The Impact of the Renminbi on the International Monetary System: an International Bond Market Approach*

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Abstract

We analyze the macroeconomic variables that influence currencies' shares in the international bond market for the five most important currencies of the International Monetary System: the Chinese Renminbi (CNY), the Eurozone Euro (EUR), the British Pound (GBP), the Japanese Yen (JPY), and the USA Dollar (USD). We collect data for bond issuances at the international level using quarterly data between 2009Q3 and 2015Q4, the period after the internationalization of the Renminbi and until the year right before its inclusion in the SDR basket, and defining three regions of issuance for each currency: America, Europe, and Asia, Oceania, and Africa. The approach is the system-based model of Seemingly Unrelated Regressions (SUR), thus distinguishing the impact of each variable on different currencies. Our results indicate that the expansion of the Chinese economy is likely to support the internationalization of the currency across all regions, but especially in Asia, where its presence is already of growing importance. Additionally, the USD still has a distinctive role that has not yet been achieved by any other currency. The results show that the share is influenced by the size of the economy, the stability of a currency's value, the financial market developments, the yield spread, and hedging motives. The impacts are not homogeneous, differing across currencies and regions under the same currency. In particular, big economies, such as the Eurozone and the USA, with already strong international currencies and established international trade relations, are able to rely less on the issuance of foreign currency international bonds.

JEL Classification: C33, F40, F41, G15.
Keywords: International Currencies; International Bonds, Seemingly Unrelated Regressions, Macroeconomic Determinants of International Currencies.

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1 Introduction

On 30 November 2015 the Executive Board of the International Monetary Fund (IMF) decided to include the Chinese Renminbi (CNY) in the Special Drawing Rights (SDR) currency basket as the fifth currency alongside the US Dollar (USD), the Eurozone Euro (Euro), the British Pound (GBP), and the Japanese Yen (JPY). Effective on 1 October 2016 the inclusion of the Renminbi in the SDR basket represents the beginning of a new era for the Chinese currency and for the International Monetary System (IMS). There are two factors that support its inclusion in the currency basket. First, the rise of China as one of the world's largest exporters in the five year period that preceded the review. Second, the Renminbi is now considered "freely usable" according to the definition stated on the IMF's Articles of Agreement: "A freely usable currency means a member's currency that the Fund determines (i) is, in fact, widely used to make payments for international transactions, and (ii) is widely traded in the principal exchange markets." (Article XXXf, IMF, 2016). Based on the factors determining the currencies' weight in the SDR basket, the CNY represented, on 1 October 2016, 10.92% of the SDR currency basket, surpassing the JPY (down from 9.4% in 2010 to 8.33% in 2015) and the GBP (down from 11.3% in 2010 to 8.09% in 2015). The USD represented 41.73% (41.9% in 2010) and the Euro 30.93% (37.4% in 2010).

In this paper we analyze the international role of the five most representative currencies of the IMS and study what economic and financial factors drive the use of these currencies at the international level, in the period after the internationalization of the Renminbi. We focus on the period after the introduction of the Renminbi in the offshore bond markets and use data from the international bond market, which include both public and private issues of bonds at the international level, thus exploring the use of currencies as stores of value and units of account. We seek to understand if the economic and financial factors that influence the share of international currencies have the same impact over the share of each of the five currencies or not. Additionally, we segregate the issuances of each currency by regions, according to the region of the issuer of the bond, to assess if the determinants that influence each of the currencies' shares also differ by geographic regions to which the issuers belong.

We offer several contributions to the literature. Chinn and Frankel (2007) perform an analysis similar to ours, but with a different methodology and not including the Renminbi, which is a key currency in our work. Cohen (2005) is one of the few examples using international bonds to study international currency choice, although the author does not analyze the Renminbi either, nor does he include important macroeconomic determinants, as we do. Bobba et al. (2007) also provide an example of using the unit of account role, but for neither the Renminbi nor the bonds market. Regarding the Chinese currency, Chinn (2015) analyzed the possibility of the Renminbi surging as a reserve currency. Li and Zhang (2017) estimated the determinants

(based on Chinn and Frankel, 2007) of internationalization of (already) important international currencies (e.g., the USD and the Eurozone Euro), in order to predict the development of the Renminbi in the IMS.

We use a system-based model of Seemingly Unrelated Regression (SUR) and reject the hypothesis of independence of the errors across equations. Since contemporaneous correlation exists across the equations of the model, we therefore estimate the model using the feasible generalized least squares (FGLS) estimator, thereby obtaining more precise point estimates for the parameters.

Results suggest that the determinants of international bonds shares do not present a homogenous pattern. There are different impacts across currencies and, in some cases, also at different issuance regions for the same currency. Determinants such as the GDP share of a currency's country, the bilateral trade share between the currency's country and the region of the issuer, the inflation rate, the yield spread, the FDI growth rate, stock market capitalization, and the volatility of the currencies against the SDR basket are all found to be statistically significant. The size of the USA and the Eurozone's economies make these regions less prone to issue international debt in their own currencies. The increasing and recent use of the Chinese currency in international trade transactions makes for an increase in the issuance of international foreign currency bonds, while the USD and the Euro (in Europe) are already established currencies in international transactions, decreasing the need for risk-sharing since there is trust for these currencies.

There are some currencies for which economic agents expect that a high inflation brings them reduced real borrowing costs (the CNY and the JPY), while for others they are concerned about the erosion of the currencies' value (the EUR and the GBP) and the USD is used as a safe haven mostly by agents outside the American continent. Results for the volatility against the SDR seem to indicate that the USD is used as a speculation instrument, while for the CNY, the EUR, and the GBP, economic agents' behavior is more risk averse. Developed stock markets in the USA and the Eurozone make for good substitutes of international bonds. Concerning the interest rate differential (spread), contrary to other currencies, for the USD and the GBP economic agents are looking for stability. In terms of FDI growth, it seems that only for the GBP and the CNY (for American issuers) and for the Euro (for European issuers) are investors concerned about hedging against future risks. We find that the expansion of the Chinese economy is likely to support the internationalization of the currency across all regions, but especially in the Asian Continent, where it already has a substantial weight, and, finally, we conclude that the USD is still a distinctive reference currency at the global level.

This work is structured as follows. In the next section we review the literature on international currencies and international bonds. In Section 3 we present empirical evidence that motivates our work. In Section 4 we describe the data and methodology applied. Section 5 analyzes the empirical results of our model using

the SUR methodology. Section 6 presents the conclusions.

2 Literature Review

We review the economic and financial determinants that influence the use of a currency at the international level. Additionally, we relate the literature on international currencies with the research that uses bonds, to study the strength of the currencies outside their domestic area, while justifying the use of international bonds. Finally, in order to analyze the particular dimension of bonds, we complete the list of determinants influencing international currencies with those that influence the issuance of international bonds.

2.1 Determinants of Currencies' International Use

Money has three fundamental roles: medium of exchange, unit of account, and store of value, which can be subsequently divided into private and official uses (Cohen, 1971; Krugman, 1984). An international currency is one that plays these three roles at the international level. With the establishment of international economic relationships as a fundamental cornerstone of modern economic development, the choice of what currency is used in such transactions came to be analyzed by economists (Kindleberger, 1967; Swoboda, 1968, 1969; Cohen, 1971; Hakkio, 1973; McKinnon, 1979; Krugman, 1980, 1984; Blinder, 1996; Chinn and Frankel, 2007). The literature on international currencies defines economic and financial factors that contribute to the international use of currencies. Since this work focuses on the store of value and unit of account roles of a currency, the goal of this section is to present the determinants identified by the economic literature, giving particular emphasis to the literature focusing on the study of these roles.

2.1.1 Output Size and Trade

Chinn and Frankel (2007) reached the conclusion that the currency of a country that possesses a large share of the world's output, trade, and finance has a strong natural advantage to become an international currency. Large economies are more likely to achieve low transaction costs, making their currencies more attractive to be used in international trade and cross-border financial transactions (Lim, 2006). Additionally, larger economies present a "high-density network of trading relationships" to foreign agents, making the currencies of these countries more attractive (Chen and Peng, 2010, p. 117). The income share appears as a statistically significant explanatory variable in the works of Chinn and Frankel (2007, 2008), Bobba *et al.* (2007), Ito and Rodriguez (2015), and Eichengreen *et al.* (2016). Specifically, Ito and Rodriguez (2015) reached the same conclusion, but based on the opposite hypothesis, i.e., they find that a country with a larger output

will rely less on Foreign Currency Denominated Debt. But all corroborate the idea that a large economy will have a tendency to have a higher share of international reserves denominated in its currency.

Similarly, trade is also considered in the literature to be an explanatory variable influencing the international status of a currency. Bobba *et al.* (2007) uses disaggregated data to study the relationship between bilateral trade shares and the share of international bonds issued in different currencies. The results suggest that an increase in the bilateral trade share between the issuer's country and the currency's country leads to an increase of bonds denominated in that currency, particularly for the subsample of developing countries, which have less power in the IMS.

2.1.2 Stability of a Currency's Value

In order to perform a role as an international store of value, economic agents need to have confidence in the value of a currency. Stability is an important factor, so that investors and economic agents do not see the value of their assets erased. Studying the international bond market, Cohen (2005) concludes that the issuance of international bonds tends to be higher for strong and stable currencies. Chinn and Frankel's (2007) empirical results suggests that exchange rate volatility and relatively high inflation levels influence negatively the share of a currency's international share as a store of value, i.e., its ability to function as a safe haven. However, in Bobba *et al.* (2007), inflation has a very low positive impact over the share of international bonds and it is statistically significant only for developed countries. The results obtained by Bobba *et al.* (2007) reveal that, although inflation undermines a currency's value, higher inflation levels can benefit the share of bonds issued in that currency, particularly at the international level. Despite the fact that unstable currencies are associated with higher risk and therefore higher interest rates for issuers, it can still be possible to reduce costs by issuing in a foreign currency that presents high inflation levels, thereby explaining the positive impact of inflation in debt issuances at the international level.

2.1.3 Financial Markets Development

The development and depth of financial centers of a country has been recognized as one of the major factors driving the ascendancy of a currency's international use (Eichengreen *et al.*, 2016). With the sophistication of domestic financial markets, the increase in liquidity, and the expansion of the available financial instruments, it is likely that international actors will rely on the currencies of countries in which financial markets are liquid, broad, and diverse. Also, historically, the two main international currencies of the 20^{th} century, the GBP and the USD, were backed by the most developed financial centers at the time, London and New York, respectively (Lim, 2006).

The most broadly used proxy to capture financial market's development is foreign exchange turnover. Chinn and Frankel (2007, 2008), Frankel (2012), Lee (2014), and Chinn (2015) use the triennial data of foreign exchange turnover from the Bank of International Settlements (BIS) as a proxy, using a log-linear interpolation method between observations. Studying foreign public debt issuance in the 20^{th} century, Eichengreen *et al.* (2016) and Eichengreen and Flandreau (2008) use bank assets relative to the GDP as a proxy for financial depth. Ito and Rodriguez (2015) use gross domestic savings as a ratio to GDP and total private credit creation to examine the development of financial markets. Finally, stock market capitalization is also considered as an alternative to measure financial market development in the work of Chinn and Frankel (2008).

2.2 Why the International Bond Market?

Empirical research on international currencies is often derived from the aggregated value of official currency reserves held by central banks (Chinn and Frankel, 2007, 2008; Eichengreen and Flandreau, 2008; Chinn, 2015; Eichengreen *et al.*, 2016), focusing mainly on the international prominence of currencies as a store of value at the official level. Also, international vehicle currencies – particularly, forex vehicle currencies – have been modelled theoretically (Swoboda, 1969; Krugman, 1980; Black, 1991; Matsuyama *et al.*, 1993; Devereux and Shi, 2013), but empirical evidence is scarce (Hartmann, 1998; Flandreau and Jobst, 2009, among the few). Regarding the unit of account function, examples of empirical evidence can be found in the works of Calvo and Vegh (1992) and Goldberg and Tille (2008).

Currency considerations derived from the denomination of international bonds can be found in the work of Cohen (2005), Bobba *et al.* (2007), Chitu *et al.* (2014), and Ito and Rodriguez (2015). Cohen (2005) tries to understand the determinants of aggregate issuance of international debt securities, using data from the BIS. Bobba *et al.* (2007) investigate the determinants of international currency choice in the context of the creation of the Euro. Chitu *et al.* (2014) investigate when the dollar surpassed the pound as the leading international currency using the bond market as a reference. Finally, Ito and Rodriguez (2015) use foreign-currency public debt to investigate the factors that drive the issuance of debt, with an emphasis not on the currencies' international strength, but rather on the issuance country's idiosyncrasies that justify its reliance on foreign debt at the government level.

By studying the international bond market, we are essentially studying two roles of a given currency. First, the use of a currency as an investment currency and therefore its capacity to be serve as store of value. Second, it measures the capacity of a currency to function as unit of account, allowing agents (both private and public) to quote debt in that currency. Moreover, as mentioned above, with greater volume of debt in

a given currency, it becomes more likely for a currency to emerge as a forex vehicle currency, contributing to the success of the currency as a medium of exchange in financial markets. Therefore, by studying the issuance of international bonds we are able to cover a wider perspective that encompasses more than a single role and takes into account the private sphere of financial markets.

Additionally, other arguments unveil the importance of the bond market. Mehl *et al.* (2004) argue that "with increasing capital mobility, central bank reserve holdings and interventions are smaller in volume than private transactions in international financial markets and are likely to have less bearing on a currency's international status", adding that bonds play an important role due to the size and volume of the market. Moreover, the majority of the foreign reserves held by central banks are foreign assets, namely bonds, because even though the main goal is to intervene in the exchange markets, central banks meanwhile want to get some return. As Ma and Yao (2016) state, "currency markets on their own are the largest financial markets, but currency trades typically involve bond purchases and sales. Thus, what we mean by a liquid and actively traded currency is primarily one backed by a big and liquid bond market".

