, 16, and 17, respectively. The change in probability is calculated from the 5th to the 95th percentile of the independent variables. The sum of each of the independent variables' predicted probabilities in each row equals zero, subject to rounding. IRATING is a dummy variable for Moody's long-term issuer credit rating, ONSBOND is the bond onshore reputation, AGE is the bank age in years from issue date of the market choice to the incorporation date of the bank issuer, UFE is unexpected future earnings calculated as bank forward earnings per share for next period less earnings per share for next period divided by current bank market share price, TENOR is the bond maturity tenor calculated in years, MVBV is the book value of banks' total assets less book value of total equity plus market value of total equity divided by total assets, SIZE is the logarithm of bond size in US Dollars, and TA is the logarithm of the book value of total assets. For a more detailed explanation of the variables refer to Table 21 in the appendix.

Table 19 - Market Choice Results for Australian Systemically Important Banks Log Pseudolikelihood Regression (Robustness Check #2)

Regression 11

Dependent variables Independent variables	**Eurobond**	**Foreign Bond**	**Global Bond**	**Yankee Bond**
SIZE	-0.9272***	-0.4277***	0.9000*	-0.9286***
	(0.0331)	(0.0916)	(0.4920)	(0.0574)
TENOR	0.0597***	-0.0285	-0.0294	-0.0782***
	(0.0231)	(0.0238)	(0.0278)	(0.0298)
UNDERWA	0.1759	-0.7444	-2.0990	1.8137***
	(0.2857)	(0.4867)	(1.3650)	(0.4301)
LIST	0.8908*	-0.1183	1.7387***	2.6206***
	(0.5039)	(0.4833)	(0.4494)	(0.1062)
BRATING	0.3263*	0.3270*	0.1369**	0.8475***
	(0.1737)	(0.1861)	(0.0571)	(0.1263)
OFFBOND	7.6604**	3.0879	-36.0535***	-19.9117
	(3.5194)	(7.3747)	(13.0601)	(16.2746)
ROAE	-0.0578***	-0.1105***	-0.0209	0.5569***
	(0.0129)	(0.0134)	(0.0328)	(0.1099)
FAE	-1.9327**	-3.6402	33.1285***	9.9139
	(0.9641)	(4.7637)	(4.8551)	(11.3375)
MVBV	4.5988	5.9671	-3.8352	-38.7845***
	(7.6561)	(9.5150)	(24.9291)	(13.3226)
TE	-0.0822	0.7885***	0.7475	0.3878
	(0.1707)	(0.1633)	(1.3758)	(0.3010)
MOVE	-0.0020	0.0046	-0.0205**	-0.0093
	(0.0054)	(0.0029)	(0.0099)	(0.0191)
LIQTA	-0.0293***	-0.0234	-0.4171***	-0.0961
	(0.0048)	(0.0355)	(0.0301)	(0.2123)
GLIQ	0.0551	0.1406	0.4866	0.1931
	(0.2117)	(0.2714)	(0.3834)	(0.3802)
INTDIFF	-1.6049*	-0.4883	3.3035**	1.5599
	(0.8434)	(1.2155)	(1.3906)	(1.4173)
Constant	7.4782	-13.4769	-25.7007	24.6530*
	(8.4480)	(9.1853)	(43.6135)	(14.6737)
Log pseudolikelihood	-1354.79	-1354.79	-1354.79	-1354.79
Pseudo R2	0.2821	0.2821	0.2821	0.2821
Observations	2,339	2,339	2,339	2,339

This table reports multinomial logistic regression for Australian Systemically Important Banks as a second robustness check. The dependent variables are bond market choices. The offshore market choices are Eurobond, Foreign Bond, Global Bond, and Yankee Bond. These are alternative choices to an Onshore Bond (base choice). Onshore Bonds are not reported in the table. SIZE is the logarithm of bond size in US Dollars, TENOR is the bond maturity tenor in years, UNDERWA is a binary dummy variable for underwritten agent banks, LIST is a binary dummy variable for listed bonds, BRATING is a dummy variable for Moody's long-term bond credit rating, OFFBOND is the bond offshore reputation, ROAE is the return on average equity calculated as a bank's net income divided by book value of average total equity, FAE is a bank's earnings per share for next period less bank earnings per share for current period divided by current bank market share price, MVBV is the book value of banks' total assets less book value of total equity plus market value of total equity divided by total assets, TE is the logarithm of the book value of total equity, MOVE is the Merrill Lynch Option Volatility Estimate, LIQTA is a bank's liquid assets divided by book value of total assets, GLIQ is the global liquidity indicator as the average of Residual developed countries, Euro area, and United States banks' claim as percentage of GDP, and INTDIFF is the spread between the Australian dollar 5-year swap rate less the Australian dollar 5-year risk-free rate and the US Dollars 5-year swap rate less the US Dollars risk-free rate. For a more detailed explanation of the variables refer to Table 21 in the appendix. Robust standard errors are clustered at the bank ticker level in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 20 - Market Choice Predictive Probabilities Results for Australian Systemically Important Banks – from Table 19 (Robustness Check #2)

