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The Shifting Dynamics of International Reserve Currencies

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The Shifting Dynamics of International Reserve Currencies

Abstract

With the recognition by the IMF of the Chinese renminbi as an international reserve currency in 2015, it is important to understand the modern influence of reserve currencies. We use currency exchange rate data and apply modified workhorse regression models to assign each country's gross domestic product at purchasing power parity to a reserve currency bloc in order to obtain a global sphere of influence for each reserve currency. We find that the United States retains its dominance but faces challenges from the renminbi and the euro in recent years as the international monetary system becomes tri-polar.

Keywords

Reserve Currencies, International Economics, China, Renminbi, Euro, Dollar

Cover Page Footnote

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Introduction

A. Statement of Purpose

The purpose of this paper is to investigate the relative decline of the United States dollar (USD) as a reserve currency. In particular, we want to quantify the use of the renminbi (RMB) as an upcoming reserve currency and predict its future impact. Our work seeks to provide an updated view of the international monetary system and compare these results to what previous researchers have found. This is extremely important as the Chinese currency has gained more recognition in recent years, there has been a very large increase in Chinese investments and trade, and there has been a shifting political climate globally.

B. Background

Leading up to the 1950's the United States did not have the dominant reserve currency. Great Brittan held this distinction. As seen in Figure 1, that changed drastically and the dollar has been dominant ever since. However, in recent years we have seen a rise in other currencies to rival the dollar. This work will investigate the global influence of the major reserve currencies including the RMB, and analyze the impacts that a paradigm shift will have on the global economy.

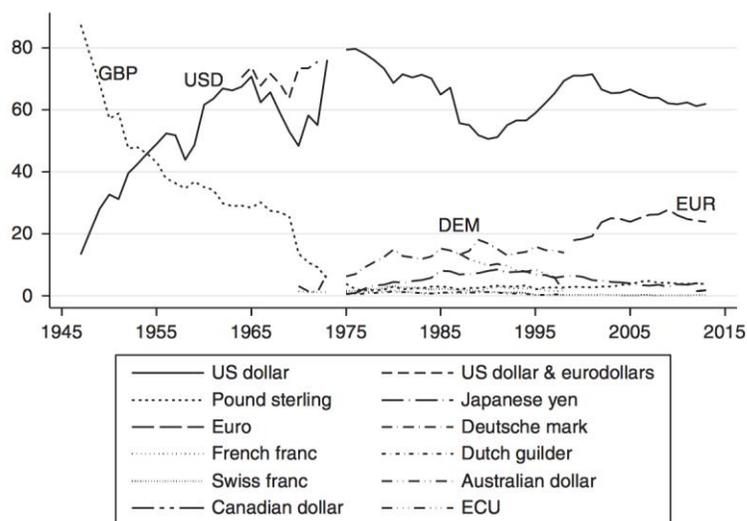


Figure 1- Currency Composition of Globally Disclosed Foreign Exchange Reserves in percent.

Source: Eichengreen, Chitu, and Mehl (2016)

Reserve currencies are held by countries' central banks in order to be used in international transactions. This includes investments and debt obligations. They are also used to manage exchange rates. Reserve currencies have long been studied to gain a better understanding of international finance and trade. Throughout most of the modern day history of the international monetary system the United States has played a dominant role. There are large economic implications for the United States having the dominant reserve currency. One such implication is that there is a very high demand for the USD and countries have a significant interest in seeing the dollar do well. The US has what is known as "exorbitant privilege;" that is, it will not have a balance of payments problem as all of its transactions are done in the USD. In addition, since the United States controls the money supply, it benefits from seigniorage or the value gained by minting money. However, there are some negatives associated with being the dominant reserve currency. This would include increased spending, and possibly cheaper imports hurting domestic firms. However, being the major reserve currency is in large part beneficial.

Therefore, it is extremely important to study the international monetary system and to examine the shifts that occur over time. The international reserve system as a whole can be criticized with an overreliance on the dollar, and the United States unfairly taking advantage of the benefits of such a role for the USD. An example can be seen with the large amounts of spending the United States had in the Vietnam War, which led to the end of the Bretton Woods system in 1971. Conversely, the USD can provide stability, liquidity, and safe assets in times of financial crises. It provides a reliable network and a common currency that most countries use in international exchanges and transactions.

