International Monetary Review

January 2015, Vol. 2, No. 1

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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WANG ZHAOXING

Vice Chairman of the China Banking Regulatory Commission
Member of IMI Advisory Board

Mr. WANG Zhaoxing was appointed Vice Chairman of the China Banking Regulatory Commission (CBRC) in December 2007. Prior to his current assignment, Mr. WANG served as Assistant Chairman of the CBRC from June 2005 to December 2007.

Before joining the CBRC, Mr. Wang had worked at Shannxi Institute of Finance and Economics and People's Bank of China (PBC). He had extensive working experience in monetary policy and banking supervision. He has represented the CBRC to engage in international financial supervision reform; served as a leading negotiator in banking area for China's accession to the WTO; chaired a series of key programs such as Financial Sector Assessment Program for China's Banking Section, the Implementation of New International Supervisory Standards by Chinese Banks, the Opening-up Program of China's Banking Sector, the Promotion of the SME Financial Services, and the Construction of Off-site Surveillance System and Risk Warning System, etc.

Apart from his positions at the CBRC, Mr. WANG also serves as a member of Basel Committee on Banking Supervision, Deputy Director of China International Finance Society, an executive member of China Society for Finance and Banking, an executive member of China Urban Financial Society, and a member of the Enterprise Internal Control Committee under Ministry of Finance.

In addition, Mr. WANG is member of the Academic Degree Committee at the Graduate School of the PBC, a part-time professor at PBC School of Finance, Tsinghua University supervising PhD candidates. He received the 'May 1st Labor' Medal", and enjoys the special government allowance from the State Council. He was also elected as a delegate of the 13th Beijing Municipal People's Congress, and a delegate of the 14th Beijing Xicheng District People's Congress.

Mr. WANG was born in 1959 in Jilin province. He received his Ph.D. in Money and Banking in 1990 from Shaanxi University of Finance and Economics.

This issue is proud to present

WANG ZHAOXING

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International Monetary Review
January 2015, Vol. 2, No. 1

In Brief

Editor's Note:

Up to the end of 2014, the advisory board members and academic committee members of IMI have been expressing their research opinions on monetary finance and economics through published articles and public speeches. The following is a summary of their research reviews.

Research Review by IMI Advisory Board Members

STEVE H. HANKE mentioned in his article "***Iran's economy, with and without a P5+1 agreement***", after decades of wrongheaded economic policies, Iran's economy is in terrible shape. Now, Iran would like to remove the economic sanctions imposed on it by the United States and its allies. He estimated that Iran's real gross domestic product has contracted by a cumulative 8.6% during the past two fiscal years 2012/13-2013/14 with estimated 79 billion forgone economic output. The haggling between Iran and the P5+1, the permanent members of the United States Security Council plus Germany is scheduled to come to a close on Monday. He outlined the importance of removal of sanctions in the following. First, trade and financial sanctions imposed since early 2012 have inflicted heavy damage on Iran's economy. Second, removal of sanctions would allow for steady increases in oil export to their pre-sanction level by the end of 2017 with estimated cumulative GDP for two fiscal years to be greater than 125 billion.

PAN GONGSHENG put forward in "***How to develop the credit investigation industry in Chinese market****"* that there are various thoughts and arguments about how to develop the credit investigation industry in China: whether to be led by the government, who participates in the process and provides services or to make it market-oriented?

He pointed out, the role of government departments is to create and nurture favorable conditions regarding laws, systems and policies for the credit investigation

agencies to develop. He suggested we need to make full use of new technologies to develop the Credit Investigation Industry. Using big data, traditional credit reporting agencies can either add information from the internet to their credit investigation system or integrate their resources. Big data companies can become new credit investigation agencies by collecting and analyzing data from the internet to provide information service for their customers. In addition, he suggested protect rights of Credit Information Owner in Credit Information Service. According to international laws and regulations on the administration of credit investigation industry and China's Regulation on the Administration of Credit Investigation Industry, personal credit investigation information is better protected than those of the companies. Last year, the Regulation on the Administration of Credit Investigation Industry was issued and implemented by the State Council and the protection of rights of credit information owner in credit information service was highlighted in it. He advised any official department should be prevented from violating the rights of credit information owner and all individuals should be given the choice to improve their credit.

Research Review by IMI Academic Committee Members

CHEN YULU pointed out in "***Financial development in the framework of Macro-Finance***" that the General Theory of Macro-Finance underlines the need to regard financial sector and real economy as a whole, the need to regard the financial system as a whole, and the need to regard China's and global financial development as a whole.

In terms of the general goal and strategic positioning of China' financial development, seeking new economic engines through effectively transforming economic growth model is the inevitable course. China's financial development model and path should play a strategic guiding role and fully serve for the general plan of national economic and social development.

He also stated that China's development concept of "Macro-Finance" should focus on constructing three cornerstones: theory, value and practice. First is the cornerstone of theory, i.e. the general rules of economic and financial operation that China's financial development must follow. Second is the cornerstone of value, i.e. the core values and principles of China's style economic growth that China's financial development must represent. Third is the cornerstone of practice, i.e. the "national endowment" on which China's financial development must rely. The

integration of the three cornerstones serves as the theoretic pillar and core value system of our concept of "Macro-Finance".

When it comes to the strategic framework and practice of China's financial development, he mentioned three parts, including internal development of financial system, financial opening up, and macro regulation of financial sector. First, two basic problems have emerged in the internal development of financial system: a) how to develop an efficient and stable modern financial system; and b) how to effectively integrate finance and real economy. Second, the main goals of financial opening up are to open up financial sector actively and prudentially, and to fully increase China's voice in global financial system in the mindset of balancing efficiency and stability. Third, the main goals of macro regulation of China's financial sector are to establish and improve a macro-prudential financial regulation system, enhance policy coordination and improve the early warning system of financial imbalance.

BEN SHENGLIN made a speech on "unconventional monetary policy" at Deutsche Bundesbank Fifth Main Meeting in Europe on October 16. As the emerging market representative, he gave his thoughts on "***centers of strength and points of vulnerability***". He made two important points of vulnerability. The first is regarding financial risk and the risk of banking sector crisis. He mentioned that the listed Chinese banks have relatively low PE and PB ratio. The last time we had such valuation levels were about 10-12 years ago, when the Chinese banks were considered "technically bankrupt". The second point of vulnerability is (geo) political: the domestic tensions in Hong Kong, Tibet and Xinjiang; the regional tensions in East China Sea and South China Sea. The speech then moved on to the benefit of the "centre of strength" which refers to Chinese centralized political, fiscal and monetary union. The Chinese government recentralized its power, making it easier for the policies to be implemented across the country. Economic liberalism is also gaining momentum with reform back as the top agenda for the government which will unleash the entrepreneurial spirit across the country and spur the next round of economic growth in China. The concluding remark is that the political recentralization in China in combination with the unfolding economic liberalism will unlock the potential and power of Chinese entrepreneurship leading the nation to the next round of economic growth.

As **CAO TONG** mentioned in his speech entitled "***The internet may create a new financing mode***" in the Internet and Finance Forum and 2014 World Internet Conference, the current transformation to direct financing follows American mode,

which mainly relies on exchanges. But if Internet financing can be utilized, we will exponentially accelerate information collection and dissemination and increase the quantity and efficiency of information. He also pointed out the direction in which China should reform its financial system - three themes of China's financial reform. The first theme, macro-economic reform can be concluded into the market-based reforms of interests rate, exchange rate, and capital control. The second theme is to adapt the whole financial system to the transformation of industries and to inject capital into consumption instead of production. The third theme is about the transformation from indirect financing to direct financing, whose target is to transform the current indirect-financing-dominated financial system to a more balanced financial system in which direct financing and indirect financing cooperate with each other, or even direct financing plays the decisive role. To create a direct financing mode with Internet as its center, we should carry out Internet-based financial regulation, achieve inter-connectivity, and provide the support of infrastructure for this newly born industry.

JIAO JINPU pointed out in "***How to overcome the barriers hindering China's demand transformation***" that we have four main challenges in protecting the interests of consumers of financial services. Firstly, he indicated conflict between conduct supervision and prudential supervision. Conduct supervision, which is good for the consumers of financial service emphasizes the direct intervention in financial products and the quality of the disclosed information. In China, the organization-oriented prudential supervision is preferred when it comes to supervising commercial banks and financial holding companies. Secondly, we need to consider the challenges brought by the gaps in regulation. Financial products that cross over between markets have emerged in large numbers and new finance such as the internet finance boosted in China. Therefore regulators face new challenges in the assignment of responsibility, information sharing and the effectiveness of regulation. Thirdly, protection of the interests of consumers of financial services versus financial innovation is another challenge. Protecting the interests of consumers of financial services will not hold back financial innovation. The sound and appropriate financial innovation will make the market more effective and expand the access of financial products and services to the customers. Lastly, there is a gap between the deficiencies of protecting the interests of consumers of financial services and increasing demand of protection. The deficiencies of protecting the interests of consumers of financial services not only exist in the number of regulators, financial institutions and the staff but also in the knowledge of financial

products, the judgment of financial risks and the handling of financial disputes.

Moreover, he provided some thoughts on promoting the protection of the interests of consumers of financial services. He suggested we should comprehensively promote the legal system for promoting the protection of the interests of consumers of financial services. We should actively explore better coordination mechanism for protecting their interests. And we also need to find better work models of protecting their interests

In an exclusive interview with Nihon Keizai Shimbun, **IL HOUNG LEE** expressed his concern that as the Fed plans to raise interest rates. South Korean economy is likely to suffer from long-term stagnation, with a series of domestic and global problems. The Japanese central bank's measures to expand its QE policies will not help boost Japan's real economy. After the end of QE, capital flows out of the US. If this causes a stock market downturn, the US's role as the global economic engine will weaken; if the Fed raises the base rate in the middle of next year, then US economy may fall into recession again. This will cause great damage to South Korea and other economies. He stated that the Japanese central bank's unexpected action to expand QE scale may only result in more speculation in the short run and long-term investment would not flow to Japan, because overseas investors had already learned that monetary easing alone could not stimulate growth.

In "***China's RMB could soon joint select group of currencies***", **DAVID MARSH** put forward that the stage is set for the Chinese RMB to develop further as a world currency by entering special drawing right, the IMF composite currency unit used in official financial transactions and reserves. Steps and measures are already taken to galvanize leading emerging market economies toward reforming world monetary arrangements, including the establishment of the New Development Bank by the five nation BRICS, as a challenge to the IMF and world bank. The British government will issue RMB denominated bonds, the first sovereign government to take such a step to be held as reserves managed by the bank of England. The IMF will undertake technical review for widening the SDR with the main condition that a currency in the SDR should be widely used in trade invoicing and should be "freely usable" in international payments and asset management. The IMF created the SDR in 1969 as an additional reserve asset to support post-war fixed-exchange rate system that collapsed only a few years later in 1971-73. Today, SDR consists of four main reserve currencies and its aim was to create a potential claim on the freely usable currencies of IMF members through voluntary exchanges between members. However, the SDR's importance gradually declined from the early 1970s due to

progressive flow of private capital. As a result of development over the next 12 months, it may make a comeback.

The annual Bank for International Settlements (BIS) meeting of Deputy Governors from EME in March 2014 on the topic "The transmission of unconventional monetary policy to the EME" contained a session on "***Internationalization of Emerging Market Currencies***". According to **HERBERT POENISCH**, the notion of an international currency broadly signifies the widespread use of a national currency by non-residents in both commercial and financial transactions. The following four indicators provide a composite proxy for the development of the internationalization of EM currencies. The first set is based on the international portfolio liabilities of EMEs, which more or less reflect the trend allocation by global investors to EME financial assets. Second is the foreign ownership of domestic currency securities in EMEs, indicating how open the local capital market is to foreign investors. The third set covers foreign exchange turnover in EM currencies and may shed light on their uses by non-residents. The fourth set is trade invoicing in the home currency, suggesting the currency's external role as a medium of exchange and unit of account. The application of these four indicators for RMB internationalization is as follows. RMB is well on the way on the fourth criteria, moving forward on the third criteria, but hardly moving on the first and second criteria. This cannot be changed in the near future due to the obvious need for continuing capital account controls, as convincingly argued by Yu Yongding and others. In order to be realistic and not raise expectations of a grand design excessively, it is therefore suggested to refer to this process as 'gradual internationalization of the RMB.

According to **ALFRED SCHIPKE** in "***Economic recovery from a global perspective***", at present, some changes occurred in the global financial market. The conditions of the developing countries are identical to those of the developed ones but may be followed with some risks.

In term of global economy situation, Chinese economy, though facing slowdown in its economic growth, remains strong comparing with other economies. The world economic recovery mainly depends on the American economy, which was sluggish in the first half of 2014 but picked up later. Modest recovery in the Eurozone and Japan was affected by aftermath of the global financial crisis. Emerging markets, especially Brazil and Russia, also face the economic slowdown; India however is an exception. In addition, conditions in the financial market have changed. Adjustments, which will happen for sure in this market, will lead to price fluctuations. U.S.

interest rate climbed, which may not be related to its economic situation. Japan faces the dual challenges of deflation and its price problem. At the same time, geopolitical risks may also weigh on the world economy.

According to the current global economy situation, he provided three suggestions. Firstly, developed economies should be more cautious. Easy monetary policy should be adopted during their easy-money exit and suitable fiscal policy should be adopted to fuel the economic recovery and growth. Besides, the risks that may occur in the future should be given enough attention. Secondly, emerging economies should be well prepared. They should be well prepared for the future risks and fluctuations that may occur in the financial market and for the rise of the global interest rate. They should therefore adjust their exchange rate policies to counter risks. Last but not least, structural reforms should be implemented. China has taken measures to increase its productivity and output by implementing reform. Those countries, which still heavily rely on public investment, should adopt policies that are favorable to investment in order to support their economic growth in the long run.

ANOOP SINGH commented on RMB internationalization at 2014 International Monetary Forum. He believes that China's external integration has been a key part of the Chinese great transformation and claims that WTO membership has integrated China's current account which allows the nation to better exploit its competitive advantages and benefits from its economic scale. He further suggests that China's external integration has made three important cornerstones. First, rapid growth in cross-border settlement and transactions; second, rapid growth in RMB denominated investment tools; third, currency swap agreements with other monetary authorities. On the Forum, he also commented on three different aspects to avoid growth natural limits. First is the exchange rate reform, which claims that currency market two way balancing is critical to independent and proactive monetary policy. Second is financial liberalization with the lending rate liberalization and also problem with "shadow banking". Third is capital account opening, suggesting China can further relax its control over capital flow through capital account liberalization and eventually phase out the QDII quotas. At the end, he made the following conclusions. First, a lot of progress has already been made in internationalizing the RMB. Second, the exchange rate and interest rate liberalization are among the cornerstones supporting reforms, promoting better allocation of resources and rebalancing economy towards consumption. Third, the SOE reform is complementary to the financial sector reform. Fourth, the gradual liberalization of capital account will reinforce and build on financial sector reform and therefore improve investment

efficiency. And lastly, exchange rate, financial sector and capital account openings reform need to be carefully timed and sequenced.

