Currency Denomination Decision and the Cost of Capital: Evidence from Global Bonds

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Abstract

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This paper studies the currency choice of government and public agency borrowers when they issue bonds in the international market. In particular, by constructing a comprehensive sample of global bonds issued by these issuers between 1999 and 2011, I find strong evidence that they choose their issuance currency in response to the cost saving opportunities associated with the deviation from uncovered and covered interest rate parity conditions. This finding is robust after controlling for a series of issue- and issuer-related characteristics. In addition, adopting a gravity model, I find that certain non-cost related connections between the issuer's country and the currency country can also motivate an issuer's currency choice.

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Dedication

to my parents

Chapter 1

Introduction

With the development of the global capital market in the last three decades, borrowers face great opportunities to choose not only at which market to place their bonds, but also in which currency their bonds are denominated. An examination of the motives behind currency choices by international borrowers can shed light on the international bond market condition and the borrowers' behavior. Empirical studies on the currency choice by corporate borrowers are abundant. However, these studies often generate mixed findings on the motives for the borrowers' currency choices. This is because there are multiple competing factors that dictate a borrower's currency choice and the empirical distinction between these factors are blurred due to incomplete information or imprecise measurement.

In this paper, by constructing a unique sample, I study whether government and public agent borrowers exhibit opportunistic behavior by strategically selecting their issuing currencies in order to achieve lower borrowing costs. I focus on borrowing behavior by sovereign governments and public agencies because they face a different set of factors in their bond denomination decisions than the corporate borrowers. Unlike corporate borrowers, public borrowers have limited foreign currency cash flows and foreign operations. When making bond currency decisions, they are largely insulated from considerations such as hedging foreign cash flows, overcoming information asymmetry, or tax arbitrage. Studying their bor-

rowing behavior allows me to concentrate on testing the opportunistic behavior hypothesis behind their currency denomination decisions.

Although sovereign and public agent borrowers may be less driven by profit-maximization than corporations and financial institutions, there is abundant evidence that they constantly monitor the global credit market conditions in terms of borrowing costs. For example, when discussing their future financing plans, Mr. Francesco Piro, minister of finance for the region of Sicily commented: "We want maximum flexibility to expand wherever possible when conditions are suitable. Selling in Asia is one of the possibilities if there are conditions and spread at least similar to those found in the euro market." In fact, because of the well-established reputation and rich experience of sovereign and agent borrowers in the global financial market, they are more capable of exploiting any borrowing cost differences across different currencies. For the matter of empirical tests, it can be argued that the non-profit-maximizing nature of these issuers will bias against finding positive evidence of their opportunistic behavior. In that case, any positive evidence of such behavior will have to overcome this bias.

Another distinctive feature of my sample is that I focus on a special bond instrument – the global bond. To my knowledge, this is the first paper to study the currency choice of this innovative bond instrument. The existing studies of currency choice focus on either Eurobonds or foreign bonds. A Eurobond is a bond instrument that is distributed to investors whose domicile country's currency is different from the bond's issuing currency. A foreign bond, which is also referred to as a Yankee bond, is issued by a foreign resident in a local market denominated in the currency of the placing country.[1] Deregulation waves around the globe since the 1980s and the technological advancement eventually led to the introduction of the "global bond." A global bond can be traded and settled by investors in previously

[1]In practice, sometimes the term "Yankee bond" is used to refer to a foreign bond in general, regardless of the issuing currency. On some other occasions, the term "Yankee bond" is specifically used to refer to a US dollar-denominated foreign bond. To avoid confusion, in this paper I use the term "Yankee bond" as the equivalent of foreign bond and use the term "US dollar Yankee bond" to refer to the Yankee bond that is issued in the US dollar.

segmented markets. In this sense, a global bond can be regarded a hybrid of a Eurobond and a foreign bond. As the most fungible of all bond types, the global bond provides us with an ideal instrument to study the currency denomination decisions.

Previous studies on currency denomination decisions mostly focus on corporate issuers in the Eurobond or foreign bond markets. They offer four explanations for why a borrower decides to issue bonds in a particular currency. The *natural hedge hypothesis* states that a borrower with foreign currency operations or assets can issue a foreign currency-denominated bond to create a natural hedge. The *market segmentation hypothesis* states that an issuer from a nation where the capital market is limited in depth or liquidity has an incentive to seek capital outside its domestic market. This hypothesis is often used to explain the foreign currency bond denomination decisions by issuers from emerging countries. Because it is very costly for these borrowers to denominate their bond issuance in their home currencies in the international capital market due to information barriers, they usually choose to denominate their bonds in one of the major international currencies. The *tax arbitrage hypothesis* states that borrowers with foreign affiliation can lower their after-tax borrowing costs by strategically locating the bond placement in countries that provide higher tax-shield benefits. The more recent *opportunistic behavior hypothesis* states that issuers seek to reduce their global borrowing costs by strategically denominating their bonds in low-cost currencies.

Empirical tests of these four hypotheses are difficult because they are not mutually exclusive. In other words, it is possible that each of them can partially explain a bond issuer's currency denomination decision. Except for a few studies that employ special data samples, most empirical studies rely on weak proxies to measure foreign exchange (FX) exposures, information barriers, and the tax arbitrage benefits. In practice, precise measure for each currency denomination incentive is not readily available. First, a test of the hedging hypothesis requires foreign operating cash flow data at the currency level for all bond issuers, which are currently not reported by corporate borrowers in their financial statements. Second, although there are various indices to measure the information asymmetry between international investors and bond issuers, imprecise proxies that rely on index variables weaken the

power of the empirical test for this hypothesis. Third, although average tax rate data are available for each country, the marginal tax rates faced by different investor groups for bonds denominated in different currencies are not public information.

Due to the non-mutually exclusive nature of the four hypotheses and the challenge posed by data availability, I don't seek to test all four hypotheses in this study. Instead, with an innovative bond sample, I focus on one motive for issuing currency choice – whether bond issuers demonstrate opportunistic behavior in their currency denomination decisions - or, in other words, do they exploit arbitrage opportunities in the international bond market to achieve lower borrowing costs? I investigate the opportunistic behavior hypothesis by constructing a special sample of issuers and issuing instrument. First, I limit my sample to include only borrowers with minimal foreign currency operating cash flow exposure: sovereign governments, supranational institutions, as well as domestic development agencies. This controls for hedging as a possible motive for the denomination decision in a particular currency, along with its accompanying challenges of exposure measurement. Second, I restrict the debt instrument to be the global bond which, compared with Eurobond or the foreign bonds, is largely free from market segmentation. The global bond is fully fungible because the identical instrument trades across markets without restrictions. Global bonds are also large in size and are often underwritten by a syndicate of reputable underwriters. Furthermore, global bond issuers are often repeat borrowers in the international bond market. As a result, these issuers face lower restrictions when they make the currency choice on their international bond issues. Third, because the sovereign governments and regional agencies in my sample have no foreign subsidiaries, they don't have the incentive to strategically choose their bond issuance locations for tax arbitrage reasons. All of these attributes of the global bond issuers allow me to focus on testing the opportunistic behavior hypothesis without the interference of the other currency choice motivations.

To measure the time variation of the currency choice by issuers in my sample, I calculate abnormal currency shares, defined as the deviations from the mean quarterly share for each issuance currency across the sample period between 1999 and 2011. I then examine the

relation between the abnormal currency shares and the covered and uncovered cost savings for each currency in each quarter. I find that in quarters when a currency has relatively high borrowing cost, the abnormal share of issuance in that currency decreases, and the opposite is true when the cost for a currency is relatively low compared with the alternative currencies. For example, the abnormal share of bonds issued in a currency increases by an average of 4 percentage points per quarter when the uncovered cost in that currency is 100 basis points below the average borrowing cost of alternative currencies. For covered borrowing cost, an average 100 basis points saving compared with the alternative currencies leads to an issuance increase in that currency by about 3 percentage points from its mean share across all sample periods.

As part of the study on uncovered cost savings, I also examine the impact of expected exchange rate movement on bond denomination decisions. Instead of imposing a structure on the exchange forecasting model adopted by the bond issuers, I explore alternative approaches for the borrowers to form their exchange expectations. I find that, on average, a currency that depreciates relative to its peers experiences subsequent abnormal share increase, and the opposite is true for a currency that appreciates relative to its peers. This finding is consistent with the proposition that borrowers hold a momentum view when they predict future exchange rate changes using past exchange rate movement information. I also find weak evidence that post-issuance relative depreciation, as predicted both by the forward premiums and survey results from currency traders, correlates to an increase in abnormal currency share. To verify whether borrowers actually achieve borrowing cost savings through favorable exchange rate movement after issuance, I examine the denominating currencies' post-issuance performance. I find that a currency's abnormal share increase/decrease is positively correlated with its ex post relative depreciation/appreciation. This indicates that bond issuers on average successfully lower their borrowing costs through exploring favorable exchange rate conditions in their currency choice.

Empirical evidence shows that macro economic conditions such as market size, liquidity, and cross-border investment can affect the attractiveness of a country's debt market to

international bond issuers. To address these factors, in my empirical tests I include a list of macroeconomic variables of the issuance currency country – the size of the economy as measured by gross domestic product (GDP), the attractiveness to foreign direct investment (FDI) as measured by in-bound FDI, and the market liquidity as measured by the currency country's domestic bond market size. These variables are largely positively related to the abnormal shares of bonds issued in a country's currency, although the statistical significance level varies depending on model specification.[2]

According to McBrady and Schill [2007], an increase of 1 percentage point in currency share of a relatively less popular currency such as the British pound reflects a considerable shift, while the same 1 percentage point increase in a major reserve currency such as the US dollar is relatively insignificant. To address the heteroskedasticity in issuance shares across currencies, they create a mean-scaled abnormal share measure. Following their approach, I construct additional dependent variables by dividing the abnormal shares with the mean issuing share for each currency. I find that, on average, mean-scaled abnormal issuance share increases by 0.94% in response to 1 basis point nominal yield saving, and it increases by 0.55% in response to 1 basis point covered cost saving. These results are comparable to the findings reported by McBrady and Schill [2007] of 0.24% and 0.75% abnormal share increase for 1 basis point in uncovered and covered cost saving, respectively.

Next, I examine the effect of uncovered and covered cost savings on two raw bond issuance measures – number of tranches and principal amount issued per currency per quarter. Both uncovered and covered cost savings have a positive effect on these two variables. On average, when a currency's nominal yield is 100 basis points below the mean nominal yields of the alternative currencies, bond issuance in that currency increases by 1.9 tranches or US$ 2.3 billion per quarter. The effect of covered cost savings on the number and value of bonds issued is also both statistically and economically significant. On average, a 100 basis points

[2]These variables are not all significant in all test results. Part of this is due to the high correlation among the three variables. In untabulated results, GDP is found to have a correlation of 0.8532 with the capital market size. For detailed discussion, please see section 6.

covered cost saving leads to an increase of 1.2 tranches, or US$ 0.7 billion, of bonds issued per currency per quarter.

Aside from empirical tests on quarterly aggregate issuance variables, I also conduct a series of conditional logit regressions on the currency choice for each bond issuance. The conditional logit tests allow me to study whether the probability of issuing a bond in one of the 7 currencies is a function of the relative prevailing borrowing costs in each currency. The test results provide similar findings as the aggregate quarterly issuance tests, i.e. that bond issuers strategically shift their issuance currency to exploit covered and uncovered cost savings among the major currencies. Using the US dollar as the base currency, I find that when a currency's nominal yield is 100 basis points below the nominal yield of the US treasury, bond issuers are 17% more likely to choose that currency over the US dollar as the issuance currency.[3] For the same 100 basis points savings in covered costs, borrowers are 13% times more likely to choose the lower cost currency over the US dollar as their issuing currency. In the conditional logit tests, the issuance currency country's GDP and FDI are found to have important influence on borrowers' denomination decisions as well.

Within the conditional logit test framework, I also find that emerging market borrowers are less likely to pursue lower cost borrowing opportunities as compared to their non-emerging market counterparts. In terms of credit rating, I find that investment grade bonds are more likely to be used to exploit deviations from interest parity conditions than speculative grade bond. Furthermore, I find that, after 2008, borrowers increase their bond issuance in currencies whose domicile countries are less affected by the global financial crisis.

A new strand of literature finds that the cross-border financial investment pattern can be explained by the gravity model, in which the explanatory variables include the economic size, geographical distance, as well as other connections between nations. Adopting the gravity model framework, I test and conclude that the evidence of borrowers' opportunistic behavior is unaffected by the inclusion of bilateral connections between the issuer country and the

[3]The US dollar is the base currency in my conditional logit tests. The choice of the base currency does not affect the regression outcome and the odds ratios.

currency country. I also find that, besides cost saving opportunities, bilateral trade is an important determinant for borrowers' currency choice. For the full sample, trade agreements and historic links are found to motivate the borrowers' currency choice. For emerging market borrowers, the important connections, beside trade, are common language and close location. Furthermore, I find that issuers are more likely to borrow in a currency when their domicile country has a matching legal system with the currency country, although the significance level depends on the specification of the legal system proxy.

In conclusion, the results from my study suggest that issuers behave in a pattern consistent with the hypothesis that they seek low-cost capital globally by strategically selecting the currency of their bond issuance. Specifically, I find that issuers react to deviations from both covered and uncovered interest parity conditions in their bond currency choice. They increase bond issuance in a currency when its covered and uncovered borrowing costs are low, and decrease issuance in a currency when the costs are high.

This paper sheds new light on the relation between issuers' currency denomination decisions and their borrowing costs. First, this is the first paper to use a large sample of fully fungible global bonds to study the opportunistic borrowing behavior of bond issuers. The choice of global bonds as the debt instrument in my sample overcomes the market segmentation constraint faced by Eurobonds and the foreign bonds that have been employed in previous studies. I also limit the borrower type to be sovereign governments and public agencies following McBrady and Schill [2007]. By focusing on such a sample of issuers that have minimal foreign operating cash flows and choosing a special bond instrument that is created for increased fungibility, this unique data set enables me to conduct a clean test on the opportunistic behavior hypothesis by controlling for the other competing currency choice motives. I find strong evidence that these issuers strategically select their issuing currency in response to deviations from the uncovered or covered parity conditions. These findings are robust for both the aggregate quarterly issuance tests and the conditional logic tests. They remain robust when I control for the currency country's economic size, foreign investment, capital market depth, as well as the trade and non-trade related connections between the

issuing country and the currency country.

Second, this study examines a series of issue- and issuer-related characteristics and how they are related to the borrowers' opportunistic behavior. By demonstrating that emerging market borrowers are less sensitive to deviations from interest parity condition, I provide evidence that the freedom to explore cost saving opportunities is inversely related to the information barriers that a borrower faces. I also demonstrate a positive link between the credit rating of a global bond and the likelihood that it is used to explore lower cost borrowing opportunities. Furthermore, for a chosen sample period from 1999 to 2011, this is the first borrowing cost and currency choice paper that covers the era after the financial crisis of 2008. I find that the borrowers consistently exhibit opportunistic behavior in currency choice both before and after the financial crisis. On the other hand, holding the cost factor constant, their preferences across individual issuing currencies are different before and after the crisis, and these preferences seems to be driven my market liquidity conditions. To my knowledge, this paper is also the first to adopt a gravity model to study the relation between currency choice and cost saving opportunities. Building on a well-established framework in international trade study, my study sheds new light on the trade- and non-trade related connections between the issuing nation and the currency nation. An extension of the gravity model also adds to our knowledge of how borrowers make currency choice based on their legal systems.

Lastly, the findings in this paper add to our knowledge of the relatively new type of financial instrument of global bond that has become more popular in the international bond market in the past two decades. It also contributes to the sovereign bond literature by examining the borrowing behavior of sovereign governments and supranational agencies. The results from my study add to our knowledge on the borrowing activities by government and other public borrowers when they raise capital beyond their own domestic market. My findings support the notion that these borrowers benefit from global borrowing opportunities and the integration of the international bond markets.

The remainder of the paper is organized as follows. Chapter 2 develops the hypotheses and reviews the literature. Chapter 3 introduces global bonds. Chapter 4 describes the empirical

models. Chapter 5 discusses the methodology of my empirical tests and describes the data. Chapter 6 presents the empirical findings of my main test on the aggregate currency issue measures. Chapter 7 presents empirical findings from the conditional logit tests. Chapter 8 summarizes and concludes. All tables and figures are presented in chapter 9.

Chapter 2

Literature Review

Corporate and sovereign borrowers in the international financial market have the option to denominate their bonds in a variety of foreign currencies besides their own domestic currency. The academic and clinical research literatures have offered a series of motivations for currency choice by bond issuers. In general, four possible motives have been offered. First, issuers have revenues or assets in a foreign currency and wish to match these revenues and assets with foreign currency cash outflows to create a natural hedge for their currency risk. Second, when a large amount of capital needs to be raised, their domestic bond market size may not be large enough to support their funding needs. So they will need to access an investor base outside their domestic market. Third, for borrowers with overseas subsidiaries, foreign currency borrowing may allow them to exploit tax differences across markets. Lastly, they may seek lower borrowing costs across markets by strategically selecting the timing and currency of bond issuance. In other words, they may demonstrate opportunistic behavior in their currency denomination decision. In this chapter, I review the main findings of the literature with respect to these four potential motives.

2.1 Natural Hedge

The natural hedge motive argues that when a borrower has future foreign operating cash inflows or has foreign currency-denominated assets, issuing foreign currency denominated bonds in the currency of exposure will help reduce the borrower's exposure to FX risk. For example, Spectra Energy Corp., an American energy company with half of its assets and employees in Canada, issues Canadian dollar-denominated bonds to raise capital. The comapany's CEO, Greg Ebel, explains: "I've largely balanced my foreign-exchange exposure. It's a bit of a natural hedge."[1]

An increasing number of studies has focused on the correlation between foreign-currency risk exposure and the issuance of foreign-currency bonds as a hedging strategy. The majority of these studies focus on corporate borrowers and on bonds denominated in currencies other than the issuer's own currency. The proxy employed to measure FX exposures in these studies include the percentage of foreign subsidiaries among all subsidiaries [Kedia and Mozumdar, 2003, Aabo, 2006], foreign earnings as a percentage of firm value [Allayannis et al., 2003], and foreign sales among total sales [Allayannis and Ofek, 2001, Elliott et al., 2003]. Overall, these studies find that the borrowers are sensitive to their currency exposures by increasing bonds issued in the currency in which they face FX risk in assets or cash flows. In general, these studies report positive findings that borrowers with FX exposures in a certain currency tend to increase bond issuance denominated in that currency to create a natural hedge. These studies do not include the borrowing cost as one of the explanatory variables for borrowers' currency choice. By doing so, they implicitly assume that the interest parity conditions hold and the borrowers are not motivated by seeking low cost financing in their currency decision.

[1]Source: "A new tool in the hedge shed," by Chana R. Schoenberger, February 27, 2012, Wall Street Journal.

2.2 Market Segmentation

Even with the progress in market connections generated by deregulation and technology innovation, barriers still exist across different capital markets. The first type of barriers are regulation barriers, which include registration requirements, listing requirements, trading rules, and different forms of capital control. The second type of barriers is caused by information asymmetry between the bond issuers and investors. The information asymmetry is especially significant for emerging market borrowers when they attempt to place bonds outside their domestic markets. Due to the limited depth of their domestic capital markets, the emerging market borrowers often need to tap the international bond market when they have large financing needs. When doing so, they often need to denominate the bonds in one of the international currencies such as the US dollar to create larger demand. Furthermore, due to the lack of reputation in the international market, they often need to pay higher yields than when they borrow in their domestic markets.

Eichengreen and Hausmann [1999] first use the term "original sin" to describe the barrier faced by emerging market borrowers who wish to borrow outside their domestic bond market. Empirical studies show that borrowers with a significant presence in the international capital market, as proxied by size, have a greater opportunity to tap international capital markets by issuing bonds globally [Allayannis and Ofek, 2001, Kedia and Mozumdar, 2003]. On the other hand, Kedia and Mozumdar [2003] fail to find the impact of market liquidity, represented by the size of the capital market as a share of the GDP of the underlying country, on borrowers' decision to issue foreign currency debt.

2.3 Tax Arbitrage

If a bond issuer has affiliations in different countries of different tax regimes, then the issuer can distribute the bonds through its subsidiary in the high-tax country and subsequently channel the funds to another subsidiary in a low-tax country to maximize the tax shields

achieved. This method of tax arbitrage is linked to the location of the bond issuance rather than the currency of denomination. This tax arbitrage strategy can motivate a borrower's currency denomination decision so that it chooses the currency of the issuing subsidiary's resident country as the issuing currency. If different countries have different tax treatment of interest and exchange rate gains (and losses), then a borrower can also exploit such differences by strategically choosing the market and currency of its bond issuance. However, using hand-collected data of foreign currency-denominated bond issues by US multinational firms, Kedia and Mozumdar [2003] do not find that tax advantages are important in the currency choice of bonds issued by these firms.

Another factor that can affect the tax treatment of a bond investment is whether the bond is in bearer form or in registration form. Using a sample of US dollar bonds issued by US corporations, Kim and Stulz [1988] note that the bonds offered off-shore are usually bearer bonds. This makes them more attractive to foreign investors because they are exempt from paying the withholding taxes that are required if they invest in domestic bonds in book-entry from.[2] For a sample period from 1989 to 2001, Amira and Handorf [2000] document that only less than 2% of US dollar-denominated global bonds are issued in bearer format, while for the non-US dollar-denominated global bonds, this number is 34%. By comparing the yields paid by issuers for registered bonds and bearer bonds, they show that investors will accept a lower yield or pay a higher price for bearer bonds. One of the explanation for this difference is that the lack of a trading record in bearer form bonds facilitates tax evasion. However, neither of these two studies finds a direct link between the registration requirement and the currency denomination decision.

[2]The 30% withholding tax levied on interest payments to foreign investors of US domestic bonds was repealed by US congress in 1984

2.4 Opportunistic Behavior

Besides the hedging consideration, the market segmentation consideration and the tax arbitrage consideration, borrowers may also be motivated to search for lower borrowing costs when they make currency decisions. If there is no deviation from the uncovered interest parity condition, then a bond issuer faces the same borrowing cost regardless of the currency choice. In other words, the loss/gain from the subsequent exchange rate movement exactly offset the gain/loss from nominal rate difference between the issuing currency and the alternative currency. Similarly, the hedging costs will eliminate gains from nominal rate savings if covered interest parity holds. However, empirical research findings have long cast doubt on the uncovered interest parity conditions in practice. Recent research also finds evidence that although covered interest parity holds relatively well in the short term, deviations from covered interest parity increase as the time horizon grows.

A survey by Graham and Harvey [2001] on more than 300 CFOs of US public firms confirms that foreign interest rates are an important factor in the decision to issue foreign debt for 52.3% of the firms surveyed. By studying a sample of Canadian financial institutions, Johnson [1988] reports that they switch their bond issuing currency between the US dollar and the Canadian dollar based on their perceived borrowing cost difference across the sample period. Using a special sample of domestic bonds, foreign bonds, and synthetic bonds issue by East Asian borrowers, Allayannis et al. [2003] conclude that these borrowers increase their percentage of issuance in foreign currency bonds when the foreign currency borrowing rates are lower than domestic borrowing rates and reduce their borrowing in foreign currencies when local currency costs are lower.

A recent strand of studies examines the opportunistic behavior of borrowers in currency choice in its time variation. These studies find that borrowers respond to covered cost savings [McBrady and Schill, 2007, Habib and Joy, 2010, McBrady et al., 2010] or uncovered cost savings [Cohen, 2005, McBrady and Schill, 2007, Habib and Joy, 2010, McBrady et al., 2010] by timing the market and shifting their bond issuance towards low-cost currencies.

These findings are strong for samples of foreign bonds and Eurobonds issued by public firms [Cohen, 2005, Habib and Joy, 2010, McBrady et al., 2010] but weak for samples foreign bonds and Eurobonds issued by sovereign governments and regional agencies [McBrady and Schill, 2007]. On the other hand, by focusing on the cross-border bond issuance between the US and the UK bond market, Henderson et al. [2006] fail to find significant evidence that borrowers issue foreign currency-denominated bonds to take advantage of lower interest rates in foreign markets.

Overall, the latest branch of research on issuers' opportunistic behavior [McBrady and Schill, 2007, Habib and Joy, 2010, McBrady et al., 2010] finds strong evidence on bond issuers' opportunistic behavior in response to uncovered cost savings. But there has been mixed evidence on their currency decision being affected by covered cost savings. In most cases, the samples utilized in previous studies have limitations so that multiple motivations for the currency choice can exist simultaneously, rendering the tests on these hypotheses less precise and less powerful.

2.5 Government and Public Agency Issuer

Sovereign governments, municipal agencies, as well as supranational agencies such as the World Bank and European Investment Bank (EIB) have long been active participants in the international bond market. The literature that studies bond issuance by sovereign governments and other public agencies is large, and the currency composition of government bonds in particular has received much attention lately, with at least 3 findings offered.

First, it has been observed that government agencies attempt to avoid "crowding out" domestic firms from the domestic bond market. So they often tap the international bond market for their funding needs. This is perhaps because government agencies realize that the private sector has a limited capacity to manage FX risk and this effect on the private sector's balance sheet can eventually become the government's contingent liabilities, leading to sovereign risk. Aguiar et al. [2009] and Aguiar and Amador [2011] show that high levels

of public debt can reduce private borrowing and investment, and as a result lead to lower economic growth in a country.

Second, sovereign governments and public agencies from emerging markets face higher hurdles to raise capital in the international bond market due to information asymmetry. As mentioned above, this phenomenon is referred to in the literature as "original sin" [Hausmann and Panizza, 2003, Chamon and Hausmann, 2005, Eichengreen et al., 2007]. Hausmann et al. [2006] report that in the presence of international transaction costs, investors have a low tendency to hold bonds in currencies of emerging countries, since these currencies offer low diversification benefits relative to the transaction costs. Claessens et al. [2007] provide evidence that the size of a country's domestic bond market is inversely related to the likelihood for the country's pubic borrowers to issue foreign currency denominated bonds.

Third, a recent strand of research studies the opportunistic borrowing activity of sovereign borrowers given their ability to strategically select between different bond instruments when they raise new capital. In a study of the borrowing behavior of emerging economies, Broner et al. [2013] argue that these borrowers favor short-term borrowing over long-term borrowing when the investors demand a high term premium for long-term bonds, even though this strategy will increase the borrowers' exposure to financial crises. In their study of government debt management in the Euro area, Wolswijk and de Haan [2005] observe that "the objectives of debt management agencies in the Euro area have remained more or less the same: the financing of public debt at low costs with acceptable risks." They also notice that after the Euro's introduction, foreign investors' ownership of the sovereign bonds issued by small European countries has increased dramatically. For example, Sweden, a country that does not participate in the European Exchange Rate Mechanism (ERM), now has about 27% of their sovereign bonds denominated in foreign currencies.

Chapter 3

An Introduction to Global Bonds

A global bond is a new type of debt instrument that is designed to be placed and traded simultaneously in multiple geographic markets at the same price. Global bonds have several distinctive features: First, global bonds can be placed simultaneously in multiple distinct markets in different geographic areas. Second, by design, global bonds can be traded between investors who reside in different countries through a globally connected clearing and settlement system. This makes global bonds more fungible than Eurobonds or foreign bonds, both of which face technical or regulative hurdles for cross-market clearing and settlement. Third, global bonds are used by public and private debtors to raise large amount of funds. Thus the issue size of global bonds is usually larger than domestic bonds or foreign bonds. Each global bond issue can contain several tranches of different size, maturity, and sometimes different currency of denomination. Fourth, issuers of global bonds tend to be large firms or government agencies who have a significant global presence. These issuers often have experience in issuing Eurobonds or foreign bonds prior to their issuance of the global bonds. Fifth, the syndicate of underwriters for global bonds typically comprises large investment banks with a strong international reputation or a strong presence in the targeted markets. Lastly, global bonds must be registered with the security regulatory agency of the target markets. For example, if part of a global bond's issue is placed in the US market, then the

global bond offer must be registered with the Security and Exchange Commission (SEC).

Despite the initial skepticism from the major investment banks at the time, the first global bond issued by the World Bank in 1989 was successfully received by the market. Since then, global bonds have been gaining popularity among investors who demand liquidity, trading convenience, and lower trading costs. In March 1992, the World Bank issued the first global bond in Yen and a year later in Deutsch Marks. Initially, the global bond market was used primarily by central governments and supranational organizations who have large funding needs, such as the World Bank and EIB. Subsequently, however, local governments, domestic development agencies, as well as large corporations have increased their presence in the global bond market, as these agencies attempt to meet their increasing funding needs by tapping into a market with more depth and liquidity than their domestic market. The first corporate global bond was issued by Matsushita Electric in 1992, and the first US firm's global bond was issued by Walt Disney in 1996.

Appendix A provides information on a sample global bond issued by Singapore Power in October 2003. It is a dual-currency multi-tranche issue with a total principal amount value equal to US$2.2 billion (S$3.8 billion). The US$ portion of the issuance includes a US$600 million 5-year tranche and a US$1 billion 10-year tranche. The Singapore dollar portion contains a S$550 million 7-year tranche and a S$500 million 15-year tranche.

3.1 The Bond Instruments: Domestic, Euro, Foreign, and Global

Before the creation of global bonds, international bonds could be categorized into 3 types: domestic, Euro, and foreign, depending on the domicile of the issuer, the domicile of the primary buyers, the nature of the underwriting syndicate, and the currency denomination. Domestic bonds are issued by a borrower located within the country underwritten, traded under the regulations of a country's domestic bond market, and denominated in that coun-

try's currency. Eurobonds are offered and traded outside of the issuer's domestic market. They are usually underwritten by an international syndicate. Foreign bonds are offered by a non-resident borrower targeting primarily that country's domestic investors and are under the regulations of the target country. The primary difference between a foreign bond and a Eurobond is the registration requirement with the domestic security regulation agency. For example, US dollar Yankee bonds must be registered with the SEC and are issued and traded in the US. Eurodollar bonds are issued outside the US and are beyond the security regulation of any single country. Since they are not registered with the SEC, Eurobonds can not be distributed in the US market until a "seasoning" period has passed. This seasoning requirement effectively prevents US investors from participating in the primary market. After the seasoning period, even though a portion of Eurodollar bonds end up in US-based portfolios, the lack of the initial participation of US investors in new offerings ensures that the secondary Eurodollar market is also dominated by non-US investors.

Global deregulation made the foreign bond and Eurobond markets increasingly connected, which led to the creation of the "global bond." Global bonds are designed to be offered and traded in both the issuer's domestic market and the Eurobond market. They can be viewed as a hybrid bond instrument designed to trade and settle both within and beyond the market of the issuer's domicile country. They are offered in multiple markets simultaneously at the same price. Given the global bond's trading and settlement mechanism, a country's domestic investors are generally indifferent between global and straight foreign issues, except where liquidity differs. A detailed discussion of the institutional differences between domestic bonds, Eurobonds, foreign bonds, and global bonds can be found in Appendix B.

Appendix C presents the descriptive statistics of different bond instruments issued between 1999 and 2011. In Table C.1, the annual market size of the 4 bond types is presented. Table C.2 reports the average issue size for each of the 4 bond instruments throughout the sample period. Table C.3 presents the annual amount of global bonds issued by 3 issuer types – government agency, financial institution, and corporation. Table C.4 reports the average

bond size issued by these 3 types of issuers. Table C.5 and C.6 list the total issuance value and average issuance size of the 4 different bond instrument types by government issues, respectively. Lastly, Table C.7 presents the percentage of bonds with investment rating by Moody's in each of the 4 bond instrument categories issued by the 3 different types of issuers.

3.2 Benefits of Global Bonds

Starting in the 1980s, institutional security investors demanded active trading of their bonds to constantly rebalance their portfolio positions according to the evolving market conditions. Yet according to Lay [1995], "the mechanisms for distributing bonds to these investors were unresponsive to change. Bonds on identical financial terms were offered in different forms in domestic and international markets for US dollar bonds," and "the organization of investment dealers' businesses and friction in cross-border clearing and settlement prevented the free movement of bonds from one market to another." In one incident in 1988, 2 bonds issued by the World Bank with almost identical terms, placed within 1 week from each other, one in New York and one in London, had differences in their yields at as wide as 1 percentage point. However, there was no cross-market trading between these two markets so the price disparity persisted for a prolonged period of time.

