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Determinants of international currency competition in the international debt securities market: An empirical analysis based on dynamic panel data model

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ABSTRACT

In order to provide reference for the internationalization of RMB, using the instrumental variable method, this study investigates the determinants of international currency competition in the international debt securities market. Empirical results show that: the international currency competition is mainly based on the comprehensive strength, currency yield and the network externality. Meanwhile, the historical inertia is significant. China should enhance the comprehensive strength, increase the openness of the domestic debt securities market, promote internationalization of RMB and regional monetary cooperation as soon as possible, which will overcome the disadvantages of "latecomer" and increase the network externality.

KEYWORDS

Currency competition; International debt securities; RMB internationalization..

INTRODUCTION

With both internal and external driving force, the internationalization of renminbi (henceforth RMB) has developed by leaps and bounds in recent years. Current studies on the internationalization of RMB focus more on the cross-border trade settlement and international monetary reserves. However, the history and current status of international currency competition shows that a sound debt securities market is becoming a more and more important driving force in currency internationalization. In fact, the process of RMB internationalization has been permeated with its internationalization in the debt securities markets. Back in October 2005, the international Finance Corporation and the Asian Development Bank respectively issued 1.13 billion yuan and 1 billion yuan of Panda debt securities in the China inter-bank debt securities market, foreign institutions issuers being introduced in China's debt securities market firstly. In January 2007, the Central bank allows mainland financial institutions to issue RMB debt securities in Hong Kong, which is known as "dim sum bonds." Since then, from the issuance of RMB cross-border debt securities and the start up of the offshore RMB debt securities market in 2007 to Panda Bonds' bringing in and dim sum bonds' going out in 2012, a series of measures introduced have boost the internationalization of RMB in debt securities market. By March 2012, the balance of RMB cross-border debt securities issuance has reached $ 60.895 billion.

The Western currency theory usually classifies the currency functions into three classic functions: medium of exchange, unit of account and means of store. When a country's currency transcends national borders, implementing one or more of these three functions in the world, it has become an international currency, and has participated in the international currency competition. To measure the international competitiveness of a currency, indicators can be used include: the share of currency in official foreign exchange reserve, the share of trading currency in forex market, the share of currency in international trade settlement, the choice of anchor currency, and the share of currency in international debt securities market, and so on. Due to the easy availability of data, the share of official foreign exchange reserves has been used more often to measure of the international currency competitiveness in existing empirical researches.

With the accelerating of financial innovation and the rapid development of financial markets, the importance of the currency internationalization in international debt securities market and foreign exchange markets and other financial markets highlights. The international debt securities both have the function of "unit of account" and "store of value". Moreover, the currency constitution in the international debt securities reflects the degree of currency internationalization to a large extent. Therefore, this paper studies the determinants of the international currency competition in the international debt securities markets and makes policy recommendations for internationalization of RMB.

LITERATURE REVIEW

Many theoretical studies on international currency competition initially spread out around the macro qualitative research on the altering power of pound and dollar before and after the two world wars. Before and after the launch of the euro, the international currency competition attracted wide attention of scholars. The theory is enriched constantly and the research perspective moves from a single macroeconomic level towards the macro and micro combination. Looking at the research on the determinants of international currency competition, it can be attributed to several representative views:

(1) The comprehensive strength theory. The international currency competition firstly is affected by a variety of factors representing the comprehensive strength, such as the economic, trade, financial markets and financial institutions, political status, etc.（George S. Tavlas，1997；Rainer Beckmann etc.，2001；Philipp Hartmann and Otmar Issing，2002；Ewe-Ghee Lim,2006）.

(2）The currency characteristics theory. International currency is a currency performing functions extending worldwide. With more trading convenience, lower transaction costs, more stable vlue, will the currency be more popular and more competitive internationally（Grassman，1973；George S. Tavlas, 1997；Matteo Bobba et al，2007）.

(3）The geopolitical theory. The influence of politics and geography on the international currency competition can't be ignored. National privileged political status, colonial wars, alliances, a joint initiative and other factors will enhance the competitiveness of a currency（Mundell，1998）.

(4) The scale theory. There is another important factor influencing the international currency competitiveness: the network externalities. People tend to choose the international currency being most widely used currently (Krugman, 1984; Cohen, 2000). To Converse from the current international currency into a new one, not only switching costs need to be paid, there may be costs should be undertaken for the loss of reducing network externalities (if other people do not convert to the new currency, network externalities of the new currency is small, not enough to compensate conversion costs). Therefore, people are more inclined to use the existing international currency, thus resulting "historical inertia" in the international currency choice (Dowd and Greenaway, 1993). When one country's currency lost its international currency status, it will first go through a gradual process, after reaching a critical point, then form a mutant, which is called "tipping phenomenon".