Despite these arguments, there has been a push for diversification. In fact, recent years have seen that there has been diversification in the international monetary system particularly with the rise of the euro leading to a bi-polar system. We would like to examine China's role in this increased diversification, particularly in the years after 2015, when the RMB was officially recognized, by the IMF, as a reserve currency in a political climate characterized by a Chinese push for global power and a United States shift toward nationalism in the age of Trump. As the reserve system shifts to a tri-polar system there are many economic implications for the United States in terms of its exorbitant privilege.

C. Previous Methods

Much of the work that has previously been published studies the shares and explicit use of various currencies globally to gauge each currency's role and influence. For example Eichengreen, Chitu, and Mehl (2016) analyze network and

policy effects by looking at the size of the shares of reported reserves. Although the work does a great job of expanding the data set back in time, there is still little data for the RMB. That is because the IMF's reporting of the relevant data for the RMB began relatively recently. Furthermore, Eichengreen, Chitu, and Mehl show that there are a lot of holes in IMF reporting, and that despite a relatively good job of plugging, it still creates problems when combining data sets from various sources over a long time frame.

This then begs the essential question of this research. How do we accurately measure the RMB's influence as a reserve currency in an international monetary system that has recently shown signs of diversifying? To answer this we turn to work done by Tovar and Nor (2018) introducing an alternative approach to measuring the influence of reserve currencies than the typical one found in other literature. More specifically, calculating the influence that each major currency bloc has on other currencies. This work, covering data from 1969-2015, will serve as the foundation for our research as we focus on a more recent time period for the reasons discussed in the previous sections.

Tovar and Nor study currency co-movements of national currencies with reserve currencies to determine what reserve currency bloc each national currency is a part of. It is then possible to calculate the global share of GDP that each reserve currency influences. The results indicate that the USD is dominant with a global share of GDP of about 40 percent. Interestingly, this is followed by the RMB with about a 30 percent share of global GDP. Finally the Euro holds around 20 percent. This indicates that the sphere of influence of the RMB is larger than otherwise thought in work analyzing reserve currency shares. In addition, the RMB going into 2015 already has an established influence globally.

In order to calculate each sphere of influence Tovar and Nor built on Frankel and Weis's (1994) methodology for analysis using workhorse regressions. This methodology is argued to have some drawbacks particularly with the fact that the RMB has been pegged to the USD in the past, which presents a collinearity problem. So to address these concerns the researchers employ Kawai and Pontines' (2016) approach to analyzing the sphere of influence of the RMB. However, they do this globally and not restricted to Asia.

To measure the global effect the researchers calculated a relative and absolute sphere of influence for each of the major reserve currency to gather an in depth look at the historical and recent state of the international monetary system. This is groundbreaking work that we look to expand upon by incorporating the most recent three-year period. We will also look to duplicate their results and corroborate their findings.

The work found that the transition from a bi-polar reserve system to a tri-polar system is well underway. However, the USD still, as is the case historically, plays the dominant role. A lot of the RMB's influence is attributed to BRICs

currencies. BRIC refers to Brazil, Russia, India and China. These countries are grouped because they are at a similar stage of economic development. Interestingly, the influence of the RMB is more on BRICS currencies as opposed to playing a central role in Asia. Part of our work will be devoted to seeing if in the last few years this makeup of the RMB's influence has changed. That is, we will look to see if the RMB dominance is extended beyond the BRICS currencies. With that said, the RMB dominance in these countries is extremely important. We expect that as these countries continue to grow, so will the role of the RMB internationally.

In addition to studying the influence of each major reserve currency, the work also analyzed what factors play an important role in determining a currency's influence. What was found was that networking effects play a big role. In addition the size of a country matters, and, as we stated before, China has seen unprecedented growth in recent history. Finally debt levels hurt the size of blocs and current account surpluses undermine them. These works lay the groundwork for how our research will be conducted.

Methods

A. Data

Our work uses exchange rate data as reported by the International Monetary Fund (IMF). The IMF has near global membership, as it is comprised of 189 countries. The IMF's main goal is to ensure the stability of the international monetary system. They also provide reliable, up to date economic data. For exchange rate data we use end of period monthly data reported by the *IMF's International Financial Statistics*. Our model uses exchange rates per USD for reasons explained in the next section. To visualize the data that will be used for this research, log scale exchange rates in terms of USD can be seen in Figure 2.