In response to this situation, the World Bank engineered a new bond instrument with an innovative placement and trading mechanism that is known as the global bond. Since its inception, the global bond market has experienced rapid growth. As shown in Table C.1, the total principal amount of global bonds issued between 1999 and 2011 exceeds 10 trillion dollars. The global bond market size has surpassed the size of the foreign bond market, which totals 2.9 trillion dollars during the same time period. The global bond market size has grown by a 9% annual rate from 328.81 billion in 1999 to 955.54 billion in 2011, making it one of the fast growing bond instruments in terms of market size. The speedy growth of the global bond market can be attributed to the many benefits it offers which, according to the World bank, include credit quality, large issue size, diverse investor

base geographically and across investor types, multiple clearing systems, trading in secondary market on electronic platforms, underwriters' commitment to secondary market making, and portfolio opportunities.[1]

3.2.1 Credit Quality

The finance literature has established that credit ratings significantly correlate to bond yields [West, 1973, Ederington et al., 1987], information content [Ederington et al., 1987, Elton et al., 2001, Boot et al., 2004], liquidity [Booth, 1992, Ericsson and Renault, 2006, Covitz and Downing, 2007], as well as the bond issuer's operating cost [Crabbe and Post, 1994]. Furthermore, a bond's credit rating can directly impact its investor base. For example, commercial banks are prohibited from investing in speculative grade bonds since 1936. Similarly, insurance companies, as well as savings and loans have also been forbidden to invest in bonds below investment grade since 1951 and 1989, respectively. In addition, most pension funds and university endowment funds adopt guidelines that restrict them from investing in speculative bonds.[2]

As shown in Table C.7, the global bonds on average have higher ratings than the other three bond instruments. For example, 98.52% of the global bonds issued by governments and public agencies are of investment grade, while the investment grade percentage for the the other three bond instruments they issue is 96.85%, 96.38%, and 97.44%, respectively. Table C.7 also shows that, across all four bond instruments, government issued bonds typically have higher average ratings than those issued by financial institutions and corporations, particularly in non-domestic bond types.

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[1] http://treasury.worldbank.org/cmd/htm/GlobalBonds.html.

[2] For a more detailed review on credit rating and financial institutions' investment policy, see Kisgen [2006].

3.2.2 Large Issue Size

Given the large fixed issuing cost of global bonds, the global bond issuance size is typically very large to achieve economy of scale. Previous research documents that liquidity increases with issuance size [Hong and Warga, 2000]. Furthermore, Fung and Rudd [1986] and Lamy and Thomson [1988] find that larger bond issues command lower relative gross spreads. Large issuance size may also lead to greater competition among underwriters, resulting in lower issuing costs as a percentage of the total proceeds. For example, using a sample of 230 US dollar-denominated global bond issued by 94 companies over the period of 1996–2003, Miller and Puthenpurackal [2005] report that the gross spread for global issues is 0.16% lower than for domestic issues and 0.46% lower than for Eurobond issues.

Table C.2 presents the average issuance size of the global bond, as well as the other three bond types – domestic bond, foreign bond, and Eurobond. The average principal amount of the global bond issuance is 966.66 million dollars, which is 8 times the size of the average issuance size of domestic bonds, 4 times that of the average size of Eurobonds, and 5 times that of the average size of foreign bonds.

3.2.3 Diverse Investor Base

Global bonds are engineered to broaden the investor base across different geographic areas who may have different motivations to trade. This in turn leads to increased trading activities. Besides a globally connected trading and clearing mechanism, longer trading hours, and lower trading costs, global bonds possess several other distinctive features that make them attractive to a diverse investor base. First, a large number of issuers list their global bonds on multiple exchanges in different geographical areas. An issuer can choose to list its global bonds on several foreign exchanges besides one of the bond issuer's domestic exchanges to appeal to a larger investor base. For example, the global bond issued by Singapore Power in Appendix A is listed on both the Singapore Exchange and the Luxembourg Exchange. Second, the syndicate of global bond underwriters usually comprises underwriters with a

strong international reputation and rich experience in placing bond instruments in distinctive markets. Third, in preparation for a global bond's placement, underwriters typically conduct roadshows in multiple countries and to a large number of investors. As reported in Appendix A, roadshows for the Singapore Power global bond issuance were held in "Hong Kong, Singapore, Europe and the US," "more than 90 accounts participated in the 5-year US$ tranche and 150 accounts in the 10-year US$ trahche," and "the average geographical breakdown was: US (55%), Asia (32%), and Europe (13%)."[3] Lastly, global bond issuers can allocate bond placement in accordance with investors' interest level in each market to fulfill their funding need. This strategy may be especially beneficial for very large global bond offers, which makes placing them in a single market difficult.

3.2.4 Multiple Clearing Systems

Unlike the Eurobonds, global bonds have to be registered with the security authority of the country in which they are traded. A detailed discussion of the clearing and settlement procedures for global bonds in each currency and in each country is beyond the scope of this paper. Instead, a look at the trading and clearing process of US dollar-denominated global bonds, which is illustrated in Figure 9.1, can shed light on this topic.[4] The Depository Trust and Clearing Corporation (DTCC) is the registered owner of dollar-denominated global bonds. Through its two subsidiaries, the Depository Trust Company (DTC) and the National Securities Clearing Corporation (NSCC), the DTCC provides clearance, settlement, and information services for global bond investors. Each bond must be deposited with the DTCC

[3]In contrast, with a sample of Euro-denominated bonds issued by non-Euro area residents from 1999 to 2003, Geis et al. [2004] report that about 90% of the roadshows for these bonds are only conducted in Europe. They also find that more than 80% of these bonds are initially bought by European investors. They attribute the noticeable lack of participation by US and UK investors to the selling restrictions in these two countries, concluding "In particular, most bonds issued by US companies were probably considered 'offshore' issues under US law (in compliance with Regulation S of the Securities and Exchange Commission (SEC)) whose sales are restricted in the United States (e.g. during a 'seasoning' period of 40 days)."

[4]Figure 9.1 is based on the trading and clearing mechanism of US dollar-denominated global bonds described in Miller and Puthenpurackal [2005].

and registered in the name of the DTCC or one of its nominees. A US investor can trade global bonds through her broker who has an account with the DTCC, the same way she would trade domestic US dollar bonds. A European investor can trade dollar-denominated global bonds through her broker who has an account with the European clearing centers such as Euroclear or Clearstream. These European clearing houses in turn will clear and settle global bonds through their DTCC depositaries. As a result, investors in various geographic markets can trade and settle global bonds through the same mechanism they use to trade domestic bonds in their respective home countries. In comparison, if a European investor wants to trade US domestic bonds, she would need to do so through a broker who has a direct account with the DTCC, which limits her broker choice or might prompt her to open a new broker account. According to the then deputy treasurer and director of the banking, capital markets, and financial engineering department at the World Bank, Kenneth Lay, "for us, the hallmark of a global deal isn't the geographical distribution at issue, it's whether the associated custody, clearing, settlement and trading arrangements help reduce inter-market friction as demand shifts in the aftermarket" and "We want to create a climate in which our investors can rest assured that they'll find a good bid when they need it, throughout the life of the deal."[5]

3.2.5 Electronic Platforms

When the World Bank interviewed major bond underwriters before they launched the first global bond in 1989, two differences between the Eurobond market and the US domestic bond market were highlighted as the potential challenges in bringing these two markets together to create the global bond. The first is the coupon payment frequency. While most fixed rate Eurodollar bonds pay coupons annually, semi-annual coupon payment is the norm for US domestic bonds. The second difference is that while most US domestic bonds are in book-entry form, it is typical for Eurodollar bonds to be in bearer form. On the other hand,

[5]Printed in the September 2002 IMF/World Bank Special Report of the International Financial Review; written by Jeff French, p. 22.

when interviewed by the World Bank, major bond investors played down the significance of these two differences.[6] In other words, they prefer a fungible, liquid, low-trading-cost bond type that does away with these differences. Eventually, global bonds are engineered to be book-entry securities, eliminating the need for the physical delivery of the bonds. The book-entry system facilitates electronic trading and settlement of the bonds by investors from separate geographic areas. This makes cross-market trading less risky as it reduces the time lag between bond delivery and payment transaction.

3.3 Costs of Global Bond

Given the many benefits offered by global bonds discussed so far, the fact that the majority of issuers still rely on either pure domestic bonds or Eurobonds for their funding needs indicates that global bonds' higher issuance costs may offset some of these benefits. According to Miller and Puthenpurackal [2005], given the large size of the global bond issuance and the attempt to attract a wider investor base, global bond issuance usually incurs higher fixed costs including roadshows, marketing to investors in different geographic markets, complying with the security regulation of multiple markets, fulfilling listing requirements at different exchanges, appointing investor relations firms in different countries, and the trading and settlement costs associated with cross-market trading platforms. The issuance size of a global bond needs to be large enough to achieve the economy of scale so that the benefits outweigh these issuing costs. This explains why the average size of global bonds is larger than that of the foreign bonds and Eurobonds, as illustrated in Table C.2.

Additionally, the issuance costs for global bonds may depend on the issuer's global reputation and previous experience in the international capital market. Issuers who have little or no visibility in the international bond market may have to incur greater issuing costs either by offering a higher yield to investors, or by paying larger fees to underwriters for pro-

[6] I thank Mr. Kenneth Lay at the Rock Creek Group for sharing his experience when he designed and executed the first global bond transaction at the World Bank.

motional work, or both. These costs can be prohibitive for issuers from emerging markets, which explains the limited participation of emerging market borrowers in the global bond market in the last two decades.

3.4 Tax Treatment for Global Bond Gains and Losses

The tax treatment with regard to interest payments and currency exchange gains and losses received by a global bond investor depends on the tax regulation of the country in which she resides, as well as the global bond's country of registration. It is beyond the scope of this paper to discuss the tax treatments for investment gains/losses of global bonds for each country. Instead, I examine the tax treatment of global bond payments in the US to generate some insights on this topic. If a global bond is sold in the US, then it must be registered with the SEC. In this case, for US investors, the tax treatment of global bonds is the same as for domestic bonds. For foreign investors, the withholding tax imposed by the US tax agencies on interest payments of global bonds sold in the US market is the same as for other bond types.[7] For global bonds not registered with the SEC, their interest payments to US investors are taxed as Eurodollar bonds, which currently have the same tax treatment as domestic bonds. If a global bond is denominated in a foreign currency, the general rule with regard to the US tax treatment of gains or losses from the currency exchange gain or loss is now to be taxed the same as the underlying bond investment. In conclusion, the US dollar-denominated global bond does not offer a tax advantage or disadvantage to US investors compared with other bond types denominated in dollars. It also has the same US tax withholding treatment as for foreign investors trading other types of dollar-denominated bonds.

A table comparing the trading and clearing process, investor base, as well as regulation

[7]Before 1984, for foreign investors in US dollar domestic bonds, they were subject to a 30% withholding tax, while such withholding tax didn't apply if they invested in US dollar Yankee bonds or Eurodollar bonds. This withholding tax was eliminated in July 1984, removing a disadvantage of US dollar domestic bonds faced by foreign investors.

across the 4 types of bonds can be found in Appendix D.

Chapter 4

Hypothesis and Model Development

My sample issuers that consist of sovereign and regional governments, public agencies, and supranational institutions largely reduce the importance of the hedging and tax arbitrage motivations due to their lack of foreign currency cash flows and foreign subsidiaries. The Global bond, the most fungible bond type among all bond instruments, helps its issuer to overcome the limited currency choice when borrowers want to place their bonds in a certain market. In sum, my sample construction allows me to focus on studying whether borrowers strategically alter their bond denomination currency in search of lower-cost opportunities. Depending on whether the bond issuers hedge their borrowing costs or not, they may react to either uncovered or covered cost savings. This chapter discusses the main testing hypothesis and develops models that will be implemented in the empirical tests in chapter 6.

4.1 Uncovered Cost Saving and Currency Denomination Choice

4.1.1 Uncovered Cost Saving: Main Hypothesis

If borrowers do not hedge their currency exposures from bond issuance, then the hypothesis on currency choice and borrowing cost can be expressed as:

- ***Hypothesis (H0):*** *Borrowers do not make their currency denomination choice in response to uncovered cost savings.*

- ***Hypothesis (H1):*** *Borrowers make their currency denomination choice in response to cost savings from the deviation of uncovered interest rate parity conditions.*

As argued by McBrady and Schill [2007], when motivations for international bond issuance other than cost saving are controlled, the opportunistic behavior hypothesis can be tested by examining the effect on issuance behavior in response to borrowing costs. By formula, the test between H0 and H1 for uncovered costs savings can be expressed as:

$$Iss_{a,t} = \alpha^u + \beta^u \Delta C^u_{a,t} + \gamma^u M_{a,t} + e^u_{a,t} \tag{4.1}$$

$Iss_{a,t}$ represents bonds issued in currency a at time t, $\Delta C^u_{a,t}$ represents the time t uncovered borrowing cost in currency a, relative to other alternatives. In other words, it measures the cost savings achieved through denominating the bond in currency a. $M_{a,t}$ measures macroeconomic control variables for currency a at time t and $e^u_{a,t}$ is the error term. If the regression coefficient β^u is significantly positive, then it will support the rejection of H0 that borrowers are insensitive to uncovered borrowing costs.

4.1.2 Uncovered Cost Saving: Two-currency Model

If borrowers do not hold the view that uncovered interest parity condition holds, then they can compare nominal borrowing rates among all the currency choices they face and explore the cost saving opportunities. This section develops the model to measure uncovered borrowing costs. Following McBrady and Schill [2007] and Habib and Joy [2010], I start with a simple two-currency cost saving model and then extend the model to a multi-currency setting.

First, consider a borrower who faces a choice to issue their global bonds in two alternative currencies: currency a and currency b. If the uncovered interest parity condition holds, then the expected borrowing costs between these two currencies are the same. That is:

$$i_{b,t} - i_{a,t} = E_t[s_{t+n}(b/a)] - s_t(b/a) \tag{4.2}$$

where $i_{a,t}$ and $i_{b,t}$ are the nominal borrowing rate for currency a and currency b, respectively. $s_t(b/a)$ represents the spot exchange rate at time t between currency a and currency b, in the form of a direct quote on a. $E_t[s_{t+n}(b/a)]$ is the expected time $t+n$ spot rate between currency a and b, based on time t information. All interest rates and exchange rates are expressed in continuous compounding format. Equation (4.2) represents the uncovered interest rate condition – if the nominal borrowing cost of currency a, $i_{a,t}$, is lower than currency b's borrowing cost, $i_{b,t}$, then currency a is expected to subsequently appreciate against currency b so that any saving from the lower nominal yield in a will be eliminated by a's expected subsequent exchange rate appreciation.

Empirical research fails to find evidence to support the uncovered interest parity condition in either the short run or the long run. That is, on average, a currency with lower nominal yield does not subsequently appreciate enough to offset the borrowing cost savings an issuer can achieve through selecting that issuance currency. If equation (4.2) doesn't hold and the borrowers have the freedom to choose between the two issuance currencies a and b, then it is possible for them to achieve cost savings expressed as:

$$\Delta C^u_{a,t} = (i_{b,t} - i_{a,t}) - (E_t[s_{t+n}(b/a)] - s_t(b/a)) \tag{4.3}$$

where $\Delta C^u_{a,t}$ reflects uncovered cost savings at time t. $\Delta C^u_{a,t}$ is positive if the nominal cost saving from placing the bond in the lower cost currency a, $i_{b,t} - i_{a,t}$, is higher than currency

a's expected subsequent exchange rate movement, $E_t[s_{t+n}(b/a)] - s_t(b/a)$. Alternatively, ΔC_t^u can also be positive if currency a is expected to depreciates against currency b so much that it more than offsets the higher nominal yield of currency a over currency b. In either case, a positive $\Delta C_{a,t}^u$ represents a cost saving opportunity that may motivate bond issuers to consider currency a as the issuance currency.

4.1.3 Uncovered Cost Saving: Multi-currency Model

When a borrower faces more than two currency choices, McBrady and Schill [2007] and Habib and Joy [2010] argue that in a multi-currency environment, the average borrowing cost of alternative currencies should be the benchmark to use when evaluating the borrowing cost of currency a. Following their approach, the uncovered cost saving in currency a, as compared to the average borrowing costs of alternative currencies, can be expressed as:

$$\Delta C_{a,t}^u = (\bar{i}_{ex(a),t} - i_{a,t}) + (E_t[\bar{s}_{t+n}(a/ex(a))] - \bar{s}_t(a/ex(a))) \tag{4.4}$$

where $\bar{i}_{ex(a),t}$ is the average yields of alternative currencies except a, $\bar{s}_t(a/ex(a))$ is the average exchange rates between currency a and the alternative currencies, and $E_t[\bar{s}_{t+n}(a/ex(a))]$ represents the average expected future exchange rates between currency a and the alternatives. Please note that in equation (4.3) the exchange rates for currency a is expressed as a direct quote of a (i.e. how many units of another currency exchange one unit of currency a). While in equation (4.4) the exchange rate for currency a is expressed as an indirect quote of a (i.e. how many units of currency a exchange one unit of another currency). The purpose of this quotation format transformation between equation (4.3) and (4.4) is to ensure the second component of equation (4.4), $E_t[\bar{s}_{t+n}(a/ex(a))] - \bar{s}_t(a/ex(a))$, has a positive sign in the equation. This will make the empirical testing and result explanation more straightforward in the following chapters. All rates are expressed in logarithm format.

4.2 Covered Cost Saving and Currency Denomination Choice

4.2.1 Covered cost savings: Main Hypothesis

If borrowers hedge their currency exposures from bond issuance, then covered cost savings, if they can be identified, can motivate the borrowers' currency decisions:

- ***Hypothesis (H0):*** *Borrowers do not make their currency denomination choice in response to covered cost savings.*

- ***Hypothesis (H1):*** *Borrowers make their currency choice in response to cost savings from the deviation of covered interest rate parity conditions.*

Similar to the uncovered cost test represented by equation (4.1), the empirical test formula on bond currency choice and covered borrowing cost can be expressed as:

$$Iss_{a,t} = \alpha^c + \beta^c \Delta C^c_{a,t} + \gamma^c M^c_{a,t} + e^c_{a,t} \tag{4.5}$$

where $\Delta C^c_{a,t}$ represents the covered borrowing cost in currency a at time t. A significantly positive β^c will support the rejection of H0 that borrowers do not alter their currency choice in response to covered borrowing costs.

Covered cost savings: two-currency model

Forward contracts are the most commonly used financial instrument to hedge exchange rate risk in a single cash flow. However, the interest and principal payment of bonds represent a stream of cash flows. In this case, if bond issuers want to hedge their currency exposures, it is more appropriate for them to use currency swaps instead of currency forwards. The covered interest rate condition, expressed with swap rates, is:

$$i_{b,t} - i_{a,t} = swp_{b,t,t+n} - swp_{a,t,t+n} \tag{4.6}$$

where $swp_{a,t,t+n}$ and $swp_{b,t,t+n}$ are currency a and currency b's swap rate covering the time period t to $t+n$, respectively. Equation (4.6) states that any difference between two currencies' nominal yields simply equals the difference between the two currencies' swap rates. In other words, any borrowing cost reduction in nominal yield will be offset by the hedging cost, resulting in both currencies having the some covered borrowing costs.

Practically, however, borrowers who issue bonds in one currency and subsequently swap the payment obligation into another often engage in what is called a cross-currency swap. A cross-currency swap consists of two components: (i) a fixed-for-floating interest swap of the same currency, and (ii) a cross-currency swap between the two currencies. In this case, equation (4.6) can be expressed as:

$$i_{a,t} - swp^{i}_{a,t,t+n} - swp^{c}_{a,t,t+n} = i_{b,t} - swp^{i}_{b,t,t+n} - swp^{c}_{b,t,t+n} \tag{4.7}$$

$swp^{i}_{a,t,t+n}$ and $swp^{i}_{b,t,t+n}$ represent the fixed-for-floating interest swap rates for currency a and b, respectively. $swp^{c}_{a,t,t+n}$ and $swp^{c}_{b,t,t+n}$ represent the currency base swap rate for currency a and b, respectively. Equation (4.7), as an extension of equation (4.6), is the expression of covered interest parity condition when bond issuers use cross-currency swap contracts to manage their currency exposures. Empirical evidence generically supports that the covered interest parity condition holds for a time horizon shorter than 1 year. However, over a longer time horizon, deviation from covered interest parity condition exists. In this case, covered cost savings are feasible and can be expressed as:

$$\Delta C^c_{a,t} = (i_{b,t} - i_{a,t}) + (swp^i_{a,t,t+n} - swp^i_{b,t,t+n}) + (swp^c_{a,t,t+n} - swp^c_{b,t,t+n}) \tag{4.8}$$

Equation (4.8) suggests that the there are 3 components of covered cost savings: (i) nominal yield difference $i_{b,t} - i_{a,t}$, (ii) interest swap rate difference $swp^i_{a,t,t+n} - swp^i_{b,t,t+n}$, and (iii) currency swap rate difference $swp^c_{a,t,t+n} - swp^c_{b,t,t+n}$. All rates are expressed in continuous compounding format.

4.2.2 Covered cost savings: multi-currency model

Following Habib and Joy [2010], I measure the covered cost saving $\Delta C^c_{a,t}$ as the difference between the borrowing cost in currency a and the average borrowing cost of the alternative currencies. When a borrower faces multiple issuance currency choices, the covered borrowing cost is thus:

$$\Delta C^c_{a,t} = (\bar{i}_{ex(a),t} - i_{a,t}) + (swp^i_{a,t,t+n} - s\bar{w}p^i_{ex(a),t,t+n}) + (swp^c_{a,t,t+n} - s\bar{w}p^c_{ex(a),t,t+n}) \tag{4.9}$$

$s\bar{w}p^i_{ex(a),t,t+n}$ and $s\bar{w}p^c_{ex(a),t,t+n}$ are the average interest swap rates and the average currency base swap rates of alternative currencies other than a, respectively. $\Delta C^c_{a,t}$ measures the average covered cost savings of choosing currency a over its alternatives, in a multi-currency setting.

Chapter 5

Variable Description and Empirical Methods

In my empirical tests of the opportunistic behavior of bond issuers, I adopt two test methods. In this chapter, I will discuss tests of uncovered and covered cost savings on a series of aggregate bond issuance measures per period. In chapter 6, I will present the model development and test results of conditional logit regressions as an alternative test.

5.0.3 Dependent Variables

To capture the opportunistic determinants of currency choice in global bonds issuance from a macroeconomic perspective, I construct 4 different types of measures of the aggregate bond issuance as the dependent variable $Iss_{a,t}$: quarterly abnormal shares of currency issuance, mean-scaled quarterly abnormal shares of currency issuance, number of tranches issued per quarter, and principal amount of issuance per quarter. Because there are two ways to calculate the quarterly abnormal shares and the mean-scaled quarterly abnormal shares – by issuing number or issuing amount – there are actually 6 dependent variables employed in my aggregate issuance tests.

Two abnormal share variables are generated based on number of tranches issued per

currency per quarter and principal amount issued per currency per quarter, respectively. To come up with these measures, I first compute:

$$share_{num,a,t} = \frac{\text{number of tranches}_{a,t}}{\sum_{a=1}^{n} \text{number of tranches}_{a,t}} \tag{5.1}$$

where number of tranches$_{a,t}$ measures the number of tranches issued in currency a in quarter t by all government or regional institution issuers. In this study, since I identify 7 major currencies for my empirical test, n = 7. Thus $share_{num,a,t}$ measures the relative weight of each of the 7 currencies at time t by number of tranches issued.

An alternative method is to use the principal value issued instead of the number of tranches to capture the weight of each currency per quarter:

$$share_{amt,a,t} = \frac{\text{principal value of tranches}_{a,t}}{\sum_{a=1}^{n} \text{principal value of tranches}_{a,t}} \tag{5.2}$$

Based on the number of bond issued per period, the abnormal currency share variable is constructed as:

$$abnshare_{a,t} = share_{num,a,t} - \frac{\sum_{t=1}^{T} share_{num,a,t}}{T} \tag{5.3}$$

where T is the total number of time periods. In other words, the abnormal share for currency a measures the deviation of currency a's share in the time period t from its average share throughout the whole sample period. A positive $abnshare_{a,t}$ means that the percentage of tranches denominated in currency a at time period t exceeds its long-term average weight in the currency pool. Similarly, negative $abnshare_{a,t}$ means that in time period t, the percentage of tranches issued in currency a is lower than currency a's whole sample period average.

Similarly, based on the principal amount issued, the alternative abnormal currency share

variable can be constructed as:

$$abmshare_{a,t} = share_{amt,a,t} - \frac{\sum_{t=1}^{T} share_{amt,a,t}}{T} \tag{5.4}$$

My data structure is a panel data set with currency and time (quarter) variable as identifiers, thus it contains $7(currencies) * 13(years, 1999 - 2011) * 4(quarters/year) = 364$ observations.

Next, to address the heteroskedasticity in average share across currencies and to compare my results with previous research, I construct a pair of mean-scaled abnormal currency share variables by dividing each currency's abnormal share per quarter by their average share across all quarters:

$$abnshareadj_{a,t} = abnshare_{a,t}/(\frac{\sum_{t=1}^{T} share_{num,a,t}}{T}) \tag{5.5}$$

and

$$abmshareadj_{a,t} = abmshare_{a,t}/(\frac{\sum_{t=1}^{T} share_{amt,a,t}}{T}) \tag{5.6}$$

Lastly, I also use two raw dependent variables – number of tranches issued per currency per quarter and principal amount issued per currency per quarter to capture the aggregate effect of opportunistic determinants of currency choice by the issuers of global bonds.

5.1 Uncovered Cost Saving

Equation (4.1) provides the framework for the empirical test of opportunistic behavior of bond issuers in response to uncovered cost savings. It describes the borrowing measure in currency a at time t, $Iss_{a,t}$, as a function of the uncovered cost saving, $\Delta C^{u}_{a,t}$. In a multi-currency choice setting, the borrowing cost saving for currency a at time t is expressed as

equation (4.4). Combining equation (4.1) and equation (4.4) leads to:

$$Iss_{a,t} = \alpha^u + \beta_1^u(\bar{i}_{ex(a),t} - i_{a,t}) + \beta_2^u(E_t[\bar{s}_{t+n}(a/ex(a))] - \bar{s}_t(a/ex(a))) + \gamma^u M_{i,t} + e_{i,t}^u \tag{5.7}$$

$Iss_{a,t}$ represents aggregate bond issuance in currency a at time t. α^u is the constant term. $\bar{i}_{ex(a),t} - i_{a,t}$ represents the difference between the nominal yield of currency a and average nominal yield of the 6 alternative currencies at time t. $E_t[\bar{s}_{t+n}(a/ex(a))] - \bar{s}_t(a/ex(a))$ represents the expected average under-appreciation or over-depreciation of currency a against the alternative currencies. $M_{i,t}$ records a vector of macroeconomic variables. β_1^u, β_2^u, and γ^u are the coefficients of the 3 independent variable sets, respectively. $e_{i,t}^u$ is the error term.

5.1.1 Measure of Nominal Yield Difference

The first component of the uncovered interest saving measure is $\bar{i}_{ex(a),t} - i_{a,t}$. I use the government treasury bond rates for each of the 7 currencies as the proxies for the nominal borrowing rate.[1] This is because I want to focus on the fundamental rate trend instead of the difference in default risk premium across currencies. The fact that majority of the bonds in my sample are investment grade bonds make government treasury bond rates reasonable proxies as the actual nominal yields by my sample issuers. It is constructed as the difference between the average government bond yields of the 6 major currencies other than currency a and the government benchmark yield of a. In my sample, the median maturity for global bonds is 5.1 years and the mean maturity of bonds issued is 8.6 years. To match the duration of uncovered cost saving measure with the average bond maturity in my sample, I use both 5-year and 10-year benchmark government bond yields in calculating $\bar{i}_{ex(a),t} - i_{a,t}$.

[1]For the Eurozone, I use the yield of the bund issued by the German government as the measure of borrowing costs because throughout my sample period, Germany consistently has the highest credit ratings among all Eurozone governments.

5.1.2 Measure of Expected Exchange Rate Movement

The second component of the uncovered saving measure is $E_t[\bar{s}_{t+n}(ex(a)/a)] - \bar{s}_t(ex(a)/a)$. The discussion of how bond issuers form their expectation of exchange rate movement is beyond the scope of this paper. Instead, I include 5 expected cost savings proxies as alternative measures that bond issuers may adopt to form their exchange rate forecasts. That is, I allow borrowers to form their exchange rate forecast with possible alternative empirical forecasting models.

First, if any change of the exchange rate is independent of the previous rate movement, then the exchange rate follows a random walk. In their seminal work, Meese and Rogoff [1983] conclude that the random walk model performs no worse than a series of structural and time-series forecasting models. Theoretical and empirical studies since then have not yielded a model that can consistently outperform the random walk model. If the exchange rate movement indeed follows a random walk, then present exchange rate is the most fitted predictor of the future exchange rate. This implies that $S_t = E(S_{t+n})$. As a result, the forecasted exchange rate movement between a pair of currency a and currency b, $E_t[s_{t+n}(b/a)] - s_t(b/a)$, should equal to zero and so does the average forecasted exchange rate movement of currency a and the alternative issuance currencies. As a result, under the random walk hypothesis, the expected benefit/cost from the issuing currency's exchange rate movement is zero. That is, $E_t[\bar{s}_{t+n}(ex(a)/a)] - \bar{s}_t(ex(a)/a) = 0$.

Second, under the condition that the forward risk premium is not a significant component of the forward rate and that the forward market reflect consensus forecast by market participants, then the forward exchange rate can also be treated as an unbiased predictor of the future exchange rate [Eun and Resnick, 2008]. Agmon and Amihud [1981] report that there is no significant difference between the forward exchange rate and the random walk model in terms of exchange rate forecasting. However, using a sample of survey data in the 1980s, MacDonald and Torrance [1990] discover that the forward premium is a biased estimator of exchange rate movement because of the risk aversion of the forecasting agents.

The expected cost savings by denominating bond issuance in currency a based on forward exchange rate is calculated with the following approach:

$$[(\sum_{b=1}^{6} \frac{F_{(\$/b),t,t+n} - S_{(\$/b),t}}{S_{(\$/b),t}})/6] - (\frac{F_{(\$/a),t,t+n} - S_{(\$/a),t}}{S_{(\$/a),t}}) \tag{5.8}$$

where $F_{(\$/a),t,t+k}$ is the forward rate of currency a from time t to $t+n$, and $S_{(\$/a),t}$ is the time t exchange rate of currency a. As a result, $(\frac{F_{(\$/a),t,t+k} - S_{(\$/a),t}}{S_{(\$/a),t}})$ measures currency a's forward premium/discount. $(\sum_{b=1}^{6} \frac{F_{(\$/b),t,t+n} - S_{(\$/b),t}}{S_{(\$/b),t}})/6)$ measures the average forward premium/discount of the major currencies other than currency a. If bond issuers use the forward rate as an indicator of expected exchange rate movement, then equation (5.8) represents expected under-appreciation or over-depreciation of currency a as compared with the average expected performance of the other 6 major currencies. A positive value for this proxy indicates that the market expects currency a to either appreciate slower or depreciate faster than its counterparts on average over time period t to $t+n$, making it a bargain to potential bond issuers, ceteris paribus.

Third, the research literature, as well as the anecdotal evidence, suggests that bond issuers also form extrapolative expectations for future exchange rate by observing past exchange rate movement. Using a sample of survey data in 1985, Cavaglia et al. [1993] find that while exchange rates between the US dollar and currencies in the European Monetary System (EMS) follow long-term fundamentals, extrapolative expectations-formation mechanism has better predicting power for exchange rates between the US dollar and non-EMS currencies than long-term economic fundamentals. To reflect the most recent trend in exchange rate movement, I include lagged exchange rate data in my tests, but do not impose any structure on a borrower's expectations-formation process. In other words, I acknowledge that bond issuers may base their future exchange rate forecast on past exchange rate movement information, but I do not specify how borrowers extrapolate the most recent trend into the future. Exchange rate movements during the 4 quarters prior to each bond issuance is

included as relevant information, formally:

$$(\bar{s}_{(\$/ex(a)),t-\tau+1} - \bar{s}_{(\$/ex(a)),t-\tau}) - (s_{(\$/a),t-\tau+1} - s_{(\$/a),t-\tau}), \tau = 1 \text{ to } 4 \tag{5.9}$$

where $s_{(\$/a),t}$ is the exchange rate of currency a against the dollar, measured at each quarter t, and τ is the number of lags, which takes the value from 1 to 4. To accommodate the multi-currency framework of the tests, I subtract the appreciation rates for currency a from the contemporaneous cross-currency average exchange rates (the terms defined with bars). Accordingly, a positive value for this proxy indicates that currency a appreciated less or depreciated more than the cross-currency average over past periods. Positive values of these proxies represent attractive borrowing opportunities if issuers believe that past trends will continue (momentum view) and unattractive borrowing opportunities if they expect them to be reversed (mean-reversion view).