In order to measure the historical inertia of the international currency competitive caused by network externalities and investigate the influence of the dependent variable lags, a dynamic model needs to be built. Chinn and Frankel[5] used a dynamic model to study the determinants of international currency competition. By adding a first-order lag of the dependent variable in the model, using the least-squares regression with dynamic panel data, the historical inertia of the international currency competitive caused by network externalities is examined. But Bond has proved, when the interpreted variable lags are interrelated with the random error term in the dynamic panel regression model, the least squares estimator will be biased.

In the dynamic panel model including "endogenous explanatory variable", usually two estimation methods are used. First is the instrumental variable method, usually two-stage least squares (TSLS, the same below). The Actual operation is divided into two steps, first to find a set of variables (called instrumental variables), the least squares regression is made for each explanatory variable in the model to the set of variables separately, and then use the transformed model to make TSLS estimates. To replace all variables with the fitted values gotten in the first stage regression, then make regression with the original equation and obtain the regression coefficient. Second is GMM, which is more suitable for panel data with large number of cross-section and fewer time-series, that is, a short panel model.

Using the international debt securities issuing data during year 1995-2004, TSLS and GMM methods, Matteo Bobba et al[4] studied the currency denomination in the international debt securities issuance. In the TSLS model, a dummy variable was added after the launch of the euro in 1999 to make a comparative analysis of the impact of currency cooperation. The currency cooperation has improved the network externalities of the euro. There is "tipping phenomenon" in the competition between the euro and the dollar. Because the dependent variable lags wasn't added in the model, so it was not sufficient to study the dynamic characteristics of the model. In the GMM dynamic panel model, by adding lagged dependent variable, the historical inertia in currency using was studied. Research shows that the lagged variable coefficients are significant and the persistence in currency using is strong. However, due to the short time span, a comparative analysis before and after the launch of the euro was not made.

Constructing a mixed panel data regression model and econometrically estimating determinants of the shares of major international currencies in the official international currency reserves, in the exports and imports of the counties, and in the international bonds and notes. Chinese scholar, Li Daokui and Liu Linlin[2] studied the factors influencing the internationalization of a currency and The European currency integration dummy variables were used to examine the impact of network externalities and currency cooperation.

In order to investigate the dynamic characteristics of the international currency competition, he impact of the euro's launch and t the financial crisis in 2008, the following approach is taken in this paper: Firstly, for the longer time span and narrow cross-section data in this article, which belongs to a long panel data model, so not the GMM but the two-stage least squares method is used in the paper. Secondly, to study the impact of regional currency cooperation, the euro dummy variable is added in the model; thirdly, the data period is expanded to the beginning of 1993 to 2012, taking into account the impact of the financial crisis since 2008 and the European debt crisis that may arise.

VARIABLES SELECTION AND DATA SOURCES DESCRIPTION

The dependent variable

The currency share of issue in the international debt securities (outstanding amount) is used to measure the extent of the currency internationalization. Five major currencies are selected: the dollar, yen, pound sterling, euro, Swiss francs.

According to the issuance maturity, the international debt securities includes: international money market instruments, international bonds and notes. To study the combined effects of these two financial instruments, both the two indexes added up- called the international debt securities - are taken as the dependent variable to measure the degree of currency internationalization in the international debt securities market.

