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Liquidity Premium, Tariffs and Currency Internationalization

Hailong Jin[1], Lok-Chi Lam[2]

[1]Hailong Jin Ness School of Management and Economics, South Dakota State University, Brookings, SD, USA
[2]Lok-Chi Lam College of Business, University of Central Florida, Orlando, FL, USA
Email: hailong.jin@sdstate.edu

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Abstract

Although China, now the world's second largest economy and largest goods trading nation, has implemented the ambitious currency reform of internationalizing its national currency while maintaining strict capital controls for nearly a decade, the influence of this unique reform path on international economy is uncertain to international economists. This paper is among the first endeavors to contribute to this thread of research from a theoretical perspective. In particular, it develops a two-country, two-currency and two-good model to investigate the implications of currency internationalization on international monetary stability and commodity price system. It shows that to coexist with the international currency, the local currency must be overvalued against its purchasing power parity level to sustain currency internationalization. The tariff of the international currency issuer would loosen the coexistence condition, while the tariff of the local currency issuer would tighten it. If there is no tariff in the developed country, the developing country must maintain a positive tariff rate to sustain its currency internationalization. In particular, full currency internationalization cannot be achieved under the no-tariffs scenario.

Keywords

Currency Internationalization, Liquidity Premium, Tariff, International Monetary System

1. Introduction

After the devastating 2008-09 global financial crisis, numerous economists have criticized the dominance of single international currencies, especially the U.S. dollar, in international transactions. According to IMF Currency Composition of Official Foreign Exchange Reserve, during the past three decades, the U.S. dollar

(USD) comprised more than 60 percent of globally disclosed official foreign reserves, international and foreign currency liabilities and claims (Bertaut et al., 2021). As a result, China, now the world's second-largest economy and largest goods-trading nation, has been urged to internationalize its national currency, renminbi (RMB), to enhance the stability of the international monetary system (IMS) (Zhou, 2009; Dorrucci & Mckay, 2011).

In response, China, now the world's second-largest economy and largest goods-trading nation, began to launch an ambitious plan to promote the internationalization of its national currency, renminbi (RMB), in 2009. Since then, the RMB internationalization has developed rapidly[1]. However, as China still maintains draconian controls on its capital and foreign exchange markets, the RMB internationalization would inevitably entail new uncertainties to the international economy (Lai, 2015; Jin et al., 2018; Clayton et al., 2022).

So far, the implications of RMB internationalization have been mainly examined from either argumentative or empirical perspectives. Few theoretical frameworks have been developed to investigate the potential impacts of RMB internationalization on the international economy. This paper contributes to this thread of research by developing a two-country, two-currency, and two-good model to characterize the Chinese-style currency intervention from an integrated international commodity markets perspective. Specifically, it assumes that the world economy consists of only two countries, named as the U.S. and China, respectively, and two goods, A and B. The U.S. has a comparative advantage in the production of good A, while China has a comparative advantage in good B. In the markets, the U.S. currency, USD, is the dominant international currency and can be directly used to purchase both goods A and B. However, the Chinese currency, RMB, is a local currency which can only be used to purchase good B. If Chinese customers want to consume good A, they must exchange their RMB for USD first. This privilege of USD is captured by a liquidity premium factor in the model and RMB internationalization is characterized by the reduction of USD premium againist RMB.

After constructing the benchmark model, we further investigate the implications of RMB internationalization on the international monetary stability and price system under the inflation-targeting and exchange rate intervention policies. It shows that under no tariff scenario, RMB must be overvalued against its purchasing power parity level to sustain its internationalization to coexist with USD. This condition will be loosened if the U.S. increases its tariff rate. However, the overvaluation of RMB cannot exceed a certain level, which is proportional to the liquidity premium factor and decreases as China's tariff rate increases. In particular, full RMB internationalization cannot be achieved if there are no trade barriers between the countries. The organization of the paper is as follows. Section 2 presents the benchmark model, which considers the household behavior and the international price system. After that, Section 3 investigates the implications of

[1]See https://en.wikipedia.org/wiki/Internationalization_of_the_renminbi.