At the end of the 20^{th} century, the idea was already set that financial transactions were important and their magnitude contributed significantly to the definition of the IMS. Blinder (1996) conceived that even though historically "the market's choice of an international reserve currency has followed the patterns of trade", in the modern world financial considerations could become more influential. Thus, at the end of the 20^{th} century, the vast majority of international transactions stemmed from trade in assets rather than trade in goods (Blinder, 1996).

2.3 Factors Influencing Currency Choice in Debt Issuance

The issuance of bonds across national borders appeared as a result of the willingness of economic agents to diversify characteristics of the assets issued for financing purposes or held as a financial asset, and the increasing globalization and capital mobility "encourage borrowers to utilize bond markets outside their country of residence" (Benzie, 1992). In this context, which contributed to the expansion of cross-border debt issuance, two main factors influence the choice of the issuance currency: borrowing costs minimizations and risk management considerations (Cohen, 2005).

2.3.1 Interest Rate Differential

One factor that influences currency choice in the issuance of international bonds is the possibility to reduce borrowing costs. The cost of borrowing money through financial markets is the yield that investors demand at the moment of raising debt. Since the yields offered by corporations in a given currency will be affected

by the benchmark interest rate in that currency, the proxy used by the literature to measure borrowing costs are differences in benchmark government bond yields. Cohen (2005) uses the 10-year yield differentials and Bobba *et al.* (2007) use one-year interest rate differentials between the dollar and other currencies. An increase in government bonds' interest rate tends to increase corporate bonds' yields, following the government benchmark curve and maintaining the risk premium.

It must be stressed that in a world with no transaction costs and perfect information both Uncovered Interest Parity (UIP) and the Covered Interest Parity (CIP) would always prevail, since any deviation from those parities would be exploited by economic agents through an arbitrage process. McBraddy and Schill (2007) study this issue empirically and find that agents without hedging motives take advantage of international foreign-currency bonds to exploit advantages and minimize borrowing costs. Additionally, they find that bond issuance tends to occur after periods of appreciation of a given currency and that consequently, on average, that bond issue precedes a period of devaluation.

Habib and Joy (2010) use bond-data to verify the existence of deviations from the equilibrium parities and their significance for the total number of foreign-currency-denominated debt bonds issued. The results obtained by Habib and Joy (2010) provide empirical microeconomic evidence that can support results at the aggregate level. They find that issuers take advantage of uncovered interest parity deviations and conclude that they will prefer to issue in lower-yield currencies. However, they also state that "issuance does not respond in a consistent manner to expected depreciation of the issuance currency", which is contrary to the findings obtained by Mcbraddy and Schill (2007).

2.3.2 Hedging Motives

Firms that possess assets or revenues in a given currency can decide to issue in that given currency in order to hedge the income generated and overcome exchange rate risks. This "natural hedge" allows firms to avoid currency mismatches between assets and liabilities, and international bonds denominated in the main currencies are often used by firms from developing countries as a risk management tool. Although evidence that the presence of foreign operations leads firms to issue in foreign currency arises from firm-level studies (Keloharju and Niskanen, 2001; Allayannis *et al.*, 2002; Kedia and Mozumdar, 2003; Esho *et al.*, 2007; Clark and Judge, 2009), Cohen (2005) takes this evidence into account and uses investment growth as a proxy to capture the use of international bonds in a given currency to hedge future cash-flows from real assets (2005, p. 59).

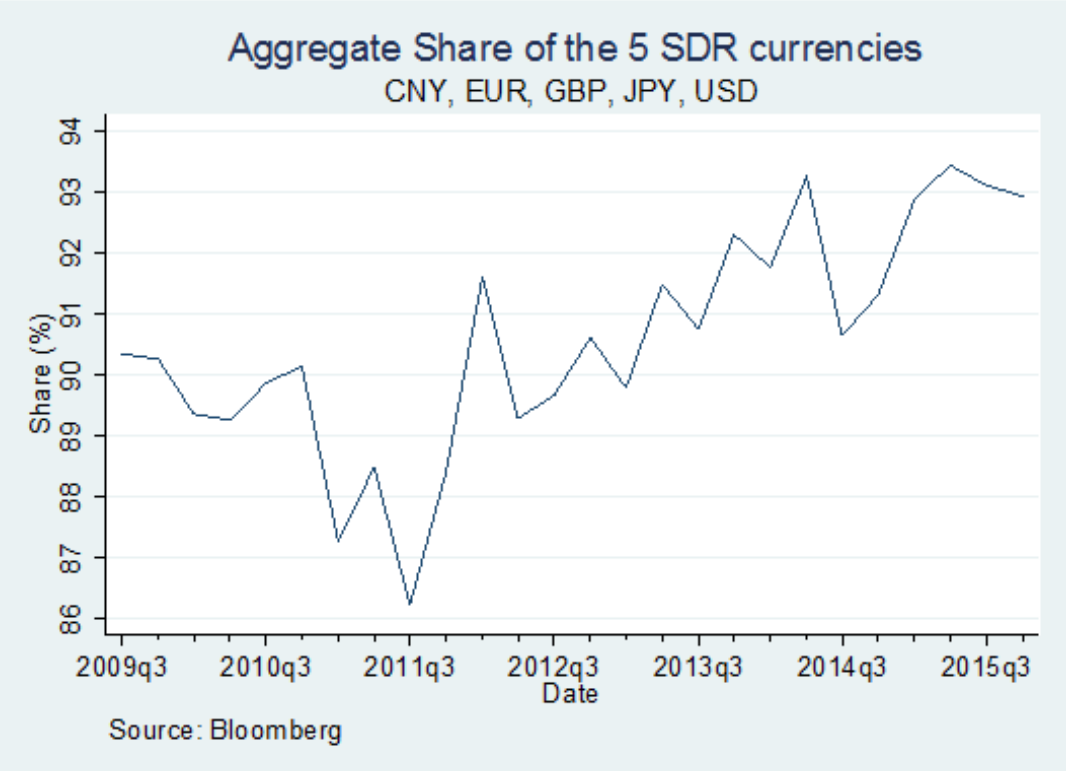
3 The Evolution of International Bonds after the Internationalization of the Renminbi

In this section we describe the evolution of the share and the amount of international bonds issued for the five currencies of our work. The analysis starts with the time series of the aggregate amount of international bonds issued, and then derives a narrower analysis by segregating the amount issued *per* region.

3.1 Aggregate Shares

Between the third quarter of 2009 and the last quarter of 2015, the total amount of international bonds issued averaged 672.3 Billion USD *per* quarter. It reached a maximum of 918.1 Billion USD in the first quarter of 2012, right after the two quarters with the lowest amount of international securities issued: the third quarter of 2011 and the minimum in the last quarter of 2011 (495.7 Billion USD). The dominance of the five currencies under analysis in the international scene is evident. The majority of international bonds are issued in one of the five currencies under study. Altogether, between the third quarter of 2009 and the end of 2015, the five currencies always represented more than 86% of the total of international issuance, reaching a maximum of 93.44% of the amount issued in the second quarter of 2015 (see Figure 1). On average, 90.55% of the amount issued was denominated in one of these currencies.

FIGURE 1 - Aggregate Share of the five SDR Currencies



Despite the dominance of the five currencies, the extent of their dominance differs depending on the location of the issuer agent. Based on the ultimate parent country of risk, we consider three geographic areas: Europe, America (North, Central, and South America), and Asia plus Oceania plus Africa. The amounts issued in a given currency *per* region are in Figures A1 to A5 in the Appendix.

3.2 Europe

Among European agents, the Dollar and the Euro were the two main currencies of issuance. During the period under study the average amount issued *per* quarter was 112.8 Billion USD and 91.8 Billion USD, for the dollar and euro, respectively. Three important events need to be mentioned. In the first quarter of 2011, with the sovereign crisis underway, there was a need for European Agents to search for financing sources in USD. The amount issued increased more than 100 Billion USD from 85.4 Billion USD to 186.3 Billion USD. The increased amount was mainly issued outside the Eurozone. Similarly, in the first quarter of 2012, during the sovereign crisis, there was a sharp increase in the amount issued by European Agents, although this time both EUR and USD denominated issuances surged – a similar movement occurred in the GBP amount. Finally, despite the upturn in the beginning of 2015, the indirect impact of the quantitative easing actions promoted by the ECB over the international bond market seem to have been reduced; this, in particular, when compared with the two data points mentioned previously.

It is possible to observe that the euro and the dollar together always represented more than 80% of the issuances among European agents (see Figure 2). Consequently, the issuances in the remaining three currencies are a reduced number among European agents. Of the three remaining currencies, only the GBP represented more than 10% of the issuance during the period under study (and for only two consecutive quarters). The GBP, the JPY, and the CNY averaged 8.88%, 2.87%, and 0.38%, respectively (Figure 3).

FIGURE 2 - EUR and USD Percentage among European Agents

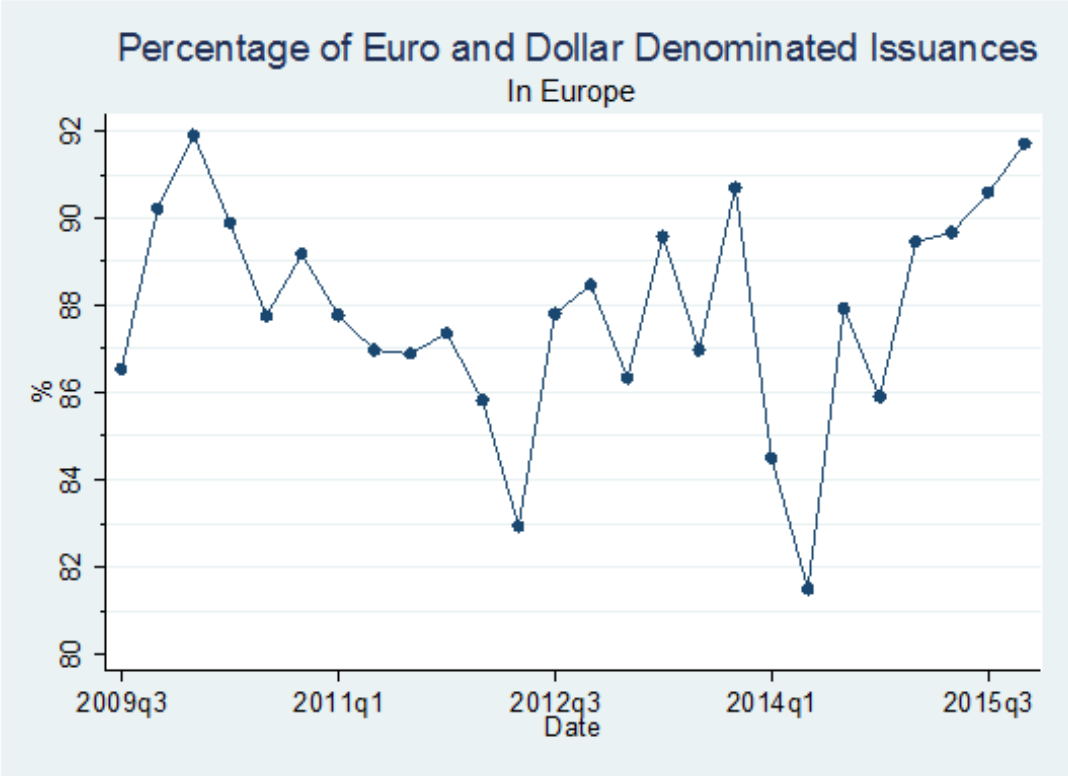
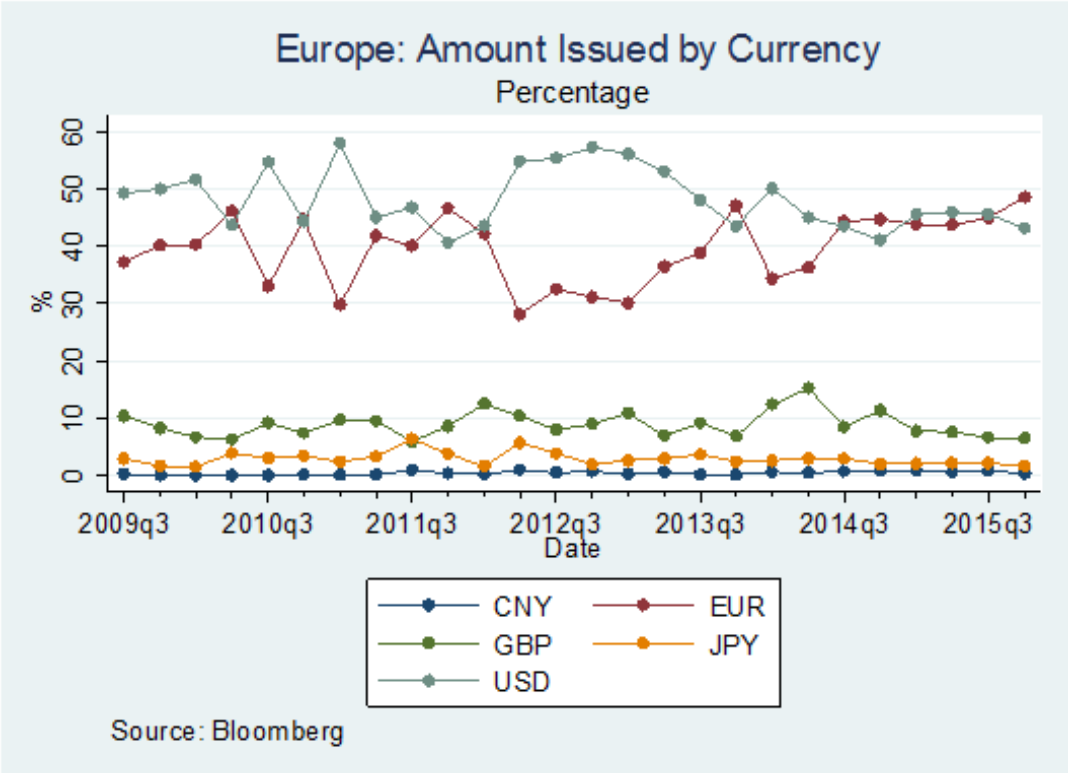