	Eurobond	Foreign Bond	Global Bond	Onshore Bond	Yankee Bond
BRATING	2%	1%	0%	-4%	1%
OFFBOND	28%	-1%	-15%	-4%	-8%
ROAE	-6%	-8%	0%	4%	10%
FAE	-2%	-2%	4%	0%	1%
TENOR	18%	-10%	-2%	-4%	-2%
MVBV	5%	2%	-1%	-2%	-4%
SIZE	-47%	15%	6%	27%	-1%
TE	-12%	11%	2%	-2%	1%

This table reports the predictive probabilities at a confidence interval of 95 percent for the market choices Eurobond, Foreign Bond, Global Bond, Yankee Bond, and Onshore Bond implied by the multinomial logistic regressions from Table 19. The change in probability is calculated from the 5th to the 95th percentile of the independent variables. The sum of each of the independent variables' predicted probabilities in each row equals zero, subject to rounding. BRATING is a dummy variable for Moody's long-term bond credit rating, OFFBOND is the bond offshore reputation, ROAE is the return on average equity calculated as a bank's net income divided by book value of average total equity, FAE is a bank's earnings per share for next period less bank earnings per share for current period divided by current bank market share price, TENOR is the bond tenor calculated in years, MVBV is the book value of banks' total assets less book value of total equity plus market value of total equity divided by total assets, SIZE is the logarithm of bond size in US Dollars, and TE is the logarithm of the book value of total equity. For a more detailed explanation of the variables refer to Table 21 in the appendix.

Table 21 - Variable, Name, Definition, Source(s)

Variable	Name	Definition	Source(s)
Dependent			
MC	Market Choice	Market of issue field. Eurobond, Foreign Bond, Global Bond, Onshore Bond, or Yankee Bond.	Refinitiv, author calculations
Independent			
AGE	Bank age	Issue date of the bond choice less the incorporation date of the bank legal parent entity.	Refinitiv, Fitch, author calculations
BRATING	Bond long-term credit rating	Moody's bond long-term credit rating discrete choice converted to sequential continuous variable by ISIN. Aaa equal to 22 / Baa3 equal to 13 at issue date of bond.	Refinitiv, author calculations
CALL	Bond callable	Binary dummy indicator equal to 1 for callable notes/bonds, otherwise 0.	Refinitiv
CPI	Consumer price index	Inflation measured by consumer price index (CPI) is defined as the change in the price of a basket of goods and services that are typically purchased by specific groups of households, reported as the annual growth rate, quarterly.	Organisation for Economic Co-operation and Development (OECD)
FAE	Future abnormal earnings	(Bank's earnings per share for next period less bank earnings per share for current period) divided by current bank market share price, US Dollars, annually.	Fitch, Datastream, author calculations
GDPPC	Gross domestic product per capita	Gross domestic product per capita on an international comparison programme, in US Dollars, annually.	World Bank
GFC	Pre-Global Financial Crisis period	Binary dummy indicator equal to 1 for bonds issued prior to 1 Jan 2009, indicator equal to 0 for bonds issued after 1 January 2009.	FSB, Local regulator
GLIQ	Global liquidity Indicator	Ease of financing in global financial markets. Average of Residual developed countries, Euro area, and United States banks' claim as percentage of GDP.	Bank of International Settlements, author calculations
GSIB	Global Systemically Important Bank	Binary dummy indicator equal to 1 for banks classified as Global Systemically Important Bank, indicator equal to 0 for banks classified as Domestic Systemically Important Bank.	FSB, local regulator, author calculations
INTDIFF	Australian-US Dollars spread	The Australian dollar spread is calculated by subtracting the Australian dollar 5-year risk-free yield from the Australian dollar 5-year swap yield. The US Dollars spread is calculated by subtracting the US Dollars 5-year risk-free yield from the US Dollars 5-year swap yield. The US Dollars spread is subtracted from the Australian dollar spread and is daily and matched to the issue date of the bond market choice.	Datastream, author calculations
IRATING	Issuer long-term credit rating	Moody's bank parent long-term credit rating discrete choice converted to sequential continuous variable. Aaa equal to 22 / Baa3 equal to 13.	Fitch, author calculations