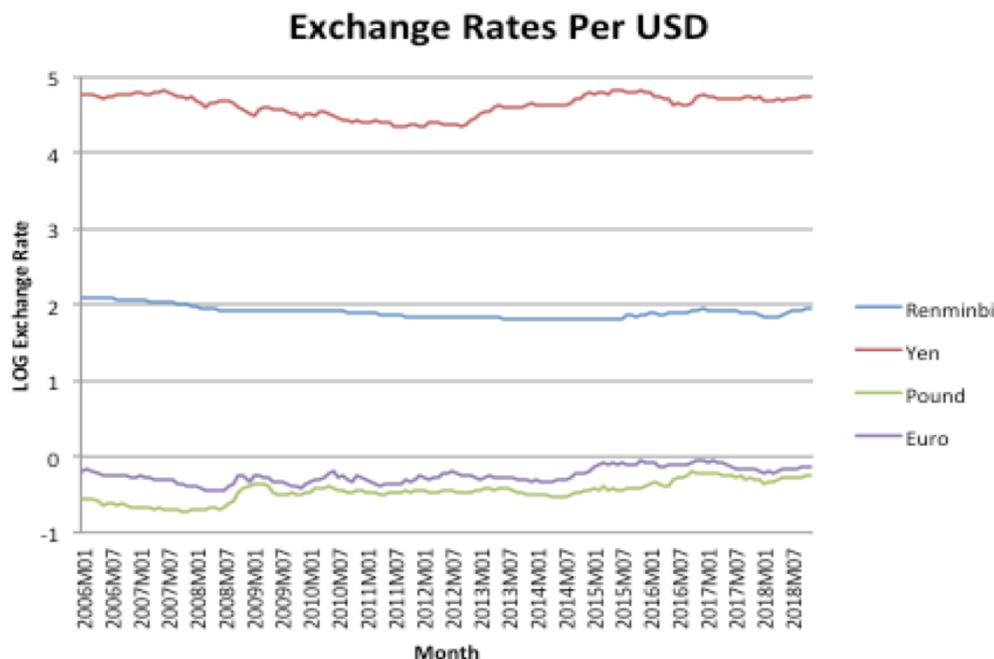


Figure 2- Log scale end of period monthly exchange rates per USD for 2006M1-2018M11.

Source: IMF

We chose our time frame from 2006M1-2018M11 for multiple reasons. First, we see very low correlation between the United States dollar and the renminbi. We found the correlation to be .546, which is extremely encouraging for the use of this time period in our results. This is especially true considering that there were time periods where the RMB was directly pegged to the USD with a perfect correlation of 1. This also implies this is actually a period of relatively free floating for the renminbi backing up historical accounts. As we will discuss later, this greatly helps to deal with the multicollinearity of our model. The second reason we used this time period is that our work looks to paint an up to date picture of the global influence of major currencies. Since China's currency started to become a large global player during this time, it is imperative that it is the focus of our study. Finally, this allows for a large sample of countries with complete data. We use a representative sample of 149 countries to estimate the global influence of the reserve currencies. Countries whose data were incomplete were removed from our sample. In addition, we argue our 155 data points are sufficient to create a respectable sample size for the model.

Our data for gross domestic product at purchasing-power parity (GDP-PPP) are obtained from the *IMF's World Economic Outlook database*. We use the individual share of GDP-PPP an individual country has in a given year. This is annual data reported at the end of each period. Our work uses the global shares of GDP-PPP for 2018. This is to ensure that our results reflect the time period that we are using, as well as to provide a clear scope of the current outlook.