FIGURE 3 - Percentage of the Amount Issued by European Agents



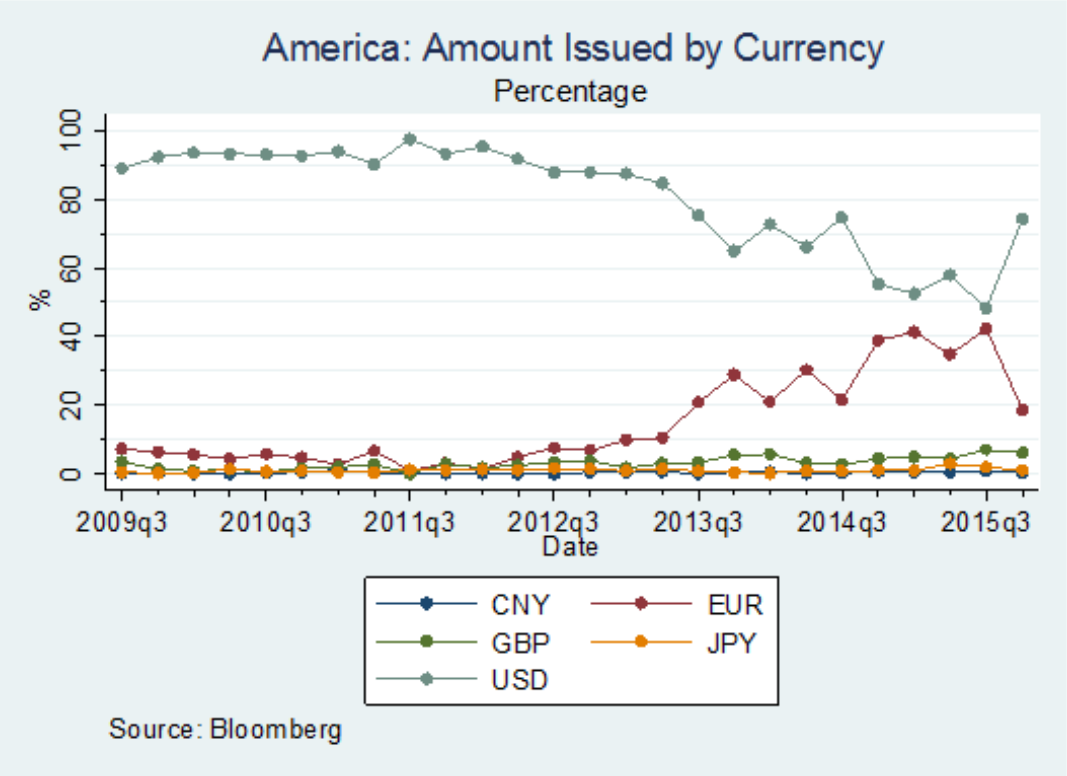
Notably, for most of the time the dollar surpassed the euro. However, the euro-denominated bonds show an upward trend since the second quarter of 2012 that helped to close the gap between the euro and the

dollar and enable the euro to end 2015 as the first-rank currency among European agents. This upward trend was obtained due to the increase in the amount of euro-denominated bonds listed in exchanges inside the Eurozone. Hence, more than showing the recovery of the euro against the dollar as an international currency among European agents, these international bonds issued by agents from outside the Eurozone also reveal that the Euro-area is being more widely used as an international financial center.

3.3 America

If we look at international bonds issued by American agents, we can conclude that the dollar remains the main currency despite the constant downward trend that started in 2010. On average, the agents from countries of North, Central, and Latin America issued 147.5 Billion USD of dollar-denominated international bonds. It represented more than 80% of the issuances of international bonds until the second quarter of 2013, falling sharply afterward and reaching a minimum of 48.12% in the third quarter of 2015. The decrease in the share of the dollar is a result of the increase in the share of euro-denominated international bonds among American issuers. If we take into account all the period under study, the second most important international currency among American issuers averaged 22.2 Billion USD *per* quarter in issuances. Between the second quarter of 2013 and the last quarter of 2015 the average amount of euro-denominated international bonds was 38.6 Billion USD whereas the average value of the dollar falls drastically to 95.5 Billion USD. The euro share reached a maximum of 42.29% in the third quarter of 2015, falling sharply again in the last quarter of 2015 (see Figure 4).

FIGURE 4 - Percentage of the Amount issued by American Agents



The sharp increase in the issued amount of euro-denominated international bonds by American agents occurred essentially inside the euro-area, while the issuances in exchanges outside the euro-area maintained a stable pattern. On the other hand, the decrease in the issuances of dollar-denominated bonds among American agents happened as a result of the continuous decline of the international bonds issued outside the United States of America. Thus, it is possible to conclude that American agents are issuing fewer dollar-denominated international bonds outside USA and issuing more euro-denominated international bonds through euro-area exchanges.

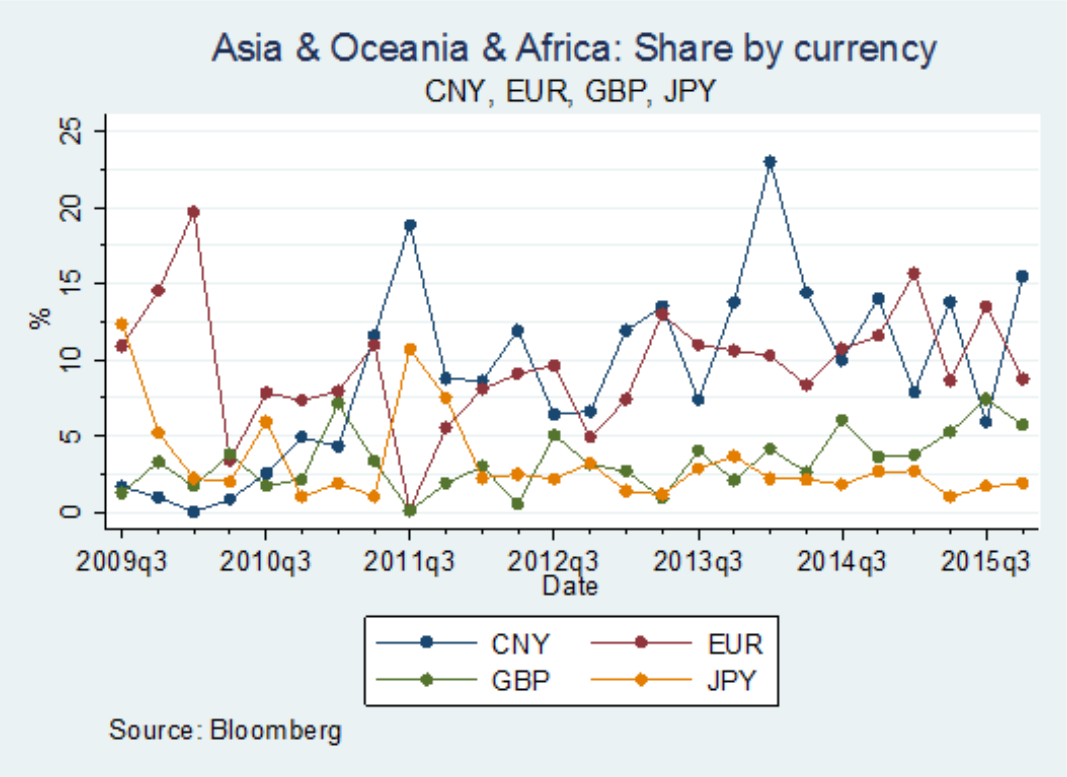
Among the American agents the other three currencies represent a tiny share of the total of international bonds issued. On average, between 2009 and 2015 the GBP, the JPY, and the CNY represented together only 4.1% of the issuances.

3.4 Asia plus Oceania plus Africa

The majority of the international debt issued by agents from Asia, Oceania, and Africa (A&O&A) is dollar-denominated. The share of the dollar-denominated international bonds averaged 74.65% of the total issuances by agents from these regions. The average amount of dollar-denominated bonds during this period was 79.6 Billion USD and although it registered a slight upward trend between 2009 and 2015, its share decreased. The decrease in the overall shared occurred mainly due to the emergence of renminbi-denominated international bonds. Although the amount of renminbi-denominated bonds is still reduced

when compared with the dollar, two interesting facts are worth mentioning. First, the Chinese currency was able to be the currency with the second largest share of international bonds issued by agents from Asia, Oceania, and Africa, surpassing the euro in 14 out of the 26 quarters (see Figure 5). Second, the share of renminbi-denominated bonds reached 22.97% in the first quarter of 2014 and averaged 9.18%, while the euro-denominated securities represented 9.58% on average between 2009 and 2015, only 0.4 p.p. more on average than issues in renminbi.

FIGURE 5 - Percentage of the Amount Issued by Agents from A&O&A, except the USD



4 Empirical Approach

In this section we describe the model as well as the data that we use in our estimations. Our sample covers the period after the internationalization of the CNY and until the year right before its inclusion in the SDR basket. Although the first issuance occurred in 2007, between the last quarter of 2008 and the third quarter of 2009 there were no issuances. Therefore, our analysis starts in the third quarter of 2009, the date from which the CNY offshore bonds have been issued ever since. The last observation is the fourth quarter of 2015, the period in which the IMF's Executive Board decided to include the CNY in the SDR currency basket. We decided not to include the period after 2016 in order to avoid the introduction of structural breaks in the model and a second regime with only a few observations, something that is not obvious how

to handle in SUR-type regressions. We make note of this fact in the conclusion. Finally, we use quarterly data because a higher frequency would make it impossible to use GDP as a key determinant in the model and would also cover periods in which only a few number of transactions had occurred.

4.1 The Model

Our main goal is to understand if the aforementioned macroeconomic determinants affect differently the currencies of interest and across different regions. Therefore, we estimate general systems of equations with a Seemingly Unrelated Regressions (SUR) specification originally developed by Zellner (1962). The SUR model is composed by 5, 10, or 15 equations, depending on how we disaggregate the data by regions, representing the different share of international bonds for each pair of currency i/region j combinations possible (i, j). The shares vary through time and are modelled as an SUR with 15 equations as follows:

$$\begin{aligned} log\left(\frac{Debt\ Share_{ijt}}{1 - Debt\ Share_{ijt}}\right) &= a_{ij} + \beta_{1ij} GDP\ Share_{it} + \beta_{2ij} Trade\ Share_{ijt-1} + \beta_{3ij} Stability_{it} + \quad (1) \\ &\quad + \beta_{4ij} Market\ Cap_{it} + \beta_{5ij} Spread_{it} + \beta_{6ij} FDI_{it} + u_{ijt} \\ i &= CNY; EUR; GBP; JPY; USD \\ j &= America;\ Europe;\ Asia, Oceania, and\ Africa \\ t &= 2009Q3, \ldots, 2015Q4 \end{aligned}$$

In the SUR model with 5 equations we aggregate over j, i.e., we have worldwide $Debt\ Share_{it}$, whereas with 10 equations we distinguish the issuances inside and outside the region of the currency of interest, i.e., $Debt\ Share_{ijt}$, $j = r, nr$, where r stands for inside region and nr for outside region. For example, $Debt\ Share_{CNY,r,t}$ represents issuances in CNY in China.

More specifically, *Debt Share* is the share of international bonds in currency i issued by agents in region j at time t, *GDP Share* is the variation in the share of the GDP of the currency i's country at time t, *Trade Share* is the average bilateral trade share between the currency i's country and the countries of the region j at time t, *Stability* is measured using two different variables: the average quarterly inflation rate and volatility of the currency i's country at time t against the SDR, *Market Cap* is the stock market capitalization share of currency i's country at time t in world's total stock market capitalization, *Spread* is the difference between the interest rate of the benchmark government bond of currency i's country and the US government yield with the same maturity, and *FDI* is the Foreign Direct Investment growth in each of the currency i's local economies at time t. The GDP share is measured in first-differences and the FDI in growth rates to guarantee that all variables in the model are weakly stationary. More details about all these

variables are provided below.

The SUR model allows the errors to be correlated between different equations in the same period of time, that is, $E(u_{ijt}u_{klt}) \neq 0$. Since our dependent variable is measured in percentages, bounded between zero and one, and since increases in one share imply decreases in at least one of the remaining shares, the estimation method allows us to investigate the correlation and the relationship between the errors of the different shares, something we find less recommendable through individual regressions or standard panel data methods. Additionally, we apply a logarithmic transformation which allows us to use standard linear SUR methods, in line with Chinn and Frankel (2008) and Bobba *et al.* (2007). Hence, the dependent variable is measured as $log\left(\frac{Debt\ Share_{ijt}}{1-Debt\ Share_{ijt}}\right)$ which lies in the real line. More details are below.

4.2 Data and Variables

4.2.1 Dependent Variable

The variable we model is the share of international bonds issued in a given currency. The definition of what might be considered an international bond is far from being consensual. The Bank of International Settlements (BIS), the institution that publishes, since the 1980s, statistics on debt capital markets, defines International Debt Securities as "debt securities issued in a market other than the local market of the country where the borrower resides. They capture issues conventionally known as Eurobonds and foreign bonds".[1]

In 2012 the BIS revised the definition of an international bond in order to harmonize their statistics with the standards existing in the Handbook on Securities Statistics (see the latest version from the IMF, the ECB, and the BIS in 2015). In the 1980s, the international bonds were a measure of a country's level of debt held by foreign investors, i.e., it was a proxy for foreign portfolio investment (Wooldridge, 2012). However, with the integration of financial markets and the liberalization of capital flows, foreign investors can access domestic markets and domestic investors can use international markets. Consequently, international bonds as they were defined, cannot, nowadays, accomplish their initial purpose of functioning as a proxy of foreign portfolio investment. Moreover, other metrics and accounting techniques appeared that perform that role better (see, for instance, the Balance of Payments and International Investment Position Statistics from the IMF).