The independent variables

Using the existing literature for reference, this paper selects the following independent variables: (1) The historical inertia. Add lag one of the dependent variable into the model to study the historical inertia of currency competition. (2)The variables of comprehensive strength, measured with the currency issuing country's GDP share to total GDP in the world, denoted gdpshare. In order to break down the impact of the exchange rate and inflation rate, GDP data are in constant 2000 U.S. dollars. To make a comprehensive survey of the comprehensive strength of a country, the variables such as GDP, foreign trade, financial market indicators should be taken into the model. But because there is a strong correlation among these economic, trade volume and financial market variables, the stepwise regression of panel data is adopted in the paper to avoid the multicollinearity. According to the regression significance, GDP is chosen as the representative variable to measure the effect of comprehensive strength. (3) Current account balance, measured with the ratio of current account surplus (deficit) of the currency issuing countries to the country's GDP, denoted cagdp. (4) Stability of the domestic currency value and the monetary policy, measured with the inflation rate of international currency issuing countries, denoted inflation. (5) The financial indicators, measured with the real yield of government bonds, denoted realrate. The interest represents income effect to investors, the higher the bond interest rate, the higher the investor gains. Meanwhile, interest represents cost-effective performance to fund-raising party. The higher the interest rates, the higher the issuing cost. (6) Currency yield. The data on exchange rate is currency's exchange rate per SDR. The average value of each currency's monthly average exchange rate against the SDR is estimated as the exchange rate in each year, after making the log first difference, and then a five-year weighted average is taken to measure the currency yields, denoted exrateap. (7) Currency volatility. Currency's volatility is estimated as the 5-year average standard deviation of the log first difference of the monthly exchange rate against the SDR, denoted exratevol. (8) Network externalities. The dummy variables of European currency integration are added in to examine the network externalities. Variables are recorded as dummy.

Data Sources

The data on the GDP, inflation rate, import and export trade, current account balance, interest rate are from the *World Bank Development Indicators database*. The data on the currency exchange rate is from *International Monetary Fund*

SDR exchange rate statistics. The data on outstanding balance of the bond market is from the *Bank for International Settlements*. The data on the capital market is from the *World Federation of Exchanges*.

Data processing before and after euro's launch

The annual statistics for study is from the beginning of 1993 to 2012. Since the statistics is across the two periods before and after the euro's launch, in order to maintain consistency and comparability, data processing is made as follows:

Data processing on the euro area country's GDP

Prior to the launch of the euro in 1998, the share of GDP in 11 euro countries before entering currency union in the world's total GDP is taken. After the launch of the euro in 1999, the ratio of GDP in countries has joined the euro-zone countries to the world's total GDP is taken, which means the euro-zone countries before and after joined the euro are taken as one country to study.

Study on the appreciation, volatility of the euro before launch

Because the euro zone countries have not yet unified the currency before euro's launch, a variable needs to be selected or constructed to measure the appreciation, volatility of the euro-zone countries' exchange rate. The share of euro-zone countries' currency denominated international bond and notes being taken as weights, the weighted average currency exchange rates of the euro-zone countries may be a good choice. Nevertheless, due to the data missing of each euro-zone member country's share of the international debt securities by currency of issue before 1998, so the weight is lack of data supporting. However, further investigation in data analysis during 1993 to 2011 shows that the total share of international debt securities by residence of issuer in euro-zone countries is closely related with the share of international debt securities by euro of issue (Figure 1). Therefore, the share of international debt securities by residence of issuer in the euro-area before euro's launch being taken as substitute variables for the weight, then weighted averaged, the appreciation, volatility of exchange rate in each year before euro's launch can be calculated.

