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Chen Yulu and Ma Yong

A General Theory of Macrofinance: Towards a New Paradigm

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Introduction to the International Monetary Institute (IMI)

Established on December 20, 2009, IMI is a non-profit academic institution affiliated to China Financial Policy Research Center and the School of Finance of Renmin University.

Following the "general theory of macro-finance", IMI aims to become a world-class think tank, focusing on the studies of international finance, in particular the international monetary system and RMB internationalization. Despite its relatively short history so far, IMI has established itself as a leading research institution and important forum, where industry leaders, policy makers and academic experts from home and abroad share their insights and expertise.



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EDMOND ALPHANDÉRY

Former French Minister of the Economy

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Mr. Edmond Alphandéry has served as Chairman of CNP Assurances in Paris since 1998. Prior to this appointment he was Chairman of Electricité de France. From 1993-1995 he worked as a Minister of the Economy in the Government of Edouard Balladur. Mr. Alphandéry graduated from Institut d'Etudes Politiques de Paris, and after studying at the University of Chicago and the University of California, Berkeley, he obtained his French Ph.D. in Economics and his "Agrégation" in Political Economy in 1971. As former Member of the Consultative Committee of R.W.E. AG, Mr. Alphandéry is presently a Board Member of CALYON (Crédit Agricole Group), of SUEZ and of ICADE. He also joined the European Advisory Board of Lehman Brothers. He also attends the Consultative Committee of the Banque de France and belongs to the French section of the "Trilateral Commission." He is the author of numerous articles and books devoted to economic and monetary affairs, as well as the founder of the "Euro50 Group" which gathers leading European personalities concerned with monetary policy of the European Central Bank.



This issue is proud to present



EDMOND ALPHANDERY

Former French Minister of the Economy
President of the Euro50 Group
Member of IMI Advisory Board

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IMI News



In Brief

Editor's Note:

Up to January 2016, members of IMI advisory board and academic committee have been expressing their research opinions on monetary finance and economics through published articles and public speeches. This column is a summary of their research reviews.

Research Review by IMI Advisory Board

As **STEVE H. HANKE** pointed out in *“Bank regulations continue to hinder the U.S. recovery”*, recently in the United States, money supply growth has started to rebound somewhat. This is a positive sign, because the quantity of money and nominal GDP, as well as related measures of aggregate demand, is all closely related. The Fed turned on the money pumps in the wake of the 2008 crisis. But, the Fed only directly controls what is known as state money. The Fed has indeed been quite loose when it comes to state money, with the state money portion of the total money supply to 21 percent today. The other 79 percent of the money supply comes from commercial banks. And that is where financial regulation comes into the picture. Higher bank capital requirements, when imposed in the middle of an economic slump, are wrong-headed because they put a squeeze on the money supply and stifle economic growth. Thus far, the result of efforts to impose these capital requirements has been financial repression — a credit crunch. This has proven to be a deadly cocktail to ingest in the middle of a slump. To increase their capital-asset ratios, banks can either boost capital or shrink risk assets. These all destroy money. So, paradoxically, the drive to deleverage banks and to shrink their balance sheets, in the name of making banks safer, destroys money balances. This, in turn, dents company liquidity and asset prices. It also reduces spending relative to where it would have been without higher capital-asset ratios.

According to **LI YANG** in the article of *“Reflections on macro-control”*, since the global financial crisis of 2007, new actions have been taken by both developed

economies and China in macro-control level. This very stage of the global economy entering further correction phase and China approaching a new normal makes it necessary to make a summary on the theoretical and practical progress achieved in macro-control during the past years.

Firstly, the accurate judgment of the reason for the current economic fluctuation is the premise for effective macro-control. If the macro fluctuation results from short term impulse, for example sharp fluctuations of oil and other bulk commodities, the macro policy should stick to the principle of “no overreaction”. If the macro fluctuation results from periodic changes, then periodic control measures should be taken. If the macro economy acts to a long term trend, which in a result causes deviation of the economy from equilibrium, drastic economic control measures should be taken. Secondly, both price control and volume control can be market oriented or non-market oriented. Without volume changing in pace of price control measures, price control would just be a way of reallocation losing its inherent efficiency as a market oriented method. Thirdly, labor productivity is the potential goal for macro control. Taking a deep observation on the actions taken by current monetary authorities, it would be found that labor productivity, which stands for changes in real economy, really matters as one potential macro control indicator compared to other virtual economic indicators like interest or price level. In addition, truth should be told in the internet era. As internet penetrates into every aspect of life, information is much more accessible, which makes it quite important to tell the truth in macro control instead of counting on the money illusion. At last, he pointed out that no more ignorance on coordination and cooperation between monetary policy and fiscal policy. In every case of macro control should monetary policy and fiscal policy cooperate with each other.

According to **PAN GONGSHENG**'s article “*Improve regulations on internet finance*”, the financial sector is relatively risky, whereby operation failures and potential risks may influence other major players in the market, even expand to the whole financial market, and cause financial crisis. If being operated well, the internet finance could better support the development of the real economy. However, associated technology, information, and security risks brought by the internet become increasingly obvious. The central bank will establish and improve the regulatory framework on internet finance based on the principle of “moderate, classified, coordinated, and innovative regulation”. He mentioned that the regulatory framework on internet finance emphasizes five basic ideals. Firstly, in terms of the design of regulatory principles and framework, the idea of opening up and tolerance

should be adhered to. Secondly, the impartiality of regulatory principles must be upheld, the coordination of regulations must be strengthened, and regulatory arbitrage must be prevented. Thirdly, major players in the market need to fully understand the relationship between regulation and professional self-regulation. Fourthly, the regulatory sector should maintain good communication with institutions. Lastly, Professional bottom lines need to be insisted via compliance and prudential operations.

In his article “*The middle way between separate and mixed operations in the financial sector*”, **WANG ZHAOXING** pointed out differences and similarities between three major structural reforms. In terms of the similarities between structural reforms in the United States, the United Kingdom, and the European Union, the future financial landscape would not be complete mixed operations or strict separate operations, but a middle way in between. A middle way will be developed to function as “boundaries” that classify and divide diverse financial behaviors based on different types of risk profiles, and associated influences on financial stability and the real economy. Financial operations and activities in different divisions will receive different levels of regulation accordingly. The United States, the United Kingdom, and the European Union, however, choose different financial structural reform plans, which are closely related to their economic and financial environments, and focus on different reform priorities.

From the experience, he concluded inspirations for financial structural reforms. Firstly, we need to prevent the risks in high-risk operations from spreading to traditional banking, and reduce the losses that taxpayers may incur. Secondly, we must prevent the financial safety net from expanding to high-risk operations like proprietary trading, avoid moral hazard, and facilitate fair competition. Thirdly, we need to reduce the complexity level of financial institutions, improve transparency, and strengthen market regulation. One of the goals of structural reforms is to reduce the complexity level and the scale of banking institutions, which will improve risk management by facilitating management and control, and increasing transparency. Fourthly, mandatory power of separation need to be given to financial regulatory authorities and resolution authorities, and mechanisms in financial institutions must be improved to promote orderly liquidation. In addition, we need to leave space for financial innovation.

XIA BIN pointed out in the article “*The international framework on macro-prudential regulation is incomplete*”, macro-prudential regulation stabilizes

the development of the financial system, and aims to provide better financial services for the stable development of the national economy. The international community's framework on macro-prudential regulation is incomplete for three reasons: firstly, the Basel III does not provide satisfactory answers to issues in international macro-prudential regulation. Secondly, the recent international reform plans aim to safeguard the financial system, but most of the plans are still confined to technicalities such as setting limits on financial enterprises' leverage ratios. Thirdly, international macro-prudential regulation comes before domestic macro-prudential regulation. In the United States, relevant acts of reform do not provide clear approaches to identifying and addressing systemic crisis.

China basically agrees about the framework on the post-crisis global financial governance system. And China will participate more actively in improving the international monetary system. Besides, China fully recognizes the facts that currently the international framework on macro-prudential regulation is incomplete and that to improve international monetary system overnight is impossible. China will adjust relevant policies to prevent negative impacts. The PBoC and CBRC should recognize their roles in macro prudential regulation. To stabilize China's financial system, the CBRC needs to regulate individual financial institutions. Meanwhile, the PBOC needs to cooperate in counter-cyclical, interest rate, exchange rate, and capital management policies.

Research Review by IMI Academic Committee

In the article "*Macro-prudential regulation: targets, tools, and relevant institutional arrangements*", CHEN YULU pointed out the four targets in macro-prudential regulation. First, along with a further developed and more complicated financial market, financial imbalances occur cyclically, and interact with an imbalanced macro economy. Second, the regulation of a single financial institution is inadequate to identify, prevent, and eliminate systemic risks in the financial system. Meanwhile, a fallacy of composition arises when individual risks evolve into systemic risks. All of these account for the failure of traditional micro-prudential regulation policies. Third, the risk points that the macro-prudential regulation focuses on are not individual or heterogenous risks of financial institutions, but common risks that the whole financial system may encounter. Fourth, one of the major targets of the macro-prudential regulation is to contain excessive procyclicality in the financial system. As for the tools, he concluded in

three parts. After the financial crisis, reforms on the design of macro-prudential regulation tools must control and mitigate excessive procyclicality in the financial system from the time dimension. From the cross-sectoral dimension, interconnections and common risk exposures need to be controlled and mitigated for a certain period. Also, in terms of the design of new macro-prudential regulation tools, potential risks that brought by financial innovations should be assessed and dealt with. He also pointed out some relevant institutional arrangements. Monetary policies and the macro-prudential regulation must be operated within independent regions, but also remain closely connected, coordinate, and cooperate with each other. And the decision making and the implementation process should be appropriately combined, so are rules and discretionary approaches. The macro-prudential regulation should meet objective requirements. A universal regulation mechanism is notably advantageous in regulation efficiency and its sensitivity to the market. Also, all nations should establish specific systems based on the characteristics. The macro-prudential regulation mechanism must be coordinated at home and abroad.

According to **BEN SHENGLIN** in the article of “*Lessons for China’s internet finance industry from the P2P regulation experience in the US and the UK*”, China’s Internet finance could learn lessons from the P2P regulation in US and UK. For P2P regulation, the US does not have specific laws but mainly relies on established laws which are relatively complete. Both the federal government and state governments carry out the regulation. Some states mainly refer to disclosures, which is similar to SEC. Other states mainly look at transaction characteristics. They impose requirements for personal financial capabilities such as income and asset. The UK, from which the P2P originates, has relatively complete regulatory laws and methods. P2P lending is primarily subject to Consumer Credit Act 1974. Apart from relative laws and regulations, P2PFA also made specific rules for P2P industry. These rules cover senior management, minimum operating capital, client money separation, credit risks management, money laundry and fraud, on-line platform regulation, disclosure of clients, system building and bankruptcy arrangements. In addition to specific laws and a regulatory body, the UK P2P industry is also characterized by self-discipline. From the lessons above, He put forward that China’s Internet Finance Industry should improve related legal system, especially basic financial laws and regulations. Also, China should speed up the establishment of the credit reporting system. It is important to improve financial consumers’ financial literacy; establish an industrial association as well. In addition, we should

improve the mechanism for handling consumer complaints.

According to **CHEN WEIDONG** in the article titled “*The pain of international finance coordination system*”, global economy and finance is increasingly vulnerable on account that global finance is under the cumulative impacts of the economic cycle and crisis management policy, and that the lack of momentum in the global economic lead to an unconfident market. Additionally, the fictitious connection around the world has been intensified. He also pointed out that International coordination system is difficult to establish owing to the development disorder in the international financial market and the ineffective coordination mechanism. Moreover, he suggested that the establishment of the new international consensus should be promoted. Firstly, difficulties of the economic development in each country should be analyzed and judged in a more comprehensive manner. Secondly, new rules should be established to stabilize the world economic cycle. Thirdly, the international community should form the consensus to promote economic growth. Finally, he explored on the future directions for the development of international financial coordination mechanism. Firstly, the balance of capital flow should be supervised. Secondly, the balance of payments disequilibrium should be analyzed together with the economic equilibrium of each country. Thirdly, IMF should improve the ability to support its members to deal with the economic crisis. Fourthly, the international finance system should promote inclusive development.

DING ZHIJIE stated that RMB’s inclusion into SDR basket is a symbolic event and strategic high ground occupied by China during the progress of RMB internationalization. It marks the RMB recognized as a widely and freely used international currency and the inclusion of first currency from a developing country in the current international monetary system, which implies the growing power of world’s developing countries. Participation of RMB in the global monetary system will contribute to the reform of the current monetary system and enhance the improvement of the worldwide environment for development. However, it is inappropriate to read too much into the SDR inclusion, attention supposed to be focused on the long term instead. The process of RMB internationalization will be accelerated after the inclusion, which contributes to china’s accommodating in the global system in a faster pace, improves the two-way opening-up in economics and finance both in depth and extent, and injects fresh impetus to form a new innovative system suitable for an opening market economy.

According to **TOMOYUKI FUKUMOTO** in his article “*Policy-based finance*

for small and medium enterprises in Japan and its implications for China”, it is a stubborn problem in China’s economy that small and medium enterprises (SMEs) have difficulty in financing. In this respect, China can draw from Japan’s experience in developing policy-based finance for SMEs and thus better support SMEs’ financing.

After the World War II, the Japanese government adopted various measures to solve SMEs’ financing difficulties. First, the government established specific policy-based finance institutions serving for SMEs and introduced a policy-based credit guarantee system. Second, the government established commercial banks and cooperative financial institutions of different scales to fit SMEs of different sizes. Third, the government kept the deposit interest rate at a relatively low level, so that SMEs can get loans from financial institutions at a relatively low interest rate. Japan’s policy-based finance for SMEs are twofold. First, policy-based finance institutions directly provide loans to SMEs. These institutions include the Japan Finance Corporation and the Shoko Chukin Bank. Second, the government provides policy-based credit guarantee for SMEs which is implemented by 52 credit guarantee associations nationwide.

Since the World War II, Japan’s policy-based finance for SMEs has played a key role in SMEs’ development, but it still has some drawbacks. While developing policy-based finance for SMEs, China should fully consider the differences in its national conditions compared with Japan.

In “*International experience on inclusive finance*”, **JIAO JINPU** explained the content and characteristics of inclusive finance. The concept of inclusive finance highlights the importance of increasing access to financial services through the use of more supportive policies and an improved market mechanism. The main characteristics of inclusive finance include gradual coverage of the whole financial system and the entire population, enriched content and advancement through international cooperation. He mentioned four countries’ experiences in developing inclusive finance. The first is Brazil whose Central Bank has implemented a two-stage project of inclusive finance. Secondly, Indonesia has provided basic financial services to the impoverished rural population and provided the low-income population with more access to financial services. Thirdly, Kenya, who has a relatively large and mature formal financial system, has provided the impoverished population with more access to affordable financial services. The fourth is Mexico. It has alleviated population through increasing the transparency of its financial institutions, improved its financial infrastructure, and has advanced the reform of the

legal system.

In the lecture titled *“Public infrastructure investment: a BRICS perspective for inclusive sustainable development”*, **JAYA JOSIE** discussed the extent to which infrastructure investment may act as a catalyst for promoting Sustainable Development Goals (SDGs). He elaborated on the role of public infrastructure investment in meeting SDGs in the BRICS countries, and pointed out that public infrastructure was a key intermediate factor for ensuring that individual’s living standard, socio-economic and political rights are sustainable in the long-term. He reviewed the current trends in infrastructure investment as they relate to gross fixed capital formation (GFCF) from a long-term BRICS perspective. He elaborated on the trends in public infrastructure financing, capital stock—the indicator for public infrastructure investment and GFCF among BRICS countries. He then put forward a possible theoretical framework for public investment to address inclusive development and basic public infrastructure service backlogs targeting SDGs in BRICS countries. Finally, Dr. Josie discussed the possible role of a BRICS development finance institution in financing public infrastructure investment, and concluded with some specific proposals. He believed that the recent establishment of the BRICS New Development Bank and the accession of the RMB to international reserve currency status presented China with an opportunity to bridge the long-term infrastructure investment financing gap faced by for developing countries for the provision of basic infrastructure services to address the SDGs.

According to **LIU JUN** in the article titled *“Disenchantment with global financial capitalism”*, after British mercantilism, the theory of comparative advantage is a new justification of the idea “National interest comes first”, namely, safeguarding national interests from a long-term perspective. Theory of comparative advantage is not only the guideline for the development of British industrial bourgeoisie, but also a cornerstone of international trade theory. It has far-reaching significance for advanced countries, but it cannot change the backward situation of developing countries. First, the theory of comparative advantage does not imply competition. Second, there are exogenous comparative advantages in science and technology and rigidity of global competition pattern. Third, scrutinize the assumptions of the theory of comparative advantage. Fourth, give full play to comparative advantage while rejecting competition is in the greatest interests of developed countries.

Many countries blindly followed the theory of comparative advantage and expected to enhance national power through benefiting from the “economic cycle”,

while few succeeded. Argentina wrongly identified its comparative advantage, taking agriculture and animal husbandry as the core competitiveness. Argentina was reduced to the “Fourth World” in that it followed the path of non-industrialization. While oil-rich countries should actively carry out economic restructuring and political reform, otherwise when their resources have been depleted, a precipitous collapse of the economic system will result. He suggested that we should have a clear understanding of the theory of comparative advantage, adapt to the change, and explore economic development paths suited to national conditions.

LU LEI discussed about dynamic mechanism in the article titled “*Dynamic mechanism of economic growth*”. He states that though the current macro-control mechanisms demonstrate the characteristics of a transitional economy, China had not abandoned its government-led development approach. The relation between the government and the market and the relation between the central government and the local government should be optimized since they have a big impact on Chinese economy. He also emphasized that establishment of a new type of regulatory framework when dealing with the relations between monetary policy, financial innovation and financial stability was essential. Moreover, systematic circulation of financial resources continues to be prominent. Focus should be given to the positive role that the incremental allocation of financial resources plays in adjusting the economic structure and transforming the growth model. Finally, he discussed the opening-up of the financial sector and Relations between the long-term development of the financial system and the short-term risks which ought to be better handled. Specifically, the spillover effects affect the direction of capital flows. Though free competition is basically ensured in commodities trade, the monetary and the financial systems are still not fully internationalized, and the rule-making efforts in the service trade and the financial market should be improved to match the international standards. On this issue, focus should be given to the costs and benefits of the full opening up of the financial sector.

According to DAVID MARSH in the commentary “*U.K. hopes to ease eurozone anxiety about possible breakup with EU*” Britain’s fluctuating relationship with the European Union has ended the year on a relatively positive note with the stage set for a referendum on U.K. membership in summer 2016. Yet the U.K. prime minister faces huge uncertainty whether the preliminary deal on renegotiating Britain’s EU ties will result in that outcome. A key factor will be the technical-sounding issue of Britain’s link — as a long-term and probably permanent member of the noneuro

group of nations. One way forward would be to depoliticize the matter by making the International Monetary Fund the ring-holder in a new relationship between the pound and the euro. The currencies linked in this way would be the constituents of the IMF's composite currency unit, the special drawing right — the dollar , euro , yen, sterling and (from Oct. 1) yuan. In this way Britain could find the protection the City, the government and the Bank of England seek without being granted a veto that would unacceptably constrain the euro's economic and monetary authorities' freedom of action. Such a move would enhance the IMF's role in fostering multilateralism, a guiding precept since it was established more than 70 years ago. The IMF's position in helping steer the world economy will be strengthened in coming years by an agreement on quota and voting reform boosting the reorientation of emerging market economies, which at last is being pushed through the US congress after five years of delays.

TU YONGHONG put forward three key points in the paper of “*Promote RMB as the key currency in countries along the Belt and Road*”. First, promote RMB as invoicing currency in commodity trade. We should facilitate the international use of RMB and decrease the transaction cost, and develop commodity and finance futures exchanges which have strong price discovery function and risk avoiding function. Second, promote RMB as key currency in financing of infrastructure construction. AIIB, NDB and Silk Road Fund can be leveraged to motivate more social capitals investing in Belt and Road construction and transform from the double invoicing currency of USD-RMB to key invoicing currency of RMB. In addition, domestic financial system needs further improvement in order to build a multilevel, highly efficient and diversified capital market. Third, promote RMB as e-commerce settlement currency. China should encourage domestic communication, internet and computer technology companies to invest directly abroad, support transportation and logistics industry construction and improves convenience of customs clearance, information safety, finance and legislation, etc. This will help the Belt and Road countries clear the obstacles in developing e-commerce and benefit RMB settlement in cross-border e-commerce events.

WANG YONGLI put forward in “*Further promote ‘mixed-ownership’ reform in state-owned banks*”, state-owned banks' shareholding structure, corporate governance and incentive and restraint mechanisms have yet to be optimized. Further optimize state-owned banks' shareholding structure, corporate governance and incentive and restraint mechanisms. It is important to start from optimizing the shareholding structure and deepening “mixed ownership” reform. To promote the

reform, we cannot just bring in non-state-owned capital and reduce the proportion of state-owned shares; instead, on the basis of optimizing shareholding structure, we should promote the in-depth reform of banks' organizational structure, corporate governance, incentive and restraint mechanisms, etc. Also, he pointed out that not only banks should deepen internal reform, but shareholder representatives of SOEs, organization department of the CPCCC, CBRC, Ministry of Finance (MOF), Central Commission for Discipline Inspection (CCDI), and Audit office should adjust and standardize state-owned banks' scope of responsibilities, management methods, laws and regulations, so that a market-based operational mechanism for modern commercial banks can be improved.

In the article "*Monetary easing is not enough to support china's economic growth*", XIANG SONGZUO pointed out 6 problems and challenges faced by the financial system. The first is improper credit portfolio or allocation of credit. Real estate, manufacturing sector and state-owned enterprises (SOEs) are loaned too much while the emerging industries, *Sannong* (agriculture, farmers, and countryside), and small and micro enterprises are loaned too little. The second is the efficiency of the credit fund plummeted. Credit expansion cannot greatly drive economic growth. Thirdly, real estate, the manufacturing sector and SOEs are heavily in debt or highly leveraged. Fourthly, risks in the banking system are becoming more prominent. Commercial banks are likely to experience a slower or even negative growth in assets, returns and profit; the banks also need more capital to protect the creditor's right in case of debt evasion by enterprises. Fifthly, usury, default of enterprises and illegal fundraising or financing should not be ignored, since these issues can provoke regional financial crisis, thus greatly impacting the region's credit and reputation. Lastly, the leverage in the stock market is ever increasing.

He put forward that monetary policy can't be the only approach. Cutting the interest rate and reserve requirement ratio is necessary. The marginal effect of the credit policy decreases significantly. Many industries and enterprises need internal adjustment instead of solely depending on monetary policy. He also mentioned that we should shift focus from the growth rate. Caring too much about the GDP is unnecessary. China's economy is unlikely to experience V-shape recovery, because China's economic growth is bound to slow down; the goal for now is to prevent a precipitous decline in growth rate. The major three problems hindering China's economic growth are: the gap between the rich and poor, environmental deterioration and rigid institutions.

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In the article “*Principle of internet finance regulation: exploring a new pattern for financial regulation*”, **ZHANG XIAOPU** concluded the functions and risk profile of internet finance in three parts. First, internet finance has not changed the functions and nature of finance. It has innovated on business technology and business models, but has not transcended the domain of the existing financial system. Second, internet finance still faces uncertainties in its future development, so over-optimism should be avoided. Internet finance, which involves a broad public participation, can easily exceed the due bounds of the law and regulations, and even trigger off systemic financial risks.

As for the international experience in regulating internet finance, he pointed out that countries generally make a point of standardizing internet finance by including

it into the existing legal framework, and meanwhile emphasize industry self-discipline. Countries have adopted external supervision of varied intensity on internet finance according to different national conditions. Regulatory measures mainly include registration and mandatory information disclosure, with a focus on protecting the rights and interests of financial customers and investors. There is seldom a unified oversight body in charge, but there are several regulatory bodies with different jurisdictions and responsibilities instead. Some countries have set out to assess the regulatory framework for internet finance to explore its future development.

He also put forward some principles of internet finance regulation in China. There should be a certain level of risk tolerance. Supervision should be dynamic and flexible in terms of intensity. Principle-based supervision and rule-based supervision should be combined. Uniform regulations should be ensured to prevent regulatory arbitrage. Be alert to and prevent systemic risks. Full-range data monitoring and analysis should be exercised. Financial illegalities should be severely punished. Information disclosure should be promoted to strengthen market discipline. There should be sound, smooth and constructive exchanges between Internet-finance companies and financial regulators. Customer education and protection should be strengthened. Industry self-discipline should be strengthened. Supervisory coordination should be enhanced.

ZHANG ZHIXIANG pointed out in an interview with *Financial View* about the significance of the RMB joining the SDR that special drawing right is always considered as “paper gold” even though its development process was quite rough. If being seen as a capital, SDR is very small in scale and actually there are only a few countries who use it. However, SDR is paid much attention around the whole world, from which we can see that SDR is playing a special role.

Firstly, the inclusion of RMB into SDR has limited effect over the short term. What is worthy of attention is the fact that during the process of the RMB joining the SDR, China’s financial revolution will be accelerated and thereupon the competence of China’s financial market will be increased. Secondly, in the long run, if domestic financial revolutions can be promoted by open measures, the SDR inclusion will constantly produce positive impacts. The prospects of RMB internationalization depends on the development of China’s economy and finance market in the future, the opening of Chinese capital accounts, continuous reforms of exchange rate mechanism, the development of RMB-denominated financial instruments and the establishment and improvement of risk management platform.

Thirdly, there are also some symbolic meanings. RMB becomes the first SDR currency that is from developing country. RMB is the first SDR currency from developing country in the post-Bretton Woods System period. It is also the first currency that joins the SDR according to freely usable standard.

According to **ZHAO XIJUN**, the inclusion of RMB into SDR basket means more than China's entering WTO in macro significance. The SDR inclusion means that institutional barriers are cleaned away if Sovereign Funds and foreign exchange reserves of IMF members want to invest in RMB. However, whether other countries regard RMB as highly as USD depends on higher return, lower risks, rapid settlement, extensive products and efficient service. SDR inclusion will accelerate innovation, opening and reforming of domestic financial markets and relevant subjects. There is no necessary connection between exchange rate fluctuation and the SDR inclusion. People will have positive expectations due to SDR inclusion. If there is no negative expectation at this time, positive expectation will generate real demand of RMB which makes RMB appreciate. On the contrary, if people have negative expectation on China's economy and stock market, the positive expectation brought by the inclusion will be diluted.

Research Report

RMB Internationalization Report 2015

Introduction

By CHEN YULU

Editor's Note:

In order to faithfully record the progress of RMB internationalization and objectively reflect the challenges in the long run, IMI has been releasing the RMB Internationalization Report since 2012. The Reports draw broad attention from all sectors of society due to the independence, objectivity and referential value for decision making. Currently, the Reports have been released in both China and abroad in English, Japanese, Korean, Russian, Arabic, simplified and traditional Chinese characters.

RMB Internationalization Report 2015 is themed Monetary Strategy in “One Belt and One Road” Initiative. It demonstrates the mutual promotion between RMB internationalization and Belt and Road Initiative and concludes that opportunities to promote the RMB internationalization can be found in the following four areas: the valuation and settlement of bulk commodities, infrastructure financing, the building of industrial parks and cross-border e-commerce. The report has been released in Beijing, New York and Almaty of Kazakhstan.

This is an introductory remark by Chen Yulu, deputy governor of PBoC, and editor-in-chief of the report.

Till 2014, if we count from 2009 when China started pilot cross-border RMB trade settlement service, the practice of internationalization of RMB has already been carried out for five years. Taking the experience of internationalization of the sovereign credit currency into consideration, five years is quite short compared with

the span of the rise of the main international currencies. Especially in the first period, it is easy for newly-developing international currencies to emerge, but it is almost impossible to progress stably and quickly. However, RMB is rewriting the history.

According to the calculation of research team from RUC, RMB internationalization index (RII) has reached 2.47% at the end of 2014. At the end of 2009, it was only 0.02%, which means it has increased more than 120 times in five years. Besides, the share of international use of the four main international currencies, including dollar, Euro, yen and pound, decreased obviously when compared to last year. Meanwhile, the share of RMB, Canadian dollar, Australia dollar and many other newly-developing international currencies increased. At the end of 2014, the yen internationalization index had decreased to 3.82%. As long as there are no major adverse events, the degree of internationalization of RMB will surpass that of yen in the coming one to two years. Then RMB will be one of the major international currencies.

In 2014, the degree of internationalization of RMB kept on growing at a relatively high speed. Trade and finance were main motives. The acceptability of RMB increased in many countries. With the progress of regional trade cooperation, the policy of cross-border RMB trade settlement gradually settles down. In 2014 the amount of cross-border RMB trade settlement reached 6.55 billion, or 41.6% of year-on-year growth. The share of cross-border RMB trade settlement increased to 2.96%. Meanwhile, finance trade gradually became the main motive of the increase of the international share of RMB. In 2014, the direct investment reached 1.05 billion, year-on-year growth is 96.5%; the market of the international RMB bond is becoming more and more prosper. Offshore RMB financial markets throughout Europe and Asia have achieved great progress. The share of RMB reached 2.8% in global capital and finance trade. At present, RMB is the second widest used currency in international trade financing, the fifth widest used means of payment and the seventh widest used currency in foreign exchange transactions. RMB has also received much recognition officially. People's Bank of China has signed currency swap agreements with 28 monetary authorities in different countries and regions. The total amount is over 4.07 billion yuan. RMB has already been accepted as reserve currency or intervening currency by some central banks.

Considering this, in 2015 it is of great possibility that RMB will be taken into currency basket of SDR. If RMB is added to SDR currency basket, it means IMF will recognize RMB as an international reserve currency officially. It is also the critical symbol of RMB entering the main international currencies. If executive board refuses RMB again with the criterion of “free use of money”, it can't hold

back or slow down the progress of internationalization of RMB. Because on the basis of existing achievement. “One Belt One Road” which is actively promoted by China will provide more and better chances for the internationalization of RMB. Then the progress of internationalization of RMB will be quick and stable.

Adhering the spirit of ancient Silk Road, which is “peaceful cooperation, open and inclusive, learning and benefit from each other, and win-win results”. In 2013, China proposed “One Belt One Road” strategy. This is a new regional cooperation pattern. The goal is to make the most of the largest economic corridor in the world. “One Belt One Road” and internationalization of RMB are the two important strategies promoted by China in the 21 century as an emerging country. These two strategies serve China's national interests, providing indispensable support for emerging countries. Meanwhile, they serve the global interest. They are further improvements for the world economic order and the international monetary system, which shows the responsibility of an emerging country.

The theme of the report on internationalization of the renminbi of 2015 is: monetization strategy in the execution of “One Belt One Road” strategy. Our research team mainly completed the following tasks. First, we clearly put forward the target, which shows the good will and history bear of China. Second, we studied the logic of the two strategies interact with each other from theory exploration, historical experience and empirical test. Finally, we emphasized that commodity pricing and account settlement, infrastructure finance, industry development zone construction, cross-border e-commerce should serve as the breakthrough of promoting the standards of the internationalization of RMB by the construction of “One Belt One Road”, and make in-depth discussion related to necessity and feasibility.

The defection in supply and structure disequilibrium of global public goods, especially the extreme defection of public goods in developing countries, seriously hinders the development of global economy and finance. In the circumstance of developed countries like the US decreased the supply of global public goods, as the world's second largest economy, the biggest trading nation and an important direct investment country, China has the ability of providing global public goods. Besides, being the biggest developing country, China can have the ability of satisfying the supply of global goods for developing countries. “One Belt One Road” will set up the most charming win-win cooperation and the common of destiny in the world. Taking this chance; China can increase the global public goods in five facets: creating new notion and new mode of international cooperation; realizing efficient device interoperability, providing new international currency; founding new

international financial organization; providing new methods of eliminating local wars and terrorism.

Countries along “One Belt One Road” use more RMB, which also means China increasing the supply of global public goods. RMB receives more and more recognition in international trades. This helps to decrease the cost of trading with China, make trade settlement convenient and avoid the risk of using a third party currency in bilateral trade. China has its own special advantage in infrastructure construction. By setting up new multilateral financial institutions and providing financial support for major projects with the method of RMB bonds, loans and direct investment, the material basis of “One Belt One Road” can be tamped. In fact, RMB fulfill the function of trade pricing and account settlement, financial transactions and foreign currency reserves, which means China provides new international currency and risk management mechanism for countries along “One Belt One Road”. By doing this, China is able to build safe anchor for economy and finance, and make great contribution for the stability of regional economic and financial stability.

“One Belt One Road” has five goals, which are policy coordination, communication facilities, free trade, unimpeded financing, unity of peoples. Ultimately, it is to strengthen the economy cooperation of China and countries along “One Belt One Road” and gradually form the big structure of regional deepen cooperation. Countries along “One Belt One Road” have different kinds of resources, so the economic complementarity is strong. The potential and space of cooperation is huge. China is promoting the progress of the internationalization of RMB and strengthening the circulation of currency of the countries. We are exerting positive effects on achieving the goals and deepen the regional economy cooperation. The results of theory and empirical studies show that increasing the share of the most frequently used currency within the region can be helpful to manage regional financial risks, reduce transaction costs, improve the integral competitiveness within the region, and facilitate the progress of trade and economic integration in the region. China is an important trade partner of countries along “One Belt One Road”. The development of economy and finance of China is in the leading position within this region. The stable politics and proper culture make good preparation for the expansion of RMB in “One Belt One Road”. As long as we keep on increasing the facility and lowering the cost, with the progress of the construction of “One Belt One Road”, countries alongside will gradually increase the share of RMB in trade, investment and financing, financial transactions, and foreign exchange reserves.

According to this report, “One Belt One Road” not only bring benefits to people in alongside countries, but also provide chances for the internationalization of RMB.

These two national development strategies, which are “One Belt One Road” and internationalize of RMB, can complement each other. But in practice, we should take the following issues into consideration:

Firstly, monetization strategy of the construction of “One Belt One Road” should seek breakthrough in the following four aspects. First, China should take active measures to promote the use of RMB as the pricing and settlement currency in commodity trades. This can be done by taking advantages of China’s large market share in this region and China’s advanced financial institutions and futures market. We should give priority to the import of iron ore, aluminum ore and coal. Second, China needs to take use of China’s experiences of infrastructure construction and capital mobilization, and make RMB be the major currency in infrastructure financing, especially in international government aids, policy loans and so on. Third, by taking advantage of China’s experiences, China can seek to promote the use of RMB in construction and operation of industrial parks in the region, which will also promote the reasonable layout of RMB off-shore financial markets and form the transaction network of global RMB. Forth, China should promote the use of RMB in e-commerce transactions by taking advantage of geographical and cultural developments.

Secondly, we need to hold on to the notion of open and inclusive to mobilize global resources and bring benefits to countries alongside. The fact that AIIB is widely accepted reminds us that it is important to find the greatest common divisor for values which we can share. Then the goal of win-win can be achieved. Therefore, China should welcome countries alongside to actively participate the construction of “One Belt One Road” and the accompanying monetary arrangements. Particularly, we need to learn the experience and wisdom of economic construction, risk management, regional cooperation and multilateral management in developed countries.

Thirdly, these two strategies need the support of the development of domestic economy. Foreign investment and loans not only need to put emphasis on the efficiency and safety of capital, but also to learn from the mistakes of western countries. To stand out from fierce competition, a country need to forbid blind drain of capital or the update of domestic industry will face great difficulty. Considering this, whether these two strategies can be successful comes down to China’s domestic economic transition, technical progress and institutional innovation.

Special Column on International Finance

RMB - The People's Currency of the World*

By BEN SHENGLIN*

Dear fellow alumni of Renmin University of China, friends from industry, public institutions, media and academia, friends from New York, the rest of US, China and the rest of the world, Ladies and gentlemen, good morning!

First of all, on behalf of International Monetary Institute (IMI) and on behalf of President CHEN of Renmin University of China, I would like to extend to all of you our warmest welcome to the Forum on RMB Internationalization here in New York. To all of you who travelled from China or other parts of the world, a special welcome to New York!