LIQDB	Liquid assets to total deposits and borrowings	Banks' liquid assets divided by book value of deposits and short-term borrowings, in US Dollars, annually.	Fitch
LIQTA	Liquid assets to total assets	Banks' liquid assets divided by book value of total assets, in US Dollars, annually.	Fitch
LIST	Listed bonds	Binary dummy indicator of 1 for listed bonds on an exchange, 0 otherwise.	Refinitiv, author calculations
MOVE	Merrill Lynch Option Volatility Estimate	Merrill Lynch Option Volatility Estimate, end of month.	Datastream
MVBV	Market value to book value	(Book value of banks' total assets less book value of total equity plus market value of total equity) divided by total assets, in US Dollars, annually.	Fitch, Datastream
OFFBOND	Offshore bond reputation	The outstanding offshore bonds each month by bank and bond seniority in US Dollars millions divided by Fitch's Total Liabilities excluding Preference Shares & Debt Hybrid Capital, with one lag period, monthly.	Refinitiv, Stata, author calculations
ONSBOND	Onshore bond reputation	The outstanding onshore bonds each month by bank and bond seniority in US Dollars millions divided by Fitch's Total Liabilities excluding Preference Shares & Debt Hybrid Capital, with one lag period, monthly.	Refinitiv, Stata, author calculations
ROAE	Return on average equity	Banks' net income divided by book value of average total equity, annually.	Fitch
SIZE	Logarithm of bond size	Logarithm of bond size.	Refinitiv, Stata
TENOR	Bond maturity tenor	(Maturity date less issue date of bond) divided by 365.	Refinitiv
TA	Logarithm of total assets	Logarithm of book value of bank total assets, annually.	Fitch, Stata
TE	Logarithm of total equity	Logarithm of book value of bank total equity, annually.	Fitch, Stata
UFE	Unexpected future earnings	(Bank forward earnings per share for next period less earnings per share for next period) divided by current bank market share price, in US Dollars, annually.	Fitch, Datastream, author calculations
UNDERW	Underwritten bonds	Binary dummy indicator equal to 1 for all bonds underwritten, 0 otherwise.	Refinitiv, author calculations
UNDERWA	Underwritten bonds agent	Binary dummy indicator equal to 1 for underwritten bonds of agent, 0 otherwise.	Refinitiv, author calculations
VIX	Chicago Board Options Exchange's Volatility Index	Chicago Board Options Exchange's Volatility Index, daily.	Datastream

References

Arena, M. P. (2011). The corporate choice between public debt, bank loans, traditional private debt placements, and 144A debt issues. *Review of Quantitative Finance and Accounting, 36*(3), 391-416. https://doi.org/10.1007/s11156-010-0182-3

Barclay, M. J., & Smith Jr, C. W. (1995). The maturity structure of corporate debt. *The Journal of Finance, 50*(2), 609-631. https://doi.org/10.1111/j.1540-6261.1995.tb04797.x

Bellrose, K., & Norman, D. (2019). *The Nature of Australian Banks' Offshore Funding.* https://www.rba.gov.au/publications/bulletin/2019/dec/pdf/the-nature-of-australian-banks-offshore-funding.pdf

Black, S., & Munro, A. (2010). Why issue bonds offshore? *BIS Working Papers, 334*, 1-51. http://dx.doi.org/10.2139/ssrn.1725989

Blackwell, D. W., & Kidwell, D. S. (1988). An investigation of cost differences between public sales and private placements of debt. *Journal of Financial Economics, 22*(2), 253-278. https://doi.org/10.1016/0304-405X(88)90071-2

Denis, D. J., & Mihov, V. T. (2003). The choice among bank debt, non-bank private debt, and public debt: evidence from new corporate borrowings. *Journal of Financial Economics, 70*(1), 3-28. https://doi.org/10.1016/S0304-405X(03)00140-5

Diamond, D. W. (1984). Financial intermediation and delegated monitoring. *The Review of Economic Studies, 51*(3), 393-414. https://doi.org/10.2307/2297430

Diamond, D. W. (1989). Reputation acquisition in debt markets. *Journal of Political Economy, 97*(4) 828-862. https://doi.org/10.1086/261775

Diamond, D. W. (1991). Monitoring and reputation: The choice between bank loans and directly placed debt. *Journal of Political Economy, 99*(4), 689-721. https://doi.org/10.1086/261775