On Oct 7, the IMF published the Report on World and Regional Economic Outlook. In the report, the economic growth forecast for 2014 and 2015 is both trimmed, which draw attention from the world and emerging market countries. In her speech "***Problems and settlements of the global economy***", **TU YONGHONG** pointed out several problems that the global economy encounters. She said the end of quantitative easing may impact the global economy. China's economic downturn is bad for global economic growth. The Ukraine crisis and the expansion of ISIS will inevitably damage Europe's economy. In addition, there is no effective medicine or vaccine for Ebola so far.

To settle these problems, she pointed out China's economic structure and governance model is reforming, and China has entered a 'new normal' stage featuring mid-and-high-speed growth. The Chinese government should do more to reform its financial and taxation system, streamline administration, delegate power and support SMEs. In addition, we should promote the coordination and cooperation of economic policies in APEC Summit. We should improve the governing institution of IMF so that emerging market countries can play a bigger role in global economic governance. Moreover, she suggested we should give play to the IMF as the supervisor and regulator of international currency, and stress its importance in maintaining international financial stability, exchange stability and regulating currency policies to promote currency diversification. At the end, we should strive to incorporate RMB into the currency basket in the SDR examination in 2015.

According to **WEI BENHUA**'s article "***China should prepare for G20 in an enthusiastic manner***", to play the role of a responsible world power in international affairs, China must take the initiative to prepare for the G20 Summit and must consider four issues in advance, if China becomes the host country of G20 Summit in 2016. In the next few years, how to walk out of the global economic mediocrity and elevate the global economy to a higher level, or the pre-crisis level, is an issue to discuss. Mainly discussing economic and financial issues, the G20 Summit pointed out that the wealth gap caused by income inequality had become a major problem in the economic sector. This APEC Summit stressed how to help developing countries build infrastructure for sound economic growth. In this term, China has made great commitments and served as an exemplar, since China built the Asian Infrastructure Investment Bank, decided with other BRICS countries to establish the BRICS Development Bank and President Xi, at the summit, announced the foundation of

the Silk Road Fund, a fund with a huge scale. Since 2009, RMB internationalization policies have been quite successful, and the RMB internationalization index has won a huge influence worldwide. Currently, based on the situation that developing countries respect China and are willing to listen to China's voice, it would be a contribution to the international community if we can respond.

According to "***View the global imbalance and financial crisis from the international monetary***" by **XIANG SONGZUO**, in the past 30 years, as the economy grow rapidly, there is a tendency that virtue economy continues to grow apart from the real economy. This derives from the central bank operation model dominated by international monetary system. So we need to understand the global imbalance and financial crisis from the international monetary perspective.

The growth rate of monetary and financial indicator is much higher than that of real economy which has negative effect on real economy. On the one hand, after the collapse of the Bretton Woods system, the real GDP growth in all developed economies slowed down substantially, manifested by poor performance of many indicators including real GDP growth rate, unemployment rate, fiscal revenue growth, business profit growth and disposable income of individuals. On the other hand, after the collapse of the Bretton Woods system, the international currency began to adopt fiat money. The international system of fiat money fundamentally changed central banks' operation model. The international monetary system of fiat money created very low interest rate globally, and the low interest rate undermine the basic resource and credit market resource allocation mechanism, and further harmed the capital investment in the real economy.

To change the international monetary system, he suggested create multilateral international reserve currencies, and decrease the dependence on the US dollar and on the foreign exchange reserve unwillingly accumulated by central banks. In addition, he advised to create multilateral agreement to stabilize the exchange rate between major countries. We will have a new version of Bretton Woods fixed exchange rate, but the success possibility of this method is low.

According to the article "***From theory inferiority to theory confidence***" by **ZHANG JIE**, after western economics quickly replaced Soviet-style economics, a kind of theory inferiority emerged. No one at that time would ever predict that advocating, or even worshipping western economics would become a tendency; what's more unpredictable, once this tendency took form, it becomes irreversible. It

is sure that eternally renewed theoretical frameworks are all grounded in the civilization of certain nations, while theoretical frameworks created through imitation or transplantation cannot guide a nation's theoretical development in the long run, even if they may be popular in the short term. Similarly, the 'oriental economics' should be based on oriental experience of economic growth and market development, whose experience, already been proved by facts, is different from the western experience and should be studied with new models. From now on, economists, both mainstream and non-mainstream, must face an unprecedented fact: Chinese economics is not seeking a mainstream position, but mainstream economics seeks support from the Chinese experience to restore explanatory power. Or in other words, mainstream economics will not be confined to western theories; eastern ones may also compete. It has long been expected that a Chinese scholar can win the Nobel Prize in economics, but this dream has not been realized. So where is the outlet? We need to reflect on what we have done and what creative ideas we have. We need to return to Chinese experience and Chinese tradition, and use real Chinese stories to breathe new life into the cold but exquisite models.

According to the article "***The foresight of credit risk management in the context of low non-performing rate***" by **ZHANG XIAOPU**, ever since the global financial crisis, China's banking sector has been learning from both positive and negative experiences from other countries in an effort to improve the foresight of risk management. This article is about three methods or tools to improve banks' foresight: pressure test, hidden non-performing rate, and default probability.

In the area of credit risk management, pressure test is an important tool to manage foresight. Pressure test can measure the risk in extreme fluctuation, namely the tail risk. So banks can use pressure test to simulate an extreme scenario and measure unexpected losses. Then, based on the test results, they can readjust their portfolio or credit policies to buffer the potential risk. In addition, hidden non-performing rate measures the quality of loans issued to enterprises in a more direct way. In principle, this index considers EBITDA, which measures a company's current profitability, and interests expenses to better measure the company's solvency and loan quality. In application, hidden non-performing rate can also serve as a warning for credit risks. Furthermore, methods to measure default probability have been improved currently. In the past we only considered the micro-economic feature of debtors and used static measurement, which was based on past data. But now we start to take macro economic factors into consideration and switch to dynamic measurement.

In summary, he gave several suggestions to improve the foresight of

non-performing loan rate. First, improve the monitoring on the fluctuation of non-performing loans. Second, improve the accuracy of loan categorization. Third, abide by credit standards. Fourth, learn from the ideas of Internet financing and innovating risk management mode and strengthening prudential regulation as well.

ZHAO XIJUN made a speech ***"Financial regulations for stability"*** at the G20 Brisbane Pre-summit. The speech consisted of three parts: the importance, progress as well as prospects of G20. First of all, he believes G20 has played a very important role in setting up the linkage between financial regulation and stability. He commented that "enhancing sound regulation", which touched upon areas such as regulatory regimes, prudential oversight, risk management, promoting integrity in financial markets, and strengthening transparency and accountability has made influential progress. Second, he reviewed what the G20s have done since the 2008 crisis. He summarized that 2009 Pittsburgh Summit took an action to enhance and expand the scope of regulation and oversight with tougher regulation of the market. 2010 Toronto Summit proposed a 4-pillar regulation reform plan that touched upon capital and liquidity, more intensive supervision, resolution of financial institutions, addressing systemically important financial institutions, financial sector responsibility, financial market infrastructure and scope of regulation, and accounting standards. 2010 G20 Seoul Summit proposed some core elements of a new financial regulatory framework and how to strengthen global financial safety nets to overcome sudden reversals of international capital flows. 2011 G20 Cannes Summit proposed to reform the financial sector, and to enhance market integrity to reinvigorate economic growth, create jobs, and ensure financial stability. 2012 G20 Los Cabos Summit emphasized the implementation of the structural and regulatory reform agenda to enhance medium-term growth prospects and job creation. 2013 G20 St. Petersburg Summit came to a conclusion on the achievements of financial regulations to date including new global capital standards, completed necessary framework for OTC derivatives, identified and heightened prudential standards of global systemically important banks and insurers; implementation of procedures for orderly resolution of large institutions and addressing potential systemic risk of shadow-banking system. Last but not least, he pointed out that there were too many things still have to be done, like tackling systemic risk and building more resilient financial institutions. He outlined the ultimate objective of promoting financial regulatory reform is to reduce moral hazard and systemic risk and to foster stable financial systems that support sustainable and balanced economic growth.

ZHOU DAOXU put forward in "***A multi-level capital market to solve financing***

difficulties" that Guizhou provincial party committee and government attach great importance on encouraging financial innovations. Multiple measures have been implemented to solve financing difficulties in order to help the business sector. First of all, increasing financial support to achieve virtuous interaction between finance and real economy; next, increasing the sum of available financial resources through central budget; then, achieving leap-forward development of direct financing; and finally, building a new financial platform with a collection of resources.

Furthermore, he suggested increasing the sum through central budget, foreign investment and vitalizing the stock; prioritizing the Key New Areas and the Five 100 projects, facilitating credit financing for private companies, and improving people's livelihood; encouraging structural and institutional innovations, increasing financing channels and financial products; avoiding systematic and regional financial risks through strengthened governance and creating a favorable environment for financial development.

January 2015
Vol. 2, No. 1

Research Report

Currency Internationalization and Offshore Market:

Historical Implication

By International Monetary Institute, Renmin University of China

Editor's Note:

RMB internationalization is one of the most important national strategies. The RMB Internationalization: Annual Report has been published annually since 2012, recording the actual course of RMB internationalization and deeply studying the key theories and policies of each stage.

This article is excerpt from the "RMB Internationalization Report 2014" which sets the topic on RMB offshore market construction. The research team has looked into the internal logic of the promotion effect offshore markets have on RMB internationalization, and focused on the implications and effects of the establishment and development of RMB offshore markets have on RMB internationalization. Combining with the current situation of offshore markets, the research team has discussed about the realistic path for RMB internationalization to follow under the circumstances that capital accounts are not fully open.

Production and trade are two perpetual topics in the development of world economy. With the development of economy, the cross-border commodity trade among nations demands the financial service to become worldwide, such as currency exchanges, international settlement and trade financing. Thus, the emergence and development of offshore financial market is one indispensable result of the development of the world economy.RMB internationalization cannot be realized without building and developing the offshore market.

1. Significance of the development of offshore financial market

The key difference between offshore financial market and domestic financial market, which distinguishes the former from traditional international financial market, is the absolute freedom.

1.1 Features of offshore market

(1) Lax regulation and flexible operation

The traditional international financial markets must be bound by the policy of the act issued by the local government, but offshore financial markets are not subject to government regulation and taxation countries limit. They get rid of management constraints under any government decree. On the one hand, the "supranational" capital market was formed to avoid the sovereign state intervention. Essentially, the currency-issuing country has no right to impose controls on the issue of national currency outside the country; on the other hand, in order to attract more European monetary fund to expand their lending business, governments in thriving markets usually adopt various preferential measures to try to create a relaxed management climate. Therefore, this market operates very free, without any control, such as flexible borrowing conditions, free intention for the use of fund; offshore financial markets have strong competitive edges because the capital allocation is flexible, and the procedure is quite simple. Offshore financial market liquidity is very fast and flexible in scheduling due to the little jurisdiction of these funds. Therefore, this market does not only meet the needs of multinational companies for both importers and exporters, but also of many Western countries and developing countries.

(2) Low cost of capital

Not subject to statutory reserves and deposit rates to the ceiling, offshore financial market interest rates compared to the domestic financial market is unique, which features on the small interest spread between deposit and withdraw. Put alternatively, the deposit interest rate is slightly higher than that of domestic financial markets, while the interest rate of an issued loan is slightly lower than the domestic financial markets. Higher deposit rate is, on the one hand because of the larger risk of deposit in foreign countries than domestic deposits, so that depositors demand a higher risk premium to compensate. On the other hand, the interest spread between deposit and loan is not subject to statutory reserves and deposit rates to the ceiling. The loan interest rate is slightly lower, because European banks enjoy duty-free and exempt from the country's reserve and other favorable conditions. This could explain the relatively low capital cost of the loan, which can lower lending rates to attract customers. Offshore financial market interest spread is small, typically 0.25% -0.5%, pretty attractive to both the lenders and borrowers.

(3) A more open, deeper and wider financial market than domestic market

Offshore financial market has an extremely large scale of fund pool. The offshore financial market has not only a wide range of funding sources around the world, but also ample liquidity, and all major convertible currencies with different period, different risks, different uses of financial products and styles, which can meet various financial needs of the government, financial institutions and multinational companies. In fact, the offshore financial market is a "wholesale market" for the most essential big customers. The amount of each financial transaction is large, typically ranging from a few hundred thousand dollars to hundreds of millions or even billions of dollars.

(4) Lending relationship mainly built by non-resident parties

Lending relationships in international financial markets are mainly between foreign investors and foreign fund-raisers, in other words, among non-residents. There are typically three types of transactions on the international financial markets: First, transactions between foreign investors and domestic fund raisers, such as foreign direct investors in the stock market directly buying securities issued by the national fund-raisers. Second, transactions between domestic investors and foreign fund raisers, such as domestic investors purchasing securities issued by foreign fund raisers on the stock market. Third, transactions between foreign investors and foreign fund raisers, such as foreign investors providing funds to foreign fund raisers through an intermediary bank or the stock market. The first and second trading is transaction between residents and non-residents, the formation of the relationship of such a transaction is the traditional lending relationship in international financial markets. At present, most of China's cross-border RMB business belongs to this type. The third type of transactions between non-residents, is also known as transit or offshore transactions. This trading relationship is the lending relationship in offshore financial markets.

1.2 Functions of Offshore Market

(1) Provide currency liquidity

Offshore financial market has an incomparably strong domestic market for capital supply and high market openness. Competitive interest rate structure and freedom make governments, multinational corporations and financial institutions willing to put money into offshore financial markets, which enhances the ability of the market to derive deposit formation independent from the currency of the country with the money supply self-circulatory system. As the offshore market does not have any deposit reserve requirements, in theory, the market has unlimited ability to derive deposits. In the absence of a financial crisis, or in normal circumstances, the

offshore market liquidity is sufficient to meet the funding needs of various market players.

(2) Provide facilitation for clearing and settlement

International offshore financial centers are distributed in several major time zones. Through the networking in different time zones, the offshore market ensures the trader to trade 24 hours a day, and radiates the impact to the world's major economies, enabling customers in various time zones normal foreign exchange transactions to be completed so as to meet international trade and financial transactions by clearing settlement demand for capital.

(3) Provide an efficient, low-cost and safe currency payment transaction platform

Offshore market has several remarkable advantages: stable politics, transparent law procedure, high latitude, a comprehensive variety of financial products and low transaction cost. Besides, due to the institutional advantages of low tax rate and good confidentiality, the offshore market is an ideal platform for international financial trade and settlement.

(4) Provide platform for national risk management

Country risk is the risk that needs management most, which could cause the largest loss. A state government, through political, legal, tax and protection of privacy and other coercive power outside a given jurisdiction, impedes the use of funds and reduces the value of assets, which would directly harm the interests of investors. Offshore financial market offers effective channels to circumvent coercive power of government issuing the currency, thus becoming an extremely popular national risk management platform among investors. The earliest offshore market in history is the U.S. dollar deposits of the former Soviet Union placed in London in case that the U.S. government might freeze the assets. Currently, one of the main reasons why the top ten global offshore markets have attracted two-thirds of U.S. dollar deposits is to avoid the unpredictable national risk.

Of course, the practice of separating the currency risk from country risk derived from the problem of excessive concentration on infrastructure or operational risk if dollars were placed within one country. The September 11, 2001 terrorist attack in New York led to the U.S. Treasury destruction, “which allows central banks to realize the potential benefits of diversity that can bring to trading places" - when the normal trading of the US Treasury suspended within the US territory, the dollar securities deposited in European offshore market by the US central government may still carry on, as the U.S. payment and settlement system continues to run, without impact on the payment activities of dollar clearing and settlement systems[1].