RMB Internationalization has been a hot topic both in China and internationally since 2009, the year when China started allowing the cross-border usage of RMB in trade and finance. Since 2012, we at International Monetary Institute have been publishing annual reports on RMB Internationalization, capturing the big trends, the progresses RMB has made and the hindrances it faces in its broader adoption by the international community. We also held various forums in China, notably in Beijing on this subject. But we know from the beginning that RMB Internationalization is NOT just a Chinese initiative, it is an opportunity for the global community and therefore requires the joint undertaking of both China and the rest of the world to have the common understanding, acceptance and adoption of RMB as an alternative complementing the existing global financial and monetary system. In this connection, we have held various forums in Beijing and other parts of China, including Hong Kong on this important subject. We also started going abroad, holding what we sometimes called “RMB Roadshows”, in other countries. Last year, in partnership with Bank of Communication and OMFIF in London and Goethe University in Frankfurt, we went to London and Frankfurt for similar events there, and our representatives also were invited to speak on several forums in Latin

*Introduction & Welcome Speech at the RMB Internationalization Forum held in New York, Oct 8, 2015

* Professor of Banking & Finance; Executive Director, IMI, Renmin University of China; and Dean, Academy of Internet Finance, Zhejiang University

American and Africa. Last month we collaborated with the Chinese central bank and held an event in Almaty, Kazakstan. Today we are gathering here in New York, the capital of global finance and US Dollar, to discuss about this same important subject! What are we here to achieve? The Forum is NOT meant to teach anybody about the subject as teaching would imply that we know a lot more than you do about the subject! Granted that we know a bit more but not that more so we are not qualified as the teacher here, that is why we are not charging any tuition or fee for this event. We are NOT here to defend RMB Internationalization or China's position either, like testifying in front of the congress or defending a thesis for PhD degree, as I did 21 years ago in this country. So what are we here for? We are here to share what we know and what we do not know; secondly we are here to listen and hear what you all have to say about the subject, suggestions and concerns; and lastly we are here to address some of your questions and concerns, if we can.

Why do China undertake the so-called RMB Internationalization initiative? People start focusing on the real motives behind it. Many people will give you various and different answers. When they confront this subject, most, if not all of them, will also compare China's rising power with the possibly declining fortune of the United States, as if RMB Internationalization were a bilateral matter between US and China, as if it were a zero-sum game between the two currencies, as if the internationalization of RMB would be necessarily good for China and inevitably be bad for US\$.

I do not know how to answer or explain the above, but let me share with you the following that we often hear:

China is a dominant producer in many industries. Steel, cement, copper, automotive vehicles, TV sets, microwave oven, air-conditioners, refrigerators, washing machines, shoes... the list goes on, it is safe to say that in any industry that produces tangible and touchable goods, we are almost always the unrivalled leader.

We are also the largest trade nation. Today China is the biggest export market for 43 countries, in 1994, only two countries exported more to China than any other market. In comparison, today America is the biggest export market for 32 countries, while the number was 44 in 1994.

We also have the largest foreign exchange reserve that we are still actively looking for good ways to deploy. In terms of GDP, some reports already suggest that China is the world No 1 already, representing 17% of the world with America's share standing at 16%, though based on the prevailing exchange rate, China only represents 14% of the world's total, while US stands at 23%.

Not surprisingly there have been some anxiety and even fear here in the US about China's rise and RMB internationalization, which are perceived as serious threats. But allow me share other side of the story! Based on a recent Economist survey, America's leadership in a number of fields paints a totally different picture.

- US has 15 of the world's 20 leading universities;
- Hollywood and Silicon Valley dominate the world's box offices and venture capital financing
 - In the so-called "new era" based on the cloud, e-commerce, social media and the sharing economy, American firms now host 61% of the world's social-media users, undertake 91% of its searches and invented the operating systems of 99% of its smart phone users.
 - America has increased its leadership in global finance and the world monetary system. The global market share of Wall Street investment banks has risen to 50%. American fund managers run 55% of the world's assets under management, up from 44% a decade ago.

At IMI, we have compiled an internationalization index: Currency Internationalization Index (CII)! Based on our calculation USD remains the dominant currency while Chinese RMB, despite some encouraging progress over the past few years, represent a less than 3% market share, measured in its composite usage in trade, finance and reserve currencies.

Why is it so? Why is there such a big disconnect between China's leadership of the so-called traditional real economy and dwarf in finance and new economy? Is it because of the unfair incumbent system? Is there a conspiracy by the West? In the meantime, people in the West also wonder: is RMB internationalization China's conspiracy to topple the US\$, an effort to dominate the global financial system just like the USD has done? Would RMB Internationalization necessarily mean the decline of USD as a global currency? Will it bad for the US? How can we ensure that the rise of the RMB will complement the unbalanced global system we have? How far should RMB Internationalization go?

We do not have the answers to all these questions, but hopefully today's conference will help us have some answers, clarify some of the misunderstandings and mitigate some concerns.

We have a great program today featuring some of the prominent opinion leaders, policy advisors and industry practitioners in this field.

Before we commence the official program, let me say a few words about Renmin University of China and IMI. Renmin University of China, meaning literally,

People's University of China, is the university equivalent of People's Bank of China – the central bank, while RMB literally means “people's currency”. Renmin University is the first university founded by the Chinese communist party in 1937, when all-out Sino-Japanese War broke out. IMI, officially founded in 2009, traced its origin to 2007, when we started the first roundtable event. It has since established itself as a leading Chinese research institution in the area of global financial system and RMB internationalization.

Renmin University and IMI were founded with certain idealism. The same can be said about RMB internationalization. But we know RMB Internationalization is complex. It is not a domestic China initiative or Sino-US bilateral matter, the stakeholder countries go beyond just China or US. It is not just a monetary or financial or economic matter, it involves technology, politics, diplomacy as well as legal and global governance issues. Therefore RMB Internationalization will be a complex process and long journey as well. But as the old Chinese saying: “a journey of one thousand miles starts with the first footstep”, we are confident that what we have done and are doing today will represent more than the first footstep. Less than ten years ago, very few people outside China knew of RMB – the people's currency, today a lot of people know that and have started using them for exchanges, trade and finance. Maybe one day RMB will become the people's currency, not just in China, but globally.

Thank you! I wish you all a wonderful morning.

The Positive Implications of Silk Road Initiative For International Stability*

By JUAN CARLOS MARTINEZ OLIVA *

The New Silk Road, also known as One Belt, One Road (OBOR) initiative, proposed by President Xi Jinping in 2013, has become a top subject among both Chinese and Western observers today, while a growing number of countries - ranging from major developed nations to small developing countries - have displayed the utmost interest in a joining a project which might come to be listed among the most ambitious in the history of civilization.

OBOR initiative aims at reviving the ancient trade maritime and overland routes that connected Asia, Africa and Europe, whose control and broader use started in later Han period twenty-one centuries ago. Long-distance trade developed as never before, as traded goods from China found their way to Afghanistan, India, Persia, and eventually Rome. Merchants brought gold, silver, and luxury goods— such as textiles from Persia and pearls, ivory, incense, and coral from South and Southeast Asia—to trade for the highly regarded Chinese silks, as well as bronze objects and lacquerware. Guangzhou became a wealthy crossroad of international trade, while Jiankang, the capital of the Southern Liang dynasty, in sixth century was the largest and most opulent city in the world. Among its most outstanding impacts, the Silk Road contributed to the spreading of Buddhism, Indian literature and Hellenistic art, and favored mutual understanding and pacific coexistence among countries from different parts of the then-known world.

In its full realization, OBOR is expected to comprehend 4.4 billion people, 65 countries, and a combined economic output of \$21 trillion which is around 40 percent of global GDP. OBOR will be financially supported by a New Silk Road Fund of \$40 billion, backed by China's foreign exchange reserves and by Chinese official investment and lending agencies.

A special attention is devoted by analysts and media, particularly in the West, on the political and security perspective of OBOR, which is viewed as a Chinese tool to enhance its geopolitical influence in the region. According to other observers,

* The opinions expressed are the author's own and do not necessarily represent those of the Bank of Italy or the Euro system.

* IMI Academic Committee Member; Principal Director for Economics, Statistics, and Research, Bank of Italy

OBOR might represent a useful channel for the vast Chinese overcapacity in industries such as steel and heavy equipment. This explanation is nonetheless weak, if one compares the size of China's \$5 trillion annual domestic investment with the expected OBOR investments, amounting to \$1 trillion over 10-15 years. Finally, some suggest that OBOR, by largely relying on yuan-denominated loans in favor of countries with sizeable infrastructural needs, might contribute to speed up the process of renminbi internationalization, a process which can be viewed as a part of a broader strategy to extend China's influence in East-Asia.

All these - and more - potential implications of OBOR have suggested to many that the Chinese vision would have profound similarities the US Marshall plan of Europe seventy years ago. Some observers have pointed out that, not differently than Marshall plan, China's Silk Road initiative "is impressive not just for its geographic scope but also for its integration of economic, political and national security considerations."

As a matter of fact, ambitious and visionary plans are based on a complex architecture, encompass different targets covering a broad range of fields, and are grounded on both a short term strategy and a long term vision. They sometimes experience a gradual evolution, following their ability to adapt to changing circumstances.

The Marshall plan was initially conceived as a means to rebuild the European economy after the Second World War. It was meant to prevent the risk that Europe's starving populations might fall under the influence of Soviet Union - in accordance with Truman Doctrine's principles - and therefore as a tool to reinforce the geopolitical influence of the United States in Western Europe. It was also seen as beneficial also for the US economy, whose excess production might be channeled in Europe with obvious advantages on both sides of the Atlantic.

In spite of the apparent similarities between the concepts of OBOR and the Marshall plan, it is worth stressing also some of the differences which make OBOR a vision more consistent with the needs of the global economy of 21st century than with the polarized world of the Cold War era.

Indeed, according to the Chinese planners, OBOR is based on the well-known Five Principles of Peaceful Coexistence: mutual respect for each other's sovereignty and territorial integrity, mutual non-aggression, mutual non-interference in each other's internal affairs, equality and mutual benefit, and peaceful coexistence. A fundamentally cooperative initiative, OBOR is meant to be based on principles of harmony and inclusiveness. It advocated tolerance among civilizations, and is meant to respects the paths and modes of development chosen by different countries. It

seeks mutual benefit and the "biggest common denominator" for cooperation so as to give full play to the wisdom and creativity, strengths and potentials of all parties.

Needless to say, the above principles might find practical obstacles in their implementation. For example, a number of the countries encompassed by the initiative are affected by political instability, corruption and the threat of terrorism.

If one looks at the positive side, however, OBOR's ambitious construction may represent a great opportunity not only for China but for the world at large. By representing a vehicle of modernization conveying market economy principles in several backward areas of the world, OBOR can be viewed as a means to introduce prosperity and therefore political stability in such areas. For its potential security implications OBOR goals should be viewed as benefitting the whole international community.

In a world struggling against economic stagnation, and security threats, a project aimed at boosting infrastructures and trade networks, as well as at enhancing mutual dialogue and peaceful coexistence may prove, if successfully implemented, as potentially beneficial for the overall international community.

Is the RMB Ready to Become a Global Currency?

The CIPS and Further Prospects

By HERBERT POENISCH*

On October 8th 2015 the first phase of the of the RMB cross-border Interbank Payment System (CIPS) started operations¹. This author among others has for a long time advocated that a centralized RMB payments and settlement system, based in Shanghai as hub of RMB should eventually replace the patchwork of RMB settlement in some 20 settlement centres round the world². This article will investigate whether this CIPS will be able to channel the bulk of RMB settlements in a quick, cost efficient and risk free manner before long, paving the way for RMB to become a global currency.

The first part will present a snapshot of RMB payment and settlement channels to clear first and foremost trade and investment settlements in RMB at the moment. The second part will compare the US CHIPS system with CIPS and highlight the major differences. The US payment system structure can serve as model but the main difference will remain as long as RMB is not fully convertible in the financial account.

The final part will outline the requirements for settlement of RMB as a global currency in future. Will it be anchored on national payment systems forever, or become truly global with direct peer-to-peer (P2P) settlement on global platforms. As China is leading this FinTech technology domestically, will it allow the RMB to become a global currency? If not, the USD might continue playing the global role during the foreseeable future.

1. Present channels of RMB cross-border payments

The current picture of RMB cross-border transactions is rather confusing for any participants in the RMB trade, even after RMB joined the SDR basket. There are onshore RMB and offshore RMB. The onshore RMB becomes offshore RMB through cross-border payment and settlement and reverse. All onshore RMB transactions, trade and financial are coded in Chinese characters and settled through

* IMI Academic Committee Member; Former Senior Economist, Bank for International Settlements

¹People's Bank of China (2015): Milestone of RMB Internationalisation: RMB Cross-border Interbank Payment System Starts Operations. 14 October 2015 www.pbc.gov.cn/english

²Latest see Poenisch Herbert (2015): Emergence of a 'Renminbi Zone'. In: SEACEN Financial Stability Journal, Vol 5, Nov 2015 www.seacen.org/publications

the China National Advanced Payment System (CNAPS) and its subsystems for security settlements etc.³

The Chinese agent banks play a major role by turning onshore RMB into offshore RMB as they participate in CNAPS and have access to refinancing by the PBOC. This is big business for Chinese banks, either through their Shanghai branches or through their establishments in RMB clearing centres round the world. There are legitimate concerns that this system is costly and inefficient. In addition there is a fierce tussle among the Chinese banks to gain an advantage over other competitors⁴. Branches of foreign banks play a minor role in this business as their market share in China is less than 2% and their RMB business is restricted.⁵

There are three channels for clearing cross-border RMB at present, through offshore RMB clearing centres, through onshore foreign exchange transactions, and recently through the CIPS.

Regarding the first channel, the table below gives an overview over these clearing centres, the Chinese agent banks, the swap agreements with the PBOC and the status of Qualified Foreign Institutional Investor (QFII) which allows local institutional investors to invest in the onshore RMB securities markets.

Table: Countries' RMB support

Country/Region	Swap agreement RMB	Chinese Bank	QFII
HK	400bn	BOC	y
Taiwan	70bn	BOC	y
Korea	360bn	Communications	y
Singapore	300bn	ICBC	y
Malaysia	180bn	BOC	y
Thailand	70bn	ICBC	?
Sydney	200bn	BOC	y
Qatar	35bn	ICBC	y
South Africa	30bn	BOC	?
London	200bn	CCB	y
Luxembourg	EU350bn	ICBC	y
Frankfurt	EU350bn	BOC	y
Paris	EU350bn	BOC	y

³BIS (2012): Payment&settlement systems of countries: China www.bis.org/cpmi/publ/d105.pdf

⁴You Xi and Dong Yuxiao (2012): Banks vying to clear RMB overseas. 12/12/2012 In: Caijing www.caijing.com.cn/english

⁵CBRC regulations for foreign banks in www.cbrc.gov.cn Most of the restrictions that apply to onshore RMB trading have been lifted at the SFTZ. In: Zhu, John (2015): RMB as a reserve currency. In: HSBC Global Research, www.hsbcnet.com

Switzerland	150bn	CCB	y
Hungary	10bn	BOC	y
Toronto	200bn	ICBC	y
Chile	22bn	CCB	y
Argentina	70bn	ICBC	?

The clearing system of offshore RMB rests on correspondent accounts with the Chinese agent banks. The credit risk and liquidity risk are managed as follows. Credit risk is determined by the quality of partner banks with correspondent accounts with the Chinese agent banks. Liquidity risk is determined by the availability of offshore RMB⁶.

The basic RMB demand is driven by demand for Chinese exports and direct investment in China. The supply of RMB is driven by Chinese imports and outward foreign direct investment. The task of the agent bank is to balance supply and demand in each of the offshore RMB centres. If an imbalance arises causing a liquidity surplus or shortage, the agent bank is first in line to transfer funds from onshore RMB to its offshore branch. If there is a persistent shortage, the RMB swap facility with the local central bank (see table) can be activated. This has not been done so far.

At present offshore RMB balances cannot flow between different RMB clearing centres, i.e. the surplus in one region cannot be compensated with a deficit in other regions. Thus offshore RMB in one centre are not only separated from onshore RMB, but also from other offshore RMB centres. This causes a discrepancy in exchange rates and interest rates of onshore RMB (CNY) and various offshore RMB, such as RMB in HK (CNH). The Continuous Linked Settlement Bank (CLS) cannot solve the problem as only Bank of China HK is a member and RMB is not a CLS settlement currency⁷.

The second channel is through forex operation against onshore RMB in China. This is called the China Domestic Foreign Currency Payment System (CDFCPS). This is an RTGS system developed by PBoC for the foreign currency payments incurred by domestic purchases of goods and services. Settlement agents are commercial banks approved by PBOC with a term of three years. Again, mainly Chinese banks are eligible as settlement agents as they have foreign exchange

⁶In its contract with customers DBS in Singapore clearly stipulates that ‘availability of RMB can limit the availability of RMB products’, ie it is beyond the control of DBS. In: Terms and Conditions governing RMB denominated deposits, accounts, telegraphic transfer services and trade settlement. www.dbs.com.sg

⁷CLS Currency Programme (2015): Briefing Book www.cls-group.com

accounts as well as onshore RMB accounts, and most important, access to the lender of last resort in onshore RMB, the PBOC. Branches of some foreign banks in Shanghai, who are members of CNAPS, can effectuate cross-border settlements whereas others can use Chinese banks as agents.

The third channel, the most recent addition, is the CIPS which started operations in October 2015. The CIPS phase 1 has the following features: RTGS for individual customers and financial institutions; one point entry by all 19 direct participants; adoption of ISO20022⁸ message coding for straight through processing of cross-border business; the operating hours are 9am to 8pm, covering the time zones of Europe, Asia, Africa and Oceania. The first batch of direct participants are the major Chinese banks, and selected major foreign banks, such as HSBC, Citibank etc⁹. In addition there are 38 domestic banks and 138 foreign banks as indirect participants. This system will facilitate cross-border use of RMB in trade and investment. The CIPS complies with the international ‘Principles for Financial Market Infrastructure’¹⁰.

The new CIPS was modeled on the US CHIPS clearing company (see section2). The main characteristics will be settlement through correspondent accounts with the direct participants in offshore RMB. This prompted the comment that this will be an offshore RMB clearing system onshore in Shanghai. The currency traded will be offshore RMB, perhaps can be called CNS. The key role of 11 Chinese agent banks will be preserved, and only 8 foreign banks’ branches (out of 107 foreign bank branches and locally incorporated subsidiaries) will be allowed to participate. The credit risk will be limited as only the major names participate directly, and liquidity risk will be reduced as direct participants need to deposit funds at the beginning of the trading day with CIPS.

Straight through processing (STP) is definitely enhanced by using the international SWIFT codes for CNY (SWIFT does not have a code for CNH) but the verification process of the ‘great firewall’ of authorised transactions (presently only trade and investment) could delay the settlement process.

According to press releases by the PBOC¹¹ there will be two phases of CIPS. The first one will focus on settling cross-border trade and investment flows, the second

⁸SWIFT notes that there will be a need for translating ISO 15022, the most commonly used coding for cross-border transactions, into ISO 20022. See: SWIFT (2012): RMB Internationalisation. www.swift.com

⁹For the full list see People’s Bank of China (2015): Milestone of RMB Internationalisation, *ibid*

¹⁰Bank for International Settlements (2012): CPSS and IOSCO Principles for Financial Market Infrastructure. www.bis.org/committee publications.

¹¹ The following PBoC references are crucial:

<http://www.pbc.gov.cn/goutongjiaoliu/113456/113469/2960456/index.html>

<http://www.pbc.gov.cn/goutongjiaoliu/113456/113469/2960452/index.html>

one will address liquidity issues and offshore RMB clearing.

2. The US CHIPS as a model for China's CIPS

In the design of CIPS, the PBOC has taken the US CHIPS as a model. It is a private company operating under the supervision of the Federal Reserve. CHIPS holds accounts with the FED New York. This section will highlight the differences between the two.

The present dominant global currency, the USD is settled through a patchwork of sub systems which have historically grown and which continue to co-exist. The core of the USD settlement system are the official FED Wire system and the private CHIPS company through which most USD transactions are settled.

The Fedwire Funds Service (Fedwire Funds), owned and operated by the Federal Reserve Banks, is a real-time gross settlement system (RTGS) that enables participants to send and receive final payments in central bank money for their own accounts and on behalf of customers¹².

An institution that maintains an account at a Federal Reserve Bank is allowed to be a Fedwire Funds participant. These institutions include Federal Reserve member banks, non-member depository institutions and certain other institutions, such as US branches and agencies of foreign banks. The US Treasury and other federal agencies also participate in the Fedwire Funds Service as fiscal principals. Some 8,300 participants are able to initiate or receive funds transfers over Fedwire Funds.

This is the crucial interface between monetary policy and payment system, which is still missing in China. There, Chinese banks and branches of foreign banks with access to central bank money are confined to the CNAPS.

The US monetary policy works through the Federal Funds rate, the interest rate at which banks lend central bank money, ie deposits at the Federal Reserve Bank to each other, in fact an interbank market rate. As depicted in graph 1¹³, foreign banks, notably Japanese banks hold an increasing share of reserves at the Federal Reserve NY, at the end of 2013 exceeding 50% of total banks' reserves (see figure 3 in graph 1). Thus foreign banks were the main participants in the FED's Quantitative Easing Policy (QE), which then on-lent the USD to other banks and non-banks outside the US causing the liquidity to flow out of the US.

In China, the main instrument of monetary policy is the variation of banks' reserves at the PBOC. These are held by Chinese banks and branches of foreign

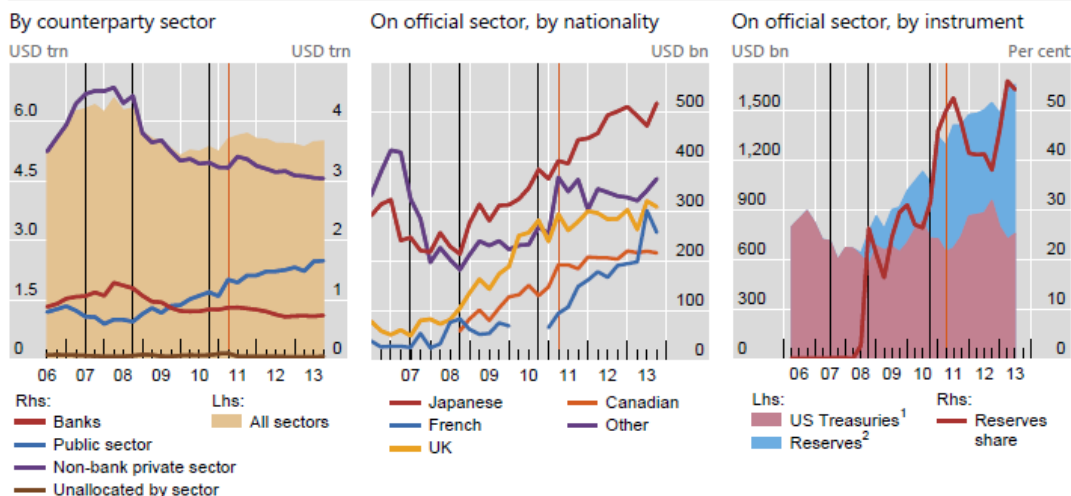
¹²BIS (2012): Payment and Settlement System of Countries: USA www.bis.org/cpmi/publ/d105.pdf

¹³McCauley, Robert and McGuire, Patrick (2014): Non-US banks' claims on the Federal Reserve. In: BIS Quarterly Review, March www.bis.org/publications

banks¹⁴. They need to hold 18% of their deposits at the PBOC which is in effect a tax on banking¹⁵.

Non-US banks' consolidated claims on the United States

Graph 1



The vertical lines indicate the start of the financial crisis (end-Q2 2007), the collapse of Lehman Brothers (end-Q3 2008), the announcement of the change to the FDIC assessment base (end-Q3 2010) and the implementation of the change (1 April 2011).

¹ Estimated holdings of US Treasury securities. Difference between claims on the US official sector in the consolidated (ultimate risk basis) statistics and holdings of reserves at the Federal Reserve. May include government agency paper. ² Reserves held at the Federal Reserve by the US branches and agencies of non-US BIS reporting banks.

Sources: Federal Financial Institutions Examination Council, *Call Reports*; BIS consolidated banking statistics (ultimate risk basis).

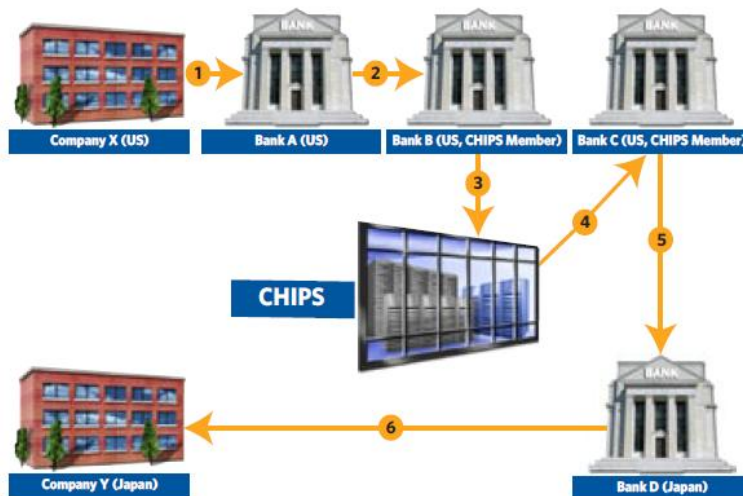
The major part, some 90% of all USD transactions, large and small, however pass through CHIPS. CHIPS is a real-time computerised system for transmitting and settling US dollar payments among its participating banks. CHIPS is operated by The Clearing House Payment Company LLC (PaymentsCo). CHIPS is subject to supervision and examination by the Federal Reserve and other federal bank supervisory agencies. The following figure depicts the payments flows through CHIPS.

¹⁴Fungachova, Zuzana, Nuutilainen, Riika, Weill Laurent (2015): Reserve requirements and the bank lending channel in China. In: Bank of Finland Discussion Papers 25 www.bof.fi

¹⁵Ma Guonan, Yan Xiandong and Liu Xi (2011): China's evolving reserve requirements. In BIS Working Papers No 360, November www.bis.org/publications

Example of cross-border payment flow

Company X in the United States needs to make a payment to Company Y in Japan. Company X requests its bank in the United States, Bank A, to send a U.S. dollar payment to Company Y. Since Bank A does not belong to CHIPS, it requests its correspondent bank, Bank B, which is a member of CHIPS, to facilitate the transfer. Bank B sends the funds transfer command to CHIPS. Bank B sends the funds transfer via CHIPS to Bank C which is also a member. Bank C is the correspondent bank for Bank D which is where Company Y has an account to receive funds.⁶



- (1) Company (X) in the U.S. requests its U.S. bank (A) to send a dollar payment to its client (Y) in Japan.
- (2) Bank A asks its U.S. correspondent bank in the U.S. (B) to facilitate this transfer.
- (3) Bank (B), a member of CHIPS, sends the funds transfer command to CHIPS.
- (4) CHIPS executes the fund transfer by crediting the account of another U.S. CHIPS member bank C.
- (5) Bank (D) in Japan is bank C's correspondent bank.
- (6) Company Y has an account with Bank D.

Source: VISA: The Inefficiencies of cross-border payments¹⁶

Participation in CHIPS is available to depository institutions resident in the US. CHIPS participants must reside in the United States and be subject to supervision by US state or federal banking supervisors. Participants use CHIPS to settle a variety of large-value international and domestic payments, including those associated with the adjustment of correspondent balances, commercial transactions, bank loans and securities transactions.

The anchor of all USD payments is a deposit account with the Federal Reserve of New York. To facilitate settlement, the CHIPS prefunded balance account (CHIPS account) was established at the Federal Reserve Bank of New York. Under the real-time finality arrangement, each CHIPS participant has a pre-established opening position requirement, which, once funded via a Fedwire Funds transfer to the CHIPS account, is used to settle payment orders throughout the day. Debits and credits are

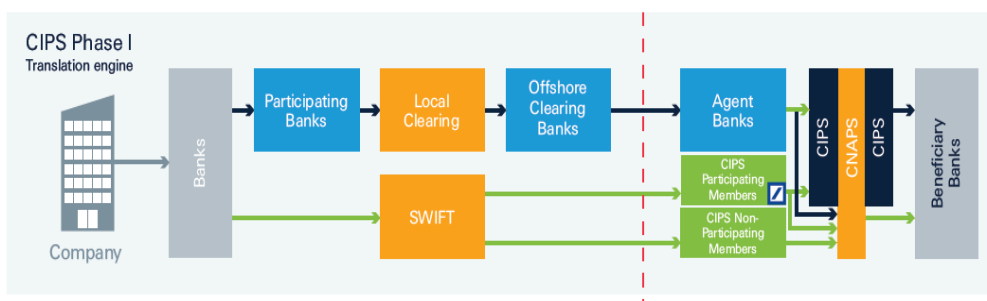
¹⁶Park, Yoon S (2006): The Inefficiencies of cross-border payments. How current forces are shaping the future. In: VISA Innovations www.visa.com/visacommercial

only reflected in CHIPS’s records and are not recorded on the books of the Federal Reserve Bank of New York. Under New York law and CHIPS rules, payment orders are finally settled at the time of release from the central CHIPS queue.

For a system like this to function, liquidity is crucial. The system provides daylight credit for institutions needing overdrafts. This is secured and limited by the deposit at FEDwire. CHIPS also caps the maximum positive position that any participant can accumulate; this mitigates against the risk of too much liquidity pooling among a few participants. At the end of the day total balances will be zero and the deposits returned to the CHIPS participating banks.

Unlike the US CHIPS system, the present Chinese CIPS does not foresee domestic transactions and is restricted to cross-border trade and investment transactions. This will require a verification process. However, the US system is subject to compliance of various security measures, such as know your client (KYC), anti-money laundering, and anti-terrorist financing regulations which also allow verification.

Similar to CHIPS, the Chinese CIPS requires a deposit by direct participants, however, it does not allow overdrafts and does not provide daylight credit. As in CHIPS the deposits are returned to direct participants at the end of the clearing day and all balances have to be zero at the end of the day. In plain languages this means that each direct participant has to manage its own credit and liquidity risk. Their deposits with CIPS can be used for temporary liquidity shortfalls.



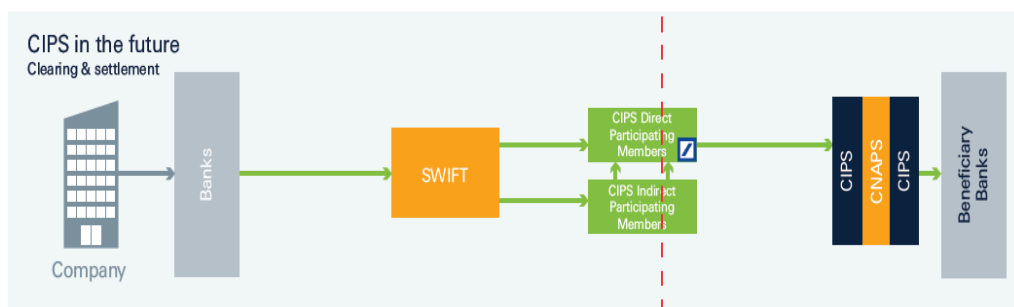
Source: Deutsche Bank: Chinese Central Bank is introducing CIPS¹⁷

Managing systemic liquidity and settlement among CIPS participants is subject to phase II of the CIPS project. It is technically possible and even desirable to engineer such an offshore RMB liquidity system as long as capital controls are in place. This will create an offshore RMB interbank market with exchange rates and short term interest possibly different from onshore RMB and no automatic equalizer between the two.

¹⁷Deutsche Bank (2015): Chinese central bank is introducing CIPS. www.db.com

3. National versus global systems

The design of the present and future RMB payment system is firmly based on China's national payment and settlement system CNAPS. CIPS will just provide the addition for cross-border settlements, for the time being for trade and investment. Perhaps later, settlement for financial transactions will be added. The figure below depicts the future functioning of CIPS, with direct and indirect participating members settling payments.



Source: Deutsche Bank: Chinese Central Bank is introducing CIPS

This is still different from global solutions which are essential for a global currency. The transnational payment and settlement systems allow funds to move between countries, anchored in the central banks of the various currency components. Examples of these are the European TARGET system, the CLS but also VISA and Mastercard. TARGET¹⁸ is firmly based in the European System of Central Banks (ESCB) and CLS rests on central bank support for its constituent currencies, such allowing final time critical clearance of forex payments and eliminating the Herstatt risk.

For a breakthrough of internationalization of RMB, four areas of global use need to be possible: (i) pricing and settlement of bulk commodity (including oil), (ii) infrastructure financing (first and foremost through AIIB, ADB and IBRD), (iii) industrial parks construction and (iv) cross-border e-commerce¹⁹.

While China is fast becoming the world leader in FinTech with domestic payments, financial transactions and wealth management provided on the internet without the intermediation of traditional banks²⁰, presently China has no plans to create a global settlement system, let alone a global currency. For the foreseeable

¹⁸TARGET2 is an enhanced version of TARGET1 incorporating technical consolidation, a single system-wide pricing structure for domestic and cross-border payments, a harmonized service level, and the system-wide pooling of available intraday liquidity.

¹⁹IMI (2016): Press Conference RMB Internationalisation Symposium, NY 8 October 2015. In: IMI Newsletter Vol 3, No 1, January www.imi.org.cn

²⁰It has been reported that the PBoC is planning to introduce tighter rules for internet finance. In: International New York Times, 22.12.2015

future the parallel existence of onshore and offshore RMB will not disappear because of controls on financial transactions. Banks will continue to play the key role of settlement agent. However, if Chinese banks wanted to play a global role, they should create their intra-bank clearing system for a number of currencies, among them the offshore RMB. Thus CNH could flow between existing clearing centres and eventually through CIPS. This would ease the pressure on the PBOC to supply or absorb liquidity in the offshore RMB market. At some stage the offshore RMB should join the CLS system as CNH or, once CIPS was sufficiently developed, as CNS.

Conclusion

For the time being CHIPS, a system designed 50 years ago which began operations in 1970, still serves as a model for China's cross border clearing and settlement. Major Chinese and branches of global banks clear via their correspondent accounts, while liquidity is provided mainly by Chinese banks who participate in the CNAPS system.

While the Chinese way of gradually introducing changes is commendable, based on Deng's expression: 摸着石头过河 managing expectations should be a major task of Chinese authorities. Experimental reforms in designated areas have proven successful once transferred to the country at large.

In the field of internationalization of RMB, expectations by some reformers in China as well as foreign parties have run wild. They see the RMB replacing the USD as global currency in the foreseeable future. Serving as a reserve currency, let alone as a global one used by third parties who have no dealings with China requires a modern payment and settlement system for all kinds of transactions, trade, investment as well as financial.

From the gradual strategy it is quite clear that it is not in China's interest to provide this global settlement currency before putting its house in order and putting safeguards in place for ensuring a smooth replacement of the USD. The early phases of CIPS promise solid foundations for settlement of offshore RMB transactions. However, it might not be able to cope with the rising volume of Chinese trade and direct investment in both directions. In addition volatile exchange rate expectations and capital flows²¹ might derail a carefully designed strategy.

²¹As capital controls are still in place, hidden capital flows can take the following form. Chinese exporters demand payment in USD to offshore accounts whereas Chinese importers settle in RMB. This could lead to an oversupply of offshore RMB and the subsequent problems.

Capital Markets Growing Together – from the Middle Kingdom to the Middle of Europe

By ROBERT ELSSEN*

Abstract

A vivid and vibrant symbol of the reform and opening up era in China is the emergence of stock exchanges. A quarter of a century ago the Shanghai Stock Exchange was launched as the first of its kind in the mainland. The stock exchange is a prominent icon of any market economy allowing companies to raise capital while pricing their securities based on supply and demand. The exchange often is considered as key indicator or trendsetter for the economic development as a whole since market participants already “price in” expected future performance of companies, industry branches and the overall economy. A stock exchange can be particularly helpful in a stage of economic reforms and privatization since it enables the capitalization of state-owned enterprises. These are just a few aspects to underline the high relevance of stock exchanges.

Given the global connectivity of markets and capital markets in particular stock exchanges may unlock their full potential only if they also operate globally or interact in a way that provides access to foreign markets. This provides market participants a broader range of products.

Any exchange also needs a stable and smooth market environment which is largely warranted by sound regulation. With the envisaged introduction of a registration-based initial public offering system as recently adopted by the State Council China underlines the commitment to a market-driven reform consistent with international practice.

Connect for Greater China

The launch of the Shanghai – Hong Kong Connect in November 2014 created an investment channel enabling interested investors on both stock markets to tap the respective connect partner. The supervisory foundation of this channel was the Joint Announcement of the China Securities Regulatory Commission (CSRC) and its counterpart in Hong Kong, i.e. the Securities and Futures Commission (SFC).

* IMI Academic Committee Member; Representative, Federal Financial Supervisory Authority (BaFin); Financial Counsellor, German Embassy in Beijing

While the connection of the Mainland and the Hong Kong exchange is subject to some restrictions such as quotas, it is nonetheless seen as a major move to open up the market within Greater China.

It's largely expected that the Shenzhen – Hong Kong Connect will follow suit next year to take another major exchange on board while also giving access to a different range of industries.

The successful start of the Shanghai – Hong Kong Connect has also fueled expectations to broaden the Connect instrument to other financial instruments. A potential connection is a commodities trade link providing traders in the mainland with access to international commodity futures while overseas investors get access to mainland contracts. Given the unique character of such contracts and also the question of physical settlement such connect would appear more complex though.

International Dimension of Stock Exchange Co-operation

While the concept of Connect covers Greater China the broader aspect is co-operation and integration of capital markets on a global scale.