The BIS "no longer refers to the targeted investor base (as before the revision) and instead focuses on the primary market, i.e., the market where securities are issued for the first time" (Wooldridge, 2012). Thus, international bonds are "those issued in a market other than the local market of the country where the

[1] See www.bis.org/statistics/about_securities_stats.htm.

borrower resides" (Wooldridge, 2012). BIS's International Debt Securities, therefore, compare two factors: the country where the borrowers reside and the market where the bond was issued. It does not take into account the currency of denomination, i.e., a US company issuing a US Dollar bond can be considered an international bond as long as this bond is issued in a country other than the US.

It is important to understand that "as financial markets become more open to foreign issuers and investors, the boundaries between domestic and international securities markets become less clear" (IMF, ECB, and BIS, 2015) and that the BIS methodology – drawn from the Handbook of International Statistics – is far from being exact and clear. This methodology is drawn primarily from the External Debt Statistics (Task Force on Finance Statistics, 2013) developed by the IMF and other institutions – including the BIS – which aims to contribute with improvements to "help assess external vulnerabilities at a time when increasing international capital flows are resulting in greater market interdependence" and, therefore, not concerned with the strength of currencies outside their original boundaries. Finally, and more importantly, the way to distinguish an international issue from a domestic one "depends on the question of interest" (Wooldridge, 2012, p. 66).

The Data The definition we use in our work is closely related with the one used by the BIS. We use Bloomberg and the function SRCH as a platform to help us differentiate international bonds from domestic ones. There are scarce tools to better discriminate between the two forms of debt. First, we will make use of the Bloomberg Field "Market Type" which allows us to understand if the market is *Domestic* (e.g., Domestic, Domestic MTN, US Domestic, etc.) or *International* (e.g., Euro MTN, Euro Non-Dollar, Global, etc.). Secondly, we use the field "Exchange Code" to understand if the bond was issued through a *Domestic Exchange* or not, when compared with the country of the currency of issuance. Therefore all bonds with a Market Type *International* and issued through *Non-Domestic Exchanges* are considered to be international. Additionally, we include issues from non-domestic agents that present an *International* Market Type and a *Domestic* Exchange Code, in relation with the currency of issuance. Since the focus of our work is the currencies, we decided to include this second group of issuances, which, although placed in multiple exchanges including domestic ones, are issued by non-residents. The focus is not on the relationship between *issuer country vs. market of issuance,* but rather between *currency vs. issuer* and *currency vs. market of issuance.*

We collect data for the five currencies for 26 quarters, with the sample ending in the last quarter of 2015. We have selected all asset classes (government and corporate) and all the securities (outstanding and matured). After that we filtered by "Market Type" and selected the bonds that presented the following

Market Type: *Euro-MTN*, *Euro Non-Dollar*, *Euro-Dollar*, *Global*, *Bulldog*[2], *Samurai*[3], *Shogun*[4], *Yankee*[5], or *US Non-Dollar*. The full list of subfields can be found in Table A1 in the Appendix.

Then, two different filters were applied in order to collect all bonds considered as International: (1) *Eurobonds* - bonds in a given currency exchanged through markets other than those of the currency's country issued by all agents; (2) *Foreign Bonds* - bonds in a given currency exchanged through the exchanges of the currency's country and issued by non-domestic agents. The full list of domestic exchanges for each currency can be found in Table A2. Examples of the first filter are euro-denominated bonds issued through an American exchange by a German entity or a euro-denominated bonds issued through an American exchange by an American firm. Both count as International Bonds denominated in euros. Examples of the second filter are euro-denominated bonds issued in a European exchange by an American or a Japanese firm, whereas euro-denominated bonds issued by European agents through a European exchange are not considered as international bonds. After this selection process, which is done individually for each currency in the study, we run the command *results* on Bloomberg.

We measured the amount issued (not the outstanding) converted to USD using the exchange rate of the period. The *Ultimate Parent Country of Risk* field returns the country of the ultimate parent company that issued the bond. We choose the ultimate parent in detriment of the issuer's country since in a considerable number of cases, the issuer is a Special Vehicle Purpose (SPV) created only with the purpose of issuing debt and incorporating it in offshore countries. By choosing the ultimate parent company we avoid considering the country of the SPVs in our sample. In order to calculate a share, we take into account all international bonds issued by issuers of a specific region regardless of the currency of issuance:

$$\begin{aligned} Debt\ Share_{ijt} &= \left(\frac{Debt_{ijt}}{\sum_i Debt_{ijt}}\right) \\ i &= CNY; EUR; GBP; JPY; USD \\ j &= America;\ Europe;\ Asia,\ Oceania,\ and\ Africa \\ t &= 2009Q3, \ldots, 2015Q4 \end{aligned} \tag{2}$$

The full list of currencies that were used can be found in Table A3. From $Debt\ Share_{ijt}$, we obtain the dependent variable, $log\left(\frac{Debt\ Share_{ijt}}{1-Debt\ Share_{ijt}}\right)$, from which we distinguish the SUR models with 5, 10, and 15 equations, as explained earlier.

[2] Pound-denominated bond issued in the United Kingdom by non-British institutions.
[3] Yen-denominated bond issued in Tokyo by non-Japanese entities.
[4] Foreign-currency bonds issued in Japan by non-Japanese entities.
[5] Dollar-denominated bonds issued in US by non-American entities.

4.2.2 Independent Variables

Next, we describe each of the independent variables used in the model. Details can be found in Table A4 in the Appendix.

GDP Share In order to measure the size of the economy of currency i's country we constructed the GDP share of the G20 total GDP for each of the five economies under study.[6] The GDP share of each country is the quarterly real GDP value in USD, with 2010 as the base year. All time series with a different base year were transformed using the OECD deflator and those denominated in other currencies were transformed into dollars using the average annual exchange rate of the given currency against the dollar in the base year. The full detailed list of the GDP variables used can be found in Table A5. Since this time-series is non-stationary we applied first-differences to it.

Bilateral Trade Share The trade share is also conceived by Chinn and Frankel (2008) as a measure of the size of the economy. In line with Bobba *et al.* (2007), we intend to capture a third dimension by introducing a bilateral trade share between the currency's country and the region of the issuer. In Bobba *et al.* (2007) the authors use country-level data to produce bilateral trade shares. In our case we produce regional data instead of country level data, since our quarterly data at a country level had a considerable number of zeros for the CNY. Hence, in order to avoid this issue, we define three regions: Europe, America, and Asia & Oceania & Africa. The regions represent the total amount of issues from countries (firms) that belong to that specific region. The countries that are included in each region can be found in Table A6 (naturally they differ across currencies). For the SUR with 5, 10, and 15 equations we consider trades of the region of the currency with the rest of the world, but for robustness check, for the SUR with 15 equations we also disaggregate trade of the region of the currency with each of the three regions (Europe, America, and Asia & Oceania & Africa).

The data were collected from the bilateral trade historical series database developed by the CEPII. We take the average bilateral share of all the countries that compose the respective regions in each currency:

$$Bilateral\ Trade\ Region_t = \frac{\sum_i Bilateral\ Trade\ Share\ Country_{it}}{Number\ of\ Countries} \tag{3}$$

Additionally, since the data are annual, we use the value obtained for the last quarter of the year and interpolate linearly for the remaining quarters. Following Bobba *et al.* (2007), we use lagged trade in order to avoid reverse-causality.

[6] The G20 total GDP is the sum of the Real GDP of all the G20 countries, except Saudi Arabia, due to lack of data.

Stability *Inflation Rate:* We use currency i's country's seasonally adjusted monthly year-on-year inflation rate data. Then we compute the average inflation value of the quarter using the monthly data. The last observation of the quarter was also tested in detriment of the averaged value.[7] Data for the UK and China had to be seasonally adjusted. The inflation rate for the currency i's country does not vary with the region.

Volatility Against the SDR: We collect data for the monthly exchange rates of each currency against the SDR basket, from which we calculate the quarterly standard deviation (volatility), using the IMF International Financial Statistics.

Market Capitalization We use stock market capitalization data produced by Bloomberg to create shares for each of the currency i's countries. As a denominator, we use the World stock market capitalization, also produced by Bloomberg. For the Eurozone, we compute the sum of the stock market capitalization for each of the 19 countries of the Euro Area.

Spread In order to analyze borrowing costs, we use 5-year government bond yields of each of the currencies' countries and compute their differences against the US Government bonds. In the case of the USD, the spread between German Bonds and US Government Bonds is used.

FDI We decided to use a variable that could enable us to test the existence of hedging motives at the aggregate level. Our choice was to include the foreign direct investment growth in the currency's country. We seasonally adjusted the data, and used growth rates to have stationarity of the observed series.

5 Results

In this section we present the results derived from the several estimated SUR models. In Table 1 we have the 5-equations SUR model (Model 1) of the shares of international bonds *per* currency without any disaggregation *per* regions; in Table 2, a 10-equations SUR model *per* currency and two regions (Model 2), the one in which the currency belongs and all the other regions in the world; in Tables 3 and 4, a 15-equations model *per* currency and three regions (Europe, America, and Asia&Oceania&Africa) in which for Table 4 we consider the bilateral trade share disaggregated by each of these three regions as well (Models 3 and 4, respectively). The estimations were adjusted for small samples using STATA options. Before discussing the estimated impacts of each macroeconomic determinant on each currency share, we present some SUR model specification results and the estimated deterministic components.

[7] We tested models with both averaged value and using the last observation of the quarter and the results had no significant differences.

The first important specification result is that we clearly reject the null hypothesis of no contemporaneous cross-equation correlations between errors. All the Breusch-Pagan tests of independence have p-values smaller than a 5% level. For most of the cases, the USD and the EUR residuals possess the largest amount of correlation. These two main currencies at the international level present negative correlations of -0.567 in Model 1, and -0.826 and -0.844 in Models 3 and 4, respectively, among European issuers. In Model 2, the largest correlation is between EUR and GBP in all regions other the one to which the currency belongs (0.728).

In general, the R-squared of the each SUR equation is quite large, varying from 0.569 (GBP) to 0.879 (CNY) in Model 1; 0.483 (EURr) and 0.903 (USDr) in Model 2; 0.284 (GBPas) and 0.895 (EURam) in Model 3; and 0.265 (GBPas) and 0.882 (USDam) in Model 4. The models perform worst, in terms of fit, in the case of the GBP. Moreover, the GBP presents one equation (Asia&Oceania&Africa) that is overall insignificant, in Models 3 and 4. Additionally, the standard F-type results strongly indicate the existence of heterogeneity across coefficients. In all specifications, the estimated joint impact of the explanatory variables across currency shares differs statistically (all p-values equal to zero). Moreover, individual impacts of any particular covariate across currency shares also differ statistically, with the exception of Market Cap in Model 1 (p-value of 0.44, contrary to the others, which are smaller than 0.10). These results demonstrate and justify the relevance of using an SUR specification.

We included quarter time dummies in order to understand if the shares of the international bonds are influenced by seasonality. Only the GBP in the third quarter (fewer shares) and the JPY in the second (larger shares) present statistically significant seasonal dummies. Additionally, we tested dummies for the first quarter of 2011 and 2012 for issuances from European Agents for all of the five currencies under study because the graphs presented spikes at those dates. However, none of the dummies ended up being statistically significant. Finally, we tested for the existence of a time trend but, again, we found no statistical evidence.

Table 1. SUR Model of the Shares of International Bonds *per* Currency

	CNY	EUR	GBP	JPY	USD
GDP	−69.185	13.743	750.013*	82.293***	3.295
	(256.407)	(50.151)	(404.943)	(26.159)	(19.340)
Trade	188.335***	−21.746*	−93.536	62.819	−12.886
	(39.045)	(12.582)	(64.361)	(75.486)	(63.528)
Infl	0.418***	−0.067	−0.097	0.071*	−0.040
	(0.117)	(0.114)	(0.078)	(0.041)	(0.032)
Spr	0.506*	−0.124	−0.669	0.156	−0.023
	(0.270)	(0.189)	(0.411)	(0.106)	(0.090)
FDI	−0.00002**	$7.01e-07$	0.00001	−0.00005**	$-3.28e-07$*
	($9.35e-06$)	($1.12e-06$)	(0.00001)	(0.00002)	($1.99e-07$)
MCap	1.330	−2.169	54.189*	−3.274	−3.046
	(9.959)	(7.086)	(29.930)	(10.890)	(2.657)
Vol	−4.935**	−5.877	−8.568***	−0.013	9.017***
	(2.474)	(6.481)	(12.211)	(0.028)	(3.510)
Q2				0.430***	
				(0.128)	
Q3			−0.250**		
			(0.122)		
C	−14.464***	1.711	−4.295**	−4.843***	2.986
	(1.449)	(1.590)	(2.050)	(1.511)	(4.220)
Rsq	0.879***	0.712***	0.569***	0.631***	0.830***

NOTES: Standard errors in parentheses; C is the constant;

Q2 and Q3 are quarters 2 and 3 dummies, respectively; Rsq is the equation R-squared

*,**,*** stands for statistically significant at 10%, 5%, 1% levels, respectively.