[1] Dong He and Robert McCauley, The offshore market of domestic currency: Issues on monetary and financial

(5) Provide third party with trading platform and consolidate the international currency status

The international currency often facilitates the economic exchanges between countries issuing non-international currencies. This is a phenomenon known as the use of international currency by the third-party. Because third-party use of international currencies is independent of the domestic economy of the country, considering the convenience and security reasons, the transactions are mainly conducted in the offshore market instead of the domestic market of the country issuing currencies. In the offshore market, the higher the degree of use of international currencies by the third party gets, the stronger the currency's international status is. For example, the U.S. foreign trade accounted for about 10 percent of global trade, investment activities of U.S. residents to participate in the global investment accounted for about 20-50%, but the U.S. share of global foreign exchange trading in up to 42%, the dollar is widely used in third-party transactions, topped the list in the international monetary system.

1.3 The influence of offshore market to the world

(1) Improve the integration of international financial market

Offshore financial markets largely break the isolated state of monetary and financial systems between countries. Development of the European market brings the financial market and foreign exchange market across the Atlantic Ocean together, thus contributing to international capital flows. Arbitrage activities engaged in a wide range of international banks makes the interest rate parity between the two international currencies valid, so as to promote the integration of international financial markets, and improve the global financial efficiency.

(2) Promote economic growth

Offshore markets establish a free-market mechanism that allows efficient flow of capital, which helps optimize the allocation of global resources, thus becoming an important power promoting the world economic growth. If there were no offshore financial markets, in the 1960s and 1970s, the "Asian Tigers", "Latin American miracle" would not have appeared. Huge amounts of money provided by offshore financial markets, in a large part helped the rapid economic recovery in Western Europe and Japan from the rubble of World War II, and created favorable conditions for developing countries to achieve "balance development" and get rid of the "Matthew Effect", the vicious economic cycle.

(3) Solve the international deficit problem

Offshore financial markets greatly facilitate short-term capital flows, and

stability [J]. Comparison, 2010(1).

especially promote the petrodollars to flow back. According to IMF estimates, in the years between 1974 and 1981, the total deficit of countries in the current account of international balance of payments current account climbed up to $ 810 billion, but the total amount of funds raised through the international financial markets amounted to $ 753 billion, which largely eased the worldwide imbalance of international payments. During this period, deposits of oil-exporting countries in the offshore financial markets amounted to $ 133 billion, which played an important role in the prevention of international payments imbalances that may lead to a currency crisis.

(4) Challenge for the validity of domestic financial monitor and currency policy

Offshore market is a parallel with the domestic national monetary system free from government regulation. If a country's business and financial activities of financial institutions put over-reliance on offshore markets, especially when hot money flows too frequently with large amount, the amount of domestic currency, asset prices and exchange rates will inevitably be disturbed. In addition, a strong currency derived from offshore market may exacerbate international transfer of inflation, and the effect of monetary expansion will flow from major currency countries, resulting in failure of the countries' currency policy or expectancy. This presents new challenges for the country's macroeconomic management.

2. Inner logic of Chinese RMB internationalization and the construction of offshore market

2.1 Construction of offshore market is beneficial for the development of RMB

(1) Construction of offshore market benefits the basic function of market

Because the reform of China's interest rate market and exchange rate market hasn't been fully accomplished, the presence of domestic and foreign financial markets dual pricing, arbitrage becomes one of the main reasons why there is a significant growth in RMB scale. By improving the construction of offshore RMB market, on the one hand, it can play an exemplary role in guiding influence the behavior of market players to promote the interest rates, exchange market, and create favorable market conditions for the RMB capital account convertibility. On the other hand, it may enhance the basic role of an "invisible hand" of RMB exchange rate and interest rates, reducing the space within the jacket arbitrage profits as well as reduce currency risks.

(2) Construction of offshore market could enlarge the body mass of RMB export

RMB internationalization means that the yuan will gradually become a third-party use of money, which requires a steady stream of export of yuan in the offshore renminbi market to maintain adequate liquidity. However, the current export of

RMB relies more on trade channels, within the context of China's trade surplus, the yuan is difficult to export, and the size is very limited, unable to meet the huge demand in the international market potential for the renminbi, which restricts the yuan to play international monetary functions. According to the estimation of Ma Xu et al, if you do not open the capital account, only by exporting the output of RMB through trade items would restrain the degree of internationalization of the RMB at less than 10% of its true potential[2].

Through the issuance of RMB bonds in the offshore market, loosening the RMB exchange limit for residents, providing RMB loans and a series of measures and arrangements targeting at an ease of capital control can effectively solve the lack of RMB export problems. The offshore market and trade surplus enables the realization of the mode of renminbi's net export, which is conducive not only to maintaining stable growth of China's economy, but also to ensuring the positive impact of export on economy growth. Also, it could avoid the Triffin Dilemma induced by RMB internationalization achieved by trade surplus. In addition, the derivation function of offshore market can play a role of the amplifier, which produces several times as much as the liquidity of the original RMB deposits. In Hong Kong, under the 25% liquidity ratio requirement specified by the Hong Kong Monetary Authority, Hong Kong can derive three trillion yuan more of deposits (4x multiplier) of "original RMB deposit" from the mainland,. If these derived yuan is used by the third party (CPB), there will be an expansion to a larger multiple times of the size of RMB as the original term of net output.

(3) Sound financial service encourages international demand for RMB

With the expansion of cross-border RMB trade settlement, more and more RMB precipitate overseas. The international community needs RMB financial services to go on, hoping to get a high quality currency exchange, payment and settlement, trade finance, risk management, wealth management services, and so on. Under the current capital controls, if there is no such a RMB offshore market with a rich variety of products and functions to meet these needs, it is difficult to establish the acceptance of the international community and the confidence for use of the RMB, and the RMB internationalization process will inevitably encounter obstacles. Therefore, at this stage the RMB offshore market has some special effects. In addition to the function of financing through offshore RMB market, it can also manage a variety of market risks through innovative RMB interest rate swaps, futures, options and other financial derivatives, increasing the value of the asset, and

[2] Jun Ma and Jiangang Xu. The path of the RMB going out: The development of offshore market and capital account liberalization [M]. Beijing. Chinese Economy Press,2012.

improving the confidence of overseas economic agents to hold the RMB. Of course, RQFII, multinational pool of RMB funds and other institutional arrangements establish a greater value-added space for the establishment of a modest channel of RMB flowing back, and thus to provide greater value-added space for overseas RMB holders, which is also conducive to improving the demand for the RMB in the international market.

2.2 Offshore market could temporarily relieve the currency exchange obstruction before opening the capital account.

(1) RMB internationalization interactively promotes the reform of capital account

Capital account liberalization is a process of gradual relaxation of capital controls, allowing residents and non-residents' holdings of cross-border assets and engaging in cross-border asset transactions, aiming to achieve a freely convertible currency. Capital account liberalization of convertibility is not completely laissez-faire and cross-border capital flows. Instead, capital account liberalization in essence is a managed exchange and capital flows. Since December 1996, although China has maintained a mixed policy of "current account liberalization+ capital account controls", the capital account has been moving toward a goal of orderly, controlled release. At present, China has overall allowed long-term two-way direct investment and trade financing except some relatively stringent controls on short-term capital flows, securities investment, cross-border lending and derivatives transactions. In the background of global capital flows significantly increased, endless practice of micro market participants to circumvent capital controls have emerged. The cost and difficulty of capital control have also increased significantly. The Chinese government is now facing an embarrassment situation of "uncontrollable" to "poor regulation".

International experience shows that capital account liberalization is not a sufficient condition for an international currency, even not a necessary condition in the early stages of an international currency. For China, RMB internationalization and capital account reforms are implemented progressively, a process from simple to complex, in which both can promote and complement each other.

On the one hand, the capital account reform pushes up the RMB internationalization index. According to the estimation of RMB internationalization Report (2013), in 2012 China's capital account openness is 0.5125 (0.5045 in 2011), at the middle level of openness in the international arena. With the continuing liberalized cross-border RMB policy over capital flows, the way of RMB outflow and reflux varies as the scale gradually expands, making in 2012 RMB internationalization index reach 0.87, an increase of 49% in comparison with the

prior year. Among them, the proportion of global RMB direct investment rose to 2.18 percent, becoming the fastest growing area of international use of the RMB. In the promotion of capital account reforms, the internationalization of RMB have developed from the sole-driven model of denomination function to the dual way model, including both the trade denomination and the financial denomination, a more reasonable and more stable pattern. Currently, some of the country's central bank and sovereign wealth funds have already held the RMB bonds and stocks through QFII channels. It is believed that as long as the country continues to allow AFII to expand the business scale, or to loosen up trade restrictions, the gradual liberalization of the capital account would simultaneously enhance the international use of the RMB.

On the other hand, the internationalization of RMB put forward higher requirements for capital account reforms. In the promotion of cross-border trade in RMB clearing business to a global scale, the channel output and the return of the RMB under the trade items have already opened. With the establishment of China's largest trading position and the expanding trade settlement in RMB, non-residents' demand for hedging and trading of RMB asset management is naturally induced, which objectively requires China to further open its capital account, in order to achieve the free convertibility of the yuan, provides a wealth of RMB investment and financing tools, and creates more levels of RMB backflow channels. Once the pace of RMB appreciation slows down, international payments tend to be balanced. Coupled with the accelerating pace of international financial institutions development, the potential to promote RMB internationalization under trade items will be exhausted. In the long term, to become an important international currency and reserve currency, the RMB will not avoid being fully convertible. Therefore, we must reform the RMB capital account to create the conditions for its broader and deeper international use.

(2) It is still premature to fully open the conversion of capital account

Capital flows promote the optimal allocation of resources in the world, with great benefit to both the countries with inflows and outflows. But capital flows themselves are a "double-edged sword" whose size and volatility tends to pose policy challenges. When a country's financial system and financial institutions have not yet been strong enough to cope with the impact of hot money on the temerity to open the capital account, it is likely to cause financial market instability and even a financial crisis. From China's specific national conditions, we think it is not the best time to completely liberalize capital account, at least not suitable in a radical way. The reasons are as follows:

First, from the perspective of international environment, under the influence of the QE monetary policy put forward by the major developed countries, international capital often in large amount flows across emerging markets. In order to guard against systemic risk, restrictions on short-term arbitrage funds are necessary. Otherwise, the asset market bubble and the huge expansion of the financial risk will be inevitable. For example, in June 2013, the Fed issued a signal to exit quantitative ease in the second half of the year. The market reacted violently, within a week causing a lot of rapid withdrawal of international hot money from emerging markets. Russia, India, Brazil and other emerging market countries stuck into a great panic of immediate liquidity shortage, and there also emerged precursor of financial distress such as economic downturn, rising interest rates and currency devaluation.

Second, from the perspective of domestic macroeconomic environment, although China's national economy has maintained strong growth, ample foreign exchange reserves, and a more professional management of financial institutions, which seem to be in line with the required preconditions of liberalizing capital accounts, according to the experience in Western countries, it cannot be ignored that there still remain many uncertainties because China is currently in a period of great reform and major adjustment where issues like price distortion or institutional inefficiencies are facing great changes. If the capital account is liberalized immediately, the international hot money may amplify the negative effect of these uncertainties, which is not conducive to China's financial stability. Besides, there are other economic dilemmas such as excessive real estate bubbles and debt of local government which could trigger another crisis. These factors remind us that special attention is needed when pondering the capital account policies.

Third, from the operation of financial market, China's capital market interest rate for deposits and loans is much higher than the international market. Arbitrage opportunities attract large cross-border flows of short-term speculative funds. It's inappropriate to fully open capital account. Fully liberalizing capital account when the domestic interest rate maintains a high level is equivalent to an opening gate for large-scale domestic and foreign capital flows, which is bound to disrupt the normal order of domestic financial market. In addition, the one-way appreciation of the RMB exchange rate is expected to guide many domestic enterprises to act the settlement in the offshore market. Some scholars pointed out that with a completely open capital account holding all other factors constant, China may witness net massive fund outflows.[3]

[3]TamimBayoumi and FranziskaOhnsorge. Do Inflows or Outflows dominate? Global Implications of Capital Account Liberalization in China[WP]. IMF working paper WP13. 2013

(3) Foster offshore market for RMB before liberalize the capital account

Under the current conditions of the capital account controls, the development of offshore RMB market is significantly positive to promote the internationalization of the RMB. Construction of the offshore RMB market has a degree of substitution effect to the capital account liberalization. For example, it is of the same nature as QFII operation to allow three types of overseas financial institutions to invest in domestic inter-bank bond market using the RMB they finance from offshore market. Companies can freely convert foreign currency through a branch in Hong Kong offshore RMB market, which to some extent breaks the restriction of currency exchanges under capital items. Fostering RMB offshore market in this phase of Chinese economy is actually a transitional financial arrangement, equivalent of a completely open capital account which could take control of potential risk of capital flows within the scope of the offshore market, and ensure the stability of the domestic financial market environment. In the meanwhile, it could boost capital account RMB internationalization under the disguised capital account liberalization. The financial arrangement in offshore market is essentially a variant to realize the capital account convertibility. The purpose is to regulate the size and structure of the offshore RMB market in a timely and orderly expansion of channels between the "offshore" and "onshore" market, so as to interactively promote the functional position of both capital account liberalization and internationalization of the RMB. It is a second best choice to foster the RMB offshore market, under the current conditions of capital account controls, to promote the internationalization of the RMB in order, because it creates a valuable time window to leave enough time and space to deepen the capital account reform, and lays a solid foundation for the smooth progress of RMB internationalization strategy.

2.3 Grab the current opportunity to promote RMB internationalization via offshore market

(1) Fully take advantage of the transformation of domestic economic structure, to promote RMB internationalization via offshore market

After the international financial crisis, the demand from Western countries was weakened, making our long-term export-oriented economic growth model unsustainable. To promote the internationalization of the RMB by building offshore market could be an important starting point to adjust and optimize the economic structure. Because the internationalization of the RMB can play an important role in speeding up economic restructuring and promoting the coordinated development of economic autonomy, and improve the international status of RMB in the offshore market, encourage financial innovations of offshore RMB products, and meet

international market demand for increasing the value of the main asset of RMB. This is sure a shortcut to the promotion of cross-border trade settlement in RMB for greater acceptance. This is not only conducive to China's gradual change in U.S. dollar-based, passive accumulation of foreign exchange reserves, but also can promote a more balanced measure in foreign trade of China to reduce the trade surplus. In addition, we can also build strong offshore RMB market, through foreign direct investment in RMB and RMB foreign lending, to further broaden our residents' channel to conduct RMB investment. Through the improvement of the offshore RMB bond market as well as the offshore RMB financial derivatives market, Chinese enterprises under "going out" policy are to be provided with richer financial services and more convenient conditions.