A prominent example is the public offering of shares issued by Mainland companies in foreign jurisdictions. While many companies intend to tap the international markets we have witnessed in the past that this approach entails some challenges and barriers. Shares of such companies typically originate from an overseas entity or a special vehicle (Inc.) established in the respective host country of the public offer instead of the Mainland company directly. As such a shareholder does not have the same position as a company's shareholder, e.g. regarding voting rights or the entitlement to dividends. The investor has to accept the role of participating in a specially established share company in the host country with usually no track record while relying on the expectation to participate on the economic development of the Mainland company.

In order to tackle this issue the CSRC and the Singapore Stock Exchange have established a "Direct Listing Framework" in November 2013. The "Direct Listing" allows companies incorporated in the Mainland to list their shares directly at the Singaporean Exchange. In case of a direct listing the CSRC, the Monetary Authority of Singapore as well as the Exchange co-operate closely so that both the Chinese regulatory rules and the local admission rules are adhered to.

From the Middle Kingdom to the Middle of Europe

Beyond Connect and Direct Listing there is another instrument to further strengthen co-operation of capital markets. In order to present this case I encourage

you to virtually travel from the Middle Kingdom to the Middle of Europe. While Germany is in the middle of Europe, Frankfurt as the financial hub is in the midst of both the continent and the country.

Germany usually comes to mind as Europe's largest economy and as leading country for manufacturing and international trade. Germany is the key trading partner for China in Europe. On the other hand it is only known to a lesser degree that Frankfurt / Main is an international financial hub which is gaining more and more relevance also as a center for Chinese investment.

Frankfurt is a town with a long-lasting tradition and its relevance dates back to Charlemagne more in the end of the eighth century. For over five hundred years, Frankfurt was the place of election and coronation of German kings and emperors. Its role as global market place developed from holding medieval trade fares and serving as a hub of European trading routes since the Middle Ages.

The Frankfurt stock exchange dates back to 1585. At first the goal of the bourse was to fix currency exchange rates – an urgent task given the vast variety of currencies in central Europe at that point of time. In the following centuries the trading expanded and the Frankfurt stock exchange established a remarkable international reputation. To illustrate the current size and performance of the exchange one may recall the planned merger of the Frankfurt stock exchange's operator Deutsche Börse AG and the New York Stock Exchange (NYSE) Euronext in 2012. If the merger had worked out as foreseen Deutsche Börse AG would have become the major shareholder with a threshold of 60% while NYSE would have received 40%.

Frankfurt is the location not only for key German banks and financial institutions but also about 200 foreign banks including 5 Chinese. The financial industry in Frankfurt is closely related to the real economy of Germany. Frankfurt is also the center for European financial institutions. The European Central Bank (ECB) is well-known as the guardian of common currency Euro. Furthermore the ECB is in charge of pan-European banking supervision and the European Systemic Risk Board in charge of identifying potential systemic risks is attached to the Bank. The European Insurance and Occupational Pension Authority (EIOPA) is based in Frankfurt as well. Thus Frankfurt is a prominent place for European solvency supervision and safeguard. Beyond the European dimension Frankfurt has also taken major steps to enhance financial and business relations with China.

A significant symbol of this exposure is the fact that Frankfurt was granted the role of a RMB Offshore Center as the first western metropolis on 28th of March 2014 when the People's Bank of China and the German Central Bank signed a declaration

of intent regarding Renminbi clearing and settlement in Frankfurt in presence of Chinese President Xi Jinping and the German Chancellor Angela Merkel. Other European financial centers such as London, Paris, Luxembourg and Zurich followed suit. Bank of China was selected as the RMB clearing bank in Germany. Clearing operations started in November 2014.

While this was major step for the two countries given their large bilateral trade volume (154 billion € in 2014) I am concentrating on the capital markets aspects in the following.

For the eighth time the German Chancellor Angela Merkel paid a visit to China end of October 2015. During her visit in Beijing and Hefei a multitude of significant business deals was signed. From the capital market perspective the two joint ventures between Deutsche Börse AG and Chinese counterparts are of high interest.

CEINEX – the first global trading venue to offer RMB-denominated products

The first Joint venture is between the three parties China Futures Exchange, Deutsche Börse AG and China Financial Futures Exchange. Just two weeks after the Chancellor's visit the China Europe International Exchange (CEINEX) was founded. One week later CEINEX opened the floor and started offering almost 200 RMB-denominated products, i.e. debt securities and exchange-traded funds (financial instrument reflecting the economic performance of an index).

This is a milestone for strengthening financial collaboration between Germany and China as well as a strategic co-operation among Chinese and German exchanges to spur the internationalization of the RMB. The new trading platform pioneers the opening up of the Chinese capital market and serves as a gateway to Europe.

In order to corroborate the new joint venture the German partner Deutsche Börse AG also signed Memoranda of Understanding with Bank of China and the China Construction Bank in order to unlock further potential to promote the whole value chain for RMB products both in China and Germany.

CEINEX lays the foundation for a new dimension of stock exchange co-operation and thus takes the role of a pioneer. While many financial centers and their exchanges are gauging various options to further connect with the Chinese counterparts it is so far only CEINEX which has already started operations. CEINEX develops the first offshore liquidity pool to Renminbi-denominated financial instruments and the first authorized trading platform for Chinese investment products outside the Mainland.

After having established the clearing bank and introduced the Renminbi Qualified Foreign Institutional Investors' Quota the new trading platform is an additional layer

to boost the internationalization of the RMB and RMB offshore markets.

CEINEX has started off with 200 RMB-denominated products and aims to gradually increase the number and range of products. Such products would include ETFs, investment funds and depository receipts linked to A-shares listed in Shanghai. Moreover CEINEX also aims to attract various corporate and sovereign issuers from China, Germany as well as third countries to tap this market while also fuelling liquidity. Product innovation and a growing interest in RMB products help to create a critical mass and a well-functioning market with international reputation. The recent decision to take the RMB on board of the IMF's Special Drawing Rights currency basket certainly accelerates this process.

Joint Venture with the China Foreign Exchange Trade System (CFETS)

CFETS was founded in 1994 by the PBoC. It has various functions - interbank foreign exchange trading, bond trading, RMB interbank lending and the interbank foreign exchange transactions in particular.

The signing ceremony during the Chancellor's visit also laid the foundation of a second Sino-German joint venture; i.e. CFETS and DBAG committing themselves to establish a JV to promote Offshore RMB exchange, fixed income product innovation and to generally further connect both markets.

It is broadly expected that the Joint Venture will come into existence in spring 2016 and be placed in Frankfurt. Thus the financial center Frankfurt can also take a pioneering role in the important asset classes of foreign exchange and fixed income.

CEINEX and the envisaged CFETS – DBAG JV thus cover a broad portfolio of financial instruments which gives the town at the river of Main a competitive edge to other financial centers. Chinese investors – already largely familiar with the stronghold of the German real economy with a range from major car manufacturers to high tech companies and a multitude of hidden champions – are able to find a conducive environment to match their needs in financial services.

Sino-German Center of Finance and Economics (SGC)

Given the academic background of the publisher it is worthwhile mentioning that next to the growing co-operation of the capital markets we have also seen a new center come into existence that provides mutual exchange on the commercial, policy and academic level. The SGC is a new tool to combine expertise from practitioners, politics and academia to initiate an ever more vibrant Sino-German exchange.

In September 2015 the SGC was officially launched at the premises of the

German Embassy Beijing. The SGC's Trustee Board is c-chaired by the Vice Governor of the PBOC Pan Gongshen and the Vice Governor of the Bundesbank Dr. Joachim Nagel. As for the academic background the Renmin University as well as the Goethe University Frankfurt (House of Finance) are in the lead to carry out research on topics of joint interest. Obviously the internationalization of the RMB and the role of Frankfurt as RMB hub are high on the agenda. Moreover the SGC can follow new trends of common interest such as the reshaping of the architecture of development banks. One may think of the gaining interest in Panda Bonds - while Daimler was at the forefront in 2014 with the first foreign corporate bond, two jurisdictions (Republic of Korea and the Province of British Columbia/Canada) are now in the process of issuing them. Given a multitude of interest rate cuts in China against a turning tide of interest rate development in the US the Panda Bonds tend to become more lucrative for issuers.

Outlook – the year ahead

2015 was a year of laying foundation for a new dimension of capital markets co-operation by envisaging joint ventures between relevant stock exchanges. The new collaboration is embedded in a new quality of political exchange (High Level Financial Dialogue between Vice Premier Ma Kai and the Minister of Finance Wolfgang Schäuble) while the newly founded Sino-German Center of Finance and Economics aims to capture a new form of academic exchange as well.

2016 is now a great opportunity to spell out the co-operation and turn it into meaningful and sustainable projects. New achievements in the financial arena such as the integration of the RMB in the SDR basket, reform of the IPO framework, further liberalization and new, innovative forms of stock cooperation will spur the development of the financial sector and its global orientation.

SDR Decision – Opening the Renminbi Gates

Expect significant inflows into renminbi following the news that it is now a global reserve currency

By JUKKA PIHLMAN*

Following the earlier announcement in November that the renminbi (RMB) meets the International Monetary Fund's (IMF's) criteria as a 'freely usable' currency, the IMF Executive Board has now formally decided to include the RMB in its Special Drawing Rights (SDR) basket of currencies from 1 October next year.

This came as no surprise to those who have followed China's unprecedented steps to open up its capital markets.

A monumental milestone for the RMB, this event will trigger significant and gradual inflows of funds into RMB – changing the global currency landscape forever, as central banks, sovereign wealth funds (SWFs) and multilateral institutions recalibrate their balance sheets.

Many won't wait until next year before taking action – indeed as many as 70 central banks have already invested part of their reserves in RMB, either onshore or offshore.

The reforms made by China to qualify for SDR inclusion have been so radical that – to public sector investors – RMB has become fully convertible with no restrictions on access or size of investment in the China interbank bond market (CIBM), something which has largely gone unnoticed in the focus on China's slowing growth.

Five out of the world's ten largest central banks have so far refrained from investing in CIBM. However, because of China's recent reforms, these and many other public sector investors are now reviewing their stance, and we are likely to see a significant, gradual increase in their investment.

Eventually, we should expect to see RMB reach a double-digit share of global reserves – inflows in the order of USD800 billion to over USD1 trillion – though this will likely take a number of years. Even a conservative estimate of

* Senior Research Fellow of IMI; Managing Director and Head of Central Banks and Sovereign Wealth Funds, Standard Chartered Bank. He previously worked for the IMF and central banks of New Zealand and Finland.

reallocation of about 1 per cent of global reserves each year would mean about USD 80 billion inflows annually – no mean sum.

Added to the moves by central banks there will of course be investment by sovereign wealth funds of some magnitude. Though this is harder to make generalised predictions on, looking at Norway's SWF for example – whose fixed income benchmark is GDP weighted – the allocation to the CIBM could be to the tune of over USD40 billion.

The implementation of RMB's inclusion to the SDR basket 10 months from now will also inevitably trigger a significant rebalancing or hedging demand for RMB, though this, too, is likely to occur gradually.

Against common perception – given that the aggregate SDR holdings/assets of the central banks in the IMF member states (around USD280 billion) have an equal amount of SDR allocations/liabilities – RMB's addition to the SDR basket won't actually trigger a system-wide hedging demand, though some countries that are long or short on SDR may hedge their positions.

Instead, by far the most significant direct effect from the RMB's inclusion on currency flows will come from multilateral institutions.

IMF's own investment account and investment by its Poverty Reduction and Growth Trust would need to be rebalanced to include RMB.

Likewise, institutions such as the Bank of International Settlements, the African Development Bank, the Islamic Development Bank, the Arab Monetary Fund and the International Fund for Agricultural Development have SDR-denominated balance sheets, which will need to be rebalanced.

The World Bank and Asian Development Bank will also be affected as some of their facilities for the world's poorest countries are denominated in SDR. The combined size of these multilateral institutions' affected balance sheets is over USD600 billion, so the resulting RMB flows could be over USD 60 billion.

Private sector investors are yet to enjoy the same unfettered access to RMB investment as their public sector counterparts, but the sheer speed and extent of China's reforms in the past year strongly signals China's intent to accelerate the full opening of its capital account. This may happen a lot faster now than people currently expect.

The 'ifs' and 'buts' for the RMB are over. For those who are yet to formulate an RMB strategy, now is the time.

Working Paper

A General Theory of Macrofinance: Towards a New Paradigm *

By CHEN YULU* and MA YONG**

Purpose - *The Global Financial Crisis of 2008 has triggered a reevaluation on economic theory and policy practice, and both economists and financial analysts are reaching a consensus that the financial system plays an important role in the macroeconomy and that macroeconomic theory must be restructured to incorporate endogenous financial factors.*

Methodology - *Based on a reflection on the inherent flaws of traditional mainstream economics, this paper puts forward a Macrofinance Theory as a new paradigm for macro financial analysis.*

Findings - *The macrofinance paradigm regards the financial system as the core element of a complete and endogenous analytical framework.*

Originality/value - *The objective of macrofinance is to construct a scientific methodology by analyzing the inherent laws of modern financial systems in order to establish a comprehensive theoretical framework that unifies the financial sector with the real economy and combines theory with policy making and implementation.*

Keywords: Macrofinance, Financial system, Real economy

1. Introduction

Since the inception of macroeconomics, “theoretical revolutions” have taken place on average every thirty years and dictated the basic development path of modern mainstream macroeconomics. The systematic retrospection on economic theory triggered by the global financial crisis has reflected the fact that the mainstream paradigm has been eroding the rationale of macroeconomic theory and the effectiveness of policy due to an omission of financial factors and the ensuing

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* Chairman of IMI Academic Committee; Deputy Governor of PBoC

** Research Fellow of IMI; China Financial Policy Research Center, School of Finance, Renmin University of China. Corresponding author. Email: mayongmail@ruc.edu.cn

theoretical bias. With the development of the modern financial system, this erosion is becoming ever more severe. When the real world goes through changes, and theories developed based on the old state of affairs are no longer capable of predicting and reflecting such changes, theoretical renovation becomes inevitable. Similarly, changes in our time demand a systematic reconstruction of macroeconomic theories based on endogenous financial factors.

The history of science has proven that when a theory cannot explain the practical world, it usually indicates that a paradigm-shift has become indispensable. After the most recent crisis, although there has been considerable criticism against mainstream macroeconomics for its lack of understanding about finance, the fundamental issue of methodology has again been neglected. For a very long time, many economists have devoted themselves to the refinement of the general equilibrium theory. Such a refinement has been characterised by problems of purely formal logic turning into mathematical minutiae, instead of putting an emphasis on the understanding of real world phenomena and behavior. Many economic theories “go around in circles” in self-fulfilling deductive systems. However, economic cycles and fluctuations are not occasional deviations from the established equilibrium, but rather are rooted in the dynamic interaction of socio-economic processes. New economic and financial theories must follow a methodology that is closer to the real world, only then will it better explain economic phenomena and behavior, and lay a solid foundation for a theoretical framework of macroeconomic stability. Against this background this paper attempts to put forward a macrofinance paradigm on the development of modern financial systems.

The proposal of macrofinance attempts to reevaluate in-depth the existing methodological paradigm that has been dominant for a long time but significantly deviated from the real world. Compared with traditional economic methodology, our theory puts much more emphasis on systematic thinking, a holistic field of vision, developmental perspective and dynamic practice, and its commitment to establishing an analytical framework that aligns logic with facts and theory with practice. Under such a framework, theories of microfinance and macrofinance are no longer isolated from one another, financial development and the real economy receive unified recognition, and a logical link between theory and practice is created in combination of general laws and “national tradition”. Based on this methodology, the theoretical framework of macrofinance will provide an overview of the modern financial system, as well as the underlying logic and theoretical framework to describe it.

2. Mainstream macroeconomics prior to the crisis: the influence of financial

factors is substantially underestimated

For far too long, financial system has been excluded from the analytical framework of mainstream macroeconomics, resulting in a long-term underestimation of the actual influence of the financial system on the macroeconomy, artificially cutting off the interaction and correlation between the two. Under the paradigm of mainstream neoclassical economics, the baseline of the perfect market and the assumption of perfect information have made it possible to circumvent the impact of uncertainty. The optimized decisions made by individuals based on predetermined possibilities automatically lead to market equilibrium. Consequently, general equilibrium theory involves neither the functions of organizations and systems, nor the innovative activities of entrepreneurs (Garrison, 1982). Under such circumstances, the general equilibrium theory, represented by the Arrow-Debreu Paradigm, set up a frictionless perfect market that completely ruled out the value and function of the financial system[1].

Using broader view of economic theory to assess financial factors, we find that although economists occasionally pay their attention to financial factors, such attention or explanations are always beyond the mainstream economic paradigm and lack a comprehensive analytical framework with an appropriate theoretical base. The early Debt-deflation theory believes that deflation during a depression would shift wealth from debtors to creditors. Shrinking net wealth of debtors would further dampen investment and consumption, leading to ongoing deterioration caused by economic depression (Fisher, 1933). In his General Theory, Keynes believed that financial factors are an assignable source of economic depression. However, he puts the analytical emphasis on investor's confidence. Keynes' successors emphasized "liquidity preference", but their analysis was similarly focused on money rather than credit. Grurly and Shaw are among the earliest to highlight the function of financial intermediaries. They believed that the intermediary function of the financial system lies mainly in facilitating the flow of loanable funds which causes enhanced economic efficiency (1955) [2]. Grurly and Shaw clearly identified the function of the financial system and banks in channeling loans and proposed ideas that were different from the Arrow-Debreu Paradigm. However, before the full blossoming of the new theories of Grurly and Shaw, the M & M Theorem (Modigliani and Miller, 1958), which is based on the Arrow-Debreu Paradigm, made a comeback. Employing mathematical models, it proves the lack of correlation between economic and financial decisions under perfect market hypothesis [3]. Due to the extensive presence of M & M Theorem, financial factors gradually disappeared from mainstream economics (Gertler, 1988).

Since the 1960s, neoclassical economics, represented by Monetarism, Rational Expectation Theory and Real Economic Cycle Theory, has become the mainstream of macroeconomics. In dealing with financial factors, the economic theories based on the neoclassical framework usually emphasize the function of money only and draw little attention to the influence of the financial system and financial intermediaries per se. Even when dealing with monetary issues, the emphasis on the function of money was significantly weakened during the development of these economic models. Friedman and Schwartz, as the representatives of monetarism, believed two difficulties that banks encounter in their operation have accelerated economic depressions. The first difficulty is the reduction in the wealth of the shareholders of bank. The second difficulty is the reduction in the money supply (Friedman and Schwartz, 1963). However, this theory suffers from two defects. First, its lack of a theoretical basis provides no explanation of why monetary factors have a long-term and consistently non-neutral effect on the real economy. Secondly, it lacks adequate evidence to attribute the persistent and sharp reduction in output solely to the reduction in the money supply. Since the 1970s, the School of Rational Expectations, represented by Lucas (1972, 1973) and Sargent and Wallace (1975, 1976), became the dominant player in economics. This school, the theoretical basis of which is the monetary misperception theory established by Lucas[4], believes in the “neutrality of expected money”[5] and the “policy-ineffectiveness proposition”. As both core propositions of the rational expectations school lack empirical support, the neoclassical explanation of the instability of total output shifted to “real impact” from the early 1980s. Hence the Real Economic Cycle Theory, represented by Kydland and Prescott (1982), was ushered in. By highlighting the assumption of the neutrality of money, it not only believed money being neutral in the long term, but also assumed its neutrality in the short term as well-known the superneutrality of money[6]. The theory of the superneutrality of money is a full comeback of the Classical Dichotomy. In this approach, all financial factors, including money, have finally faded out of the theoretical framework of mainstream economics.

Economics has been clearly divided into microeconomics and macroeconomics since the publication of Keynes’ General Theory in 1936. On the one hand, the Walras General Equilibrium in the realm of microeconomics is still the dominant theory although there are the Monopolistic Competition Theory (Chamberlain, 1933) and Incomplete Competition Theory (Robinson, 1933). On the other hand, macroeconomic model based on the Keynesian IS-L Model is believed to lack a micro basis, the same is true in terms of Monetary Theory. In search for a micro basis, macroeconomic research is increasingly inclined toward neoclassical

economics. Since the 1960s, neoclassical theories have played a significant role in macroeconomics, at least in terms of methodology. As such, we can see that the development of theoretical economics clearly demonstrates how financial factors faded from mainstream macroeconomics, from the “long-term neutrality of money” proposed by the early monetarists, to the “neutrality of expected money” proposed by the school of rational expectations, and finally to the superneutrality of money set forth by the school of Real Economic Cycles.

However, the neglect of financial factors in mainstream economics based on the neoclassical framework is not because the financial system plays an insignificant role in the operation of the economy, but because it is difficult to combine financial (monetary) theories with theories of value. Within the neoclassical framework, the major obstacle for macroeconomics to include financial factors lies in the difficulty in providing a rational micro basis for financial (monetary) theory. Neoclassical macroeconomics has never satisfactorily answered this question[7]. From the viewpoint of methodology, the neoclassical model represented by the M & M theorem has gained so much popularity not only because of the “beautiful form” of its mathematical deductions, but also because of its elimination of the difficulty in modeling by simply excluding difficult financial factors. This is a deep-rooted methodological reason for the popularity of such financial factor-deprived models. Based on the M & M Theorem, both the neoclassical Investment Theory (Hall and Jorgenson, 1967) and the Stochastic Competitive Equilibrium Growth Model (Brock and Mirman, 1972) excluded financial factors in their modeling. Such a financial factor-deprived concept of modeling had dominated mainstream economic theory in the 1960s. The revolution in macroeconomic methodologies in the 1970s further strengthened this trend. As a result, financial factors have withdrawn from consideration of eminent economists performing theoretical modeling and empirical analysis.

Although financial factors have been dismissed from the theoretical frameworks of mainstream economics, the impact of financial systems on the macroeconomy remains evident. Especially since the 1970s, with the establishment and development of the modern financial system, financial factors start to play an increasingly important role in the economy, and the correlation between the financial and the real economy began to draw the attention of some economists. By stressing the imperfection of capital markets, Tobin (1975) pointed out that the Debt-deflation” Theory (Fisher, 1933) was a natural complement to Keynes’ theory of income determination. Minsky (1975) and Kindleberger (1978) discussed the damage of financial instability and financial crises on the real economy from the perspective of

the capitalist economic system and financial history. On the view of monetarist, Bernanke (1983) believed that a change in the money supply was not sufficient in explaining the Great Depression and that the paralysis of the financial system was an important cause for sustained deep recession[8]. Entering the 1990s, ever-evolving financial innovation served as fertile soil for the development of financial theory. Merton (1995) and Levine (1997) reviewed the function and importance of the financial system under uncertainty. They pointed out that the presence of financial markets and financial intermediaries would not only facilitate the allocation of resources, but also improve social welfare by improving risk sharing and reducing transaction costs. Allen and Gale (2000) compared the strengths and weaknesses of financial intermediaries and financial markets in promoting a shift from savings to investments, facilitating transactions, implementing joint control, improving risk management, acquiring investment information, and allocating resources. They further expanded the theoretical assumption of the function of the financial system, giving rise to the “Comparative Financial Systems Theory”. Researches in the correlation between the financial cycle and the economic cycle have been lagging behind. The most prominent studies are the Financial and Economic Cycle Theory (Bernanke, Gertler and Gilchrist, 1999) and the Credit Cycle Theory (Kiyotaki and Moore 1997). These two approaches attempt to include financial factors into the framework of mainstream economics. However, with a closer look into them, one may find that the Financial and Economic Cycle Theory is based on the financial accelerator effect and the Credit Cycle Theory on the restraint effect of mortgage credit. Both focus on analysis of financial constraints caused by information asymmetry. Credit and financial frictions are considered to be results from adverse selection and moral hazard under asymmetric information. These two theories offer no clear explanations on the key issues such as the endogenous relationship among money, credit and the real economy or dynamic feedback paths. In this sense they cannot offer convincing explanations of shocks that originate from the financial system.

In short, under neither mainstream nor alternative paradigms has macroeconomic theory managed to offer a general analytical framework for financial factors in the operation of the economy with consistent logic and a sound theoretical foundation. Until now, most of the studies on the link between finance and the macroeconomy have failed to deliver a comprehensive analysis of financial system. Most analysis of the impact of financial system on macroeconomy is conducted by implanting certain financial frictions into the neoclassical or Keynesian models. However, if mainstream economics only regards financial factors as “frictions” and fails to

include them as a key component of economic system, research on monetary and financial theory can only create “small alterations” and never escape the traditional framework of neoclassical economics[9]. It seems unlikely that macroeconomic theory can make any major breakthrough if the inherent laws of the financial system and the endogenous correlation between the financial system and real economy are not fully comprehended and explored.

3. The macrofinance proposition: three principal elements

Since the 1970s, as the financial system developed and grew more complicated, financial imbalances have taken place periodically, and financial and macroeconomic imbalances have reinforced each other. Such reinforcements sometimes led to frequent, sustained and significant deviation from the long-term economic trend. The breakout of the recent global financial crisis has put the global economic and financial system under severe tension. This once-in-a-century financial crisis has taught us three lessons. First, the feature and function of financial factors in economic development are not yet fully recognized, and financial risks have been underestimated for a long time. Secondly, the development of finance has severely departed from factual economic growth. There is a need for scholars and practitioners to clarify the relationship between finance and the real economy. Thirdly, the traditional economic framework has failed to integrate financial theory at both macro and micro levels.

In this circumstance, a financial theory should be built up with a more holistic, systematic and realistic methodology. The macrofinance defined in this paper is based on the notion of combining macro and micro financial theories. Conceptually this definition originates from the idea that the financial system and the real economy are integral parts of the economic system. The macrofinance paradigm intends to identify and outline the general laws of financial development with a global vision and to analyze the dynamic relationship between financial and economic development from a historical perspective. Based on our initial analysis, we have developed three principal elements of macrofinance, which are elaborated as follows.

The first element of macrofinance is that the financial theory under such framework stresses the integration of macro and micro analysis. Economic and financial phenomena are an integral part of micro activities and macro performance. If cutting the inherent connection between micro and macro finance or regard micro and macro finance as conceptual “opposites”, we face tremendous challenges to make breakthroughs in financial theory and will not be able to effectively explain

real world phenomena. For a long time, there has been a huge gap between the micro financial theories represented by Asset Pricing Model and corporate finance, and the macro financial theories represented by monetary economics and the Credit Cycle Theory. The former focuses only on the behavior and decision-making of individual market players, while the latter attempts to circumvent the interaction between individual market players and tries to establish connections between aggregates. One of the lessons that we have learned from the global financial crisis is that the macro analysis of finance has not really adopted a top-down approach to exploring how changes in macrofinance affect behaviors and decisions of individual market players at the micro level. Micro financial analysis has not adopted a bottom-up approach to analyzing how the behavior of the individual market players may lead to macroeconomic and financial imbalances due to the “fallacy of composition” (Huang, 2010). The fallacy in methodology has become a huge impediment to the development of financial theory. To solve this problem, we would need to regard micro and macro finances as integral parts of a more general framework. Only when we analyze the two aspects cohesively and consistently and establish a sound logical connection between micro behaviors and macro phenomenon, can the financial theory step into a new era.

Secondly, with regard to financial history, macrofinance stresses the unity of finance and the real economy. Finance functions to meet demands of the real economy. However, since its inception financial innovations have become more complicated, and financial activities have deviated from the real economy. Externalities caused by the financial system have become a critical source of systemic risk. Unlike industrial capital, financial capital is not limited to a particular industry or region. It is more homogenous and volatile and has a shorter capital cycle. Because of this feature, financial capital is unique and independent of industrial capital, and the financial cycle frequently deviates from the industrial cycle. With the development of modern financial system, the foundation and conditions for financial operations keep changing, and the value basis of the financial system is also evolving. Financial expansions that deviate from the real economy have proved to be unsustainable and extremely harmful to long term economic stability. Therefore, financial development should be in consistence with the real economy, and economic expansions should be based on accumulation of wealth. In essence, the combination of finance and real economy is also a process of reconstructing the theoretical foundation of finance, because this combination is the key to understand modern financial and economic system. Lastly, with regard to development of finance, macrofinance stresses the combination of general laws of

economics and finance with “national tradition”. The efficacy of a theory depends on both whether it is derived from logical deductions made under general assumptions and whether it is able to explain and guide practice. As a theory of explaining complicated phenomena, finance has to clearly define the applicability and constraints of the general laws it endorses. One general law may lead to totally different outcomes under different contexts. Therefore, when a general law of finance is used to guide the policy practice of a country, it has to take account of specific constraints to the country. The history of global financial development has shown that the formation of financial system is never an isolated process, and the national tradition has profound influence on its financial system. The “national tradition” includes not only resources in a general sense, but also the social, economic and political environments that in historical terms specifically determines the actual choices and development direction of a country’s financial system over the long term. Whether we can combine the general laws of finance with national tradition is the key to the effectiveness of finance in theory and practice. In particular, whether China can develop a new financial management system consistently with its national tradition and the globalization trend under economic globalization and financial integration is the key to the success of China’s global financial vision.

In view of these three principal elements, China should focus on the following three foundations to develop a macrofinance framework:

- The empirical foundation – the methodology must be built upon objective facts and experiences.
- The value foundation – China’s financial development should be in line with the long-term sustainable development of China’s economy.
- The practice foundation – China’s financial development should be based on its own national tradition.

4. Theoretical foundation of macrofinance: reconstructing a scientific methodology

As a bridge between lenders and borrowers, the financial system has long been regarded as a “black box”. Economists draw much more attention to what is happening on the two ends of the bridge, whereas how credit moves and alters within the box is given insufficient attention. Under the framework of mainstream neoclassical economics, the general equilibrium theory, represented by the Arrow-Debreu Paradigm, enables a “frictionless” perfect market with the assumptions of zero transaction costs and perfect information. In this system, the financial sector is of little significance, as it has no impact on the conditions and

processes of market equilibrium. The last few decades of the development of economics witnessed a fade-out of financial factors from the mainstream economics since the M & M Theorem proved that economic decisions made under perfect market conditions are independent of financial judgment. Particularly since a wide application of the Efficient Market Theory, research on economic cycles and volatility has focused on economic factors rather than financial factors. As a result, risk has been systemically underestimated.

In recent years, financial deviations from the real economy have attracted the attention of economists and commentators. People began to complain that unchecked financial expansion had hurt economic growth and social welfare and blame this on regulation loopholes and immoral bankers. However, the long-term deviation of the financial system from the real economy actually reflects the fact that the financial system has its special laws that are different from those of the real economy. With the methodology of mainstream economics, instability is not explained as a special feature of the financial system, and endogenous instability is not regarded as something that must be explained by a renewing theory. Neither Traditional Keynesian Theory nor the Popular Monetarism Theory can explain instability in the macroeconomy and the financial system. In fact, economic performance is so closely related to financial system that only when financial factors are incorporated into the traditional macroeconomics can such a theory serve as a guide to practice (Minsky, 1986). In this sense, instability in the macroeconomy nowadays can be attributed to the partial understanding of financial laws rather than to greedy Wall Street tycoons or the slow and weak reaction of regulators.

In the past several decades, mainstream economic theories have in a biased manner ignored the importance of financial factors. We rarely come across any systematic analysis of endogenous financial factors in economic literature. This not only causes confusion in understanding the real economy, but also has triggered a crisis in economic theory. Under such circumstances, to sophisticatedly reconstruct macroeconomic theory to include endogenous financial factors has become urgent. If we look at macroeconomic development from a historical perspective, the next 10 or 20 years would be a critical period for another revolution in macroeconomic theory. The Great Depression in the 1930s gave rise to Keynesian theory. The “stagflation” in the 1970s and 1980s prompted advancement of neoclassical economics (including monetarism, the Rational Expectations Theory and the Real Economic Cycle Theory). Most recently, the global financial crisis has brought on calls for macroeconomic theory to incorporate financial factors. Macroeconomic “revolutions” have occurred every 30 years or so. This partly reflects a shift in

economic theories over time and partly exposes inadequacies of previous theories in generality and applicability.

In reconstructing a theory, its relevance to practice is a foremost consideration for rationality and legitimacy. For an economic theory to be beneficial to sound policy decisions, it must be compatible with reality. However, for mainstream macroeconomics, the economic world it tries to build has never existed. Right now the challenge economists must face is how to transition from unrealistic modeling to theoretical reconstruction with insight and sensitivity. Insight and sensitivity implies that new theories must be universally applicable, aligned with the real world, and have explanatory and predictive power. They should not only be able to explain historical events, but also be predictive of current development and future trend. Only a scientific economic methodology derived from the real world can support a universal and living analytical framework. The three principal elements of macrofinance are proposed on the basis of this retrospection on the mainstream economic methodology. The objective of macrofinance is to return to scientific economic methodology by analyzing the inherent laws of modern financial system and set up a comprehensive theoretical framework to unify finance with the real economy by combining theory and practice.

In general, macrofinance tends to provide a distinctive methodology that is able to identify the fundamental notions and principles of economic and financial systems and to offer practical guidance for policy making. In contrast to the traditional economic methodology, macrofinance puts much more emphasis on systematic thinking, a holistic field of vision, far-reaching perspective, dynamic practice, and its commitment to establishing a analytical framework that aligns logic with facts and theories with practice. Under such a framework, theories about microfinance and macrofinance are no longer isolated from one another, finance and the real economy along with internal and external financial development receive unified recognition, and a logical linkage between theory and practice is created to combine general laws with “national tradition”. Based on such a methodology, the theoretical framework of macrofinance will provide an overview of the contemporary financial system, as well as the underlying logic and theoretical framework used to create describe it.

5. Modern financial theories based on “macrofinance”: a new paradigm

In general, the global financial crisis has triggered a re-evaluation on economic theories and policy implementation. An increasing number of economists are reaching a consensus that the financial system plays an imperative role in the macroeconomy and macroeconomic theory and that macroeconomics must be

restructured to incorporate endogenous financial factors. Such restructured theories will become the foundation for the study of macroeconomics and the formulation of macroeconomic (and financial) policies.

In restructuring macroeconomic theory by incorporating endogenous financial factors, we need first of all to examine characteristics and laws of financial system and set up an analytical framework that can clearly outline and describe laws of dictating the operation and evolution of finance. According to the general principle and methodology of macrofinance, such an analytical framework must be based on configuration and development of financial system so that it can summarize and integrate the existing foundation and developmental laws. To do this, we should consider the connections between the real economy and the financial system, as well as central queries about the transmission of economic policy within the real economy and financial system.

Furthermore, every theory has a value orientation that determines the perspective and foundation of analysis. Based on the core elements of macrofinance and function of the financial system in the operation of an economy, financial development aims to promote long term, sustainable and stable economic development by setting up a highly competitive modern financial system. As such, the logical path for establishing a theoretical framework of macrofinance is to analyse factors that affect the financial competitiveness of a country in the long term, draw conclusions about major features and laws of evolution of the financial system, and restructure the theoretical ground of modern financial system.

Evidence has shown that, although there are many factors that could affect the competitiveness of a country's financial system, the history of global economic and financial development has demonstrated that there are three core factors that determine the competitiveness of a nation's financial system, namely efficiency, stability and the ability to contain crises. The first two factors are the pillars of financial competitiveness, while the ability to contain crises determines to what degree a country's financial system can regain efficiency and stability after a crisis strikes. In short, efficiency determines the "vitality" of a financial system. Stability determines its "flexibility". The ability to contain a crisis determines its "resilience". These three complementary factors constitute the "three pillars" of competitiveness of a modern financial system.

5.1 Efficiency

The financial system affects economic output through its impact on resource allocation. The efficiency of a financial system can be evaluated from two aspects. The first aspect is the efficiency of the financial system. The second is whether or

not resource allocation within the financial system can affect economic output. The former is about the transmission mechanism within the financial system, while the latter is about the efficiency realization mechanism. Under the macrofinance framework, the evaluation of the efficiency of a financial system should not be confined to the system itself, but be extended to the correlation between the financial system and the real economy. The key is a profound connection between its micro basis and macro effects. A comprehensive evaluation of efficiency of a country's financial system should include three efficiency - micro efficiency, macro efficiency and synergistic efficiency. Within the realization of financial efficiency, the transition from micro efficiency to macro efficiency is not a process of simple linear aggregation, but relates to the reinforcing, offsetting, or mutating effects caused by various frictions and synergies created during its composition. Only when we correctly understand these nonlinear transmission mechanisms can we set up a link between micro efficiency, based on individuals, and macro efficiency, based on the aggregate. Furthermore, financial systems never work in isolation but are intimately and extensively related to their external environment and policy variables. Development of financial systems in different countries have all shown that the efficiency of a financial system is broadly affected by the economic, political, cultural, and policy environments of a country during the transition from micro foundations to macro effects. Therefore, the efficiency of a financial system depends not only on the mutuality and quality of the financial system itself, but also on the correlation and level of coordination between the financial system and the real economy. In this process, to create the external conditions (policy environment, legal framework, ethics, social and cultural environment, etc.), which can ensure the interaction between the financial system and the real economy, is critical to all countries.