RMB internationalization on IMS. Section 4 concludes the paper.

2. Benchmark Model

Assume that the world economy consists of only two countries, a developed economy and a developing country, vividly named as the U.S. and China, respectively. There are two goods, A and B, in the economy. The U.S. has a comparative advantage in the production of good A, while China has a comparative advantage in the production of good B. In the 3 markets, the U.S. currency, USD, is an international currency which can be directly used to purchase both goods A and B. In comparison, the Chinese currency, RMB, is a local currency which can only be used to purchase good B. To purchase the good A, the Chinese consumers must first exchange their RMB for USD, which inevitably entails an efficiency loss. The benchmark setting of the model is as follows.

2.1. Household Behavior

The representative households' preferences in U.S. and China are homogeneous and are characterized as the following constant elasticity of substitution (CES) consumption aggregator:

$$C_i = \left[0.5^{1/\phi} C_{iH}^{1-1/\phi} + 0.5^{1/\phi} C_{iF}^{1-1/\phi}\right]^{\frac{1}{1-1/\phi}}, \tag{1}$$

where $i = a, b$ denote U.S. and China, respectively. C_{iH} is country i's home (exportable) good consumption, while C_{iF} is its foreign (importable) good consumption. For example, for the U.S. household, $C_{aH} = C_{aA}$, $C_{aF} = C_{aB}$. The parameter $\phi > 0$ equals to the elasticity of substitution between two goods. In particular, $\phi > 1$ implies the two goods are gross complements, while $\phi < 1$ implies the two goods are gross complements; if ϕ approaches 1, the function converges to a Cobb-Douglas function in which the two goods are neither substitutes nor complements.

The representative households are price takers, and the budget constraint of country i is defined as

$$P_{iH} C_{iH} + P_{iF} C_{iF} = M_i, \tag{2}$$

where P_{iH} and P_{iF} are the prices of the home good and the foreign good, respectively. M_i is the household's nominal income of country i. All of which are denominated by the country i's currency.

Furthermore, under capital account controls, the two countries' capital markets are separated and hence the two representative households cannot borrow from each other. Accordingly, a country's household aggregate consumption maximization problem would be equivalent to minimizing the cost $P_{iH} C_{iH} + P_{iF} C_{iF}$ subject to $C_i = 1$. Accordingly, it follows that

$$P_i = \left[0.5 P_{iH}^{1-\phi} + 0.5 P_{iF}^{1-\phi}\right]^{\frac{1}{1-\phi}}, \tag{3}$$

where P_i represents the aggregate price, which is defined as the minimum cost per unit aggregate consumption.

2.2. Liquidity Premium and Tariffs

In IMS, USD is the international currency which can be used to purchase both goods A and B directly. In contrast, RMB is relatively local and can only be used to settle transactions of the home good of China, or good B. It cannot be directly used to purchase good A. To do that, the Chinese household must first purchase USD from the commercial banking system, which inevitably entails an efficiency loss. In other words, the international currency USD enjoys a liquidity premium against the local currency RMB in international trade.

Firstly, let e denote the official RMB/USD exchange rate in the commercial banking system, i.e., 1 USD = e RMB. Following Jin et al. (2018), we borrow the idea of "iceberg melting" in the economic geography literature[2] and model the illiquidity cost of RMB is from the "iceberg cost" perspective. Specifically, assume that the efficiency loss of receiving 1 USD equals to θ USD. Hence the net RMB/USD exchange rate to RMB holders is: $(1-\theta)$ USD = e RMB. Since 1 USD enjoys θ USD premium against e RMB in the international markets, we refer θ as the factor liquidity premium hereafter. Accordingly, the internationalization of the local currency can be defined as declines in the magnitude of θ. In particular, $\theta = 0$ indicates that there is no liquidity premium of the international currency against the local currency, or both currencies are equally internationalized.