B. Model

This work utilizes models employed by Tovar and Nor (2018). These models are difference in log workhorse regression models that were initially used by Frankel and Wei (1994). They are designed to analyze co-movement of international currencies with the major reserve currencies. However, there were some drawbacks to Frankel and Wei's equation. Namely, the biggest problem was the fact that the effects of the RMB were not measured. This at the time was understandable, but as the RMB began to play the role of a major reserve currency, it needed to be included. Therefore Tovar and Nor use a modified approach used by Kawai and Pontines (2016). This model measured the effect of the RMB. Kawai and Pontines' model only focused on a localized region in Asia in their analysis. Therefore, Tovar and Nor extended this model on the global scale. They were the first researchers to do a global scale of this kind of analysis. We will employ the same equation that Tovar and Nor used in their work. Our work will then show an updated picture of the various reserve currencies on the global scale in the age of Trump and post official recognition of the RMB as a reserve currency by the IMF. The model is expressed in the following form:

$$\Delta \log(x/USD)_t = \beta_0 + \beta_1 \Delta \log(EUR/USD)_t + \beta_2 \Delta \log(GBP/USD)_t + \beta_3 \Delta \log(JPY/USD)_t + \beta_4 \Delta \log(RMB/USD)_t + \varepsilon_t \quad (1)$$

where x is an individual country and USD serves as our choice for the numeraire currency. Our dependent variable is the logarithmic change in of a country's currency in terms of the USD. The regression coefficients represent the weight each major reserve currency has on currency x . Since we use difference in log we can calculate the "inferred" United States effect. This is done by the constraint $\beta_5 = 1 - \beta_1 - \beta_2 - \beta_3 - \beta_4$.

Tovar and Nor (2018) use equation (1) throughout their work but express collinearity problems with the RMB as it was pegged to the USD for a long period of time. They address these problems by employing a second two-stage model. In this work we use an alternative method to address these problems. That

is, we use a sample period in which the RMB was not pegged to the USD. As stated before, our period will range from 2006-2018. By choosing the USD as our numeraire currency, as well as leaving it out of our initial model and calculating the effect afterwards, we are able to alleviate the collinearity problem.

Our methods use a comprehensive list of 149 countries to create a balanced sample to estimate effects. We will repeat equation (1) 149 times running the regression once for each country in our sample. In each case we will note the highest coefficient in the model. Country x will then be placed into the reserve currency bloc for whichever has the highest coefficient. So by calculating the weight of each reserve currency on each individual country we can calculate the sphere of influence each reserve currency has. We obtain the size of reserve currency blocs by assigning a country's GDP-PPP reported by the IMF global outlook data to the country whose reserve currency has the greatest influence on that country's currency, as found from the coefficients in (1).

Our methods serve as an alternative to traditional studies about reserve currencies. Typical studies look mostly as shares of reserve currencies and factors that affect reserve currencies. Our methods are beneficial in that we can measure the direct effect the reserve currencies themselves have internationally. They are also useful in that they not only paint a picture on the global scale with currency blocs, but we can also point to individual countries and how each currency is directly impacted. In addition, our methods allow for measuring the effect of the RMB both prior to and post being officially recognized as a reserve currency by the IMF in 2015.

Results

A. Global Impacts

Based on our regression results for each country individually we assigned global shares of GDP-PPP to each reserve currency. These are known as currency blocs. We constructed our reserve currency blocs in two ways. The first were absolute currency blocs. This involved assigning each country to a reserve currency solely based on which reserve currency accounted for the most movement in that particular country's currency. The next were relative currency blocs. In this case each country's global share of GDP-PPP was split between each of the major reserve currencies based on the coefficients in each individual regression.

First we will discuss the absolute currency blocs. The results can be seen in Table 1. About 5% of the global share of GDP-PPP was unaccounted for. This is for two reasons. The first is that not every country had GDP-PPP data. The

second is that not every country had complete data on exchange rates from 2006-2018. However we feel that this is a very good representation of the current state of the international monetary fund. We find, like Tovar and Nor (2018), that the international monetary system is now tri-polar. China has a strong foothold in the global economy. Surprisingly we find that in this time period the United States has a share of 31.21 which is less than the 40.7 Tovar and Nor found from 2011-2015. Interestingly we do not see an increased share for China. They found the Chinese share to be 32.5 where we find it to be 30.07. It is Europe that sees the increased share from 19.5 to 27.43. That leads us to believe that as the dollar loses grip in the international monetary system, it will be the euro that makes up this ground.