5.2 Stability

Financial stability is the essential premise for the financial system to function, as well as a necessary condition for sustained economic growth. Economic history has shown that financial crises, especially banking crises caused by housing bubbles, incur huge economic and social costs. Since the 1970s, financial crises on the global scale have the following features. (a) Financial innovation is increasingly related to financial crises. (b) Crises frequently occur during financial deregulation and liberalization. (c) Credit expansions and asset pricing bubbles are a major cause of crises. (d) Financial crises are more likely to spread to a global scale. (e) The ability for a country to manage its financial system plays an important role in financial stability. In practice, financial stability is affected by many factors in a complicated

way and is beyond the explanation of any specific factor. Empirical analysis of the major world economies shows that, although economic factors play a critical role in kicking off and intensifying a financial crisis, noneconomic factors, such as political, institutional, and regulatory factors, cannot be overlooked. This implies that we need to adopt a multidimensional perspective when we look back upon financial crises and financial stability. Furthermore, the breakout, spread and expansion of financial crises are inherently related. We need to analyze the crisis from a dynamic prospect. Under the macrofinance framework, our views have to be expanded to include the formation, development, and collapse of bubble economies and financial crises in their entirety in fully examining the linkages between the real economy and the financial system. Understanding the market process is the key to analyzing the formation of bubble economies and financial crises. Through an understanding of the interactions between the financial sector and real economy for price, interest rates and credit during the crisis, can we gain an insight into the process of how bubble economies push towards financial crises and explore how the crises can be detected and prevented.

5.3 Ability to contain crises

Evidence has shown that the ability to contain crises is critical to the stable and efficient operation of financial system in the long term. Only those countries that can successfully fend off financial crises and efficiently cope with financial instability are able to sustain and strengthen the efficiency and stability of their financial system in the long term. Major factors of affecting a country's ability to handle crises include emergency bailout programs during the crises, the effectiveness of intervention measures, the effectiveness of monetary and fiscal policies, early warning mechanisms for crises, the treatment of problematic financial institutions, etc. To deal with the recent crisis, central banks have expanded their balance sheets and tried to ease credit crunches by injecting outside liquidity. However, whether such liquidity injections can boost the economy as expected depends on how such liquidity is utilized. In the modern banking system, the willingness to lend is more crucial than the credit reserves of central banks. During a credit squeeze, what is truly scarce is not money or liquidity, but the real generation of credit along with the expansion of production. In the long run, we should focus on four aspects in strengthening the ability of central banks to handle crises. (a) As the authoritative body, central bank should be granted necessary autonomy and establish a institutional framework balancing between autonomous powers and the constraints of responsibility. (b) In terms of policy targets, central banks should continuously monitor asset price bubbles and credit expansions, and adopt measures when

necessary to strike a balance among price, production, and financial stability. (c) In terms of policy tools, when the interest rate is approaching zero, central banks should launch nontraditional monetary tools on top of traditional measures to cope with all the complications triggered by the crisis. (d) In terms of policy implementation, when the transmission mechanism of traditional monetary policies is interrupted during a crisis, central banks should be able to reconstruct a mechanism for the transmission of clear monetary policy. These aspects will determine the ability of central banks to counter the crisis.

It should be pointed out that the analytical framework of modern financial systems based on the “three pillars” is aimed to explore the basic factors of change in a country’s financial system from the inside. Such an analytical framework offers us a structural view on the financial system. However, to understand the laws of the operation and development of modern financial systems in a more comprehensive manner, it is important to extend our analysis to the interrelationship among the financial system, the real economy, and macroeconomic (financial) policies. Based on this we would be able to formulate the macrofinance framework. In fact, global economic and financial development has demonstrated that the financial system will not only hamper economic sustainability, but also lead to serious asset pricing bubbles and financial crises if it deviates from the real economy. In particular, financial assets will deviate from the real economy and the investment logic will override production logic when the opportunity cost of industrial investments is determined by financial transactions. When financial capital drives out industrial capital and pursues self expansion and self realization, financial risks begin to accumulate in an accelerated manner. Furthermore, under the macrofinance framework, each country will present an optimized financial structure that is consistent with its social and economic development and reflects the unique characteristics of its history and culture. While minimizing financial costs and maximizing financial stability at the same time, the ability to satisfy the economic development in different stages will be the key to an efficient financial structure.

To sum up, the analytical framework of microfinance should logically keep on a process of deconstruction followed by comprehensive theoretical reconstruction, as summarized in Figure I.

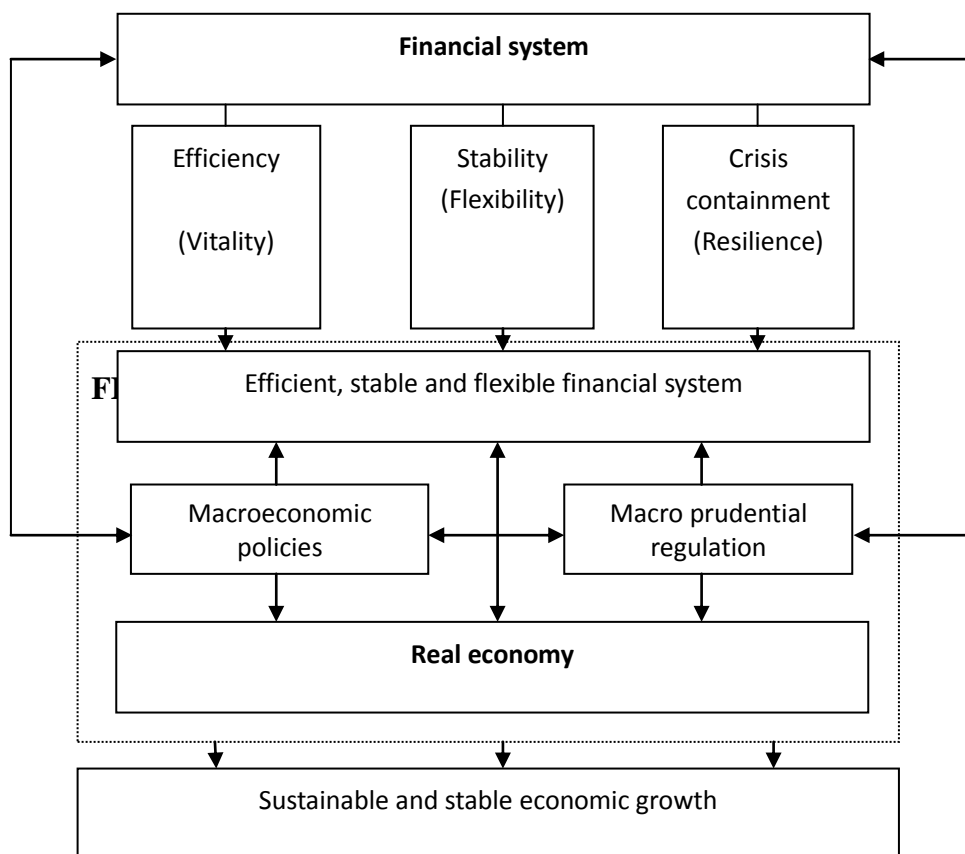


Figure 1. The Basic Framework of Macrofinance

6. Conclusion

As a logical framework to establish links between observable facts, economic theories should be based on empirical facts and must be logically consistent. An economic approach should be laid on three grounds. (a) The empirical foundation – the methodology must be built upon reality and evidence. (b) The behavioral foundation – the methodology must be based on the logic and rules of behavior of the market players. (c) The practice foundation – the methodology must have a clear path to direct theories into practice. The guidelines for the macrofinance methodology are derived from these three principles. On the one hand, we need a plain and unambiguous theoretical framework of including the laws for the development of the global financial system. On the other hand, we need to apply these laws to the economic development and policy making processes of a country.

As a holistic approach, macrofinance offers us a new paradigm to understand and research into the laws of the operation and evolution of modern financial systems. With its depth and breadth, the paradigm not only offers us a bird-eye view over the whole financial system, but also provides a logical track that leads from general theory to practice. As a “projection” of the real world, economic theories carry the basic goal of establishing a logic structure that is consistent with the empirical facts so as to depict the relationships between facts and thus to explain and guide practice. Therefore, the consistency between theory and fact is the premise of a rational and legitimate reform. If an economic theory can appropriately guide policy making, it must be compatible with the real world. The objective of macrofinance is to reconstruct a scientific methodology by analyzing the inherent laws of modern financial systems to set up a theoretical framework that unifies the financial sector with the real economy and combines theory and policy practice.

In summary, the macrofinance approach explores the financial system as a central part of a complete and endogenous analytical framework. Going beyond the visible boundaries of economic phenomenon is the only way to thoroughly understanding it. Instead of confining the view to the fragmental factors, such as money or currency, a comprehensive financial theory must be established through a logical framework. As such, in restructuring a modern financial theory the macrofinance proposition focuses on three pillars (efficiency, stability, and ability to contain crises) and extends them to the endogenous relationship among the financial system, the real economy, and economic policies.

Notes

1. Under the Arrow-Debreu paradigm, however, the allocative efficiency of market is based on a series of unrealistic assumptions such as zero transaction costs, perfect credit, divisibility of assets and contracts and perfect information. These assumptions not only rule out the necessity of existing of financial system as a theoretical premise, but also completely cut off the endogenous connection between the financial system and the real economy. In a perfect market with zero transaction costs, zero credit friction and perfect information, there is no need to allocate resources for information retrieval, research, management supervision and designing contracts to facilitate transactions and improve risk positions, neither is it necessary to have central banks, regulators and other financial systems to restrict the financial market and financial intermediaries.
2. Meanwhile, Grurly and Shaw also believe that with the development of the financial system, the monetary stock will no longer be an accurate measure of credit flow. As such, they put forward the concept of “financial capacity” that not only includes monetary stock but also monetary analogues
3. The M & M Theorem includes several key assumptions of the “perfect market” – efficient market, no tax distortions, no bankruptcy cost for banks, and complete information.

4. Based on the Rational Expectations Theory, there will not be a short-term substitution between unemployment and inflation unless there is monetary misperception, i.e. money is neutral. Essentially, the rational expectations school is against Keynesianism. It has impact on the argument between Keynesianism and monetarism about the function and enforcement of macroeconomic stability policies (or monetary policy). The emergence of the school of rational expectations signifies the further “resurrection” of these conservative ideas. It stresses market completeness and extreme policy ineffectiveness, which effectively strengthens the Friedman theory.

5. i.e. expected money is neutral.

6. The initial real economic cycle theory does not involve the monetary factor. At the beginning, Kydland and Prescott (1982) developed a model that only includes real variables but can be extended to consider nominal variables. However, after they generated the initial model, Kydland and Prescott summarized that since economic cycles can almost be completely explained by real variables, it is unnecessary to introduce the monetary factor (1982). The concept of the superneutrality of money proposed by the real economic cycle theory is significantly different from the perspectives of Keynesianism, monetarism, and neoclassical economics in the late 1970s. The main representatives of such economic schools like Tobin, Friedman, and Lucas all agree that growth in the money supply has real effects and plays an important role in explaining fluctuations in output. As pointed out by Lucas (1996), “at least starting from Hume, the see-sawing battle between the two mutually exclusive views – one believing in the neutrality of money and one believing that the change in the money supply will lead to employment and a change in output in the corresponding direction – have always been the core of monetary theories.”

7. Since the 1980s, neoclassical economics attempted to offer a solution to the longstanding issue of combining monetary theories with value theories. A typical way of combining the two theories is to provide a micro basis for the monetary theories based on the consistency between general equilibrium and optimized individual behavior. Such neoclassical analysis on monetary theories is called “new monetary economics”. There are two ways of research on “new monetary economics”. The first is to combine monetary theories with modern financial theories, or the so called BFH system; it is targeted at the micro basis of Patinkin or Gurley and Shaw’s “new ideas”. The second is the model developed by Sargent, Wallace, Bryant and Lucas, which attempt to take the major issues in macroeconomics and apply them to microeconomic theory, following Hicks’ ideas (1935).

8. Bernanke (1983) believed that financial crises lead to an increased real cost of capital flow between creditors and debtors. When the credit channel is blocked, on the one hand, potential borrowers cannot obtain sufficient funds for investment. On the other hand, lenders have to invest their capital to “less-than-optimal” projects. Besides, due to financial crisis, the credit market cannot effectively spread risk and it is difficult to get finance for indivisible projects. All of these not only hampers the efficiency of capital but also deepens the economic recession. Therefore, different from the M & M Theorem under perfect market assumptions, financial factors play a very important role in explaining the depth and length of economic recessions in times of information asymmetry.

9. Early works have been carried out effectively in this respect. For example, Austrian economists Hayek and Mises analyze the adverse impact of credit market frictions and financial distortions on economy. Such analysis

is based on the adjustment of the market structure and stresses the “non-neutrality” of money and “endogenous” credit. They point out that credit expansion and monetary distortion will bring severe consequences (Hayek, 1933). However, as modern mainstream economics follows the pure mathematical logic paradigm, the methodologies of the Austrian economists have faded out and now appear as “ornaments” in works of a very few number of economists.

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Renminbi Internationalisation: How the World Can Cope

With the Change*

By YUKSEL GORMEZ and BEN SHENGLIN*

After the official announcement from the International Monetary Fund (“IMF”) to include Chinese currency in the calculation of the special drawing rights (“SDR”) with a weight of 10.92 percentage, there seems no way out other than trying our best to understand how Chinese financial markets will respond to this paradigm shift and how international stakeholders will manage the change in their best interests. The global financial governance will never be the same after October 1st, 2016, when the SDR decision takes effect.

Speed of light may be an exaggeration to describe the evolution of renminbi internationalization but it is generally agreed that Chinese currency may have been moving too fast which may further complicate the complexity of managing the change: adaptation to massive changes in such a short time can be challenging not only in China but also internationally. Stakeholders might try their best to analyse pros and cons, though it might not be so easy all times given the risks of unexpected consequences. However there is no other way but to closely follow up latest developments and try as many simulations as possible to envisage probable scenarios about the future directions, analyse its implications and take appropriate actions. (JEL Classification: E5, F6, G2)

1. Introduction

Many countries from Argentina to Finland, from Mexico to Turkey, have been changing a lot when compared in two different periods, be it decades or centuries, though the magnitude of change might be quite different from one to another. Comparatively China is considered the one that has changed most. In every decade

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* Yuksel Gormez, Senior Research Fellow of IMI; Senior Economist, The Central Bank of Turkey, Research and Monetary Policy Department; Ben Shenglin, Professor and Dean, Academy of Internet Finance of Zhejiang University, and Executive Director of International Monetary Institute, Renmin University of China. We would like to thank International Monetary Institute for the initiation of this paper. The views expressed herein are strictly those of the authors and do not necessarily reflect the views of the Central Bank of the Republic of Turkey, Renmin or Zhejiang Universities. The authors alone are responsible for any remaining errors and weaknesses and usual disclaimers apply. Email to correspondent author: yuksel.gormez@tcmb.gov.tr

since 1949, when PRC was founded, China has been experiencing major changes in terms of political and/or economic governance structures. One may recall the periods of *Great Leap Forward* and *Cultural Revolution* as such examples, though the consequences were considered undesirable, to say the least.

The change continued after 1971, when PRC became a full member of The United Nations (“UN”), but its pace accelerated from 1978, when DENG Xiaoping led a paradigm shift with the opening up policies. One may argue that internationalisation of the renminbi (RMB) started from that time. One advantage for China at that time was that compared with all other then socialist countries around the world, barter had never fundamentally been institutionalised in China, with food and other goods of shortage allocated and sold on a quota/coupon-based system. Ultimate barter-based economy would have diminished the concept of value. Keeping the concept of value in the minds of the households and corporates helped a lot to bring the concept of money back into “market action” as soon as China decided to adopt an open door policy in 1978.

If the understanding of the value had been eliminated structurally from the societal life, opening-up wouldn’t have been such a success due to the lack of entrepreneurial skills. Because of the difficulties in the measure of relative prices without the concept of value represented by national money or RMB, corporatisation would have been facing extreme hurdles as well therefore limiting their capacity to change, which is a prerequisite to successfully implement the opening up strategies.

Luckily, China had enough entrepreneurial spirit to adjust to the new realities of doing business from 1978. Foreign investors found both human resource capacities to realise their investment motivations and supportive governments to help them ease their burden for sustainable investor friendly business climate. As a result, technological gap between China and the World narrowed quickly with this recipe of combining China’s business climate conditions and foreign investments. The transformation began on a win-win basis from the very beginning, with both sides gaining by fulfilling each other’s gaps.

Let’s go over some of the turning points of this process that has triggered internationalisation of RMB from 1978. This note will first look at the main stages of this transformation after addressing the importance of money as the ultimate societal agreement for any given society including China. Then, we will investigate and evaluate latest inclusion of RMB into the special drawing rights (SDR) calculations. The note will conclude with some recommendations.

2. Value, money and internationalisation

If there is no exchange among economic agents, there will be no role for money for any given society. In the early stages of life with its primitive form with no social interaction where standard forms of food, shelter and clothing are consumed, the contribution of money was quite limited if not nil. Social interaction supported exchanges first and barter had been upgraded with the invention of money progressively but after many millenniums. It is well documented that money, in the forms of coins, was invented by Lydian's in Minor Asia, which is now Turkey today. Money, in the forms of paper, was invented by Chinese a couple of centuries later. National and international trade increased progressively as well and became more and more sophisticated with the help of so-called Silk Roads. Marine transportation and railway technologies supported that trend even further. However one thing did not change much: the need for a standard, reliable `value` measurement, a common numeraire and a common understanding of value. From this perspective, *money may be called as the most critical societal agreement* within a nation or within a region. This can easily be put into the right context with a simple analogy to be the answer of the question of why we need money in the first place:

“If there are n commodities, there are at least $(n(n-1))/2$ separate values. The number of bilateral exchange ratios (prices) rises quickly. With $n = 100$ commodities, there are at least 4950 prices to know. At $n = 500$, the number is 124,750, and with 1000 commodities there are at least 499,500 prices. Without a unit of account, trade would be very limited by costs of information. Use of a unit of account to express value reduces the number of prices from $(n*(n-1)/2)$ to n .” (Meltzer, 1999).

Money survives under extreme conditions because of this very simple arithmetic. Whenever there are social interaction and exchanges among people, then there will be demand for a common numeraire for the simplification of exchanges. It was cigarettes during the German hyperinflation periods or it can be sea shells in the oceanic way of life. In one form or another, money emerges to simplify trade and goods and service exchanges among economic units.

Money in fiat form had actually been tested before in the early centuries but somehow all those experiments had failed in one way or another. Commodity standard became the common practice for many centuries. But, after the collapse of Bretton-Woods system, fiat money became the new norm in one way or another. All the major currencies that are being exchanged and traded today are the same type of `I Owe You` promissory notes, without the backing of gold or another commodity. When a paper or coin currency is delivered to the exchequer or to the central bank, all a holder will get is a `brand new` paper or coin form, a promissory note

representative of value.

This is also true for all the current SDR member currencies, namely American dollar (USD), euro (EUR), British pound sterling (GBP) and Japanese yen (JPY). In the foreseeable future, fiat money may survive without much challenge. In fiat form, money creation can go to infinity opposite to commodity based money norms. As a result, monetary policy is more of an art than science under fiat money form.

China's Stable Renminbi

The history of opening up in China may be called as *re-monetization of the economy*. To make the point clearer, partial coupon-based production and distributions models may be re-called. Accounting of communal production, distribution and consumption processes had never been left out in the Chinese governance structure, therefore rapid adaptation to the opening up was supported by the institutional capacity and human resource capacity of the Chinese society in terms of keeping records of all economic activities, be it distribution or production or consumption. Value survived to support accounting procedures, and as a measurement of value, money had never been taken out of sight institutionally. Once full-monetisation (that is “market-based reforms”) was decided after the opening up, the necessary infrastructure was already there to support the reforms and transformation. One may question why we focused so much on this argument, but the virtual non-existence of high and volatile inflation or hyperinflation in the process of China's economic re-structuring from 1978 provided the strongest support for this argument. Money has categorically or institutionally used differently in China opposite to many other emerging countries in Latin America, Africa or Eastern Europe. Printing money in the form of short-term advances to the Treasury to pay public servants salaries has never been a common practice in China. Neither money printing for project financing nor non-cash borrowing practices to help support unsustainable public investment were being utilised extensively as a resilient monetary or economic policy tool in China from the early stages of the reform process.

This probably should be taken as just another reason why transformation of Chinese economy has been an unprecedented success whereas many other trials around the world (by other emerging countries and regions) failed to come anywhere close to that success. Inflating money to create sustainable money illusion was also never a common practice as well. This has helped keep the value of renminbi as one of the most stable among emerging countries. It is noteworthy that inflation in China was NOT shaped mostly by exchange rate pass-through and its related spill-over effects whereas this was among the hottest topics during the Eastern Europe, when

they transitioned from planned to market economies, be it Romania or Hungary. From that perspective, it may have argued that awareness of value (because of the institutional capacity of the Chinese economy even under extreme communal based dynamics) was one of the main reasons for the extremely successful re-monetisation of the economy. With this capacity, renminbi first became a very stable currency to serve all the main functions of money without creating many issues that have always been very visible in many emerging economies all around the world. Institutional capacity of “value awareness” in China helped design, develop and implement a very successful monetary regime to best serve economic growth. Renminbi’s positioning of its primary role as the main oil for the sustainable growth engine will attract heightened research interest in the future, as a broad effort to understand why China has been so successful when many failed.

Emergence (and making) of renminbi as a safe and sound currency has helped, more than many perceived, in terms of the role of money during the transformation of the Chinese economy. Once money is well designed at national level and value is represented with money in fiat form, production, distribution and consumption of goods and services become more efficient compared to barter models due to the simple arithmetic that was explained earlier. China benefited from the survival of the concept of value during the difficult decades and it was much easier to re-monetise the economy after the opening up decision. Non-inflationary renminbi with its stable value to hard currencies supported successful re-structuring without damaging corporate China’s balance sheets and without creating distortions on fiscal policy to lead typical issues such as *original sin* that has been quite destructive for many other emerging countries. Financial system was transformed successfully as well with the help of stable, safe and sound RMB: NO systemic collapse of banking system during the transition period.

3. Chinese transformation: the RMB perspective

Economic transition in China is sometimes called a great success. The term “success” may be considered insufficient to describe what really happened in China. Even the term “beyond success” such as `miracle` may not be enough: miracles may happen in more than one place and more than one time. It is the argument of this paper that the massive change in the Chinese economy can best be described as a `magic`, because a magic is once and for all. It cannot be done second time, other than re-doing it endlessly in its fixed processes. Also, a real magic can only be performed by one person. As soon as others can learn it, it loses its “magic-ness” and becomes a standard show. It requires a certain level of human resource capacity

with advanced analytical and technological capabilities. It is not a chance but a direct result of hard work, strong planning with optimal use of resources. Chinese re-structuring is a case where `magic` describes best. Whatever happened since 1978 in China will never happen anywhere else around the world including China. It was one-off. It will be the argument of this paper that renminbi played an unprecedented role in this magic transformation.

To make the point clearer, we may compare how countries in transition in Eastern Europe transformed their economies from mono-banks to market based financial service provision. Without getting into details, it may be argued that European transition from command to market economy was too fast and without proper planning. Ownership transfers were mostly realised by distributing coupons of the state-owned enterprises into households without providing much corporatisation capacity. Departing from the old models of Soviet distribution channels and creating a national currency was not well designed and planned as well. Initial high and volatile inflation was a main common aspect of the malaise of transition. Most of those national currencies failed to create credibility as they lost once and burdened by all the side effects of *original sin* phenomenon. Some of them have been and are still trying to rely on currency board arrangements to support macroeconomic stability. As the change in this part of the world was (too) fast and furious, it was almost impossible to manage the transformation optimally and the end outcome is that after so many years, many countries in the region still lack a potential growth rate anywhere close to five percent for one reason or another.

The Chinese story has been quite different from that. First of all, right from the beginning, the transformation was experimental with principles. One of the principles was to confirm the truth with actual outcomes as it is mostly phrased as *finding the truth from the facts*. This principle prevented major policy mistakes as decisions were taken partially first and after being tested with positive findings, then national launch was taken as timely. Second principle was the *sequential characteristics of the reform process*. This one may best be rephrased as “*feeling the stones when crossing the river*”. It also means progressive decision making with a step-by-step option. Any decision becomes reversible in this strategy as soon as it becomes clear from the mission that it is not reaching the intended target. Instead of “wholesale decision-making” that covers all everywhere without no going back, “*retail*” decisions were being taken to wait for the national roll-outs after *confirming the expected results from the partial outcomes*. One of the best examples of this strategy is to create special economic zones to open up the economy for global trade and investment such as Shenzhen area. A small fishing village,

Shenzhen was assigned the task for attracting foreign direct investment to create jobs for millions and to bring technical capacity and capital that was much needed to trigger growth in China. The model became so successful that additional special zones were declared one by one. During that experiment, China gained a very unique capacity to administer rapid growth and to manage changes, which, with a risk of unexpected consequences, have been almost fully controlled.

While the discussion topic here is more on RMB instead of industrialisation, it is worth pointing out that these *special economic zones were also responsible for rapid monetisation of the economy*. Without a well-functioning financial or banking system, sustainable growth is almost impossible. China could have chosen to open up banking industry to foreign investment and allow foreign banks to capture those industries and support rapid industrialisation similar to the preference of countries in transition in Europe. The side effect of that strategy was being observed during the recent global financial crises when many foreign banks had to limit their funding in those countries because of the banks' (global) capital adequacy problems. Instead, China decided to adapt financial service provision rules to the requirements of global trade and to the requirements of being an open economy. This was the deepening stage of socialism with Chinese characteristics. As corporatisation gained further speed and as private ownership was being allowed more and more progressively, mono-banking governance structure was not sustainable. Lack of oil as the growth engine was becoming more and more obvious. Consequently, fractional reserve banking model that has proven itself as growth friendly in many developed countries for many centuries was designed and developed in China intentionally, leaving behind the non-dynamic mono-banking model where one single bank collects all the deposits, allocates all the credits and manages all the finances of households, corporates and state.

People's Bank of China was at the centre of change in the middle of 1980s. This period may best be recalled as the period to design the basis of a modern financial system to serve the rapid development that has already been going on contemporaneously. First of all, the roles of central banking, commercial and investment banking were separated. This was a functional separation to bring the rules of socialism with Chinese characteristics into the financial service provision. Again, it was following the main principles of "*sequential tactics*". For example, private or foreign banks were not being licenced in advance systemically. It was an intentional choice to avoid complicated financial deepening that will lead in front of the macroeconomic capacity and to lead for a financial crisis because of the lack of financial risk awareness and lack of human resource capacity to avoid that sort of

financial risks. More than that, there were serious bottlenecks on the financial service provision technologies such as online real-time gross wholesale settlement system. In those years, there were absolutely a lot for China to learn, to design, to develop and to manage in terms of financial infrastructure. At the same time, with the success of opening up, private capital formation was accelerating, creating demand for more financial products beyond typical depository or credit facilities. However, there was no intention to liberalise financial market during that decade because there was no real financial market at that stage, be it money market, foreign exchange market or bond market.

After the grand design of the financial service provision in the middle of 1980s characterized by the division of the mono-bank or the PBoC into different financial institutions in accordance with their functions, the next decade followed a similar logic, characterized as a *decade of the development of payment and markets infrastructures* for sustainable finance. From online real time wholesale gross settlement systems to credit and debit cards payment models, from custodian systems for government bonds to custodian systems for corporate bonds, many projects were jointly or separately designed and developed. During the same period, elements of further financial liberalisation were integrated into the system progressively. One example was the participation of foreign banks into the national market and the other one was the private licences being allocated to local investors.

After re-designing a modern financial system model in 1980's and investing in financial infrastructure in 1990's, China moved to design, develop and operate markets and bring more sophisticated financial products. *2001, when China became a member of World Trade Organisation ("WTO"), may best considered as the start of marketisation in terms of financial deepening.* Non-bank financial institutions were emerging in this period as well. From insurance to leasing to factoring, more specialized financial institutions joined the sector. Money and foreign exchange markets were emerging at the national level as well. One opportunity at this stage was utilised successfully: Privatisations. Proceedings were used to eliminate emerging non-performing loans and banking re-structuring was practised to create an institutional capacity to develop resolution models. Asset management companies emerged during this period.

There was one story on the central banking front as well. Unique development strategy of China by totally relying on national resources to support rapid growth with the structures of the open economy rules led to a massive accumulation of foreign exchange reserves. PBoC had to learn, as a consequence, how to manage reserves. Massive learning followed on how to work with global banks as agents,

how to use reserves optimally in order to prevent losses and how to increase returns without aiming for profit maximisation. That learning allowed designing and developing wealth management and investment companies to increase the return on reserves. In order to manage the excess liquidity injected to buy hard currencies, PBoC also learned to issue short term bills.

It was the time to develop bond markets at this stage. Emergence of bond markets in China was a bit complicated because of the uniqueness of the Chinese economy: China did not originate rapid growth with external or internal borrowing. The needed capital and initial capital formation was being utilised with foreign direct investment that did not create external debt. Corporatisation in China also did not start with massive borrowing opportunities. More than that, Chinese fiscal policy has never faced massive hurdles that almost all emerging countries faced for centuries: non-ending negative cash balances of the government that leaves a need for almost permanent borrowing to create liquid bond markets with many volatility risks. PBoC took the lead in this reform and supported markets by all means, most of the time leading the way to create organised markets.

The reader may find it confusing how complicated Chinese financial transformation from 1978 up until 2008. For this period, *financial liberalisation had never systemically been a priority, with all deposit and loans rates largely dictated by the government*. Our observations suggest that financial liberalisation and capital account opening-up have been included in the policy agenda after 2008. From the experiences of other countries such as Brazil, Mexico and Turkey, China learned that un-timely financial liberalisation and early currency convertibility without strong institutional framework and capability to manage the associated risks may be a perfect cause of a financial crises or magnify the impact of an unavoidable destructive financial stress. By being conservative for 30 years, China managed to avoid those economic and financial crises. China has applied and perfected its “sequencing strategy” in other areas as well. Energy sufficiency was just such an example, as China as an emerging economy successfully managed such a massive transition and transformation without any systemic electric shortage or any systemic shortage of any input, with carefully planned and speedy completion of massive infrastructure projects. Massive urbanisation maybe another example of such success¹. More than that China managed to avoid spill-overs from both the Asian

¹Environmental issues will be out of the scope of this paper but it is worth taking a note that an economic transformation in the size of Chinese scale couldn't have been realized without any unexpected consequences. Pollution of water, air and land seems the main side effect and needs appropriate solutions by using all the available resources of green development supported by green finance from green banks to green bonds and green insurance.

financial crises just before the millennium and the global financial crises from 2008.

The current stage of financial sector transformation of China may best be described as financial liberalisation and capital account opening up. Both have been going through hand in hand. New markets such as gold market in Shanghai have emerged, new products in the futures and options have been developed, along with this comes *the inevitable financial volatility*. Two years ago, there was a very strong lack of liquidity where money market interest rates jumped into double digits. While it was nothing compared to triple or even five digit interest rates in other counties, it was such a big development in China as both deposit and credit rates were de-regulated gradually and smoothly. 2015 may also be recorded as the end of one-side bets on the value of renminbi. During summer times, there was even a very sharp correction on the RMB forex rates in terms of other currencies. The role of markets in deposit and credit interest rates and in the value determination of RMB has been increasing progressively for quite a while.

As a timely appreciation and encouragement of China's effort to transform its financial sector, the IMF took the decision to include RMB in its SDR calculation from Oct 2016, the implications of which will be the focus of next section.

4. RMB as a SDR currency and implications

As of 1 October 2016, the RMB will have a weight of 10.92% in the SDR valuation basket, which is currently composed of USD, EUR, JPY and GBP. This will be the biggest re-structuring of the SDR calculation since 1980 when 19 currencies used for calculations were reduced to five and in 1999 to four after the French franc and Deutsche mark were merged under EUR.

How will the weight for the RMB be compensated for the SDR inclusion? The answer will be by cutting the other currencies' weights as follows:

- The USD weight will be reduced to 41.73% from 41.90%
- The EUR weight will decline to 30.93% from 37.40%
- The JPY weight will be cut to 8.33% from 9.40%
- The GBP weight will be trimmed from 8.09% from 11.30%.

One interesting note is that there were adjustments to the latest calculation methodologies. Old models provided an implied weight of roughly 14 percentages for RMB. Nevertheless this is a very important stage for RMB internationalisation, for which there is more than one reason:

First of all, SDR inclusion is a continuation and confirmation of China's successful (re)integration into the global community, with various milestones such

as joining UN in 1971, opening-up in 1978, and WTO membership in 2001.

Secondly, RMB will be the only “emerging market currency” in the SDR calculation. All the other four currencies represent developed economies.

Thirdly, RMB inclusion in the SDR calculation is part of the global effort to transform the currently out-dated international financial system in order to be more reflective and representative of the changing world economic order.

Fourthly, it is a milestone on the so-called internationalisation of the RMB. Now, it is official that RMB is a global currency not only de facto but de jure as well, freely useable in not just trade, but also in official reserves, official foreign currency assets, international banking liabilities, international debt securities outstanding, issuance of international debt securities, trade finance including letters of credit, cross border payments and currency composition of the global foreign exchange market turnover.

After more than three decades of growth, becoming the factory of the world and the biggest trading nation, China now sees its national currency taking another important step to shoulder further responsibilities in global financial governance. However the future will absolutely be full of new challenges, with one inevitable phenomenon of heightened currency volatility in the following years, the history of `one-way` bet on RMB is behind us and price fluctuations will be going in either direction. Moreover, economic activity in China will be exposed to more foreign exchange rate risk. The risk here might be to either exaggerate or underestimate the magnitude of the change. We do not expect that as soon as RMB is included in the SDR valuation almost all the central banks of the world will start collecting or creating RMB positions or they will convert much of their reserves from other hard currencies into RMB. Equally we do not anticipate that households in Latin America or in Africa will start opening RMB accounts in their countries in the foreseeable future. Renminbisation may not come around in such a short period of time because of many reasons including habitual stickiness as well. Consequently, the real implication will not be a rapid or fast renminbisation of global financial system but it will be a gradual, step-by-step and sequential change to experience annual gains for RMB in all measurements from official reserves share to official foreign currency assets, from international banking liabilities to international debt securities outstanding, from issuance of international debt securities to trade finance including letters of credit and finally from cross border payments to currency composition of the global foreign exchange market turnover.

In some corners of the world there is hype that RMB is about to challenge USD dominance in many aspects. This is simply not a realistic scenario, at least not for

the foreseeable future. First of all, USD became the hegemonic currency of the World almost many more decades after the American economy became the biggest. The GBP served the global financial markets and funded global trade satisfactorily. To be more precise: the American (US) economy surpassed the British in size in 1872 (In real terms - 1990 International Geary-Kamis dollars). On the other hand, US exports did not surpass the UK exports until 1915. The development of the American financial system stayed behind, lacking the financial deepening, an example of which is that US did not establish a central bank until 1913 and relied on gold standard for financial and monetary stability. During the years following 1914 with the WWI, the US changed position from net debtor to net creditor. At the same time, the UK moved in the opposite direction (Chinn and Frankel, 2008). It has been generally accepted that the hegemony of the USD did not take place (over GBP) until around the middle of the 20th century, though Eichengreen & Flandreau (2009) and Chitu, Eichengreen & Mehl (2012) believed that it was much earlier: 1930s or as early as 1929.

From this perspective, it will be premature to argue that RMB will soon assume the current role of the USD in the global financial architecture. Size of the economy, sticky habits or traditions aside, USD's global payment and custody infrastructure has been functioning quite efficiently compared even to gold standard periods in the last four or five decades where rapid expansion of global trade and global financial deepening has been going on. As long as the USD keeps doing a good job to defend safety, stability and credibility, then there might be less demand a change. There might mean less space for a competitor, be it RMB or EUR. If we may call this as "pull and push" factor dynamics, any challenge to USD should have two dimensions at least. On one hand, USD should be losing its efficiency and effectiveness in serving the nation at home and addressing the needs of global finance in terms of trade and investment and financial innovation. On the other hand, other currencies from EUR to RMB should be doing a better job not only at home but also globally to fulfil the gap somehow. From this simplification, RMB may still be in the very early stages of such a competition because it needs to prove itself not only as a reliable, effective and efficient currency at home but also get mature enough to create a real alternative for global payments, trade finance, savings and all the rest of the demand of global finance, from pension funds to sovereign wealth funds to infrastructure finance.

Arguably, RMB has been moving in the right direction by becoming more and more international. There will surely be more space in the global financial architecture for the RMB as we have the so-called global imbalances. Current

structure seems imperfect enough that the saving surpluses of the world go into the places where external savings are demanded most with structural saving deficits. There especially seems to be a massive deficit in terms of global infrastructure project finance. Consequently, RMB does not need to challenge the hegemonic position of the USD as far as USD keeps doing a good job. The alternative could be to try to fulfil the current gaps where the USD or other currencies do not manage to perform as well as they perform in other areas. RMB seems to have enough capacity and credibility to fill those gaps, be it infrastructure finance or financing mega engineering projects to upgrade aging structures.