Secondly, $\tau_i \geq 0$ represents the tariff rate of country i. In reality, tariff rates are determined by governments, and may not adjust synchronously among countries, especially countries with trade conflicts like U.S. and China. Therefore, τ_a and τ_b are assumed to be heterogeneous.

Accordingly, it follows that

$$P_{aB} = \frac{1+\tau_a}{e} P_{bB} \quad \text{and} \quad P_{bA} = \frac{e(1+\tau_b)}{1-\theta} P_{aA}. \tag{4}$$

Under the no-tariffs scenario ($\tau_a, \tau_b = 0$), the Chinese home good B costs the same in U.S. and China: $P_{aB} = \frac{1}{e} P_{bB}$, while the U.S. home good A is more expensive in China than in U.S.: $P_{bA} = \frac{e}{1-\theta} P_{aA} > eP_{aA}$. If a country conducts a positive tariff rate policy, then its foreign good's price would be higher than the good's price at the home country.

3. Implications of Currency Internationalization

Nowadays, inflation-targeting has become a primary tool for monetary controls in most major economies[3]. Assume that both countries conduct strict inflation control policies so that the aggregate prices P_i's are predetermined. The exchange rate e, the international currency liquidity premium coefficient θ and the tariff

[2]See Anderson and Wincoop (2003) for example.

[3]See Roger (2010) for instruction. More details can be found in https://en.wikipedia.org/wiki/Inflation_targeting.

rates τ_a, τ_b are the only macroeconomic factors that affect the economy.

3.1. Coexistence Condition

From (3) and (4), the home goods' prices of U.S. and China respectively equal to

$$\begin{cases} P_{aA} = \left[\dfrac{2\epsilon^{1-\phi} - 2\left(1+\tau_a\right)^{1-\phi}}{\left(1-\theta\right)^{1-\phi} - \left[\left(1+\tau_a\right)\left(1+\tau_b\right)\right]^{1-\phi}} \right]^{\frac{1}{1-\phi}} \dfrac{1-\theta}{\epsilon} P_a \\ P_{bB} = \left[\dfrac{2\left(1-\theta\right)^{1-\phi} - 2\left[\epsilon\left(1+\tau_b\right)\right]^{1-\phi}}{\left(1-\theta\right)^{1-\phi} - \left[\left(1+\tau_a\right)\left(1+\tau_b\right)\right]^{1-\phi}} \right]^{\frac{1}{1-\phi}} P_b \end{cases}, \tag{5}$$

where $\epsilon = \dfrac{eP_a}{P_b}$ is the real exchange rate of the U.S. aggregate consumption against the Chinese aggregate consumption.

In reality, goods' prices must be strictly positive. Applying these constraints to (4) and (5) yields the following condition:

$$\frac{1-\theta}{1+\tau_b} < \epsilon < 1+\tau_a . \tag{6}$$

Therefore, the real exchange rate must be strictly bounded to sustain the positive price system. In particular, for the no-tariffs scenario ($\tau_a, \tau_b = 0$), (6) reduces to

$$1-\theta < \epsilon < 1 . \tag{7}$$

This means that the upper bound and the lower bound of the real exchange rate ϵ are 1 and $1-\theta$, respectively.

The implications of (7) are as follows. On the one hand, if $\epsilon > 1$, then USD would have higher purchasing power than RMB in China, which deters RMB from entering IMS.