(2) Fully take advantage of the adjustment period of international offshore financial center, to globally construct the offshore market of RMB

The current international offshore financial center is in the adjustment period of business structure mainly in the following aspects: First, since the 21 century, under financial liberalization and highly competitive environment, structural changes have occurred to offshore financial centers. The development of offshore financial centers relies more on the improvement of efficiency and quality such as market liquidity, depth, breadth, settlement and other payment services, rather than a variety of incentives. Therefore offshore financial markets with a more sound financial have developed rapidly relying on the wave of financial globalization, while the number of offshore financial centers famous for tax havens such as the Caribbean island offshore financial centers shows a trend of business contraction, even gradual extinction. Second, the 2008 financial tsunami made the tax-based offshore centers widely criticized because they promised to provide confidentiality as well as tax incentives for many international funds which could drift outside the international regulatory system. At the same time, OECD, FSF, FATF and other international organizations have repeatedly attached importance on transparency, cooperation and information exchange. They also urge to improve the conditions of the under-regulated offshore market through the establishment of a system of unified international norms measures. Under the pressure imposed by the international organizations, the offshore financial island centers have amended some necessary confidentiality policies and tax incentive regulations, which could be regarded as a start of integration to regulate the financial business structure of international offshore market. Third, after the financial crisis, with the international financial environment changes, the increasing competition among offshore financial centers and the slowing down business revenue growth contribute to some mergers among

large exchanges. Traditional offshore centers need to seek new profit growth opportunities.

We should make full use of the opportunities of the major offshore financial centers' adjustment period competing offshore RMB business to rationally distribute the world's offshore RMB market. After the financial crisis, emerging markets, especially China, have become one of the main forces driving global economic growth. As the world's largest exporter and second largest importer, the economic and trade relations between China and the rest of the have become a major driving force of local economic development. With the steady increase of China's import and export trade as well as the amount of cross-border investment, driven by cross-border RMB trade settlement and central bank currency swap agreements, foreign stocks and trading volume of RMB are experiencing rapid growth. Once an offshore market becomes an offshore RMB center, naturally there will be more RMB trading volume, which would lead to more financial institutions entering and bringing in more innovative financial products, so as to stimulate the development of the local financial industry, which is a great appeal for any financial center. Because of this opportunity, after the establishment of Hong Kong RMB offshore financial market, London, Singapore, Luxembourg, Paris, Frankfurt, Zurich, Geneva, Sydney, Taipei have expressed willingness to develop offshore RMB center. China should seize this historic opportunity to actively promote the layout of offshore RMB center, giving full play to their respective advantages of offshore centers, rational planning the function positioning. China should use the function of aggregation, circulation and radiation effect of the offshore market to develop the offshore RMB financial services and business, so as to expand the scope of overseas use of the yuan, and to promote the internationalization of RMB.

(3) Fully take advantage of the demand for currencies hedging risks in the international market, to provide more diversified financial services in offshore RMB business.

The current recession in western countries after the financial crisis and the period of unconventional monetary policy create a large liquidity injection into the international market. The value of U.S. dollar, euro, yen and other major reserve currencies fluctuates frequently. On the one hand, the U.S. economic recovery is weak, and there arises a global risk aversion against the European debt crisis. The demand from the market for financial hedging instruments and safe-haven assets will continue to improve; on the other hand, paradoxically, the euro and the US dollar which have been long considered to avoid currency risk are now suffering from a trust crisis due to the impact of unconventional monetary policy, which will

forced the market to choose a new safe haven currency from market varieties. A large number of hedge funds and profit-driven capital start looking for a new currency with stable value as means of settlement and investment. At the same time, the strong economic growth in emerging market countries encourages their currencies to be sought after at varying degrees by the international market. Especially after the start of yuan-denominated cross-border trade settlement pilot in China, the Southeast Asian countries as well as our neighboring markets form a strong market demand for the renminbi. In the current environment, the market demand would further promote the process of RMB internationalization through the cross-border trade coupled with the construction of offshore yuan market.

Overall, this time window is staged. Once Europe and other major economies gradually recover from the crisis, it would get more difficult to promote the internationalization of the RMB. Therefore, it should be, in the current environment, better to grasp of market demand, on the basis of the steady development of China's economic environment and international trade, as well as the stable value of RMB to promote third party transactions via offshore RMB market. In addition, importance should also be attached to RMB direct investment and offshore RMB futures product so that the function of measurement, investment intermediaries and storage of RMB would be maximized, conducive to RMB internationalization.

3. Promote RMB internationalization on the basis of offshore market: Theoretical and empirical analysis[4]

3.1 Factors influencing the distribution of international currency regions

(1) Trade and the real economy

The scale of international trade is an important factor in determining the distribution of the international monetary regions. Rey (2001) pointed out that changes of the pattern of world trade at the beginning of the last century directly contributed to the rise of the dollar and the decline of the status of pounds, and directly affected the distribution of the dollar and the pound in the world. In fact, if it is essential or of great weight for a country’s international trade with a country issuing international currencies, the latter's currency will be more attractive because the exporters and importers of the former country would have more opportunities to trade with the currency-issuing country, and thus the according international currency would be used more (Ding YibingZhong Yang, 2013). Therefore, if there is more international trade between currency outflow countries and currency inflow countries, the currency of the currency-outflow country will take a large weight in

[4] Limited by the coverage, detailed empirical process and the full reference is not included in this chapter. For readers with any interest, you could refer to the full version of text at http://imi-sf.ruc.edu.cn

its global distribution. Bergsten (1997), Mckinnon (1998) and Mundell (1998) in empirical research also show the importance of international trade in determining the extent of currency internationalization. High volumes of foreign trade will generate a lot of currency trading, thus naturally making the currency of the economy become an integral part of the currency exchange market. At the same time, the existence of economies of scale reduces the marginal cost of the large number of transactions, and also enhances the willingness of importers, exporters as well as foreign investors to use international currency. In addition, along with a strong economy and the improvement of production efficiency, the expansion of foreign trade and high surplus of trade balance. The high trade surplus lays a solid economic foundation for the export of the currency and the country's capital and financial account appears a large deficit. High trade surplus and high capital and financial account deficit are the infant characteristics of the internationalization of a currency. From the historical point of view, similar patterns of currency internationalization were also identified in the U.S. and the UK experience.

But trade volume is not the sole factor in determining the global distribution of a currency. The development of real economy of the currency-outflow country and the relative status of the international currency in the world monetary system also play an important role in the global distribution of the international currency. For example, in the internationalization of the yen, Japan's export trade was also developing fast. However, because the main destination of Japan's exports are Europe and other developed countries, it is difficult to output the yen, which cannot constitute into a considerable size of distribution, circulation and trading markets. Article Seiichi (2001) pointed out that high risk of the yen exchange rate, poor negotiation power of import and export business and the selection tendencies in using foreign exchanges (inertia) are important reasons frustrating the yen internationalization. Therefore, from the experience of Japan, which is a typical "international trade country", the dilemma of the yen internationalization reflects the difficulties of "trade countries" in the current international economic and financial system (Li, 2005). In addition, after the economic bubble burst in the 1980s, Japan encountered a long period of recession. Due to the lack of a huge domestic market and economies of scale to support the process of internationalization of the yen, the yen internationalization eventually stagnate (Zhang Guoqing, Liu Junmin, 2009).

Table 1 Proportion of imported raw material over total import in Japan

Product	1980	1985	1990	1995	2000	2005	2009
Energy & Fuel	50.03%	43.75%	24.25%	16.09%	20.36%	25.64%	27.63%
Metal & Mine	9.99%	8.91%	9.05%	6.65%	5.57%	6.10%	6.35%
Agriculture	8.64 %	6.68 %	6.56%	5.56 %	3.09%	1.99 %	1.44 %

Source：World Development Indicators & Global Development Finance, World Bank Data

Table 2 Proportion of trade volumes of Japan in different export regions

Regions	1991	1994	1997	2000	2003	2006	2009
Developing	19.56%	23.19%	25.45%	22.63%	28.35%	32.01%	38.91%
Developed	80.44%	76.81%	74.55%	77.37%	71.65%	67.99%	61.09%

Source：World Development Indicators & Global Development Finance, World Bank Data

(2) Capital and investment factors

In general, the flow of transnational capital can often improve the scope of use of the international currency in the currency-inflow countries, thereby reducing their transaction costs and conversion costs. Kindleberger (1967) pointed out that if an international currency can flow in a larger context, it will receive a higher demand, thereby reducing transaction costs. Krugman (1984) and Rey (2001) expanded the theory of Kindleberger arguing that trade and investment can promote the use of international currency in the currency-inflow countries. And Prasad et al. (2006) believes that the official capital flows (such as aid, foreign exchange reserves, etc.) would indirectly impact international currency transactions through international capital flows.

Secondly, the higher the degree of financial development of a country gets, the more transparent and less costly its information and international currency transactions are, thereby increasing the local trade of international currency. Chen and Khan (1997) pointed out that the direction of capital flows were affected by the extent of the country's financial development and growth potential of the capital inflow countries. If a country has a more developed financial market, it is easier to attract capital inflows. In addition, the role of the international financial center in the currency internationalization is increasingly important. Despite the widely suspicion about the virtual economy after the global financial crisis, its role in promoting the development of the world economy is undeniable. This also means that if a currency

is intended to become an international currency, it is inseparable from the international financial status of the country issuing the currency. This is because the developed financial market is not only beneficial to the international community to increase demand for the currency, but also help importers and exporters in the international trade with foreign exchange risk management. New York and London, for example, they used to play an important role in promoting the US dollars and the British pounds to be the international currency. On the other hand, since Japan did not do enough towards the financial system, Tokyo has not developed into a major international financial center. According to statistics of 2013, from a global comparative look at forex trading, the proportion of forex trading in London and New York over global foreign exchange trading volumes were 40.9% and 18.9%, while only 5.6% in Tokyo, closer to that of Singapore and Hong Kong.

Accordingly, what can be learnt from the development of the US dollar and the British pounds is that at least three areas should be addressed by developed financial market to enhance the attractiveness of the domestic currency in the world, thereby expanding the distribution range of the international currency. First, the developed financial markets provide the international market investors with an open stock market with good liquidity. Generally, investors will not solely hold the balance of international currency, but will invest the majority of its international currencies in interest-earning assets with good liquidity, in order to avoid capital losses. Second, the developed financial markets also provide investors with a range of quality services, such as financing or domestic currency investment, or services to increase the value of international currencies. Third, a well-developed financial market can attract amounts of overseas business by attracting foreign companies of good quality to get listed and invested.

(3) Geographic factors

More and more studies show that geographic location has a significant influence on the transaction costs and using habit of a currency, thereby affecting the regional distribution of international currencies. Ghosh and Wolf (2000) believe that due to the geographical disadvantage, Africa and the western countries relative to other areas have more difficulty in obtaining capital inflows. Flandreau and Jobst (2009) in the empirical study on the process of the internationalization of the British pounds in the 19th century found that geographic distance does cause discrepancies in the level of use of international currencies through the varied transaction cost. However, due to the presence of network externalities of currency, the smaller the scope of an international currency used in the region is, the higher the transaction costs are, which will further impede the local use of the international currency.

On the other hand, from the perspective of the assets, geographic factors could impact the asymmetric information problems in currency trading. In general, due to asymmetric information problems, investors prefer domestic assets, thereby reducing the willingness of domestic investors to use the international currencies (Gehrig, 1993; Kang and Stulz, 1997). Specifically, Tesar and Werner (1995) consider that the geographic barriers prevent some information collection from investors. Problem of asymmetric information is caused by factors such as language, institutions, laws and the cost of access to foreign information. The Coval and Moskowitz (1999) argue that the problem caused by geopolitical factors, such as ticket prices between the two countries and the number of telephone lines exacerbated the problem of asymmetric information in the course of currency trading.

(4) Political and cultural factors

To become a regional economic core or international currency, a currency will be involved in the process of cross-cultural cooperation and integration, including recognitions regarding social systems, life philosophy and the market. And due to the large difference between the Chinese economic developments, social systems, history and culture with the West, the RMB, in order to form a comprehensive layout on a global scale must undergo a relatively long period of time. The internationalization of Euro shows that within the common political or cultural context, the international development of a currency will be relatively smooth. Cohen (1997) pointed out that whether two countries are using a shared language had a very significant impact on the distribution of regional currencies. Hattari and Rajan (2011) believe similar cultural habits can increase the mutual identity of the two peoples, which helps to improve the use of the international currency in the country with currency inflows.

In addition, during the process of currency internationalization, political and other external factors cannot be ignored. In fact, currency internationalization is not simply a financial struggle, but a comprehensive competition involving politics, military, technology, culture and other aspects. For the United States and other countries enjoying the current international monetary seigniorage, they will not be willing to give up their market share. In addition, because of the contrast political system adopted by China to the west, foreign investors appear more cautious about China's economic and political environment and the use of the yuan. Generally, factors like political stability and a sound system of institution have significant influence on the promotion of the local use of the international currency. This is because a stable political system and a sound legal system help improve the social

stability, the transparency of information, and reduce the cost of information. Bergsten (1975) noted that the political factor in promoting the scope of us of the international currency includes a stable social institution and good support from international cooperation, and Mundell (1983) believes that political stability, military forces have to consolidate the international status of the currency.

(5) Institutional construction (Offshore market construction)

From the aspect of currency internationalization, a country's currency in order to become a major international currency must have an offshore market in leading international financial centers, because it can improve the acceptance of the RMB among foreign importers and exporters (He and McCauley, 2010). From the internationalization experience of the U.S. dollars, the development of the money market and bond market of Eurodollar prompted foreign investors to a greater extent to use the U.S. dollars in the local transactions. The 2010 BIS report shows that, approximately 80% of the U.S. dollar foreign exchange transactions (including spot and forwards, swaps, options and other derivative instruments) occurred in the offshore markets outside the United States. Meanwhile, the rise of the volume of dollar transactions promoted the improvement of the dollar clearing and settlement systems, thereby reducing transaction costs of the U.S. dollar, and further increasing the convenience of dollars in the local use, which in turn increased the proportion of the U.S. dollar in local trade. The internationalization of the euro was also accompanied by the development of the offshore market. Ma (2011) also pointed out that the internationalization of the RMB is inseparable from the construction of the offshore market. Those currencies without reliance on offshore market have little potential to become an international reserve currency. Instead, they are basically currencies of small economies for clearance and denomination, such as the currencies in regions like South Korea, Taiwan and Singapore.

Therefore, the establishment of the RMB offshore market can improve the region's acceptance and frequencies of use of the RMB to promote the rational distribution of the yuan in various regions of the world, which is a global monetary network. This is because the construction of the offshore market provides greater convenience for foreign investors, which could promote a large number of "third party" transactions using RMB. From the experience of the development of the U.S. dollar, a large number of U.S. dollar foreign exchange transactions overseas are unrelated to the domestic economy of the United States, but are mostly to meet the needs of other countries dealing with the trade, investment and foreign exchange reserves settlement. Therefore, if the RMB offshore market further expands into other regions, it will be beneficial to exporters and investors in that region to deal

with clearing and settlement in RMB, which can reduce transaction costs. Secondly, the construction of the offshore market can improve the security of RMB transactions, increasing investors' confidence in the region to use the yuan. From the perspective of the development path of dollars, the worldwide US dollar offshore market ensures the 24-hour trading in U.S. dollar, which to some extent reduces the risk of the U.S. dollar clearing and settlement, and improves the exporters and investors' confidence in the use of the U.S. dollar. Finally, the construction of the offshore market can induce domestic residents and foreign residents to hold RMB assets[5]. When the RMB offshore market matures, funds had inflows into China may choose financial products traded in offshore market measured in the RMB, which will increase the RMB overseas volumes of transactions.