5. Conclusions and recommendations

China has been gradually and consistently expanding its position in the global economy since 1971 when the country took a UN position. From 1978, when the opening-up became the national priority, the magnitude of globalisation has been increasing in every decade. In particular, after joining WTO in 2001, China became an even more “mercantilist” economy that has benefited from globalisation most, continuing its uninterrupted impressive growth for three decades, without much disruptive volatility in terms of inflation or foreign exchange rates. With the largest foreign exchange reserve and insignificant amount of external debt, China has recently embarked on liberalising financial markets and currency convertibility. The process is not complete yet and it will not be surprising to see just another step in the right direction to bring Chinese economy in the territories of a fully open economy in goods markets as well as in services markets.

Internationalisation of RMB might be seen very slowly in the area of capital account opening up. However, global financial architecture has been evolving at a speed that has never been experienced before in terms of the shift of manufacturing epicentre of the world and in terms of massive reserve accumulation and financial deepening in China in the last three decades. When EUR was launched in 1999, much change has been expected in terms of EUR’s increasing role and USD’s diminishing role. Now RMB has become an ultimate part of global currency architecture and is likely to accelerate the changes. Such a fast change will always be difficult for any generation to adjust and adapt.

Against all odds, RMB will be taken into account on the SDR valuations effective from October 1st, 2016. This will be the moment of de jure convertibility of RMB as well. This decision is a direct consequence of the long discussion whether RMB is a freely useable currency and there is consensus now that it is. From then on, there will surely be more volatility in terms of foreign exchange rate movements in China.

All stakeholders from households to companies to foreign investors to states will be having certain homework to analyse and investigate the long term implications of the valuation inclusion of RMB into the SDR. By this step, China becomes an ultimate part of the global financial transmission mechanism and it becomes almost impossible to understand global dynamics of that transmission without having a certain level of understanding of the Chinese economy. We have observed massive changes with many financial and economic crises since the collapse of Bretton-Woods systems and we have survived by managing many changes effectively and efficiently since then. Now is the time to prove once again that we can absorb the changes that will be brought by the inclusion of RMB into the SDR calculations. This time, change has been coming very fast and we have to handle with care to minimise unexpected consequences with social welfare destruction both in China and in the world economy. Human resource capacity that has been accumulated for many decades now will be our best asset when we face all these challenges.

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The Geographic Distribution of International Currencies and RMB Internationalization *

By HE QING* , IIKKA KORHONEN** , GUO JUNJIE*** and LIU FANGGE****

The paper investigates the determinants of geographical distribution of international currencies in global financial market transactions. We implement a gravity model, in which international currency distribution depends on the characteristics of the source and destination countries. We find that the source country's currency is more likely to be used in the financial market transactions of the destination country if the bilateral trade and capital flows are large or the destination country's economy is the larger of the two. We also find that the level of development of the destination country's financial market and whether the two countries use a common language are important determinants of the currency distribution. In addition, our model suggests that, to be a true international currency, the renminbi should be used more extensively in the financial markets of the US and UK. (JEL Classification: F33; F36; G15)

Keywords: Currency Internationalization; Distribution of Currencies; Gravity Model

1. Introduction

International use of different currencies is one of the key issues in international finance. Yet the reasons for using the currencies of different countries in financial transactions remain somewhat unclear. Since the collapse of Bretton Woods system in the early 1970s, the selection of international currencies has interested academics and policy makers. Kenen (1983) shows that to be an international currency the

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* Research Fellow of IMI; School of Finance & China Financial Policy Research Center, Renmin University of China. We thank Jian Wang and seminar participants at 2014 China International Conference in Finance for their suggestive and helpful comments. This research is supported by the Fundamental Research Funds for the Central Universities, and the Research Funds of Renmin University of China (IMI14&ZD07). Qing He carried out some of this work when he was a visiting researcher at the Bank of Finland's Institute for Economics in Transition (BOFIT). Corresponding author: Qing He, School of Finance, Renmin University of China. Beijing, China. Phone: +86 10 82500500, fax: +86 10 82509260, email: qinghe@ruc.edu.cn.

** BOFIT- Institute for Economics in Transition, Bank of Finland

*** Department of Economics, Indiana University Bloomington

**** Academic Journal Press, Renmin University of China

currency should be able to simultaneously play the roles of store of value, medium of exchange and unit of account. This means that there are several dimensions to consider when assessing the degree to which a currency has the characteristics needed to be used internationally.

The literature on international currencies has typically focused on the roles of invoicing currency for international trade and store of value. For example, Bachetta and Van Wincoop (2005) provide a theoretical analysis of the determinants of countries' currency invoicing share in international trade. Ito and Chinn (2013) empirically investigate the determinants of currency choice for trade invoicing in a cross-country context. Chinn and Frankel (2007, 2008) provide empirical evidence that GDP level, financial development and openness to the rest of the world are crucial for reserve- currency status. However, an international currency, as a vehicle currency, should be traded globally in foreign exchange markets as well. There are very few well- established results on the requirements for a currency to serve as a medium of financial market transactions.

To shed light on this issue, we implement a gravity model¹ to investigate the determinants of currency choice in international financial transactions. More specifically, we address the following two important issues: whether the international currencies differ geographically in their transactions across foreign exchange markets and what currency and country characteristics can explain the transaction pattern of the geographical distribution of international currencies.

Based on a set of data on cross-border foreign exchange transactions, we first provide evidence on the distribution of currencies in international financial transactions. The empirical results show that the gravity model performs well in explaining cross- border transactions of international currencies. We find that bilateral investment and trade between source and destination countries are important determinants of the use of an international currency. International currencies are traded disproportionately in the larger economies². We also find that institutional and cultural factors, such as legal origins and common language, significantly affect the use of international currencies. The use of international currencies in the destination country increases significantly when the destination country implements common law or both the source and destination countries use a common language. Somewhat surprisingly, we find that international transactions with the world's major currencies are not influenced by geographical distance. This result suggests that truly international currencies are weightless, and less subject to the information

¹ The gravity model has been used extensively to explain trade and asset flows between countries.

² We use population and real per capita GDP to proxy economic mass.

asymmetry due to long distance.

We obtain similar results across a wide range of specification tests. Our results remain robust after controlling for the impact of capital account restrictions on the distribution of international currencies by including several measures of financial openness common in the international finance literature. In addition, we find that some country specific factors for currency transactions, e.g. the degree of insider trading and the sophistication of financial markets, are also important factors shaping the geographical distribution of international currency transactions.

We then use the predictions of the model to estimate the expected distribution of the Chinese renminbi (RMB) within the global foreign exchange market. The gap between the predicted and actual distribution of RMB offshore transactions is wide. Although Hong Kong is the leading RMB offshore market, and more than 50% of offshore RMB are traded in this market, our generated prediction is for the expected volume of RMB offshore transactions in the US to be larger than in Hong Kong. As the economic relationships between China and the UK and the EU are gaining in importance, a significant part of RMB transactions should be conducted in these areas. Hence, the establishment of offshore RMB markets in more western countries, including the US, UK and euro area, are important for increasing the international use of RMB.

The remainder of this paper is organized as follows. Section 2 presents a simple model and testable hypotheses. Research design is provided in Section 3. Section 4 describes the data we have collected and provides the summary statistics. Section 5 presents empirical results. In section 6, we provide an estimation of global distribution of RMB transactions and Section 7 concludes.

2. Theory and hypotheses

2.1 The Model

The international use of a currency occurs whenever a national currency performs the function of money outside of the issuing country. One important role of an international currency is to serve for asset denomination and international financial market transactions (Frankel, 2011). Whether and how faster a currency becomes internationally used depends on several key points (Ito and Chinn, 2013). The value of currency should be market-determined, so that investors can construct their own portfolio strategy accordingly. It also needs to be convenient in terms of both time and location for home investors to purchase or sell currency-denominated assets. In this sense, international currencies are actually assets bought by nonresidents, with the particular quantities of each currency depending upon their respective cost and return

characteristics (Dowd and Greenaway, 1993). To investigate factors regarding demand on an international currency, we present a model for international trade in currency assets.

The model is a variant of the asset trade model of Martin and Rey (2004). Consider a two-period model with two countries (A and B respectively). Country A and country B are populated with l_A and l_B risk-averse immobile agents respectively. In the first period, agents in both countries are respectively endowed with n_A and n_B units of good (the numeraire), which they can use to consume or invest in risky assets³. Assets in country A and country B are denominated in their respective currencies. In the second period, there are L equally likely states of nature. The contingent asset return is d if state i occurs, and 0 otherwise. Asset returns are the only sources of consumption in the second period. Shares of assets are traded in both countries' stock markets. It implies that agents can directly develop (invest) a specific asset or buy shares of this asset through stock market.

In the first period, agents buy or sell shares of assets and construct their own portfolio strategy. When they trade assets internationally, they pay a transaction cost⁴. In this case, an agent g_A located in country A pays $(1 + \tau) \mathbf{p}_j \mathbf{s}_{g_A}^j$ to buy a foreign currency asset, where p_j is the price of foreign currency asset and $\mathbf{s}_{g_A}^j$ is the demand of agent g_A for this foreign currency asset. If the asset return is d in second period, the agent g_A receives only $d(1 - \tau)$ per share⁵. Hence, the budget constraint for an agent g_A in country A is:

$$c_{1,g_A} + f(z_{g_A}) + \sum_{\substack{i \in M_A \\ i \in Z_{g_A}}} p_i s_{g_A}^i + \sum_{j \in M_B} (1 + \tau) p_j s_{g_A}^j = n_A + \sum_{k \in Z_{g_A}} p_{g_A}^k \alpha_{g_A}^k \quad (1)$$

Where c_{1,g_A} is consumption of agent g_A in period 1; $f(z_{g_A})$ is the investment cost of assets; i and k denote home currency assets and j denotes foreign ones. The two last terms on the left side are demands for home and foreign currency assets. M_A and M_B denote sets of risky assets developed in country A and country B respectively. Z_{g_A} denotes the set of home currency assets developed by agent g_A . (We denote by m_A , m_B and z_{g_A} the corresponding number of currency assets). Agent g_A only buys assets that are developed by other agents. Hence, there are $(m_A - z_{g_A})$ home currency assets and m_B foreign currency assets that agent g_A can choose. $\mathbf{s}_{g_A}^i$ is agent g_A 's demand for home

³ The assets can be risky projects that agents directly develop or other financial assets.

⁴ International transactions on assets occur a variety of costs, such as exchange-rate transaction costs, bank and security commission, and other information costs.

⁵ The transaction costs for an agent g_B in country B is similar.

currency assets. p_i is the price for home currency assets. On the right-hand side (revenue side), in addition to the endowment n_A , agent g_A can keep a proportion $(1 - \alpha^{g_A^k})$ of each asset $k \in Z_{g_A}$ that he has developed and sell the rest on the market. $\mathbf{p}_{g_A}^k$ is the relative asset price of risky assets developed by agent g_A . The budget constraint for an agent g_B in country B is defined in a symmetric way. The consumption of agent g_A in the second period (c_{2,g_A}) depends on returns of his assets.

$$c_{2,g_A} = ds_{g_A}^i \text{ if state } i \in M_A, i \notin Z_{g_A} \text{ occurs;}$$

$$c_{2,g_A} = d(1 - \tau)s_{g_A}^j \text{ if state } j \in M_B \text{ occurs;}$$

$$c_{2,g_A} = d(1 - \alpha_{g_A}^k) \text{ if state } k \in Z_{g_A} \text{ occurs; } c_{2,g_A} = 0 \text{ otherwise.}$$

Following Martin and Rey (2004), we adopt a linear utility function so that the utility of an agent g_A in country A is as follows:

$$EU_{g_A} = c_{1,g_A}^{1-1/\sigma} + \beta E \left(\frac{c_{2,g_A}^{1-1/\sigma}}{1-1/\sigma} \right) \quad (2)$$

where d is the discount rate and σ is the inverse of the degree of risk aversion ($\sigma > 1$). Give above description of asset returns, the expected utility of agent g_A is:

$$EU_{g_A} = c_{1,g_A} + \frac{D}{1-1/\sigma} \left(\sum_{\substack{i \in M_A \\ i \notin Z_{g_A}}} s_{g_A}^i \right)^{1-1/\sigma} + \frac{D(1-\tau)^{1-1/\sigma}}{1-1/\sigma} \left(\sum_{j \in M_B} s_{g_A}^j \right)^{1-1/\sigma} + \frac{D}{1-1/\sigma} \left(\sum_{k \in Z_{g_A}} (1 - \alpha_{g_A}^k)^{1-1/\sigma} \right) \quad (3)$$

where $D = \beta d^{1-1/\sigma} / L$

Agent g_A maximizes his expected utility by choosing c_{1,g_A} , $\alpha_{g_A}^k$, $s_{g_A}^i$ and $s_{g_A}^j$ under budget constraints (Equation 1). The first order condition for agent g_A 's demand for home currency assets and demand for foreign currency assets are:

$$s_{g_A}^i = p_i^{-\sigma} D^\sigma \text{ } i \in M_A - \{Z_{g_A}\} \quad (4)$$

$$s_{g_A}^j = p_j^{-\sigma} D^\sigma \frac{\phi}{1+\tau} \text{ } j \in M_B \quad (5)$$

Where $\phi = \left(\frac{1-\tau}{1+\tau}\right)^{\sigma-1}$ is a transformation of transaction costs and is less than 1 ($\sigma > 1$)⁶. We omit the notations of the identity of the agents (assets)⁷. Thus, agents (their assets) are identified only by their nationality A or B . The subscript denotes the nationality of purchaser and the superscript denotes the origin of the asset. For example, z_A and z_B are the number of assets developed by each agent in country A and B . The corresponding prices of assets are p_A and p_B respectively. s_A^B is the demand⁸

of an agent in country A for a currency asset of country B , which equals $p_B^{-\sigma} D^{\sigma} \frac{\phi}{1+\tau}$.

As the aggregate value of currency assets in country B is $p_B l_B z_B$ and the total demand of agents in country A for a currency asset of country B is $l_A s_A^B$, the bilateral flows in currency assets (the currency assets of country B bought by agents in country A with transaction costs) is $TC_A^B = p_B l_B z_B l_A s_A^B (1+\tau)$. With the equilibrium condition (the equation for s_A^B), the log of transactions in currency assets from country B to country A is given by following expression.

$$\log(TC_A^B) = \log(p_B l_B z_B) + \log l_A + \log \phi + \sigma \log \frac{d}{p_B L} + \log \frac{\beta^{\sigma}}{d} \quad (6)$$

The first two terms are measures of economic masses of country A and country B (here financial wealth and population). The third term represents transaction cost. The fourth term presents the effects of financial depth (here expected asset returns) and the last term is the constant.

2.2 Testable Hypotheses

Given the idea outlined above, we present several testable hypotheses. First, equation (6) shows that economic masses in both countries are positively related with the cross-border currency transactions. The literature on international currencies also suggests that the size of an economy is positively related to the

⁶ Martin and Rey (2004) show that this parameter measures the extent of market segmentation. Higher transaction cost leads to higher market segmentation and lower ϕ .

⁷ As all agents (assets) in the same country are identical (symmetric), agents of the same nationality are symmetric in the demand for the assets of a given country. The prices of assets of a given country are also identical.

⁸ Thus, the total demand of agents in country A for a currency asset of country B is $l_A s_A^B$.

volume of circulation of its currency. Krugman (1984) argued that the relative economic size of trading partners is crucial for the choice of transactions currencies. We expect that the economic size in both source and destination countries positively influence the use of source country's currency in the destination country.

Next, equation (6) implies that lower international transaction costs lead to higher ϕ and larger bilateral flows in currency assets. Hence, we state some hypotheses about the relationship between transaction costs and international trade in currencies. Tavlas (1997) suggests that transaction costs, such as switching costs and information asymmetries (information costs), are primary considerations for a nonresident to use an international currency. Switching costs from one country to another are reduced when the scale of circulation is large enough (Dowd and Greenaway, 1993). Rey (2001) confirms this hypothesis and finds that international trade increases the circulation of a given domestic currency in destination countries. We expect that the extent of foreign trade of source countries will lead to a greater use of their currencies in the destination countries.

The finance literature has documented that information available to market participants can differ substantially. Gehrig (1993) shows that asymmetric information between domestic and foreign investors can explain home bias in asset holdings. When domestic investors hold assets denominated in foreign currencies, they are usually less informed than the investors in the source country of the currency.

Information asymmetries may be due to some type of "familiarity" effect. Tesar and Werner (1999) suggest that the cost of obtaining information about foreign assets increases with linguistic, institutional and cultural differences. Ghosh and Wolf (2000) find evidence that capital is less likely to flow into Africa and less developed countries in the Western Hemisphere, as these regions are at a large "economic distance" from developed countries. Flandreau and Jobst (2009) show that geographical distance is positively associated with the transaction costs of using the pound. Hattari and Rajan (2011) underline the importance of language and culture for equity flows between countries. We expect that the use of a source country's currency in the destination country increases with similarity of culture and language and decreases with bilateral distance.

Recent literature in information asymmetries has addressed the importance of informal barriers constituted by politics, institutional standards and practices. Bekaert (1995) show that poor information or information frictions, such as political risks, poor accounting standards and poor investor protections are indirect barriers to foreign investors, preventing capital flows into emerging markets. Bergsten (1997)

provides further evidence that social and political stability are important for evaluating assets, as investors can access more relevant information. Flandreau and Jobst (2009) find that democracy, parliamentary control of the executive and rule of law influence the international use of domestic currencies. Based on the above discussion, we expect that the distribution of international currencies in destination countries is positively related to the political stability and legal systems of both the source and destination countries. Finally, the theory suggests that the bilateral flows in currency assets increase in financial depth (see Equation 6). An open and well-developed financial market can efficiently funnel large amounts of capital from savers to borrowers. Furthermore, deep and liquid markets can help to reduce uncertainties due to exchange rate fluctuations and reduce the currency-exchange transaction costs. Empirical results suggest that financial market development and openness of the capital market are crucial for the international use of a country's currency (Chinn and Ito, 2006). Chen and Khan (1997) find that countries with higher capital returns attract the largest flows of capital; hence international currencies are more likely to be traded in such countries. Prasad et al. (2006) show that currencies follow capital movements and thus that the latter influence the patterns of currencies in international transactions. Papaioannou (2009) finds that deep and developed financial markets in destination countries lead to low transaction costs. Along the same lines, Ito and Chinn (2013) suggest that underdeveloped financial markets reduce the desirability of a currency in international transactions. Based on discussion above, we expect that the use of an international currency in destination country increases with bilateral capital flows and with the development of financial markets in destination countries.

3. Research design

Equation (6) is very similar to a “gravity” equation in international trade. Thus, we use an empirical specification similar to those of Rose and Spiegel (2007) and Goldberg and Tille (2008)⁹. We also introduce some other variables that have been suggested to influence the geographic use of international currencies. More specifically, the basic estimating equation takes the following form:

$$Share_{ij} = \beta_0 + \beta_1 X + \beta_2 C + \beta_3 D + \varepsilon_{ij} \quad (7)$$

As we focus on the distribution of currencies in international financial transactions,

⁹ The gravity model explains economic behaviors between two countries as a function of economic mass and distance. Variants of gravity models have been used in the international finance literature, such as Pors and Rey (2005) and Rose and Spiegel (2007).

the dependent variable $Share_{ij}$ is measured as the ratio of financial transactions invoiced in currency i in country j to global financial transactions invoiced in currency i ¹⁰. The vector X includes a series of economic and financial factors of country i and country j that suggested by the theory. Variable $trade_i$ ($trade_j$) is the percentage of bilateral trade between country i and country j in total trade of country i (country j)¹¹. This variable can serve as a proxy for the reliance of a country on bilateral trade with the other country. Using their currencies for transactions or settlements can reduce the transaction costs substantially. $lninvestment_{ij}$ is the natural logarithm of the sum of the cross-border portfolio investments between country i and country j (in millions of dollars)¹², which measures the degree of bilateral capital flows. As Rose and Spiegel (2007) suggest that a well-developed financial market is able to lower transaction costs, and facilitates shifting assets offshore, we include a dummy variable $center_j$, which equals one if country j has an offshore financial center and zero otherwise¹³. Traditional variables that proxy economic mass in a gravity model, e.g. GDP *per capita* and population, are also included.

Vector C includes political and institutional factors that affect the information costs of currency transactions. $civili$ ($civil_j$) is a dummy variable, which equals one if country i (country j) is a civil-law country and zero otherwise¹⁴. La porta et al. (2001) suggests that legal origins have an important impact on financial development and innovation. A civil-law system provides better investor protection. Hence, an international currency should be more extensively used in civil-law countries. Political stability is positively related to the extent of information disclosure, which relates to lower transaction costs. To measure the political stability of county i (ps_i) and country j (ps_j), we use the index developed by Governance Matters *III* from the World Bank database.¹⁵

The vector D_{ii} includes cultural and distance factors. The literature of international trade and finance has suggested the important role of distance. Ghosh and Wolf (1999), studying cross-border asset holdings, provide empirical evidence that information asymmetries increase with distance. De Menil (1999) finds that distance can explain FDI flows among European countries. To capture this effect, we include the variable $lndist_{ij}$, which is the natural logarithm of distance between capitals of

¹⁰ Transactions of currency i in its home country are excluded.

¹¹ $trade_{ij} = (TotalVolume\ between\ i\ and\ j / Total\ trade\ volume\ of\ i)$

¹² According to IMF CPIS data, portfolio investment is defined as cross-border transactions and positions involving debt or equity securities, other than those included in direct investment or reserve assets.

¹³ The criterion for financial center is based on The Global Financial Centre Index. <http://www.longfinance.net>.

¹⁴ For legal origins, we use the dataset from the well-known paper *The Economic Consequences of Legal Origins*, Laport et al. (2008).

¹⁵ Detailed information is available at <http://info.worldbank.org/governance/wgi/index.aspx>.

country i and country j . Language is directly related to the cost of obtaining information (Tesar and Werner, 1995). Hau (2001) finds that German traders perform better than foreign traders when they transact on the German stock market. Hence, we expect that a common language between source (country i) and destination (country j) can alleviate the problem of asymmetric information. $comlang_{ij}$ is a dummy variable that equals one if country i and country j use the same official language and zero otherwise. Detailed definitions of the variables are presented in the Appendix. Following Portes and Rey (2005), we include country fixed effects in our regression analysis to control for the unobserved time-invariant country factors that might influence the distribution of international currencies. Time dummies are included to control for the year fixed effects. Subsequently, we check for robustness by splitting samples and using various specifications. We also examine the impact of capital account restrictions and country specific factors for currency transactions on the distribution of international currencies by including several measures commonly used in the international finance literature. All the empirical results and robustness checks are presented in section 5.

4. Data and summary statistics

We begin by taking advantage of the Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity (hereafter, Triennial Survey). The Triennial Survey is conducted every 3 years and is available on the BIS website. There are 8 years of the panel, 1995-2013. In particular, we use Table 10, which provides a geographic breakdown of the transactions in world major currencies. Thus, we can determine the transaction volume of an international currency in each country's foreign exchange market. For instance, Table 10 reports that, at the end of 2013, the volume of Pound transactions in Germany was 15891 million dollars, while in US it was 134812 million dollars.

Our dataset on the geographic breakdown of transactions covers 26 countries, consistent with the sample size of Triennial Survey in 1995. Although BIS included more countries in the following Surveys, the transaction volume of 26 countries accounts for more than 89% of total transactions¹⁶ in 2013. Following Chinn & Frankel (2008), we select 7 international currencies: US Dollar, British Pound, Euro¹⁷, Japanese Yen, Swiss Franc, Canadian Dollar and Australian Dollar. Hence, our

¹⁶ To maintain a balanced panel, we restrict our sample size to cover 26 countries. To check the robustness, we also allow a varying extent of coverage. Our primary results remain quantitatively unchanged. For the sake of simplicity, these results are not reported, but available upon request.

¹⁷ As the euro did not come into existence until 1999, we proxy euro transactions before 1999, by aggregating the transactions of currencies of euro members as well as the EMS (European Monetary System).

dataset includes 7 source (currency i) and 26 destination (country j) countries. The transaction variable we use in most specifications is the ratio of transactions in currency i (source) in country j (destination) to global transactions in currency i . As we focus on currency transactions outside of a given country, the transactions of currency i in country i are excluded.

Table 1
Distribution Proportion of International Currencies in Destination Countries

Destination Countries	U.S Dollar	Euro	Japanese Yen	British Pound	Swiss Franc	Canadian Dollar	Australian Dollar
United States	-	22.54%	25.22%	38.33%	24.71%	35.54%	20.11%
United Kingdom	40.24%	50.61%	40.22%	-	40.53%	37.30%	37.40%
Austria	0.58%	-	0.42%	0.45%	1.39%	0.16%	0.10%
Belgium	1.32%	-	0.60%	2.71%	0.75%	1.27%	0.68%
Denmark	2.17%	2.07%	0.52%	1.70%	3.07%	0.39%	0.27%
France	4.02%	-	2.56%	6.44%	4.44%	2.43%	1.78%
Germany	4.96%	-	2.84%	7.91%	6.86%	1.32%	1.44%
Italy	1.25%	-	0.67%	1.58%	0.76%	0.22%	0.23%
Luxembourg	1.11%	-	0.65%	1.69%	1.18%	0.49%	1.13%
Netherlands	1.79%	-	0.92%	3.42%	2.40%	0.61%	0.54%
Norway	0.76%	0.65%	0.14%	0.54%	0.18%	0.12%	0.31%
Sweden	1.16%	1.67%	0.29%	1.18%	0.71%	0.39%	0.18%
Switzerland	5.93%	7.76%	3.51%	9.45%	-	3.17%	2.37%
Canada	2.73%	1.00%	1.06%	2.40%	1.28%	-	0.91%
Japan	10.66%	4.90%	-	7.48%	1.76%	3.98%	9.41%
Finland	0.23%	-	0.03%	0.22%	0.57%	0.09%	0.02%
Greece	0.18%	-	0.51%	0.17%	0.22%	0.04%	0.05%
Ireland	0.39%	0.70%	0.32%	2.09%	0.23%	0.41%	0.14%
Portugal	0.13%	-	0.08%	0.28%	0.11%	0.04%	0.02%
Spain	0.85%	-	0.23%	1.50%	0.26%	0.14%	0.09%
Australia	4.55%	2.47%	3.49%	5.08%	1.52%	2.50%	-
New Zealand	0.43%	0.08%	0.19%	0.26%	0.05%	0.08%	2.06%
South Africa	0.59%	0.17%	0.11%	0.49%	0.07%	0.03%	0.05%
Bahrain	0.17%	0.13%	0.14%	0.33%	0.15%	0.04%	0.02%
Hong Kong SAR	6.36%	1.66%	6.96%	7.68%	1.94%	2.61%	8.98%
Singapore	8.33%	4.43%	9.20%	9.92%	4.86%	6.63%	12.66%

Note: This table summarizes the average distribution proportion of 7 international currencies in 26 countries and regions, from 1995 to 2013.

"-" means that currency transactions in their home countries are excluded.

$$\text{Distribution proportion in country } i = \frac{\text{Trading volumn in country } i}{\text{Total trading volumn (home country excluded)}}$$

Data Source: BIS Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity (1995, 1998, 2001, 2004, 2007, 2010, 2013)

Summary statistics for the geographic distribution of currency transactions are presented in Table 1. For each international currency, we report the mean geographic currency share across 26 countries or regions over the entire period (1995-2013). The transactions of world major currencies show similar patterns in their global transactions. Most international currencies are traded in countries or regions with global financial centers. e.g. United States, United Kingdom and Hong Kong. For instance, the currency shares of world major currencies traded in the United Kingdom ranges from 37.3% for the Canadian dollar to 50.61 % for the euro. However, currency shares differ substantially across countries and regions. For example, the shares of the British Pound traded in Commonwealth Nations such as Canada (2.4%), Singapore (9.92%) and Hong Kong SAR (7.99%), are much higher than other currencies. This suggests that culture and language may be important for the international use of a currency. We also find that 73% of transactions in Swiss Franc are conducted in the euro area, much higher than other currencies, which suggests that distance may influence the use of international currency.

Table 2 reports summary statistics on country characteristics of both source and destination countries. The mean of $Share_{ij}$ is 0.0433 and the standard deviation is 0.0937, which suggests an uneven distribution of international currencies among different countries and regions. The variable $trade_i$ is the ratio of bilateral trade between country i and country j to the total trade volume of country i (bilateral trade between country j and country i to total trade volume of country j). These indicators reflect the trade concentration between the two countries (Massell, 1970). The higher the trade concentration between two countries, the higher the degree of economic integration. Therefore, it is natural to infer that high trade concentration between two countries is more likely to contribute to the use of country i 's (country j 's) currency if it is an international currency.

Results show that most destination countries have civil-law systems. The political stability of source countries is higher than that of destination countries. This suggests that a country's political stability may be positively related to the international use of its currency. Only a small proportion of countries have a common language. The average of the natural logarithm of distance is 8.14 (about

3484 kilometers), indicating that the bilateral geographic distance may not be an important determinant of the use of an international currency.

Table 2
Summary Statistics

Variables	Mean	Standard Deviation	Minimum	Maximum	Median
$share_{ij}$	0.0433	0.0937	0.0000	0.5536	0.0080
$lninvesetment_{ij}$	9.8342	2.3857	0.0000	14.9060	10.0517
$trade_i$	0.0246	0.0510	0.0000	0.6825	0.0079
$trade_j$	0.0590	0.0940	0.0004	0.6890	0.0259
$lnpop_i$	17.9409	1.3031	15.7605	19.6174	17.9026
$lnpop_j$	16.5309	1.3507	13.1834	19.5646	16.1719
$lngdp_i$	10.8060	0.8935	9.8044	13.1835	10.5588
$lngdp_j$	10.2408	0.5922	8.0130	11.5850	10.2876
$center_j$	0.4723	0.4994	0	1	0
$civil_i$	0.4286	0.4951	0	1	0
$civil_j$	0.6571	0.4749	0	1	1.
ps_i	0.9397	0.3123	0.0496	1.4915	1.0021
ps_j	0.8700	0.5459	-1.2169	1.6681	1.0132
$lndist_{ij}$	8.1562	1.0451	5.2883	9.3599	8.5265
$comlang_{ij}$	0.2866	0.4524	0	1	0

Note: i and j are country indices. $Share_{ij}$ is the ratio of transactions in currency i (source) in country j (destination) to global transactions in currency i . $lninvesetment_{ij}$ is the natural logarithm of the sum of the cross-border portfolio investments between country i and country j (in millions of dollars). $trade_i$ ($trade_j$) is the percentage of bilateral trade between country i and country j in total trade of country i (country j). $lnpop$ is the natural logarithm of population. $lngdp$ is the natural logarithm of population. $civil$ is a dummy variable, which equals one if a country is a civil-law country and zero otherwise. ps is an index of political stability. $comlang_{ij}$ is a dummy variable that equals one if country i and country j use the same official language and zero otherwise. $lndist_{ij}$ is the natural logarithm of distance between capitals of country i and country j . The detailed information of variables are given in the Appendix.

5. Empirical results

5.1. Basic results

Table 3 reports our baseline model for the determinants of geographic distribution of the international currencies. Following Portes and Rey (2005), we estimate this model with country or regional fixed effects. Dummy variables for year-specific

fixed effect are also included. White corrected (heteroskedasticity-consistent) standard errors are reported in parentheses below the coefficient estimates.

Our first specification, which includes the conventional explanation variables of a gravity model, is tabulated in Column (1) of Table 3. The variables that proxy economic mass (bilateral investment, including the countries' foreign equity and debt securities) enter with the expected signs and with very well-determined coefficients.

The bilateral variables indicate that if the source country's (country i) proportion of bilateral trade with destination country (country j) increases by 1 percent, the use of currency i in country j might increase by 0.4 percent. Meanwhile, if the cross-border investment between country i in country j increases 1%, the use of currency i in country j increases 0.67%. It is natural that with an increase in bilateral trade and asset holding, transactions cost by using source country's currency is substantially reduced. This result is consistent with the argument of Prasad et al. (2006) that the currency indeed follows capital flow and other factors.

Other variables for economic mass matter as well. International currencies are more likely to be traded in countries with larger population and GDP per capita. This is natural, as a larger economic mass is associated with a higher demand for international currencies for international transactions and settlements. We include financial variables in the second column of Table 3. The coefficient of $center_j$ is positive and statistically significantly different from zero, indicating that international currencies are disproportionately traded in global financial centers. As global financial centers put few constraints on the cross-border capital flows, and provide various financial products for international investors, the transactions in international currencies naturally tend to be concentrated in global financial centers.

To examine institutional effects, we include legal origin and political and institutional variables in the third column of Table 3. Political stability apparently has no significant effect on the geographic use of international currencies. International currencies are more likely to be traded in the common law countries. As common law countries usually impose few stringent regulations on financial activities, it is natural that the transactions of international currencies are concentrated in these countries.

Following the literature, we add geographical and cultural variables in the fourth column of Table 3. International trade literature has shown that the geographic distance can proxy for informational costs. Surprisingly, we do not find a significant effect of distance on the geographic distribution of international currencies. As international currencies are weightless, they are less subject to informational

asymmetries due to long distance. Interestingly, we find that $comlang_{ij}$ is significantly positive. This indicates that if country i and country j have a common language, country i 's currency is more likely to be traded in country j . As having a common language in two countries indicates their “similarity”, the transaction costs of country i 's currency in country j should be lower. For example, Hong Kong was a colony of the UK, hence, the percentage of British Pound transactions in Hong Kong is much higher than that of other currencies.

Table 3
Determinants of International Currencies Distribution

	(1)	(2)	(3)	(4)
$\ln investment_{ij}$	0.0067*** (0.0025)	0.0058*** (0.0022)	0.0064*** (0.0022)	0.0048*** (0.0018)
$trade_i$	0.4040*** (0.0579)	0.3395*** (0.0587)	0.3308*** (0.0619)	0.2933*** (0.0702)
$trade_j$	0.0306 (0.0247)	0.0263 (0.0223)	0.0259 (0.0221)	0.0251 (0.0215)
$\ln pop_i$	0.0010 (0.0038)	0.0011 (0.0034)	0.0024 (0.0037)	0.0040 (0.0043)
$\ln pop_j$	0.0126** (0.0057)	0.0093* (0.0048)	0.0106** (0.0049)	0.0110*** (0.0041)
$\ln gdp_i$	0.0064 (0.0151)	0.0025 (0.0146)	0.0021 (0.0179)	0.0057 (0.0164)
$\ln gdp_j$	0.0109** (0.0050)	0.0072 (0.0051)	0.0088 (0.0056)	0.0098* (0.0055)
$center_j$		0.0378*** (0.0156)	0.0328*** (0.0162)	0.0323*** (0.0146)
$civil_i$			0.0059 (0.0103)	0.0183 (0.0115)
$civil_j$			-0.0181*** (0.0063)	-0.0180*** (0.0062)
ps_i			0.0101 (0.0105)	0.0100 (0.0124)
ps_j			0.0033 (0.0034)	0.0031 (0.0030)
$\ln dist_{ij}$				-0.0034 (0.0052)
$comlang_{ij}$				0.0305** (0.0129)
Constant	-0.4470** (0.2044)	-0.3204* (0.1884)	-0.3763* (0.2080)	-0.3082* (0.1830)
Observation	923	894	827	800
R-squared	0.3524	0.4603	0.4575	0.4563

Note: This table shows the OLS regression results for basic specification. Dependent variable $Share_{ij}$, which is measured as the ratio of transactions in currency i (source) in country j (destination) to global transactions in currency i . The definition of all other variables are given in the Appendix. Country and time fixed effects are included but not reported. Heteroskedasticity robust standard errors are reported in parentheses. ***, ** and * indicate marginal significance at 1%, 5% and 10% levels.

5.2. Robustness Checks

As euro was introduced to the world financial markets on Jan 1, 1999, transactions in that currency prior to 1999 are proxied by aggregating the transactions of the currencies of euro members as well as the EMS (European Monetary System). However, this aggregation may not be a good proxy for the euro's transaction volume. Moreover, different from other currencies, such as the British Pound and US dollar, the euro is a super-sovereignty currency, which certainly affects its use in global capital markets. We might ask whether our results hold if the euro is not included in our sample.