Fourth, I use the 1-year exchange rate forecast data provided by Datastream to calculate the expected 1-year cost savings due to exchange rate under-appreciation or over-depreciation. Research shows that professional forecasters as a whole can not outperform the random walk model. However, some professionals can significantly outperform the random walk model on selected currencies [Levich, 1982, Eun and Sabherwal, 2002]. Datastream provides exchange rate forecast data from surveys of professional traders for up to 1 year. This measure is constructed in a similar pattern as the 1-year cost savings calculated based on forward premiums:

$$[(\sum_{b=1}^{6} \frac{FCST_{(\$/b),t,t+n} - S_{(\$/b),t}}{S_{(\$/b),t}})/6] - (\frac{FCST_{(\$/a),t,t+n} - S_{(\$/a),t}}{S_{(\$/a),t}}) \tag{5.10}$$

where $FCST_{(\$/a),t,t+n}$ and $FCST_{(\$/b),t,t+n}$ are the forecasted exchange rate of currency a and currency b at t for the time point $t+n$, respectively. Equation (5.10) represents the forecasted under-appreciation or over-depreciation of currency a as compared to the average exchange rate movement of the other 6 major currencies. A positive value of this proxy

represents the forecasted cost savings of currency a as compared to the average costs of the other issuance currency choices in terms of currency movement.

The last approach that can be used to capture savings from expected exchange rate movement is to assume perfect foresight and measure exchange rate movement by observing *ex post* exchange rate changes. That is, assume $E_t[s_{t+n}] - s_t = s_{t+n} - s_t$. A potential challenge with this approach is that it requires a lengthy horizon during the *ex post* period, which can sometimes be hard to achieve if the sample period is rather recent. Given that my sample period ends at year 2011, I am able to observe 5-year post-issuance exchange rate movement data, which approximately matches the median maturity of 5.1 years for bonds in my sample.

5.1.3 Covered Cost Saving

The basic framework for empirical tests on the opportunistic behavior of borrowers in response to covered cost saving is from equation (4.5). The covered borrowing cost saving, $\Delta C^c_{a,t}$, is defined as the difference in spreads between long-term bond yields and currency swap rates in the chosen currency and alternative currency, respectively.

In multivariate regressions, I allow covered cost savings to be entered as a single dependent variable and also by its three separate components expressed in equation (4.9). In empirical tests I estimate both equation (4.5) and the following equation:

$$\begin{aligned} Iss_{a,t} = \alpha^c + \beta^c_1(\bar{i}_{ex(a),t} - i_{a,t}) + \beta^c_2(swp^i_{a,t,t+n} - s\bar{w}p^i_{ex(a),t,t+n}) \\ + \beta^c_3(swp^c_{a,t,t+n} - s\bar{w}p^c_{ex(a),t,t+n}) + \gamma^c M_{i,t} + e^c_{i,t} \end{aligned} \tag{5.11}$$

where $\bar{i}_{ex(a),t} - i_{a,t}$, $swp^i_{a,t,t+n} - s\bar{w}p^i_{ex(a),t,t+n}$, and $swp^c_{a,t,t+n} - s\bar{w}p^c_{ex(a),t,t+n}$ represent cost savings from nominal rate difference, from interest swap rate difference, and from currency swap rate difference, respectively. A positive value of β^c_1, β^c_2, or β^c_3 will imply that the borrowers increase their bond issuance in currency a in response to nominal cost savings, interest swap rate savings, or currency swap rate savings, respectively. $M_{i,t}$ is the matrix of

macroeconomic variables and γ^c records their coefficients. $e^c_{i,t}$ is the error term in the covered cost test.

5.2 Macroeconomic Variables

In conducting the empirical tests, my purpose is to isolate the opportunistic cost saving motivation from other motivations by the borrowers. The sample design minimizes the influence of hedging, tax arbitrage, as well as market segmentation factors. To further control for macroeconomic factors that represent the attractiveness of the issuing currency beyond the 4 motivation discussed above, I also use 3 variables to control for characteristics of the issuing currency's domicile country: GDP, FDI, and capital market size.

I use the real GDP in the currency country to represent the size of the economy. In the seminal work by Eichengreen and Hausmann [1999], they find the size of the currency country's economy to be an important determinant of both the attractiveness and the hurdle faced by emerging market borrowers. Habib and Joy [2010] find empirical evidence that the economy size of the target market is positively correlated with the number of entries by foreign borrowers.

Claessens et al. [2007] find a country's capital account openness to have a significant impact on the borrowers' decision to choose that country's currency for their bond denomination. Using a large sample of foreign bond issues, Habib and Joy [2010] also report that the investment inflow into a country is positively related to the likelihood that foreign borrowers want to borrow in that country's currency. Following Habib and Joy [2010], I use the in-bound FDI toward a country to represent the country's attractiveness to foreign investors. Unlike out-bound FDI, in-bound FDI is directly related to the foreign demand for a country's currency, which in turn correlates with borrowing in that country's currency through bond issuance.[2]

[2]In unreported robustness tests, I also use out-bound FDI and total FDI to replace in-bound FDI in regressions. The results are qualitatively the same.

In a paper studying the choice of currency in bond issuance by a sample of European firms, Siegfried et al. [2007] report that, on the macroeconomic side, the size of the capital market in the issuance currency country appears to affect the firm's currency choice decision. With a sample of government bonds in both domestic and foreign currencies, Claessens et al. [2007] show that investor base matters to the currency choice of sovereign bond issuers. Although the bond instrument in my study, the global bond, is fully fungible beyond national financial market boundaries, if investors exhibit a certain extent of home bias for their bond investment, then the size of a currency country's investor base can potentially influence a borrower's denomination decision. Following Claessens et al. [2007] and Habib and Joy [2010], I use a currency country's aggregate bond issuance volume, which includes all bond types issued in the country's currency in each period, as the proxy for the size of the investor base.

Chapter 6

Data and Empirical Results

6.1 Data

My sample includes non-convertible, fixed-rate coupon global bond offerings from January 1, 1999 to December 31, 2011 from the SDC Global New Issues Database. I omit global bonds issued before 1999 to focus on the post-Euro era of the international bond markets and to avoid including bonds issued during the transitional period by Eurozone countries. SDC data provide at-issue information for global bonds on the issuer, issuer industry, issuer's domicile nation, issuing currency, principal amount, issuing market, listing exchange, underwriter, as well as general information for each tranche of the bonds. I restrict the issuers to be categorized as government and public agencies (SIC code in the 9000s or 6111). I also limit the denomination currency to be the 7 major international currencies: Australian dollar (AUD), Canadian dollar (CAD), Swiss frank (CHF), Euro (EUR), British pound (GBP), Japanese yen (JPY), and US dollar (USD). Bonds with "Market Area" variable equal to "global" are retained in the sample. In addition to these tranches, I also screen the SDC database for potential omissions.[1] I employ a list of criteria to identify global

[1]There is evidence that SDC's recording on global bonds can be incomplete. First, several global bond issuances reported in the news media, including the 4 tranches issued by Singapore Power described in Appendix A, are not indicated as "global" in their "Market Area" variable value. Second, in an recent interview on Feb. 27, 2017, Kenneth Lay told the author that although many bonds are not officially

bonds incorrectly labeled as either "international" or "European" in SDC's global new issue data set.[2] As a result, 636 tranches are added to the 1145 tranches defined as global bond tranches by SDC, making the total tranches (observations) in my sample 1781. Exchange rate data, treasury rate data, and short-term forward rate data are from DataStream. Long-term forward rate data and swaps data are from Bloomberg. Macroeconomic data, including GDP, FDI, and the inflation rate are from the International Monetary Fund (IMF) and the Organization for Economic Cooperation and Development (OECD). I also obtain capital market size data from the SDC Global New Issues Database. For detailed information of data sources and variable definitions, please refer to Appendix E.

6.2 Descriptive Results

Table 9.1 shows the distribution of global bonds by home country, issuing year, aggregate annual principal amount, Moody's rating, and issuer industry for the sample of global bonds offered in the 7 major currencies between 1999 and 2011. These 1781 tranches represent 922 bond issues.

Panel A of Table 9.1 reports the total number of tranches of global bonds by borrower's country of origin. "Freq." indicates the issuance frequency by issuers from the indicated nation. It is shown that the issuers in my sample are from a total number of 49 countries, with the US, Germany, and Canada ranked in the top 3 in terms of country of origin in numbers of tranches issued.[3] The category "supranational" includes global bonds issued by international and regional institutions such as the World Bank and the EIB. These supranational agencies

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labeled as global bonds, they bear the global bond's hallmark features of multi-market listing, cross-market clearance, and around the clock trading.

[2]The criteria I use to identify additional global bonds not labeled by SDC include: bond tranches that are listed at multiple exchanges at issuance; bond tranches issued by the same issuer on the same issuance date that belong to the same issuance; bond issuances that are reported in news media to be named as global bonds or have global bond features.

[3]Note that in this table, each observation is a bond tranche. The number in Panel A of Table 9.1 indicates the total number of tranches issued, not the total number of issuers or the total number of bonds.

issued a total 313 global bonds during the sample period, making them important players in the global bond market. Panel B reports the distribution of the denomination currency among the 7 major currencies. The US dollar is the most popular currency, followed by the Euro and the Canadian dollar. Except for the US dollar and the Euro, the other 5 currencies have zero tranches issued in them in at least one year during the 13-year period. This is reasonable given the reserve currency status of these two currencies in the international financial market. Panel C reports the distribution of annual aggregate principal amount ($ million) across the 7 major currencies. As expected, the dollar and the Euro have the highest aggregate principal amount issued in them. Panel D reports the distribution of Moody's ratings for the bonds. "NR" indicates that a tranche is not rated. In the sample, of the 1255 tranches that have a Moody's rating, about 80% receive a rating of investment grade. This finding, plus the fact that all of the issuers are government or regional public agencies, makes it reasonable to assume that the number of speculative-grade tranches in the "NR" group is very small. I keep all of the NR tranches because retaining a large percentage of the data outweighs the cost of including a few more speculative grade tranches.[4] Panel E reports the distribution of issuers by industry as described in the SDC Database and Panel F reports the frequency of the global bond's listing exchanges. Luxembourg and London are the top two listing exchanges for global bonds. There are also large quantities of global bonds that are traded over the counter (OTC). In Panel G, a table of domicile nations of the global bond issuers and the number of tranches issued each year from those nations is presented. Issuers from the developed economies are still the dominant borrowers in the global bond market while borrowers from the emerging markets also have a noticeable presence.

Table 9.2 provides summary statistics of the test variables. To make this table more

[4]The number of tranches without Moodys rating is 526, which represents 29.5% of the total number of 1781 tranches. If these unrated tranches are omitted, it will affect the testing power of the statistical regressions significantly. On the other hand, admitting potential speculative tranches will undermine my choice of using government treasure yield as the nominal borrowing yield for issuers in my sample. I keep the unrated samples for my main tests. However in robustness tests, I check and confirm that my findings hold with the rated sample, the investment grade sample, and the Aaa rated sample, respectively, in Table 9.14.

informative, the summary statistics are displayed at currency level.[5] There are considerable degrees of variation for variable values across different currencies. The US dollar has a dominant role in issuance currency, followed by the Euro. The other 5 currencies have lower weights measured by issuance number and issuance amount. By construction, the means of the abnormal shares and mean-scaled abnormal shares variables are all zero. In the conditional logit model, the US dollar is treated as the base currency, thus all the variables on rate difference take a value of zero for the US dollar. The standard deviations, minimal values, maximum values, as well as units of these variables are also reported in Table 9.2.

6.3 Multivariate Regression Results

Based upon the empirical models developed in chapter 5, I perform a series of panel regressions of uncovered and covered cost savings. These aggregate bond issuance measures include the abnormal currency shares, the number of tranches issued, the aggregate principal amount issued, as well as the mean-scaled abnormal shares.

6.3.1 Test Results on Abnormal Shares

In my first multivariate test, I capture the sizeable differences in average issuance shares across currencies and time by including the abnormal share as the dependent variable. Throughout my tests, I use beginning-of-quarter bond yields and swap rates to minimize any endogenity concerns. There are two concerns about error term clustering. The first one is the correlation of error terms across currencies in a given time period. The second concern is the correlation of error terms for the same currency across time. With clustered error terms, OLS regressions can produce unbiased estimations of the regression coefficients but the p-values will not be correctly estimated. To address these concerns, I take the following steps: in the first step, in order to eliminate serial correlation in the error term for the same

[5]The summary statistics for the independent variables in the gravity model are omitted, because those variables describe currency pairs, and thus cannot be summarized based solely on the issuance currency.

currency across time, I apply Prais–Winsten [Prais and Winsten, 1954] transformations to equation (5.7) and equation (5.11). In the second step, I estimate unbiased regression coefficients using OLS regressions but standard errors are generated with the Newey–West method [Newey and West, 1987] which overcomes autocorrelation and heteroskedasticity in the error terms in panel data. After these two steps, correct p-values for the regression coefficients are generated.

Equation (5.7) and equation (5.11) motivate the specification of the regressions of the aggregate bond issuance variables on the estimated uncovered and covered costs of global bonds.

Table 9.3 reports the empirical findings on abnormal bond shares issued and uncovered cost savings. In Panel A and C, abnormal shares constructed from the number of tranches issued are used as the dependent variable. In Panel B and D, abnormal shares constructed from the issuance amount are used as the dependent variable. In Panel A and B, the 5-year treasury bond rate difference $NomSaving_{5Y}$ is used as the variable to measure nominal interest rate savings while in Panel C and D the 10-year treasury bond rate difference $NomSaving_{10Y}$ is used. As discussed in chapter 5, I employ 5 alternative proxies to represent forecasted exchange rate movement by bond issuers. First, following the random walk model, the expected exchange rate movement is assumed to be zero. The second set of variables used is the lagged relative exchange rate movement in each of the 4 quarters prior to bond issuance, $UnderApp_{(t-1,t),(t-2,t-1),(t-3,t-2),(t-4,t-3)}$, which captures the historic information used for issuers to form extrapolative expectations. The third measure of forecasted exchange rate movement draws from survey data of bankers and foreign currency traders. $FcstExSaving$ measures the forecasted relative under-appreciation or over-depreciation of a currency as compared with the average movement of the other currencies. A positive value of $FcstExSaving$ means cost savings related to forecasted exchange rate movement. Similarly, $FwdSaving$ measures expected costs savings calculated as the difference between average 1-year forward premiums of alternative currencies and the forward premium of the issuance currency. Lastly, given that my sample period ends at 2011, I am able to collect

5-year exchange rate movement data after bond issuance. $ExpostFXSaving$ measures the post-issuance under-appreciation or over-depreciation of the issuance currency as compared with the average performance of the alternative currencies.

In regressions 1 to 5 of Panel A of Table 9.3, these five alternative measures of savings from forecasted exchange rate movement are included as independent variables individually, together with the independent variable $NomSaving_{5Y}$, which measures savings from nominal rate differences. In regressions 6 to 10, macroeconomic variables GDP_{share}, FDI_{share}, and $CapMkSize_{share}$ are included to control for macroeconomic conditions of the currency country. In all regression results presented in Panel A, the nominal interest rate variable, $NomSaving_{5Y}$, remains statistically significant at the 1% level. This is evidence that issuers raise their share of issuance in a sample currency when the nominal interest rate of issuance in that currency is lower than the average rate of the other 6 currencies. This finding is consistent with the hypothesis that issuers exhibit opportunistic behavior in their currency denomination decisions.

Among the four alternative measures of expected savings other than the random walk approach, the lagged exchange rate under-appreciation or over-depreciation in the two quarters prior to bond issuance are found to be positively correlated with abnormal shares of bond issuance in a specific currency. This is consistent with the hypothesis that bond issuers hold a momentum view when predicting future exchange rate movement based on past currency performance. I also find strong evidence that the 1-year forward premium difference, as a predictor of future exchange rate relative movement, is positively related with currency abnormal shares measures. The forecasted 1-year exchange rate movement and the 5-year ex post exchange rate movement are both found not to be significantly related to the abnormal shares of bond issuance. There can be two interpretations for this. It is either because these two proxies are imperfect measures of bond issuers' future exchange rate expectations, or it is because bond issuers do not change their abnormal shares of issuance based on forecasted exchange rate movement, at least not as sensitively as their reaction to nominal interest rate savings.

Among the three macroeconomic variables, a currency country's capital market size measured against total capital market size of the 7 markets is shown to be most significantly related to a currency's share of issuance. The capital market size represents the liquidity in a market and a liquid market attracts more bond issuers, ceteris paribus. A country's receipt of FDI is also found to be positively correlated with abnormal bond shares issued in that country's currency,[6] although that significance level is weaker than the level found for the capital market size variable.

Panel B of Table 9.3 presents results similar to Panel A, except the dependent variable is abnormal issuance shares based on issuance value instead of issuance frequency. The results on nominal rate difference and lagged exchange rate movement are similar to those found in Panel A. It is shown in Panel B that the savings from the 5-year exchange rate movement after bond issuance are positively correlated with the abnormal issuance shares measured by issuance amount. Capital market size is no longer significantly positively correlated with the abnormal shares in issuance amount. I find weak, but positive, evidence that GDP shares correlate with abnormal bond issuance shares. In Panel C and Panel D, when nominal interest saving is measured by the 10-year treasury bond rate difference, the empirical findings are qualitatively the same as those in Panel A and B.

Overall, the results in Table 9.3 are consistent with the view that bond issuers select the issuance currency based on perceived uncovered cost savings at issuance. Among the alternative inputs bond issuers may adopt to form their exchange rate forecast, recent relative exchange rate under-appreciation/over-depreciation and forward premium/discount have the strongest impact on issuers' decisions to choose issuance currency. The exchange rate forecast by professionals and actual post-issuance exchange rate movement also have low explanatory power for the abnormal currency shares.

Table 9.4 presents empirical test results on the abnormal issuance shares and covered cost savings. Similar to Table 9.3, the results are presented in 4 panels. The dependent variable

[6]When collecting macroeconomic data on GDP, FDI, and capital market size, the economic data for the entire Eurozone is collected for the currency Euro.

is *abnshare*, the abnormal share measured by the number of tranches issued, in Panel A and C. The abnormal share measured by the principal amount issued, *abmshare*, is used as the dependent variable in Panel B and D. Regression models with 5-year cost saving variables are presented in Panel A and B, and with 10-year cost saving variables presented in Panel C and D.

In model 1 of Panel A, $CoveredSaving_{5Y}$ is the independent variable. It is constructed as an aggregate of 3 components – the nominal interest saving, the interest swap rate saving, and the currency base swap rate saving. The covered cost saving is found to be strongly positively correlated with the abnormal shares of bonds issued in a currency.

In model 2, I replace $CoveredSaving_{5Y}$ with the 3 components including $NomSaving_{5Y}$ which measures 5-year nominal rate savings, $IntSwapSaving_{5Y}$ which measures 5-year interest swap rate savings, and $CurSwapSaving_{5Y}$ which measures 5-year currency base savings. I find that both $NomSaving_{5Y}$ and $IntSwapSaving_{5Y}$ are positively related to the abnormal issuance shares. The coefficient for $CurSwapSaving_{5Y}$ has a positive sign, but is not statistically significant. Given that the currency basis swap rate difference is much smaller in magnitude than the interest rate swap rate difference, it is not surprising that the interest rate swap component dominates the currency base swap component in affecting bond borrowers' behavior.

In models 3 and 4, three macroeconomic variables are added as independent variables. The covered cost saving variable continues to show a positive correlation with the abnormal bond shares in model 3. The findings in model 4 confirm what has been discovered in model 2, that bond issuers are responsive to nominal yield difference and interest swap rate savings, but are not responsive to currency base savings. Among the 3 macroeconomic variables, capital market size has a strong positive correlation while in-bound FDI has only a weak positive correlation with the abnormal bond shares.

In Panel B to Panel D of Table 9.4, the findings on covered cost savings and its components are largely the same as reported in Panel A. The results are consistent with the hypothesis that issuers in my sample respond to both covered and uncovered cost savings by increasing

currency shares when the costs are low for a currency. They also react to previous under-appreciation or over-depreciation of a currency in making their denomination decisions. As for macroeconomic factors, capital market size and in-bound FDI have a positive, albeit weak, impact on the total number and value of bonds denominated in each currency in each quarter.

6.3.2 Test Results on Mean-scaled Abnormal Shares

Next, I create dependent variables in the format of mean-scaled abnormal shares following McBrady and Schill [2007]. In their research design, they first regress each currency share on an intercept term. Then they divide the regression residual by the predicted value. Unlike my variable design on abnormal shares which bears a simple interpretation of average percentage point increase in shares of issuance across all currencies, their dependent variables represent the observed currency share as a percentage point change over its mean value, which they claim controls for the heterogeneity in currency popularity in general. In Table 9.5, the results of regression tests of uncovered cost savings on the mean-scaled abnormal share variables are reported. The uncovered cost saving variables are significant in both Panel A, where they are measured based on 5-year rates, and in Panel B, where they are measured based on 10-year rates. Take model 1 of Panel A as an example. On average, issuance shares increase by 0.94% in response to 1 basis point increase in nominal yield savings.[7] This effect is somewhat higher than findings reported by McBrady and Schill [2007], where they find the effect to be 0.24% in their sample. The coefficients for the 3 macroeconomic variables, including capital market size, are not significant in the Table 9.5 results. For the same 1 percentage point issuance share change, the mean-scaled abnormal share measure generates a higher value for currencies that have lower average share among the 7 issuance currencies

[7]McBrady and Schill [2007] report the effect on mean-scaled abnormal share based on 1 basis point of cost saving. To make my results directly comparable to theirs, I report my findings based on the same unit of 1 basis point of cost saving. This is different from unit of cost savings I use earlier when reporting findings on abnormal shares.

such as the Australian dollar or Canadian dollar. This adjustment generates lower values for dominant currencies such as the Euro and the US dollar. Thus it is less likely to be affected by the macroeconomic variables that usually take higher values for the US and Eurozone.

In Table 9.6, test results of covered cost saving variables on mean-scaled abnormal shares are reported. I find positive, but statistically weaker, result on the impact of covered cost savings on mean-scaled abnormal currency issuance share. In model 1 of Panel A, for example, it shows that on average, issuance shares increase by 0.55% in response to a 1 basis point increase in covered yield savings. This finding is comparable with findings reported by McBrady and Schill [2007], where they find the effect to be 0.75% in their sample.[8]

6.3.3 Test Results on Number of Tranches Issued

Besides abnormal issuance shares, I also study the influence of uncovered and covered cost savings on two raw measures of bond issuance – number of tranches issued per currency per quarter and total principal amount of bonds issued per currency per quarter. The results are reported in Table 9.7 to Table 9.10.

Table 9.7 reports the test results of the effects of uncovered cost savings on the number of tranches issued per currency per quarter. The coefficients of the uncovered saving variables remain positive and statistically significant in all models in both Panel A, where the uncovered saving variables are measured based on 5-year rates, and Panel B, where 10-year rates are used to construct uncovered cost savings. For example, based on model 1 of Panel A, when a currency's nominal yield is 100 basis point lower than the average nominal yield of the 6 alternative currencies, borrowers increase global bond issuance denominated in that

[8]For the same 1 basis point of cost saving, McBrady and Schill [2007] find weaker effect on issuance share from uncovered borrowing (0.24%) than covered borrowing (0.75%). While I find the effect on uncovered cost saving (0.94%) to be stronger than covered cost saving (0.55%) for the same 1 basis point saving. This difference in the relative size of the 2 effects can be attributed to the difference in sample characteristics between their study and this one. The difference includes the sample period, bond instrument, currency choice, as well as other aspects. But most importantly, due to data limitation, the covered cost calculation in McBrady and Schill [2007] doesn't include the currency base swap component, while in my study, both interest rate swap rate and currency swap rate are included as covered cost components. This makes my measure of covered cost more precise than that of McBrady and Schill [2007].

currency by 1.87 tranches in that quarter.[9] The 5 proxies for expected exchange rate movement employed in these models are similar to those included in Table 9.3. However, the coefficients for these variables are mostly insignificant, except for the exchange rate movement variable in $t-2$, $UnderApp_{(t-2,t-1)}$, in model 2, and the 5-year post-issuance exchange rate movement variable, $ExpostFXSaving$, in model 5 in both Panel A and Panel B. Since the dependent variable number of traches issued is a raw variable of issuance choice, in the tests I include macroeconomic variables as raw variables instead of percentage share variables as I did in the abnormal shares tests. Three variables GDP, FDI, and $CapMktSize$ are included to control for macroeconomic conditions that can make a currency attractive to borrowers beyond cost saving considerations. I find that a currency country's capital market size significantly affects the number of bonds denominated in that currency, regardless if 5-year rates or 10-year rates are adopted to measure uncovered cost savings. I also find the currency country's economic size measured by GDP to be weakly significant in Panel A.

Table 9.8 reports the regression results of the covered cost savings on the number of tranches issued. In model 1 and 3 of Panel A, it shows that covered cost savings have a significant impact on the number of tranches issued in a currency, with or without controls of the macroeconomic factors. Based on model 1 of Panel A, a 100 basis point covered cost saving will lead to an average 1.23 tranches increase in bonds denominated in a currency. Among the 3 macroeconomic variables, a country's capital market size continues to show a significant impact on number of tranches issued in the country's domicile currency.

6.3.4 Test Results on Principal Amount Issued

In my tests of the impact of uncovered and covered cost savings on the principal amount issued reported in Table 9.9 and 9.10, the results are largely the same as those reported in

[9]Although an increase of 1.87 tranches seems small, it represent significant change given that my sample is limited to global bonds issued by public agencies. These borrowers issued a total of 1781 global bond tranches from 1999 to 2011, which translate into an average of 34.25 tranches per quarter across all 7 currencies and an average 4.9 tranches per currency per quarter.

Table 9.7 and 9.8. Uncovered cost savings have a significantly positive effect on the principal value of bonds issued in a currency. Take model 1 of Panel A of Table 9.9 as an example. Here, on average, a 100 basis point uncovered cost saving in a currency will lead to an increase in bonds issued in that currency by 2315 millon dollars. Findings on covered cost savings are similar to those reported in the tests on the number of tranches issued. For example, based on the regression coefficients reported in model 1 of Panel A of Table 9.10, a 100 basis point covered cost savings leads to an average 709 million dollar increase in bonds issued in a currency per quarter. Larger capital markets continue to be found to be a significant factor to attract borrowers to denominate bonds in that country's currency. Economy size measured by GDP has a mixed effect on the amount of global bonds issued in a currency country.

Chapter 7

Conditional Logit Tests

This chapter presents an alternative method to examine the currency denomination choice of government and public agency issuers. Instead of studying aggregate currency shares over a period of time, in this chapter I treat each bond tranche as an observation and study whether the currency choice for each tranche is affected by the covered and uncovered costs of not only the denomination currency but also the alternative currencies. Specifically, I adopt a conditional logit model [Green, 2008] where the issuer makes currency denomination decisions based on the prevailing conditions of multiple alternatives of currency choice, including covered cost, uncovered cost, as well as macroeconomic conditions. The conditional logit model can be used to study richer data sets that include alternative-specific variables and not just the chosen alternative. It allows the choice set to vary across individuals and across time.

I model currency choice as a function of nominal yields, exchange rate movement, covered yields, and macroeconomic factors. More formally, this choice is modeled in the following equation:

$$prob(ISS_n = a) = \frac{e^{\beta' x_{n,a}} * e^{\alpha' w_a}}{\sum_{a=1}^{K} e^{\beta' x_{n,a}} * e^{\alpha' w_a}} \tag{7.1}$$

In this specification, the probability of issue n being denominated in currency a is a function of $x_{n,a}$, which is a vector containing the currency cost attributes for issue n and choice a, which can take a value from 1 to K. β is a vector containing the respective coefficients. It is also a function of w_a, which contains a set of indicators for the currency being equal to a, and α is a vector containing the respective coefficients.

Coefficients of alternative-specific regressors bear a simple interpretation. If the coefficient of a specific independent variable is positive, this means that if that variable increases for one of the currencies, then that currency is chosen more and other currencies are chosen less, and vice versa for a negative coefficient. To avoid multicollinearity, I omit the indicator for the US dollar, and thus the dummy variable coefficients, which will not be reported, represent the probability of issuing in the given currency with respect to the US dollar.

One benefit in adopting the conditional logit model as an alternative test is that all the cost and rate variables can be measured on a monthly basis instead of a quarterly basis. The regression model to be carried out is based on equation (7.1). Each explanatory variable is measured as the value associated with currency a at the beginning of the month when a bond is issued and the value associated with the dollar is treated as the base case.

7.1 Conditional Logit Tests on Uncovered Issuing Costs

The results of the conditional logit test of uncovered issuing costs on currency choices are presented in Table 9.11. The dependent variable is the currency choice of each global bond issued by public borrowers. For each bond issuance, the currency choice is paired with each of the 7 alternative currencies, including the chosen currency itself. So a total of 1781 tranches issued generate 12467 observations.

I obtain monthly interest rate and exchange rate data to generate a panel of prevailing uncovered borrowing cost measures across the 7 sample currencies. The independent variable $NomDif_{5Y}$ is the nominal yield difference between the 5-year US treasury rate and 5-year treasury bond rate of the issuing currency. While treasury bond yields do not represent the

specific yields at which each of the public agency borrowers could issue a bond, they are designed to serve as pricing benchmarks. A positive value of $NomDif_{5Y}$ represents a cost saving in currency a as opposed to issuing in dollars, and vice versa for a negative value. Similar to the uncovered cost saving tests in chapter 6, I use several alternatives to represent bond issuers' expected exchange rate movement without imposing a specific forecasting model. Besides the random walk model which assumes the exchange rate change to be zero on average, the first alternative, $ExRateChg_{t-1Y,t}$, measures the 1-year lagged exchange rate movement from year $t-1$ to the bond issuing date t. The exchange rates are all expressed in direct quotes of currency a per dollar in continuous compounding terms. A positive value of $ExRateChg_{t-1Y,t}$ suggests that currency a depreciated against the dollar during the 1-year period prior to the bond issuance, and vice versa for a negative value. The second measure for expected exchange rate movement, $ExRateFcst$, is the forecasted 1-year exchange rate movement based on survey results of professional traders. I also include the 1-year forward premium/discount measure, $FwdPremium_{1Y}$, as the third proxy for expected exchange rate movement. Lastly, I include 5-year ex post exchange rate movement, $ExpostEXChg_{5Y}$, as another measure of the exchange rate forecast by bond issuers at the date of issuance. Besides the nominal yield difference and expected exchange rate movement variables, I also include 3 macroeconomic variables that can affect a bond issuer's denomination decision beyond the cost saving consideration. They include GDP, in-bound FDI, and capital market size measured by the total value of bonds issued in each currency.

In Panel A of Table 9.11, the nominal yield difference between the 5-year US treasury rate and the 5-year treasury bond rate of the issuing country, $NomDif_{5Y}$, is adopted to measure the nominal saving in interest rate difference. Model 1 of Panel A represents the random walk approach of exchange rate forecasting. In model 2 to 5, 4 alternative exchange rate forecast proxies are included, together with $NomDif_{5Y}$. In all the test results, $NomDif_{5Y}$ remains positive and statistically significant. This is consistent with the hypothesis that bond issuers engage in opportunistic behavior by increasing bond issuance in currencies that have relatively low nominal costs. The finding on uncovered costs is also economically

significant. Take model 1 as an example, the odds ratio calculated based on the regression coefficients is 1.17. This suggests that when a currency's nominal yield is 1 percentage point lower than the US treasury nominal yield, investors are 17% times more likely to choose that currency over dollar as the issuance currency. Among the 4 alternative exchange rate forecast variables, only $ExpostEXChg_{5Y}$ is found to be statistically significant. This suggests that neither lagged exchange rate movement nor short-term forecasted exchange rate movement significantly impact the bond issuer's currency denomination decision, but the denomination currency is more likely to experience ex post under-appreciation or over-depreciation compared with its alternatives over a 5-year horizon post-bond issuance. In model 6 to 10, I repeat model 1 to 5 tests while adding macroeconomic control variables. $NomDif_{5Y}$ and $ExpostEXChg_{5Y}$ continue to be significantly positive. Among the three macroeconomic variables, GDP and FDI are found to significantly increase the likelihood of a currency being chosen as a denominated currency of a global bond while the capital market size is found to largely have no direct impact on such a likelihood.

Coefficients for currency variables are also reported in Panel A of Table 9.11. These coefficients represent the likelihood that a currency is chosen as issuance currency over the US dollar, after controlling for cost differences. As expected, these coefficients are all significantly negative, confirming that issuers are less likely to choose one of these currencies over the US dollar, holding everything else equal in a model. For example, from the regression results of model 1, the odds ratio for CAD can be computed as 0.043, which means that, holding everything else the same, the probability of the Canadian dollar being chosen over the US dollar as the global bond issuance currency is only 4.3%. Similar calculation shows the likelihood of the Euro being chosen over the US dollar to be 11%, ceteris paribus.