Proposition 1. *Under the no-tariffs scenario, RMB must be overvalued against its purchasing power parity (PPP) level in order to enter IMS.*

On the other hand, if $\epsilon < 1-\theta$, then RMB would have higher purchasing power than USD in U.S., which would drive USD out of IMS. In particular, RMB would completely replace USD if the overvaluation rate of RMB ($1-\epsilon$) exceeds the USD's liquidity premium (θ). Furthermore, noticing that the lower bound of the real exchange rate ϵ rises to 1 as the USD liquidity premium θ shrinks to zero, we can see that

Proposition 2. *The two currencies should have equivalent purchasing powers in both countries if RMB is fully internationalized.*

Since (6) and (7) define the regions where USD and RMB may coexist, we refer them as "USD-RMB coexistence conditions" hereafter.

3.2. Tariffs and Currency Internationalization

We now examine the implications of positive tariff rates on the USD-RMB coexistence condition. From (6), we can see that the tariffs of the U.S. and China

would respectively raise the upper bound and the lower bound of the real exchange rate. On the one hand, if the U.S. imposes a positive tariff rate, i.e., $\tau_a > 0$, then an undervalued RMB against its PPP level can still coexist with USD as long as the undervaluation rate does not exceed the tariff rate. On the other hand, if China imposes a positive tariff rate, i.e., $\tau_b > 0$, the left-hand side of (6) is less than that of (7), $\frac{1-\theta}{1+\tau_b} < 1-\theta$.

The associated economic implications are as follows. A local currency would face appreciation pressure during its internationalization if it's originally undervalued in IMS, it. However, this pressure would be relieved if the international currency issuer country raises its tariff rate. In contrast, a local currency would face depreciation pressure if it's originally overvalued, and a rise in the tariff of the local currency issuer country would reduce the pressure. In general, these properties can be summarized as follows.

Proposition 3. *A country's tariff would strengthen its currency value in IMS.*

During RMB internationalization, the liquidity premium θ diminishes. From (6), it follows that $\theta > \max\{0, 1-(1+\tau_b)\epsilon\}$. Obviously, RMB cannot be fully internationalized (θ approaches 0) if $1-(1+\tau_b)\epsilon$ is strictly positive. Accordingly, a necessary full currency internationalization condition can be written as follows:

$$\tau_b \geq \underline{\tau_b} \quad \text{where} \quad \underline{\tau_b} \geq \frac{1}{\epsilon} - 1. \tag{8}$$

When RMB is undervalued ($\epsilon < 1$), the tariff rate of China must be sufficiently high to complete full internationalization of RMB: $\tau_b \geq \frac{1}{\epsilon} - 1$. In other words, under local currency undervaluation, the issuer country's tariff rate must be sufficiently high to achieve full currency internationalization.

However, when RMB is overvalued ($\epsilon > 1$), the currency coexistence condition (6) implies the real exchange rate faces an effective upper limit:

$$\frac{1}{\epsilon} > \frac{1}{1+\tau_a} \quad \text{or} \quad \tau_a > \epsilon - 1. \tag{9}$$

In other words, for coexistence of RMB and USD in IMS, the U.S. tariff rate must be strictly positive and exceed the overvaluation rate of the real exchange rate.

These results are summarized as the following proposition:

Proposition 4. Full local currency internationalization is not achievable if both countries conduct zero-tariff policies.

4. Concluding Remarks

We have developed a two-country, two-goods model to characterize the Chinese style currency internationalization. Because China has only successfully integrated its commodity markets into the international economy, we confine our analyses on price transmissions. For simplicity, the model only consists of two compo-

nents: 1) homogeneous representative households with same preferences; and 2) heterogeneous governments with asymmetric macroeconomic policies. Hence, there might be numerous rooms to elaborate on the framework by including more sectors or elaborate household behaviors.

In general, the model may serve as a referential guidance to study the Chinese style currency internationalization. First, the equivalence of household consumption aggregator maximization problem and the minimum cost per aggregate consumption problem captures the capital account controls in China. Second, the USD liquidity premium corresponds to the persistent exchange rate intervention policy conducted by China. Moreover, analyses of tariffs can be used as a reference to infer the potential consequences of trade barriers or conflicts on international economic development.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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