To check the robustness of our results, we re-estimate the basic specifications of Table 3 by excluding the euro. Results are reported in Table 4. They show that our primary results are robust to this exercise. As a result, it is reasonable to keep the euro transactions in our specifications

Table 4
Robustness Tests: Excluding Euro

	(1)	(2)	(3)	(4)
$\ln\text{investment}_{ij}$	0.0058** (0.0023)	0.0048** (0.0019)	0.0055*** (0.0020)	0.0046*** (0.0017)
trade_i	0.3948*** (0.0569)	0.3273*** (0.0612)	0.3187*** (0.0662)	0.3071*** (0.0722)
trade_j	0.0225 (0.0207)	0.0180 (0.0179)	0.0185 (0.0181)	0.0181 (0.0180)
$\ln\text{pop}_i$	0.0020 (0.0039)	0.0025 (0.0034)	0.0033 (0.0035)	0.0041 (0.0044)
$\ln\text{pop}_j$	0.0127** (0.0060)	0.0099** (0.0049)	0.0111** (0.0051)	0.0100** (0.0041)
$\ln\text{gdp}_i$	0.0011 (0.0120)	0.0052 (0.0114)	-0.0023 (0.0201)	0.0058 (0.0164)
$\ln\text{gdp}_j$	0.0127*** (0.0048)	0.0097** (0.0047)	0.0109** (0.0051)	0.0121** (0.0050)
center_j		0.0357*** (0.0163)	0.0309*** (0.0169)	0.0293*** (0.0146)
civil_i			0.0072 (0.0121)	0.0155 (0.0117)
civil_j			-0.0150** (0.0058)	-0.0139** (0.0054)
ps_i			0.0081 (0.0082)	0.0088 (0.0095)
ps_j			-0.0025 (0.0035)	-0.0019 (0.0030)
$\ln\text{dist}_{ij}$				0.0010 (0.0036)
comlang_{ij}				0.0258* (0.0134)
Constant	-0.4163** (0.2065)	-0.3973** (0.1845)	-0.3670* (0.1913)	-0.4706** (0.2140)
Observation	876	847	784	757
R-squared	0.4951	0.5997	0.5945	0.6089

Note: This table displays the results of subsample OLS regressions (excluding euro). Dependent variable Share_{ij} , which is measured as the ratio of transactions in currency i (source) in country j (destination) to global transactions in currency i . The definition of all other variables are given in the Appendix. Country and time fixed effects are included but not reported. Heteroskedasticity robust standard errors are reported in parentheses. ***, ** and * indicate marginal significance at 1%, 5% and 10% levels.

The literature on international trade usually uses a wide range of dummy variables related with economic exchange between two countries. We therefore introduce these dummy variables into our basic specifications. First, Rose et al (2007) show that countries or regions identified as money launderers are likely to be offshore financial centers. As countries with high tolerance or less strict regulation of money laundering are more likely to attract international capital, international currencies can be readily traded in these countries. We introduce a dummy variable *moneyl*¹⁸, which equals one if these countries or regions are identified as money launderers, zero otherwise. Second, the entry barriers for trade and capital flows vis-a-vis island nations differ substantially from continental nations, which may influence the geographic use of international currencies. We therefore introduce a dummy variable *island*¹⁹, which equals one if the country is an island nation, zero otherwise. This variable also serves as an alternative measure of geographical effects. Third, Portes and Rey (2005) show that geographical adjacency may influence the cross-border equity transactions. As adjacent countries are likely to have similar culture and language, and especially as transportation costs between adjacent countries are much lower, country *i*'s currency is disproportionately used in its adjacent countries. To catch this effect, we include a dummy variable *border*, which equals one if country *i* is adjacent to country *j*, and zero otherwise.

Results are reported in Table 5. The coefficients for our main explanatory variables remain qualitatively unchanged in all specifications. Interestingly, we find that the coefficient of *moneyl_j* is positive and statistically significant different from zero at the 1% confidence level. Consistent with our expectations, countries or regions identified as money launderers are more likely to be involved in international capital flows. We also find that the coefficient of *island_j* is significantly positive, which suggests that international currencies are more likely to be traded in island nations. The coefficient of *border_{ij}* is negative, but not significant in column (3). Consistent with our expectation, currencies are weightless, so that geographic factors are not important determinants of the use of international currencies.

¹⁸ The data is available at: http://www1.oecd.org/fatf/pdf/AR2000_en.pdf.

¹⁹ The data is available at <https://www.cia.gov/library/publications/the-world-factbook/>

Table 5
Robustness Tests: Including More Dummy Variables

	(1)	(2)	(3)
lninvestment _{ij}	0.0055*** (0.0020)	0.0045** (0.0018)	0.0053*** (0.0020)
trade _i	0.3190*** (0.0624)	0.3239*** (0.0608)	0.4041*** (0.0690)
trade _j	0.0238 (0.0210)	0.0231 (0.0186)	0.0242 (0.0212)
lnpop _i	0.0028 (0.0038)	0.0011 (0.0038)	0.0012 (0.0035)
lnpop _j	0.0106** (0.0047)	0.0140** (0.0056)	0.0096** (0.0047)
lngdp _i	-0.0050 (0.0149)	0.0006 (0.0147)	0.0055 (0.0152)
lngdp _j	0.0078 (0.0056)	0.0146** (0.0059)	0.0090 (0.0058)
center _j	0.0369*** (0.0143)	0.0268*** (0.0111)	0.0355*** (0.0142)
money _{1i}	-0.0141* (0.0076)		
money _{1j}	0.0116*** (0.0038)		
island _i		0.0062 (0.0101)	
island _j		0.0392** (0.0154)	
border _{ij}			-0.0581 -0.0372
comlang _{ij}	0.0291*** (0.0103)	0.0233** (0.0097)	0.0310*** (0.0106)
Constant	-0.2967 (0.1821)	-0.4544** (0.2177)	-0.3768* (0.1948)
Observation	878	878	884
R-squared	0.4921	0.5048	0.4968

Note: This table shows the OLS regression results by including more dummy variables. Dependent variable Share_{ij}, which is measured as the ratio of transactions in currency *i* (source) in country *j* (destination) to global transactions in currency *i*. The definition of all other variables are given in the Appendix. Country and time fixed effects are included but not reported. Heteroskedasticity robust standard errors are reported in parentheses. ***, ** and * indicate marginal significance at 1%, 5% and 10% levels.

Ports and Ray (2005) find that the currency block effect is important for the cross-border equity transactions. We include this regional bloc effect in our baseline specifications. More specifically, we construct a dummy variable *continent*, which takes the value of one if the source and destination countries are on the same continent and zero otherwise. Regional integration in Europe has probably affected goods trade and capital flows in this region. We include a dummy variable *euro*, which equals one if the destination country is a member of the euro area and zero otherwise. Most financial transactions are performed in the world's major financial centers. Cities like New York and London have the world's largest foreign exchange markets, and many international currencies are heavily traded in these regions (Mason and Warnock, 2001). We construct variable *fc* which is the rank of the destination country's global foreign exchange trading²⁰.

The results, reported in Table 6, show that the coefficients of our initial explanatory variables remain stable across all specifications. The coefficient of *continent* is negative, but statistically not different from zero, which suggests that the continent effect is negligible in the use of international currencies. As reported in Table 6, the coefficient of *euro* has the expected sign in the regression and is statistically significantly at conventional confidence levels. As countries in Europe tend to use the euro as the medium of exchange or the invoice money more than other international currencies, this reduces the use of other international currencies in the euro area. As expected, the coefficient of *fc* is significantly positive. The world's major financial centers have the largest foreign exchange markets. Hence, international currencies are disproportionately traded in these centers.

²⁰ The rank of each destination country is estimated based on the amount of its annual foreign exchange trading. The data are available at <http://www.bis.org/publ/rpfx13.htm>.

Table 6
Robustness Tests: Other Control Variables

	(1)	(2)	(3)	(4)
lninvestment _{ij}	0.0040*** (0.0014)	0.0051*** (0.0019)	0.0061*** (0.0021)	0.0042*** (0.0016)
trade _i	0.3094*** (0.0999)	0.2923*** (0.0672)	0.4324*** (0.0774)	0.3788*** (0.0972)
trade _j	0.0295 (0.0229)	0.0254 (0.0209)	0.0252 (0.0216)	0.0270 (0.0209)
lnpop _i	0.0050 (0.0039)	0.0029 (0.0037)	0.0033 (0.0043)	0.0048 (0.0033)
lnpop _j	0.0089** (0.0039)	0.0229*** (0.0067)	0.0151** (0.0059)	0.0137*** (0.0051)
lngdp _i	-0.0032 (0.0171)	-0.0033 (0.0192)	0.0014 (0.0207)	0.0021 (0.0215)
lngdp _j	0.0037* (0.0021)	0.0213*** (0.0068)	0.0172** (0.0068)	0.0097* (0.0063)
civil _i	0.0119 (0.0118)	0.0111 (0.011)	0.0157 (0.0134)	0.0080 (0.0112)
civil _j	-0.0118* (0.0063)	-0.0321*** (0.0083)	-0.0258*** (0.0079)	-0.0161** (0.0063)
psi	0.0045 (0.0123)	0.0035 (0.0109)	0.0079 (0.0113)	0.0059 (0.0113)
psj	0.0077** (0.0034)	0.0087** (0.0035)	0.0077** (0.0036)	0.0085** (0.0034)
fc	-0.0023*** (0.0008)			-0.0018*** (0.0006)
euro		-0.0421*** (0.011)		-0.0324*** (0.0097)
continent			-0.0677 (0.0481)	-0.0544 (0.0376)
comlang _{ij}	0.0317** (0.0136)	0.0266** (0.0118)	0.0500*** (0.0154)	0.0293** (0.0132)
Constant	-0.2146 (0.1839)	-0.5982** (0.2284)	-0.5322** (0.2232)	-0.4058* (0.2332)
Observation	816	822	846	805
R-squared	0.3612	0.4389	0.4020	0.3926

Note: This table shows the OLS regression results by including other control variables. Dependent variable Share_{ij}, which is measured as the ratio of transactions in currency *i* (source) in country *j* (destination) to global

transactions in currency i . The definition of all other variables are given in the Appendix. Country and time fixed effects are included but not reported. Heteroskedasticity robust standard errors are reported in parentheses. ***, ** and * indicate marginal significance at 1%, 5% and 10% levels.

5.3 Financial openness

The literature has stressed the important role of capital account restrictions on international movements of capital. Chinn and Frankel (2007, 2008) show that a country's financial openness to the rest of world is a critical factor for international use of its currency. Restrictions on capital flows lead to misallocation of financial resources and limited use of those countries' currencies in international transactions (Fischer, 1998, 2003; Obstfeld, 1998; Rogoff, 1999; Summers, 2000)²¹.

However, capital account liberalization may not increase the depth of the financial market, which is important for currency transactions. Klein and Oliver (2008) show that the openness of the capital account brings unequal benefits to countries. In particular, IMF (2012) suggests that adequate institutions and sound macroeconomic policies are important for full realization of the benefits of capital account liberalization.

To examine whether our results are robust to the inclusion of capital account liberalization, we use several measures of capital account openness in our model specifications. Quantity measures of capital controls (or financial openness) may be *de facto* or *de jure*. Edwards (1999) suggest that policy goals of capital control are usually unclear, and the private sector can circumvents capital account restrictions. Hence, a country's financial integration is often used as a *de facto* measure of capital transaction restrictions (Rajan, 2003). Following Lane & Milesi-Ferretti (2007), we use the ratio of the sum of total international assets and liabilities to GDP to measure financial integration. Many researchers use the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (*AREAER*)²². Chinn and Ito (2013) suggest that a drawback of *de facto* measures is that they depend on the normalization of the volumes of cross- border capital transactions. For instance, normalizing the sum of total assets and liabilities as a ratio to GDP would make the index appear unnecessarily low for large economies such as the US and very high for an international financial center such as Hong Kong. Chinn and Ito (2013) develop the KAOPEN index based on the AREAER tabulation using the extent and intensity of

²¹ Many emerging market countries from Santiago to Seoul have implemented some form of capital account liberalization over the past 20 years.

²² AREAER provides the rules and regulations governing capital account transactions for most countries.

capital controls. Hence, we use this *de jure* measure of financial openness as an alternative measure of capital account openness. The results, reported in Table 7, show that the coefficients of the main variables remain stable in the presence measures of financial openness. We also find that neither measure of financial openness is statistically significantly different from zero.

Table 7
Effect of financial openness on the distribution of international currencies

	(1)	(2)	(3)	(4)
lninvestment _{ij}	0.00672*** (0.008)	0.0066*** (0.0022)	0.0086*** (0.007)	0.0012** (0.0006)
trade _i	0.404*** (0.000)	0.3348*** (0.0728)	0.398*** (0.000)	0.34*** (0.0691)
trade _j	0.0306 (0.219)	0.0274 (0.0231)	0.0300 (0.221)	0.0272 (0.0226)
lnpop _i	0.00105 (0.786)	0.0138 (0.1001)	0.0001 (0.981)	0.0005 (0.0046)
lnpop _j	0.0126** (0.034)	0.0138*** (0.0048)	0.0117* (0.054)	0.0134** (0.0049)
lngdp _i	0.0064 (0.673)	0.0012 (0.0232)	0.0058 (0.704)	-0.0021 (0.0024)
lngdp _j	0.0109* (0.034)	0.0153 (0.0064)	0.0058 (0.525)	0.0066 (0.0093)
civil _i		0.3724 (0.3916)		0.0176 (0.0132)
civil _j		-0.0255*** (0.0080)		-0.0243*** (0.0074)
ps _i		0.0026 (0.0085)		0.0077 (0.0126)
ps _j		-0.0066 (0.0031)		-0.0061 (0.0032)
lndist _{ij}		-0.0009 (0.0076)		-0.0031 (0.0053)
comlang _{ij}		0.0383*** (0.0164)		0.3881** (0.1679)
integration	-0.0001 (0.958)	-0.0001 (0.0001)		
kaopen _j			0.00389 (0.535)	0.0075 (0.0068)
Constant	-0.447** (0.030)	-0.3204 (0.1884)	-0.380* (0.052)	-0.3763* (0.2080)
Observation	923	799	811	799
R-squared	0.362	0.4603	0.363	0.4575

Note: This table reports the effect of financial openness on the distribution of international currencies. Dependent variable $Share_{ij}$, which is measured as the ratio of transactions in currency i (source) in country j (destination) to global transactions in currency i . Variable $integration$ is measured as the ratio of the sum of total international assets and liabilities over GDP. $Kaopen$ is a measure of financial openness constructed by Chinn and Ito (2013). The definition of all other variables are given in the Appendix. Country and time fixed effects are included but not reported. Heteroskedasticity robust standard errors are reported in parentheses. ***, ** and * indicate marginal significance at 1%, 5% and 10% levels.

5.4 Further analysis

So far our regression analysis has focused on the variables commonly adopted in the literature to explain bilateral trade and capital flows between countries. Although currency transaction is accordingly to serve for international trade and capital flows, some country specific factors for currency transactions themselves may be important determinants of international currency distribution. In this part, we further include a variety of variables that could directly influence the use of international currencies in transactions²³.

Following the literature of financial asset transaction (Portes and Rey, 2005), we consider the variables related with information cost and the efficiency of the transaction technology. To capture the information cost of currency transaction, we use the degree of overlap in trading hours $overlap_{ij}$, measured as number of trading hours overlap between major financial centers of country i and country j . As information cost may be positively related with the asymmetry between domestic and foreign investors, we also include a measure of the degree of insider trading (*insider*) in the stock market.

Portes and Ray (2005) use the index of sophistication of financial markets as a measure of transaction technology. We use the same method and construct a variable $soph$, indicating the extent of sophistication of financial markets. Coval and Moskowitz (2001) show that the efficiency of transaction technology depends on the development of financial market. Thus, we include several additional indices of financial market development such as the ratio of capital marketization over GDP ($mktcap$), the ratio of private credit over GDP ($credit$) and exchange-stability dummy variable ($exstability$)²⁴. Detailed definitions and data sources of variables are presented in the Appendix.

We first include two information cost variables into our basic specification. The

²³ These variables are actually alternative measures for transaction costs and financial depth (Equation 6).

²⁴ $exstability$ is a dummy variable that equals one if the exchange rate between source and destination countries is fixed and zero otherwise.

first column of Table 8 shows that the coefficient of *overlap_{ij}* is negative but statistically insignificant different from zero. The extent of insider trading in destination country (*insider_j*) apparently has significantly negative effect on the transaction of international currencies. As information cost of transaction is higher in countries with heavier insider trading, the transaction volume in these countries should be lower. We next include variables related with the efficiency of the transaction technology. The sophistication of financial market variables enters with expected sign (Column 2 of Table 8): the greater the sophistication of financial market in destination country, the more likely international currencies trade in this country. In Column (3) of Table 8, we add several measures of financial development. The development of credit market and the exchange rate stability do not seem to have a significant influence on the use of international currencies. International currencies are disproportionately traded in countries with a developed capital market. We include all variables in Column 4 of Table 8, and similar results are obtained.

The empirical results, reported in Table 8, also show that the coefficients of our initial explanatory variables remain stable across all specifications. It suggests that our results are robust to the inclusion of country specific factors for currency transactions.

Table 8
Country Specific Factors for Currency Transactions

	(1)	(2)	(3)	(4)
lninvestment _{ij}	0.0061*** (0.0021)	0.0054** (0.0021)	0.0061*** (0.0021)	0.0045** (0.0019)
trade _i	0.3887*** (0.0584)	0.3458*** (0.0662)	0.3470*** (0.0658)	0.3365*** (0.0659)
trade _j	0.0281 (0.0232)	0.0280 (0.0227)	0.0284 (0.0234)	0.0274 (0.0215)
lnpop _i	-0.0004 (0.0046)	0.0025 (0.0069)	0.0017 (0.0063)	0.0048 (0.0072)
lnpop _j	0.0090** (0.0038)	0.0060* (0.0031)	0.0113*** (0.0042)	0.0075** (0.0031)
lngdp _i	0.0067 (0.0138)	0.0033 (0.0134)	0.0032 (0.0147)	0.0005 (0.0125)
lngdp _j	-0.0020 (0.0075)	0.0126*** (0.0047)	0.0125** (0.0051)	-0.0142 (0.0132)
comlang _{ij}	0.0263* (0.0138)	0.0249* (0.0146)	0.0253* (0.0144)	0.0103* (0.0006)
lndist _{ij}	-0.0022 (0.0066)	-0.0002 (0.0060)	-0.0015 (0.0057)	-0.0076 (0.0084)
overlap _{ij}	-0.0021 (0.0023)			-0.0016 (0.0025)
insider _j	-0.0187** (0.0075)			-0.0298** (0.0120)
soph _i		-0.0016 (0.0038)		-0.0022 (0.0046)
soph _j		0.0129** (0.0051)		0.0109** (0.0048)
exstability _{ij}			-0.0040 (0.0131)	-0.0006 (0.0137)
credit _i			-0.0001 (0.0001)	-0.0001 (0.0001)
credit _j			0.0001 (0.0001)	-0.0000 (0.0001)
mktcap _i			0.0000 (0.0001)	0.0000 (0.0001)
mktcap _j			0.0001*** (0.0000)	0.0002*** (0.0000)
Constant	-0.1511 (0.1808)	-0.4047** (0.1806)	-0.4141*** (0.1347)	0.0135 (0.1868)
Observation	891	860	856	826
R-squared	0.3943	0.3987	0.3908	0.4309

Note: This table shows the OLS regression results by including country specific factors for currency transactions. Dependent variable $Share_{ij}$, which is measured as the ratio of transactions in currency i (source) in country j (destination) to global transactions in currency i . The definition of all other variables are given in the Appendix. Country and time fixed effects are included but not reported. Heteroskedasticity robust standard errors are reported in parentheses. ***, ** and * indicate marginal significance at 1%, 5% and 10% levels.

6. Implications for RMB

With China's rapid economic growth, the use of RMB in international markets has risen significantly in recent years. At the end of 2013, about 16% of China's trade was settled in RMB. According to the Society for Worldwide Interbank Financial Telecommunication (SWIFT), China's RMB has overtaken the euro to become the second most used currency in international trade finance. The transactions share of RMB in global financial market has increased to 1.39%, to rank 7th in the world (BIS, 2014). Many countries have signed currency swap agreements with China.

As RMB is increasingly used in overseas markets, global financial centers are competing with each other for larger slices of RMB business. However, China still maintains restrictions on capital flows and limits the convertibility of RMB. Nevertheless, Chinese government has attempted to foster the use of RMB through the development of offshore markets in the Chinese Yuan²⁵. Hong Kong has become the leading offshore RMB market since the Bank of China (Hong Kong) became a clearing bank. On July 6, 2012, China and Singapore signed an agreement to designate a Chinese bank to clear RMB deals in Singapore. Since then many international financial centers have gained the right to be RMB clearing and settlement hubs²⁶.

As China still has not liberalized its capital account, the early development of RMB offshore business has depended on policy support from the Chinese government. Location and timing of offshore establishments are still a major concern for the Chinese government.

BIS began to collect RMB transaction data in 2010. Based on observations from 2010 to 2013, we construct the actual global distribution of RMB transactions in foreign exchange markets. Figure 1 plots the transaction share of RMB in 6 countries or regions in 2010 and 2013. It shows that most of RMB trading takes place in Hong Kong. As Hong Kong has a similar culture, economic structure and a close

²⁵ Offshore markets can help to increase the recognition and acceptance of currencies (He and McCauley, 2010). The success of US dollar internationalization is largely accredited to the euro-dollar market where approximately 80% of the US dollar trading takes place.

²⁶ The British and Chinese government agreed to establish a clearing bank in London for RMB (Reuters, 2013). Frankfurt was also chosen as an RMB clearing and settlement hub in 2014 and is starting to compete with other RMB offshore markets.

relationship with mainland China, it is natural that Hong Kong would be the leading offshore RMB market. The figure shows that about 50 percent of RMB trading occurs in the Hong Kong offshore market. Singapore is the second largest RMB offshore market, and it has a close trade relationship with China as well as a large Chinese-speaking population. On the other hand, despite a high level of bilateral trade between China and Germany, few RMB transactions take place in the Germany.

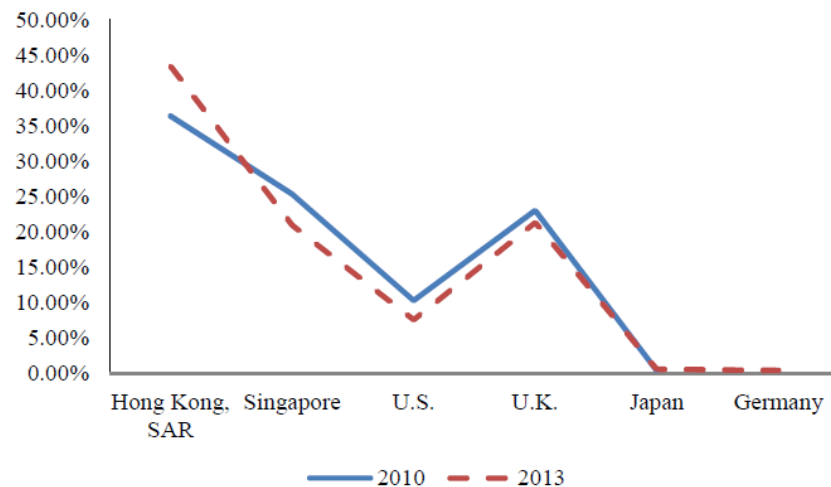


Figure 1 RMB transactions in global major financial centers.

Figure 2 shows the predicted proportion of RMB in global foreign exchange market transactions. For simplicity, we only plot transaction shares for RMB in US, UK, Japan, Singapore, Germany and Hong Kong, from 1995 to 2013. The estimates are based on the results of our benchmark specification²⁷.

Overall, the actual distribution of RMB transactions is much more concentrated than the model estimates. For example, our model predicts that only 10 % of global RMB transactions are settled in Hong Kong whereas the actual share of RMB transactions in Hong Kong is more than 50%. The prediction also suggests that the largest offshore RMB market should be established in US instead of Hong Kong. As of 2013, the end of our sample period, the share of the RMB offshore transactions in Germany would be 6 % whereas the actual share was essentially non-existent.

²⁷ More specifically, our prediction is based on the estimation results in column (1) of Table 4. To check the robustness, we implemented various specifications. It turns out that our prediction remains unchanged.

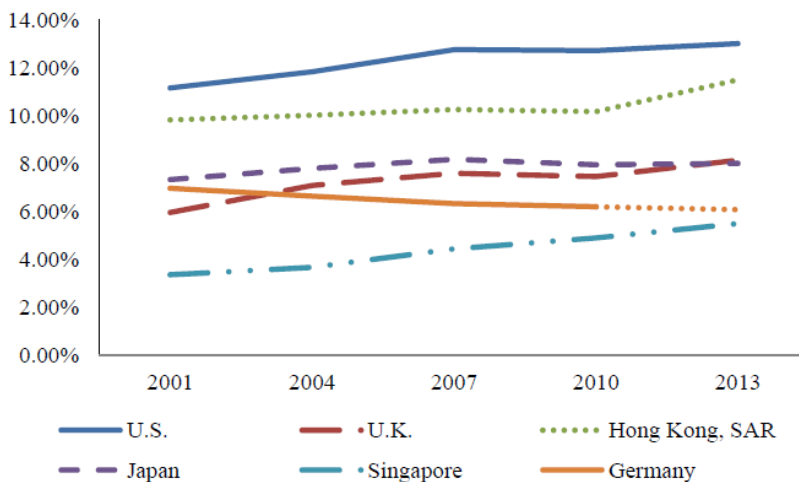


Figure 2 Predicted RMB transactions in global major financial centers

To examine the model’s ability to predict other features of international currency markets we illustrate the predicted and actual distributions of international currencies in the world’s major financial centers. It appears that our predicted results are fairly well in line with reality for the other international currencies.

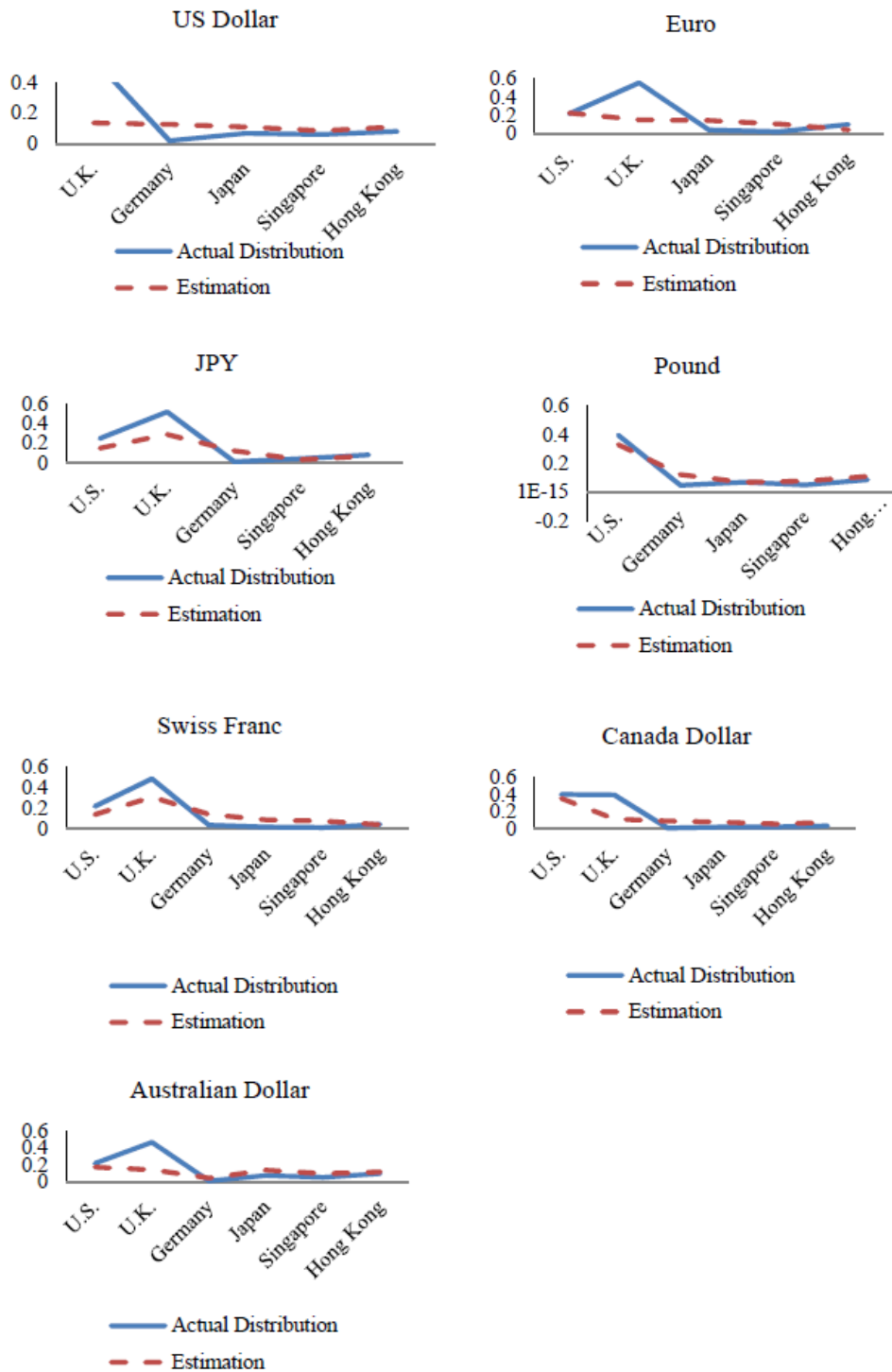


Figure 3 Transactions in international currencies in global major financial centers

These models suggest that our predictions are reliable, and the gap between the predicted and actual distributions of RMB offshore transactions is large. The US has a much larger economic mass than Hong Kong. Bilateral economic activities between US and China have played an important role in international trade and finance. Therefore, RMB offshore transactions in US are expected to be larger than in Hong Kong. Meanwhile, economic relationships between China and UK as well as China and EU are increasingly important. Bilateral trade between China and the UK surpassed \$70bn (£43bn) in 2013. Bilateral trade between China and EU area was 729.97 billion USD in 2013. The EU remains China's biggest export market (17 per cent of its exports) and China is now the EU's second biggest export market (9 per cent). Bilateral investment flows have increased in the last ten years. However, various administrative measures continue to restrict RMB trading internationally. At the same time Hong Kong enjoys a preferred position here and therefore it is not surprising that the majority of RMB trading takes place there. To facilitate global use of RMB restrictions for other financial centers should be loosened.

7. Conclusion

Using a data set from seven international currencies' transactions across 26 countries and regions from 1995 through 2013, we implement a gravity model and investigate the determinants of the geographical distribution of international currencies. The empirical results show that bilateral trade and capital flows between source and destination countries are important determinants of geographic use of international currencies. International currencies are traded disproportionately in destination countries with large economic mass, non-civil law systems, better-developed financial market and where the source and destination countries share a common language. However, the distance between source and destination countries plays no role in explaining the geographic use of international currencies. In this sense currencies are truly weightless. We then predict the distribution of RMB trading in the global foreign exchange markets. Most RMB transactions are concentrated in the Hong Kong financial market. In fact, trading in Hong Kong is much higher than predicted by our empirical model.

This can be explained by China's restrictions on capital movements and the preferred status of Hong Kong. To be widely internationally used, the RMB should be heavily traded in the US and UK. This will not happen until restrictions on capital movements are relaxed to a significant degree. Even then, it is not certain that China's currency will be used in international transactions as much as China's economic size would suggest. The case of Japan shows that even a large country's currency may be

relatively little used in global financial markets.

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Appendix 1: Variable Definition and Data Source

Variable	Definition	Data source
Share _{<i>i,j</i>}	The distribution proportion of currency <i>i</i> in country <i>j</i> , measured as the ratio of financial transactions invoiced in currency <i>i</i> in country <i>j</i> to global financial transactions invoiced in currency <i>i</i>	The BIS Triennial Central Bank Survey https://www.bis.org/publ/rpfx13.htm
lninvestment _{<i>i,j</i>}	The natural logarithm of the sum of the cross-border portfolio investments between country <i>i</i> and country <i>j</i> (in millions of dollars)	Coordinated Portfolio Investment Survey (CPIS) from the IMF http://cpis.imf.org/
trade _{<i>i</i>}	The ratio of bilateral trade between country <i>i</i> and country <i>j</i> to total trade volume in country <i>i</i>	IMF-Direction of Trade Statistics (DOTS) www.elibrary-data.imf.org
trade _{<i>j</i>}	The ratio of bilateral trade between country <i>i</i> and country <i>j</i> to total trade volume in country <i>j</i>	IMF-Direction of Trade Statistics (DOTS) www.elibrary-data.imf.org
lndist _{<i>i,j</i>}	The natural logarithm of distance between capitals of country <i>i</i> and country <i>j</i> .	http://www.worldatlas.com/travelaids/flight_distance.htm
comlang _{<i>i,j</i>}	A dummy variable that equals one if country <i>i</i> and country <i>j</i> use the same official language and zero otherwise	https://www.cia.gov/library/publications/the-world-factbook/
border _{<i>i,j</i>}	A dummy variable that equals one if country <i>i</i> is adjacent to country <i>j</i> and zero otherwise.	https://www.cia.gov/library/publications/the-world-factbook/
lnpop	The natural logarithm of population	World Development Indicators - The World Bank www.data.worldbank.org
island	A dummy variable that equals one if a country is an island nation and zero otherwise	Rose dataset http://faculty.haas.berkeley.edu/arose/StabData.zip
lngdp	The natural logarithm of annual real GDP per capita in dollars	World Development Indicators - The World Bank www.data.worldbank.org
center	A dummy variable that equals one if a country has an offshore financial center and zero otherwise	http://www.longfinance.net
civil	A dummy variable that equals	The Economic Consequences of Legal

	one for a country is a civil-law country and zero otherwise	Origins, La port et al. (2008)
ps	Index of political stability	“Governance Matters VIII” World Bank Policy Research Working Paper, Kaufmann et al(2009). http://info.worldbank.org/governance/wgi/index.aspx
moneyl	A dummy variable that equals one if a country is identified as money launderer nation and zero otherwise	http://www1.oecd.org/fatf/pdf/AR2000_en.pdf
fc	The rank of a country’s annual foreign exchange transaction value. The greater the foreign exchange transaction value of a country, the higher its ranking.	http://www.bis.org/publ/rpfx13.htm
euro	A dummy variable that equals one if destination country is in euro area and zero otherwise.	http://www.ecb.europa.eu/stats/html/index.en.html .
continent	A dummy variable that equals one if source country and destination country are in the same continent and zero otherwise.	https://www.cia.gov/library/publications/the-world-factbook/
integration	The ratio of the sum of total international assets and liabilities over GDP	New External Wealth of Nations Mark II (EWN II) http://www.philiplane.org/EWN.html
kaopen	A measure of financial openness constructed by Chinn and Ito (2013).	http://web.pdx.edu/~io/ Chinn-Ito_website.htm
overlap	Number of trading hours overlap between source and destination country	Portes and Rey(2005)
insider	Index of insider trading.	World Competitiveness Report, http://www.imd.org/business-school/wcc/the-global-competitiveness-report.html
soph	Index of sophistication of financial markets	World Competitiveness Report, http://www.imd.org/business-school/wcc/the-global-competitiveness-report.html
mktcap	The ratio of equity market value over GDP	World Development Indicators -www.data.worldbank.org

credit	The ratio of private credit over GDP	World Development Indicators - www.data.worldbank.org
exstability	A dummy variable that equals one if the exchange rate between source and destination countries is fixed and zero otherwise	Portes and Rey(2005)

Note: *i* and *j* are country indices.

Appendix 2. Correlations of Independent Variables

	DISTANCE	GDP	TRADE	FTA	FDI	CAOP	INF	DEFAULT	ADVANCED	GOV	DIF_GOV	CORRUP	DIF_CORRUP
DISTANCE	1												
GDP	-0.199	1											
TRADE	-0.330	0.932	1										
FTA	-0.244	0.133	0.288	1									
FDI	-0.161	-0.149	-0.119	-0.026	1								
CAOP	-0.017	0.353	0.366	0.051	-0.100	1							
INF	0.049	-0.090	-0.073	-0.029	0.004	-0.148	1						
DEFAULT	0.212	0.050	0.024	0.062	-0.057	-0.047	-0.027	1					
ADVANCED	-0.180	0.534	0.497	-0.008	-0.088	0.500	-0.053	-0.185	1				
GOV	-0.169	0.569	0.531	0.110	-0.133	0.581	-0.134	-0.185	0.805	1			
DIF_GOV	-0.070	0.294	0.300	0.044	-0.001	0.243	0.084	-0.144	0.685	0.475	1		
CORRUP	-0.066	0.477	0.424	0.066	-0.150	0.536	-0.126	-0.179	0.784	0.950	0.543	1	
DIF_CORRUP	-0.097	0.473	0.438	0.081	-0.091	0.478	-0.015	-0.200	0.803	0.878	0.716	0.930	1

Source: BBVA Research

Indeterminacy in a Matching Model of Money with Productive Government Expenditure *

By ANGUS C. CHU ^{*}, CHIH-HSING LIAO ^{**}, LIU XIANGBO ^{***} and ZHANG
MENGBO ^{****}

This study explores the effects of inflation on economic growth in a monetary search-and-matching model with productive government expenditure. Our results can be summarized as follows. When labor intensity in the production function is below a threshold value, the economy features a unique balanced growth equilibrium in which inflation reduces economic growth. When labor intensity in the production function is above a threshold value, the economy may feature multiple balanced growth paths. Multiple equilibria (i.e., global indeterminacy) arise when the matching probability in the decentralized market is sufficiently large. In this case, the high-growth equilibrium features a negative effect of inflation on economic growth whereas the low-growth equilibrium features a U-shaped effect of inflation on growth. Furthermore, under a sufficiently large matching probability in the decentralized market, both equilibria are locally determinate, and hence, either equilibrium may emerge in the economy. (JEL Classification: E30, E40, O42)

Keywords: economic growth; inflation; money; random matching; indeterminacy

1. Introduction

This study explores the effects of inflation on economic growth in a monetary search-and-matching model with equilibrium indeterminacy. We consider a two-sector search-and-matching model from Lagos and Wright (2005) and follow Aruoba et al. (2011) and Waller (2011) to incorporate endogenous capital accumulation into the model. The novelty of our study is that we allow for capital externality via productive government spending as in the seminal study by Barro (1990) in order to generate endogenous economic growth. The resulting monetary

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^{*} University of Liverpool Management School, University of Liverpool, Liverpool, United Kingdom. Email: angusccc@gmail.com.