In Panel B of Table 9.11, the difference between the 10-year US treasury rate and the 10-year treasury bond rate of the issuing country, $NomDif_{10Y}$, replaces $NomDif_{5Y}$ to measure the nominal yield difference. The results are largely the same as those found in Panel A. The odds ratio based on regression results in model 1 of panel B is 1.63 for the 10-year uncovered cost saving variable, suggesting borrowers are 63% more likely to choose another

currency over the dollar as their denomination currency when the perceived nominal yield in that currency is 100 basis points lower than in the dollar. The consistently significant coefficients of $NomDif_{10Y}$ suggest that borrowers are more likely to denominate their bonds in a currency that has a lower nominal cost than in alternative currencies. All currency coefficients remain significantly negative.

7.2 Conditional Logit Tests on Covered Issuing Costs

Next, I conduct a series of conditional logit tests on the currency denomination decision and covered cost savings. Covered issuance costs have three components: the nominal bond yield, fixed-to-floating interest swap rate, and currency base swap rate. Thus the covered cost saving variables, $CoveredCost_{5Y}$ and $CoveredCost_{10Y}$, are the sum of nominal interest rate difference, interest swap rate difference, and currency base swap rate difference, between the dollar and the issuing currency a. In Panel A of Table 9.12, the 5-year covered rate and its components are also separately included as independent variables in some models. In model 1 of Panel A, the 5-year covered rate saving against the dollar, $CoveredCost_{5Y}$, is found to be significantly positive at the 1% level. Odd ratio calculation based on the coefficients of model 1 in Panel A indicates that a bond issuer is 13% more likely to choose an issuance currency over the dollar if that currency's covered cost is 100 basis points lower than the borrowing cost in US dollar,after the hedging expense. In model 2, the first two components of $CoveredCost_{5Y}$, $NomDif_{5Y}$ and $ISWDIF_{5Y}$, are included separately as independent variables. The coefficients for both variables are insignificant. In model 3, the first and third components of $CoveredCost_{5Y}$, $NomDif_{5Y}$ and $CSWDIF_{5Y}$, are included as independent variables separately. When a bond issuer skips the interest swap step and directly converts the fixed rate bond in currency a to a fixed rate bond in dollars, these are the two costs that the issuer faces. In model 4, all three components of the covered cost savings are included separately as independent variables and they are all found to be insignificant when inserted separately as independent variables.

In model 5 to 8 of Panel A, I repeat the tests in model 1 to 4 by adding macroeconomic variables in the conditional logit regressions. The findings on $CoveredCost_{5Y}$ and its components are qualitatively the same as the findings in model 1 to 4. Among the three macroeconomic variables, the findings are similar to those in Table 9.11. GDP and FDI are found to significantly increase the likelihood that a currency will be chosen as a denomination currency of a global bond while the capital market size is found to have only weak effect on such a probability.

In Panel B of Table 9.12, the 10-year covered rate savings, $CoveredCost_{10Y}$ and its components, are adopted as independent variables. The size of the coefficients for $CoveredCost_{10Y}$ larger than those found for $CoveredCost_{5Y}$ in Panel A, although in model 1 the coefficient is only 5% statistically significant rather than 1% significant as reported in model 5. I also find that the 10-year nominal rate difference, $NomDif_{10Y}$ is significantly positive throughout all the models and currency base swap rate savings $CSWDIF_{10Y}$ also remain positive and mostly significant. The findings on the three macroeconomic variables are similar to Panel A – a significantly increased likelihood for a currency to be chosen as the denomination currency when the domicile country's GDP is larger or receives a higher volume of FDI, and that likelihood is statistically unaffected by capital market size after the other two factors are controlled for.

Overall, the conditional logit test results confirm the findings from the abnormal shares test that borrowers react to deviations from uncovered and covered parity conditions. They increase bonds denominated in a currency when its uncovered or covered costs are lower than the alternatives. Macroeconomic conditions such as a country's GDP level, in-bound FDI, and, to a weaker extent, capital market size, also influence the currency denomination choice of public borrowers when they issue global bonds.

7.3 Robustness Test: Issue- and Issuer-related Characteristics

To further study the borrowers' opportunistic behavior, I conduct a series of tests on issue- and issuer-related characteristics and the cost saving behavior within a conditional logit test framework. Specifically, I look into 3 characteristics of each bond issuance: a) whether the issuer is from an emerging market or not; b) the credit rating of the bond tranche issued; c) whether the bond is issued before or after the 2008 global financial crisis.

7.3.1 Emerging Market Status

According to the original sin literature, emerging market borrowers face greater information asymmetry when they approach the international credit market to raise capital. As a result, they have less freedom in selecting their issuing currency as compared with their developed market counterparts. To examine this hypothesis, I conduct conditional logit tests on currency choice and borrowing cost for both the emerging and non-emerging market borrowers, respectively. The emerging market subsample include all tranches issued by sovereign and public agency borrowers from emerging markets as defined by the IMF.[1] The non-emerging market subsample includes sovereign and public borrowers from developed countries, as well as supranational borrowers such as the World Bank and the EIB.

Table 9.13 reports the empirical test results for borrowing costs and currency choice based on emerging market status. Panel A shows that, for the emerging market borrower subsample, all coefficients for uncovered cost savings are positive but not statistically significant. In comparison, for the results reported in Panel B for the non-emerging subsample, all coefficients for the uncovered cost saving variable are positive and statistically significant.[2]

[1] http://www.imf.org/external/pubs/ft/weo/2015/02/pdf/text.pdf.

[2] It should be pointed out that size of the coefficients on nominal yield difference for models in Panel A is comparable to the corresponding coefficients in Panel B. In some models, such as model 3, 4, 7, 8 and 9, the coefficients for $NomDif_{5Y}$ in Panel A are larger than those in Panel B. The lack of statistically significant findings in Panel A could be partly attribute to the smaller sample size of the emerging market group,

Panel C and D of Table 9.13 report similar findings for covered cost savings. While the coefficients are positive in both panels, they are statistically insignificant for the emerging market borrowers reported in Panel C and significant for the borrowers with non-emerging status reported in Panel D.

The findings in Table 9.13 confirm that emerging market borrowers are less reactive to cost saving opportunities when making bond currency choices than developed market borrowers. This is consistent with the view that, with less international experience and higher information barriers, emerging market borrowers enjoy less freedom in alternating between different bond markets when they place bonds outside their own domestic markets.

7.3.2 Conditional Logit Tests: Credit Rating

In the full sample conditional logit tests results shown in Table 9.11 and Table 9.12, all bond tranches, regardless of their credit rating, are retained. To investigate whether my findings are driven by the low-rating bonds or bonds without credit ratings, I conduct tests on the currency choice and cost savings for groups with different rating status.

Another important reason to examine the effect of credit ratings is because I use government bond yields as the proxy for the uncovered borrowing costs for issuers in my sample. If a large portion of the tranches in my sample receive a below investment grade rating, then this raises the question of the validity of using government bond yields as a proxy for nominal borrowing costs.

Based on Moody's rating information, I create 3 groups of observations from the full sample: a) the rated group, in which all tranches with missing information on Moody's rating are removed; b) the investment grade group, in which all tranches with Moody's rating at or above Baa are retained; c) the Aaa group, in which only Aaa rated tranches are retained.

Table 9.14 reports conditional logit test findings for the 3 groups. Panel A shows that all

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which contains only 446 observations, while the non-emerging market group contains 1335 observations.

the coefficients for the nominal yield difference variables remain positive and significant in all models. Panel B reports similar findings for coefficients for the covered cost saving variables. Results from Table 9.14 suggests that omitting unrated tranches or speculative grade bonds does not alter the findings on borrowers' opportunistic behavior. In particular, findings for the Aaa sample confirm that, in a sample where the issuers' borrowing costs are very close to government bond yields, my main findings on borrowers' opportunistic behavior remain robust.

7.3.3 Conditional logit Tests: Financial Crisis

The financial crisis of 2008 had a great impact on the global bond market's liquidity conditions. On the one hand, this liquidity crunch may have limited the borrowers' currency choice freedom as compared with the pre-crisis era. On the other hand, due to the financial crisis' different degree of impact on different countries, there may be larger deviations from parity conditions in the post-crisis era, thus providing greater cost saving opportunities. Furthermore, the global financial crisis's distinctive impact in different currency markets not only can affect the overall sensitivity of borrowers to cost saving opportunities, but it may also affect their specific currency choice based on non-cost-related conditions.

I define pre-crisis issues as tranches issued between 1999 and 2007, and the rest are defined as post-crisis issues. I study financial crisis' distinct impact for each currency by including a post-crisis indicator variable as a "case variable" in the conditional logit model. The conditional logit model allows two types of independent variables. The first type of independent variable is alternative-specific, i.e. they depend on the choices a subject faces. For example, borrowing cost is a alternative-specific variable because it varies across the 7 currency choices each borrower faces. The second type of independent variable is case-specific, i.e. they depend on the subject making the choices. The borrower's industry is an example of a case-specific variable. The indicator variable, post-crisis, is also a case-specific variable which equals 1 if a tranche is issued post-2008, and 0 otherwise. A case variable

such as post-crisis can have different coefficients for each of the choices the issuer faces.

Table 9.15 reports the conditional logit test results with the post-crisis case variable. All the constants for the currency variables are negative and significant. This reflects the fact that, compared with the base currency of the US dollar, the other 6 currencies are less likely to be chosen, ceteris paribus. The coefficients for the uncovered cost saving variables in model 1 and 2, and for the covered cost savings in model 3 and 4 are all positive and significant.

Across the 6 currency choices other than the base currency of USD, the post-crisis variable's coefficients are positive and significant for AUD and CHF, while they are negative and significant for EUR and GBP. The findings support the view that, compared with the pre-crisis era, bond issuers increase their bond issuance in AUD and CHF, while they decrease their borrowing in EUR and GBP. While an extensive discussion of the financial crisis's impact around the world is beyond the scope of this paper, this finding is consistent with previous findings that Australia and Switzerland are less affected by the credit crunch than their industrial country peers, while the Eurozone and the UK both suffer more severe liquidity drain as a result of the financial crisis.[3]

7.3.4 Conditional Logit Tests: All Three Characters

I adopt two approaches within the conditional logit test framework to study the effect of all three issue- or issuer-related characteristics together.

In the first approach, using 3 indicator variables *Emerging*, *Investment grade*, and *Post-crisis*, I create 3 interaction variables by multiplying them individually with the cost saving variables. These interaction variables are included as alternative-specific independent variables in the conditional logit tests.

Table 9.16 reports the findings from conditional logit tests on uncovered costs, with

[3]According to the World Bank, the annual GDP growth rate in 2008 is 3.7% for Australia, 2.3% for Switzerland, 1.0% for Canada, 0.4% for the Eurozone, -0.3% for United States, -0.6% for United Kingdom, and -1.1% for Japan.

the interaction variables. The tranches without credit ratings are omitted from the tests and the sample has 1255 cases and 8785 observations. In Panel A, the interaction variable $NomDif_{5Y} * emg$ measures how being an emerging market issuer affects the borrower's propensity to select a low-cost currency. The coefficients for this variable are all negative and are statistically significant in model 2 and 7. This is consistent with the finding reported in Table 9.13 that emerging market issues are less sensitive to deviations from interest parity conditions, ceritas paribus. The interaction variable $NomDif_{5Y} * inv$ measures how being an investment grade tranche affects the likelihood that the tranche is used to pursue low-cost borrowing opportunities by its issuer. The coefficients are all positive and significant. This suggests that investment grade bonds are more likely to be used as an instrument to explore lower cost borrowing opportunities than speculative grade bonds. The third interaction variable, $NomDif_{5Y} * post$ measures the incremental sensitivity to uncovered cost saving opportunities in the post-crisis era. The coefficients are negative but insignificant, which suggests no significant change of borrowers' aggregate opportunistic behavior towards uncovered cost savings in the post-crisis era.

In Panel B of Table 9.16, the reported findings on the interaction variables are similar to those in Panel A. The interaction variable of covered cost savings and emerging market status has significantly negative coefficients in all the models in which it is included. On the other hand, interaction variable of covered cost savings and investment grade indicator has positive and significant coefficients. The third interaction variable of covered cost savings and post-crisis indicator remains mostly insignificant in all models.

In summary, the results in Table 9.16 support the view that emerging market issuers are less likely to explore cost saving opportunities and the investment grade instruments are more likely to be used to issue bonds in low-cost currencies.

In the second approach, I adopt the three indicator variables $Emerging$, $Invgrade$, and $Postcrisis$ as case-specific variables and inspect how they affect borrowers' choice for each currency differently. The results are reported in Table 9.17. Model 1 and 2 show results for uncovered cost tests, while model 3 and 4 show results from covered cost tests.

The indicator variable *Emerging* is significantly negative for all currencies except CHF, which is also negative but insignificant. Because the base currency in all the conditional logit tests is always the USD, this finding shows that holding the borrowing costs constant, the emerging market borrowers are more likely to choose the US dollar as the issuing currency than non-emerging market borrowers. This is consistent with the original sin theory – the US dollar bond market is the largest and the most liquid among all bond markets. Thus emerging market borrowers faces lower barriers when they enter the US dollar bond market than other markets.

The indicator variable *Invgrade* is positive for all currencies except for GBP. This suggests when issuing in non-US dollar currencies, borrowers are more likely to issue investment grade bonds, except for British Pounds. One explanation for the negative coefficients for *invgrade* in GBP is that because of London's financial center status and sophisticated banking system, speculative grade bonds are easier to be placed in the UK than the US.

Lastly, the variable *Postcrisis* has positive coefficients for AUD, CAD, and CHF, while the coefficients for EUR, GBP, and JPY are negative. These findings are similar to those reported in Table 9.15 and bear similar interpretation. Those countries less affected by financial crisis, including Australia, Canada, and Switzerland, attract more bond issuance in their currencies after 2008, while the other 3 economies including the Eurozone, the UK, and Japan, who are affected more severely by the financial crisis, attract less bond issuance in their currencies after 2008.

7.4 Conditional Logit Tests: Gravity Model

Besides cost saving opportunities, the decision for a borrower to select an issuing currency could be based on the bilateral links between the issuer's domicile country and the currency country. To explore these bilateral links and verify whether the opportunistic behavior remains valid after controlling for these links, I adopt the gravity model of international trade to shed light on this subject.

7.4.1 Gravity Model: An introduction

The gravity model generally refers to the practice of using Newtonian physics to study human behavior in social science. Linder [1961] and Linnemann [1966] are among the first to propose using the gravity model to study international trade patterns. Since then, it has gained great popularity among researchers who study bilateral trade. In this section I discuss some findings from gravity model in international trade and finance. For a detailed review of the gravity model literature, please see Anderson and van Wincoop [2003].

Only recently have researchers applied the gravity equation to study international financial capital flows. In a theoretical study, Martin and Rey [2004] propose a two-country model where the interaction of a risk-diversification motive and market segmentation explains the international trade of financial assets. Okawa and van Wincoop [2012] respond to the need for a theoretical foundation of a gravity equation for international financial asset flows by deriving a gravity equation for asset trade. They start with a simple static portfolio choice framework where investors can form their portfolios with financial assets from a number of countries. When international financial frictions in the form of information asymmetries are introduced, this leads to a gravity equation where bilateral financial traction depends on both economic size and the financial frictions between two nations.

Using a specially constructed bilateral cross-border equity flow data, Portes and Rey [2005] report that the cross-border portfolio transaction depends on the economic size of the two countries, as well as the distance between them. They find that the same gravity equation also explains trade in goods. They initially find the explanatory power of geographic distance for capital flows puzzling, because unlike goods, financial assets are "weightless," thus distance cannot proxy transportation costs. They explain this finding as that geographical distance correlates with information barriers and provide empirical support for this explanation. Acknowledging the findings on distance and capital flows by Portes and Rey [2005], Aviat and Coeurdacier [2007] adopt a different point of view. They conclude that since the same gravity model can explain both trade in goods and transaction in financial assets, this

suggests that trade and financial transactions are mutually reinforcing. They argue that the strong impact of distance on financial transactions is the result of the complementarity between bilateral trades and financial investment. Using a special data set from Finland, Grinblatt and Keloharju [2001] document that Finnish investors are more likely to invest in companies that share 3 connections with them: same language, geographic adjacency, and cultural proximity. They also find these effects are weaker for sophisticated investors. Using survey data of foreign debt and equity portfolio investment from 2001 to 2007, Aarwal et al. [2012] extend the gravity model by constructing a set of cultural variables based on a list of cultural dimensions. They find that the cultural traits of the originating and destination countries interact with other gravity variables to determine the global foreign portfolio investment patterns.

In the gravity model literature, two key variables are identified as important determinants of bilateral trade flows: the economic size of the two trading partners and the geographic distance between them [Grinblatt and Keloharju, 2001, Portes and Rey, 2005, Aviat and Coeurdacier, 2007, Aarwal et al., 2012]. Empirical research also often identifies several other links that may explain cross-border trade flow. These links include: a) common language – it is feasible that two nations sharing the same language will trade more with each other; b) free trade agreement – participants of the same trade union have the incentive to trade more with each other; c) cultural and historic links – for example, Hong Kong may have the incentive to trade more with China and the UK, while former Soviet Union nations may trade more among each other. Bussière et al. [2008] offers a detailed discussion about these bilateral connections.

The focus of this paper is not to study cross-border portfolio investment but currency choice in bond issuance. Thus I augment the gravity model to suit the purpose of this study. First, unlike the international trade literature where bilateral trade is the outcome variable, following Aviat and Coeurdacier [2007], I include bilateral trade as one of the explanatory variables to study whether it has a complementary relation with cross-border financial investment patterns. Second, I include the connection measures including common

language, geographic proximity, and trade agreement, as well as historic link in the currency choice tests. Third, I only include the currency country's GDP as a proxy for economic size, because the issuing country's GDP is invariant among the currency choices so there is no need to add it to the currency country's GDP, as often carried out by international trade gravity studies.

7.4.2 Gravity Model: Sample and Variables

The Euro currency poses certain challenges in conducting the gravity model test. The Eurozone has many member nations. They have different official languages and various historic links with other countries in the sample. Including the Euro will introduce unnecessary complication to the tests. As a result, I drop all observations where the Euro is the issuing currency. I also drop the Euro as a currency choice from the sample.[4] Thus each issuer now faces 6 currency choices instead of 7. Also, the bilateral connection measures only apply if the issuer's nation and the currency nation are different. So all domestic currency tranches are removed from the sample. Relatedly, all bonds from supranational issuers are removed from the sample. Lastly, I also omit observations where bilateral connection information is missing. This leaves me with 602 tranches in the gravity test sample.

The bilateral trade data are obtained from the IMF.[5] The IMF publishes monthly bilateral import and export data on goods. Trade information on services and other current account items is not reported. Borrowing in a country's currency is more closely to the demand in that country's currency, which in turn is more related to its trade partners' import from that country. Thus I report the findings based on the import data as a measure of trade.[6] To measure the relative importance of each currency country a in terms of trade to the issuer

[4]In unreported tests where I keep the Euro observations and the Euro as a currency choice, the main findings from the gravity tests remain mostly unaffected.

[5]http://data.imf.org/regular.aspx?key=61013712.

[6]In unreported robustness tests I also use the export data and total trade data which is the sum of import and export as proxies of bilateral trade. The results are qualitatively the same.

country, I create the variable *Import* as a percentage variable. It equals the issuer country's import from country a divided by the total import from all 6 currency countries and then multiplied by 100. This measure is calculated based on the monthly import data for the issuing month.

In addition, I create 4 indicator variables to record if the issuing country and the currency country share a common connection based on a group of matrices reported in Appendix F. *Language* equals 1 if the two countries share a common official language, and 0 otherwise. *Location* equals 1 if the two countries are located in the same geographic area, and 0 otherwise. $TradeUnion$ equals 1 if the two countries belong to the same trade union, and 0 otherwise. Lastly, $HisLink$ equals 1 if the two countries share historic or cultural links. For detailed information about the gravity test variable definition, please refer to Appendix F.

7.4.3 Gravity Model: Results

Table 9.18 reports the gravity test results with full sample results reported in Panel A and the emerging market subsample results reported in Panel B.[7] Model 1 to 3 of Panel A report the full sample gravity test results with the uncovered cost saving variable, while model 4 to 6 report the gravity test results with the covered cost saving variable. The coefficients for both the uncovered and covered cost saving variables remain significantly positive. This confirms that the findings on borrowers' opportunistic behavior remain robust after controlling for bilateral connections between the borrower country and the currency country.

From Panel A, the coefficients for *Import* are positive and significant. This suggests that, ceteris paribus, stronger trade ties motivate a borrower to choose the issuance currency of its main trading partner. Among the 4 dummy variables, $TradeUnion$ and $HisLink$ are positive and significant, while *Language* and *Location* are positive but insignificant. This suggests that free trade agreements and historical links increase the likelihood of a country's currency being chosen by borrowers from its partner country.

[7]Due to collinearity, gravity test results for the non-emerging subsample can not be computed because for too many observations there is no within-case variability.

Panel B of Table 9.18 reports the gravity test results for the emerging market subsample, which contains 384 tranches. The coefficients for uncovered and covered saving variables remain positive, but with a lower significance level than the full sample results. The bilateral trade connection variable *Import* has positive and significant coefficients, similar to the findings in Panel A. However, the 4 indicator variables exhibit different patterns than those reported in Panel A. In the emerging market subsample, the common language indicator *Language* and the geographic proximity indicator *Location* are positive and significant, suggesting the importance of these two links when emerging market borrowers select issuing currencies, ceteris paribus. On the other hand, having a free trade agreement doesn't increase the likelihood for a emerging market borrower to select the currency from a country that is in the same trade union. Coefficients for the historic link variable $HisLink$ have a negative sign and are weakly significant. One interpretation for this is that emerging market borrowers avoid using currencies from countries that have colonial ties with their own country.

7.5 Conditional Logit Tests: Law and Issuing Currency

The theoretical framework in law and finance predicts a positive relation between a country's legal effectiveness and foreign participation in its debt market. Empirically, however, the findings are mixed. For example, using WorldScope data for 1689 firms as well as 315 firms from East Asian countries, Allayannis et al. [2005] find that legal protection is important for the currency denomination of the foreign debt. On the other hand, using a large sample of US multinational corporations (MNCs), Kedia and Mozumdar [2003] fail to find that legal regimes influence the currency decision in the foreign bond market.

My sample consists of bonds issued only in the 7 major currencies. There isn't enough cross-country legal effectiveness variation among the 7 currency countries. For example, according to the judicial effectiveness index of 1 to 10 created by Porta et al. [2000], 5 of the currency countries – Australia, Japan, Switzerland, the UK and the US, all have a value of 10. The country with the lowest value, Canada, has an index value of 9.25. This

limited variability of legal effectiveness prevents me from conducting a comprehensive test on creditor protection and currency choice. To shed light on the relation between legal system and currency choice given this limitation, I create two indicator variables to record whether the issuer country's legal system matches that of the currency country. $Law2match$ equals 1 if both countries have the common law system or both have the civil law system, and 0 if their legal systems don't match. $Law4match$ equals 1 if both countries have the same legal system categorized in 4 types (common law, French civil law, German civil law, and Scandinavian civil law), and 0 otherwise. The data for legal system is from Professor Andrei Shleifer's webpage.[8]

The empirical test results are reported in Table 9.19. Across all models, the gravity test variables are included. In model 1,2,5, and 6, the coefficients for $Law2match$ are positive and significant. In model 3, 4, 7, and 8, the coefficients for $Law4match$ are positive but insignificant. The results show that borrowers are more likely to choose issuing currencies whose domicile country has a matching legal system with their own country. This effect is weaker when a more specific legal system category is used rather than a simple civil law/common law distinction.

[8]https://scholar.harvard.edu/shleifer/publications/investor-protection-and-corporate-governance.

Chapter 8

Conclusions

Using a sample of global bonds issued by public and government borrowers in the period between 1999 and 2011, I examine whether currency denomination is motivated by bargain seeking. Overall, my findings are consistent with the hypothesis that borrowers make currency denomination decisions to lower their borrowing costs. Collectively, they issue a greater share of bonds in those currencies with relatively low covered and uncovered borrowing costs. I also find that countries with larger economic size, receiving more FDI inflow, and having larger total debt market size have more bonds denominated in their currencies, ceteris paribus. This finding of borrowers' opportunistic behavior is supported by the conditional logit test results, with different model specifications and extensions.

I also discover that the borrowers' emerging country status, the credit rating of the bond instrument, and the era of bond placement play an important role in borrowers' overall responsiveness to the deviations of interest parity condition. Under a gravity model framework, I also provide evidence that trade flow, common language, geographic adjacency, trade agreement, and historic links motivate borrowers from a country to issue bond in another country's currency if they share such links. In addition, matching legal systems are shown to motivate cross-country bond issuance by issuers in my sample.

This study uses a specially calibrated data set to examine the opportunistic behavior of

government and public agency borrowers. The design of the data set allows me to minimize the effect on a borrower's currency denomination decision of competing explanations such as natural hedge, seeking alternative market, and tax arbitrage. It allows a clean and accurate test of one important motivation behind a borrower's denomination decision that has not been fully studied in the literature. The strong evidence that these government and public agency borrowers exhibit opportunistic behavior in the global bond market has important implications for the development of the international capital market in general. These issuers are usually repeat borrowers with established reputations in the international bond market. The bond instruments examined in this study, global bonds, are usually large in size and fully fungible across markets. As a result, the bonds' issuances in my sample are the least likely to be subject to market frictions and most likely to face a condition that is close to a perfect market condition. Borrowers who traditionally face less freedom in alternating their issuing currencies can also benefit from reduced borrow costs if market barrier is further reduced and the global trading system is more integrated.

Chapter 9

Tables and Figures

Table 9.1: Summary of Global Bond Offering Sample

This table shows the distribution of home country, issuing year, aggregate annual principal amount, Moody's rating, and issuer industry for the 1999-2011 sample of global bonds offered in Australian dollar (AUD), Canadian dollar (CAD), Swiss frank (CHF), Euro (EUR), British pound (GBP), Japanese yen (JPY), and US dollar (USD). Panel A reports the total number of tranches of global bonds by borrower's country of origin. Freq. indicates frequency of issuance by issuers from the indicated issuer nation. Panel B reports the distribution of the denominated currency among the 7 major currencies stated above. Panel C reports the distribution of the annual aggregate principal amount ($ million) across the 7 major currencies. Panel D reports the distributing of Moody's rating. NR indicates that a tranche is not rated. Panel E reports the distribution of the issuer's industry as described in the SDC. Panel F reports the distribution of frequency of the sample global bond's listing exchange. The symbol of exchange is from the SDC. Panel G reports annual tranches of global bond issuance by country.

Panel A: Global Bond by Issuer's Nation

Nation	**Freq.**	**Pct.**	**Nation**	**Freq.**	**Pct.**	**Nation**	**Freq.**	**Pct.**
Argentina	18	1.01	Hungary	7	0.39	Poland	13	0.73
Australia	1	0.06	Indonesia	11	0.62	Qatar	5	0.28
Bolivia	15	0.84	Ireland-Rep	2	0.11	South Africa	11	0.62
Brazil	38	2.13	Israel	10	0.56	South Korea	25	1.40
Canada	157	8.82	Italy	41	2.3	Spain	43	2.41
Chile	8	0.45	Jamaica	9	0.73	Sweden	24	1.35
China	1	0.06	Japan	4	0.51	Turkey	46	2.58
Colombia	28	1.57	Lebanon	20	0.22	Ukraine	2	0.11
Costa Rica	2	0.11	Luxembourg	1	1.12	United Kingdom	27	1.52
Croatia	1	0.06	Malaysia	4	5.22	United States	541	30.38
Denmark	6	0.34	Mexico	36	0.22	Uruguay	13	0.73
Egypt	4	0.22	Netherlands	11	2.02	Utd Arab Em	7	0.39
Finland	1	0.06	Norway	19	0.62	Venezuela	7	0.39
France	38	2.13	Pakistan	2	1.07	supranational	313	17.57
Germany	138	7.75	Panama	20	0.11			
Greece	1	0.06	Peru	10	1.12			
Hong Kong	1	0.06	Philippines	39	3.43	Total	1,781	100.00

Panel B: Number of Global Bond by Currency Year

	AUD	**CAD**	**CHF**	**EUR**	**GBP**	**JPY**	**USD**	**Sum**
1999	0	2	0	25	16	10	103	156
2000	0	0	0	38	8	9	83	138
2001	1	3	0	22	8	3	109	146
2002	13	2	0	17	2	1	135	170
2003	3	1	0	12	1	0	105	122
2004	1	4	0	5	0	1	110	121
2005	0	1	0	9	0	1	115	126
2006	0	6	2	7	0	2	107	124
2007	0	15	6	4	3	11	80	119
2008	1	5	2	7	0	4	113	132
2009	2	10	14	10	0	0	113	149
2010	4	6	0	7	1	5	127	150
2011	6	3	3	3	2	0	111	128
Total	31	58	27	166	41	47	1,411	1,781

Panel C: Value of Global Bond by Currency Year ($million)

	AUD	**CAD**	**CHF**	**EUR**	**GBP**	**JPY**	**USD**	**Sum**
1999	0	856	0	22,280	22,545	2,815	141,832	190,328
2000	0	0	0	30,854	15,023	3,360	169,672	218,910
2001	147	1,128	0	38,127	22,755	1,653	180,808	244,618
2002	845	731	0	29,808	3,925	758	182,143	218,210
2003	151	27	0	29,502	825	0	168,970	199,475
2004	791	1,534	0	16,202	0	950	154,840	174,317
2005	0	365	0	31,880	0	924	174,020	207,189
2006	0	6,125	262	18,864	0	867	188,991	215,109
2007	0	20,477	1,648	14,153	1,382	3,811	137,506	178,978
2008	469	23,208	145	42,248	0	1,869	214,263	282,202
2009	1,247	33,147	1,927	20,353	0	0	264,482	321,155
2010	923	16,806	0	34,511	956	2,068	248,926	304,191
2011	3,275	6,825	371	15,389	403	0	198,173	224,436
Total	7,848	111,228	4,353	344,171	67,816	19,075	2,424,626	2,979,116

Panel D: Global Bond Rating (Moody's)

Rating	Freq.	Pct.	Rating	Freq.	Pct.	Rating	Freq.	Pct.
Aaa	664	37.28	A3	22	1.24	Ba3	42	2.36
Aa1	61	3.43	Baa1	30	1.68	B1	74	4.15
Aa2	104	5.84	Baa2	19	1.07	B2	39	2.19
Aa3	36	2.02	Baa3	29	1.63	B3	8	0.45
A1	20	1.12	Ba1	46	2.58	NR	526	29.53
A2	26	1.46	Ba2	35	1.97	Total	1,781	100.00

Panel E: Distribution of Issuer Industry

Industry	Freq.	Pct.	Industry	Freq.	Pct.
City Government	18	1.01	Non-Gov't Agency	313	17.57
Fedl Credit Agcy	529	29.70	Regional Agency	6	0.34
National Agency	302	16.96	Regional Gov't	95	5.33
National Gov't	518	29.08	Total	1,781	100.00

Panel F: Distribution of Listing Exchange

Exchange	Freq.	Pct.	Exchange	Freq.	Pct.	Exchange	Freq.	Pct.
AMSTR	1	0.06	LONDN	108	6.06	SWISS	31	1.74
ATHNS	1	0.06	LUXBG	817	45.87	SWNEW	1	0.06
AUSLA	4	0.22	MADRD	7	0.39	TOKYO	2	0.11
BEIR	1	0.06	NDUBA	1	0.06	TORON	13	0.73
BOLIV	15	0.84	NYOTC	2	0.11	VIENA	1	0.06
BOSBE	32	1.80	NYSE	9	0.51	ZAGRB	1	0.06
DUBLN	3	0.17	NYSEA	1	0.06	ZURCH	1	0.06
EUROA	1	0.06	OTC	541	30.38	NONE	87	4.88
FRANK	35	1.97	PARIS	32	1.80	MISSING	9	0.51
HONGK	1	0.06	SINGP	19	1.07			
IRISH	2	0.11	STUTT	2	0.11	Total	1781	100
						Total	1,772	100.00

Panel G: Global Bond Issuance by Country and Year

Issuer Nation	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Sum
US	41	42	47	57	43	45	43	44	38	48	37	33	23	541
Canada	6	4	17	15	11	3	5	9	18	14	23	19	13	157
Germany	3	3	3	5	7	12	14	18	15	15	13	17	13	138
Turkey	5	4	2	6	5	4	3	2	3	4	3	3	2	46
Spain	10	18	11	2	0	0	0	0	0	0	2	0	0	43
Italy	0	6	6	7	5	5	2	5	1	1	1	2	0	41
Philippines	5	2	0	4	2	7	4	5	1	1	3	3	2	39
Brazil	2	4	3	3	5	4	10	3	1	0	1	1	1	38
France	11	16	4	0	0	0	0	0	2	1	4	0	0	38
Mexico	5	2	3	3	6	2	3	0	3	2	2	3	2	36
Colombia	3	1	7	2	3	2	2	2	1	2	1	2	0	28
UK	10	7	8	2	0	0	0	0	0	0	0	0	0	27
South Korea	1	0	1	3	5	3	2	2	0	1	3	2	2	25
Sweden	0	6	0	2	1	1	2	2	4	0	3	1	2	24
Lebanon	4	1	0	0	0	4	0	0	0	0	4	2	5	20
Panama	1	1	2	3	1	3	2	1	1	2	1	2	0	20
Norway	0	0	1	6	0	2	1	2	3	0	1	2	1	19
Argentina	11	3	3	0	0	0	0	0	0	0	0	1	0	18
Other Countries	21	7	8	13	14	8	16	12	7	12	19	19	14	170
Supranational	17	11	20	37	14	16	17	17	21	29	28	38	48	313
Total	156	138	146	170	122	121	126	124	119	132	149	150	128	1,781

Table 9.2: Variable Summary Statistics

This table reports the unit, number of observations, mean, standard deviation, minimal, and maximal values for all variables. Panel A reports variable summary statistics for all observations. Panel B reports summary statistics for all variables by currency.