	US	Europe	China	Japan	UK
Absolute Share	31.2	27.4	30.1	4.2	2.2
Tovar and Nor (2018)	40.1	19.5	32.5	4.8	2.5

Table 1- Absolute currency bloc of global shares of GDP-PPP in percent (Approx. 5% of global GDP-PP is unaccounted for in our work)

We then turn to the relative currency blocs. The results can be seen in Table 2. We see similar results as the absolute bloc in that there is a tri-polar system. However, we see in this case that the US bloc is not the dominant one and that in fact the Chinese bloc is. This is very surprising. However, we do not see these results as reliable as the absolute blocs. This is mostly because they are much more vulnerable to error in our estimations. For example in the relative bloc we find Japan to have 3.22% of global GDP-PPP, however this is less than its own GDP. This is because we are relying on the culmination of many insignificant coefficients in which many appear as negative. This is opposed to basing the blocs on strongly significant coefficients like we do for the absolute bloc.

	US	Europe	China	Japan	UK
Relative Share	25.2	28.2	31.8	3.2	6.8
Tovar and Nor (2018)	39	20.3	31.6	5.3	4

Table 2- Relative currency bloc of global shares of GDP-PPP in percent (Approx. 5% of global GDP-PP is unaccounted for)

Our results have major impacts on the global scale. Figure 3 shows a map graph for each absolute currency bloc. Clearly neighboring countries are more prone to being included in a major bloc, with some exceptions. This includes Mexico and Canada which Tovar and Nor (2018) find to be in the US bloc. This is another example of the decline of the United States global economic influence in the past few years. It is clear that there are three major reserve currency blocs and that the international monetary system in its current state is tri-polar.

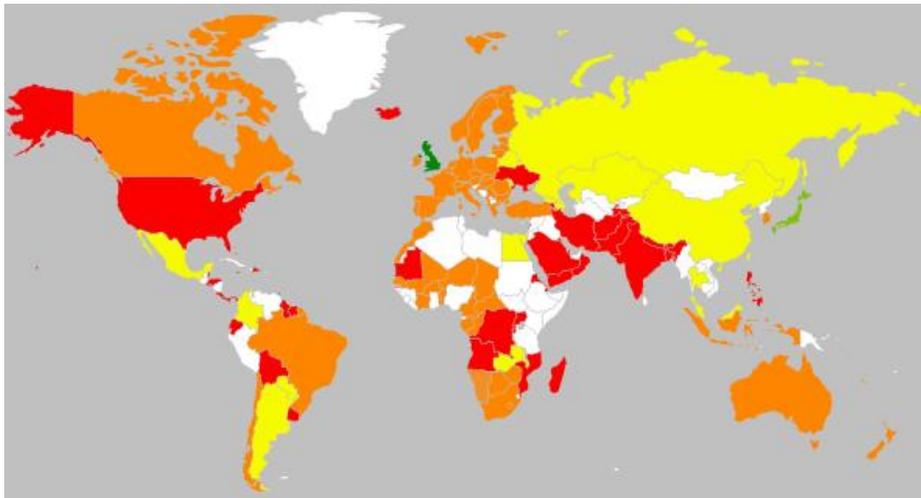


Figure 3- Map graph of absolute major reserve blocs. Red represents the US, yellow China, orange Europe, dark green UK, light green Japan, and white countries do not have complete data.

We also have to consider the argument that we need to remove the country's own GDP-PPP from the bloc. By subtracting this out from the absolute shares we see that the United States and Europe become virtually even at 16% of global GDP-PPP. China goes to 11% and both the UK and Japan go to 0%. This does not change the overall scope of our results. It does however, bode in favor of Europe, which throughout this analysis has shown strong upticks in comparison to the work of Tovar and Nor.

Conclusions

Our results show a tri-polar international monetary system. This is directly in line with the results found by Tovar and Nor (2018). However, we see an increase in the influence of the Euro over our time frame from 2006-2018 in addition to a decrease in the dominance of the dollar. We see geographical changes such as Canada and Mexico changing from the US bloc to the Euro bloc and Chinese bloc respectively. We additionally found that the Chinese renminbi has a bloc of

around 30% of the global share of GDP-PPP. Surprisingly with the recognition of the Chinese RMB as a reserve currency in 2015, there does not seem to be a rise in its sphere of influence attributable to that recognition. It is the Euro whose influence seems to grow as the dollar's influence falls. We find that in absolute terms the United States still dominates the international monetary system, but in relative terms its influence has declined.

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