^{**} Department of Economics, Chinese Culture University, Taipei, Taiwan. Email: chihhsingliao@gmail.com.

^{***} Hanqing Advanced Institute of Economics and Finance and International Monetary Institute, Renmin University, Beijing, China. Email: xiangbo.liu@gmail.com.

^{****} Department of Economics, University of California, Los Angeles, United States. Email: mbzhangucla@g.ucla.edu.

search-and-matching model with productive government spending features equilibrium indeterminacy that is absent in the Barro model and the Lagos-Wright model.

Our results can be summarized as follows. When labor intensity in the production function is below a threshold value, the economy features a unique and determinate balanced growth equilibrium in which an increase in the money growth rate leads to a lower growth rate of output. Interestingly, when labor intensity in the production function is above a threshold value, the economy either features multiple balanced growth equilibria or exhibits no equilibrium. Multiple equilibria (i.e., global indeterminacy) arise when the matching probability in the decentralized market is above a threshold value. When the matching probability is above this threshold but not too large, the low-growth equilibrium is locally determinate whereas the high-growth equilibrium is locally indeterminate and subject to sunspot fluctuations around it. When the matching probability is sufficiently large, both equilibria are locally determinate. In this case, either equilibrium could emerge in the economy. When multiple equilibria are present, the high-growth equilibrium always features a negative effect of inflation on economic growth whereas the low-growth equilibrium features a U-shaped effect of inflation on growth.

The intuition behind the different effects of inflation on growth can be explained as follows. A higher inflation rate increases the cost of consumption in the decentralized market where consumption requires the use of money as a medium of exchange. Due to this lower demand for consumption goods in the decentralized market, individuals have less incentives to accumulate physical capital, which is a factor input for the production of consumption goods in the decentralized market. As a result, higher inflation reduces capital accumulation and causes a negative effect on economic growth. This negative capital-accumulation effect of inflation is standard in the literature. However, with the presence of productive government spending, inflation has an additional positive labor-market effect on growth. When inflation reduces the demand for consumption in the decentralized market, it also shifts the demand for consumption to the centralized market, where money is not needed for transaction purposes. This increase in consumption causes the individuals to also want to consume more leisure and reduces their supply of labor in the centralized market. Given that the labor demand curve may become upward sloping in the presence of productive government spending, the shift in labor supply in this case leads to a surprising increase in equilibrium labor input, which in turn increases the levels of output and capital investment. At the low-growth equilibrium, both this positive labor-market effect and the negative capital-accumulation effect are present

to generate a non-monotonic effect of inflation on economic growth in the form of a U-shape.

This study relates to the literature on matching models of money and capital; see for example, Shi (1999), Menner (2006), Williamson and Wright (2010), Aruoba et al. (2011), Bencivenga and Camera (2011) and Waller (2011). Our study differs from these studies by allowing for endogenous economic growth in the long run. Chu et al. (2014) also consider the effects of inflation on endogenous economic growth in a matching model of money and capital, but their model does not exhibit equilibrium indeterminacy. Our model features a unique equilibrium with the same comparative static effects of inflation as in Chu et al. (2014) under one parameter space but also multiple equilibria with different comparative static effects of inflation under another parameter space. In other words, the analysis in this study nests the analysis in Chu et al. (2014) as a special case.

The study also relates to the literature on inflation and economic growth; see for example, Wang and Yip (1992), Gomme (1993), Dotsey and Ireland (1996), Ho et al. (2007), Chang et al. (2007), Chen et al. (2008) and Chu and Cozzi (2014). Some studies, such as Farmer (1997), Itaya and Mino (2003) and Lai and Chin (2010), also explore the effects of inflation on equilibrium indeterminacy.¹ Studies in this literature model money demand using the classical approaches, such as a cash-in-advance constraint, money in utility and transaction costs, without considering search and matching. This study attempts to relate this literature to the literature on matching models of money and capital in order to highlight the implications of random matching on growth and indeterminacy. We find that the matching probability in the decentralized market is a key determinant of the dynamic properties of the multiple equilibria in which monetary policy has different effects on economic growth.

The rest of this study is organized as follows. Section 2 presents the model. Section 3 analyzes the dynamics of the model. Section 4 studies the effects of inflation. The final section concludes.

2. The model

We consider an economy that consists of a unit continuum of identical and infinitely-lived individuals in discrete time. In each period, there are economic activities in two markets: individuals first enter a decentralized market (hereafter DM) and then a centralized market (hereafter CM). Following the literature, we

¹ See Benhabib and Farmer (1994, 1996) and Schmitt-Grohe and Uribe (1997) for seminal studies on equilibrium indeterminacy. Benhabib and Farmer (1999) provide a survey of this literature.

assume that there is no discounting within each period, while the discount factor is $\beta \in (0,1)$ between any two consecutive periods.

2.1 Individuals' optimization in the CM

In the CM, individuals consume and invest the general goods to maximize their lifetime discounted utility. Their instantaneous utility function is represented by

$$u_t = \theta \ln x_t - \gamma h_t$$

where x_t is the consumption of general goods, h_t is the supply of labor, and the parameters $\gamma > 0$ and $\theta > 0$ determine respectively the disutility of labor supply and the importance of consumption. Let's denote $W(m_t, k_t)$ and $V(m_t, k_t)$ as the period- t value functions for individuals in the CM and the DM, respectively. For the maximization problem of individuals in the CM, we have

$$W(m_t, k_t) = \max_{x_t, h_t, m_{t+1}, k_{t+1}} \{ \theta \ln x_t - \gamma h_t + \beta V(m_{t+1}, k_{t+1}) \} \quad (1)$$

subject to a sequence of budget constraints given by

$$k_{t+1} + \frac{m_{t+1}}{p_t} = (1 - \tau_t)(w_t h_t + r_t k_t) + (1 - \delta)k_t - x_t + z_t + \frac{m_t}{p_t} \quad (2)$$

where p_t is the price of general goods x_t , w_t is the real wage rate, r_t is the real rental price of capital, $\tau_t \in (0,1)$ denotes the income tax rate, k_t denotes the capital stock owned by an individual, and m_t is the nominal money balance in period t . The parameter $\delta \in (0,1)$ is the depreciation rate of capital. z_t denotes a real lump-sum transfer from the government.

If we use the budget constraint to substitute h_t into equation (1), then standard dynamic optimization leads to the following first-order conditions:

$$\frac{\theta}{x_t} = \frac{\gamma}{(1 - \tau_t) w_t} \quad (3)$$

$$\frac{\theta}{x_t} = \beta V_k(m_{t+1}, k_{t+1}) \quad (4)$$

$$\frac{\theta}{p_t x_t} = \beta V_m(m_{t+1}, k_{t+1}) \quad (5)$$

Equation (3) represents a horizontal labor supply curve. Furthermore, equations (3) to (5) imply that all individuals enter the DM in the next period with the same holdings of capital and money because x_t is the same across individuals, due to their quasi-linear preference, as shown in (3). Finally, the envelope conditions are given by

$$W_k(m_t, k_t) = \frac{\theta [1 - \delta + (1 - \tau_t) r_t]}{x_t} \quad (6)$$

$$W_m(m_t, k_t) = \frac{\theta}{p_t x_t} \quad (7)$$

2.2 Individuals' optimization in the DM

In the DM, firms do not operate, and a special good is produced and traded privately among individuals. We denote $\sigma \in (0, 0.5)$ as the probability of an agent becoming a buyer. Similarly, with probability σ an agent becomes a seller, and with probability $1 - 2\sigma$ he is a nontrader. Following Lagos and Wright (2005), one buyer meets one seller randomly and anonymously with a matching technology and buyers pay money in trade. Given this matching setup, the value of entering the DM is given by

$$V(m_t, k_t) = \sigma V^b(m_t, k_t) + \sigma V^s(m_t, k_t) + (1 - 2\sigma) W(m_t, k_t) \quad (8)$$

where $V^b(m_t, k_t)$ and $V^s(m_t, k_t)$ are the values of being a buyer and a seller, respectively.

To analyze $V^b(\cdot)$ and $V^s(\cdot)$, we consider the following functional forms for the buyers' preference and the sellers' production technology. In the DM, each buyer's utility $\ln q_t^b$ is increasing and concave in the consumption of special goods. Each seller produces special goods q_t^s by combining her capital k_t and effort e_t subject to the following Cobb-Douglas production function:

$$q_t^s = F(k_t, A_t e_t) = k_t^\alpha (A_t e_t)^{1-\alpha} \quad (9)$$

where the parameter $\alpha \in (0, 1)$ determines labor intensity $1 - \alpha$ in production and A_t is the level of labor productivity. As in the seminal study by Barro (1990), labor productivity is determined by productive government expenditure; i.e., we assume that $A_t = G_t$. Rewriting equation (9), we can express the utility cost of production in terms of effort as

$$e \left(\frac{q_t^s}{G_t}, \frac{k_t}{G_t} \right) = \left(\frac{q_t^s}{G_t} \right)^{1/(1-\alpha)} \left(\frac{k_t}{G_t} \right)^{-\alpha/(1-\alpha)} \quad (10)$$

Buyers purchase special goods q_t^b by spending money d_t^b , whereas sellers earn money d_t^s by producing special goods q_t^s . Given these terms of trade, the values of being a buyer and a seller are respectively

$$V^b(m_t, k_t) = \ln q_t^b + W(m_t - d_t^b, k_t) \quad (11)$$

$$V^s(m_t, k_t) = -e\left(\frac{q_t^s}{G_t}, \frac{k_t}{G_t}\right) + W(m_t + d_t^s, k_t) \quad (12)$$

Differentiating (11) and (12) and substituting them into (8), we can obtain the following envelope condition for m_t :

$$\begin{aligned} V_m(m_t, k_t) &= (1 - 2\sigma)W_m(m_t, k_t) + \sigma \left[\frac{1}{q_t^b} \frac{\partial q_t^b}{\partial m_t} + W_m(m_t - d_t^b, k_t) \left(1 - \frac{\partial d_t^b}{\partial m_t}\right) \right] \\ &+ \sigma \left[-e_1\left(\frac{q_t^s}{G_t}, \frac{k_t}{G_t}\right) \frac{1}{G_t} \frac{\partial q_t^s}{\partial m_t} + W_m(m_t + d_t^s, k_t) \left(1 + \frac{\partial d_t^s}{\partial m_t}\right) \right], \end{aligned} \quad (13)$$

where $W_m(m_t, k_t) = W_m(m_t - d_t^b, k_t) = W_m(m_t + d_t^b, k_t) = \theta/(p_t x_t)$ from (7). Similarly, we can obtain the following envelope condition for k_t :

$$\begin{aligned} V_k(m_t, k_t) &= (1 - 2\sigma)W_k(m_t, k_t) + \sigma \left[\frac{1}{q_t^b} \frac{\partial q_t^b}{\partial k_t} - W_m(m_t - d_t^b, k_t) \frac{\partial d_t^b}{\partial k_t} + W_k(m_t - d_t^b, k_t) \right] \\ &+ \sigma \left[-e_1\left(\frac{q_t^s}{G_t}, \frac{k_t}{G_t}\right) \frac{1}{G_t} \frac{\partial q_t^s}{\partial k_t} - e_2\left(\frac{q_t^s}{G_t}, \frac{k_t}{G_t}\right) \frac{1}{G_t} + W_m(m_t + d_t^s, k_t) \frac{\partial d_t^s}{\partial k_t} + W_k(m_t + d_t^s, k_t) \right] \end{aligned} \quad (14)$$

where $W_k(m_t, k_t) = W_k(m_t - d_t^b, k_t) = W_k(m_t + d_t^b, k_t) = \theta[(1 - \tau_t)r_t + (1 - \delta)]/x_t$ from (6). To solve the marginal value of holding money (13) and capital (14), we consider a competitive equilibrium with price taking as in Aruoba et al. (2011) and Waller (2011).² Under price taking, once buyers and sellers are matched, they both act as price takers. Given the price \bar{p}_t of special goods, buyers choose q_t^b to maximize

$$V^b(m_t, k_t) = \max_{q_t^b} [\ln q_t^b + W(m_t - \bar{p}_t q_t^b, k_t)] \quad (15)$$

subject to the budget constraint

$$d_t^b = \bar{p}_t q_t^b \leq m_t \quad (16)$$

In the DM, buyers spend all their money, so that the money constraint implies that

$$q_t^b = m_t / \bar{p}_t \quad (17)$$

As for sellers' maximization problem in the DM, it is given by

$$V^s(m_t, k_t) = \max_{q_t^s} \left[-e\left(\frac{q_t^s}{G_t}, \frac{k_t}{G_t}\right) + W(m_t + \bar{p}_t q_t^s, k_t) \right] \quad (18)$$

Sellers' optimal supplies of special goods can be obtained from the following condition:

² We cannot consider bargaining in this model because the bargaining condition is incompatible with endogenous growth; see Appendix A in Chu et al. (2014) for a detailed discussion.

$$e_1 \left(\frac{q_t^s}{G_t}, \frac{k_t}{G_t} \right) \frac{1}{G_t} = \bar{p}_t W_m(m_t + \bar{p}_t q_t^s, k_t) \Leftrightarrow \frac{1}{1-\alpha} e \left(\frac{q_t^s}{G_t}, \frac{k_t}{G_t} \right) = \theta \frac{\bar{p}_t q_t^s}{p_t x_t} \quad (19)$$

where the second equality of (19) makes use of (7) and (10).

Using (17) and (19), we can obtain $\frac{\partial q_t^b}{\partial m_t} = 1/\bar{p}_t$, $\frac{\partial d_t^b}{\partial m_t} = 1$ and $\frac{\partial d_t^s}{\partial m_t} = \bar{p}_t (\partial q_t^s / \partial k_t)$, whereas the other partial derivatives, $\partial q_t^b / \partial k_t$, $\partial d_t^b / \partial k_t$, $\partial q_t^b / \partial m_t$ and $\partial d_t^s / \partial m_t$, in (13) and (14) are zero. Substituting these conditions, $q_t^b = q_t^s = q_t$ and (19) into (13) and (14), we can derive the following conditions:

$$V_m(m_t, k_t) = \frac{(1-\sigma)\theta}{p_t x_t} + \frac{\sigma}{\bar{p}_t q_t} \quad (20)$$

$$V_k(m_t, k_t) = \frac{\theta [(1-\tau_t)r_t + (1-\delta)]}{x_t} - \frac{\sigma}{G_t} e_2 \left(\frac{q_t}{G_t}, \frac{k_t}{G_t} \right) \quad (21)$$

The intuition behind these two conditions can be explained as follows. The marginal value of money holding is the expected gain in utility by either consuming more special goods q_t in the DM with probability σ or consuming more general goods x_t in the CM with probability $1-\sigma$. The marginal value of capital holding is the gain in utility by consuming more general goods x_t in the CM with the after-tax net capital income $(1-T_t)r_t + 1 - \delta$ plus the expected gain in utility by incurring less production effort as a seller in the DM with probability σ .³

2.3 Firms' optimization in the CM

In the CM, there is a large number of identical firms. In each period, each firm produces general goods using capital K_t and labor H_t . The production function is given by

$$Y_{x,t} = K_t^\alpha (A_t H_t)^{1-\alpha} \quad (22)$$

where labor productivity is determined by productive government spending as before; i.e., $A_t = G_t$. Taking factor prices and the government's expenditure as given, the representative firm chooses H_t and K_t to maximize its profits. Interior solutions of the firm's problem are characterized by the first-order conditions as follows:

$$r_t = \alpha K_t^{\alpha-1} (G_t H_t)^{1-\alpha} \quad (23)$$

$$w_t = (1-\alpha) K_t^\alpha H_t^{-\alpha} G_t^{1-\alpha} \quad (24)$$

³ Recall that $e_2(\frac{q_t}{G_t}, \frac{k_t}{G_t}) < 0$; see equation (10).

In equilibrium, $K_t=k_t$ and $H_t=h_t$.

2.4 Government

In this economy, the government plays the following two roles: it implements fiscal and monetary policies. In each period, the government's public expenditure is financed by imposing an income tax on individuals. Therefore, the government's budget constraint is given by

$$G_t = \tau_t Y_{x,t} \quad (25)$$

The government also issues money at an exogenously given rate at $\mu_t = (m_{t+1}-m_t)/m_t$ to finance a lump-sum transfer that has a real value of $z_t = (m_{t+1}-m_t)/p_t = \mu_t m_t/p_t$. We separate the fiscal and monetary components of the government in order to allow for monetary policy independence. In other words, we do not consider the case in which the government can use the central bank to finance its fiscal spending.⁴

2.5 Equilibrium

The equilibrium is defined as a sequence of allocations $\{G_t, x_t, h_t, Y_{x,t}, q_t, d_t, m_{t+1}, k_{t+1}\}_{t=0}^{\infty}$, a sequence of prices $\{r_t, w_t, p_t, \tilde{p}_t\}_{t=0}^{\infty}$ and a sequence of policies $\{\mu_t, \tau_t, z_t\}_{t=0}^{\infty}$, with the following conditions satisfied in each period.

- In the CM, individuals choose $\{x_t, h_t, m_{t+1}, k_{t+1}\}$ to maximize (1) subject to (2), taking $\{x_t, h_t, m_{t+1}, k_{t+1}\}$ and $\{\mu_t, \tau_t, z_t\}$ as given;
- In the DM, buyers and sellers choose $\{q_t, d_t\}$ to maximize (11) and (12) respectively, taking $\{\tilde{p}_t\}$ as given;

- Firms in the CM produce $\{Y_{x,t}\}$ competitively to maximize profit taking $\{r_t, w_t\}$ and $\{G_t\}$ as given;

- The real aggregate consumption includes consumption in CM and DM such that

$$c_t = (p_t x_t + \sigma \tilde{p}_t q_t) / p_t;$$

- The real aggregate output includes output in CM and DM such that

$$Y_t = (p_t Y_{x,t} + \sigma \tilde{p}_t q_t) / p_t;$$

- The capital stock accumulates through investment from general goods such that

⁴ In the case of seigniorage, higher inflation would increase tax revenue for productive government spending, and hence, it would have another positive effect on economic growth.

$$k_{t+1} = Y_{x,t} - x_t - G_t + (1 - \delta) k_t$$

- The government balances its budget in every period such that $G_t = \tau_t Y_{x,t}$ and $z_t = \mu_t m_t / p_t$
- All markets clear in every period.

3. Equilibrium indeterminacy

In the rest of the paper, we assume stationary monetary and tax policies, i.e. $\mu_t = \mu$ and $\tau_t = \tau$. It should be noted that the stationary money growth rate has a lower bound, i.e., $\mu \geq \beta - 1$, which is equivalent to a zero lower bound on the nominal interest rate. The dynamical system can be derived as follows. First, we define two transformed variables $\Phi_t \equiv m_t / (p_t x_t)$ and $\Omega_t \equiv x_t / k_t$, Φ_t represents the ratio of real money balance to consumption in the CM, whereas Ω_t represents the consumption-capital ratio in CM. Note that Φ_t and Ω_t are both jump variables and they are stationary on a balanced growth path. From equations (5) and (20), we obtain the recursive equation of Φ_t , which is given by

$$\Phi_{t+1} = \frac{1 + \mu}{\beta(1 - \sigma)} \Phi_t - \frac{\sigma}{\theta(1 - \sigma)} \equiv f(\Phi_t) \tag{26}$$

Figure 1 shows that the money-consumption ratio Φ_t jumps immediately to a unique and saddle-point stable steady-state equilibrium Φ .

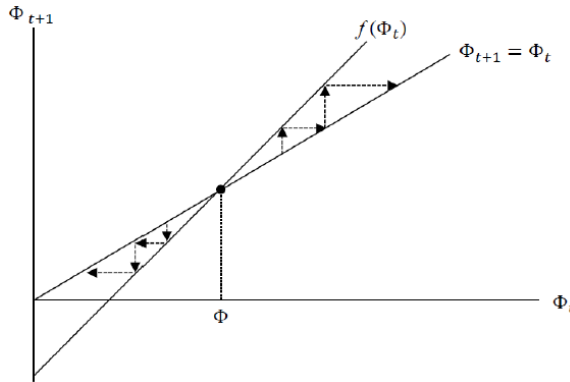


Figure 1: Phase diagram of Φ_t

Manipulating equations (22) and (25) yields $G_t = \tau^{1/\alpha} k_t h_t^{(1-\alpha)/\alpha}$, which is increasing in labor h_t . We then use this condition to rearrange (23) and (24) as

$$r_t = \alpha (\tau h_t)^{(1-\alpha)/\alpha} \tag{23a}$$

$$w_t = (1 - \alpha) \tau^{(1-\alpha)/\alpha} k_t h_t^{(1-2\alpha)/\alpha} \quad (24a)$$

It is useful to note that (24a) represents the labor demand curve, which is upward sloping if and only if $\alpha < 1/2$ (i.e., labor intensity $1-\alpha > 1/2$). Combining labor demand in (24a) and labor supply in (3), we derive that the following equilibrium relationship between labor h_t and the consumption-capital ratio Ω_t

$$h_t = \left[\frac{\theta}{\gamma} (1 - \tau) (1 - \alpha) \tau^{(1-\alpha)/\alpha} \right]^{\alpha/(2\alpha-1)} \Omega_t^{\alpha/(1-2\alpha)} \quad (27)$$

which shows a positive relationship between labor h_t and the consumption-capital ratio Ω_t if and only if $\alpha < 1/2$ (i.e., labor intensity $1-\alpha > 1/2$).

Combining equations (4), (10), (19), (21), (23a) and (27), we obtain the dynamical equation of consumption in the CM:

$$\frac{x_{t+1}}{x_t} = \beta [1 - \delta + \alpha D \Omega_{t+1}^\epsilon + \alpha \sigma \Phi_{t+1} \Omega_{t+1}] \quad (28)$$

where we define two composite parameters $\{D, \epsilon\}$ as follows.

And $\epsilon \equiv (1 - \alpha)/(1 - 2\alpha)$. For convenience, we plot the value of ϵ against α in Figure 2.

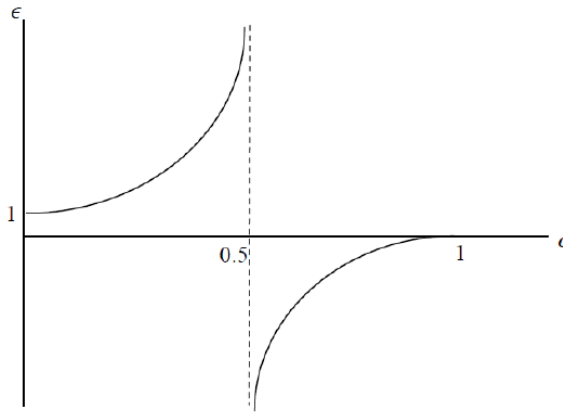


Figure 2: Relationship between α and ϵ

The resource constraint implies the following dynamics of the capital stock k_t :

$$\frac{k_{t+1}}{k_t} = D \Omega_t^\epsilon - \Omega_t + 1 - \delta \quad (29)$$

where we have used (22), (27) and $G_t = \tau^{1/\alpha} k_t h_t^{(1-\alpha)/\alpha}$. Combining equations (28)

and (29), we derive the dynamics of $\Omega_t \equiv x_t/k_t$ as follows.

$$\frac{\Omega_{t+1}}{\Omega_t} = \frac{\beta [1 - \delta + \alpha D\Omega_{t+1}^\epsilon + \alpha \sigma \Phi_{t+1} \Omega_{t+1}]}{D\Omega_t^\epsilon - \Omega_t + 1 - \delta} \quad (30)$$

From (26) and (30), the steady-state values of Φ_t and Ω_t , denoted as Φ and Ω , are determined by

$$\Phi = \frac{\sigma \beta}{\theta [1 + \mu - (1 - \sigma) \beta]} \quad (31)$$

$$(1 + \alpha \beta \sigma \Phi) \Omega = (1 - \alpha \beta) D\Omega^\epsilon + (1 - \beta) (1 - \delta) \quad (32)$$

We first substitute (31) into (32) and then plot the left-hand side (LHS) and right-hand side (RHS) of (32) in Figure 3.

Figure 3a shows that when $\alpha > 1/2$ (i.e., $\epsilon < 0$), there is a unique steady-state equilibrium value of Ω . In this case, an increase in μ raises the steady-state equilibrium value of Ω . Intuitively, higher inflation increases the cost of consumption in the DM where money is used as a medium of exchange. Due to this lower demand for consumption in the DM, there is less incentives to accumulate physical capital, which is factor input for production in the DM. Furthermore, the lower demand for consumption in the DM shifts the demand for consumption to the CM. Both these effects lead to an increase in the consumption-capital ratio Ω in the CM.

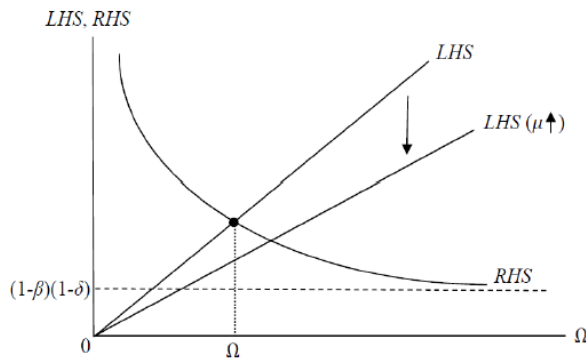


Figure 3a: Unique equilibrium under $\alpha > 1/2$

Figure 3b shows that when $\alpha > 1/2$ (i.e., $\epsilon > 1$) and σ is sufficiently large, there are two steady-state equilibrium values of Ω denoted as $\{\Omega^{low}, \Omega^{high}\}$. In this case, an increase in μ leads to an increase in Ω^{low} but a decrease in Ω^{high} . Given the two equilibria, we have global indeterminacy. The intuition can be understood as follows.

Substituting $G = \tau^{1/\alpha} k_t h_t^{(1-\alpha)/\alpha}$ into (22) yields $Y_{x,t} = \tau^{1/\alpha} k_t H_t^{(1-\alpha)/\alpha}$, where $(1 - \alpha)/\alpha > 1$ if and only if $\alpha < 1/2$ (i.e., labor intensity $1 - \alpha > 1/2$). When $(1 - \alpha) = > 1$, the aggregate production function exhibits increasing returns to scale in labor, which in turn gives rise to an upward-sloping labor demand curve. Together with a horizontal labor supply curve from the quasi-linear preference, global indeterminacy arises. Finally, when $\alpha < 1/2$ (i.e., $\epsilon > 1$) and σ is sufficiently small, there is no equilibrium, and we rule out this parameter space by assumption.

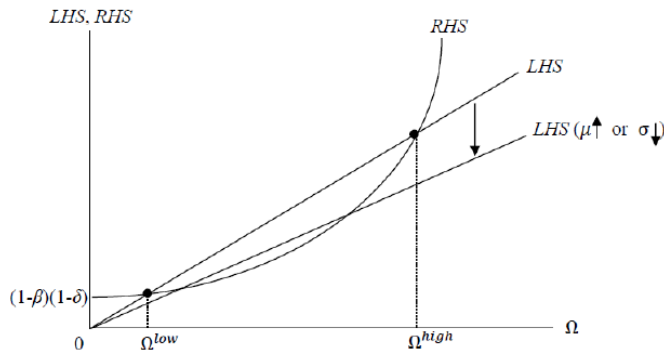


Figure 3b: Multiple equilibria under $\alpha < 1=2$

In (30), the variable Φ_t jumps to its unique steady-state value Φ given in (31). Therefore, equation (30) represents an autonomous one-dimensional dynamical system for Ω_t . Taking a linear approximation around the steady-state equilibrium value and using (32), we derive

$$\Omega_{t+1} = (1 - \xi)\Omega + \xi\Omega_t \equiv F(\Omega_t) \quad (33)$$

where $\xi \equiv [(1 - \delta) + (1 - \epsilon)D\Omega^\epsilon] / \{\beta[(1 - \delta) + \alpha(1 - \epsilon)D\Omega^\epsilon]\}$ is the characteristic root of the dynamical system. Figure 4 plots the phase diagram of the local dynamics of Ω_t under $\alpha > 1=2$. When $\alpha > 1=2$ (i.e., $\epsilon < 0$), the characteristic root ξ is greater than one. In this case, Figure 4 shows that the unique steady-state equilibrium exhibits saddle-point stability; therefore, Ω_t always jumps to the unique steady state.

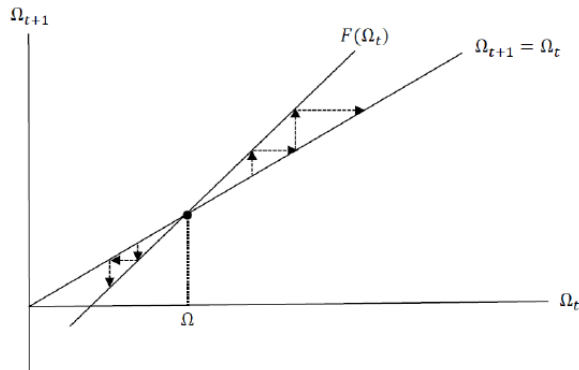


Figure 4: Phase diagram of Ω_t under $\alpha > 1/2$

For the case of $\alpha < 1/2$ (i.e., $\epsilon > 1$), it would be easier to understand the results if we first plot the relationship between the characteristic root ξ and the steady-state equilibrium value

Ω . Also, it is useful to recall that $\xi \in (-1, 1)$ implies a dynamically stable (i.e., locally indeterminate) system and that a system is dynamically unstable (i.e., locally determinate) if $\xi < -1$ or $\xi > 1$. Figure 5 shows that the equilibrium Ω^{low} is always dynamically unstable because $\Omega^{low} < \Omega^{**}$ which implies $\xi > 1$, whereas the equilibrium Ω^{high} can be either dynamically unstable (when $\Omega^{high} > \Omega^{**}$ which implies $\xi < -1$ or $\xi > 1$) or dynamically stable (when $\Omega^{high} < \Omega^{**}$ which implies $\xi \in (-1, 1)$).⁵

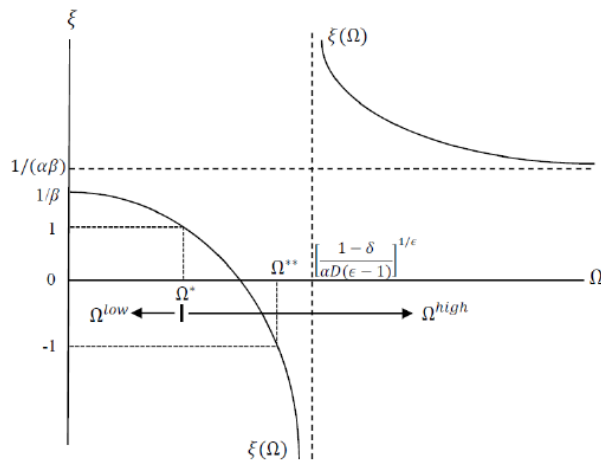


Figure 5: Relationship between ξ and Ω under $\alpha < 1/2$

⁵ We will show that $\Omega^{high} > \Omega^*$ and also derive Ω^* and Ω^{**} in Appendix A.

Recall from Figure 3b that Ω^{high} is increasing in the value of the matching parameter σ . Then, Figure 6a shows that when $\alpha < 1/2$ and σ is not too large,⁶ the equilibrium Ω^{high} is locally indeterminate (i.e., dynamically stable) because $\Omega^* < \Omega^{high} < \Omega^{**}$ whereas the equilibrium Ω^{low} is always locally determinate (i.e., dynamically unstable) because $\Omega^{low} < \Omega^*$. When Ω^{low} is unstable and Ω^{high} is stable, Ω_t reaching the unstable equilibrium Ω^{low} is a measure-zero event. In this case, the economy is subject to sunspot fluctuations around the stable equilibrium high.

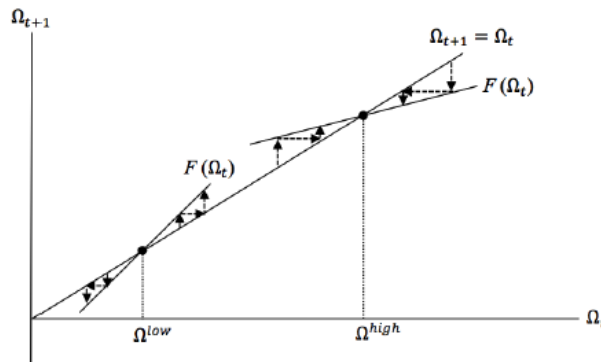


Figure 6a: Phase diagram of Ω_t under $\alpha < 1/2$ and a small σ

Figure 6b⁷ shows that when $\alpha < 1/2$ and σ is sufficiently large, the two equilibria are both locally determinate (i.e., dynamically unstable) because $\Omega^{high} > \Omega^{**}$ and $\Omega^{low} < \Omega^{**}$. In this case, it is possible for Ω_t to jump to either equilibrium. Therefore, unlike the case with a small σ , we cannot rule out the steady-state equilibrium Ω^{low} under a sufficiently large σ . We summarize these results in Proposition 1.

⁶ Here we assume that σ is sufficiently large for the presence of equilibria but not excessively large. In the proof of Proposition 1, we explicitly derive these threshold values; see Appendix A.

⁷ In this figure, we draw the case in which the characteristic root at the steady-state equilibrium high is $\xi < -1$. One can also draw the case of $\xi > 1$.

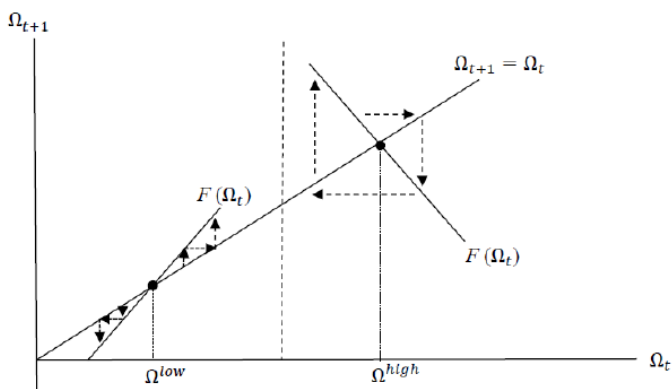


Figure 6b: Phase diagram of Ω_t under $\alpha < 1/2$ and a large σ

Proposition 1 If $\alpha > 1/2$, then there exists a unique steady-state equilibrium value of Ω_t , which exhibits saddle-point stability. If $\alpha < 1/2$, then there exist two equilibria. One is locally determinate and the other one is locally indeterminate under a sufficiently small σ whereas they are both locally determinate under a sufficiently large σ .

Proof. See Appendix A. ■

4. Inflation and economic growth

In this section, we examine the relationship between inflation and economic growth. Given that in our analysis we treat the growth rate of money supply m_t as an exogenous policy parameter μ , we first need to discuss the relationship between μ and the endogenous inflation rate π . Along a balanced-growth path, aggregate variables, such as output, consumption, capital and real money balance, grow at the same long-run growth rate g . In other words, the growth rate of m_t/p_t is equal to g , which in turn implies that $(1+g) = (1+\mu) = (1+\pi)$ because the growth rates of m_t and p_t are respectively μ and π . From the approximation $\ln(1+X) \approx X$, the relationship $(1+\pi) = (1+\mu) = (1+g)$ becomes $\pi = \mu - g(\mu)$, where the long-run growth rate $g(\mu)$ is a function of μ as we will show below. Taking the derivative yields $\partial \pi / \partial \mu = 1 - g'(\mu)$. Therefore, if money growth μ has a negative effect on economic growth g , then it must have a positive effect on inflation π implying also a negative relationship between inflation and economic growth. Even if money growth μ has a positive effect on economic growth g , it would still have a positive effect on inflation π so long as its effect on economic growth is not excessively large (i.e., $g'(\mu) < 1$). In this case, the positive relationship between money growth and

economic growth implies also a positive relationship between inflation and economic growth. Therefore, the relationship between money growth and economic growth generally carries over to inflation and economic growth.