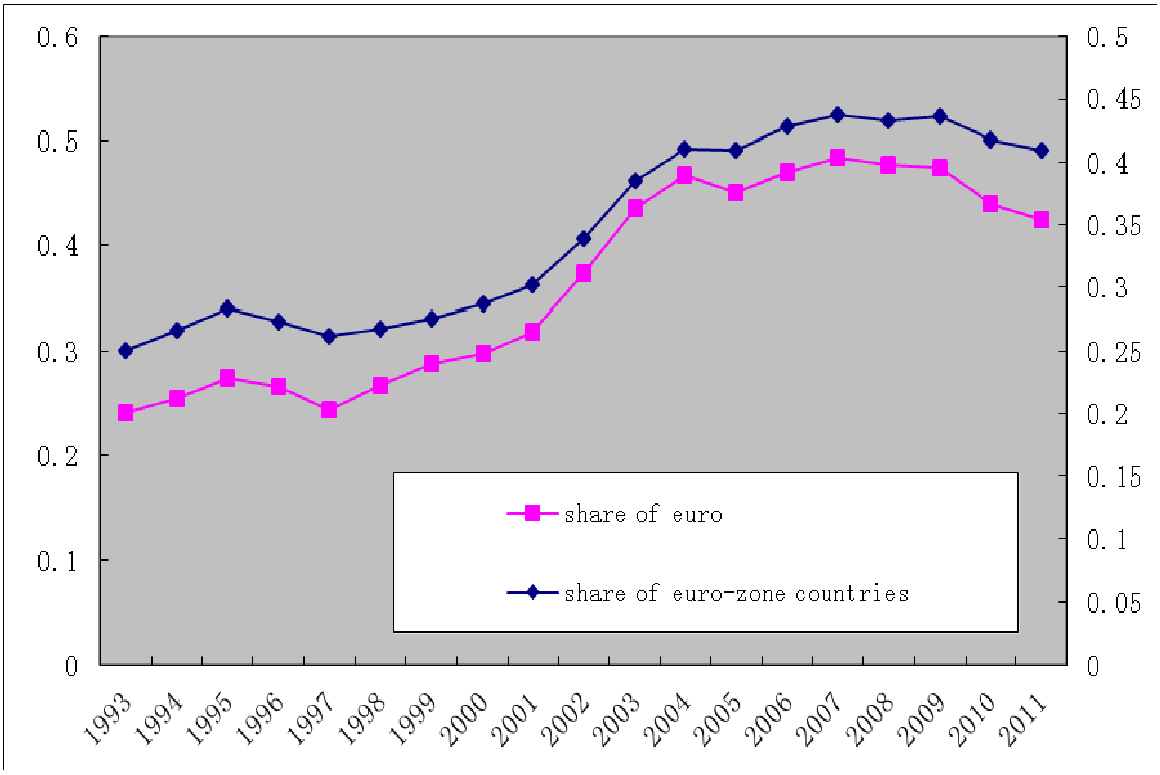

Figure 1 : Comparison the share of euro in international security issuance with the share of euro-zone countries issuance

MODEL CONSTRUCTION AND ESTIMATION

Figure 2 illustrates the share of currencies employed in international security issuance during 1993 to 2011. Since year 2003, the euro has takes substantial market share (over 40%), overtaking the US dollar.

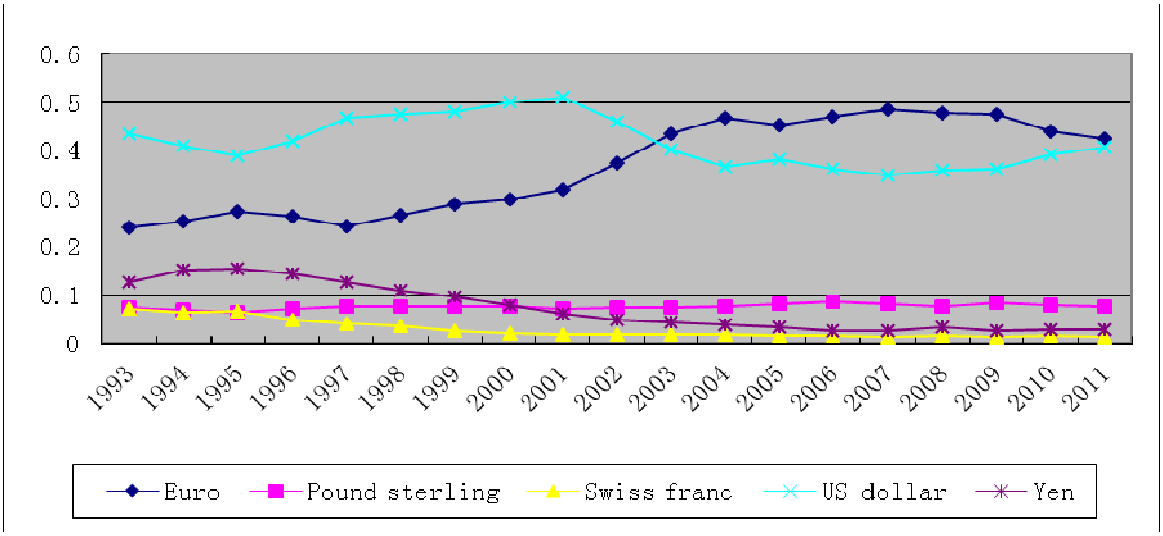

Figure 2 : Currency denomination in international security issuance

In the beginning of the financial crisis, the share of dollar employed in international security issuance is declining, whereas after the financial crisis intensified, the dollar's share is beginning to rebound. The financial crisis and the European debt crisis also makes this "tipping phenomenon" reversed, indicating that the historical inertia in international currency using is fairly strong and the relationship between currency competitiveness and its determinants is not a simple linear.

The regression model with the dependent variable –the share of currency denomination in international security issuance (denoted share debt_share) and its determinant variables (X1, X2..... Xk) being Constructed, the basic empirical model can then be represented by the following equation:

$$\text{debt\_share}_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \ldots + \beta_k X_{kit} + \varepsilon_{it} \quad \textbf{(1)}$$

The dependent variable debt_Share is in the range (0,1), if use the ordinary least squares estimation method, the regression results will be problematic: the value is near 0 or 1, the independent variable is very insensitive to the changes of dependent variables, and the relation is highly nonlinear.