3.2 Empirical research on the factors influencing the distribution of currency

(1) Data and variable

In order to measure the distribution in the various regions of the international monetary, we use the forex trading volume of the national currencies in each region as measurement. Transaction data of various international currencies was taken from BIS Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity (hereinafter referred to as Triennial Survey). Triennial Survey was published every three years by the Bank for International Settlements (BIS), from 1995 to date seven times in total. The survey covers almost global foreign exchange trading, which is an important source for policy makers and market participants to understand the global foreign exchange.

Based on this investigation, this paper selected the foreign exchange trading volume in years of 1995, 1998, 2001, 2004, 2007, 2010, and 2013 to analyze the distribution of international currency in different regions. Meanwhile, in order to maintain the consistency of the sample, this article selected 26 countries and regions[6], the same as those reported in the 1995 Triennial Survey. According to Chinn and Frankel (2008) study, this paper selects the dollar, pound, euro, Japanese yen, Swiss franc, Canadian dollar, Australian dollar seven major international currencies. It should be noted that, in view of the fact that euro didn't appear until 1999, this paper simulate the share of transactions of euro in Eurozone countries and the European Monetary System currencies (EMC) prior to 1999 so as to maintain

[5] In order to diversify risks, investors would choose to purchase in the offshore market assets denominated by this currency (He and McCauley,2010)

[6] The Triennial Survey in 1995 only included 26 countries and regions. In consideration for sample consistency, this paper selected the same 26 countries and regions as the benchmark. In the meantime, 80% of the total transaction volumes are involved in these 26 countries and regions, which justify again the typicality of the sample selection of this paper.

consistency.

This paper defines Country i as a currency-outflow country, Country j as a currency-inflow country. Table 3 describes the main variables:

Table 3 Definition of main variables

Variable	Definition
shareijt	In year t, the proportion of transaction volumes of the international currency i over the total foreign transaction volume.
lninvestmentijt	In year t, log of the amount of the bilateral equity and bond investment between country i and j[7]
tradeit	In year t, the proportion of the trade volume between county i and country j over the total trade volume of country i[8]
tradejt	In year t, the proportion of the trade volume between county i and country j over the total trade volume of country j[9]
lnpopit	In year t, log of the population of country i
lnpopjt	In year t, log of the population of country i
lngdpit	In year t, log of the GDP per capita of country i
lngdpjt	In year t, log of the GDP per capita of country i
centerj	A dummy variable equal to one if Country j is an offshore financial center, zero otherwise[10]
civili	A dummy variable equal to one if the legal system of Country i is civil law, zero otherwise
civilj	A dummy variable equal to one if the legal system of Country j is civil law, zero otherwise
psit	In year t, the political stability of country i[11]
psjt	In year t, the political stability of country j[12]
lndistij	Log of the distance between country i and country j
Comlangij	A dummy variable equal to 1 if country i and j share the same language, zero otherwise

[7] Data source: IMF Coordinated Portfolio Investment Survey.
[8] Data source: IMF International Trade Statistics
[9] Refer to footnote 8
[10] Data source: IMF Offshore Financial Centers Report
[11] For detailed estimation of Kaufmann, please refer to "Governance Matters III" World Bank Policy Research Working Paper
[12] Refer to footnote 11.

Table 4 reveals the proportion of the trade volumes of the seven international currencies over total trading volumes in different countries and regions[13]. According to the statistics, the international currencies are mainly concentrated in England, the US, Japan, Singapore and Hong Kong. However, the geographic distribution of a currency greatly differs from each other. For instance, the proportion of trade for euro in England (nearly 50%) is higher than that of other international currencies in England. But the proportion of euro in regions like Japan, Singapore and Hong Kong is lower than that of other currencies like the US dollar, the British pound and the Australian dollar.

Table 5 reports the statistical features of the main variables. It could be found that the trading proportion of international currencies differs greatly with each other. The maximum is approximately 70 times as much as the median, while the maximum of investment in log form is 1.5 times of the median, which implies the sharp difference of international trade in different countries. From the perspective of population and gross GDP, there's great difference among economic entities. Besides, it could be found from the average level that the political stability of the currency-inflow country is slightly better than that of the currency-outflow country, and there is a higher proportion of currency-inflow currencies practicing civil law than that of currency-outflow countries.

(2) Empirical Analysis

This paper employs the method adopted by Martin and Rey (2004), who employed the gravity model to analyze the factors determining the distribution of the regions of international currencies. Four conclusions could be drawn upon the empirical results:

First, in terms of the influence on the distribution of international currency regions, of population, GDP per capita, bilateral trade and capital communication, the empirical results reveal to us that the trading proportion of the international currency is positively affected by population and GDP per capita in currency-inflow countries (or regions). This suggests that the larger the economic scale of the currency-inflow country is, the greater the demand of the international currency in local trade is, and thereby expanding the network for currency circulation and reducing the transaction costs. In the meanwhile, the empirical results also suggest that the bilateral trade and capital communications have a positive influence on the proportion of local trade over the foreign trade volumes of an international currency,

[13] Given that this paper focuses on the foreign distribution of a currency, the according share in domestic trade is excluded (For Euro, the trading proportion of Euro in the European Union members is excluded).

Table 4 Share of distribution of 7 main international currencies in 26 countries and regions

Currency-inflow Country	US dollar	Euro	Yen	Pound	Swiss Franc	Canadian dollar	Australian dollar
The US	-	22.54%	25.22%	38.33%	24.71%	35.54%	20.11%
England	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%
Swiss	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	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: "-"means no share is included in the distribution of the currency in this area.

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

Table 5 Descriptive Summary

Variable	Mean	Sd.	Min	Max	Median
share$_{ijt}$	0.0433	0.0937	0.0000	0.5536	0.0080
lninvesetment$_{ijt}$	9.8342	2.3857	0.0000	14.9060	10.0517
trade$_{it}$	0.0246	0.0510	0.0000	0.6825	0.0079
trade$_{jt}$	0.0590	0.0940	0.0004	0.6890	0.0259
lnpop$_{it}$	17.9409	1.3031	15.7605	19.6174	17.9026
lnpop$_{jt}$	16.5309	1.3507	13.1834	19.5646	16.1719
lngdp$_{it}$	10.8060	0.8935	9.8044	13.1835	10.5588
lngdp$_{jt}$	10.2408	0.5922	8.0130	11.5850	10.2876
center$_{j}$	0.4723	0.4994	0	1	0
civil$_{it}$	0.4286	0.4951	0	1	0
civil$_{jt}$	0.6571	0.4749	0	1	1.
ps$_{it}$	0.9397	0.3123	0.0496	1.4915	1.0021
ps$_{jt}$	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	0.0000	1.0000	0.0000

which proves the first hypothesis right. Particularly, the higher proportion of the currency-inflow country's trading volumes from the currency-outflow country over the total trading volumes of the currency-outflow country, the higher is the proportion of that of this international currency in currency-inflow countries. In the real world, the United State, the Euro zone and Japan's great economic power grants them with prerogative in negotiation. The advantage of being used for international clearance and settlement makes the currency of the country receives greater demand from currency-inflow currencies, thereby increasing the weight of the international currency in local trade.

Second, whether the currency-inflow country is an offshore financial center has a significant influence on the trading volumes of international currency in local trade. According to the record, 70% percent of the trade volumes of the international currency lies in London, New York and Japan who have offshore financial centers. Generally speaking, since the offshore financial centers are large and historical with sound systems and facilities, there is great liquidity of the international currency in local trade and relatively low transaction cost. In the meanwhile, the strong radiation effect of the offshore financial center has a significant influence on the network for

expanding the currency circulation, which further increases the trading volumes of the currency in local trade. This suggests the great importance of the offshore financial center in promoting the internationalization level of a currency.

Third, the significant influence of political and legal systems. The empirical results show us that political stability could increase the use of international currencies in local trade. In addition, if the currency-inflow country has Anglo-American legal system, it would positively influence the use of international currency in local trade, statistically significant at the level of 1%. In real world, countries with Anglo-American legal system (such as England, the US, Singapore and Hong Kong) have higher extent of financial openness and freedom, which makes for an easier requirement for the local use of international currencies and larger trading scale and circulation of the international currency in local trade. In general, a good social institution would prompt the local use of the international currency.

Fourth, while language culture makes a difference, geographic distance does not. The empirical results show that the variable of common language (comlang) is statistically significant at the 5% level. Portes and Rey(2005) pointed out that if two countries share a common language,the currency-inflow country would have a higher recognition to the currency-outflow country, known as "familiar effect", which in turn broadens the scale of asset transaction. For example, in regions like Australia, New Zealand, Singapore and Hong Kong, the trading proportion of the British pound is greater than that of the Japanese Yen and the Swiss Franc. Therefore, this to some extent proves the importance of language culture in determining the geographical distribution of international currencies. As for geographic distance, even if it has a negative coefficient, the variable is not statistically significant at the 10% level. Different from trade, the currency trade does not require transportation; hence there is little influence of geographic distance on the international trade of different currencies. In the meanwhile, with the development of information technology, both the openness and renewal of information has developed further, and the transaction cost has decreased thanks to the Internet. Therefore, this paper attempts to conclude that geographic distance is not one of the deciding factors of the geographic distribution of international currencies.

3.3 Simulation of the trading proportion of the RMB in the main international offshore financial centers.

On the basis of the standard model, this paper estimates the trading proportion of the RMB in the five main international offshore financial centers, in the year of 2001, 2004, 2007, 2010 and 2013. On the grounds that the internationalization of the RMB

is still in the infant stage, it is assumed that the RMB is a relatively mature international currency before we start to simulate the distribution of the RMB in the main international offshore financial centers. Basically, the assumptions are as follows:

1. The RMB capital account is convertible, and the RMB could flow across the border.

2. The offshore market of the RMB develops very well where a great variety of financial product is denominated by the RMB.

3. A well-developed offshore clearance and settlement system of the RMB.

4. Approximately the same international recognition of the RMB as other international currencies.

This paper estimates the trading proportion of the RMB in five regions, the US, England, Japan, Hong Kong and Singapore, by using the data of bilateral trade, capital communication, population and GDP per capita in the year of 2001, 2004, 2007, 2010 and 2013 (See Figure 1).

It could be found in Figure 1 that the proportion of the RMB in these five offshore financial centers increases from 37.65% to over 45%, consistent with the global transaction volumes of foreign currencies in these five offshore financial markets. However, there are still some discrepancies between estimation and reality. According to the estimation results, the RMB's trading proportion in the US is higher than that in Hong Kong, similarly, the proportion in England and Japan is higher than that in Singapore. But according to the record in June, 2013, the stock of the RMB in the international offshore market is approximately 900 billion yuan, in which 600 billion in Hong Kong, 100 billion in Singapore, less in other regions.

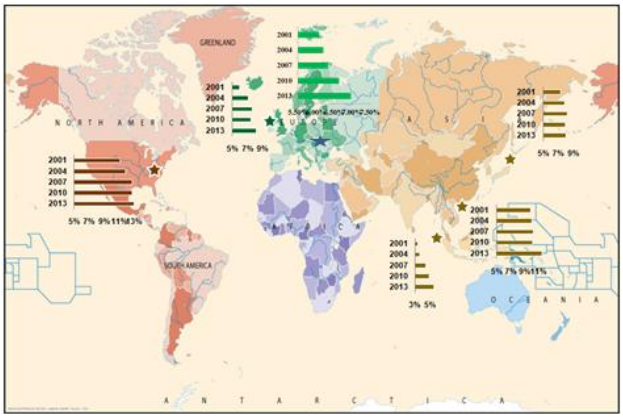

Figure 1 Distribution of the RMB trade in the main international offshore financial centers

Source: BIS, Triennial Central Bank Survey of Foreign Exchange and Derivatives Market

Activity, processed by the author

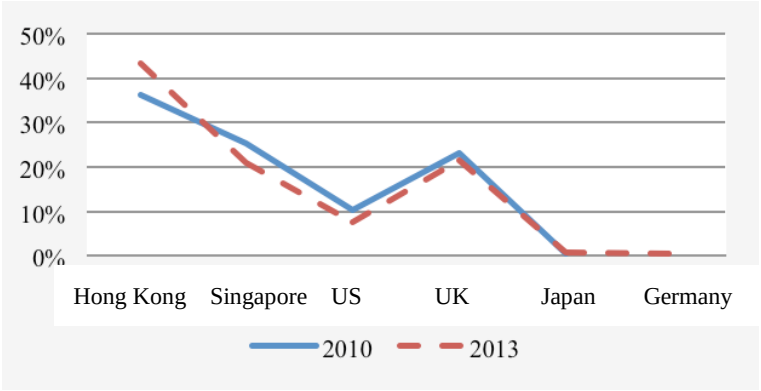

Figure 2 Distribution of the RMB trade in the main international offshore financial centers

Source: BIS, Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity, processed by the author

In recent years, Hong Kong and Singapore have been playing an important role as the offshore financial centers of the RMB, which are the only two regions with the RMB clearance bank. Therefore, the convenience of clearance and settlement reduces the transaction cost of RMB trading in Hong Kong and Singapore. In the meanwhile, due to the common language tradition between Mainland China, Chinese Hong Kong and Singapore, the RMB is well accepted by local residents. Hence, most of overseas business of the RMB takes place in Hong Kong and Singapore.

However, from the path of the internationalization of a currency, if the RMB is intended to become one of the international currencies, the RMB offshore financial market must be built in the main international financial centers. In fact, the trade and financial business between China and regions like England, the US and Japan is not necessarily less than that of Hong Kong and Singapore, and the population and economic scale are sharply greater than that of Hong Kong and Singapore. Therefore, in theory, the RMB would take a big share in these three regions. But as the majority of the RMB offshore financial market is distributed in Hong Kong and Singapore, most of the offshore business of the RMB takes place in these two areas. With regard to factors restraining the development of the RMB offshore market in the US and England, the first is policy barriers. Capital control has not been fully freed and the marketization of the RMB interest rate and exchange rate hasn’t been fully

completed. The second is the constraint put by the market supply and demand. One the one hand, there lacks quality financial product, from the suppliers' side, in the offshore market; on the other hand, the lack of liquidity of the RMB and the product denominated by yuan inhibit the foreign demand for the RMB. The third is the lag of construction of the overseas clearance and settlement trading system. The current technology of the RMB clearance and settlement cannot meet every technique required by the clearance business in the US and European zones. Therefore, the pertinent department of the authority should further promote the reform of the RMB's interest rate and exchange rate, enrich the variety of overseas financial product of the RMB and overseas RMB clearance and settlement, and thereby develop the RMB offshore financial market, improve the global distribution as well as internationalization of the RMB. In addition, China could also strengthen its foreign influence by promote Confucius Institute to promoting the recognition of foreign residents towards China in an attempt to increase the internationalization of the RMB.