Using (29), we obtain the following expression for the long-run growth rate of the economy:

$$g \equiv \frac{k_{t+1}}{k_t} - 1 = D\Omega_t^\epsilon - \Omega_t - \delta \quad (34)$$

In the case of a unique equilibrium (i.e., $\alpha > 1/2$ and $\epsilon < 0$), we have $\frac{\partial g}{\partial \Omega} < 0$.

Furthermore, Figure 3a shows that $\frac{\partial \Omega}{\partial \mu} > 0$. Therefore, the overall effect of μ on g is negative. Intuitively, an increase in inflation leads to a higher cost of money holding, which in turn increases the cost of consumption and reduces the level of consumption in the DM. As a result, there are less incentives to accumulate capital for production in the DM, and the lower rate of capital accumulation leads to a lower growth rate. This result is similar to the one in Chu et al. (2014). We summarize this result in Proposition 2.

Proposition 2 If $\alpha > 1/2$, then there exists a unique balanced growth equilibrium in which a higher money growth rate μ reduces economic growth.

Proof. See Appendix A. ■

In the case of multiple equilibria (i.e., $\alpha < 1/2$ and $\epsilon > 1$), it would be more transparent if we use (28) to express the long-run growth rate of the economy as

$$g \equiv \frac{x_{t+1}}{x_t} - 1 = \beta [1 - \delta + \alpha D\Omega^\epsilon + \alpha \sigma \Phi \Omega] - 1 \quad (35)$$

where Φ is the steady-state ratio of real money balance to consumption in the CM as shown in (31). The ratio of real money balance to consumption in the DM is decreasing in the growth rate of money supply, and this result can be shown as follows:

$$\frac{\partial \Phi}{\partial \mu} = -\frac{\sigma \beta}{\theta [(1 + \mu) - \beta (1 - \sigma)]^2} < 0. \quad (36)$$

Intuitively, a higher money growth rate increases inflation, which in turn raises the cost of money holding. Equation (35) also shows that a larger Ω corresponds to a higher growth rate for a given Φ because ϵ is positive. Therefore, Ω^{high} corresponds to the high-growth equilibrium g^{high} whereas Ω^{low} corresponds

to the low-growth equilibrium glow.

Figure 3b shows that Ω^{high} is decreasing in μ . Together with the result that Φ is also decreasing in μ , we find that the high-growth equilibrium growth rate g^{high} is decreasing in the money growth rate μ . Therefore, the effect of inflation on growth in the high-growth equilibrium is the same as in the unique equilibrium. However, the intuition behind these results is different. In the case of the high-growth equilibrium, an increase in inflation reduces the consumption-capital ratio Ω^{high} in the CM, and this counterintuitive result is due to the presence of global indeterminacy. From (34), we see that Ω has a positive effect on g via $D \Omega^\epsilon$ (when ϵ is positive) and a negative effect on g via $-\Omega$. The overall relationship between g and Ω in (34) is a U-shaped function⁸ as we show in Figure 7.⁹ Because Ω^{high} is always on the upward-sloping side of the U-shape, the increase in μ leads to a decrease in both Ω^{high} and g^{high} . In this case, when inflation decreases consumption in the CM, it causes the individuals to also want to consume less leisure and raises their supply of labor in the CM. Given that the labor demand curve is upward sloping due to productive government spending, this shift in labor supply leads to a surprising decrease in equilibrium labor input, which in turn reduces the levels of output and capital investment.

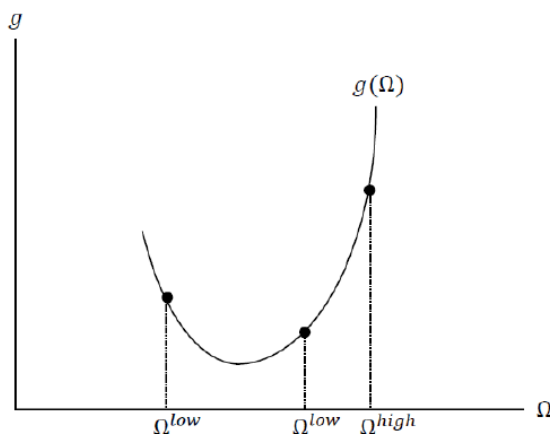


Figure 7: Relationship between g and Ω in (34) when $\epsilon > 1$

As for Ω^{low} it is increasing in μ as shown in Figure 3b. However, g^{low} can be either increasing or decreasing in μ . Recall from (34) that g is a U-shaped function

⁸ Recall that $\epsilon > 1$ when $\alpha < 1/2$.

⁹ In Figure 7, the equilibria $\{\Omega^{low}, \Omega^{high}\}$ are determined by the intersection of $g(\Omega)$ in (34) and $g(\Omega)$ in (35), where the latter is a monotonically increasing function in Ω when ϵ is positive. We do not draw (35) in Figure 7 to simplify the diagram.

in Ω when $\epsilon > 1$. Therefore, when Ω^{low} is sufficiently small, the increase in Ω^{low} caused by an increase in μ reduces the growth rate g^{low} . Intuitively, higher inflation reduces both consumption and the incentives to accumulate capital for production in the DM. This lower rate of capital accumulation causes the lower growth rate. This is the standard negative capital-accumulation effect of inflation. In contrast, when Ω^{low} is sufficiently large, the increase in Ω^{low} caused by an increase in μ raises the growth rate g^{low} . Intuitively, when inflation increases consumption in the CM, it causes the individuals to also want to consume more leisure and reduces their supply of labor in the CM. Given that the labor demand curve is upward sloping due to productive government spending, this shift in labor supply leads to a surprising increase in equilibrium labor input, which in turn increases the levels of output and capital investment. This is the novel positive labor-market effect of inflation in the presence of productive government spending. Finally, the overall effect of μ on the low-growth equilibrium growth rate g^{low} follows a U-shaped function.¹⁰ We summarize these results in Proposition 3.

Proposition 3 If $\alpha < 1/2$, then a higher money growth rate μ has the following effects on economic growth: the high-growth equilibrium g^{high} is decreasing in μ whereas the low-growth equilibrium g^{low} is a U-shaped function in μ .

Proof. See Appendix A. ■

5. Conclusion

In this study, we have explored the effects of inflation in a monetary search-and-matching model. A novelty of our analysis is that we introduce productive government expenditure into the model in order to generate endogenous economic growth and equilibrium indeterminacy. We find that when labor intensity is below a threshold value, the model features a unique balanced growth equilibrium in which inflation has a negative effect on economic growth as in previous studies. However, when labor intensity is above a threshold value, the model features two balanced growth equilibria, in which the two equilibria display different comparative statics of economic growth with respect to changes in inflation. Specifically, the high-growth equilibrium features a negative effect of inflation on economic growth whereas the low-growth equilibrium features a U-shaped effect of inflation on growth. Furthermore, under a sufficiently large matching probability in the

¹⁰ In the proof of Proposition 3, we also derive the growth-minimizing value of μ .

decentralized market, both equilibria are locally determinate. Therefore, either equilibrium may emerge in the economy.

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Appendix A

Proof of Proposition 1. Equation (30) shows that the variable Φ_t jumps to its unique steady state Φ given in (31). We substitute Φ into (30) to obtain the following autonomous one-dimensional dynamical system for Ω_t

$$\frac{\Omega_{t+1}}{\Omega_t} = \frac{\beta [1 - \delta + \alpha D\Omega_{t+1}^\epsilon + \alpha \sigma \Phi \Omega_{t+1}]}{D\Omega_t^\epsilon - \Omega_t + 1 - \delta} \quad (\text{A1})$$

Taking a linear approximation around the steady-state equilibrium Ω yields

$$\Omega_{t+1} = \Omega + \frac{(1 - \delta) + (1 - \epsilon) D\Omega^\epsilon}{\beta [(1 - \delta) + \alpha (1 - \epsilon) D\Omega^\epsilon]} (\Omega_t - \Omega) \quad (\text{A2})$$

where we have used (32). Based on (A2), the characteristic root ξ of the dynamical system can be expressed as

$$\xi \equiv \frac{(1 - \delta) + (1 - \epsilon) D\Omega^\epsilon}{\beta [(1 - \delta) + \alpha (1 - \epsilon) D\Omega^\epsilon]} \quad (\text{A3})$$

The local stability properties of the steady state are determined by comparing the number of the stable root with the number of predetermined variables in the dynamical system. In (A2), there is no predetermined variable because Ω_t is a jump variable. As a result, the steady-state equilibrium Ω is locally determinate when the

characteristic root is unstable (i.e., $|\xi| > 1$) whereas it is locally indeterminate when the characteristic root is stable (i.e., $|\xi| < 1$). Given these properties, we have the following results. First, if $\alpha > 1/2$ (i.e., $\epsilon < 0$), then the dynamical system exists a unstable root. This result implies that Ω_t displays saddle-point stability and equilibrium uniqueness as shown in Figures 3a and 4.

Second, if $\alpha < 1/2$ (i.e., $\epsilon > 1$), then whether the root is unstable or stable is determined by the steady-state equilibrium value of Ω . The result implies that the multiple equilibria may emerge as shown in Figure 3b. To derive a range for the steady-state equilibrium value of Ω , we first make use of (32) to obtain

$$\frac{\partial LHS}{\partial \Omega} = \frac{\partial RHS}{\partial \Omega} \Rightarrow \Omega^* \equiv \left[\frac{(1-\beta)(1-\delta)}{(1-\alpha\beta)(\epsilon-1)D} \right]^{1/\epsilon} \tag{A4}$$

where Ω^* is a threshold value under which $\Omega^{low} < \Omega^*$ and $\Omega^{high} > \Omega^*$ as shown in Figure 8.

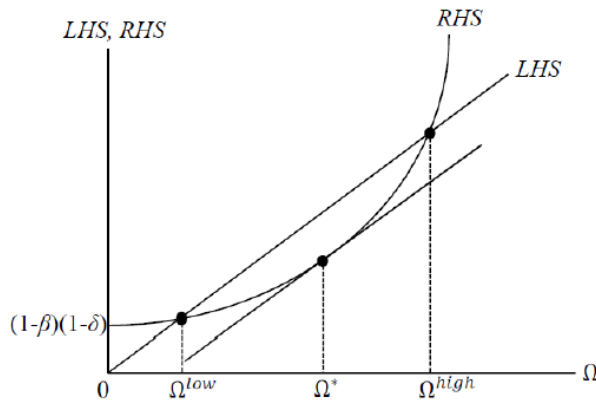


Figure 8

A steady-state equilibrium Ω is dynamically stable if $\xi \in (-1,1)$. One can manipulate (A3) to show that $\xi \in (-1,1)$ is equivalent to

$$\Omega^* < \Omega < \Omega^{**} \tag{A5}$$

where $\Omega^{**} \equiv \left\{ \frac{[(1+\beta)(1-\delta)]}{[(1+\alpha\beta)(\epsilon-1)D]} \right\}^{1/\epsilon}$. Therefore, a steady-state equilibrium Ω is locally indeterminate if $\Omega \in (\Omega^*, \Omega^{**})$ whereas it is locally determinate if $\Omega < \Omega^*$ or $\Omega > \Omega^{**}$. We can now conclude that Ω^{low} is locally determinate because $\Omega^{low} < \Omega^*$. However, Ω^{high} can be either locally indeterminate when $\Omega^* < \Omega^{high} < \Omega^{**}$ or it can be locally determinate when $\Omega^{high} < \Omega^{**}$.

Next, we examine how the matching probability σ affects the steady-state

equilibrium values of $\{\Phi, \Omega\}$, which in turn affect the dynamical properties of Ω_t . Differentiating (31) and (32) with respect to σ yields

$$\frac{\partial \Phi}{\partial \sigma} = \frac{\beta(1 + \mu - \beta)}{\theta[(1 + \mu) - \beta(1 - \sigma)]^2} > 0 \quad (\text{A6})$$

$$\frac{\partial \Omega}{\partial \sigma} = \underbrace{\frac{\alpha\beta\Omega^2}{(1 - \alpha\beta)(\epsilon - 1)D\Omega^\epsilon - (1 - \beta)(1 - \delta)}}_{?} \underbrace{\left(\Phi + \sigma \frac{\partial \Phi}{\partial \sigma}\right)}_{+} \quad (\text{A7})$$

Equation (A6) indicates that increasing σ has a positive effect on Φ . Equation (A7) shows that increasing σ has an ambiguous effect on Ω . Specifically, if and only if $\Omega > \Omega^*$, then Ω is increasing in σ . The result implies that an increase in σ may cause Ω^{high} to change from being locally indeterminate (i.e., $\Omega^{high} < \Omega^{**}$) to being locally determinate (i.e., $\Omega^{high} > \Omega^{**}$). Finally, it can be shown that when σ is sufficiently large (small), we must obtain $\Omega^{high} > \Omega^{**}$ ($\Omega^{high} < \Omega^{**}$). To prove this statement, we make use of (32) to obtain

$$(1 + \alpha\beta\sigma\Phi) = (1 - \alpha\beta)D\Omega^{\epsilon-1} + \frac{(1 - \beta)(1 - \delta)}{\Omega} \quad (\text{A8})$$

The right-hand side (RHS) of (A8) is increasing in Ω , and this result can be shown as follows:

$$\frac{\partial RHS}{\partial \Omega} = \frac{1}{\Omega^2} \underbrace{[(1 - \alpha\beta)(\epsilon - 1)D\Omega^\epsilon - (1 - \beta)(1 - \delta)]}_{+} > 0 \quad (\text{A9})$$

Given $\Omega^{high} < \Omega^{**}$, we substitute Ω^{**} into the RHS of (A8) to obtain $(1 + \alpha\beta\sigma\Phi) < (RHS)_{\Omega=\Omega^{**}}$. Based on $\partial\Phi/\partial\sigma > 0$, there exists a point σ so that $(1 + \alpha\beta\sigma\Phi) = (RHS)_{\Omega=\Omega^{**}}$ at $\sigma = \sigma^{**}$, where

$$\sigma^{**} \equiv \frac{1}{2\alpha\beta^2} \left\{ \theta\beta(\Theta - 1) + \sqrt{[\theta\beta(\Theta - 1)]^2 + 4\alpha\theta\beta^2(\Theta - 1)[1 + \mu - \beta]} \right\} > 0, \quad (\text{A10})$$

$$\Theta \equiv (1 - \alpha\beta)D(\Omega^{**})^{\epsilon-1} + \frac{(1 - \beta)(1 - \delta)}{\Omega^{**}} > 1 \quad (\text{A11})$$

By analogous inference, we substitute Ω^* into (A8) to derive

$$\sigma^* \equiv \frac{1}{2\alpha\beta^2} \left\{ \theta\beta(\Psi - 1) + \sqrt{[\theta\beta(\Psi - 1)]^2 + 4\alpha\theta\beta^2(\Psi - 1)[1 + \mu - \beta]} \right\} > 0 \quad (\text{12})$$

$$\Psi \equiv (1 - \alpha\beta)D(\Omega^*)^{\epsilon-1} + \frac{(1 - \beta)(1 - \delta)}{\Omega^*} > 1 \quad (13)$$

As a result, if σ is sufficiently large (i.e., $\sigma > \sigma^{**}$), then Ω^{high} changes from being locally indeterminate to being locally determinate. On the contrary, if σ is sufficiently small (i.e., $\sigma \in (\sigma^*, \sigma^{**})$), then Ω^{high} exists and is locally indeterminate.

Proof of Proposition 2. Differentiating (32) with respect to μ and using (36) yield

$$\frac{\partial \Omega}{\partial \mu} = \underbrace{\frac{\alpha\beta\sigma\Omega^2}{(1 - \alpha\beta)(\epsilon - 1)D\Omega^\epsilon - (1 - \beta)(1 - \delta)}}_{?} \times \underbrace{\frac{\partial \Phi}{\partial \mu}}_{-} \quad (14)$$

Given $\alpha > 1/2$ and $\epsilon < 0$, we have the following results. First, there is a unique steady-state equilibrium value of Ω which is increasing in μ as reported in Figure 3a. Second, based on (34), the growth rate is monotonically decreasing in the consumption-capital ratio in CM (i.e., $\frac{\partial g}{\partial \Omega} = \epsilon D\Omega^{\epsilon-1} - 1 < 0$). We make use of these results and take the differentials of (34) with respect to μ to obtain

$$\frac{\partial g}{\partial \mu} = \underbrace{\frac{\partial g}{\partial \Omega}}_{-} \times \underbrace{\frac{\partial \Omega}{\partial \mu}}_{+} < 0 \quad (A15)$$

Equation (A15) shows that if $\alpha > 1/2$, there exists a unique balanced-growth equilibrium in which an increase in μ reduces g .

Proof of Proposition 3. Given $\alpha < 1/2$ and $\epsilon > 1$, (A14) shows that an increase in μ leads to a decrease in Ω when $\Omega > \Omega^*$ whereas it leads to an increase in Ω when $\Omega < \Omega^*$.

In other words, when $\alpha < 1/2$ and $\epsilon > 1$, a higher μ increases Ω^{low} and decreases Ω^{high} as shown in Figure 3b. We take the differentials of (35) with respect to μ to obtain

$$\frac{\partial g}{\partial \mu} = \underbrace{\left[\alpha\sigma\beta\Omega + \frac{\alpha^2\beta^2\sigma\Omega^2(\epsilon D\Omega^{\epsilon-1} + \sigma\Phi)}{(1 - \alpha\beta)(\epsilon - 1)D\Omega^\epsilon - (1 - \beta)(1 - \delta)} \right]}_{?} \times \underbrace{\frac{\partial \Phi}{\partial \mu}}_{-} \quad (A16)$$

where we have used (A14). Equation (A16) shows that when $\Omega > \Omega^*$, g is decreasing in μ . In other words, the high-growth equilibrium g^{high} is always decreasing in μ .

As for the case of $\Omega < \Omega^*$, we substitute (32) into (A16) to derive

$$\frac{\partial g}{\partial \mu} = \underbrace{\frac{\alpha\beta\sigma\Omega^2 (\epsilon D\Omega^{\epsilon-1} - 1)}{(1 - \alpha\beta)(\epsilon - 1) D\Omega^\epsilon - (1 - \beta)(1 - \delta)}}_{?} \times \underbrace{\frac{\partial \Phi}{\partial \mu}}_{-} \quad (\text{A17})$$

Equation (A17) shows that when $\Omega < \Omega^*$, a higher μ has an ambiguous effect on g . Specifically, if $\Omega > \bar{\Omega} \equiv [1/\epsilon D]^{1/(\epsilon-1)}$, then an increase in μ leads to an increase in g . Moreover, given $\Omega < \Omega^*$, the right-hand side (RHS) of (A8) is decreasing in Ω , and this result can be shown as follows:

$$\frac{\partial RHS}{\partial \Omega} = \frac{1}{\Omega^2} \underbrace{[(1 - \alpha\beta)(\epsilon - 1) D\Omega^\epsilon - (1 - \beta)(1 - \delta)]}_{-} < 0 \quad (\text{A18})$$

Substituting $\bar{\Omega}$ into the RHS of (A8) to obtain $(1 + \alpha\beta\sigma\Phi) < (RHS)_{\Omega=\bar{\Omega}}$ Given $\partial \Phi / \partial \mu <$

0, there exists a point $\bar{\mu}$ so that $(1 + \alpha\beta\sigma\Phi) = (RHS)_{\Omega=\bar{\Omega}}$ at $\mu = \bar{\mu}$, where

$$\bar{\mu} \equiv \frac{\alpha\beta^2\sigma^2}{\theta [(1 - \alpha\beta)/\epsilon + (1 - \beta)(1 - \delta)(\epsilon D)^{1/(\epsilon-1)} - 1]} + \beta(1 - \sigma) - 1 \quad (\text{A19})$$

As a result, if $\mu > \bar{\mu}$, then we have a positive effect of inflation in the low-growth equilibrium glow. On the contrary, if $\mu < \bar{\mu}$, then we have a negative effect of inflation in the low-growth equilibrium glow. Therefore, the overall effect of μ on glow follows a U-shaped function.

IMI News

President Chen Yulu Appointed as Deputy Governor of PBoC

On October 30, the State Council of China appointed Chen Yulu, chairman of the IMI Academic Committee and the former president of Renmin University of China (RUC), as the deputy governor of People's Bank of China. Professor Chen Yulu has been the president of RUC since November, 2011. As the youngest president of "985 Projects" university, he took a position of vice-ministerial level. Now he is leaving RUC where he studied and worked for thirty years for No.32 Chengfang Street, becoming the youngest deputy governor of PBoC. At present, there are three deputy governors of PBoC graduating from RUC. They are Pan Gongsheng, Fan Yifei and Chen Yulu.

Press Conference and RMB Internationalization Symposium in New York

On October 8, the Press Conference and RMB Internationalization Symposium was held in New York, organized by International Monetary Institute (IMI) of Renmin University of China, co-organized by RUC North America Alumni Association, Center for Global Business at Pennsylvania State University, the EMBA Program of Zhejiang University and Official Monetary and Financial Institutions Forum (OMFIF).

The conference was attended by William Purpura, chairman of COMEX Governors Committee; David Marsh, member of IMI Academic Committee and managing director of OMFIF; Anoop Singh, member of IMI Academic Committee, adjunct professor of Georgetown University, and former director of Asia & Pacific Dept. of IMF, and Regulatory Strategy Head of Asia Pacific JP Morgan; Dominick Salvatore, advisor for UN, World Bank and IMF; director of the PhD Program in Economics at Fordham University; Warren Coats, former chief of the SDR division of Finance Department and assistant director of the Money and Capital Markets

Department of IMF; Wanda Tseng, former deputy director at Asia and Pacific department of IMF; Zach Pandl, managing director of Goldman Sachs; Zhang Zhixiang, former director general of International Department of PBoC, and former Executive Director of IMF for China; Ben Shenglin, executive director of IMI and director of EMBA Program of Zhejiang University; Xiang Songzuo, deputy director of IMI and chief economist of Agricultural Bank of China; Song Ke, deputy director of IMI; and more than 200 representatives from international organizations, universities, think tanks, and corporate community. The conference was reported by media from over 20 countries including People's daily, Xinhua News Agency, CCTV, Phoenixtv, Wall Street Journal, Bloomberg, etc.

The first session of the conference is themed "Monetary strategy in 'One Belt and One Road' Initiative, moderated by Ms. Wanda Tseng. Dr. Xiang Songzuo made the keynote speech interpreting the RMB internationalization report 2015. He stated it is promising that RMB will surpass yen in two years to be the fourth major world currency. By the calculation of the research group of IMI, the RMB internationalization index has risen from 0.02 by the end of 2009 to 2.47 by the end of 2014. The second session of the conference themed "RMB exchange rate, capital account liberalization, SDR and the global reserve system" began with the keynote speech by Mr. Anoop Singh on "RMB as an international currency". During the speech, he distinguished the roles RMB will play as a reserve currency and as an international currency. He also put great emphasis on the stability of economy in the period of reforming.

Macro-Finance Salon (No. 28): The Comprehensive Financial Reform and Management of Regional Risks in Wenzhou

On December 13, the Macro-Finance Salon (No. 28) was held in Renmin University of China. Dr. Wang Yi, senior research fellow of IMI, deputy mayor of Wenzhou, and deputy director-general of the Statistics and Analysis Department of PBoC, was invited as the guest speaker and delivered a keynote speech entitled "The Comprehensive Financial Reform and Management Regional Risks in Wenzhou". Mr. Zheng Wufu, deputy director-general of the Personnel and Education Department of PBoC, also attended meeting and commented on the speech. The meeting was presided over by Prof. Tu Yonghong, deputy director of IMI and professor of School of Finance at Renmin University.

In his speech, Dr. Wang Yi briefed the background and basic information about the comprehensive financial reform in Wenzhou. Based on the characteristics of Wenzhou's economic structure, he studied the market condition when the financial reform was initiated in 2012, whereby there were large number of small and micro enterprises, large amount of private capital, and substantial difficulties in financing and investment. Therefore, he considered that regional risks in Wenzhou should be managed through financial reforms. However, at the initial stage of the reform, preparations for the formal finance's exposure to risks were inadequate, and subsequent judicial and taxation problems were difficult to tackle at regional level. He introduced the basic mentality of the financial reform, and concluded the achievements of reform from different perspectives such as "dual chains" of enterprises, handling toxic assets, injecting liquidity, judicial enforcements, the standardization of private financing, the credit system, and the social integrity environment. At last, Dr. Wang shared his reflections on the comprehensive financial reform of Wenzhou. He said that the foundation of industries should be consolidated, and traditional industries need to be upgraded to lay solid foundation for operations in the financial sector. He also said that we should strike a balance between the private financing and the formal finance, be more prudent towards financial innovations, and improve the judicial protection mechanism for bankruptcy and the taxation system for disposing risk capital.

McKinnon Lectures (No. 6): Public Infrastructure Investment—A BRICS Perspective for Inclusive Sustainable Development

On December 15, McKinnon Lectures (No. 6) was held by IMI in Renmin University of China. Dr. Jaya Josie, Head of BRICS Research Center at Human Sciences Research Council (HSRC), delivered a speech entitled "Public Infrastructure Investment—A BRICS Perspective for Inclusive Sustainable Development". The lecture was presided over by Prof. Zhang Zhixiang, member of IMI Academic Committee and former director-general of International Department of PBoC.

In his speech, Dr. Josie first discussed the extent to which infrastructure investment may act as a catalyst for promoting Sustainable Development Goals (SDGs). He elaborated on the role of public infrastructure investment in meeting SDGs in the BRICS countries, and pointed out that public infrastructure was a key

intermediate factor for ensuring that individual's living standard, socio-economic and political rights are sustainable in the long-term.

Dr. Josie reviewed the current trends in infrastructure investment as they relate to gross fixed capital formation (GFCF) from a long-term BRICS perspective. He elaborated on the trends in public infrastructure financing, capital stock—the indicator for public infrastructure investment and GFCF among BRICS countries. He then put forward a possible theoretical framework for public investment to address inclusive development and basic public infrastructure service backlogs targeting SDGs in BRICS countries. Finally, Dr. Josie discussed the possible role of a BRICS development finance institution in financing public infrastructure investment, and concluded with some specific proposals. He believed that the recent establishment of the BRICS New Development Bank and the accession of the RMB to international reserve currency status presented China with an opportunity to bridge the long-term infrastructure investment financing gap faced by for developing countries for the provision of basic infrastructure services to address the SDGs.

After his speech, Dr. Josie was appointed as member of IMI Academic Committee. Prof. Zhang Zhixiang, on behalf of IMI, presented Dr. Josie the letter of appointment.

Tao Xiang International Finance Lectures (No. 1): Building Good Models for Credit Risk Management—Learning from US Banking Industry

On November 14, the first Tao Xiang International Finance Lectures, jointly organized by the School of Finance of Renmin University of China and International Monetary Institute (IMI), was held in Qiushi Building of Renmin University. Dr. Chen Weiping, Senior Vice President of Wells Fargo, delivered a speech “Building Good Models for Credit Risk Management—Learning from US Banking Industry”. The lecture was chaired by Prof. He Qing, research fellow of IMI and professor of School of Finance of Renmin University of China.

Dr. Chen mentioned in the speech that financial risk management received serious attention after the financial crisis in 2008, and risk qualification model would play a key role in risk management success. An excellent risk model analyst should be qualified with honest and good thinking, understanding in financial trade and good communication and professional skills. Dr. Chen also highlighted the importance of data digging, literature composing and simplicity after analyzing the process of a

successful risk model.

Tao Xiang International Finance (No. 2): Insights into the Global Asset Allocation

On December 19, Tao Xiang International Finance Lectures (No.2), co-organized by IMI and School of Finance of Renmin University, was held in Room 830 of Mingde Building at RUC. Mr. Hong Hao, the general manager of Bocom International made a keynote speech on international investment strategies. Mr. Wei Benhua, member of IMI Academic Committee and former deputy administrator-in-bureau of SAFE, commented on the speech. The meeting was chaired by Prof. Tu Yonghong, deputy director of IMI and professor of School of Finance of Renmin University.

In the speech, Mr. Hong first shared some thoughts on the reserve asset allocation of central banks worldwide. By studying the key phenomena in the current global monetary system and analyzing the investment decisions made by sovereign wealth fund, he pointed out 3 factors that had caused the slowdown of the total reserve asset accumulation of central banks. First, China's foreign-exchange reserves declined; second, the forex reserves of oil producing countries dropped due to the sharp decline of oil prices; and third, the central banks of developed countries cut their holdings of US dollars because they no longer need to intervene in the foreign exchange market. However, US dollars accounted for 68% of the world forex reserves, which made non-dollar currencies under more pressure during forex reserve restructuring, causing the dollar to appreciate.

He then analyzed how China should react under the new circumstance, and predicted that China's service sector may witness a breakthrough in the upcoming future. He also analyzed the saving glut in China by citing the money shortage in June 2013 and the stock market bubble in 2015. He believed that as there is great need for domestic asset allocation, the exchange rate of RMB would be the most important one in the asset class. China's central bank has adopted the RMB exchange rate formation mechanism, and other central banks would continue to witness slowdown in forex reserve asset accumulation. He emphasized that we must take into account the reduced demand for US treasuries when we invest and allocate assets especially at a global scale.

Alumni of Renmin University Donate to the “Series of IMF History” Project

On November 7, the Signing Ceremony of WeChat Non-Profitable Donation by Renmin University Alumni of Class 1986 was held in Beijing. As representatives of the alumni, Li Tao and Zhang Liang signed the donation agreement respectively for the “Series of IMF History” Project, and “Shan Bei Public School Site Renovation” Project. The fund raised for the “Series of IMF History” Project would be used to support the publishing of “Series of IMF History” compiled by IMI and China Financial Publishing House.

The WeChat Non-Profitable Foundation was established by Renmin University Alumni of Class 1986 on the Internet Finance and Financial Innovation Forum held in Shenzhen on May 23. Determined to establish a sustainable platform providing public benefit service, the foundation aims at making contribution not only to Renmin University but also to the benefit of the whole society. This is its first donation through the platform of WeChat, with 500 thousand yuan raised for the “Series of IMF History” Project and 200 thousand yuan raised for the “Shan Bei Public School Site Renovation” Project.

5th Plenary Meeting of the “Series of IMF History” Project

On November 16, the 5th plenary meeting for the “Series of IMF History” Project was held at Renmin University of China (RUC). Wang Lu, associate editor-in-chief of China Financial Publishing House; Zhang Jie, director of IMI; Tu Yonghong, deputy director of IMI, and other team leaders of the project attended the meeting. The meeting was hosted by the project director Wei Benhua, IMI Academic Committee member and the former deputy Administrator-in-Bureau of SAFE.

Ms. Wang Lu expressed her appreciation on the effort made by the translators and expected to know more about the work progress of each team. Prof. Zhang Jie pointed out that the “Series of IMF History” Project was one of the most important projects of IMI, and that it was an authoritative introduction of IMF history. Afterwards, each team leader reported their work progress, followed by an exchange of valued experiences of their views about the difficulties in translation.

Launch of IMF World Economic Outlook

On October 19, the Launch of IMF World Economic Outlook was held in Renmin University of China. The event was co-hosted by IMI, IMF China and Minsheng Securities Co., Ltd. Participants include Paul Steinmetz, Luxembourg Ambassador to China; Raphael Lam, IMF deputy representative for China; Rudolfs Bems and Lian Weicheng, economists of IMF; Wei Benhua, former deputy administrator-in-bureau of SAFE and former executive director for China in IMF; Guan Qingyou, executive dean of Minsheng Securities Academy and chief economist of Minsheng Wealth Management; Sun Lujun, director of Guoxin International Investment Co. Ltd., and counselors to China from the Embassy of U.S., Germany, Italy, Canada, Russia, Australia and other countries. The conference was presided over by Zhang Zhixiang, former director-general of International Department, PBoC, and former executive director for China in IMF.

Mr. Rudolfs Bems made a keynote speech titled “Where are commodity exporters headed? Output growth in the aftermath of the commodity boom”. He suggested that all the countries should make full use of the reform opportunities in crisis to improve labor market, infrastructure and economy environment, etc. Mr. Lian Weicheng delivered a speech titled “Exchange rate and trade: disconnected?” It was mentioned in the World Economic Outlook this year that the global economy was predicted to increase by 3.1%, 0.3% lower than that of 2014. The prospect of major countries and regions are still imbalanced.

Founding Ceremony of China Asset Securitization

On October 24, the Founding Ceremony of China Asset Securitization 100 Forum was held in Beijing, co-hosted by Xiamen International Finance Technology Co., LTD and the magazine of *Modern Bankers*. IMI took the post of academic partner of the Forum. Cao Tong, IMI Co-Director and Chairman of Board of Xiamen International Finance Technology Co.LTD, serves as the director of the Forum Council. More than 100 leaders and experts from government sectors and industries attended the ceremony, including Ma Delun, former Deputy Governor of PBoC and Chairman of Banking and Accounting Society of China; Shen Bingxi, former Deputy Director-General of Financial Markets Department at PBoC; Yan Hong, Professor of Shanghai Advanced Institute of Finance; Duan Bing, Deputy General Manager, Financial Markets Department, Agricultural Bank of China; Dang

Junzhang, General Manager, Financial Markets Department, Postal Savings Bank of China; Yan Yan, Chairman of Board, CCXI; Ren Jin, President of J.P. Morgan First Capital Securities Co., Ltd.; Liu Xiangdong, Vice President of Everbright Xinglong Trust Co., Ltd; Lv Xiangdong, Vice President of Dagong Global Credit Rating Co., LTD, etc.

The ceremony centered on “Credit Risk and Asset Securitization” and focused on how to improve the risk pricing mechanism of China’s fixed income market through principles and methods of asset securitization and to provide market basis for solving the bail-out. Mr. Cao Tong delivered a speech of “Internet Contributes to Solving the Mismatch Problem between Asset Securitization and Credit Risk”. Mr. Ma Delun gave a speech titled “Non-performing Asset Securitization will Perform Well”. Mr. Shen Bingxi delivered a speech of “Asset Securitization Has Positive Influence on Controlling Financial Risks”.

Co-CEO of Sino-German Center Visit IMI

On November 13, Dr. Ruediger von Rosen, co-CEO of Sino-German Center of Finance and Economics (SGC), visited IMI. Wei Benhua, a member of the academic committee of IMI and the former deputy administrator-in-bureau of the State Administration of Foreign Exchange; Tu Yonghong, deputy director of IMI, professor of the School of Finance of RUC; and Qi Lan, the project director of SGC and deputy director of Sino-German Financial Reform Program, GIZ, attended the meeting. They decided to jointly carry out the research on the development of the RMB offshore market in Frankfurt and the German’s experience of the risk management on the convertibility of Deutsche Mark. They also planned to organize a study tour to Frankfurt for in-depth research in May of 2016.

Mr. Jin Yu and Dr. Jaya Josie Join IMI Academic Committee

Mr. Jin Yu, Chairman of Board, Bank of Shanghai, and Dr. Jaya Josie, Head of BRICS Research Center at Human Sciences Research Council (HSRC) accepted the invitation to join IMI academic committee. Up to now, the IMI Academic Committee has 36 members from home and abroad. They are experts and scholars from research institutes, government sectors and financial institutions. Chen Yulu, Deputy Governor of the PBOC, serves as the chairman of the committee.

Jiao Jinpu, former Director-General of Financial Consumer Protection Bureau,

PBOC, was recently elected as the new Chairman of the Shanghai Gold Exchange (SGE). Zhao Haiying, former Vice President of Central Huijin Investment Ltd., has been appointed as the Chief Risk Officer of China Investment Corporation. Zhou Daoxu, former Deputy Secretary of the Guizhou Provincial Government and Director of the Guizhou Provincial Finance Bureau, is now Chairman of Board of Huarong International Trust Co., Ltd. Tomoyuki Fukumoto, former Chief Representative of Bank of Japan Beijing Office, currently serves as the President of Bank of Japan Kita-Kyushu Branch. Huang Jinlao, senior research fellow of IMI and former Vice President of Huaxia Bank, has been appointed as the Vice President of Suning Group and Executive Vice President of Suning Financial Group.



Call for Papers

International Monetary Review

International Monetary Review is an internal academic magazine sponsored by International Monetary Institute. Following the principle of including both Chinese and western merits with precise and practical academic spirit, International Monetary Review focuses on the cutting-edge theoretical researches in internationalization of RMB, reform of international monetary system, regional monetary and financial cooperation, China's international financial strategies, and other macro-financial theories and policies. We welcome submissions by scholars, experts and practitioners in financial industry. Papers and articles should center on key financial issues and follow academic standard and scientific methodology. We welcome quality articles based on data analysis and theoretical model and other insightful articles with standard writing.

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中国人民大学国际货币研究所

Address: Room 605, Culture Square, Renmin University of China, No. 59 Zhongguancun Street, Haidian District, Beijing 100872, P. R. China

Tel: 86-10-62516755