Panel A: Summary statistics for all observations.

Variable	**Unit**	**Obs.**	**Mean**	**S.D.**	**Min**	**Max**
Dependent variables						
$abnshare_{i,t}$	pct.	364	0.00	4.35	-37.16	40.85
$abmshare_{i,t}$	pct.	364	0.00	4.97	-23.98	22.97
$numpcpq$	tranche	364	4.51	10.50	0.00	68.00
$amtpcpq$	$ million	364	8,036.57	17,839.67	0.00	104,322.30
$abnshareadj_{i,t}$	pct.	364	0.00	315.03	-100.00	3,950.00
$abmshareadj_{i,t}$	pct.	364	0.00	348.07	-100.00	4,285.65
Uncovered cost variables						
$NomSaving_{5Y}$	basis pt.	364	0.00	141.29	-296.61	412.60
$NomSaving_{10Y}$	basis pt.	364	0.00	128.46	-240.37	345.44

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Variable	Unit	Obs.	Mean	S.D.	Min	Max
$UnderApp_{(t-1,t)}$	basis pt.	364	0.00	298.72	-924.15	759.32
$UnderApp_{(t-2,t-1)}$	basis pt.	364	0.00	294.23	-766.09	785.99
$UnderApp_{(t-3,t-2)}$	basis pt.	364	0.00	375.42	-1,671.84	596.57
$UnderApp_{(t-4,t-3)}$	basis pt.	364	0.00	346.11	-1,298.00	690.89
$FcstExSaving$	basis pt.	364	0.00	39.46	-219.21	191.10
$FwdSaving$	basis pt.	364	0.00	174.39	-474.39	414.87
$ExpostFXSaving$	basis pt.	364	0.00	1,360.22	-3,646.56	3,555.69
Covered cost variables						
$CoveredSaving_{5Y}$	basis pt.	364	0.00	60.99	-171.03	217.72
$CoveredSaving_{10Y}$	basis pt.	364	0.00	44.81	-178.20	169.65
$IntSwapSaving_{5Y}$	basis pt.	364	0.00	155.59	-323.96	413.28
$IntSwapSaving_{10Y}$	basis pt.	364	0.00	138.70	-271.48	372.79
$CurSwapSaving_{5Y}$	basis pt.	364	0.00	12.79	-51.04	47.29
$CurSwapSaving_{10Y}$	basis pt.	364	0.00	12.12	-47.11	27.79
Macroeconomic variables						
GDP	$ trillion	364	0.32	0.44	0.00	1.71
FDI	$ billion	364	36.56	57.78	0.04	429.06
$CapMktSize$	$ billion	364	151.98	210.19	3.24	907.72

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Variable	Unit	Obs.	Mean	S.D.	Min	Max
GDP_{share}	pct.	364	14.29	18.93	0.11	58.08
FDI_{share}	pct.	364	14.29	18.67	0.01	80.47
$CapMkSize_{share}$	pct.	364	14.29	18.74	0.48	68.17
Conditional logit test variables						
$NomDif_{5Y}$	basis pt.	12467	26.09	155.77	-391.56	553.07
$NomDif_{10Y}$	basis pt.	12467	47.55	134.97	-261.50	467.70
$CoveredCost_{5Y}$	basis pt.	12467	-2.89	14.57	-66.91	45.84
$CoveredCost_{10Y}$	basis pt.	12467	-2.86	13.50	-47.65	41.55
$ExRateChg_{t-1Y,t}$	basis pt.	12467	204.42	959.26	-3,462.07	3,336.40
$ExRateFcst$	basis pt.	12467	297.71	1,491.91	-2,200.47	42,045.43
$FwdPremium_{1Y}$	basis pt.	12467	22.77	268.97	-996.31	1,145.70
$ExpostEXChg_{5Y}$	basis pt.	12467	885.79	1,907.41	-3,954.73	4,909.24
$ISWDIF_{5Y}$	basis pt.	12467	-49.09	172.21	-611.39	403.49
$CSWDIF_{5Y}$	basis pt.	12467	-2.66	14.54	-66.63	45.50
$ISWDIF_{10Y}$	basis pt.	12467	-61.84	149.82	-544.22	289.47
$CSWDIF_{10Y}$	basis pt.	12467	-2.72	13.49	-47.00	41.00

Panel B: Summary statistics by currency

Variable	Unit	Cur.	Obs.	Mean	S.D.	Min	Max
Dependent variables							
$abnshare_{i,t}$	pct.	AUD	52	0.00	0.74	-0.21	3.36
		CAD	52	0.00	6.73	-3.59	40.85
		CHF	52	0.00	1.87	-0.32	12.72
		EUR	52	0.00	3.06	-4.71	8.34
		GBP	52	0.00	1.31	-0.32	6.35
		JPY	52	0.00	3.23	-1.85	14.15
		USD	52	0.00	8.00	-37.16	10.99
$abmshare_{i,t}$	pct.	AUD	52	0.00	0.19	-0.04	1.13
		CAD	52	0.00	5.90	-3.47	22.97
		CHF	52	0.00	0.25	-0.04	1.72
		EUR	52	0.00	7.23	-9.29	15.15
		GBP	52	0.00	0.30	-0.06	1.94
		JPY	52	0.00	1.00	-0.58	3.33
		USD	52	0.00	9.34	-23.98	13.49
numpcpq	tranche	AUD	52	2.88	0.27	0.00	9.00
		CAD	52	3.15	1.88	0.00	12.00

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Variable	Unit	Cur.	Obs.	Mean	S.D.	Min	Max
		CHF	52	0.83	0.44	0.00	3.00
		EUR	52	6.47	1.04	2.00	15.00
		GBP	52	4.60	0.24	1.00	11.00
		JPY	52	1.27	1.01	1.00	5.00
		USD	52	28.23	10.35	10.00	68.00
numpcpq	$ million	AUD	52	133.26	135.55	0.00	791.40
		CAD	52	2,138.48	3,530.94	0.00	10,851.33
		CHF	52	91.26	120.77	0.00	862.43
		EUR	52	9,447.34	4,488.15	239.80	17,276.35
		GBP	52	262.03	137.29	91.40	956.16
		JPY	52	316.94	515.93	47.30	1,832.90
		USD	52	48,274.69	16,795.69	17,750.00	123,361.57
amtpcpq	pct.	AUD	52	0.00	357.71	-100.00	1,619.19
		CAD	52	0.00	187.38	-100.00	1,137.90
		CHF	52	0.00	580.82	-100.00	3,950.00
		EUR	52	0.00	64.94	-85.60	177.05
		GBP	52	0.00	413.62	-91.70	2,004.16
		JPY	52	0.00	174.82	-92.50	767.15
		USD	52	0.00	8.99	-41.75	12.35

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Variable	Unit	Cur.	Obs.	Mean	S.D.	Min	Max
$abmshareadj_{i,t}$	pct.	AUD	52	0.00	417.11	-100.00	2,534.86
		CAD	52	0.00	169.95	-100.00	661.46
		CHF	52	0.00	616.40	-100.00	4,285.65
		EUR	52	0.00	77.81	-82.60	163.07
		GBP	52	0.00	494.00	-89.70	3,244.63
		JPY	52	0.00	171.26	-92.40	569.99
		USD	52	0.00	10.80	-27.72	15.60
Uncovered cost variables							
$NomSaving_{5Y}$	basis pt.	AUD	52	-189.65	52.25	-296.61	91.64
		CAD	52	-45.50	46.03	-132.83	46.45
		CHF	52	84.14	35.78	0.25	156.15
		EUR	52	-7.11	30.11	-65.29	53.83
		GBP	52	-82.04	41.95	-147.48	12.75
		JPY	52	264.13	67.51	109.83	412.60
		USD	52	-23.97	64.05	-132.35	73.89
$NomSaving_{10Y}$	basis pt.	AUD	52	-169.05	35.40	6 -240.37	99.82
		CAD	52	-54.71	42.47	-127.39	28.38
		CHF	52	111.99	24.08	53.58	152.43

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Variable	Unit	Cur.	Obs.	Mean	S.D.	Min	Max
		EUR	52	-12.71	24.26	-52.83	32.41
		GBP	52	-66.40	19.06	-100.55	-35.03
		JPY	52	235.56	52.71	108.87	345.44
		USD	52	-44.68	42.72	-122.27	50.64
$UnderApp_{(t-1,t)}$	basis pt.	AUD	52	40.98	440.98	-1,089.91	825.09
		CAD	52	22.38	356.27	-1,092.78	724.16
		CHF	52	25.90	327.66	-587.60	929.12
		EUR	52	-28.90	281.14	-574.16	520.65
		GBP	52	-68.84	339.21	-1,671.84	596.57
		JPY	52	59.09	539.61	-686.68	933.67
		USD	52	-50.61	343.10	-766.09	785.99
$UnderApp_{(t-2,t-1)}$	basis pt.	AUD	52	41.31	440.49	-1,089.91	825.09
		CAD	52	16.08	366.09	-1,092.78	724.16
		CHF	52	48.22	346.11	-587.60	929.12
		EUR	52	-8.05	294.31	-574.16	701.81
		GBP	52	-71.40	338.19	-1,671.84	596.57
		JPY	52	38.80	522.04	-686.68	933.67
		USD	52	-64.96	335.62	-766.09	785.99
$UnderApp_{(t-3,t-2)}$	basis pt.	AUD	52	30.57	446.43	-1,089.91	825.09

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Variable	Unit	Cur.	Obs.	Mean	S.D.	Min	Max
		CAD	52	18.07	364.87	-1,092.78	724.16
		CHF	52	40.13	337.24	-587.60	929.12
		EUR	52	-0.28	298.72	-574.16	701.81
		GBP	52	-64.45	337.82	-1,671.84	596.57
		JPY	52	31.92	523.01	-686.68	933.67
		USD	52	-55.96	336.12	-766.09	785.99
$UnderApp_{(t-4,t-3)}$	basis pt.	AUD	52	34.61	447.27	-1,089.91	825.09
		CAD	52	19.48	365.37	-1,092.78	724.16
		CHF	52	34.64	342.08	-587.60	929.12
		EUR	52	-12.28	294.23	-574.16	701.81
		GBP	52	-63.21	338.93	-1,671.84	596.57
		JPY	52	38.06	518.79	-686.68	933.67
		USD	52	-51.31	336.38	-766.09	785.99
$FcstExSaving$	basis pt.	AUD	52	18.35	30.38	-33.40	101.30
		CAD	52	-1.82	33.52	-86.19	63.65
		CHF	52	-15.63	39.41	-219.21	51.14
		EUR	52	-5.07	22.07	-87.89	36.52
		GBP	52	3.39	28.33	-128.67	84.57
		JPY	52	-2.18	71.58	-210.77	191.10

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Variable	Unit	Cur.	Obs.	Mean	S.D.	Min	Max
		USD	52	2.97	20.47	-55.69	49.40
FwdSaving	basis pt.	AUD	52	246.98	84.81	87.13	414.87
		CAD	52	31.15	66.13	-122.77	171.86
		CHF	52	-146.08	62.69	-414.57	-32.26
		EUR	52	-6.10	51.08	-90.02	102.52
		GBP	52	108.52	91.51	-106.98	239.14
		JPY	52	-262.61	104.03	-474.39	-37.14
		USD	52	28.14	105.05	-117.20	231.94
ExpostFXSaving	basis pt.	AUD	52	-741.84	1,071.91	-2,314.97	1,668.35
		CAD	52	-235.94	749.17	-2,136.19	1,526.92
		CHF	52	-1,030.53	615.72	-2,175.55	410.49
		EUR	52	34.25	942.14	-1,475.69	1,777.76
		GBP	52	856.44	1,476.09	-1,366.47	3,555.69
		JPY	52	267.49	1,733.51	-3,646.56	2,551.99
		USD	52	850.13	1,322.35	-2,182.01	2,824.84
Covered cost variables							
$CoveredSaving_{5Y}$	basis pt.	AUD	52	32.99	20.39	2.80	78.14
		CAD	52	6.59	21.21	-61.28	42.80

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Variable	Unit	Cur.	Obs.	Mean	S.D.	Min	Max
		CHF	52	-45.60	19.64	-81.23	6.38
		EUR	52	-8.65	48.87	-119.07	94.12
		GBP	52	11.90	65.76	-123.71	163.79
		JPY	52	-24.41	75.97	-171.03	124.42
		USD	52	27.17	88.80	-151.64	217.72
$CoveredCost_{10Y}$	basis pt.	AUD	52	25.05	23.42	-12.87	82.99
		CAD	52	6.14	16.88	-45.40	37.09
		CHF	52	-6.38	11.40	-31.65	17.77
		EUR	52	-5.49	39.45	-75.65	65.60
		GBP	52	-3.72	31.43	-83.16	54.15
		JPY	52	-33.89	68.43	-178.20	121.11
		USD	52	18.31	61.82	-98.26	169.65
$IntSwapSaving_{5Y}$	basis pt.	AUD	52	-209.58	59.94	-323.96	108.26
		CAD	52	-40.13	50.71	-132.47	81.57
		CHF	52	123.08	28.58	58.50	187.83
		EUR	52	-3.68	34.19	-78.02	60.13
		GBP	52	-97.80	44.25	-178.31	2.30
		JPY	52	276.75	71.67	124.37	413.28
		USD	52	-48.63	70.09	-172.61	58.78

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Variable	Unit	Cur.	Obs.	Mean	S.D.	Min	Max
$IntSwapSaving_{10Y}$	basis pt.	AUD	52	-182.14	48.30	-271.48	101.59
		CAD	52	-48.27	42.11	-135.00	50.33
		CHF	52	112.61	23.27	37.52	151.18
		EUR	52	-10.16	28.98	-81.70	48.59
		GBP	52	-68.56	22.28	-113.51	-18.16
		JPY	52	257.01	55.26	136.73	372.79
		USD	52	-60.49	52.69	-157.79	32.40
$CurSwapSaving_{5Y}$	basis pt.	AUD	52	-13.06	11.93	-51.04	2.32
		CAD	52	-11.96	9.51	-47.68	0.45
		CHF	52	6.66	7.47	-4.07	26.74
		EUR	52	5.22	6.75	-2.39	21.24
		GBP	52	3.86	8.12	-15.20	30.04
		JPY	52	11.79	12.63	-11.82	47.29
		USD	52	-2.52	6.92	-25.46	3.68
$CurSwapSaving_{10Y}$	basis pt.	AUD	52	-11.96	13.34	-47.11	18.18
		CAD	52	-12.58	8.28	-40.48	0.68
		CHF	52	5.76	7.90	-4.86	24.33
		EUR	52	2.94	4.73	-4.64	13.87
		GBP	52	5.89	4.90	-0.71	21.86

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Variable	Unit	Cur.	Obs.	Mean	S.D.	Min	Max
		JPY	52	12.44	10.48	-16.11	27.79
		USD	52	-2.49	5.52	-22.64	3.11
Macroeconomic variables							
GDP	$ trillion	AUD	52	0.24	0.07	0.13	0.40
		CAD	52	1.21	0.29	0.80	1.71
		CHF	52	0.11	0.03	0.07	0.18
		EUR	52	2.27	0.71	0.92	3.84
		GBP	52	0.67	0.11	0.52	0.88
		JPY	52	1.37	0.55	0.82	1.93
		USD	52	2.89	0.98	1.05	4.12
FDI	$ billion	AUD	52	7.65	8.73	0.07	38.82
		CAD	52	10.77	9.42	0.05	50.90
		CHF	52	6.00	5.50	0.04	29.42
		EUR	52	134.17	89.34	1.63	429.06
		GBP	52	35.39	28.67	0.40	147.20
		JPY	52	3.48	2.91	0.10	13.58
		USD	52	58.44	30.90	1.60	148.90
CapMktSize	$billion	AUD	52	17.28	12.17	3.24	47.89

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Variable	Unit	Cur.	Obs.	Mean	S.D.	Min	Max
		CAD	52	23.79	14.69	7.75	59.57
		CHF	52	13.65	5.85	5.05	31.97
		EUR	52	357.84	149.22	119.00	711.70
		GBP	52	58.38	37.71	22.23	195.58
		JPY	52	56.39	19.93	25.12	92.48
		USD	52	536.50	151.67	250.48	907.72
GDP_{share}	pct.	AUD	52	2.74	1.36	4.83	3.25
		CAD	52	13.81	2.46	29.29	13.27
		CHF	52	1.26	0.68	2.84	1.56
		EUR	52	25.91	0.09	33.65	29.51
		GBP	52	7.65	3.78	19.00	6.85
		JPY	52	15.64	0.29	29.95	14.90
		USD	52	32.99	0.11	38.42	31.78
FDI_{share}	pct.	AUD	52	3.20	3.51	0.01	19.42
		CAD	52	4.09	2.43	0.04	12.28
		CHF	52	2.56	2.32	0.02	9.64
		EUR	52	50.20	16.30	1.12	80.47
		GBP	52	14.43	10.83	0.44	47.37
		JPY	52	1.46	1.05	0.03	5.64

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Variable	Unit	Cur.	Obs.	Mean	S.D.	Min	Max
		USD	52	24.07	10.99	1.81	57.51
$CapMkSize_{share}$	pct.	AUD	52	1.52	0.78	0.48	3.41
		CAD	52	2.14	1.05	0.97	4.81
		CHF	52	1.27	0.28	0.73	1.97
		EUR	52	32.98	5.92	18.90	45.76
		GBP	52	5.38	2.88	2.55	17.88
		JPY	52	5.45	1.67	2.53	10.39
		USD	52	51.27	7.21	28.14	68.17
Conditional logit test variables							
$NomDif_{5Y}$	basis pt.	AUD	1781	-163.17	104.31	-391.56	31.72
		CAD	1781	-20.93	51.49	-174.77	85.25
		CHF	1781	108.74	94.10	-61.85	307.30
		EUR	1781	19.33	74.69	-128.73	181.38
		GBP	1781	-54.08	59.70	-190.36	67.68
		JPY	1781	292.78	123.24	50.49	553.07
		USD	1781	0.00	0.00	0.00	0.00
$NomDif_{10Y}$	basis pt.	AUD	1781	-121.53	65.28	-261.50	2.83
		CAD	1781	-8.01	42.18	-135.03	70.73

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Variable	Unit	Cur.	Obs.	Mean	S.D.	Min	Max
		CHF	1781	158.95	56.08	2.93	272.15
		EUR	1781	35.13	48.98	-79.88	135.81
		GBP	1781	-16.25	48.84	-137.92	96.34
		JPY	1781	284.57	82.41	73.95	467.70
		USD	1781	0.00	0.00	0.00	0.00
$CoveredCost_{5Y}$	basis pt.	AUD	1781	10.74	8.32	-13.06	45.84
		CAD	1781	8.56	6.74	-16.06	36.78
		CHF	1781	-9.72	13.29	-44.32	4.73
		EUR	1781	-8.12	12.87	-46.88	2.68
		GBP	1781	-6.86	12.39	-55.97	6.13
		JPY	1781	-14.86	17.84	-66.91	12.43
		USD	1781	0.00	0.00	0.00	0.00
$CoveredCost_{10Y}$	basis pt.	AUD	1781	9.51	12.81	-35.53	41.55
		CAD	1781	9.41	7.53	-18.30	36.23
		CHF	1781	-8.31	11.43	-35.26	6.30
		EUR	1781	-5.71	8.58	-34.25	3.22
		GBP	1781	-9.03	9.71	-44.80	1.14
		JPY	1781	-15.88	14.14	-47.65	17.34
		USD	1781	0.00	0.00	0.00	0.00

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Variable	Unit	Cur.	Obs.	Mean	S.D.	Min	Max
$ExRateChg_{t-1Y,t}$	basis pt.	AUD	1781	360.91	1,343.60	-3,397.46	3,336.40
		CAD	1781	294.81	829.05	-2,326.57	2,119.45
		CHF	1781	340.09	964.30	-1,749.95	2,924.59
		EUR	1781	113.97	1,044.42	-2,279.19	2,319.15
		GBP	1781	-54.23	966.59	-3,462.07	1,504.18
		JPY	1781	375.39	894.13	-1,586.35	2,451.35
		USD	1781	0.00	0.00	0.00	0.00
$ExRateFcst$	basis pt.	AUD	1781	-868.66	688.92	-2,200.47	512.09
		CAD	1781	-119.74	300.93	-747.05	1,117.82
		CHF	1781	885.49	400.30	-799.28	1,619.41
		EUR	1781	330.18	430.82	-680.38	1,104.42
		GBP	1781	80.12	3,170.76	-978.65	42,045.43
		JPY	1781	1,776.55	645.65	649.22	3,286.88
		USD	1781	0.00	0.00	0.00	0.00
$FwdPremium_{1Y}$	basis pt.	AUD	1781	-247.87	302.50	-996.31	1,145.70
		CAD	1781	-19.85	177.72	-482.02	1,093.31
		CHF	1781	174.58	232.61	-338.81	1,091.54
		EUR	1781	39.46	223.79	-658.14	508.40
		GBP	1781	-75.91	175.71	-565.00	395.14

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Variable	Unit	Cur.	Obs.	Mean	S.D.	Min	Max
		JPY	1781	288.96	262.53	-260.15	989.40
		USD	1781	0.00	0.00	0.00	0.00
$ExpostEXChg_{5Y}$	basis pt.	AUD	1781	1,594.85	2,278.52	-3,786.83	4,909.23
		CAD	1781	1,101.61	1,961.57	-3,584.68	4,854.06
		CHF	1781	1,941.17	1,210.31	-1,791.38	4,572.48
		EUR	1781	926.07	2,039.01	-2,557.10	4,224.57
		GBP	1781	162.57	1,837.00	-2,838.41	3,207.69
		JPY	1781	474.26	2,073.56	-3,954.73	4,480.45
		USD	1781	0.00	0.00	0.00	0.00

Table 9.3: Abnormal Shares and Uncovered Cost Saving

This table presents the multivariate regression results that are estimated based on equation (5.7). Dependent variables are abnormal shares. The 5-year treasury rate difference, $NomSaving_{5Y}$, is used as the independent variable for the nominal rate difference measure in Panel A and B. The 10-year treasury rate difference, $NomSaving_{10Y}$, is used in Panel C and D. $UnderApp_{(t-1,t),(t-2,t-1),(t-3,t-2),(t-4,t-3)}$ represents the exchange rate movement in time $t-1$, $t-2$, $t-3$, and $t-4$, respectively. $FcstExSaving$ measures the expected exchange rate under-appreciation or over-depreciation of currency a based on the 1-year forecast rate. $FwdSaving$ measures the 1-year forward premium difference between currency a and the average forward premium of the other 6 currencies. $ExpostFXSaving$ measures the relative exchange rate movement over the 5-year period after bond issuance. P-values are listed below each coefficient. Significance at the 0.01, 0.05, and 0.10 levels is indicated by $***$, $**$, and $*$, respectively.

Panel A: The dependent variable is the abnormal currency shares as measured by the number of tranches issued. The nominal rate difference is constructed based on the 5-year treasury rates.

	1	2	3	4	5	6	7	8	9	10
$NomSaving_{5Y}$	0.0444***	0.0466***	0.0447***	0.0481***	0.0452***	0.0431***	0.0453***	0.0433***	0.0464***	0.0433***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$UnderApp_{(t-1,t)}$		0.0015**					0.0013**			
		(0.019)					(0.023)			
$UnderApp_{(t-2,t-1)}$		0.0013*					0.0014*			
		(0.087)					(0.091)			
$UnderApp_{(t-3,t-2)}$		0.0001					0.0002			
		(0.688)					(0.602)			
$UnderApp_{(t-4,t-3)}$		-0.0002					-0.0002			
		(0.651)					(0.651)			
$FcstExSaving$			0.0051					0.0039		
			(0.181)					(0.304)		
$FwdSaving$				0.0057***					0.0049**	
				(0.008)					(0.039)	
$ExpostFXSaving$					0.0002					0.0001
					(0.157)					(0.714)
GDP_{share}						0.1293	0.0541	0.1145	0.0375	0.1169
						(0.121)	(0.496)	(0.181)	(0.710)	(0.198)
FDI_{share}						0.0575*	0.0544*	0.0574*	0.0553*	0.0574*
						(0.074)	(0.078)	(0.075)	(0.081)	(0.073)
$CapMkSize_{share}$						0.1113***	0.1127***	0.1115***	0.1149***	0.1069***
						(0.005)	(0.001)	(0.006)	(0.007)	(0.006)
Currency fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj R-squared	0.232	0.260	0.234	0.242	0.235	0.257	0.281	0.258	0.263	0.257
Observations	364	364	364	364	364	364	364	364	364	364

Panel B: The dependent variable is the abnormal currency shares as measured by the principal amount issued in the currency quarter. The nominal rate difference is constructed based on the 5-year treasury rates.

	1	2	3	4	5	6	7	8	9	10
$NomSaving_{5Y}$	0.0377***	0.0415***	0.0382***	0.0491***	0.0396***	0.0368***	0.0405***	0.0372***	0.0488***	0.0389***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$UnderApp_{(t-1,t)}$		0.0022***					0.0021***			
		(0.006)					(0.006)			
$UnderApp_{(t-2,t-1)}$		0.0012*					0.0012*			
		(0.079)					(0.099)			
$UnderApp_{(t-3,t-2)}$		0.0015**					0.0015**			
		(0.041)					(0.042)			
$UnderApp_{(t-4,t-3)}$		-0.0001					-0.0001			
		(0.888)					(0.851)			
$FcstExSaving$			0.0076*					0.0059		
			(0.083)					(0.184)		
$FwdSaving$				0.0172***					0.0178***	
				(0.000)					(0.000)	
$ExpostFXSaving$					0.0006***					0.0005**
					(0.004)					(0.024)
GDP_{share}						0.2289***	0.1003	0.2067***	-0.1022	0.1161
						(0.004)	(0.245)	(0.009)	(0.405)	(0.225)
FDI_{share}						0.0472	0.0464	0.0469	0.0392	0.0461
						(0.333)	(0.311)	(0.336)	(0.393)	(0.343)
$CapMkSize_{share}$						0.0546	0.0611	0.0548	0.0674	0.0139
						(0.662)	(0.632)	(0.661)	(0.552)	(0.915)
Currency fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj R-squared	0.129	0.169	0.132	0.199	0.148	0.144	0.179	0.146	0.207	0.156
Observations	364	364	364	364	364	364	364	364	364	364

Panel C: The dependent variable is the abnormal currency shares as measured by the number of tranches issued. The nominal rate difference is constructed based on the 10-year treasury rates.

	1	2	3	4	5	6	7	8	9	10
$NomSaving_{10Y}$	0.0564***	0.0584***	0.0568***	0.0609***	0.0567***	0.0545***	0.0567***	.0549***	0.0592***	0.0543***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$UnderApp_{(t-1,t)}$		0.0011*					0.0011*			
		(0.078)					(0.083)			
$UnderApp_{(t-2,t-1)}$		0.0013*					0.0013*			
		(0.075)					(0.077)			
$UnderApp_{(t-3,t-2)}$		-0.0001					0.0001			
		(0.879)					(0.923)			
$UnderApp_{(t-4,t-3)}$		-0.0003					-0.0002			
		(0.591)					(0.622)			
$FcstExSaving$			0.048					0.0041		
			(0.247)					(0.329)		
$FwdSaving$				0.0051**					0.0049*	
				(0.029)					(0.054)	
$ExpostFXSaving$					0.0001					-0.0001
					(0.491)					(0.794)
GDP_{share}						0.0691	0.0033	0.0532	-0.0274	0.0786
						(0.435)	(0.971)	(0.558)	(0.797)	(0.415)
FDI_{share}						0.0569*	0.0544*	0.0568*	0.0547*	0.0571*
						(0.083)	(0.084)	(0.084)	(0.087)	(0.083)
$CapMkSize_{share}$						0.1241***	0.1245***	0.1242***	0.1281***	0.1274***
						(0.002)	(0.003)	(0.002)	(0.002)	(0.001)
Currency fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj R-squared	0.203	0.227	0.206	0.211	0.205	0.229	0.249	0.229	0.235	0.229
Observations	364	364	364	364	364	364	364	364	364	364

Panel D: The dependent variable is the abnormal currency shares as measured by the principal amount issued in the currency quarter. The nominal rate difference is constructed based on the 10-year treasury rates.

	1	2	3	4	5	6	7	8	9	10
$NomSaving_{10Y}$	0.0521***	0.0554***	0.0527***	0.0676***	0.0533***	0.0504***	0.0541***	0.0511***	0.0688***	0.0522***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$UnderApp_{(t-1,t)}$		0.0019**					0.0018**			
		(0.014)					(0.013)			
$UnderApp_{(t-2,t-1)}$		0.0013*					0.0013*			
		(0.062)					(0.073)			
$UnderApp_{(t-3,t-2)}$		0.0013*					0.0014*			
		(0.062)					(0.058)			
$UnderApp_{(t-4,t-3)}$		-0.0002					-0.0002			
		(0.813)					(0.813)			
$FcstExSaving$			0.0077*					0.0064		
			(0.089)					(0.162)		
$FwdSaving$				0.0174***					0.0192***	
				(0.000)					(0.000)	
$ExpostFXSaving$					0.0005**					0.0004*
					(0.017)					(0.058)
GDP_{share}						0.1711**	0.0474	0.1467*	-0.2039	0.0732
						(0.034)	(0.596)	(0.072)	(0.181)	(0.435)
FDI_{share}						0.0464	0.0461	0.0461	0.0375	0.0455
						(0.341)	(0.314)	(0.344)	(0.402)	(0.349)
$CapMkSize_{share}$						0.0623	0.0689	0.0626	0.0779	0.0286
						(0.626)	(0.596)	(0.625)	(0.499)	(0.831)
Currency fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj R-squared	0.133	0.167	0.137	0.205	0.147	0.146	0.176	0.148	0.215	0.155
Observations	364	364	364	364	364	364	364	364	364	364

Table 9.4: Abnormal Shares and Covered Cost Saving

This table presents the multivariate regressions results that are estimated based on equation (5.11). The dependent variable is abnormal shares. The independent variables include covered cost saving variables and three macro variables. For detailed information on these variables, please refer to Appendix E. P-values are listed below each coefficient. Significance at the 0.01, 0.05, and 0.10 levels is indicated by $***$, $**$, and $*$, respectively.

Panel A: The dependent variable is the abnormal currency share as measured by the number of tranches issued. $CoveredSaving_{5Y}$ is the covered cost saving calculated based on the 5-year treasury rates and the 5-year swap rates. $NomSaving_{5Y}$ is the 5-year treasury rate difference between currency a and the other 6 currencies. $IntSwapSaving_{5Y}$ is the 5-year interest swap rate difference. $CurSwapSaving_{5Y}$ is the currency base swap rate difference.