To sum up, due to the network externality of the international currency and the asset nature in itself, the transaction cost and information cost make a great difference in the distribution of international currencies. To be more specific, the global distribution of an international currency is affected by the bilateral financial trade, the economic scale of the currency-inflow country, financial development, legal system and language culture. But geographic distance makes little difference in the global distribution of a currency. Particularly, the trade and capital communication between the currency-outflow country and the currency-inflow country really matters because the international movement of a currency needs economic activities as media so as to expand the circulation and scale of use in local trade of the currency and realize the economic scale effect. Similarly, the higher the population and GDP per capita of the currency-inflow country, the higher is the demand of the international currency in currency-inflow countries, which benefits the economy of scale of the international currency's circulation. Financial development and legal system would influence the transaction cost and information cost of the international currency in local use indirectly. Finally, common language culture would increase the recognition of the currency-inflow country to the international currency and the willingness of the residents of the currency-inflow country to hold the international currency, thereby increase the share of the currency in local trade.

In the long run, the share of the RMB offshore financial services and its trading scale in the main international financial centers would be one of the most important

criteria judging whether the RMB has become a main international currency or not. It should be seen that it would be a result of market selection whether or to what extent the RMB is accepted by these developed international financial centers. It is ultimately decided by the various parties on the local market. Therefore, in the future when we are building the RMB offshore market in developed countries like the US and England, not only should Chinese enterprises cooperate with the internationalization of Chinese financial organizations, but also the monetary bureau should tackle with the institutional barriers and technical problems of the global trade of the RMB asset. In addition, the according promotion of Chinese culture in developed countries would remarkably increase the worldwide recognition of the RMB, encourage the acceptance of the RMB asset in the main international financial centers and ensure the achievement of the RMB internationalization.

Featured: IMI International Exchange

Editor's Note:

IMI has been dedicated to establishing a platform for academic exchange and international cooperation, with long-term strategic partnerships established with organizations and academic institutions from Europe, America and Asia, including IMF, Official Monetary and Financial Institutions Forum (OMFIF), International Finance Forum (IFF), Goethe University Frankfurt, Korea Institute for International Economic Policy (KIEP), and Fung Global Institute. By far, IMI has hosted more than 20 major international and domestic academic conferences and over a hundred small and medium conferences. We have forged series of high-end forum and seminar brands with significant academic influence, including International Monetary Forum, Roundtable on Money and Finance, Macro-Finance Salon, Yanshan Forum, and IMI Lectures.

In the last season of 2014, IMI has hosted 14 academic conferences and has invited 4 international keynote speakers to deliver excellent speeches on subjects of monetary finance and macroeconomics. The following are brief minutes recording their points of views.

January 2015
Vol. 2, No. 1

Minutes of IMI Lectures (No. 4): South Korea's Experience of the Capital Market Development

Keynote Speaker: Dr. Jae-Hoon YOO, Chairman & CEO of Korea Securities Depository

17 Oct. 2014, Beijing

Capital market development for emerging economics

- Financial development has potential effects on long-term growth (King and Levine 1993). A positive and significant correlation between stock market development and economic growth (Levine and Zervos 1998). Bond market development influences real economic activity. (Find, Haiss, and Hristoforova, 2003)
- There are still many aspects that we have not figured out yet, impact channels between capital market and economic development, effectiveness of impact channels to economic development, and conditions and consequences determining efficiency of capital market development policies.
- Although it is convenient to use advanced capital market, sovereign capital market is essential for domestic economic growth.

Korean capital market standing

- Capital market in Korean experienced five progressive stages, reaches a relatively highly-diversified, large and international status.

What makes Korean market different

- Promoters in Korean early recognized of importance of corporate direct finance, by mobilizing domestic savings through retail investments and encouraging going public. Industry opening, supported by the government, also accompanies the capital market development.
- IT industry in Korean although started late, is getting ahead in the world. In this case, IT infrastructures are applied for both market supervision and operation. In Korean market, KOSDAQ, KONEX and K-OTC were innovative for prime SMEs, growing SMEs and unlisted companies.
- Exceptional innovations is performed by only a small number of SMEs and restricted by externality, information asymmetry and agency cost. Equity

finance is really important and special development of equity market should be innovated for these companies.

Way forward

- Many lessons can be learned for Korean experience and all economics are coping with new and old challenges. Asian capital market can be initiated and linked with European economics build silk road economic belt.

Minutes of Macro-Finance Salon (No. 12): Systemic Risk and Macro-prudential Regulation

Keynote Speaker: Nicholas Beale, Chairman of Sciteb, Visiting Fellow at the Isaac Newton Institute

19 October 2014, Beijing

Factors identified to explain the financial crack down in 2008

- It is noticeable that financial regulation was unable to keep pace with financial innovation.
- The system itself was fragmented and did not address important conflict of interest. The issue of individual and systemic risk was raised by the crisis in which regulations was focused on promoting health of individual firm rather than the whole system. Many proposals for financial reform address the need for systemic regulation - that is for regulations to focus on soundness of the whole financial system rather than individual institutions.

Individual versus systemic risk and the Regulator's Dilemma

- A super linear cost requires systemic regulation and a simple measure predict much of systemic cost variation.
- Leverage ratio is a better predictor of financial failure than risk-based capital ratio and capital for systemic cost varies on pattern of risk correlation across the system.

Areas of research directions

- Use stress test data to explore financial system dynamic

- Establish agent base model from CRISIS program to examine crisis stability and explore the cost and benefits associated with regulatory system.
- The concept of "immune" system was introduced to the economy by injecting capital into reserve to prevent another crisis. The concerned for "immune" system was identify that it was costly but also extremely complex. The economy also needs to have a systemic robust regulation to try to minimize or eliminate mistrusts among institutions.

Minutes of Macro-Finance Salon (No. 13): Trends and Challenges in Reserve Management

Keynote Speaker: Marlene Amstad, Regional Adviser and Asset Management Representative at Bank for International Settlements in Hong Kong

26 Oct. 2014, Beijing

There is a sharp increase in reserves level since 1980s

- FX reserves continue to accumulate since the beginning of this century; increases are mainly driven by Asian countries. China holds 3.75 trillion dollars as the largest reserve holder followed by Japan and Europe.
- There are six precautionary motives to hold reserves including current account buffer, financial account buffer, exchange rate targeting, exchange rate stability, foreign exchange market stability and store of national wealth.
- We need more reserves than we thought before crisis, but (probably) less than we have.

Central banks consider two areas on reserve management including currencies and asset classes

- Currency allocation is fairly stable, and it has an impressive growth in EME currencies.
- Before crisis, asset classes were under-diversified and investments were too conservative. During crisis, reserve managers were "between a rock" and "at a hard place". On the one hand, they did fundamental reassessing of the risks of different asset classes and reduced risk free investment universe. On the other

hand, reserve managers were not able to benefit from a decrease of bond yield since it has already dropped to almost zero in bond markets.

- Emerging market is good diversifying, and it behaves differently from usual U.S treasury bonds.
- It is not easy to diversify asset classes because currencies and bond returns are driven by one factor; however, the second factor is getting more and more important over time. Overall, diversification is not a one way street, each country should find its optimal reserves level and optimal diversification.

After crisis, balance sheet of central banks is not only used for reserve management but also by monetary policy makers

- Reserve portfolio is a part of other balance sheets which is used for different agendas. And central banks balance sheets are considered as a multi-purpose use after crisis.

Minutes of Macro-Finance Salon (No. 14): Money, Internationalization and Yield Curve – Relevance to RMB

Yüksel Görmez, Economic Counsellor, Central Bank of Turkey

1 Nov. 2014, Beijing

Money

- Money in the fiat form is the most accepted agreement in the world. Money is what money is - under fiat standard, with functions such as legal tender; with intermediary requirements such as trust and credibility and with long debated issues such as senior versus seniorage.
- The evolution history of money is extremely complicated. As a result, it may be recommended to renew and update the understanding and the knowledge of money and value. The mainstream future of fiat money may include electronic payments, and the financial universe may be dominated by electronic money, electronic banking and e-financial service provision.
- Coins in Turkey and paper money in China are the beginning of invention of money.
- Fiat money does not have a backing such as gold. In the future money is backed by profit generating productivity supported by entrepreneurial skills that pays

taxes, which may fund the necessary structural issues for any given economy or sector or region. Backing is relative and strength of different money competes contemporaneously.

- Conventional money may not be as perfect as it is generally perceived because there are nano payments, which are payments less than one unit like Fen. Service trade needs more efficient and reliable payment system solutions especially for nano payments. Central banks should not be against electronic money innovations as we are not competent enough to execute nano payments

Internationalization

- According to the chart that shows the history of global reserve currencies since 1450, we can see clearly that Portugal gold once was the most held global currency for about 80 years, and the role of the US dollars as predominant world currency still remained the same since 1921. After the collapse of Bretton Woods in 1972, fiat money became the mainstream in the world.
- In terms of RMB functions, RMB has no original sin as a unit of account because the Chinese government can borrow in their own currency and has no dollarization.
- From the three perspectives - functions, institutions and supply - demand equilibrium of RMB, RMB may be taken as ready to internationalize.

Yield curve

- The world is far from perfect. Mature developed markets with no QEs and/or forex interventions and emerging markets under heavy capital outflows can cause permanent liquidity deficit; while developed markets with quantitative easing and/or excessive reserves and emerging markets under heavy capital inflows cause permanent liquidity surplus. Also, most emerging countries should be blamed for volatile liquidity conditions.
- In the long-run, yield curve effectiveness and efficiency is one of the biggest challenges for central banking of China.

Conclusions and recommendations

- RMB has already been taking part in a multiple reserve currency system. It is so important because RMB can support excessive liquidity creation through extreme reserve accumulation. China, as a result, may play a partial creditor of last resort role.
- With a global mind after a history of 5000 years, China is the world factory, the biggest exporter, the biggest trader, the biggest expected importer, the

constructor of global infrastructure with a USD 4 trio reserve, the biggest economy of the world (with new PPP series) and. As a result, one may conclude that internationalization of RMB might be inevitable from many perspectives. On the other hand, hegemony of the RMB will stay as an open question that we can find the answer only in the long run.

January 2015
Vol. 2, No. 1

Working Paper

Risk Perception and Equity Returns: Evidence from the SPX and VIX*

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We use the semi-nonparametric (SNP) model to study the relationship between the innovation of the Volatility Index (VIX) and the expected S&P 500 Index (SPX) returns. We estimate the one-step-ahead contemporaneous relation subject to leverage GARCH effect. Results agree with a body of newly established literature arguing non-linearity, and asymmetries. In addition, the risk-return behaviour depends on the signs as well as magnitudes of the perceived risk. We conclude that influence of fear or exuberance on the conditional market return is non-monotonic and hump-shaped. Very deep fear does not necessarily mean huge losses, instead, the loss may not be as bad as fears of normal levels. Results pass the robustness tests. (*JEL Classification:* G17, C01, C02, C14, C15)

1. Introduction

The relationship between risk and return is crucial in the finance world. Whether or not asset prices and hence expected return should reflect investors' willingness to bear risk attracts tremendous attention and there has been a huge body of literature contributed to this topic. It is important in asset pricing, hedging, derivative pricing and risk management. But there is an ongoing debate on the nature of the risk-return relationship. Standard finance theory, e.g., Merton's (1973, 1980) Intertemporal Capital Asset Pricing Model (ICAPM) implies that the cross-section of stock returns should be affected by systematic volatility and this relation turns out to be linear and positive. Similar results are also indicated by Ghysels *et al.* (2005) using weighted rolling sample windows in the variance measurements. For a survey of these and related studies, see Lettau and Ludvigson (2009).

*IMI Working Paper No. 1501 [EN]
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Motivated by Merton's work, many other studies, e.g. Campbell (1987) and Glosten *et al.* (1993), find evidence of a negative relation using US datasets. Brandt and Kang (2004) model the conditional mean and volatility of stock returns as a latent VAR process without relying on exogenous predictors. They also find a negative correlation between the innovations to the conditional moments leading to pronounced counter-cyclical variation in the Sharpe ratio. Harvey (2001), on the other hand, uses exogenous predictors and concludes that the correlation between the moments generally depends on the model and the information set used in conditional moments.

Recent work in asset pricing on the question of volatility innovations studies the cross- sectional risk premia induced by covariance between volatility changes and stock returns and finds negative premia, e.g., Ang *et al.* (2006). A sensible explanation resides in a scenario where a volatile time of period (such as a recession) comes, co-varing stocks (in term of volatility) pay off and hence are required for less premia.

While Ang *et al.* show that the cross-sectional pricing of sensitivity to innovations in implied market volatility is robust, it does not account for the asymmetric return responses to positive and negative changes in expected systematic volatility, as found by Dennis *et al.* (2006). Thus, the relation between sensitivity to market volatility innovations and returns may not yet be fully understood. We hence propose a new fundamental work to reveal the relation between market returns and expected volatility changes while allowing for asymmetric volatility responses on a time-series dimension. We find that the asymmetric volatility phenomenon is an important element in the return process. The coexistence of negative and positive relationship is unearthed and is subject to non-monotonic trend.

Our paper implies the possibility that the expected risk-return trade-off documented in literature might be subject to misspecified models and most importantly, the sign as well as magnitude of market sentiment changes. As clearly stated in Christensen *et al.* (2010) that restrictive linear conditions are unreasonable and inconsistent to empirical fact, we therefore use semi-nonparametric (SNP) models to nest explicit expected risk metrics (proxied by the innovation in the Volatility Index (VIX)) and the total S&P 500 Index (SPX) returns. The choice of the risk measurement is justified by Chen (2003) who demonstrates that changes in the expectation of future market volatility are a source of risk. Our bivariate system is led by a flexible GARCH term which allows leverage effect or complex

non-parametric characteristics.[1]The SNP model in our paper enables us to exploit potential asymmetries and non-monotonic nonlinearity which was pioneered by Pagan and Hong (1991). They argue that the risk premium, μ_t, and the conditional variance, σ_t^2, are highly non-linear functions of the past whose form is not captured by standard parametric GARCH-M models.

Recent scholars also generalize GARCH-family models to explain the non-linear risk-return relationship. Following the conjecture of inadequacy in non-linearity by Das and Sarkar (2000) using an ARCH-in-Nonlinear-Mean (ARCH-NM) model,[2] Linton and Perron (2003) step forward by suggesting an algorithm to allow a satisfactory non-linear property. Linton and Perron's (2003) model is semiparametric in the sense that it is parametric in the conditional variance function while at the same time allowing for an arbitrary functional form to describe the relationship between risk and returns at market level. An application of their theory to the exponential GARCH-M model uncovers a non-linear and non-monotonic relationship. Similar work but revised estimators in the conditional variance function based on the GARCH-M model also finds its way in Conrad and Mammen (2008), and a simpler version (without testing the parametric specification of the mean function) of the model is derived by Christensen *et al.* (2010).

We also propose to use a semi-nonparametric tool to study the risk-return relation, but in a quite different way.

First, we do not add in any GARCH-family model unconditionally, and even when the model selecting procedure does imply the GARCH effect, it is still subject to diagnostic tests and potential expansion in the conditional mean term. More specifically, the conditional one-step ahead joint density starts from a standard normal distribution and is optimally expanded using Hermite polynomials and estimated by maximum likelihood (ML) method. This SNP procedure has been developed recently by Gallant and Tauchen (2006) to nest a generalized asymmetric VAR-GARCH model as its leading density together with the leverage effect. The advantage of adopting such a strategy lies in the fact that a specific predetermined functional form of the risk-return correlation is sometimes redundant and an adequate but parsimonious model which nests necessary observed information might

[1] Models are selected based on Baysian information criteria and author-designed diagnostics. For detailed procedures of Hermite expansion whilst alowing different leading terms, readers are advised to refer to the work by Gallant and Tauchen (2006).