Table 2. SUR Model of the Shares of International Bonds *per* Currency and Two Regions

	CNYr	CNYnr	EURr	EURnr	GBPr	GBPnr
GDP	−544.936	579.504*	38.160	−277.056**	672.307**	−693.817
	(652.566)	(306.768)	(72.205)	(113.993)	(333.732)	(1011.949)
Trade	299.756***	89.742*	46.647***	−4.483	−130.314**	−221.404
	(94.411)	(46.229)	(17.133)	(24.642)	(59.669)	(169.445)
Infl	0.902***	0.055	−0.073	−1.144***	0.084	−0.472**
	(0.269)	(0.132)	(0.155)	(0.211)	(0.079)	(0.215)
Spr	1.220*	0.465	−0.217	0.872***	−0.473	−1.545
	(0.631)	(0.307)	(0.245)	(0.317)	(0.344)	(0.965)
FDI	−0.00001	$8.55e-06$	$2.13e-06$	$-7.45e-06$***	0.00002 **	0.00001
	(0.00003)	(0.00001)	($1.37e-06$)	($1.90e-06$)	($9.52e-06$)	(0.00002)
MCap	9.023	7.309	−8.176	−32.879***	1.956	133.652*
	(22.747)	(11.408)	(8.823)	(12.648)	(27.307)	(79.182)
Vol	−9.652	3.152	−17.347**	−40.377***	−8.185	0.655
	(5.879)	(2.905)	(8.556)	(11.474)	(10.121)	(28.735)
Q2						
Q3					−0.157	−0.450
					(0.103)	(0.284)
C	−23.633***	−14.369***	−6.353***	3.538	−1.400	−7.491***
	(4.900)	(2.361)	(2.061)	(2.693)	(1.907)	(5.242)
Rsq	0.741***	0.591***	0.483***	0.797***	0.488***	0.540***

NOTES: See Table 1. "r" is inside region; "nr" is outside region

Table 2. SUR Model of the Shares of International Bonds *per* Currency and Two Regions (cont.)

	JPYr	JPYnr	USDr	USDnr
GDP	106.589**	49.086	−52.265*	21.399
	(51.829)	(31.492)	(30.213)	(25.580)
Trade	−41.113	94.168	−205.155*	31.969
	(139.686)	(83.939)	(106.597)	(89.836)
Infl	0.221***	0.063	0.074	−0.085*
	(0.078)	(0.047)	(0.056)	(0.044)
Spr	0.551**	0.127	0.213	−0.139
	(0.222)	(0.134)	(0.137)	(0.117)
FDI	−0.00002	−0.00004	$-1.20e-06$***	$3.11e-07$
	(0.00004)	(0.00002)	($3.40e-07$)	($2.79e-07$)
MCap	−12.033	9.307	−11.088***	2.884
	(20.011)	(12.054)	(4.200)	(3.653)
Vol	0.017	−0.027	19.308***	−6.813
	(0.051)	(0.030)	(5.463)	(4.627)
Q2	−0.094	0.499***		
	(0.242)	(0.142)		
Q3				
C	−3.451	−6.666***	16.022**	−4.176
	(2.789)	(1.670)	(6.941)	(5.895)
Rsq	0.721***	0.617***	0.903***	0.639***

NOTES: See Table 1. "r" is inside region; "nr" is outside region

Table 3. SUR Model of the Shares of International Bonds *per* Currency and Three Regions

	CNYam	CNYe	CNYas	EURam	EURe	EURas	GBPam	GBPe
GDP	650.584	−573.257*	−157.595	−52.077	−13.913	174.158	211.972	572.482*
	(780.008)	(338.927)	(161.795)	(101.754)	(37.803)	(227.680)	(867.607)	(306.907)
Trade	175.096	193.687***	155.480***	−91.027***	17.832	77.914	−391.75***	−65.024
	(125.006)	(56.447)	(26.574)	(24.238)	(10.936)	(48.002)	(147.661)	(49.539)
Infl	0.309	0.308*	0.481***	−1.208***	0.015	−0.592	−0.470**	0.020
	(0.367)	(0.160)	(0.078)	(0.212)	(0.101)	(0.405)	(0.190)	(0.061)
Spr	0.057	1.209***	0.231	0.611*	−0.286	0.337	−1.304	−0.561*
	(0.838)	(0.379)	(0.174)	(0.340)	(0.174)	(0.625)	(0.862)	(0.303)
FDI	0.00006**	$4.15e-06$	$-1e-05$***	$-5e-06$**	$2e-06$ *	$-7e-06$*	0.00003	$-2e-06$
	(0.00002)	(0.00001)	($5.52e-06$)	($2.10e-06$)	($8.36e-07$)	($4.16e-06$)	(0.00002)	($8.47e-06$)
MCap	11.620	4.518	−2.856	−20.547	1.567	−35.119	115.180	44.032*
	(30.966)	(13.661)	(6.439)	(13.522)	(5.787)	(27.071)	(75.778)	(23.666)
Vol	5.071	4.529	−5.246***	−11.789	6.724	−58.537**	24.521	−20.507**
	(7.328)	(3.095)	(1.541)	(12.072)	(4.740)	(23.731)	(23.695)	(8.926)
Q2								
Q3							−0.8816***	−0.170*
							(0.243)	(0.090)
C	−22.851***	−21.214***	−10.458***	13.111***	−3.044**	−5.721	−2.529	−3.581**
	(4.840)	(2.248)	(1.048)	(2.861)	(1.530)	(5.253)	(4.532)	(1.590)
Rsq	0.396***	0.807***	0.843***	0.895***	0.391**	0.304***	0.619***	0.443***

NOTES: See Table 1. "am" is America; "e" is Europe; "as" is Asia&Oceania&Africa

Table 4. SUR Model of the Shares of International Bonds *per* Currency and Three Regions (also in Bilateral Trade Share)

	CNYam	CNYe	CNYas	EURam	EURe	EURas	GBPam	GBPe
GDP	908.119	559.089	−151.897	−23.704	−18.794	143.365	489.829	619.124**
	(774.815)	(358.254)	(165.013)	(100.201)	(39.263)	(231.214)	(876.244)	(292.234)
Trade	412.578	252.070***	100.048***	−82.870***	11.474	83.125	−752.48***	−69.589
	(367.522)	(96.620)	(16.969)	(21.626)	(11.883)	(52.184)	(284.411)	(46.790)
Infl	0.288	0.269	0.473***	−1.123***	0.070	−0.780*	−0.503**	0.012
	(0.395)	(0.170)	(0.080)	(0.213)	(0.104)	(0.408)	(0.199)	(0.059)
Spr	−0.001	1.572***	0.216	0.648*	−0.330*	0.467	−1.772**	−0.582*
	(0.967)	(0.380)	(0.176)	(0.360)	(0.177)	(0.629)	(0.882)	(0.312)
FDI	0.00006**	$3.82e-06$	$-1e-05$***	$-5e-06$**	$1e-06$	$-7e-06$*	0.00002	$-4e-06$
	(0.00002)	(0.00001)	($5.68e{-}06$)	($2.11e{-}06$)	($8.78e{-}07$)	($4.17e{-}06$)	(0.00002)	($7.89e{-}06$)
MCap	26.624	20.935*	−4.806	−17.119	5.812	−35.223	212.575**	44.000*
	(25.601)	(12.155)	(6.837)	(13.617)	(6.809)	(27.847)	(84.722)	(23.827)
Vol	9.156	3.643	−5.200***	−9.718	5.961	−56.501**	17.285	−17.524**
	(7.340)	(3.308)	(1.571)	(11.933)	(5.033)	(24.235)	(23.929)	(8.624)
Q2								
Q3							−0.940***	−0.176**
							(0.251)	(0.089)
C	−27.116***	−17.176***	−10.813***	5.143***	−3.513	−0.913	−11.442***	−2.791
	(8.960)	(1.687)	(1.081)	(1.847)	(2.192)	(3.575)	(4.427)	(1.800)
Rsq	0.378***	0.780***	0.835***	0.893***	0.376	0.271**	0.635***	0.462***

NOTES: See Table 1. "am" is America; "e" is Europe; "as" is Asia&Oceania&Africa

Table 3. SUR Model of the Shares of International Bonds *per* Currency and Three Regions (cont.)

	GBPas	JPYam	JPYe	JPYas	USDam	USDe	USDas
GDP	1109.349	−11.355	67.957**	82.293	−106.734*	−44.232**	60.012
	(1085.063)	(56.312)	(33.171)	(57.763)	(64.370)	(18.412)	(38.310)
Trade	34.548	−586.278***	294.871***	37.428	−148.542	−59.256	−13.188
	(178.400)	(180.143)	(100.008)	(185.117)	(209.637)	(72.700)	(130.345)
Infl	−0.308	−0.054	0.167***	−0.021	0.386***	−0.067*	−0.091
	(0.220)	(0.092)	(0.053)	(0.096)	(0.106)	(0.036)	(0.066)
Spr	0.210	1.185***	0.084	0.379	−0.002	−0.188	0.073
	(1.085)	(0.236)	(0.137)	(0.244)	(0.294)	(0.117)	(0.163)
FDI	0.00002	−0.00005	−0.00007**	0.00004	$-7.09e-07$	$-1.51e-07$	$-5.72e-07$
	(0.00003)	(0.00005)	(0.00003)	(0.00005)	($6.62e{-}07$)	($2.22e{-}07$)	($4.18e{-}07$)
MCap	−16.703	19.599	20.050	29.608	−20.212**	0.432	−6.047
	(85.893)	(22.808)	(13.713)	(23.248)	(8.404)	(2.894)	(5.116)
Vol	−2.804	0.008	−0.089**	0.107*	12.409	−3.735	2.240
	(31.489)	(0.059)	(0.036)	(0.060)	(11.357)	(4.018)	(6.664)
Q2		0.372	0.422***	−0.424			
		(0.260)	(0.162)	(0.271)			
Q3	−0.285						
	(0.319)						
C	−2.573	5.106	−9.967***	−6.191*	17.416	3.526	5.662
	(5.539)	(3.598)	(2.005)	(3.724)	(13.787)	(4.693)	(8.501)
Rsq	0.284	0.586***	0.667***	0.470***	0.885***	0.406***	0.530***

NOTES: See Table 1. "am" is America; "e" is Europe; "as" is Asia&Oceania&Africa

Table 4. SUR Model of the Shares of International Bonds *per* Currency and Three Regions (also in Bilateral Trade Share) (cont.)

	GBPas	JPYam	JPYe	JPYas	USDam	USDe	USDas
GDP	1783.325	29.338	37.313	73.633	−80.248	−32.657*	41.320
	(1100.732)	(63.596)	(39.416)	(60.513)	(55.604)	(19.140)	(34.154)
Trade	112.620	−426.924*	658.830	−33.706	92.575	47.353	−66.996*
	(111.636)	(222.792)	(401.03)	(85.365)	(89.706)	(77.328)	(36.064)
Infl	−0.427*	0.030	0.134*	−0.050	0.422***	−0.059	−0.126**
	(0.227)	(0.095)	(0.071)	(0.095)	(0.096)	(0.036)	(0.060)
Spr	−0.278	0.998***	0.249	0.425*	−0.017	−0.229**	0.236
	(1.075)	(0.259)	(0.156)	(0.252)	(0.260)	(0.112)	(0.158)
FDI	$7.70e-06$	−0.00005	−0.00007*	0.00003	$3.76e-07$	$-1.78e-07$	$-9.42e-07$***
	(0.00003)	(0.00006)	(0.00004)	(0.00005)	(9.02e−07)	(3.36e−07)	(3.50e−07)
MCap	43.440	8.310	18.494	27.645	−22.824***	2.848	−9.240**
	(88.880)	(26.340)	(16.694)	(24.462)	(7.449)	(3.046)	(4.636)
Vol	−13.294	−0.0108	−0.067	0.107*	11.653	−2.832	3.385
	(30.711)	(0.068)	(0.043)	(0.064)	(10.777)	(4.320)	(6.272)
Q2		0.465	0.308	−0.404			
		(0.292)	(0.193)	(0.285)			
Q3	−0.274						
	(0.313)						
C	−6.282	3.302	−9.264***	−4.205	−1.075	−1.702	9.981***
	(5.191)	(4.751)	(3.092)	(3.473)	(9.337)	(2.318)	(2.925)
Rsq	0.265	0.449***	0.543***	0.454***	0.882***	0.376**	0.553***

NOTES: See Table 1. "am" is America; "e" is Europe; "as" is Asia&Oceania&Africa

5.1 Analysis by Currencies

In this section we analyze the results by currency, while looking at Tables 1 to 4, which allow for an increasing disaggregation of the estimation results. Diverse results by country for most variables imply that some effects are country or currency-specific.

5.1.1 Chinese Renminbi

Regarding the Chinese currency, results for Table 1 show that lagged bilateral trade, the spread, and inflation have positive relationships with the share of international foreign-currency-denominated bonds and FDI growth and volatility against the SDR have negative ones. In fact, in all tables the bilateral trade share has a positive effect on the share of the CNY, suggesting that the CNY has the potential to become a relevant currency not only in its local region, but globally (results for the change in the GDP share for regions outside the region of the CNY in Table 2 and for Europe in Table 3, also reflect this). These results for bilateral trade and for the change in GDP share are similar to those found in the empirical literature (Chinn and Frankel, 2007, 2008; Bobba *et al.*, 2007; Ito and Rodriguez, 2015, Eichengreen *et al.*, 2016, Eichengreen and Lombardi, 2017). The sign for the spread is also coherent across tables, indicating an increasing demand for Chinese international bonds when the differential between the 5-year Chinese government bonds and the 5-year US government bonds is positive, i.e., investors are looking for a higher-return financial asset (searching for yield). Regarding inflation, as in Bobba *et al.* (2007) inflation presents a positive sign, i.e.,

whenever inflation increases the share of international foreign currency bonds increases, across all tables. Hence, despite the higher risk associated with high inflation levels, issuing in a foreign currency with high inflation can still reduce costs. For the case of the volatility against the SDR, the increase in the volatility increases uncertainty, thus reducing the share of international foreign currency bonds, especially for A&O&A issuers in Tables 3 and 4.