	1	2	3	4
$CoveredSaving_{5Y}$	0.0299***		0.0293***	
	(0.000)		(0.000)	
$NomSaving_{5Y}$		0.0512***		0.0494***
		(0.000)		(0.000)
$IntSwapSaving_{5Y}$		0.0146***		0.0132***
		(0.001)		(0.005)
$CurSwapSaving_{5Y}$		0.0181		0.0211
		(0.369)		(0.361)
GDP_{share}			-0.1081	0.0063
			(0.331)	(0.956)
FDI_{share}			0.0481	0.0522*
			(0.156)	(0.091)
$CapMkSize_{share}$			0.1383***	0.1079***
			(0.009)	(0.004)
Currency fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Adj R-squared	0.133	0.256	0.157	0.275
Observations	364	364	364	364

Panel B: The dependent variable is the abnormal currency share as measured by the principal value of bonds issued in the currency quarter. $CoveredSaving_{5Y}$ is the covered cost saving calculated based on the 5-year treasury rate and the 5-year swap rate. $NomSaving_{5Y}$ is the 5-year treasury rate difference between currency a and the other 6 currencies. $IntSwapSaving_{5Y}$ is the 5-year interest swap rate difference between currency a and the other 6 currencies. $CurSwapSaving_{5Y}$ is the currency base swap rate difference between currency a and the other 6 currencies.

	1	2	3	4
$CoveredSaving_{5Y}$	0.0377***		0.0375***	
	(0.000)		(0.000)	
$NomSaving_{5Y}$		0.0509***		0.0501***
		(0.000)		(0.000)
$IntSwapSaving_{5Y}$		0.0281***		0.0274***
		(0.000)		(0.000)
$CurSwapSaving_{5Y}$		0.024		0.0257
		(0.329)		(0.323)
GDP_{share}			-0.0869	-0.0077
			(0.431)	(0.947)
FDI_{share}			0.0331	0.0353
			(0.473)	(0.435)
$CapMkSize_{share}$			0.0643	0.0441
			(0.574)	(0.699)
Currency fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Adj R-squared	0.162	0.199	0.168	0.204
Observations	364	364	364	364

Panel C: The dependent variable is the abnormal currency share as measured by the number of tranches issued in the currency quarter. $CoveredSaving_{10Y}$ is the covered cost saving calculated based on the 10-year treasury rate and the 10-year swap rate. $NomSaving_{10Y}$ is the 10-year treasury rate difference between currency a and the other 6 currencies. $IntSwapSaving_{5Y}$ is the 10-year interest swap rate difference between currency a and the other 6 currencies. $CurSwapSaving_{10Y}$ is the currency base swap rate difference between currency a and the other 6 currencies.

	1	2	3	4
$CoveredSaving_{10Y}$	0.0357***		0.0337***	
	(0.000)		(0.000)	
$NomSaving_{10Y}$		0.0673***		0.0649***
		(0.000)		(0.000)
$IntSwapSaving_{10Y}$		0.0195***		0.0177***
		(0.002)		(0.006)
$CurSwapSaving_{10Y}$		-0.0206		-0.0206
		(0.382)		(0.452)
GDP_{share}			-0.0502	-0.0317
			(0.657)	(0.788)
FDI_{share}			0.0476	0.0499
			(0.167)	(0.107)
$CapMkSize_{share}$			0.1354***	0.1123***
			(0.008)	(0.007)
Currency fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Adj R-squared	0.108	0.231	0.129	0.249
Observations	364	364	364	364

Panel D: The dependent variable is the abnormal currency share as measured by the principal value of bonds issued in the currency quarter. $CoveredSaving_{10Y}$ is the covered cost saving calculated based on the 5-year treasury rate and the 10-year swap rate. $NomSaving_{10Y}$ is the 10-year treasury rate difference between currency a and the other 6 currencies. $IntSwapSaving_{5Y}$ is the 10-year interest swap rate difference between currency a and the other 6 currencies. $CurSwapSaving_{10Y}$ is the currency base swap rate difference between currency a and the other 6 currencies.

	1	2	3	4
$CoveredSaving_{10Y}$	0.0461***		0.0449***	
	(0.000)		(0.000)	
$NomSaving_{10Y}$		0.0708***		0.0692***
		(0.000)		(0.000)
$IntSwapSaving_{10Y}$		0.0348***		0.0333
		(0.000)		(0.000)
$CurSwapSaving_{10Y}$		-0.0072		-0.0048
		(0.762)		(0.855)
GDP_{share}			-0.0233	0.0295
			(0.828)	(0.782)
FDI_{share}			0.0317	0.0329
			(0.501)	(0.466)
$CapMkSize_{share}$			0.0589	0.0403
			(0.624)	(0.735)
Currency fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Adj R-squared	0.138	0.197	0.143	0.202
Observations	364	364	364	364

Table 9.5: Mean-scaled abnormal share and uncovered cost saving

The dependent variable in this table is the mean-scaled abnormal issuance share, which is measured as the abnormal shares of currency a-denominated bonds issued in each quarter divided by the average shares of currency a-denominated bonds issued in all quarters. Uncovered cost saving variables are constructed based on the 5-year rates in Panel A and B and they are constructed based on the 10-year rates in Panel C and D. $UnderApp_{(t-1,t),(t-2,t-1),(t-3,t-2),(t-4,t-3)}$ represents the relative exchange rate movement in the 4 quarters prior to bond issuance, respectively. $FcstExSaving$ is the forecasted exchange rate saving. $FwdSaving$ is the relative forward premium between the issuance currency and the average premium of the 6 alternatives. $ExpostFXSaving$ is the 5-year post-bond issuance relative exchange rate movement. GDP, FDI, and $CapMktSize$ measures the issuing currency country's GDP, FDI, and capital market size, respectively. P-values are listed below each coefficient. Significance at the 0.01, 0.05, and 0.10 levels is indicated by $***$, $**$, and $*$, respectively.

Panel A: The dependent variable is the abnormal currency shares as measured by the number of tranches issued. The nominal rate difference is constructed based on the 5-year treasury rates.

	1	2	3	4	5	6	7	8	9	10
$NomSaving_{5Y}$	0.9415***	0.9389**	0.9613***	1.0498***	0.8862***	0.9542***	0.9555**	0.9747***	1.0663***	0.8719**
	(0.006)	(0.012)	(0.007)	(0.002)	(0.006)	(0.008)	(0.016)	(0.009)	(0.006)	(0.014)
$UnderApp_{(t-1,t)}$		0.0163					0.0156			
		(0.651)					(0.673)			
$UnderApp_{(t-2,t-1)}$		0.0571*					0.0584			
		(0.081)					(0.115)			
$UnderApp_{(t-3,t-2)}$		-0.0518					-0.0507			
		(0.285)					(0.301)			
$UnderApp_{(t-4,t-3)}$		0.0916					0.0922			
		(0.248)					(0.252)			
$FcstExSaving$			0.3264					0.3174		
			(0.364)					(0.407)		
$FwdSaving$				0.1653					0.1676	
				(0.357)					(0.183)	
$ExpostFXSaving$					0.0176					-0.0204
					(0.176)					(0.127)
GDP_{share}						2.0769	-1.1240	0.8953	-1.0388	6.5426
						(0.893)	(0.945)	(0.955)	(0.946)	(0.683)
FDI_{share}						0.6367	0.5131	0.6204	0.5614	0.6826
						(0.535)	(0.625)	(0.542)	(0.568)	(0.517)
$CapMkSize_{share}$						-2.0119	-2.0415	-2.0004	-1.8916	-0.4036
						(0.251)	(0.292)	(0.257)	(0.291)	(0.819)
Currency fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj R-squared	0.148	0.168	0.149	0.149	0.152	0.149	0.169	0.153	0.152	0.154
Observations	364	364	364	364	364	364	364	364	364	364

Panel B: The dependent variable is the mean-scaled abnormal currency shares as measured by the principal amount issued in the currency quarter. The nominal rate difference is constructed based on the 5-year treasury rates.

	1	2	3	4	5	6	7	8	9	10
$NomSaving_{5Y}$	0.9308**	0.9520**	0.9561**	0.9921***	0.9027**	0.9572**	0.9947**	0.9872**	1.0682**	0.9358**
	(0.021)	(0.024)	(0.021)	(0.003)	(0.015)	(0.025)	(0.032)	(0.026)	(0.016)	(0.026)
$UnderApp_{(t-1,t)}$		0.0284***					0.0343			
		(0.481)					(0.405)			
$UnderApp_{(t-2,t-1)}$		0.0502					0.0586			
		(0.117)					(0.164)			
$UnderApp_{(t-3,t-2)}$		-0.0271					-0.0211			
		(0.631)					(0.705)			
$UnderApp_{(t-4,t-3)}$		0.1067					0.1122			
		(0.188)					(0.178)			
$FcstExSaving$			0.4146					0.4653		
			(0.238)					(0.254)		
$FwdSaving$				0.0935					0.1659	
				(0.645)					(0.168)	
$ExpostFXSaving$					0.0089					-0.0053
					(0.606)					(0.715)
GDP_{share}						-5.5426	-10.5264	-7.275	-8.6269	-4.3819
						(0.805)	(0.657)	(0.753)	(0.705)	(0.844)
FDI_{share}						0.0119	-0.0586	-0.0121	-0.0626	0.0239
						(0.989)	(0.949)	(0.989)	(0.941)	(0.978)
$CapMkSize_{share}$						-2.4456	-2.3177	-2.4287	-2.3265	-2.0276
						(0.222)	(0.277)	(0.226)	(0.251)	(0.343)
Currency fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj R-squared	0.149	0.166	0.151	0.149	0.150	0.150	0.169	0.153	0.151	0.151
Observations	364	364	364	364	364	364	364	364	364	364

Panel C: The dependent variable is the mean-scaled abnormal currency shares as measured by the number of tranches issued. The nominal rate difference is constructed based on the 10-year treasury rates.

	1	2	3	4	5	6	7	8	9	10
$NomSaving_{10Y}$	0.8973***	0.8736**	0.9219***	0.9829***	0.8469***	0.9027**	0.8918**	0.9313**	0.9935***	0.8054**
	(0.006)	(0.021)	(0.000)	(0.001)	(0.007)	(0.012)	(0.034)	(0.013)	(0.006)	(0.027)
$UnderApp_{(t-1,t)}$		0.0057					0.0052			
		(0.871)					(0.884)			
$UnderApp_{(t-2,t-1)}$		0.0559					0.0575			
		(0.081)					(0.127)			
$UnderApp_{(t-3,t-2)}$		-0.0576					-0.0564			
		(0.238)					(0.254)			
$UnderApp_{(t-4,t-3)}$		0.0912					0.0921			
		(0.251)					(0.253)			
$FcstExSaving$			0.2994					0.2957		
			(0.402)					(0.439)		
$FwdSaving$				0.0958					0.094	
				(0.606)					(0.378)	
$ExpostFXSaving$					-0.0203					-0.0236
					(0.141)					(0.393)
GDP_{share}						1.2289	-1.5115	0.0944	-0.6289	6.4956
						(0.939)	(0.928)	(0.995)	(0.968)	(0.694)
FDI_{share}						0.6563	0.5462	0.6404	0.6121	0.7082
						(0.548)	(0.621)	(0.553)	(0.567)	(0.529)
$CapMkSize_{share}$						-1.4753	-1.5569	-1.4627	-1.3982	0.3394
						(0.352)	(0.383)	(0.366)	(0.383)	(0.835)
Currency fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj R-squared	0.138	0.158	0.139	0.138	0.143	0.138	0.141	0.139	0.145	0.149
Observations	364	364	364	364	364	364	364	364	364	364

Panel D: The dependent variable is the mean-scaled abnormal currency shares as measured by the principal amount issued in the currency quarter. The nominal rate difference is constructed based on the 10-year treasury rates.

	1	2	3	4	5	6	7	8	9	10
$NomSaving_{10Y}$	1.0062***	1.0004	1.0387***	1.0479***	0.9779***	1.0518***	1.0759**	1.0958***	1.1747***	1.0183***
	(0.002)	(0.007)	(0.002)	(0.000)	(0.001)	(0.006)	(0.014)	(0.007)	(0.002)	(0.008)
$UnderApp_{(t-1,t)}$		0.0188					0.0252			
		(0.641)					(0.528)			
$UnderApp_{(t-2,t-1)}$		0.0496					0.0586			
		(0.123)					(0.167)			
$UnderApp_{(t-3,t-2)}$		-0.0324					-0.0259			
		(0.571)					(0.642)			
$UnderApp_{(t-4,t-3)}$		0.1061					0.1119			
		(0.192)					(0.181)			
$FcstExSaving$			0.3962					0.4556		
			(0.256)					(0.259)		
$FwdSaving$				0.0468					0.1276	
				(0.849)					(0.311)	
$ExpostFXSaving$					-0.011					0.0081
					(0.535)					(0.591)
GDP_{share}						-6.6274	-11.2607	-8.3755	-9.1436	-4.8181
						(0.773)	(0.641)	(0.723)	(0.687)	(0.831)
FDI_{share}						0.0169	-0.03999	-0.0075	-0.0429	0.0348
						(0.985)	(0.966)	(0.993)	(0.961)	(0.969)
$CapMkSize_{share}$						-2.0292	-1.9276	-2.0097	-1.9247	-1.4058
						(0.266)	(0.327)	(0.274)	(0.297)	(0.478)
Currency fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj R-squared	0.143	0.159	0.145	0.143	0.145	0.145	0.163	0.147	0.145	0.145
Observations	364	364	364	364	364	364	364	364	364	364

Table 9.6: Mean-scaled abnormal share and covered cost saving

The dependent variable in this table is the mean-scaled abnormal issuance share, which is measured as the abnormal shares of currency a-denominated bonds issued in each quarter divided by the average shares of currency a-denominated bonds issued in all quarters. The covered cost saving variables are constructed based on 5-year rates in Panel A and B and they are constructed based on 10-year rates in Panel C and D. GDP, FDI, and $CapMktSize$ measures the issuing currency country's GDP, FDI and capital market size, respectively. P-values are listed below each coefficient. Significance at the 0.01, 0.05, and 0.10 levels is indicated by $***$, $**$, and $*$, respectively.

Panel A: The dependent variable is the mean-scaled abnormal currency shares based on the number of tranches issued. The covered cost savings are based on the 5-year rates.

	1	2	3	4
$CoveredSaving_{5Y}$	0.5494*		0.5724*	
	(0.067)		(0.061)	
$NomSaving_{5Y}$		1.0502***		1.0553**
		(0.005)		(0.012)
$IntSwapSaving_{5Y}$		0.1867		0.1585
		(0.572)		(0.576)
$CurSwapSaving_{5Y}$		1.4159		1.5733
		(0.459)		(0.489)
GDP_{share}			-2.4973	2.4461
			(0.878)	(0.884)
FDI_{share}			0.4653	0.4727
			(0.642)	(0.641)
$CapMkSize_{share}$			-1.334	-2.4014
			(0.451)	(0.173)
Currency fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Adj R-squared	0.137	0.151	0.137	0.152
Observations	364	364	364	364

Panel B: The dependent variable is the mean-scaled abnormal currency shares based on the principal amount issued in currency quarter. The covered cost saving variables are constructed based on the 5-year rates.

	1	2	3	4
$CoveredSaving_{5Y}$	0.3384**		0.4279**	
	(0.016)		(0.039)	
$NomSaving_{5Y}$		0.9139**		0.9651**
		(0.011)		(0.036)
$IntSwapSaving_{5Y}$		0.0782		0.0261
		(0.811)		(0.915)
$CurSwapSaving_{5Y}$		1.612		1.5103
		(0.412)		(0.559)
GDP_{share}			-8.8096	-3.8149
			(0.714)	(0.876)
FDI_{share}			-0.0881	-0.0585
			(0.921)	(0.951)
$CapMkSize_{share}$			-1.6091	-2.7190
			(0.382)	(0.151)
Currency fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Adj R-squared	0.136	0.151	0.138	0.152
Observations	364	364	364	364

Panel C: The dependent variable is the mean-scaled abnormal currency shares as measured by the number of tranches issued. The covered cost saving variables are constructed based on the 10-year rates.

	1	2	3	4
$CoveredSaving_{10Y}$	0.4363*		0.4341**	
	(0.098)		(0.027)	
$NomSaving_{10Y}$		1.0028***		0.9815**
		(0.003)		(0.021)
$IntSwapSaving_{10Y}$		0.2592		0.2267
		(0.412)		(0.403)
$CurSwapSaving_{10Y}$		2.0175		2.2029
		(0.334)		(0.389)
GDP_{share}			0.0157	3.4233
			(0.999)	(0.851)
FDI_{share}			0.5554	0.5516
			(0.619)	(0.621)
$CapMkSize_{share}$			-1.1618	-1.6095
			(0.491)	(0.323)
Currency fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Adj R-squared	0.131	0.142	0.131	0.142
Observations	364	364	364	364

Panel D: The dependent variable is the mean-scaled abnormal currency shares based on the principal amount issued in currency quarter. The covered cost saving variables are constructed based on the 10-year rates.

	1	2	3	4
$CoveredSaving_{10Y}$	0.2802**		0.3733*	
	(0.027)		(0.096)	
$NomSaving_{10Y}$		0.9881***		1.0554**
		(0.001)		(0.017)
$IntSwapSaving_{10Y}$		0.0418		0.0932
		(0.903)		(0.706)
$CurSwapSaving_{10Y}$		2.4430		2.2141
		(0.218)		(0.427)
GDP_{share}			-7.2295	-3.8776
			(0.759)	(0.881)
FDI_{share}			-0.0422	-0.0338
			(0.964)	(0.971)
$CapMkSize_{share}$			-1.5299	-2.0756
			(0.404)	(0.258)
Currency fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Adj R-squared	0.134	0.147	0.135	0.147
Observations	364	364	364	364

Table 9.7: Number of tranches and uncovered cost saving

The dependent variable in this table is *numpcpq*, which is the number of tranches issued in each currency quarter. The nominal yield savings based on the 5-year treasury rate difference, $NomSaving_{5Y}$, is used in Panel A and Nominal yield savings based on the 10-year treasury rate difference, $NomSaving_{5Y}$, is used in Panel B.
$UnderApp_{(t-1,t),(t-2,t-1),(t-3,t-2),(t-4,t-3)}$ represents the relative exchange rate movement in the 4 quarters prior to bond issuance, respectively. $FcstExSaving$ is the forecasted exchange rate saving. $FwdSaving$ is the relative forward premium between the issuance currency and the average premium of the 6 alternatives. $ExpostFXSaving$ is the 5-year post-bond issuance relative exchange rate movement. GDP, FDI, and $CapMktSize$ measures the issuing currency country's GDP, FDI, and capital market size, respectively. P-values are listed below each coefficient. Significance at the 0.01, 0.05, and 0.10 levels is indicated by $***$, $**$, and $*$, respectively.

Panel A: Nominal rate difference is constructed based on the 5-year treasury rates.

	1	2	3	4	5	6	7	8	9	10
$NomSaving_{5Y}$	0.0187***	0.0196***	0.0189***	0.0199***	0.0198***	0.0167***	0.0178***	0.0169***	0.0183***	0.0181***
	(0.000)	(0.000)	(0.000)	(0.006)	(0.001)	(0.000)	(0.002)	(0.002)	(0.009)	(0.003)
$UnderApp_{(t-1,t)}$		0.0005					0.0005			
		(0.288)					(0.308)			
$UnderApp_{(t-2,t-1)}$		0.0006*					0.0004			
		(0.097)					(0.466)			
$UnderApp_{(t-3,t-2)}$		0.0002					0.0002			
		(0.665)					(0.659)			
$UnderApp_{(t-4,t-3)}$		0.0005					0.0004			
		(0.343)					(0.417)			
$FcstExSaving$			0.0035					0.0027		
			(0.369)					(0.487)		
$FwdSaving$				0.0018					0.0023	
				(0.671)					(0.568)	
$ExpostFXSaving$					0.0004*					0.0002
					(0.036)					(0.331)
GDP						3.0065**	2.5161*	2.9077*	2.8834*	1.7715
						(0.047)	(0.074)	(0.056)	(0.051)	(0.319)
FDI						-0.0011	-0.011	-0.0012	-0.0015	-0.0026
						(0.793)	(0.824)	(0.781)	(0.749)	(0.603)
$CapMktSize$						0.0133***	0.0131***	0.0133***	0.0135***	0.0127***
						(0.001)	(0.002)	(0.001)	(0.001)	(0.004)
Currency fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj R-squared	0.862	0.862	0.864	0.864	0.863	0.869	0.869	0.869	0.869	0.871
Observations	364	364	364	364	364	364	364	364	364	364

Panel B: Nominal rate difference is constructed based on the 10-year treasury rates.

	1	2	3	4	5	6	7	8	9	10
$NomSaving_{10Y}$	0.0233***	0.0239***	0.0236***	0.0246***	0.0241***	0.0212***	0.0222***	0.0215***	0.0233***	0.0228***
	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.002)	(0.002)	(0.002)	(0.009)	(0.003)
$UnderApp_{(t-1,t)}$		0.0004					0.0040			
		(0.449)					(0.445)			
$UnderApp_{(t-2,t-1)}$		0.0006*					0.0003			
		(0.093)					(0.447)			
$UnderApp_{(t-3,t-2)}$		0.0001					0.0001			
		(0.907)					(0.771)			
$UnderApp_{(t-4,t-3)}$		0.0004					0.0004			
		(0.367)					(0.432)			
$FcstExSaving$			0.0033					0.0026		
			(0.385)					(0.483)		
$FwdSaving$				0.0014					0.0021	
				(0.729)					(0.598)	
$ExpostFXSaving$					0.0003*					0.0002
					(0.058)					(0.382)
GDP						2.4217	1.9675	2.3084	2.2265	1.2938
						(0.116)	(0.175)	(0.139)	(0.126)	(0.491)
FDI						-0.0016	-0.0015	-0.0017	-0.0019	-0.0029
						(0.719)	(0.744)	(0.705)	(0.675)	(0.562)
$CapMktSize$						0.0136***	0.0135***	0.0135***	0.0138***	0.0131***
						(0.001)	(0.002)	(0.001)	(0.001)	(0.003)
Currency fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj R-squared	0.861	0.859	0.861	0.861	0.862	0.868	0.867	0.868	0.868	0.868
Observations	364	364	364	364	364	364	364	364	364	364

Table 9.8: Number of tranches and covered cost saving

The dependent variable in this table is *numpcpq*, which is the number of tranches issued in each currency quarter. Covered cost savings are measured by $CoveredSaving_{5Y}$, as well its 3 components $NomSaving_{5Y}$, $IntSwapSaving_{5Y}$, and $CurSwapSaving_{5Y}$ in Panel A. In Panel B, $CoveredSaving_{10Y}$, and its 3 components are included as independent variables to measure 10-year covered cost savings. GDP, FDI, and $CapMktSize$ measures the issuing currency country's GDP, FDI, and capital market size, respectively. P-values are listed below each coefficient. Significance at the 0.01, 0.05, and 0.10 levels is indicated by $***$, $**$, and $*$, respectively.

Panel A: Covered cost variables constructed based on the 5-year rates.

	1	2	3	4
$CoveredSaving_{5Y}$	0.0123***		0.01365**	
	(0.004)		(0.044)	
$NomSaving_{5Y}$		0.02147***		0.0206***
		(0.007)		(0.005)
$IntSwapSaving_{5Y}$		0.0053		0.0086
		(0.457)		(0.204)
$CurSwapSaving_{5Y}$		0.0106		-0.0123
		(0.435)		(0.365)
GDP			4.5675***	3.6468**
			(0.002)	(0.028)
FDI			-0.0024	-0.0015
			(0.677)	(0.753)
$CapMktSize$			0.0152***	0.0143***
			(0.001)	(0.001)
Currency fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Adj R-squared	0.858	0.862	0.869	0.871
Observations	364	364	364	364

Panel B: Covered cost variables are constructed based on the 10-year rates.

	1	2	3	4
$CoveredSaving_{10Y}$	0.0136**		0.0166**	
	(0.012)		(0.039)	
$NomSaving_{10Y}$		0.0271***		0.0274***
		(0.007)		(0.004)
$IntSwapSaving_{10Y}$		0.0072		0.0131
		(0.404)		(0.119)
$CurSwapSaving_{10Y}$		0.0041		0.0162
		(0.778)		(0.291)
GDP			4.3039***	3.0449*
			(0.003)	(0.072)
FDI			-0.0017	-0.0015
			(0.729)	(0.754)
$CapMktSize$			0.0155***	0.0152**
			(0.001)	(0.000)
Currency fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Adj R-squared	0.857	0.861	0.868	0.871
Observations	364	364	364	364

Table 9.9: Principal amount issued and uncovered cost saving

The dependent variable in this table is *amtpcpq*, which is the total principal value of bonds issued in each currency quarter. Nominal yield savings based on the 5-year treasury rate difference, $NomSaving_{5Y}$, is used in Panel A and Nominal yield savings based on the 10-year treasury rate difference, $NomSaving_{5Y}$, is used in Panel B. $UnderApp_{(t-1,t),(t-2,t-1),(t-3,t-2),(t-4,t-3)}$ represents the relative exchange rate movement in the 4 quarters prior to bond issuance, respectively. $FcstExSaving$ is the forecasted exchange rate saving. $FwdSaving$ is the relative forward premium between the issuance currency and the average premium of the 6 alternatives. $ExpostFXSaving$ is the 5-year post-bond issuance relative exchange rate movement. GDP, FDI, and $CapMktSize$ measures the issuing currency country's GDP, FDI, and capital market size, respectively. P-values are listed below each coefficient. Significance at the 0.01, 0.05, and 0.10 levels is indicated by $***$, $**$, and $*$, respectively.

Panel A: Nominal rate difference is constructed based on the 5-year treasury rates.

	1	2	3	4	5	6	7	8	9	10
$NomSaving_{5Y}$	23.1531***	26.4415***	23.548***	25.1689**	23.3893***	19.2047**	23.4015***	19.5978**	22.5781**	16.1059***
	(0.008)	(0.002)	(0.007)	(0..012)	(0.007)	(0.017)	(0.004)	(0.016)	(0.021)	(0.042)
$UnderApp_{(t-1,t)}$		1.7701**					1.7298**			
		(0.043)					(0.022)			
$UnderApp_{(t-2,t-1)}$		1.8198*					1.4369*			
		(0.065)					(0.097)			
$UnderApp_{(t-3,t-2)}$		1.3729*					1.4373**			
		(0.061)					(0.032)			
$UnderApp_{(t-4,t-3)}$		0.8275					0.6865			
		(0.268)					(0.349)			
$FcstExSaving$			6.4732					4.4723		
			(0.263)					(0.355)		
$FwdSaving$				3.0759					4.9657	
				(0.543)					(0.324)	
$ExpostFXSaving$					0.0753*					0.4941
					(0.079)					(0.144)
GDP						5.2327**	3.4581	5.0533**	4.9728**	8.146**
						(0.037)	(0.145)	(0.045)	(0.045)	(0.013)
FDI						-6.6234	-5.8502	-6.7675	-7.1874	-3.3764
						(0.548)	(0.588)	(0.541)	(0.518)	(0.763)
$CapMktSize$						37.9196***	37.4769***	37.8568***	38.2507***	39.5159***
						(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Currency fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj R-squared	0.869	0.871	0.869	0.869	0.869	0.892	0.894	0.892	0.892	0.892
Observations	364	364	364	364	364	364	364	364	364	364

Panel B: Nominal rate difference is constructed based on the 10-year treasury rates.

	1	2	3	4	5	6	7	8	9	10
$NomSaving_{10Y}$	32.6374***	35.6559***	33.1735***	35.6123***	32.7076***	29.5917***	34.4911***	30.2573***	35.1873***	25.5254**
	(0.003)	(0.001)	(0.003)	(0.004)	(0.003)	(0.005)	(0.001)	(0.005)	(0.005)	(0.017)
$UnderApp_{(t-1,t)}$		1.5853*					1.6143**			
		(0.066)					(0.028)			
$UnderApp_{(t-2,t-1)}$		1.8422*					1.5042*			
		(0.059)					(0.081)			
$UnderApp_{(t-3,t-2)}$		1.2709*					1.3926**			
		(0.077)					(0.037)			
$UnderApp_{(t-4,t-3)}$		0.7897					0.6712			
		(0.288)					(0.359)			
$FcstExSaving$			6.5379					5.3431		
			(0.254)					(0.305)		
$FwdSaving$				3.3303					5.670	
				(0.484)					(0.238)	
$ExpostFXSaving$					0.0284					0.4754
					(0.916)					(0.151)
GDP						3.8778	2.0166	3.6505	3.3534	6.8226**
						(0.134)	(0.417)	(0.162)	(0.192)	(0.041)
FDI						-7.0991	-6.4442	-7.2677	-7.8418	-3.8959
						(0.518)	(0.551)	(0.509)	(0.479)	(0.727)
$CapMktSize$						38.1395***	37.7513***	38.0821***	38.5749***	39.6378***
						(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Currency fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj R-squared	0.869	0.872	0.869	0.869	0.869	0.892	0.894	0.892	0.892	0.893
Observations	364	364	364	364	364	364	364	364	364	364

Table 9.10: Principal amount issued and covered cost saving

The dependent variable in this table is *amtpcpq*, which is total principal value of bonds issued in each currency per quarter. Covered cost savings are measured by $CoveredSaving_{5Y}$, as well its 3 components $NomSaving_{5Y}$, $IntSwapSaving_{5Y}$, and $CurSwapSaving_{5Y}$ in Panel A. In Panel B, $CoveredSaving_{10Y}$, and its 3 components are included as independent variables to measure 10-year covered cost savings. GDP, FDI, and $CapMktSize$ measures the issuing currency country's GDP, FDI, and capital market size, respectively. P-values are listed below each coefficient. Significance at the 0.01, 0.05, and 0.10 levels is indicated by $***$, $**$, and $*$, respectively.

Panel A: Covered cost variables constructed based on the 5-year rates.

	1	2	3	4
$CoveredSaving_{5Y}$	7.0884***		12.1678**	
	(0.507)		(0.049)	
$NomSaving_{5Y}$		21.0835*		21.7345**
		(0.073)		(0.042)
$IntSwapSaving_{5Y}$		2.9833		5.8105
		(0.781)		(0.548)
$CurSwapSaving_{5Y}$		-48.0148		54.4812
		(0.262)		(0.133)
GDP			7.1805***	4.4219*
			(0.002)	(0.091)
FDI			-7.5583	-6.8646
			(0.512)	(0.537)
$CapMktSize$			39.7429***	38.5214***
			(0.000)	(0.000)
Currency fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Adj R-squared	0.865	0.869	0.891	0.892
Observations	364	364	364	364

Panel B: Covered cost variables are constructed based on the 10-year rates.

	1	2	3	4
$CoveredSaving_{10Y}$	4.5732		13.6541	
	(0.772)		(0.321)	
$NomSaving_{10Y}$		27.883*		32.7644**
		(0.091)		(0.029)
$IntSwapSaving_{10Y}$		10.6822		3.5628
		(0.539)		(0.812)
$CurSwapSaving_{10Y}$		-58.6073		-37.7561
		(0.183)		(0.294)
GDP			7.0032***	3.2569**
			(0.003)	(0.029)
FDI			-7.2806	-7.2115
			(0.532)	(0.519)
$CapMktSize$			39.9243***	38.1824***
			(0.000)	(0.000)
Currency fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Adj R-squared	0.865	0.872	0.889	0.892
Observations	364	364	364	364

Table 9.11: Conditional Logit Test on Uncovered Cost

This table presents the conditional logit regressions results that are estimated based on equation (5.11). In Panel A the 5-year treasury rate difference is used as the independent variable for nominal interest saving. In Panel B, a similar measure based on the 10-year treasure bond rate is used. The sample period is from 1999 to 2011. P-values are listed below each coefficient. The regression has 12467 observations with 1781 cases. Significance at the 0.01, 0.05, and 0.10 levels is indicated by $***$, $**$, and $*$, respectively (the significance levels for the currency variables are not displayed).

Panel A: Conditional logit regression results on the currency denomination decision. $NomDif_{5Y}$ is the 5-year treasury rate difference between currency a and the US 5-year treasury bond.