Because of the tipping phenomenon in the international currency competition, it will not be a simple linear relationship between the dependent variable and the independent variables in the model, so use of the original variables to make regression estimates is unreasonable. Therefore, the logistic transformation with the dependent variable debt_share is made, abbreviated as Logit, and whose one term lagged variable is denoted L.logit. Then the author make TSLS regression based on dynamic panel data, with both two term lagged independent variable and all of the exogenous variables taken as instrumental variables. According to the statistical significance of the regression, the model to be estimated can be represented by the following equation is as following:

Model 1 : $\text{Logit}=\beta_1*\text{L.logit}_{it}+\beta_2*\text{gdpshare}_{it}+\beta_3*\text{exrateap}_{it}+\beta_4*\text{exratevol}_{it}+\beta_5*\text{realrate}_{it}+\beta_6*\text{inflation}_{it}+\beta_7*\text{dummmy}_{it}+\beta_8*\text{constant}+\varepsilon_{it}$ **(2)**

Model 2 : $\text{Logit}=\beta_1*\text{L.logit}_{it}+\beta_2*\text{gdpshare}_{it}+\beta_3*\text{exrateap}_{it}+\beta_4*\text{exratevol}_{it}+\beta_5*\text{cagdp}_{it}+\beta_6*\text{realrate}_{it}+\beta_7*\text{inflation}_{it}+\beta_8*\text{dummmy}_{it}+\beta_9*\text{constant}+\varepsilon_{it}$ **(3)**

Model 3 : $\text{Logit}=\beta_1*\text{L.logit}_{it}+\beta_2*\text{gdpshare}_{it}+\beta_3*\text{exrateap}_{it}+\beta_4*\text{exratevol}_{it}+\beta_5*\text{realrate}_{it}+\beta_6*\text{inflation}_{it}+\beta_7*\text{dummmy}_{it}+\beta_8*\text{constant}+\varepsilon_{it}$ **(4)**

The regression result is as TABLE 1. The estimation effect of model 3 is the best among the three models. The share of the euro has grown rapidly since the launch of the euro, and the dummy variable of European monetary integration is significant. The share of the currency is in proportional to it's one period lagged variable and the coefficient is significant, indicating that there is a strong historical inertia in the international currency competition. The gdpshare is positive and significant, suggesting that it's the most fundamental variable in determining the currency share of international debt securities market. The exchange rate appreciation (exrateap), the real interest rate (realrate) is positive and significant, which imply that in the international debt securities, the international currency with higher profitability has a stronger attraction. The trade surplus (exratevol) is negative and significant, which indicates that the country with deficit current account has a higher internationalization degree of its currency in the international debt securities market.

Inflation rate is positive and significant, which seems to be contrary to the international currency competition rules, but to some extent it is consistent with the facts: the inflation rate in U.S. is relatively higher, the share of US dollar is also higher; the inflation rate in Japan is very low, the share of the yen has flattened out. However, this phenomenon happens under the auspices of US dollar dominates, whether it is applicable to the general rules of international currency competition, the study should be put in a longer historical period. On the other hand, the absolute value of the coefficient is very small and only has a limited impact.

TABLE 1 : General Models for Currency Shares: 2SLS Estimates

Mode 1		**Mode 2**		**Mode 3**	
L.	0.9163	L.	0.8961	L.	0.8955
	(0.0255)***		(0.0275)***		(0. 2744)***
gdpshare	0.7420	gdpshare	0.7849	gdpshare	0.8076
	(0.2713)***		(0.2684)***		(0. 2656)***
exrateap	0.9843	exrateap	1.2271	exrateap	1. 2961
	(0.4732)**		(0.4851)**		(0.4736)***
exratevol	-0.2839	exratevol	-2.2518		
	(3.2193)		(3.1890)		
		cagdp	-0.4324	cagdp	-0.4495
			(0.2382)*		(0.2362)**
realrate	0.0244	realrate	0.0241	realrate	0.2589
	(0.0100)***		(0.0099)***		(0.0095)***
inflation	0.0685	inflation	0.0701	inflation	0.07423
	(0.0144)***		(0.0142)***		(0.01296)***
dummy	0.1478	dummy	0.1724	dummy	0.1728
	(0.0430)***		(0.0445)***		(0.0444)***
Constant	-0.4383	Constant	-0.4910	Constant	-0.5453
	(0.1373)***		(0.1383)***		(0.1146)***
Observations	85	No.	85	No.	85
Nuber of currencies	5	Nuber of currencies	5	Nuber of currencies	5
R^2	0.95	R^2	0.95	R^2	0.95