In Table 2 we have the disaggregation of the currencies between the region in which they belong and all other regions (the sum of the remaining two). The signs of the variables that were already significant in Table 1 are the same.

Table 3 shows again a coherence of results regarding the previous tables, but now the sign for FDI for American issuers has a positive sign, and for A&O&A has a negative sign (this also happens in Table 4). According to previous empirical evidence (Cohen, 2005), American issuers seem to be hedging against exchange rate risk. For the other issuers, this risk is not considered a problem. According to information from the Ministry of Commerce of the People's Republic of China, among the biggest FDI investors to China are Hong Kong S.A.R., Taiwan Province, and Singapore.[8] Most of the FDI from these regions is considered to be "round tripping", i.e., investment from Chinese domestic residents who want to receive incentives available only to foreign investors, but also from other countries and from Taiwan and Singapore that use Hong Kong intermediaries (Graham and Wada, 2001). For these investors hedging is not a priority.

Results for Table 4 are similar to results of Table 3, but now market capitalization is significant, with a positive sign for European issuers, which is in accordance with previous empirical literature (Chinn and Frankel, 2008). Countries that develop and deepen their financial system are more prone to have their currency ascend to international status. Fatum *et al.* (2017) state that although the Chinese stock market is the second largest in the World, the Chinese currency has not achieved safe haven status yet, due to some restrictions in capital mobility.

Summing up, the share of renminbi-denominated international bonds reacts positively to increases in growth of the GDP share and also to the increase in bilateral trade between China and its trade partners, which is an indication of the growing importance of this currency. Additionally, the positive differential in government bonds' yields (spread) and the increase in stock market capitalization are also triggers for the share. Investors in the Chinese currency dislike volatility, like risk-averse agents, but look for reduced real borrowing costs if inflation in China increases, and are not concerned with the erosion of value of financial assets. FDI growth can be a concern (hedging motives), but only for American issuers.

[8] See http://english.mofcom.gov.cn/article/statistic/foreigninvestment/201801/20180102693997.shtml

5.1.2 Eurozone Euro

Lagged bilateral trade appears in Table 1 with a negative sign. Contrary to what happens in Table 1, in Table 2 bilateral trade appears with a positive sign for the Eurozone region. Additionally, in Table 2, FDI growth, the variations in the GDP share, the inflation rate, market capitalization, and the volatility against the SDR appear with a negative sign, all of them for non-European issuers. Volatility against the SDR also appears with a negative sign for European issuers. The spread appears with a positive sign for non-European issuers. As for market capitalization, the sophisticated stock market of the Eurozone countries works like a substitute to foreign currency international bonds denominated in euros. Regarding variations in the GDP for non-European issuers, the size of the Eurozone economy seems to be decreasing the need for foreign international currency bonds denominated in euros.

In Table 3 the bilateral trade share has a negative sign for American issuers, as well as in Table 4. Additionally, the inflation rate has a negative sign for American issuers in Table 3 and for both American and A&O&A issuers in Table 4, showing that these issuers do not like the erosion of value of financial assets that inflation brings. Regarding volatility against the SDR, in Tables 3 and 4, A&O&A issuers dislike volatility of the Eurozone currency foreign-denominated bonds against the SDR basket, working like a negative factor to the share of these assets. FDI growth presents a positive sign in the Eurozone territory and negative in all others. European issuers (which include many countries outside the Eurozone) seem to be hedging against risk, while in the other regions, risk from future real returns does not seem to be a concern regarding the Eurozone currency. As for the spread, it continues to be positive for American issuers in Tables 3 and 4, reflecting the fact that the higher spread signals a higher demand for other financial assets rather than only government bonds. However, in Table 4, European issuers see a higher spread as a disincentive for issuing euro-denominated international bonds.

Taking an overview of Tables 1 to 4 for the bilateral trade share, we can see that the minus sign in Table 1, which does not disaggregate between regions, is "imposed" by the issuers that are outside Europe, while in Europe the relationship between bilateral trade share and international foreign currency bond is positive, as we can see in Tables 2 to 4. It seems that European issuers use the euro for trade and also for risk-sharing purposes, while non-European issuers, American agents, use their currency, the dollar, since it is the vehicle currency of the IMS.

The shares of euro-denominated international bonds react negatively to increases in the growth of the share of GDP, which can be evidence that the size of the European economy works like an element of trust. In the case of the bilateral trade share, for American issuers, it shows up with a negative sign, since the dollar is used in most international trade transactions. For European issuers it shows up with a positive

sign, since the euro is commonly used in intra-European trade. Regarding stability, the debt share of euro-denominated international bonds reacts negatively to increases in both inflation and volatility of the euro against the SDR basket. The sophisticated European stock market seems to be a substitute for these euro international bonds, as well as government bonds (in this case only for European issuers), which indicates a lower need to issue these bonds for financing purposes. FDI growth is a concern for European issuers, not for American issuers.

5.1.3 Great Britain Pound

Results for the GBP are very consistent across tables. In Table 1 market capitalization and variations in the GDP share present positive signs. Variations in the GDP share, in all other tables, also present positive signs, but always for the region of the currency (Europe). Market capitalization, also with a positive sign, has a significant value for the regions other than Europe in Table 2, for Europe in Table 3, and for Europe and America in Table 4. In the case of the British Pound it seems that the size of the economy and the sophistication of the financial market are positive influences in increasing the share of foreign-currency denominated international bonds.

In Table 2 the lagged bilateral trade share and inflation exhibit a negative relationship with the share of foreign currency-denominated international bonds, the first variable only for Europe, the second for all other non-European issuers. Regarding the bilateral trade share, the GBP has no bargaining power relative to the euro (in Europe), and relative to the USD (in Tables 3 and 4 is for American issuers only), using the two currencies in international trade much more than their own. Investors see inflation as a cost in the non-European regions, especially in the American continents (Table 3) and in America and A&O&A (Table 4). FDI growth in Table 2, for Europe, has a positive sign, i.e., it seems that investors use the GBP-denominated international bonds as a hedging mechanism.

In Table 3 the spread appears with a negative sign for European issuers, while in Table 4 it appears in both Europe and America. It seems that British government bonds are substitutes for British pound-denominated international bonds.

The share of the GBP-denominated international bonds reacts positively to an increase in the growth of the GDP share but negatively to an increase in the bilateral trade share. The GBP is not commonly used in international payments, so this negative sign for bilateral trade is not unusual. As in the case of the Eurozone euro, stability is a great concern in the case of this currency, for both inflation and volatility against the SDR, both with negative signs. The sophisticated British stock market enhances the demand for GBP-denominated international bonds and FDI in the British economy does the same. But an increase in the

interest rate differential between UK and US government bonds reduces the issuance of GBP-denominated international bonds.

5.1.4 Japanese Yen

Regarding the JPY, in Table 1 the variation of the GDP share and inflation presents a positive sign, while FDI growth presents a negative one. In fact, the size of the economy has a consistent positive sign for all tables, as well as inflation, i.e., borrowers expect reduced real costs associated with higher interest rates, as in the case of the Chinese currency. FDI growth has a negative sign for all tables, i.e., hedging risk is not a priority.

In Table 2 the spread appears with a positive sign, as well as in Tables 3 and 4, showing an appetite for a higher return on financial asset. Lagged bilateral trade is significant only in Tables 3 and 4, presenting a negative sign for the American continents, for which trade transactions are made with USD and a positive one for the European in Table 3, i.e., European-issuers take a more risk-sharing approach in the trade relations involving Japan. Also in Table 3, the volatility against the SDR is positive when we consider the A&O&A continents (which includes the continent of the Japanese currency) and negative when we consider the European continent.

The share of JPY-denominated international bonds reacts positively to an increase in the growth of the GDP share. European issuers react positively to increases in the bilateral trade share but American issuers have the opposite behavior. Inflation is considered a good signal to reduce real borrowing costs (positive sign) and volatility against the SDR basket has a positive influence in the A&O&A continents, but not to European issuers. The increase in the spread is a good incentive to issue JPY-denominated international bonds. FDI growth is not a concern (hedging motives) since it presents a negative sign. The behavior of the Japanese currency is the one most similar to the Chinese currency.

5.1.5 USA Dollar

In the case of the USD, the FDI growth presents a negative sign in Table 1 as well as in all other tables, while the volatility against the SDR presents a positive sign also in all tables, in which it is significant.

In Table 2 variations in the GDP share, the lagged bilateral trade share, and the stock market capitalization present negative signs (all for the American continents in this table), which will again be verified in Tables 3 and 4. The sign of the first two variables reflects the power of the USA economy and currency. If the dollar is widely used internationally as a vehicle currency, there is no need for issuing international bonds denominated in dollars in order to decrease risk associated with international transactions. Also in Table 2,

inflation presents a negative sign for regions outside the American continents, which will repeat in Tables 3 and 4 for A&O&A continents, but a positive sign both in Tables 3 and 4 for the American continents, which seems to indicate that dollar-denominated international bonds are used for different purposes inside and outside the American continent. Finally, in Table 4, for the European continent, the spread has a negative sign.

The Eurozone euro has the closest behavior with the USD. Both the increase in the growth of the GDP share and an increase in the bilateral trade share decrease the need to issue in dollar-denominated international bonds, showing that the largest economy in the World already has it currency widely used in international trade and financial transactions in the IMS. Regarding stability, an increase in the volatility of the USD against the SDR basket increases the issuance of USD-denominated international bonds, which leads to the conclusion that the dollar may be used as a speculation instrument and inflation also has a positive sign in American issuers, which means that the currency is also being used in the search to reduce real costs for borrowers. However, other continents do not like the erosion of value that high inflation brings to the USD. An increase in the spread and an increase in stock market capitalization reduce the issuance of dollar-denominated international bonds, i.e., these financial assets act like substitutes for international bonds. Hedging against future returns related to FDI is also not a concern for FDI investors.

5.1.6 Discussion

In this section we discuss similarities between variables for different currencies. Regarding the variation of the GDP share, we find that the EUR and the USD have always presented negative signs regarding this variable's relationship with the foreign currency-denominated international bonds, but for the Chinese, Japanese, and UK currencies, have always presented positive signs. The USD's and the EUR's countries represent the two largest economies in the world, which gives these two regions/continents a higher probability of being able to issue debt in their own currencies, i.e., they are less reliant on major foreign currencies.

The lagged bilateral trade share presents a positive sign for the Chinese currency, supporting previous empirical evidence that an increase in trade leads to an increase in bonds, due to a risk sharing perspective. For all other currencies (with two exceptions - for the euro, for European issuers and for the JPY for European issuers as well) the sign is negative, and it usually happens for American issuers, showing the great power of the USA currency in international transactions (the exception is for the GBP in Table 2, showing that in Europe, the euro has more international status than the GBP).

Regarding inflation, the CNY and the JPY present positive signs, showing that investors expect that high inflation currencies can give them an advantage and reduce real borrowing costs in this way; while for the

EUR and the GBP we estimate negative signs, showing that in these two currencies investors are concerned about the erosion of the currencies' value. For the USD, while for the American continents we have reached a positive sign, for the other regions (in particular for the A&O&A continents) we have estimated negative signs. Both the EUR and the USD are used as safe-havens and have stable inflation rates in their local economies and, therefore, are rarely used by issuers as an instrument to reduce costs of borrowing based on continuous erosion of value through inflation. Hence, a sudden increase in inflation is not sufficient to change expectations among issuers that the long-term level of inflation will steadily increase. Rather, it can be seen as a measure of risk and, as a consequence, the role of a safe-haven currency is affected, which consequently reduces the issuances among international actors.

Concerning the spread, the CNY and the JPY have positive signs, while the USD and the GBP have negative ones. Assuming no change in the risk spread associated with international bonds, the spread between international bonds will also widen due to the increase in the spread of the benchmark bonds. Hence, this can have one of two consequences: an increase in the demand of international bonds of the currency with the relative higher interest rate or a decrease in the supply of international bonds of that same currency. If the first occurs, then the share of bonds denominated in that currency tends to be higher; with a decrease in the supply, however, the share of bonds tends to be lower. In the case of the USD and the GBP, since the spread has a negative impact over the share of international bonds denominated in dollars and pounds, respectively, we can conclude that, when the interest rate is relatively higher, the downward movement in the supply curve offsets any possible upward movement in the demand curve. Thus, investors do not "search for yield" in USD (or GBP)-denominated bonds but rather look for stability, regardless of the issuer's region. The opposite seems to occur with the remaining currencies, with the exception of the EUR among European agents, a region where the EUR is also the reference currency.

For FDI growth, the GBP always presents positive signs, while the JPY and the USD always present negative ones. Regarding the CNY, for its region we have encountered a negative sign, while for the American continents we have found a positive one. For the EUR, in its continent we have found a positive sign, while for all other regions we have negative ones. It seems that for only the GBP and CNY (for American issuers) and for the euro (for European issuers) is hedging against future risks a concern.

The stock market capitalization always has a positive influence on the CNY and the GBP debt share, while for the EUR and for the USD always has a negative influence. Hence, it seems that the more sophisticated European and American stock markets are good substitutes for issuing foreign currency-denominated international bonds in these currencies.

Finally, for the volatility against the SDR, the sign of this variable is always negative for the CNY, the

EUR, and the GBP, which is according to the behavior of risk-averse economic agents, and always positive for the USD, which seems to indicate a speculation motive behind this sign. For the JPY, for the A&O&A continents is positive, while for the European-issuers is negative.