	1	2	3	4	5	6	7	8	9	10
$NomDif_{5Y}$	0.0028***	0.0029***	0.0028***	0.0031***	0.0023***	0.0025***	0.0024***	0.0025***	0.0029***	0.0016**
	(0.000)	(0.000)	(0.000)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.048)
$ExRateChg_{t-1Y,t}$		0.0000					0.0000			
		(0.852)					(0.584)			
$ExRateFcst$			0.0000					0.0000		
			(0.962)					(0.878)		
$FwdPremium_{1Y}$				-0.0001					-0.0002	
				(0.680)					(0.440)	
$ExpostEXChg_{5Y}$					0.0001***					0.0002***
					(0.000)					(0.000)
GDP						1.7652***	1.8047***	1.7652***	1.7817***	3.2939***
						(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FDI						0.0012***	0.0013***	0.0012***	0.0013***	0.0011***
						(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
$CapMktSize$						0.0013	0.0013	0.0013	0.0014	0.0022*
						(0.230)	(0.222)	(0.229)	(0.204)	(0.053)
AUD	-3.3873	-3.3831	-3.3874	-3.3829	-3.7224	-3.5129	-3.5303	-3.5127	-3.4926	-4.4295
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CAD	-3.1382	-3.1409	-3.1382	-3.1361	-3.3075	-5.0439	-5.0809	-5.0435	-5.0443	-7.0248
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CHF	-4.2901	-4.2988	-4.2899	-4.2932	-4.4997	-4.1732	-4.1499	-4.1723	-4.1648	-4.5518
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
EUR	-2.2088	-2.2108	-2.2087	-2.2081	-2.3429	-2.2014	-2.1958	-2.2007	-2.1963	-2.3764
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GBP	-3.3933	-3.390	-3.3931	-3.3911	-3.4643	-4.3049	-4.3373	-4.3040	-4.2962	-5.2365
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
JPY	-4.2821	-4.3017	-4.2818	-4.3123	-4.2289	-4.4101	-4.3547	-4.4091	-4.4566	-4.1482
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
USD (base)										
Prob>chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Number of cases	1781	1781	1781	1781	1781	1781	1781	1781	1781	1781
Observations	12467	12467	12467	12467	12467	12467	12467	12467	12467	12467

Panel B: Conditional logit regression results on the currency denomination decision. $NomDif_{10Y}$ is the 10-year treasury rate difference between currency a and the US 10-year treasury bond.

	1	2	3	4	5	6	7	8	9	10
$NomDif_{10Y}$	0.0049***	0.0049***	0.0049***	0.0052***	0.0047***	0.0041***	0.0039***	0.0042***	0.0046**	0.0036***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.002)
$ExRateChg_{t-1Y,t}$		0.0000					0.0000			
		(0.959)					(0.486)			
$ExRateFcst$			0.0000					0.0000		
			(0.618)					(0.923)		
$FwdPremium_{1Y}$				-0.0002					-0.0002	
				(0.601)					(0.487)	
$ExpostEXChg_{5Y}$					0.0001***					0.0002***
					(0.000)					(0.000)
GDP						1.5837***	1.6399***	1.5820***	1.5777***	3.164***
						(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
FDI						0.0013***	0.0013***	0.0013***	0.0013***	0.0011***
						(0.003)	(0.002)	(0.003)	(0.002)	(0.007)
$CapMktSize$						0.0011	0.0011	0.0011	0.0012	0.0017
						(0.324)	(0.321)	(0.322)	(0.290)	(0.150)
AUD	-3.2653	-3.2643	-3.2649	-3.2586	-3.5817	-3.4048	-3.4309	-3.4067	-3.3819	-4.1561
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CAD	-3.1676	-3.1686	-3.1682	-3.1687	-3.3301	-4.8853	-4.9408	-4.8828	-4.8627	-6.9764
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CHF	-4.7533	-4.7568	-4.7557	-4.7866	-5.0224	-4.5632	-4.5241	-4.5641	-4.5905	-5.0076
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
EUR	-2.3287	-2.3296	-2.3281	-2.3359	-2.4813	-2.3131	-2.3035	-2.3124	-2.3184	-2.5037
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GBP	-3.4781	-3.4776	-3.4769	-3.4855	-3.5455	-4.2837	-4.3239	-4.2812	-4.2733	-5.2689
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
JPY	-4.8504	-4.8563	-4.8526	-4.9136	-4.9165	-4.8986	-4.8258	-4.8993	-4.9732	-4.7901
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
USD (base)										
Prob>chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Number of cases	1781	1781	1781	1781	1781	1781	1781	1781	1781	1781
Observations	12467	12467	12467	12467	12467	12467	12467	12467	12467	12467

Table 9.12: Conditional Logit Test on Covered Cost

This table presents the conditional logit regression results that are estimated based on equation (5.11). In Panel A the 5-year treasury rate difference is used as the independent variable for the nominal interest saving. In Panel B, a similar measure based on the 10-year treasure bond rate is used. The sample period is from 1999 to 2011. P-values are listed below each coefficient. The regression has 12467 observations with 1781 cases. Significance at the 0.01, 0.05, and 0.10 levels is indicated by $***$, $**$, and $*$, respectively (the significance levels for the currency variables are not displayed).

Panel A: Conditional logit regression results on the currency denomination decision. $CoveredCost_{5Y}$ is the 5-year covered cost of bond issuance in currency a.

	1	2	3	4	5	6	7	8
$CoveredCost_{5Y}$	0.0014***				0.0013***			
	(0.000)				(0.000)			
$NomDif_{5Y}$		0.0001	0.0025***	0.0005		0.0011	0.0231***	0.0009
		(0.944)	(0.001)	(0.799)		(0.575)	(0.002)	(0.669)
$ISWDIF_{5Y}$		-0.0026		-0.0019		-0.0035		-0.0003
		(0.131)		(0.292)		(0.349)		(0.469)
$CSWDIF_{5Y}$			0.0097**	0.0084			0.0063	0.0041
			(0.046)	(0.103)			(0.193)	(0.434)
GDP					1.7900***	1.8731***	1.7011***	1.8212***
					(0.000)	(0.000)	(0.000)	(0.000)
FDI					0.0012***	0.013***	0.0012***	0.0012***
					(0.003)	(0.002)	(0.004)	(0.003)
$CapMktSize$					0.001	0.0010	0.0012	0.0009
					(0.350)	(0.391)	(0.272)	(0.409)
AUD	-3.4070	-3.4220	-3.5325	-3.5379	-3.5634	-3.6253	-3.6097	-3.6760
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CAD	-3.1895	-3.2123	-3.2294	-3.2721	-5.1681	-5.3334	-5.0432	-5.3050
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CHF	-4.3702	-4.4334	-4.1784	-4.3005	-4.3016	-4.4387	-4.1136	-4.3756
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
EUR	-2.2383	-2.2758	-2.1345	-2.1959	-2.2463	-2.3188	-2.1545	-2.2789
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GBP	-3.3909	-3.4154	-3.3478	-3.3698	-4.3575	-4.4596	-4.2498	-4.4094
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
JPY	-4.3267	-4.3395	-4.0614	-4.1329	-4.5318	-4.5856	-4.2716	-4.4805
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
USD (base)								
Prob>chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Number of cases	1781	1781	1781	1781	1781	1781	1781	1781
Observations	12467	12467	12467	12467	12467	12467	12467	12467

Panel B: Conditional logit regression results on the currency denomination decision. $CoveredCost_{10Y}$ is the 10-year covered cost of bond issuance in currency a.

	1	2	3	4	5	6	7	8
$CoveredCost_{10Y}$	0.0022**				0.0020***			
	(0.000)				(0.000)			
$NomDif_{10Y}$		0.0052**	0.0048***	0.0062***		0.0038*	0.0042***	0.0032**
		(0.011)	(0.000)	(0.004)		(0.092)	(0.000)	(0.043)
$ISWDIF_{10Y}$		0.0002		0.0013		-0.0014		-0.0009
		(0.872)		(0.487)		(0.446)		(0.653)
$CSWDIF_{10Y}$			0.0111*	0.0121**			0.0064	0.0056
			(0.080)	(0.066)			(0.314)	(0.411)
GDP					1.6969***	1.6783***	1.5104***	1.5802***
					(0.000)	(0.000)	(0.001)	(0.001)
FDI					0.0013***	0.013***	0.0012***	0.0012***
					(0.000)	(0.002)	(0.004)	(0.004)
$CapMktSize$					0.001	0.0100	0.0010	0.0009
					(0.393)	(0.358)	(0.385)	(0.421)
AUD	-3.3548	-3.2611	-3.3753	-3.3679	-3.5151	-3.4658	-3.4809	-3.5080
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CAD	-3.2286	-3.1629	-3.2738	-3.2633	-5.1101	-5.0457	-4.8919	-4.9932
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CHF	-4.6852	-4.7533	-4.6682	-4.6595	-4.5833	-4.5925	-4.5482	-4.5689
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
EUR	-2.3347	-2.3253	-2.2724	-2.2496	-2.3398	-2.3405	-2.2893	-2.3100
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GBP	-3.4845	-3.475	-3.3868	-3.3667	-4.3947	-4.3795	-4.2138	-4.2836
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
JPY	-4.7391	-4.8474	-4.6695	-4.6415	-4.9114	-4.9448	-4.8238	-4.8619
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
USD (base)								
Prob>chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Number of cases	1781	1781	1781	1781	1781	1781	1781	1781
Observations	12467	12467	12467	12467	12467	12467	12467	12467

Table 9.13: Conditional Logit Test Based on Emerging Country Status

This table presents the conditional logit regression results on two subsamples – emerging country borrowers and non-emerging country borrowers. Emerging country borrowers include sovereign and regional borrowers from emerging markets. Non-merging country borrowers include borrowers from developed countries as well as supranational agencies such as the World Bank and EIB. Panel A and B present the conditional logit test results of the 5-year uncovered cost savings for emerging market borrowers and non-emerging market borrowers, respectively. Panel C and D present the 5-year covered savings test results for emerging market and non-emerging market borrowers, respectively. Significance at the 0.01, 0.05, and 0.10 levels is indicated by $***$, $**$, and $*$, respectively (the significance levels for the currency variables are not displayed).

Panel A: Emerging market subsample – currency denomination decision and uncovered cost savings

	1	2	3	4	5	6	7	8	9	10
$NomDif_{5Y}$	0.0012	0.0030	0.0069	0.0045	0.0017	0.0010	0.0027	0.0074	0.0050	0.0014
	(0.646)	(0.355)	(0.181)	(0.385)	(0.477)	(0.652)	(0.286)	(0.145)	(0.367)	(0.478)
$ExRateChg_{t-1Y,t}$		0.0004*					0.0004*			
		(0.094)					(0.054)			
$ExRateFcst$			-0.0012					-0.0014		
			(0.137)					(0.115)		
$FwdPremium_{1Y}$				-0.0018					-0.0013	
				(0.297)					(0.486)	
$ExpostEXChg_{5Y}$					-0.0001					-0.0001
					(0.362)					(0.514)
GDP						7.4012**	6.9544**	7.7763*	7.2918*	6.6002*
						(0.048)	(0.032)	(0.088)	(0.067)	(0.059)
FDI						-0.0063	-0.0071**	-0.0061*	-0.0068*	-0.0064**
						(0.041)	(0.045)	(0.060)	(0.053)	(0.034)
$CapMktSize$						0.0039	0.0046	0.0052	0.2207	0.0036
						(0.312)	(0.244)	(0.192)	(0.982)	(0.347)
Prob>chi2	0.646	0.246	0.328	0.579	0.476	0.003	0.000	0.000	0.005	0.004
Number of cases	446	446	446	446	446	446	446	446	446	446
Observations	3122	3122	3122	3122	3122	3122	3122	3122	3122	3122

Panel B: Non-emerging market subsample – currency choice and uncovered cost savings

	1	2	3	4	5	6	7	8	9	10
$NomDif_{5Y}$	0.0031***	0.0031***	0.0031***	0.0033***	0.0025***	0.0028***	0.0026***	0.0028***	0.0032***	0.0018**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)	(0.002)	(0.000)	(0.001)	(0.043)
$ExRateChg_{t-1Y,t}$		0.0000					0.0000			
		(0.962)					(0.446)			
$ExRateFcst$			0.0000					0.0000		
			(0.595)					(0.567)		
$FwdPremium_{1Y}$				-0.0001					-0.0002	
				(0.731)					(0.454)	
$ExpostEXChg_{5Y}$					0.0002***					0.0002***
					(0.000)					(0.000)
GDP						1.6269***	1.6848***	1.6268***	1.6449***	3.2512***
						(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FDI						0.0013***	0.0013***	0.0013***	0.0013***	0.0011***
						(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
$CapMktSize$						0.0013	0.0013	0.0013	0.0014	0.0022*
						(0.266)	(0.254)	(0.264)	(0.238)	(0.061)
Prob>chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Number of cases	1335	1335	1335	1335	1335	1335	1335	1335	1335	1335
Observations	9345	9345	9345	9345	9345	9345	9345	9345	9345	9345

Panel C: Emerging market subsample – currency choice and covered cost savings

	1	2
$CoveredCost_{5Y}$	0.0030	0.0054
	(0.864)	(0.712)
GDP		7.2615**
		(0.047)
FDI		0.0065**
		(0.032)
$CapMktSize$		0.0042
		(0.276)
Prob>chi2	0.864	0.004
Number of cases	446	446
Observations	3122	3122

Panel D: Non-emerging market subsample – currency choice and covered cost savings

	1	2
$CoveredCost_{5Y}$	0.0142***	0.0095**
	(0.002)	(0.046)
$NomDif_{5Y}$		
$ISWDIF_{5Y}$		
$CSWDIF_{5Y}$		
GDP		1.5494***
		(0.000)
FDI		0.0013***
		(0.000)
$CapMktSize$		0.0023**
		(0.041)
Prob>chi2	0.002	0.000
Number of cases	1335	1335
Observations	9345	9345

Table 9.14: Conditional Logit Test for Subsamples with Different Rating Criteria

This table presents the conditional logit regression results for three subsamples with different selection criteria based on Moody's credit ratings. The rated sample includes all bond tranches with Moody's ratings, while all tranches with Moody's rating as "NR" or with missing rating information are removed. The investment grade sample includes all bond tranches with Moody's rating of "Baa" and above, while tranches below investment grade and tranches not rated by Moody's are removed. The Aaa sample includes only tranches that have "Aaa" rating by Moody's. Panel A presents conditional logit test results for the 5-year uncovered cost savings and panel B presents the conditional logit test results for the 5-year covered cost savings. Significance at the 0.01, 0.05, and 0.10 levels is indicated by $***$, $**$, and $*$.

Panel A: Conditional logit regression results on the currency choice and uncovered cost savings for 3 subsamples with different rating criteria.

	Rated Sample		**Investment Grade Sample**		**Aaa Sample**	
$NomDif_{5Y}$	0.0037***	0.0032***	0.0042***	0.0038***	0.0035***	0.0033***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
GDP		1.7076***		1.4436***		2.0247***
		(0.001)		(0.005)		(0.000)
FDI		0.0015***		0.0014***		0.0014***
		(0.000)		(0.000)		(0.004)
$CapMktSize$		0.0015		0.0013		0.0005
		(0.251)		(0.301)		(0.731)
Prob>chi2	0.000	0.000	0.000	0.000	0.000	0.000
Number of cases	1255	1255	1011	1011	664	664
Observations	8785	8785	7077	7077	4648	4648

Panel B: Conditional logit regression results on the currency choice and covered cost savings for 3 subsamples with different rating criteria.

	Rated Sample		**Investment Grade Sample**		**Aaa Sample**	
$CoveredCost_{5Y}$	0.0151***	0.0099**	0.0180***	0.0131***	0.0186***	0.0134**
	(0.001)	(0.042)	(0.000)	(0.007)	(0.001)	(0.018)
GDP		1.6477***		1.3569***		1.7924***
		(0.001)		(0.004)		(0.000)
FDI		0.0016***		0.0014***		0.0013***
		(0.000)		(0.000)		(0.006)
$CapMktSize$		0.0028**		0.0028**		0.0014
		(0.026)		(0.030)		(0.350)
Prob>chi2	0.001	0.000	0.000	0.000	0.000	0.000
Number of cases	1255	1255	1011	1011	664	664
Observations	8785	8785	7077	7077	4648	4648

Table 9.15: Conditional Logit Test and Financial Crisis

This table presents the results of the conditional logit regressions on covered and the uncovered cost variables before and after the 2008 financial crisis. Constant is the constant interception variable for each currency. Postcrisis is an indicator variable that takes the value of 1 if the bond is issued after the 2008, and 0 otherwise. Significance at the 0.01, 0.05, and 0.10 levels is indicated by $***$, $**$, and $*$, respectively.

		1	**2**	**3**	**4**
	$NomDif_{5Y}$	0.0037***	0.0032***		
		(0.000)	(0.000)		
	$CoveredCost_{5Y}$			0.0018***	0.0016***
				(0.000)	(0.000)
	GDP		1.8107**		1.8816**
			(0.021)		(0.016)
	FDI		0.0012***		0.0012***
			(0.004)		(0.004)
	$CapMktSize$		0.0008		0.0007
			(0.509)		(0.569)
AUD	Constant	-3.5859***	-3.7673***	-3.6329***	-3.8276***
		(0.000)	(0.000)	(0.000)	(0.000)
	Postcrisis	1.1019**	0.7520*	1.0652**	0.7961*
		(0.012)	(0.069)	(0.009)	(0.057)
CAD	Constant	-3.2856***	-5.0794***	-3.3539***	-5.2335***
		(0.000)	(0.000)	(0.000)	(0.000)
	Postcrisis	0.4449	-0.2710	0.4524*	-0.2907
		(0.104)	(0.570)	(0.098)	(0.538)
CHF	Constant	-5.3571***	-5.2596***	-5.4623***	-5.3915***
		(0.000)	(0.000)	(0.000)	(0.000)
	Postcrisis	2.1003***	1.9629***	2.1527***	2.0183***
		(0.000)	(0.000)	(0.000)	(0.000)
EUR	Constant	-2.0974***	-2.1013***	-2.1675***	-2.1734***

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		1	**2**	**3**	**4**
		(0.000)	(0.000)	(0.000)	(0.000)
	Postcrisis	-0.6411***	-0.6634***	-0.5143**	-0.5448**
		(0.005)	(0.004)	(0.031)	(0.023)
GBP	Constant	-3.0561***	-4.0806***	-3.0734***	-4.1544***
		(0.000)	(0.000)	(0.000)	(0.000)
	Postcrisis	-1.7493***	-1.7783***	-1.6940***	-1.7334***
		(0.004)	(0.003)	(0.005)	(0.004)
JPY	Constant	-4.5652***	-4.7003***	-4.6153***	-4.7972***
		(0.000)	(0.000)	(0.000)	(0.000)
	Postcrisis	0.0576	0.0476	0.1301	0.1169
		(0.890)	(0.909)	(0.759)	(0.782)
	USD (base)				
	Prob>chi2	0.000	0.000	0.000	0.000
	Number of cases	1781	1781	1781	1781
	Observations	12467	12467	12467	12467

Table 9.16: Conditional Logit Test with Interaction Variables

This table presents the conditional logit regression results with interaction variables. The indicator variable *emg* equals 1 if a tranche is issued by a emerging market borrower, and 0 otherwise. The indicator variable *inv* equals 1 if a tranche receives an investment grade credit rating from Moody's, and 0 otherwise. Indicator variable *post* equals 1 if a tranche is issued after 2008, and 0 otherwise. Tranches without Moody's ratings are omitted. Significance at the 0.01, 0.05, and 0.10 levels is indicated by $***$, $**$, and $*$, respectively.

Panel A: Conditional logit regression results for the 5-year uncovered cost savings with interaction variables.

	1	2	3	4	5	6	7	8	9	10
$NomDif_{5Y}$	0.0028***	0.0034***	-0.0003	0.0030***	0.0002	0.0025***	0.0030***	-0.0006	0.0026***	-0.0003
	(0.000)	(0.000)	(0.632)	(0.000)	(0.786)	(0.001)	(0.000)	(0.395)	(0.001)	(0.728)
$NomDif_{5Y} * emg$		-0.0022***			-0.0007		-0.0021***			-0.0007
		(0.000)			(0.185)		(0.000)			(0.221)
$NomDif_{5Y} * inv$			0.0055***		0.0052***			0.0053***		0.0051***
			(0.000)		(0.000)			(0.000)		(0.000)
$NomDif_{5Y} * post$				-0.0014	-0.0013				-0.0004	-0.0004
				(0.273)	(0.300)				(0.713)	(0.745)
GDP						1.7652***	1.7684**	1.7979***	1.7227***	1.7605***
						(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FDI						0.0012***	0.0012***	0.0011***	0.0012***	0.0011**
						(0.002)	(0.004)	(0.009)	(0.002)	(0.010)
$CapMktSize$						0.0013	0.0013	0.0015	0.0013	0.0014
						(0.230)	(0.225)	(0.175)	(0.247)	(0.185)
Prob>chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Number of cases	1255	1255	1255	1255	1255	1255	1255	1255	1255	1255
Observations	8785	8785	8785	8785	8785	8785	8785	8785	8785	8785

Panel B: Conditional logit regression results for the 5-year covered cost savings with interaction variables.

	1	2	3	4	5	6	7	8	9	10
$CoveredCost_{5Y}$	0.0019***	0.0025***	-0.0001	0.0019***	0.0016***	0.0017**	0.0024***	-0.0002	0.0017***	-0.0002
	(0.000)	(0.000)	(0.786)	(0.000)	(0.002)	(0.000)	(0.000)	(0.603)	(0.000)	(0.508)
$CoveredCost_{5Y} * emg$		-0.0023***			-0.0017***		-0.0021***			-0.0007**
		(0.000)			(0.000)		(0.000)			(0.023)
$CoveredCost_{5Y} * inv$			0.0024***		0.0009**			0.0023***		0.0028***
			(0.000)		(0.020)			(0.000)		(0.000)
$CoveredCost_{5Y} * post$				-0.0002	-0.0001				0.0001	0.004
				(0.811)	(0.939)				(0.830)	(0.572)
GDP						1.7419***	1.7284***	1.7552***	1.7647***	1.8364***
						(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
FDI						0.0015***	0.0013***	0.0014***	0.0015***	0.0010**
						(0.000)	(0.002)	(0.001)	(0.000)	(0.014)
CapMkSz						0.0011	0.0010	0.0011	0.0011	0.0012*
						(0.398)	(0.430)	(0.390)	(0.393)	(0.263)
Prob>chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Number of cases	1255	1255	1255	1255	1255	1255	1255	1255	1255	1255
Observations	8785	8785	8785	8785	8785	8785	8785	8785	8785	8785

Table 9.17: Conditional Logit Test with Case Variables

This table presents the results of the conditional logit regressions on the covered and uncovered cost variables as well as a list of characteristic variables for each issuer or issuance. Cons is the constant interception variable for each currency. Emerging is an indicator variable that equals 1 if the issuer is from an emerging country, and 0 if the issuer is from a non-emerging country or is a supranational institution. Invgrade is an indicator variable that equals 1 if an issue receives investment grade rating from Moody's, and 0 otherwise. Postcrisis is an indicator variable that equals 1 if the bond is issued after 2008, and 0 otherwise. Significance at the 0.01, 0.05, and 0.10 levels is indicated by $***$, $**$, and $*$, respectively.

		1	**2**	**3**
	$NomDif_{5Y}$	0.0040***		0.0039***
		(0.0000)		(0.0000)
	$CoveredCost_{5Y}$		-0.0050	-0.0019
			(0.5060)	(0.7980)
AUD	Cons	-3.2896***	-3.6509***	-3.2758***
		(0.000)	(0.000)	(0.000)
	Emerging	-15.9552***	-16.6986***	-15.9552***
		(0.000)	(0.000)	(0.000)
	Invgrade	0.1982	0.1943	0.1983
		(0.654)	(0.658)	(0.653)
	Postcrisis	0.9783**	0.3275	0.9849**
		(0.033)	(0.440)	(0.031)
CAD	Cons	-3.5517***	-3.5575***	-3.5376***
		(0.000)	(0.000)	(0.000)
	Emerging	-2.9577***	-2.9874***	-2.9588***
		(0.004)	(0.003)	(0.004)
	Invgrade	0.9802***	0.9908***	0.9801***

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		1	**2**	**3**
		(0.003)	(0.003)	(0.003)
	Postcrisis	0.2279	0.1503	0.2317
		(0.402)	(0.581)	(0.397)
CHF	Cons	-5.9706***	-5.3498***	-5.9699***
		(0.000)	(0.000)	(0.000)
	Emerging	-0.9571	-0.9728	-0.9615
		(0.139)	(0.131)	(0.138)
	Invgrade	1.2471**	1.2393**	1.2463**
		(0.031)	(0.031)	(0.031)
	Postcrisis	1.8869***	1.2141***	1.8399***
		(0.000)	(0.007)	(0.000)
EUR	Cons	-2.8818***	-2.6881***	-2.8818***
		(0.000)	(0.000)	(0.000)
	Emerging	-1.0509***	-1.0464***	-1.0517***
		(0.000)	(0.000)	(0.000)
	Invgrade	1.5225***	1.5067***	1.5228***
		(0.000)	(0.000)	(0.000)
	Postcrisis	-0.9132***	-1.3226***	-0.9591***
		(0.000)	(0.000)	(0.001)
GBP	Cons	-2.2408***	-2.4229***	-2.2460***
		(0.000)	(0.000)	(0.000)
	Emerging	-15.9033***	-16.6455***	-15.9034***
		(0.000)	(0.000)	(0.000)
	Invgrade	-1.1360***	-1.1346***	-1.1354***

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		1	**2**	**3**
		(0.001)	(0.001)	(0.001)
	Postcrisis	-1.5530***	-1.7136***	-1.5822**
		(0.008)	(0.007)	(0.011)
JPY	Cons	-6.0444***	-4.6009***	-6.0512***
		(0.000)	(0.000)	(0.000)
	Emerging	-1.8570**	-1.9001**	-1.8617**
		(0.012)	(0.010)	(0.012)
	Invgrade	2.2772***	2.2537***	2.2791***
		(0.000)	(0.000)	(0.000)
	Postcrisis	-0.2316	-1.1896**	-0.2762
		(0.581)	(0.012)	(0.571)
USD (base)				
Prob>chi2	0.000	0.000	0.000	0.000
Number of cases	1781	1781	1781	1781
Observations	12467	12467	12467	12467

Table 9.18: Conditional Logit Test with Gravity Model

This table presents the conditional logit regression results with the gravity model variables. *Import* equals the percentage of import by a issuer county from a currency country among its imports from all 6 currency countries. *Language* equals 1 if the two countries share a common official language, and 0 otherwise. *Location* equals 1 if the two countries share the same geographic area, and 0 otherwise. $TradeUnion$ equals 1 if the two countries belong to the same trade union, and 0 otherwise. Lastly, $HisLink$ equals 1 if the two countries shares historic or cultural links. For detailed information about the gravity test variable definition, please refer to Appendix F. Significance at the 0.01, 0.05, and 0.10 levels is indicated by $***$, $**$, and $*$, respectively.

Panel A: 5-year uncovered cost savings and covered cost savings for the full sample.

	1	2	3	4	5	6
$NomDif_{5Y}$	0.0041***	0.0039**	0.0039**			
	(0.007)	(0.013)	(0.013)			
$CoveredCost_{5Y}$				0.0020***	0.0019***	0.0019***
				(0.004)	(0.007)	(0.007)
$Import$	0.0291***	0.0265***	0.0260***	0.0297***	0.0271***	0.0267***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$Language$		0.5431	0.5407		0.5489	0.5463
		(0.173)	(0.171)		(0.173)	(0.171)
$Location$		0.3701	0.3749		0.3561	0.3611
		(0.239)	(0.230)		(0.265)	(0.255)
$TradeUnion$		15.7972***	15.7486***		15.8217***	15.7713***
		(0.000)	(0.000)		(0.000)	(0.000)
$HisLink$		0.8213***	0.8176***		0.8316***	0.8268***
		(0.000)	(0.000)		(0.000)	(0.000)
GDP			0.9143			1.0077
			(0.233)			(0.197)
Prob>chi2	0.000	0.000	0.000	0.000	0.000	0.000
Number of cases	602	602	602	602	602	602
Observations	3612	3612	3612	3612	3612	3612

Panel B: 5-year uncovered cost savings and covered cost savings for the emerging market issuer sample.

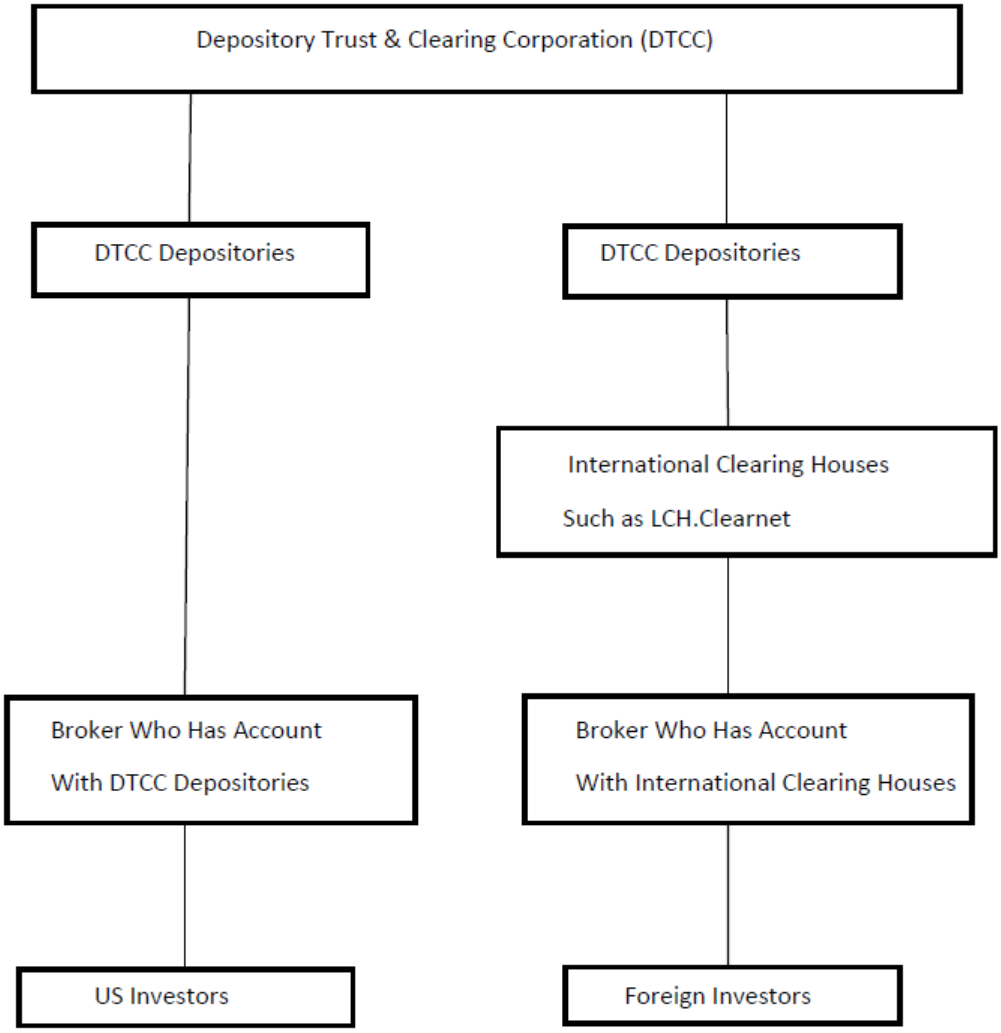
	1	2	3	4	5	6
$NomDif_{5Y}$	0.0070***	0.0072	0.0040			
	(0.003)	(0.116)	(0.428)			
$CoveredCost_{5Y}$				0.0025**	0.002	-0.0001
				(0.021)	(0.394)	(0.977)
$Import$	0.0539***	0.0876***	0.1103***	0.0508***	0.0788***	0.1022***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$Language$		24.8124***	18.4455***		24.2659***	16.1144***
		(0.000)	(0.000)		(0.000)	(0.000)
$Location$		4.1909***	5.5759***		4.0145***	5.4797***
		(0.009)	(0.001)		(0.002)	(0.000)
$TradeUnion$		2.8544	3.4438		2.7191	6.7514**
		(0.389)	(0.403)		(0.260)	(0.035)
$HisLink$		-0.8274*	-0.6456		-0.7575*	-0.5971
		(0.050)	(0.203)		(0.061)	(0.240)
GDP			-34.3770**			-39.7282**
			(0.022)			(0.019)
Prob>chi2	0.000	0.000	0.000	0.000	0.000	0.000
Number of cases	384	384	384	384	384	384
Observations	2304	2304	2304	2304	2304	2304

Table 9.19: Conditional Logit Test with governance variables

This table presents the conditional logit regression results with law origin variables. *Law2match* equals 1 if both countries have a common law system or both have a civil law sytem, and 0 otherwise. *Law4match* equals 1 if both countries have the same legal system categorized in 4 types (common law, French civil law, German civil law, and Scandinavian civil law), and 0 otherwise. Significance at the 0.01, 0.05, and 0.10 levels is indicated by $***$, $**$, and $*$, respectively.