[2] Das and Sarkar (2000) defines the risk premium as a Box-Cox power transformation of the conditional variance.

be a better choice.

Second, on the aspect of choosing the metrics of risk, we follow the work by Chen (2003), who demonstrates that changes in the expectation of future market volatility are a source of risk. This prediction is later on verified by Ang *et al.* (2006), in which they find that sensitivities to changes in implied market volatility have a cross-sectional effect on firm-level returns. In our paper, we choose the daily innovation in the implied volatility (CBOE VIX) as a proxy of change in the expected market volatility on the time series dimension.

We find insufficient literature that contributes to direct estimations of the relation between the innovations of VIX and market returns. A critical question that needs to be answered is to what extent and how the sentiment shifts (fear or exuberance) change expected market returns. In other words, should Chen's (2003) argument hold, risk perception would be reflected in market returns through shifts in sentiment. Significant literature, however, shows the asymmetry where positive returns are associated with smaller changes in implied volatilities than negative returns of the same magnitude. Specifically, Dennis *et al.* (2006) examine the relation between stock returns and *VIX* allowing for stock returns to react asymmetrically to volatility shocks. Their goal, however, is to determine if the asymmetric volatility phenomenon stems from systematic or idiosyncratic effects but not directly test for a risk-return relation.

However, we conclude that the contemporaneous risk-return behaviour depends not only on the sign of risk metrics (sentiment shifts), but also on the magnitudes of the change. In other words, fear or exuberance (extreme innovation of VIX) does correlate to conditional return, but the correlation is non-monotonic and hump-shaped. On the one hand, very deep fear does not necessarily mean huge losses, instead, the loss may not be as bad as fears of normal levels, while on the other, exuberance does not correlated to big returns.

Finally, the present paper is different from a similar work by Christensen and Nielsen (2007), in which a negative but monotonic relation is found and hence is consistent with the cross-sectional case by considering aggregated returns and volatility innovations in both realized and implied volatility. Our results partly agree on their conclusion. We argue that the negativity is subject to the magnitude of innovations of the expected volatility and that a positive relation also exists given dramatic changes of sentiment, so that a non-monotonic relationship seems to be the full story. Empirical threshold is also given.

Our method is also different from an SNP estimation by Linton and Perron (2003), who find a non-monotonic, hump-shaped risk premium-variance relation using a

non-parametric EGARCH model. We, however, do not estimate the conditional variance of returns, but instead examine the marginal density and moments of conditional returns against innovations of the implied volatility. Therefore, our metrics of risk is proxied by the fear gauge or change of sentiment/expectation.

Nonetheless, our framework is not intended to be predictive or keen to solve some causal link of anything, but merely to directly illustrate the conditional contemporaneous risk-return relation. And the relation is also allowed to change conditional on the contemporaneous market condition and on how much the VIX increases or decreases. The paper can be thought as an extension of Christensen *et al.* (2010) on the dimension of nesting not only the signs but also magnitudes of innovations as the information set. Our results partly agree with Linton and Perron (2003), in which we also show a hump-shaped pattern of the total returns relative to risk perceptions but it turns out to be more smooth. And the robustness check indicates our model works reasonably well.

This paper is organized as follows: Section II explains the dataset and adjustment; Section III exhibits the estimation strategy and model specifications; Section IV and V discuss the empirical models and results; Section VI shows the robustness tests; and finally, Section VII delivers the conclusion.

2. Data Description

2.1 Risk metrics: innovation of VIX

Lots of study on volatility dynamics relies on volatility estimated from historical data (namely, the realized volatility), but statistical estimation may produce sampling and model specification errors. Its lack of prediction power also limits the connection to real trading. We tend to care more about the expectation of the future realized volatility, especially the downside volatility, namely the risk. There hence exist incentives to use some *ex ante* measurement which directly targets an estimation of such risks.

The use of such a proxy of risk as changes in the implied volatility is justified thanks to a pioneer work by Chen (2003) which demonstrates that changes in the expectation of future market volatility are a source of risk. This prediction is further verified by Ang *et al.* (2006), where they find that sensitivities to changes in implied market volatility have a cross-sectional effect on firm-level returns. There is also a body of literature that uses the innovation of VIX as a measurement of risk, for example, a recent work by Dennis *et al.* (2006) examines the relation between stock returns and *VIX* allowing for stock returns to react asymmetrically to volatility shocks. Their goal, however, is to determine if the asymmetric volatility phenomenon

stems from systematic or idiosyncratic effects while not directly testing for a risk-return relation. A paper by Christensen and Nielsen (2007) also uses the same innovation of VIX. Their conclusion suggests a monotonic negative relation by considering aggregated returns and volatility innovations in both realized and implied volatility.

In the present paper, we choose the innovation of the CBOE VIX as a risk metrics. Specifically, we calculate the daily innovation as a proportion of the previous-day VIX levels (namely the percentage change of VIX, denoted by %VIX) to be a proxy of change in the expected market volatility. Financial literature finds conclusive evidence of the relation between the implied volatility and the realized volatility. Such literature can date back to the work by Feinstein (1989) which demonstrates that implied volatility from ATM and near expiration option provides the closest approximation to the average volatility over the life of the option. Poon and Granger (2003) review 93 papers regarding the forecasting performance of various volatility models (historical, stochastic and implied volatility). Their key conclusion is that the performance of option implied standard deviation outstands that of the alternative methods.

More recent articles dealing with the US equity markets suggest that, in general, implied volatility is a superior predictor of future volatility. Three representative articles are by Giot, Jiang and Tian, and Core and Miller. Giot (2005) evaluates the information content of VIX and VXN as the predictors of the realized volatility and finds meaningful forecasting results. Similarly, Corrado and Miller (2005) report that the CBOE implied volatility indices (VIX, VXO and VXN) act as an outperforming estimators of the future realized volatility compared to the forecast from the historical volatility. Jiang and Tian (2005) investigate the characteristics of the model-free approximation. They discover that the model-free implied variance, represented by the new VIX, subsumes all information contained in the Black-Scholes implied volatility.

As for the performance of the implied volatility outside the US, empirical findings are mainly consistent with those dealing with the implied volatility in the US. Although Dowling and Muthuswamy (2005) report that their Australian implied volatility index is a poor predictor of the future realized volatility, Bluhm and Yu (2001), Skiadopoulos (2004), Nishina *et al.* (2006) and Areal (2008) all find their implied volatility indices are superior estimators of the future standard deviation.

The CBOE VIX, introduced in 1993, quickly became the benchmark for stock market volatility. It is widely followed and cited in hundreds of new articles in the *Wall Street Journal*, *Barron's* and other leading financial publications. The VIX

measures market expectations of near term volatility conveyed by stock index option prices. Since the VIX signifies financial turmoil, it is commonly referred to as the 'investor fear gauge' by market practitioners and academics as well. The VIX is based on weighted averages of Black-Scholes put and call implied volatility and it is designed to be a forward-looking measure of volatility which predicts the volatility of the following 30 calendar days (22 trading days for estimation purpose) for the S&P 500 index (CBOE ticker: SPX). Since the depth of the index option market ensures that transacted prices are representative of the aggregate consensus, the VIX index is often regarded as market participants' best guess of the volatility associated with the SPX index.

Since the VIX is not a statistical estimated volatility, it does not induce traditional estimation errors. Moreover, model misspecification error is relatively small compared to statistical volatility metrics, insofar as the underlying option-pricing model based on the work of Black and Scholes (1973) and Merton (1973) is robust and widely used in the market.

2.2 Dataset

Return dataset is the total daily returns of the S&P500 index (CBOE ticker: SPX) and the daily innovation of CBOE implied volatility (CBOE ticker: VIX) in terms of percentage change (denoted by %VIX).

The data period is between 2 January 1990 and 29 December 2006, where 2 January 1990 is the introduction date of the VIX when it was officially traded in the market. The VIX is based on forming portfolios of European options and measures the market's expectation of te next 30 calendar days (22 trading days) forward S&P500 index volatility implicit in the index option prices.

Plots of the SPX index and VIX are shown in Figure 1, in which the dotted line is the raw *VIX* level and the solid line is the SPX index. Intuitively, when SPX goes up, it tends to calm the market, so that the *VIX* displays a decline and vice versa, but this is not always true. Figure 2 shows a mean-reverting process for the return series, but outliers seem to play a role.[3]

2.3 Seasonal effects

To adjust seasonalities, we use dummy-variable models to identify seasonal effects. The following dummies are considered:

- Day-of-the-week dummies (one for each day, Tuesday through Friday);

[3] Adjustment is introduced separately using a spline function to the original dataset to eliminate the outlier effect as can be found in later sections. Similar adjustment is also used by Gallant *et al.* (1992).

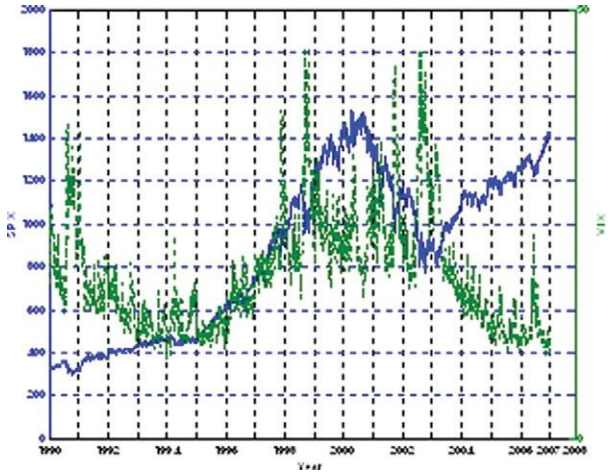

Fig. 1. VIX level and SPX level.

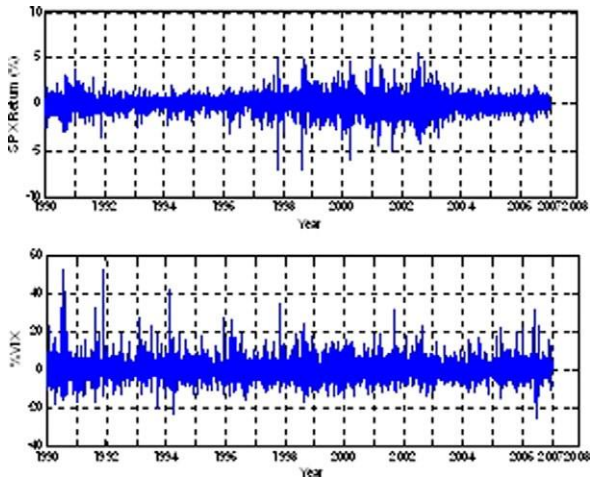

Fig. 2. SPX return and %*VIX*.

• Dummies for each number of non-trading days preceding the current trading day(one non-trading day: 39, two non-trading days: 781, and three non-trading days: 105);

• Dummies for months of March, April, May, June, July, August, September, October, and November;

• Dummies for each week of December and January;

• *t*, *t*2 trend variables (not included in the mean regressions for the price change).

We first regress the SPX total returns and the %*VIX* on these dummies respectively to do a mean adjustment (location adjustment) and then regress the residuals from previous models on these dummies to do a variance adjustment.

More specifically, the location adjustment is:

$$w = x'\beta + u \qquad \text{(mean equation)}$$

where w is the series to be adjusted (dataset) and x contains the adjustment regressors (dummies). The least squares residuals (u) are taken from the mean equation to construct a variance equation, and the variance equation is used to standardize the residuals from the mean equation.

$$\log(\widehat{u}^2) = x'\gamma + \epsilon \qquad \text{(variance equation)}$$

Finally, a final linear transformation is performed to calculate the adjusted w:

$$w_{adj} = a + b\left[\frac{\widehat{u}}{\exp(x'\gamma/2)}\right]$$

where a and b are chosen so that the sample means and variances of w and w_{adj} are the same. The linear transformation makes the units of measurement of adjusted and unadjusted data the same, which facilitates interpretation of our empirical results.

In our research, however, we find that all coefficients for seasonal dummies of both conditional mean and variance equations are generally insignificant. As a result, the fitted conditional mean and variance curves should not be very smooth and there should be local maxima in the process of estimation. Therefore, if we adjust the seasonal effects unconditionally, the procedure itself will make the adjusted data series spurious simply because datasets of SPX returns and VIX innovations suggest little evidence of seasonal effects. The exact SAS procedure can be obtained by request. Results are listed in Appendix I.

2.4 Outliers

For occasional outliers in our dataset we introduce a spline treatment as follows to the raw dataset to eliminate such effects:

$$\widehat{x_i} = \begin{cases} \frac{1}{2}\left\{x_i + \frac{4}{\pi}\arctan\left[\frac{\pi}{4}(x_i + \sigma_{tr})\right] - \sigma_{tr}\right\} & x_i < -\sigma_{tr} \\ x_i & -\sigma_{tr} \le x_i \le \sigma_{tr} \\ \frac{1}{2}\left\{x_i + \frac{4}{\pi}\arctan\left[\frac{\pi}{4}(x_i + \sigma_{tr})\right] + \sigma_{tr}\right\} & \sigma_{tr} < x_i \end{cases}$$

where x_i denotes an element of $x_t - 1$ (lagged raw datasets). This is a trigonometric spline transformation that has no effect on values of x_i within $[-\sigma_{tr}, \sigma_{tr}]$, but

progressively compresses values that exceed $\pm\sigma_{tr}$.

Because it affects only y_t−1,..., y_t−L (the conditioning set) and not y_t (data), so the asymptotic properties of SNP estimators are unaltered.

For data from financial markets, Gallant and Tauchen (2006) cited a huge amount of empirical evidence that suggests a long simulation from a fitted model has unconditional variance and kurtosis much larger than the variance and kurtosis of the sample. When the spline transform is imposed, this anomaly is effectively eliminated while the estimated coefficients and the value of likelihood are not much affected. Thanks to their contribution we can apply spline transformations to the x_t–1 that enters $P(z, x)$, μ_x, and $_x$ with σ_{tr} = 2. The order the transformations are implemented is as follows:

$\widetilde{y}_t$	→	y_t	→	x_{t-1}	→	$\widehat{x}_{t-1}$	→	μ_x, R_x
raw data		centred, scaled		lagged		spline data		location-scale transformed

where all inputs and outputs are in the units of the raw data $\widetilde{y}_t$.

3. Model of Density

The present work begins with an examination of the characteristics of the law of motion itself, with the primary objective to determine the extent to which it deviates from the Gaussian vector autoregressive (VAR) model. Elaborating on a paper by Phillips (1983) and Gallant and Nychka (1987), in which they propose to approximate the unknown density in a model by Hermite series. This approach finally develops to a parsimonious but sufficient procedure of empirical density function by Gallant and Tauchen (1999). This estimation strategy is called the SemiNonParametric (SNP) methodology, which is an approach that applies conventional estimation and testing to models derived from series expansions.