6 Conclusion

The CNY is now considered a "free usable" currency by the IMF. How much this currency will be used outside its borders is still uncertain. However, according to the data that we collect, the CNY was able, after only a few years of its introduction in the international markets, to be the second most used currency – after the USD – among issuers from Asia, Oceania, and Africa. The offshore bonds denominated in CNY appeared in 2007 and since then the IMS seems to be in a continuous process of adaptation to the internationalization of the renminbi. As proof of that, the CNY is now part of the SDR basket with the third highest weight after the USD and the EUR.

In line with these changes, our goal was to understand how the macroeconomic determinants influence the different shares of international bonds after the internationalization of the renminbi. When studying the determinants that influence the strength of a currency at the international level, the literature analyzes the currencies altogether and does not distinguish among currencies. In this paper we model the shares of international currencies using SUR specifications and data observed between 2009Q3 and 2015Q4. The SUR specification allows us to distinguish the impacts of the variables between currencies. The data are composed of international debt shares of each of the five currencies of the current SDR basket, which are subsequently divided into two and three regions (America; Europe; and Asia plus Oceania plus Africa), based on the country of the parent company of issuance.

We find strong evidence supporting the hypothesis of distinct coefficients across equations, thus justifying our modelling technique based on SUR models. We find that the share of international bonds is influenced by the size of the economy (changes in the GDP share and the bilateral trade share), stability of a currency's value (the inflation rate and the volatility against the SDR), financial market developments, the yield spread, and hedging motives. In these estimated models, the behavior of the Japanese currency is more similar to the Chinese currency and the Eurozone euro's behavior resembles more the USD.

The USD and EUR countries represent the two largest economies in the world, which gives these two regions/continents a higher probability of being able to issue debt in their own currencies, i.e., they are less reliant on major foreign currencies. The positive sign for the Chinese currency of the lagged bilateral trade share is in accordance with previous empirical evidence that an increase in trade leads to an increase in bonds, due to a risk sharing perspective. But for the USD, all over the world, and for the euro, in particular

in Europe, the sign for this variable is negative, showing the great power of the USD in international transactions, and the euro in intra-European transactions.

As for inflation, in the cases of the CNY and the JPY, investors expect that high inflation can give them an advantage and reduce real borrowing costs. Inversely, in the case of the EUR and the GBP investors are concerned about the erosion of the currencies' value. The USD is mostly used as a safe haven currency by agents from outside the American continent. The volatility against the SDR has a negative relationship with the share of international bonds for the CNY, the EUR, and the GBP, which is in accordance with the behavior of risk-averse economic agents, and always positive for the USD, which seems to indicate a speculation motive behind this observed sign.

The stock market capitalization presents a negative relationship for the EUR and the USD with the share of international bonds, which seems to indicate that their developed stock markets work as substitutes for international bonds. Concerning the spread, investors do not "search for yield" in USD (or GBP)-denominated bonds, but rather look for stability. In terms of proxy for hedging risk (FDI growth), it seems that only for the GBP and for the CNY (for American issuers) and for the euro (for European issuers) are investors concerned about hedging against future risks.

Despite these interesting findings, our empirical approach has some limitations. Further research could take into account the exchange venues where these bonds are traded and analyze the shares based on the exchanges rather than on the country of the issuer. Although many bonds end up being traded *over-the-counter*, we believe that further research on this could also bring interesting results. Finally, it will also be interesting in the future to compare the CNY share in two different regimes: prior to and after its inclusion in the SDR currency basket. The data available so far do not allow us to have enough information with respect to the second regime.

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7 Appendix A

Table A1: Market Types on Bloomberg

	Market Type
Included	Euro-MTN
	Euro Non-Dollar
	Euro-Dollar
	Global
	Bulldog
	Samurai
	Shogun
	Yankee
	US Non-Dollar
Excluded	Australian
	Canadian
	Domestic
	Domestic MTN
	Private Placement
	Restructured Debt
	UK Guilt Stock
	US Domestic
	US Govt
	Warrant

Table A2: List of Domestic Exchanges *per* Currency

Domestic Exchanges	Market Type	Domestic Exchanges	Market Type
CNY	Shangai Stock Exchange	EUR (Cont.)	SIBE
	Shengzhen Stock Exchange		NYSE BondMatch
EUR	Luxemburg		Mercato telemati
	Frankfurt		Extra MOT Pro
	Dusseldorf	GBP	London
	Vienna		London Intl
	Dublin		MTS Amsterdam
	Amsterdam		MTS S.P.A.
	Paris		MTS Belgium
	Madrid		MTS Portugal
	Brussels		MTS France
	Milan		MTS Ireland
	NOMX Helsinki		MTS Greece
	Berlin		Chi-X
	Hamburg		Tradeweb Europe
	Hannover		Tradeweb LLC
	Munich		LSE-Retail
	Stuttgart	JPY	Tokyo
	Lisbon		Tokyo 2
	Athens		Osaka
	Valencia		Osaka 2
	Bilbao		Nagoya
	AIAF		Fukuoka
	Lyon		Sapporo
	Strasbourg	USD	New York
	Marseille		NYSE MKT LLC
	Nancy		Yellow Sheets
	Nantes		Nasdaq
	Barcelona		NYSE Area
	Cent Anotacione		Trace

Table A2: List of Domestic Exchanges *per* Currency (Cont.)

Domestic Exchanges	Market Type	Domestic Exchanges	Market Type
EUR (Cont.)	All German SE	USD (Cont.)	CBOE
	Malta		Nasdaq OMX PHLX
	Nouveau Marche		Chicago
	Euronext-Paris		Cincinnati
	Euronext-Amsterdam		Nasdaq/NCM
	Euronext-Brussels		Nasdaq/NGM
	TLX		Nasdaq/NGS
	EuroMTF		Third Mkt Corp
	Euwax Stuttgart		BATS
	Antwerp		
	SEDEX-Milan		
	EuroTLX		
	Xetra		
	SCDACH-Frankfurt		

Table A3: List of Currencies

Currency	Designation
AED	United Arab Emirates Dirham
ARS	Argentine Peso
AUD	Australian Dollar
BRL	Brazilian Real
CAD	Canadian Dollar
CHF	Swiss Franc
CLP	Chilean Peso
CNY	Chinese Renminbi
COP	Colombian Peso
CZK	Czech Koruna
DKK	Danish Krone
EGP	Egyptian Pound
EUR	Eurozone Euro
GBP	Great Britain Pound Sterling
HKD	Hong Kong Dollar
HUF	Hungarian Forint
ILS	New Israeli Shekel
IDR	Indonesian Rupiah
INR	Indian Rupee
JPY	Japanese Yen
KRW	South Korean Won
KZT	Kazakhstani Tenge
MXN	Mexican Peso
NGN	Nigerian Naira
NOK	Norwegian Krone
NZD	New Zealand Dollar
PEN	Peruvian Nuevo Sol
PLN	Polish Zloty
RON	Romanian New Leu

Table A3: List of Currencies (Cont.)

Currency	Designation
RUB	Russian Ruble
SEK	Swedish Krona
SGD	Singapore Dollar
TRY	Turkish Lira
TWD	Taiwan Dollar
USD	US Dollar
VEB	Venezuelan Bolívar
VND	Vietnamese Dong
ZAR	South African Rand

Table A4: Details of the Database

Variable	Currency	Source	Bloomberg Ticker	Obs.
GDP	CNY	Bloomberg	CNGDGDP Index	China's quarterly GDP series starts in 2011Q1. The remaining observations were obtained using the YoY growth rate.
	EUR	Bloomberg	EUGVEMU Index	
	GBP	Bloomberg	EUGVUKI Index	
	JPY	Bloomberg	JGDPOGDP Index	
	USD	Bloomberg	GDP CHWG Index	
Trade	CNY	CEPII	n.a.	
Share	EUR	CEPII	n.a.	
	GBP	CEPII	n.a.	
	JPY	CEPII	n.a.	
	USD	CEPII	n.a.	
Inflation	CNY	OECD	n.a.	
	EUR	OECD	n.a.	
	GBP	OECD	n.a.	
	JPY	OECD	n.a.	
	USD	OECD	n.a.	
Volatility	CNY	IMF	n.a.	IMF Financial Data
SDR	EUR	IMF	n.a.	IMF Financial Data
	GBP	IMF	n.a.	IMF Financial Data
	JPY	IMF	n.a.	IMF Financial Data
	USD	IMF	n.a.	IMF Financial Data

Table A4: Details of the Database (Cont.)

Variable	Currency	Source	Bloomberg Ticker	Obs.
FDI	CNY	Bloomberg	CHCUNFE Index and CHCUNFER Index	Two ticker used because from 2010 on China started FDI in USD (CHCUNFER), and we segregate both amounts
	EUR	Bloomberg	EUCAYF56 Index and EUCAYF57 Index	EUCAYF56 Index: FDI from Monetary and Financial Institutions, EUCAYF57 Index: FDI from other sectors
	GBP	Bloomberg	UKCAHJYR Index	
	JPY	Bloomberg	JNBPFDEL Index	
	USD	Bloomberg	UACSIEQO Index	
Government 5-year yield	CNY	Bloomberg	GTCNY5Y govt	
	EUR	Bloomberg	GDBR5 Index	
	GBP	Bloomberg	GUKG5 Index	
	JPY	Bloomberg	GTJPY5Y govt	
	USD	Bloomberg	USGG5YR Index	
Market Capitalization	CNY	Bloomberg	WCAUCHIN Index	
	EUR	Bloomberg	n.a.	sum of all 19 countries from Eurozone, based on the respective tickers
	GBP	Bloomberg	WCAUUK Index	
	JPY	Bloomberg	WCAUJAPA Index	
	USD	Bloomberg	WCAUUS Index	

Table A5: Details of the GDP Variable Used

Country	Bloomberg Ticker	Obs.
China	CNGDGDP Index	
UK	EUGVUKI Index	
Eurozone	EUGVEMU Index	
US	GDP CHWG Index	
Japan	JGDPOGDP Index	
EU	EUGNEU27 Index	
Argentina	ARADTOTL Index	
Australia	AUNAGDP Index	
Brazil	BZGDGDPQ Index	
Canada	CGE9MP Index	
India	IGQREGDP Index	IGQREGDP Index: between 2011Q2 and 2015Q4;
	and INQGGDP Index	INQGGDP Index: between 2009Q3 and 2011Q1
Indonesia	IDGDP Index	
Mexico	MXGPLEVL Index	
Russia	RUDPGDPN Index	RUDPGDPN Index: between 2011Q1 and 2015Q4;
	and RUDPGL Index	INQGGDP Index: between 2009Q3 and 2010Q4
South Africa	SAGDP Index	
South Korea	KOECSTOT Index	
Turkey	TUGPCU Index	

Table A6: Countries *per* Currency

Currency	Region	Country Code (ISO)	Currency	Region	Country Code (ISO)
CNY	A&O&A	CN	CNY	Americas	US
		HK			CA
		AU			MX
		KR			KY
		AE			VG
		SG			BR
		TW	EUR	A&O&A	CN
		JP			AU
		IN			JP
		ZA			KR
		MY			ZA
		QA			IN
		RU			QA
		NZ			AE
		TH			NZ
		MN			RU
CNY	Europe	GB			IL
		FR			HK
		DE			LB
		NL	EUR	Europe	CH
		LU			GB
		CH			SE
		SE			NO
		IT			JE
		ES			DK
		AT			IS
		IE			CZ
		HU			HU

Table A6: Countries *per* Currency (Cont.)

Currency	Region	Country Code (ISO)	Currency	Region	Country Code (ISO)
EUR (Cont.)	Europe (Cont.)	PL	EUR (Cont.)	Americas (Cont.)	VE
		TR			CO
		GI			CL
		RO			VC
		HR			JM
		BG	GBP	A&O&A	AU
		LI			CN
		FR			JP
		DE			SG
		NL			HK
		LU			ZA
		BE			AE
		IT			NZ
		ES			IN
		AT			KR
		PT			RU
		IE			MY
		GR			KZ
		FI			IL
		EE	GBP	Europe	ES
		CY			NL
EUR	Americas	US			IE
		KY			SE
		CA			DE
		BR			JE
		BM			NO
		AR			LU
		MX			FI

Table A6: Countries *per* Currency (Cont.)

Currency	Region	Country Code (ISO)	Currency	Region	Country Code (ISO)
GBP (Cont.)	Europe (Cont.)	CH	JPY (Cont.)	A&O&A (Cont.)	SG
		IT			IN
		AT			TW
		FR			ZA
		IS			MY
		PT	JPY	Europe	DE
		DK			GB
		GG			NO
		BE			FR
		IM			SE
		GR			NL
		GB			CH
		GI			LU
GBP	Americas	US			FI
		CA			DK
		KY			ES
		BM			AT
		VG			IE
		BB			IT
		BR			BE
		MX			JE
JPY	A&O&A	JP			IS
		AU			PT
		KR			GR
		AE			TR
		CN	JPY	Americas	US
		HK			CA
		NZ			KY

Table A6: Countries *per* Currency (Cont.)