	1	2	3	4	5	6	7	8
$NomDif_{5Y}$	0.0035**	0.0039**	0.0033**	0.0035**				
	(0.031)	(0.017)	(0.041)	(0.035)				
$CoveredCost_{5Y}$					0.0018**	0.0020***	0.0017**	0.0018**
					(0.018)	(0.008)	(0.025)	(0.019)
Import	0.0445***	0.0573***	0.0439***	0.0538***	0.0449***	0.0584***	0.0443***	0.0548***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Law2match	6.9179***	7.7438***			6.9134***	8.0548***		1.0077
	(0.000)	(0.000)			(0.000)	(0.000)		(0.197)
Law4match			0.1275	-0.2044			0.1432	-0.1776
			(0.674)	(0.604)			(0.639)	(0.653)
Language		0.1666		0.6908		0.1695		0.680
		(0.731)		(0.165)		(0.729)		(0.175)
Location		-0.8977**		-0.8618*		-0.9264**		-0.8949*
		(0.025)		(0.062)		(0.023)		(0.058)
TradeUnion		14.7598***		15.0152		15.4588***		15.1065***
		(0.000)		(0.000)		(0.000)		(0.000)
HisLink		1.0442***		0.9078***		1.0626***		0.9206***
		(0.000)		(0.000)		(0.000)		(0.000)
Prob>chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Number of cases	505	505	505	505	505	505	505	505
Observations	3030	3030	3030	3030	3030	3030	3030	3030

Figure 9.1: Dollar-Denominated Global Bond Trading and Clearing Process



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Appendix A

Singapore Power in Benchmark Global Bond

"A DUAL-CURRENCY multi-tranche global bond was issued by Singapore Power in October – possibly the largest transaction to ever originate from the garden city. The deal is also the biggest bond issue to hit Asia (ex-Japan) so far this year.

The jumbo US$2.2 billion (S$3.8 billion) issue attracted credit-thirsty investors, with the rarity of it's name. Books for the US-dollar portion were believed to be in excess of US$5.7 billion, 3.5 times oversubscribed for both the 5- and 10-year tranches.

The bond was issued through the company's wholly-owned subsidiary, SP PowerAssets. It is the first out of SP PowerAssets' US$3.5 billion (S$6 billion) global MTN programme. DBS Bank and Morgan Stanley jointly led the issue.

The bond featured a US$1.6 billion tranche and a S$1.05 billion portion. The Singapore-dollar portion was further split into: a S$550 million seven-year tranche which was priced at par to yield 3.73%, equivalent to 25bps over the Singapore-dollar swap offer rate (SOR); the initial marketing range was 26.25-31.25bps; and a S$500 million 15-year portion which was priced at par to yield 4.84%, equivalent to 53bps over SGS or 38bps over the benchmark bond; the initial marketing range was 42–47bps.

The US-dollar portion was split into: a US$600 million 5-year bond which was issued at 99.955 and pays a coupon of 3.8% to yield 3.81%, equivalent to 55bps over US Treasuries, or 15bps over Libor; the initial marketing range was 20–25bps, and a US$1 billion 10-year bond which was issued at 99.363 and pays a coupon of 5% to yield 5.082, equivalent to 73bps over US Treasuries, or 30bps over Libor; the initial marketing range was 35–40 bps.

Before pricing of the issue took place, Standard & Poor's downgraded the parent company's long-term corporate credit ratings by two notches to AA+ from AAA due to an expected weakening of its financial position with the additional burden of raising capital via the global bond route. 'The Singapore government does not explicitly support the company (Singapore Power),' explains Sharad Jain, credit analyst and director of the corporate and infrastructure ratings group at S&P. Meanwhile, the rating agency has also assigned a AA+ long-term rating to SP PowerAssets.

Roadshows were held in Hong Kong, Singapore, Europe and the US. More than 90 accounts participated in the 5-year US$ tranche and 150 accounts in the 10-year US$ tranche. The average geographical breakdown was: US (55%), Asia (32%) and Europe (13%).

The notes will be listed in both Singapore and Luxembourg. Proceeds will be used to fund SP PowerAssets' acquisition of PowerGrid from SingPower."

Source:Euromoney Institutional Investor PLC. November 2003, Vol. 14 Issue 9, page 11–12, By Roy Chew.

Appendix B

Domestic Bond, Eurobond, Foreign Bond, and Global Bond

In the last 3 decades, thanks to deregulation by security authorities around the globe and technology innovation, we have witnessed a tremendous growth of the bond market sizes, both domestically and internationally. Sovereign governments and public agencies have played an important role in the growth of the global capital market when they provide a large amount of debt issuance to finance their budget deficits. The international corporate debt market was traditionally dominated by firms from developed economies. But in recent years, emerging market corporate borrowers, encouraged by some early successes, have increased their borrowing activities outside their domestic markets. Depending on the issuance currency, exchange listing, investor base, as well as regulation authority, bonds can be divided in to 4 categories: domestic, foreign, Euro and global.

Domestic Bond

Domestic bonds are issued and traded within a country's domestic market. They are denominated in the local currency and are under the regulations of the domestic country's security law. Domestic bonds can be issued by the sovereign government and its agencies,

municipal agencies, as well as corporations. The main participants on the demand side for the domestic bonds are the local investors. Foreign investors can also participate in a domestic bond market provided that they meet local security regulations and can establish trading and clearing mechanisms.

Since the denomination currency for domestic bonds is the issuer's domicile country's currency, domestic bond issuers do not face FX risk in their repayments of coupons and principal values. However, for many emerging market borrowers who need a large amount of capital, their domestic bond markets are often not large enough to provide their funding needs. These borrowers often have to borrow beyond their domestic bond markets. The market size consideration not only affects the borrowing decisions of corporations and financial institutions, it also affect the borrowing behavior of the emerging countries' sovereign governments. To avoid "squeezing out" the domestic private borrowers, the government and government agencies of the emerging countries often choose to raise capital outside their domestic markets.

Eurobonds

A Eurobond is issued outside the country in whose currency the bond is denominated. The Eurobond market in London is the main issuing and trading center for Eurobonds. The Eurobond market is also often referred to as the offshore bond market. Eurobonds have several distinctive characteristics:

- They are denominated in currencies that may or may not be the issuer's domicile currencies. Their denomination currencies can also be different than the domicile currencies of the countries in which they are listed.

- The are issued and traded outside the jurisdiction of any single country's security authority.

- They face a larger investor base than the domestic bonds, allowing their issuers to raise a larger amount of equity.
- The issuing costs of Eurobonds are typically larger than those of the domestic bonds.
- They are often issued in bearer form instead of registered form, making tracing their transaction difficulty.

The investors for Eurobonds can be from many different countries. Given the large and diverse investor base of Eurobonds, a Eurobond's issuance is often led by not just one but a syndicate of underwriters who help with roadshows and account building in different geographic areas of the world. Because of their higher issuing cost than domestic bonds, Eurobonds are often adopted by sovereign governments, supranational agencies, and large corporations who often need to raise a substantial amount of capital.

Eurobonds are often named after the currency they are denominated in. For example, Eurodollar bonds are denominated in the US dollar and Europound bonds are denominated in UK pound. If a Eurobond's issuance currency is different than the issuer's domicile currency, then it faces FX risks in its future payments to investors. This is particularly true for emerging market borrowers in the Eurobond market because they often can not issue bonds in their own country's currencies but have to resort to denominating their bonds in one of the international currencies such as the US dollar or Euro.

Since Eurobonds are traded beyond a single domestic market and are subjected to the regulations of a single country's security authority, there are often restrictions for a country's investors to participate in the Eurobond market. Take the Eurodollar bonds as an example. Because the Eurodollar bonds are not registered with the SEC, they can not be purchased by US domestic investors until a "seasoning period" has passed. This effectively locks out the US investors from the primary market. After the seasoning period and a Eurodollar issue has "come to rest," US investors can purchase the bond in the secondary market. But the seasoning period requirement has caused the Eurodollar market to be dominated by non-US

investors.

Foreign Bond

Foreign bonds are issued by non-residents in a country's domestic bond markets and denominated in that country's currency. For example, the US dollar Yankee bonds are US dollar-denominated bonds issued by foreigners in the US. Like domestic bonds, foreign bonds must comply with the regulation of the country in which they are issued. For example, the US dollar Yankee bonds must register with the SEC and are regulated similarly to the US dollar domestic bonds.

Similar to Eurobond issuers who denominate the bonds with a currency different from their own, foreign bond issuers face exchange rate risk in their future bond repayments. Foreign bonds allow their issuers to tap into a country's investor pool without incurring the high issuing costs that Eurobonds entail. For example, the bulldog bond market allows borrowers to raise capital from the British investors. The size of the foreign bond market is smaller than the Eurobond market and the former's liquidity is also lower than the latter's. Supranational agencies such as the World Bank and the EIB have been the dominant issuers in the foreign bond market, but recently there has been a growth in the participation by sovereign government and public agency borrowers.

Because foreign bonds comply with local security regulations, the local investors can participate in both the primary and secondary markets of foreign bonds issue. They can trade foreign bonds with the clearing and settlement mechanism as they trade domestic bonds at the same time do not face exchange rate risk. Foreign bonds often offer additional yields compared with the domestic bonds of the same terms due to the information barrier between foreign issuers and domestic investors.

Global Bond

With the deregulation wave that started in the 1980s and the technology advancement to connect the clearing and settlement mechanism of different bond markets, the dividing lines between domestic bonds, Eurobonds and foreign bonds have become increasingly blurred. It is not uncommon for investors to exploit yield differences across different markets when such opportunities appear. The growing appetite of the bond borrowers led by supranational institutions and sovereign government also called for a bond instrument that could target a wider investor base than faced by the 3 traditional types of bond instruments. The global bond is an innovative debt instrument that is created under such a situation.

In 1989, the World Bank issued the first global bond, which is denominated in US dollars. The bond bears the features of both the Eurodollar bond and the US dollar Yankee bond because it is registered with the SEC and is placed both in the US bond market and the Eurodollar market. Despite initial skepticism, the first global bond issue was a great success. The World Bank issued the first global bond denominated in Yen in 1992. Today, global bonds have become one of the most important debt instruments in the international bond market. The global bond's success illustrates the increasing integration between the Eurobond and the domestic bond markets, which provide more trading convenience and lower trading costs for investors around the world.

Global bonds have several defining features:

- they are sold simultaneously in multiple markets, such as the US and Euromarkets, at the same offer price
- they are extremely large offerings that are often presented in multiple tranches of differing size and maturity
- they can be traded in multiple markets without restrictions

Similar to Eurobonds, global bonds are typically underwritten by a syndicate of under-

writers who have wide experience in the international bond market. Due to the diverse investor base of the global bonds, the lead underwriter often choose members of the syndicate based on their experience in distinct geographic areas to facilitate the global bond placement. By design, the offer price for a global bond must be the same across different markets.

According to the World Bank special report of the IFR, global bonds offer the following benefits to investors:

- "Credit quality"
- "Large issue size"
- "Diverse investor base geographically and across investor types"
- "Multiple clearing systems"
- "Traded in secondary market on electronic platforms"
- "Underwriters commit to secondary market making"
- "Portfolio opportunities"

Unlike Eurobonds that often take bearer form, all global bonds are in book-entry form. Investors will not need to send or receive global bonds in physical form when they trade the bonds. This book-entry form is necessary for the simultaneous transfer of the securities and cash at the same time across geographically distinctive markets.

The DTCC manage the global bond entitlement transfers and maintains custody of all the global bonds. US investors can trade global bonds directly through DTCC, while investors in Europe can clear their global bond trade through Clearstream or Euroclear. From the view of the investors, wherever they reside, global bonds are engineered to trade and settle as domestic bonds in their own country. This means, for example, US investors can trade

global bonds as they do US domestic bonds and Euromarket investors trade global bonds as they do Eurobonds. As a comparison, if a Euromarket investor wants to trade in a US domestic bond, she needs to open an account with a bond broker who has an account with the DTCC to carry out the trade.

Besides a wider investor base and the associated benefit of a large amount of capital raised, the key feature of the global bond is that it streamlines the trading of the securities across different geographic areas. According to the World bank, "Traditionally, global bonds have been viewed as global because of their size, liquidity and broad placement. While size will always be a substantial portion of this equation, the World Bank hopes this perception will shift from one in which its bonds are viewed as being held by a wide audience to one that they are easily tradable among a wide audience thanks to their linked clearing features."[1]

Initially, the primary issuers of global bonds are supranational institutions and central governments. However, given the benefits provided by this innovative bond instrument, other public agency borrowers, such as the US Federal Mortgage Credit agencies, have increasingly issued global bonds for their funding needs. The OECD has speculated that on the basis of recent trends, it should appear that the market for global bonds is, for the time being, evolving into an extension of the domestic US market and an additional source of funds for US borrowers.[2]

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[1]IMF/World Bank special report of the IFR, 2002, p. 22.

[2]Financial market trends, OECD, Parais, June 1995, p. 79.

Appendix C

Descriptive Statistics of Bond Instruments and Issuer Types

This appendix presents summary statistics of the number of issuance and issuance size of all bond types by different category of issuers. The sample contains all bond issues in the SDC Global New Issue data set from 1999 to 2011, which is larger than the sample of study in the empirical analysis of this paper. This appendix presents background information on global bonds as a bond instrument as compared to domestic bonds, Eurobonds, and international bonds. It also presents information on the borrowing behavior of government/public agency borrowers, including their borrowing frequency, borrowing size, and instruments used.

Table C.1: Principal Amount Issued for Different Bond Types ($billion)

Year	**Domestic**	**Euro**	**Foreign**	**Global**	**Total**
1999	1,854.45	827.24	254.94	328.81	3,265.44
2000	1,478.96	783.96	233.84	464.80	2,961.56
2001	1,661.38	882.67	269.50	666.33	3,479.88
2002	1,308.89	934.05	266.76	596.39	3,106.09
2003	1,491.62	1,493.75	326.97	617.45	3,929.79
2004	1,151.95	1,887.45	318.16	593.58	3,951.14
2005	926.25	2,255.72	239.88	662.26	4,084.11
2006	1,061.98	3,248.44	275.54	844.14	5,430.10
2007	1,165.89	3,244.70	218.51	1,046.63	5,675.73
2008	1,345.64	2,986.02	129.61	1,148.07	5,609.33
2009	1,656.94	3,319.37	116.84	1,358.35	6,451.51
2010	1,717.54	2,533.52	139.63	1,215.25	5,605.95
2011	1,740.32	2,474.49	111.55	955.54	5,281.91
Total	18,561.81	26,871.39	2,901.74	10,497.59	58,832.53

Table C.2: Average Principal Amount Issued for Different Bond Types ($million)

Year	**Domestic**	**Euro**	**Foreign**	**Global**
1999	129.56	237.92	112.71	1,217.81
2000	109.46	220.21	121.86	1,287.54
2001	81.56	214.09	179.19	1,114.26
2002	63.67	200.01	179.03	1,074.57
2003	74.78	261.74	211.22	1,085.15
2004	74.13	283.57	240.12	1,026.96
2005	87.90	257.59	266.53	861.19
2006	96.77	238.93	299.50	768.79
2007	104.63	252.11	277.30	732.93
2008	105.47	454.42	248.77	967.20
2009	125.94	563.85	256.80	992.22
2010	110.74	386.80	272.72	638.60
2011	120.82	363.04	252.38	637.45
Average	115.68	239.43	175.86	966.74

Table C.3: Principal Amount of Global Bond by Issuer Types ($billion)

Year	**Gov. Agency**	**Fin. Institution**	**Corporation**	**Total**
1999	169.57	120.83	38.41	328.81
2000	223.85	168.86	70.15	462.86
2001	322.48	253.80	89.04	665.33
2002	310.71	218.18	64.73	593.62
2003	333.12	218.25	64.00	615.37
2004	306.21	255.77	29.84	591.83
2005	332.40	299.31	27.65	659.36
2006	329.26	392.90	120.27	842.43
2007	309.48	549.60	184.62	1,043.70
2008	420.82	495.85	229.20	1,145.87
2009	594.36	441.73	316.28	1,352.37
2010	587.69	380.27	245.04	1,213.00
2011	421.06	292.46	235.63	949.14
Total	4,661.02	4,087.80	1,714.86	10,463.69

Table C.4: Average Size of Global Bond Issuance by Issuer Type ($million)

Year	**Gov. Agency**	**Fin. Institution**	**Corporation**
1999	1,389.91	1,129.22	936.94
2000	1,850.04	943.33	1,188.92
2001	1,096.89	1,148.41	1,085.91
2002	1,232.98	996.27	809.09
2003	1,370.84	928.74	727.27
2004	1,297.52	875.93	621.73
2005	971.94	793.92	588.27
2006	855.23	709.20	770.97
2007	651.54	795.37	712.83
2008	1,107.42	985.79	758.94
2009	1,471.19	859.39	707.56
2010	977.86	411.55	649.97
2011	997.77	398.99	693.02
Average	1,174.70	844.31	788.57

Table C.5: Principal Amount of Bonds Issued by Government/Public Agency ($billion)

Year	**Domestic**	**Euro**	**Foreign**	**Global**	**Total**
1999	901.04	177.32	19.40	169.57	1,267.33
2000	624.47	161.53	16.08	223.85	1,025.92
2001	698.68	166.02	22.52	322.48	1,209.71
2002	394.56	218.52	19.68	310.71	943.48
2003	443.74	330.91	15.00	333.12	1,122.77
2004	292.09	377.73	16.52	306.21	992.55
2005	143.09	427.89	16.74	332.40	920.13
2006	217.51	374.85	20.83	329.26	942.45
2007	275.34	419.72	25.16	309.48	1,029.69
2008	416.72	434.71	22.05	420.82	1,294.31
2009	460.68	681.59	46.08	594.36	1,782.71
2010	571.19	602.61	46.88	587.69	1,808.38
2011	441.81	666.09	34.04	421.06	1,563.00
Total	11,507.14	6,044.19	548.91	4,938.34	23,038.58

Table C.6: Average Size of Bonds Issued by Government/Public Agency ($million)

Year	**Domestic**	**Euro**	**Foreign**	**Global**
1999	344.17	250.80	150.42	1,389.91
2000	344.82	251.99	165.72	1,850.04
2001	178.10	295.41	194.18	1,096.89
2002	104.35	286.40	189.26	1,232.98
2003	93.66	410.56	187.47	1,370.84
2004	72.99	425.85	242.90	1,297.52
2005	55.35	351.02	188.12	971.94
2006	72.48	344.21	191.10	855.23
2007	87.33	395.58	201.27	651.54
2008	95.45	402.88	173.65	1,107.42
2009	94.97	504.88	223.70	1,471.19
2010	109.42	328.94	263.37	977.86
2011	100.30	345.48	301.23	997.77
Average	134.88	353.39	205.57	1,174.70

Table C.7: Percentage of Investment Grade Issuance (%)

Issuer Type	**Domestic**	**Euro**	**Foreign**	**Global**
Government/Public Agency	96.85	96.38	97.44	98.52
Financial Institution	97.77	91.89	92.33	98.45
Corporation	88.52	74.66	87.20	96.56

Appendix D

Domestic Bonds, Eurobonds, Foreign Bonds and Global Bonds

This table compares trading, clearing, reporting, and registration requirements, as well as the investor base, for the 4 different bond types. To keep the comparison straightforward, I compared all 4 bond types denominated in the US dollar.

	US Domestic Bond	Eurodollar Bond	US $ Yankee Bond	US $ Global Bond
Trading and Listing	Trading mainly in the US dealer market with some bonds listed and traded on the NYSE and AMEX.	Trading mainly in the European dealer market with some Eurobonds listed and traded on Luxembourg or London Exchanges.	Trading mainly in the US dealer market with some bonds listed and traded on the NYSE and AMEX.	Trading in both the US and European dealer markets which increases the number of trading hours of global bonds; Some bonds are listed on multiple Exchanges.

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	US Domestic Bond	Eurodollar Bond	US $ Yankee Bond	US $ Global Bond
Clearing and Settlement	Domestic bonds settle through the DTCC or Fedwire. To trade in a domestic bond, an investor must have a DTCC account or have an account with a dealer who has a DTCC account.	Eurobonds settle through Clearstream or Euroclear, and to trade in a Eurobond, a Eurobond investor must have a Clearstream (or Euroclear) account or have an account with a dealer who has such account.	Unlike Eurdollar bonds, US dollar Yankee bonds are registered securites; They settle through the DTCC or Fedwire.	Global bonds settle through Clearstream, Euroclear and DTCC. A US investor trades and settles global bonds in the same way she would a domestic bond; Eurobond investors are also able to use their accounts with Clearstream and Euroclear to trade global bond.
Issue Size	Usually less than $350 million.	The size of euro bonds is, on average, smaller than domestic bonds.	The size of Yankee bonds is, on average, smaller than Eurobonds.	Large bond offerings typically over $1 billion in size.

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	US Domestic Bond	Eurodollar Bond	US $ Yankee Bond	US $ Global Bond
Investor Base	Mainly targeted at US investors. Eurobond investors can buy domestic bonds but transacting in them is less efficient relative to global bonds. Also, a number of institutional investors require a listing on a local exchange to be able to invest in a bond.	Mainly targeted at Eurobond investors in Europe, Asia, and Middle East. SEC regulation allows US investors to buy Eurobonds only 40 days (seasoning period) after the bond has been issued.	The US dollar Yankee bond market encompasses those foreign-domiciled issuers who register with the SEC and borrow dollars via issues underwritten by a US syndicate for delivery in the US. The principal trading market is in the US, although foreign buyers can and do participate.	Placed at both US market and Eurobond market. Investors from both markets can purchase the bonds without any restrictions and can trade the bonds across markets. Hence, global bonds have the largest potential investor base.

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	US Domestic Bond	Eurodollar Bond	US $ Yankee Bond	US $ Global Bond
Information Disclosure and Registration Require-ments	Issuer complies with SEC informant disclosure and registration requirements.	Issuer complies with the disclosure requirements and regulations in the countries where the bond are being sold.	US dollar Yankee bonds are registered with the SEC and need to comply with SEC informant disclosure regulations.	Issuers complies with SEC information disclosure and registration requirements as long as part of the issue is being placed in the US market.

Appendix E

Variable Definitions

This table provides definition, data source, and unit for variables in empirical tests. SDC refers to Thomson Reuters Securities Data Company, Datastream refers to Thomson Reuters Data Company, Datastream, Bloomberg refers to Bloomberg Data Service, OECD refers to Organization for Economic Cooperation and Development, and IMF refers to International Monetary Fund.

Variable	Definition	Source	Unit
Dependent variables			
$abnshare_{a,t}$	Abnormal share of number of bond issuance by currency a in time t, as compared with average share of number of bond issuance in currency a across all time	SDC	percentage point

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Variable	Definition	Source	Unit
$abmshare_{a,t}$	Abnormal share of value of bond issuance by currency a in time t, as compared with average share of value of bond issuance in currency a across all time	SDC	percentage point
$abnshareadj_{a,t}$	Mean-scaled abnormal share of number of bond issuance by currency a in time t, measured by dividing $abnshare_{a,t}$ by the average share of number of bond issuance by currency a across all time	SDC	percentage point
$abmshareadj_{a,t}$	Mean-scaled abnormal share of value of bond issuance by currency a in time t, measured by dividing $abnshare_{a,t}$ by the average share of value of bond issuance by currency a across all time	SDC	percentage point
$numpcpq$	Number of tranches issued in currency a during quarter t	SDC	tranche
$amtpcpq$	Principal amount (in million dollars) of all tranches issued in currency a during quarter t	SDC	$ million
Uncovered costs			
$NomSaving_{5Y}$	Difference between average 5-year treasury rates of alternative 6 major currencies and 5-year treasury rate of issuance currency a	Datastream	basis point
$NomSaving_{10Y}$	Difference between average 10-year treasury rates of alternative 6 major currencies and 10-year treasury rate of issuance currency a	Datastream	basis point

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Variable	Definition	Source	Unit
$UnderApp_{(t-1,t)}$	Difference between average exchange rate movement from time $t-1$ to time t of alternative 6 major currencies and exchange rate movement of issuance currency a during the same time period	Datastream	basis point
$UnderApp_{(t-2,t-1)}$	Difference between average exchange rate movement from time $t-2$ to time $t-1$ of alternative 6 major currencies and exchange rate movement of issuance currency a during the same time period	Datastream	basis point
$UnderApp_{(t-3,t-2)}$	Difference between average exchange rate movement from time $t-3$ to time $t-2$ of alternative 6 major currencies and exchange rate movement of issuance currency a during the same time period	Datastream	basis point
$UnderApp_{(t-4,t-3)}$	Difference between average exchange rate movement from time $t-4$ to time $t-3$ of alternative 6 major currencies and exchange rate movement of issuance currency a during the same time period	Datastream	basis point
$FcstExSaving$	Difference between average forecasted 1-year exchange rate movement of alternative 6 major currencies and forecasted 1-year exchange rate movement of issuance currency a	Datastream	basis point

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Variable	Definition	Source	Unit
$FwdSaving$	Difference between average 1-year forward premium/discount of alternative 6 major currencies and 1-year forward premium/discount of issuance currency a	Datastream	basis point
$ExpostFXSaving$	Difference between average 5-year post-issuance exchange rate movement of alternative 6 major currencies and 5-year post-issuance exchange rate movement of issuance currency a	Datastream	basis point
Covered costs			
$CoveredSaving_{5Y}$	Covered cost saving based on 5-year rates; It is computed as the difference between average covered costs for 5-year bonds of the alternative 6 major currencies and covered costs for 5-year bonds of the issuance currency a	Bloomberg	basis point
$CoveredSaving_{10Y}$	Covered cost saving based on 10-year rates; It is computed as the difference between average covered costs for 10-year bonds of the alternative 6 major currencies and covered costs for 10-year bonds of the issuance currency a	Bloomberg	basis point
$IntSwapSaving_{5Y}$	Difference between average 5-year fixed for floating interest swap rates of alternative 6 major currencies and 5-year fixed for floating interest swap rates of the issuance currency a	Bloomberg	basis point

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Variable	Definition	Source	Unit
$IntSwapSaving_{10Y}$	Difference between average 10-year fixed for floating interest swap rates of alternative 6 major currencies and 10-year fixed for floating interest swap rates of the issuance currency a	Bloomberg	basis point
$CurSwapSaving_{5Y}$	Difference between average 5-year currency base swap rates of alternative 6 major currencies and 5-year currency base swap rates of the issuance currency a	Bloomberg	basis point
$CurSwapSaving_{10Y}$	Difference between average 10-year currency base swap rates of alternative 6 major currencies and 10-year currency base swap rates of the issuance currency a	Bloomberg	basis point
Macroeconomic variables			
GDP	Real GDP in the issuance currency country; For bonds denominated in Euro, GDP for the entire Eurozone is used	IMF/OECD	$ trillion
FDI	In-bound FDI received by issuance currency country country; Eurozone FDI is used for bond denominated in Euro	IMF/OECD	$ billion
$CapMktSize$	Total principal value of public bonds, including all bond types, denominated in the issuance currency	SDC	$ billion
GDP_{share}	share of the issuance currency country's GDP among total GDP of the 7 economies;	IMF/OECD	percentage point
FDI_{share}	Share of in-bound FDI received by bond currency domicile country among total in-bound FDI received by the 7 economies	IMF/OECD	percentage point

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Variable	Definition	Source	Unit
$CapMktSize_{share}$	share of a country's capital market size among total market size of all the 7 economies	SDC	percentage point
Conditional logit test variables			
$NomDif_{5Y}$	Difference between 5-year US treasury rate and 5-year treasury rate of currency a	Datastream; Bloomberg	basis point
$NomDif_{10Y}$	Difference between 10-year US treasury rate and 10-year treasury rate of currency a	Datastream; Bloomberg	basis point
$CoveredCost_{5Y}$	Covered cost of converting currency a-denominated fixed-rate 5-year bond into dollar-denominated floating-rate 5-year bond	Datastream; Bloomberg	basis point
$CoveredCost_{10Y}$	Covered cost of converting currency a-denominated fixed-rate 10-year bond into dollar-denominated floating-rate 10-year bond	Datastream; Bloomberg	basis point
$ExRateChg_{t-1Y,t}$	Exchange rate change 1 year prior to the issuing date; Exchange rates are direct quotes of dollar per issuing currency, continuous compounding	Datastream	basis point
$ExRateFcst$	Difference between forecasted exchange rate 1-year post-bond issuance and spot rate of issuing month; Exchange rates are direct quotes of dollar per issuing currency, continuous compounding	Datastream	basis point

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Variable	Definition	Source	Unit
$FwdPremium_{1Y}$	1-year forward exchange rate premium at issuing month; Exchange rates are direct quotes of dollar per issuing currency, continuous compounding	Datastream	basis point
$ExpostEXChg_{5Y}$	Exchange rate change over 5-year period after the issuing date; Exchange rate quotes are in the form of dollar per currency a, continuous compounding	Datastream	basis point
Emerging	Indicator variable that equals 1 if the issuer is from an emerging market, and 0 otherwise	IMF	na
Invgrade	Indicator variable that equals 1 if the issue receives an investment grade credit rating from Moody's, and 0 otherwise	SDC	na
Postcrisis	Indicator variable that equals 1 if the issue is placed after 2008, and 0 otherwise	SDC	na
Gravity test variables			
Import	Issuer country's import from country a divided by the total import from all 6 currency countries and then multiply by 100 for the issuing month	IMF	percentage point

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Variable	Definition	Source	Unit
Language	Indicator variable that equals 1 if the issuer country and the currency country share a common language, and 0 otherwise	Bussière et al. [2008]; Wikipedia	na
Location	Indicator variable that equals 1 if the issuer country and the currency country share a common geographic location area, and 0 otherwise	Bussière et al. [2008]; Google Earth	na
TradeUnion	Indicator variable that equals 1 if the issuer country and the currency country have a trade agreement, and 0 otherwise	Bussière et al. [2008]; IMF	na
HisLink	Indicator variable that equals 1 if the issuer country and the currency country have a historic link, and 0 otherwise	Wikipedia	na
Law2match	Indicator variable that equals 1 if the issuer country and the currency country both have the common law system or both have the civil law system, and 0 otherwise	Porta et al. [2000]	na

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Variable	Definition	Source	Unit
Law4match	Indicator variable that equals 1 if the issuer country and the currency country have the same legal system based on 4 categories – common law, French civil law, German civil law, and Scandinavian civil law, and 0 otherwise	Porta et al. [2000]	na

Appendix F

Gravity and Governance Data

Bilateral trade[1]**:** IMF reports monthly data of bilateral trade of goods for all issuing countries in my sample, except Ivory Coast. This data only includes goods traded, both imports and exports, but it does not include bilateral trade of services and other current account items.

Common language[2]**:** The common-language variable is constructed based on the official language information for countries in my sample: English (Australia, Canada, India, Ireland, Hong Kong, Jamaica, New Zealand, Philippines, Singapore, South Africa, UK, and the US); Spanish (Argentina, Bolivia, Chile, Colombia, Costa Rica, Mexico, Panama, Peru, Spain, Uruguay, Venezuela); French (Belgium, Canada, France, Luxembourg, Switzerland); German (Germany, Luxembourg, Switzerland); Chinese (China, Hong Kong, Singapore); Arabic (Egypt, Lebanon, Qatar, United Arab Emirates, Israel); Finnish (Finland, Sweden); Portuguese (Brazil, Portugal, Luxembourg); Malay (Malaysia, Singapore).

Trade union[3]**:** The trade union variable is constructed based on the free trade agreement member countries and participating year: ASEAN Association of South East Asian Nations: Brunei, Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singa-

[1]Source: IMF http://data.imf.org/regular.aspx?key=61013712.

[2]Source: Bussière et al. [2008] and Wikipedia.

[3]Source: Bussière et al. [2008] and IMF.

pore, Thailand, Vietnam; CEFTA Central European Free Trade Agreement: Bulgaria, Czech Republic, Hungary, Poland, Romania, Slovak Republic, Slovenia; European Union: Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, Netherlands, Portugal, Spain, Sweden, UK; MERCOSUR Southern Common Market: Argentina, Brazil, Paraguay, Uruguay; NAFTA North American Free Trade Agreement: Canada, Mexico, US.

Geographical location: The geographical location variable is constructed based on the geographical area group matrices: Asia and Oceania: China, Hong Kong, Indonesia, Japan, Malaysia, Pakistan, Philippines, South Korea, Australia; Europe: Croatia, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Spain, Sweden, Switzerland, Ukraine, UK; Africa: Egypt, Ivory Coast, South Africa; Middle East: Israel, Lebanon, Qatar, Turkey, United Arab Emirates; North America: Canada, Mexico, US; Latin and South America: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Jamaica, Mexico, Panama, Peru, Uruguay, Venezuela.

Historic link: A matrix of historic connections is constructed based on the colonial history, historic common territory, and historic political union membership. The historically connected country is listed in the parenthesis after each of the 6 currency countries (Euro is not included in this list). Australia (UK); Canada (UK); Japan (South Korea); Switzerland (none); UK (Australia, Canada, Egypt, Hong Kong, Ireland, Pakistan, United States); US (Jamaica, Panama, Philippines, UK).