*** Significant at 10%; ** significant at 5%;***significant at 1%**

CONCLUSIONS AND IMPLICATIONS FOR RMB INTERNATIONALIZATION

In this paper the author discusses the determinants of international currency competition in the international debt securities market. Using instrumental variable methods, panel data international debt securities issued by five major currencies from the beginning of 1993 to 2012, the author makes a dynamic panel data regression analysis, and also inspects the impact of the financial crisis since 2008 and the European debt crisis. The main conclusions and implications for the in

Firstly, the empirical analysis shows that the share of currency in international debt securities is proportional to the comprehensive strength, currency yield, current account surplus of the country, which indicates that the international currency competition in international debt securities mainly focuses on the competition in the comprehensive strength and currency yield. The internationalization of RMB in debt securities needs firstly to be supported by China's strong comprehensive national strength. Only by development of economic, trade and finance can the international status of RMB be effectively improved. Both measured with interest rate and exchange rate, the currency with higher yields is more competitive. In recent years, the exchange rate of RMB has remained steadily growth, exchange rate gains are considerable, which will improve its attractiveness in the international debt securities market.

Secondly, the lagged dependent variable is significant in the model, indicating that there is a strong inertia in international currency choice. After the launch of the euro, its' share in the international debt securities grows rapidly. The dummy variable of European monetary integration is significant, which suggests that monetary cooperation will significantly enhance the network externalities. The currency choice in the international debt securities has significant network externalities and historical inertia. On the one hand, there is a first-mover advantage in the international currency competition, so the internationalization of RMB should be early implemented. Earlier layout of the economic, trade and financial services network in the neighboring countries and regions is conducive for RMB to get an edge. On the other hand, it shows that regional monetary cooperation has a significant positive impact on improving share of international currency. As a post-market entrant, whether to compete in the periphery, regional, or international markets, RMB has obvious "network externalities" weaknesses and disadvantages. Moreover, Chinese debt securities market is relatively backward, so it is more

necessary for China to put forward the regional monetary cooperation. China should establish a regional exchange rate coordination mechanism as the basis, take regional economic, monetary and financial cooperation as the backstop, sign regional cooperation agreement for system security, through regional cooperation to increase network externalities, thus overcome the weaknesses in historical inertia and improve the international competitiveness of RMB.

Thirdly, the dependent variable is inversely proportional to the trade surplus (exratevol) in the model, which indicates that the country with deficit current account has a higher internationalization degree of its currency in the international debt securities market. This is consistent with the economic principle "the deficit current account should be offset by the capital account surplus ". With the improvement of the international status of RMB, China's current special situation, "double surplus" in both current account and capital account will change. That is, China's current account surplus will gradually decrease and gradually transport RMB to the world through current account deficit. This requires China's economic development mode must be changed from current "export-dependent" to the "domestic-driven".

Fourthly, the data analysis of the euro in the international debt securities market shows that the international level of one country's debt securities market significantly affects the currency competitiveness (Figure 1). China needs to overcome the structural defects of the capital market which has "big stock market, small bond market" and strengthen the debt securities market. The internationalization of the debt securities market includes "going out" and "coming in". The internationalization experience of the euro shows that the openness of the domestic debt securities market will help improve the internationalization of the currency in debt securities markets. Therefore, while promoting RMB going to the international market in various forms, we should increase the openness of the domestic debt securities market, attract more foreign institutions to issue bonds and notes.

In summary, the international currency competition in debt securities market mainly appears as the competition of the comprehensive strength, currency gains, network externalities, and has showed significant historical inertia. The essence of RMB internationalization is to combine the general law of the international currency competition with Chinese special national conditions. In the future, what position will RMB achieve in the international currency competition will depend on the long-term development of China's comprehensive strength, status and role of the RMB in the East Asian region, as well as long-term dynamic game result among China, the United States, the euro area countries, Japan and other world powers. Learning from international experience, China should enhance the comprehensive strength, increase the openness of the domestic debt securities market, boost RMB internationalization and regional currency cooperation as earlier as possible to overcome the "aftermath" competitive disadvantage and to enhance the network externalities.

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