Currency	Region	Country Code (ISO)	Currency	Region	Country Code (ISO)
JPY (Cont.)	Americas (Cont.)	AR	USD (Cont.)	Europe (Cont.)	IE
		BR			LU
		PA			BE
		CL			NO
USD	A&O&A	CN			IT
		AU			DK
		JP			UA
		KR			AT
		HK			TR
		IN			FI
		TW			JE
		AE	USD	Americas	US
		RU			CA
		SG			BR
		ID			MX
		ZA			AR
		PH			PA
		MY			KY
		TH			CL
		NZ			KY
		KZ			BM
USD	Europe	GB			CO
		DE			PE
		FR			VG
		CH			JM
		NL			
		ES			
		GG			
		SE			

Figure A1: CNY amount issued per Region

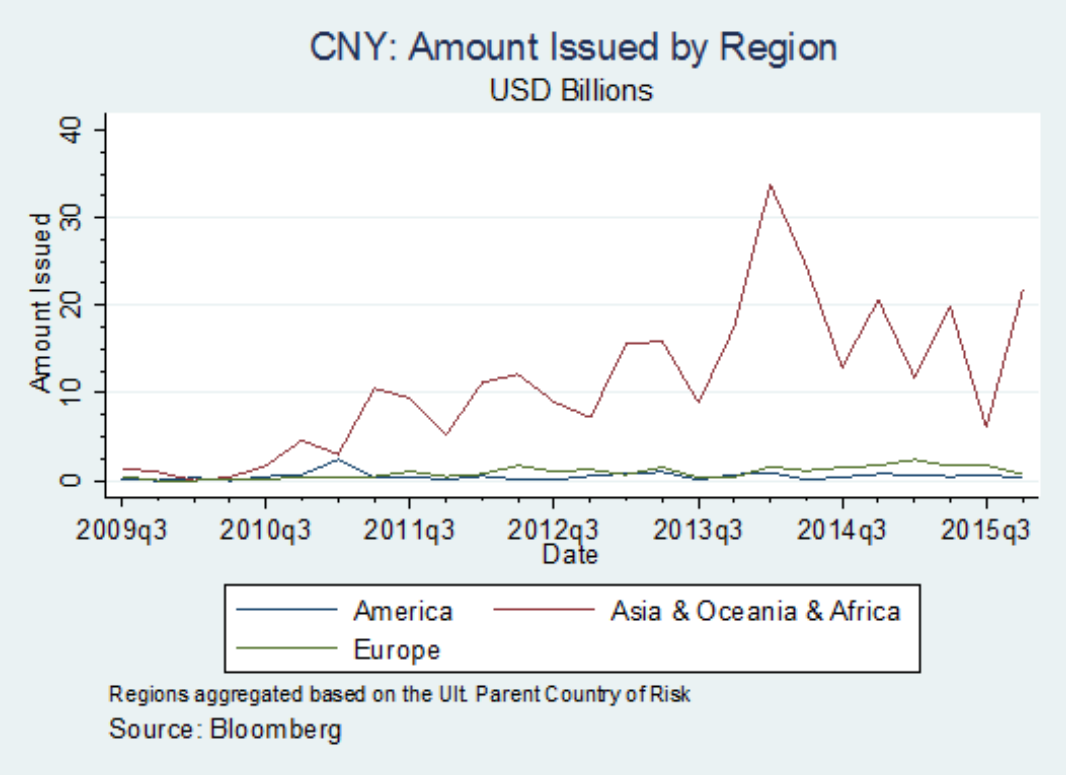


Figure A2: USD amount issued per Region

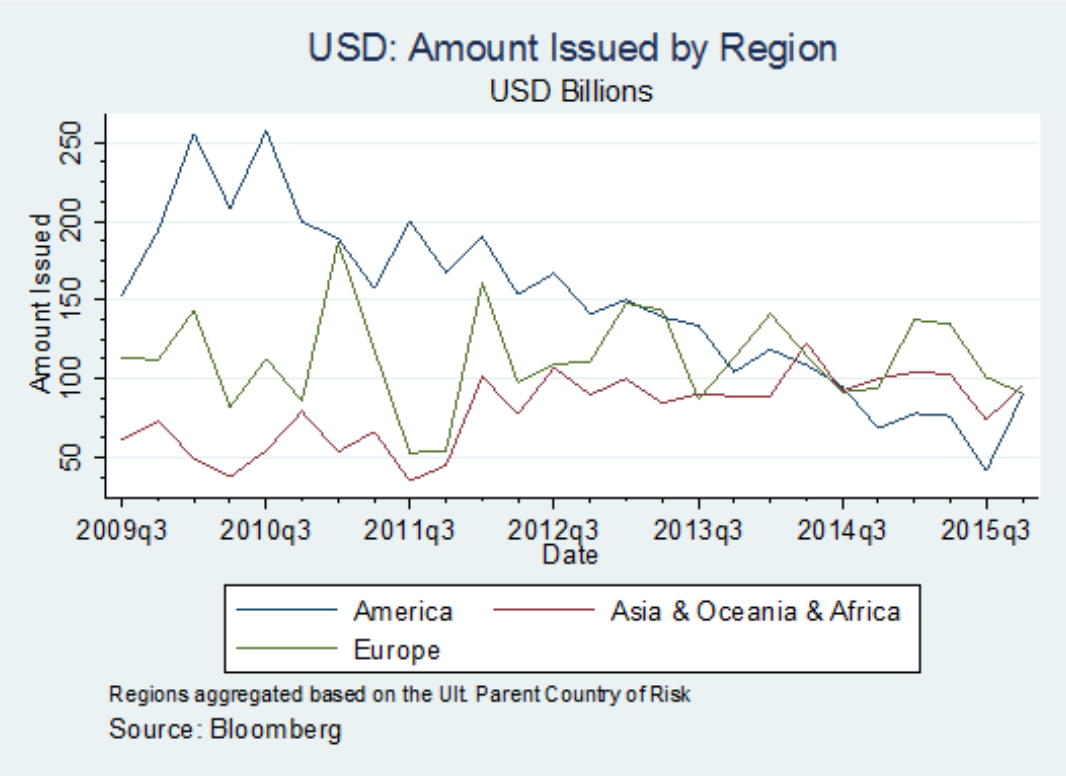


Figure A3: EUR amount issued per Region

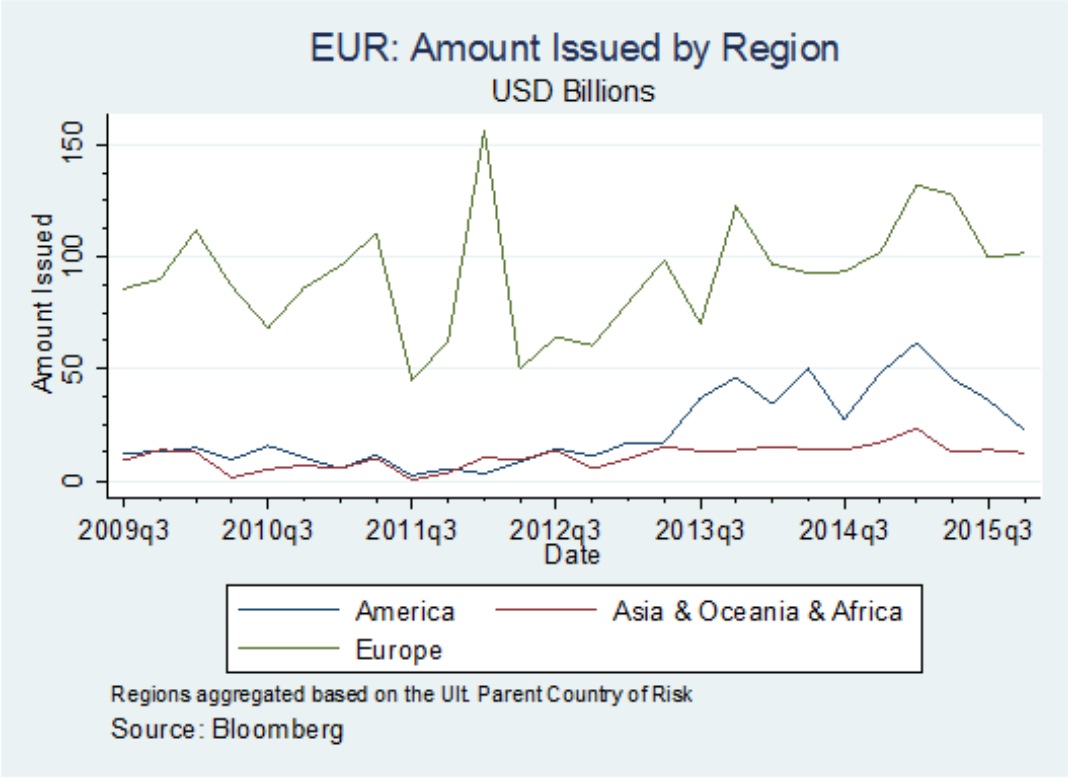


Figure A4: JPY amount issued per Region

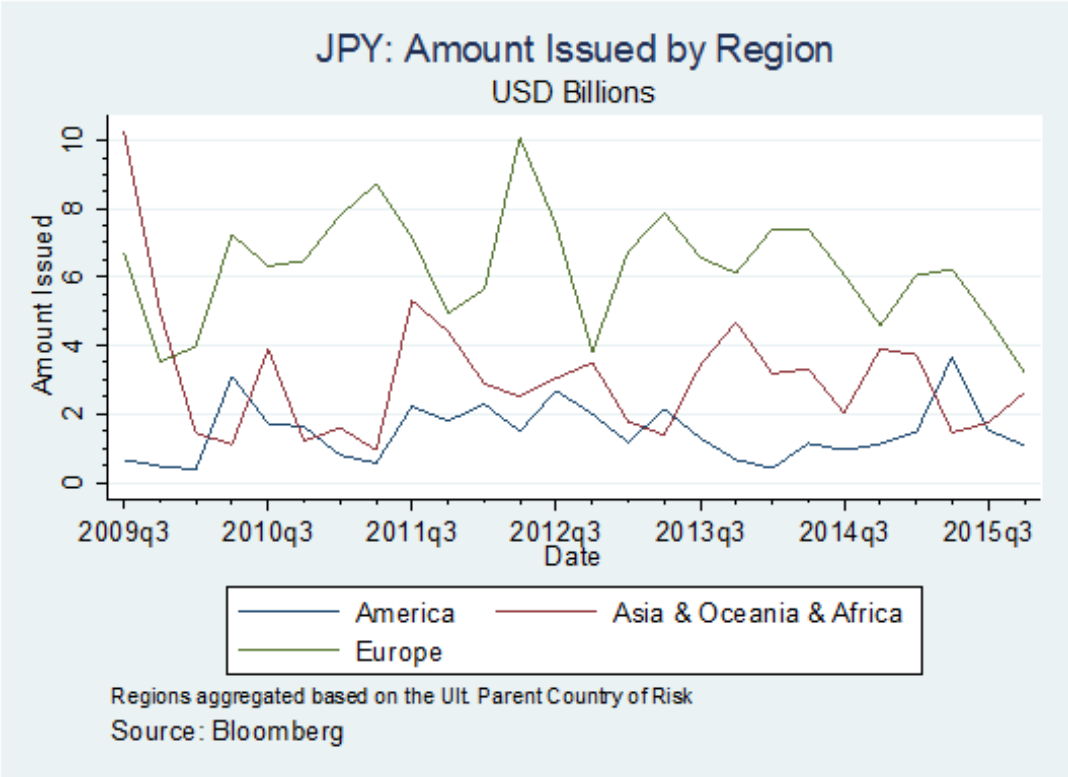
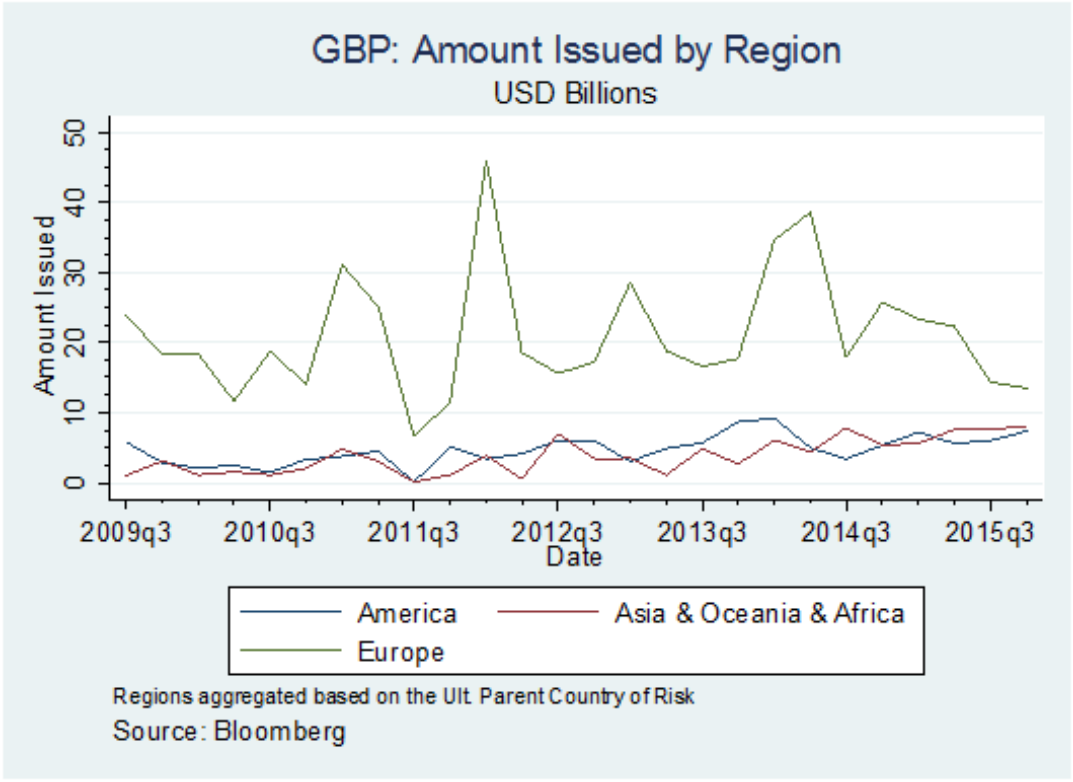


Figure A5: GBP amount issued per Region


GBP: Amount Issued by Region
USD Billions
Amount Issued
0
10
20
30
40
50
2009q3
2010q3
2011q3
2012q3
2013q3
2014q3
2015q3
Date
America
Asia & Oceania & Africa
Europe
Regions aggregated based on the Ult. Parent Country of Risk
Source: Bloomberg