Esho, N., Lam, Y., & Sharpe, I. G. (2001). Choice of financing source in international debt markets. *Journal of Financial Intermediation, 10*(3-4), 276-305. https://doi.org/10.1006/jfin.2001.0318

Fuertes, A., & Serena, J. M. (2018). How firms borrow in international bond markets: Securities regulation and market segmentation. *Journal of Financial Regulation and Compliance, 26*(1), 135-169. https://doi.org/10.1108/JFRC-11-2016-0100

Gao, Y. (2011). The Sarbanes-Oxley Act and the choice of bond market by foreign firms: Sarbanes-Oxley Act and choice of bond market. *Journal of Accounting Research, 49*(4), 933-968. https://doi.org/10.1111/j.1475-679X.2011.00416.x

Gomes, A., & Phillips, G. (2012). Why do public firms issue private and public securities? *Journal of Financial Intermediation, 21*(4), 619-658. https://doi.org/10.1016/j.jfi.2012.03.001

Hale, G., & Santos, J. A. (2008). The decision to first enter the public bond market: The role of firm reputation, funding choices, and bank relationships. *Journal of Banking & Finance, 32*(9), 1928-1940. https://doi.org/10.1016/j.jbankfin.2007.12.016

Jensen, M. C., & Meckling, W. H. (1976). The theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics, 3*(4), 305-360. https://doi.org/10.1016/0304-405X(76)90026-X

Johnson, S. A. (1997). An empirical analysis of the determinants of corporate debt ownership structure. *The Journal of Financial and Quantitative Analysis, 32*(1), 47-69. https://doi.org/10.2307/2331316

Krishnaswami, S., Spindt, P. A., & Subramaniam, V. (1999). Information asymmetry, monitoring, and the placement structure of corporate debt. *Journal of Financial Economics, 51*(3), 407-434. https://doi.org/10.1016/S0304-405X(98)00059-2

Kwan, S. H., & Carleton, W. T. (2010). Financial contracting and the choice between private placement and publicly offered bonds. *Journal of Money, Credit and Banking, 42*(5), 907-929. https://doi.org/10.1111/j.1538-4616.2010.00312.x

Long, J. S., & Freese, J. (2014). *Regression Models for Categorical Dependent Variables Using Stata* (3rd edition). Stata Press.

McBrady, M. R., & Schill, M. J. (2007). Foreign currency-denominated borrowing in the absence of operating incentives. *Journal of Financial Economics, 86*(2007), 145-177. https://doi:10.1016/j.jfineco.2006.08.00

Mizen, P., Packer, F., Remolona, E. M., & Tsoukas, S. (2012). Why do firms issue abroad? Lessons from onshore and offshore corporate bond finance in Asian emerging markets. Available from SSRN: https://ssrn.com/abstract=2247964

Myers, S. C. (1977). Determinants of corporate borrowing. *Journal of Financial Economics, 5*(2), 147-175. https://doi.org/10.1016/0304-405X(77)90015-0

Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics, 13*(2), 187-221. https://doi.org/10.1016/0304-405X(84)90023-0

Rajan, R. G. (1992). Insiders and outsiders: The choice between informed and arm's-length debt. *The Journal of Finance, 47*(4), 1367-1400. https://doi.org/10.1111/j.1540-6261.1992.tb04662.x

Reserve Bank of Australia (RBA). (2002). *Why do so many Australian borrowers issue bonds offshore?* https://www.rba.gov.au/publications/bulletin/2002/dec/pdf/bu-1202-4.pdf

Reserve Bank of Australia (RBA). (2023). *Financial Stability.* https://www.rba.gov.au/fin-stability/

Securities Industry and Financial Markets Association (SIFMA). (2024). *2022 Capital Markets Fact Book.* https://www.sifma.org/wp-content/uploads/2022/07/2023-SIFMA-Capital-Markets-Factbook.pdf

Serena, J. M., & Moreno, R. (2016). Domestic financial markets and offshore bond financing. BIS Quarterly Review September. Available at SSRN: https://ssrn.com/abstract=2842333

Standard & Poor's Global Market Intelligence (S&P). (2020). *The World's 100 largest banks, 2020.* https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/the-world-s-100-largest-banks-2020-57854079

Tawatnuntachai, O., & Yaman, D. (2008). Why do firms issue global bonds? *Managerial Finance, 34*(1), 23-40. https://doi.org/10.1108/03074350810838208

Turner, G., & Nugent, J. (2015). International linkages of the Australian banking system: Implications for financial stability. *JASSA, 3*, 34-43. https://doi.org/10.3316/ielapa.757154917027027