The method is based on the notion that a Hermite expansion can be used as a general approximation to an empirical density function. Let z denote a vector of a dimension M, the probability density of this vector can be written as an approximation by Hermite polynomials (namely the Hermite density) which is of the form,

$$h(z) = \frac{[\rho(z)]^2 \phi(z)}{\int [\rho(s)]^2 \phi(s) ds} \tag{1}$$

where $\rho(z)$ denotes a multivariate polynomial of degree K_z and $\varphi(z)$ denotes the

density function of a multivariate Gaussian distribution with mean zero and the identity as its variance-covariance matrix. Denote the coefficient vector of ρ (*z*) by *a* whose length depends on K_z and *M*. The constant factor $\frac{1}{\int [\rho(s)]^2 \phi(s) ds}$ makes sure *h* (*z*) to integrate to one.

Given the Hermite density above in Equation (1), we can easily expand the density even further by allowing conditional heteroskedasticities, heterogeneities and potential interactions in the multivariate case. The variables within *y* (the dataset) are standardized using the location scale transformation $y = Rz + \mu$, where *R* is an upper triangular matrix and μ is an *M*-vector, gives

$$f(y|\theta) = \frac{\left\{\rho\left[R^{-1}(y-\mu)\right]\right\}^2 \left\{\phi\left[R^{-1}(y-\mu)\right] / |\det(R)|\right\}}{\int [\rho(s)]^2 \phi(s) ds} \tag{2}$$

Because $\varphi[R^{-1}(y - \mu)]/|\det(R)|$ is the density function of the *M*-dimensional, multivariate, Gaussian distribution with mean μ and variance-covariance matrix $\Sigma = RR'$, and because the leading term of the polynomial part is one, then the leading term of the entire expansion is proportional to the multivariate, Gaussian density function. Denote the Gaussian density of dimension *M* with mean vector μ and variance-covariance matrixΣby $n_M(y|\mu, \Sigma)$ and write

$$f(y|\theta) = \frac{[\rho(z)]^2 n_M(y|\mu, \Sigma)}{\int [\rho(s)]^2 \phi(s) ds} \tag{3}$$

where $z = R^{-1}(y - \mu)$. And the parameter set θ is made up of the coefficients *a* of the polynomial ρ(*z*) together with μ and *R* and they are estimated by maximum likelihood. When K_z is put to zero, one gets $f(y|\theta) = n_M(y|\mu, \Sigma)$ exactly because the leading term in the Hermite expansion of $[\rho(z)]^2$ is one. When K_z is positive, one gets a Gaussian density whose shape is modified due to multiplication by a polynomial $[\rho(z)]^2$. The shape modifications thus can be arbitrarily rich and hence give increasing precision of the density approximation as K_z becomes large.

It is also possible that some heterogeneity property exists (the distribution of z_t depends on x_t−1). In this case, each coefficient of the polynomial ρ(*z*) is a polynomial of degree K_x in *x* (same as x_t−1). Denote this polynomial by ρ(*z*, *x*). Denote the mapping from *x* to the coefficients *a* of ρ(*z*) such that $\rho(z|a_x) = \rho(z, x)$ by a_x and the number of lags on which it depends by L_p. The form of the density with this modification is

$$f(y|x,\theta) = \frac{[\rho(z,x)]^2 n_M(y|\mu_x, \Sigma)}{\int [\rho(s)]^2 \phi(s) ds} \tag{4}$$

where $y_t = Rz_t + \mu_x$, and μ_x is a linear function that depends on L_u lags,

$$\mu_x = b_0 + Bx_{t-1} \tag{5}$$

So if K_x is put to a positive integer, the shape of the density will depend upon x. Hence, all moments can depend upon x and the density can, in principle, approximate any form of conditional heterogeneity (Gallant and Tauchen, 1999; Gallant *et al.*, 1991).

It is obvious that the leading term of the expansion is $n_M(y|\mu_x, \Sigma)$ which is called the Gaussian vector auto regression or Gaussian VAR. When K_z is put to non-zero, one gets a semiparametric VAR density that can approximate well over a large class of densities whose first moment depends linearly on x according to Equation (5) and whose shape is constant with respect to variation in x.

For the case of $M > 1$(multivariate estimation), a number of interactions (cross product terms) for even modest settings of degree K_z would exist. Accordingly, additional tuning parameters, I_z and I_x are introduced in estimations to control higher order interactions.

In practice, the leading term $n_M(y|\mu_x, \Sigma)$ can be put to a Gaussian GARCH rather than a Gaussian VAR. The form is:

$$\Sigma_{x_{t-1}} = R_0 R_0' \tag{6}$$

$$+ \sum_{i=1}^{Lg} Q_i \Sigma_{x_{t-1-i}} Q_i' \tag{7}$$

$$+ \sum_{i=1}^{Lr} P_i (y_{t-i} - \mu_{x_{t-1-i}})(y_{t-i} - \mu_{x_{t-1-i}})' P_i' \tag{8}$$

$$+ \sum_{i=1}^{Lv} \max[0, V_i(y_{t-i} - \mu_{x_{t-1-i}})] \max[0, V_i(y_{t-i} - \mu_{x_{t-1-i}})]' \tag{9}$$

$$+ \sum_{i=1}^{Lw} W_i x_{(1),t-i} x_{(1),t-i}' W_i' \tag{10}$$

where R_0 is a factorized upper triangular matrix, the matrices P_i, Q_i, V_i and W_i can be scalar, diagonal or full M by M matrices, the notation $x_{(1),t}-i$ indicates that only the first column of $x_{(1),t}-i$ enters the computation, and the $max(0, x)$ function is applied

elementwise. Accordingly we call these four types of heteroscedasticities *Q-type*, *P-type*, *V-type*, and *W-type*, and the lags of x_t-1 on which they depend are denoted as L_g, L_r, L_v and L_w, respectively. Clearly if $L_r>0$, an ARCH effect is present, which makes the leading term a Gaussian ARCH, and when $L_g>0$, and $L_r>0$ at the same time a GARCH effect is entering the leading term, which is of the form of Gaussian GARCH.

Therefore a much general leading term is achieved by allowing conditional heteroskedasticity, so with $\Sigma_{x_{t-1}}$ specified as either an ARCH or GARCH as above, the form of the conditional density becomes:

$$f(y|x,\theta)=\frac{[\rho(z,x)]^2 n_M\left(y|\mu_x,\Sigma_{x_{t-1}}\right)}{\int[\rho(s)]^2\phi(s)ds} \tag{11}$$

where $z_t=R_x^{-1}(y-\mu_x)$. And all the coefficients are arranged inside the vector of θ,

$$\theta=vec\left[a_0|A|b_0|B|R_0|P_1\ldots P_p|Q_1\ldots Q_q|V_1\ldots V_q|W_1\ldots W_q\right]$$

in which a_0 is the subset of a that does not depend on x, and A controls the mapping from x to the subset of a that does depend on x. The parameters of the location function are $[b_0|B]$ whose length is controlled by L_u. The other variables in θ are all stated in above texts. And all these parameters are estimated by maximum likelihood estimation.

To sum up, as seen in Table 1, the SNP method employs an expansion in Hermite functions to approximate the conditional density of a multivariate process by setting principal tuning parameters and hence different model modifications away from a Gaussian distribution can be achieved.

An appealing feature of this expansion is that it is a non-linear non-parametric model that directly nests the Gaussian VAR model, the semi-parametric VAR model, the Gaussian ARCH model, the semi-parametric ARCH model, the Gaussian GARCH model, and the semiparametric GARCH model. The SNP model is fitted using conventional maximum likelihood together with a model selection strategy determining the appropriate order of expansion.

TABLE1

Model Types and Principal Tuning Parameters

Parameter setting						*Characterization of* $\{y_t\}$
Lu = 0	Lg = 0	Lr = 0	Lp ≥ 0	Kz = 0	Kx = 0	iid Gaussian Gaussian
Lu > 0	Lg = 0	Lr = 0	Lp ≥ 0	Kz = 0	Kx = 0	VAR semi-parametric
Lu > 0	Lg = 0	Lr = 0	Lp ≥ 0	Kz ≥ 0	Kx = 0	VAR Gaussian ARCH
Lu ≥ 0	Lg = 0	Lr >0	Lp ≥ 0	Kz = 0	Kx = 0	semi-parametric ARCH
Lu ≥ 0	Lg = 0	Lr >0	Lp ≥ 0	Kz >0	Kx = 0	Gaussian GARCH
Lu ≥ 0	Lg > 0	Lr >0	Lp ≥ 0	Kz = 0	Kx = 0	semi-parametric
Lu ≥ 0	Lg > 0	Lr >0	Lp ≥ 0	Kz >0	Kx = 0	GARCH non-linear
Lu ≥ 0	Lg ≥ 0	Lr ≥ 0	Lp > 0	Kz >0	Kx > 0	non-parametric

4. Empirical Evidence

Results of the SNP model specifications and diagnostic tests are summarized in Table 2 for both bivariate models (Panel A and B) and univariate models (Panel C), in which all the values are comparable and they are listed in a way along the excessively rich parameterization (increasing P_θ), and the 'Obj.' column contains minimized negative log-likelihoods in each set of SNP estimation, and the column labelled 'BIC' indicates the Schwarz information criterion. All the other labels in Table 2 have already been defined in the previous section.

Among the models in Panel A of Table 2 which specify the ARCH-leading models in the bivariate Hermite density expansion, the Schwarz-preferred model has $L_u = 3$, $L_r = 13$, $L_p = 1$, $I_z = I_x = 0$,and $K_z = 4$ with $P_\theta = 51$. Under this specification the short-term diagnostic Wilks's lambda is significant for the conditional mean regression. This indicates that there exists short-term conditional heterogeneity that is not accounted for by the current model specification. Separately, the short-term conditional variance is adequately approximated. Therefore a single Schwarz criterion turns out to be too aggressive to cut down further extension of non-linear property (the case of $K_x > 0$) from entering the Hermite density specification. This fact can be found by comparing the 8th and the 9th row in Panel A where the BIC shows a jump in value when K_x moves from 0 to 1, whereas the specification test based on Wilks's lambda on conditional mean moves from significant to highly insignificant in the mean time.

The GARCH-leading term SNP bivariate model shown in Panel B of Table 2 indicates that the Schwarz-preferred model has $L_u = 3$, $L_g = 1$, $L_v = 1$, $L_r = 1$, $L_p = 1$,

$I_z = I_x = 0$,and $K_z = 4$ with $P_\theta = 29$, while the short-term diagnostic Wilks's lambda is significant for the conditional mean. It suggests an insufficiency to fully explain the heterogeneity. We hence increase K_x (the degree of polynomials in the coefficients of Hermite expansion $\rho(z, x)$ in both ARCH-leading and GARCH-leading models) and find the optimized value is $K_x = 1$ under both leading terms, but the BICs increase by less than 0.002 compared with the models with $K_x = 0$. However, by doing so, the short-term diagnostic tests are highly insignificant which suggests the Hermite expansions deviate little from the truth. In other words, the customized diagnostics can be seen as a remedy to compensate the conservative and aggressive properties of the BIC. Therefore, the BIC-preferred fittings further justified by diagnostics can then be trusted to be parsimonious enough as well as reflecting the true data generating process with little lack of explanatory variables. It is clear a parsimonious GARCH-leading SNP model dominates a large ARCH-leading term model because of smaller BIC and the diagnostics from our results in Table 2. Diagnostics apart from the information criteria are also suggestions by Gallant and Tauchen (2006) but exact procedures vary across literature.

In past decades, the risk-return relationship has been examined by lots of researchers but it is still open to further study. Some issues pertain to the predictability of price changes, the nature of the relationship between price changes and volatility, and the shape characteristics of the probability density of price changes. Others concern asymmetry of the conditional variance function (leverage effect) and the relationship between the risk and conditional price volatility. Our methods look into these issues by an SNP estimation of the one step-ahead, bivariate, conditional density. The estimation itself embodies sufficient sample information without unreasonable presumptions (property of non-parametric approaches), and the customized diagnostics/information criteria keep the model parsimonious in the meanwhile.

The optimized conditional density is a function of 31 variables, it is hard to describe directly about all the economic meanings of Hermite expansion coefficients and conditional heteroscedasticity coefficients directly. The final fit of GARCH-leading SNP model is the one with $L_u = 3$, $L_g = 1$, $L_v = 1$, $L_r = 1$, $L_p = 1$, $I_z = I_x = 1$, $K_x = 1$ and $K_z = 4$ (bottom row in Panel B of Table 2). Due to the length of this paper, only the final fit is reported in Table 3, others can be distributed upon request.

TABLE 2

SNP Return and Change of VIX Series: Optimized Models

													Specification Tests on 20 lag cubic			
													Mean		*Variance*	
Lu	Lg	Lr	Lp	Lv	Lw	Kz	Iz	Kx	Ix	P_θ	*Obj.*	*BIC*	*Wilks*	*pv*	*Wilks*	*pv*
Panel A: Bivariate ARCH Leading Term SNP Estimation																
1	0	0	1	0	0	0	0	0	0	9	2.80	2.81*	0.85	<.00	0.68	<.00
3	0	0	1	0	0	0	0	0	0	17	2.79	2.80*	0.87	<.00	0.68	<.00
3	0	13	1	0	0	0	0	0	0	43	2.59	2.63*	0.94	0.14	0.96	0.99
3	0	13	1	0	0	4	0	0	0	51	2.51	2.56*	0.93	0.01	0.95	0.80
3	0	13	1	0	0	4	0	1	0	53	2.51	2.57*	0.94	0.11	0.95	0.91
3	0	13	1	0	0	4	1	1	0	53	2.51	2.57*	0.94	0.11	0.95	0.91
3	0	13	1	0	0	4	1	1	1	53	2.51	2.57*	0.94	0.54	0.95	0.91
Panel B: Bivariate GARCH Leading Term SNP Estimation																
1	0	0	1	0	0	0	0	0	0	9	2.80	2.81*	0.85	<.00	0.68	<.00
3	0	0	1	0	0	0	0	0	0	17	2.79	2.80*	0.87	<.00	0.68	<.00
3	1	1	1	0	0	0	0	0	0	20	2.58	2.60*	0.94	0.10	0.93	0.01
3	1	1	1	1	0	0	0	0	0	21	2.57	2.59*	0.93	0.04	0.94	0.12
3	1	1	1	1	0	4	0	0	0	29	2.50	2.52*	0.93	0.01	0.94	0.08
3	1	1	1	1	0	4	0	1	0	31	2.50	2.53*	0.94	0.06	0.94	0.20
3	1	1	1	1	0	4	1	1	0	31	2.50	2.53*	0.93	0.01	0.94	0.20
3	1	1	1	1	0	4	1	1	1	31	2.50	2.53*	0.94	0.06	0.94	0.20
Panel C: Univariate GARCH Leading Term SNP Estimation																
1	0	0	1	0	0	0	0	0	0	3	1.40	1.41*	3.64	<.00	16.59	<.00
1	1	1	1	0	0	0	0	0	0	5	1.27	1.27*	1.21	0.13	0.80	0.86
1	1	1	1	1	0	0	0	0	0	6	1.26	1.26*	1.05	0.37	0.61	0.99
1	1	1	1	1	0	4	0	0	0	10	1.24	1.25*	1.03	0.41	0.59	0.99
1	1	1	1	1	0	4	0	1	0	11	1.24	1.25*	1.02	0.43	0.59	0.99

Note: Superscript "*" means the relevant model is optimized.

TABLE 3
Optimized Bivariate GARCH-leading SNP Model

Index	*Theta* (θ)	*Standard error*	*t-statistic*	*Descriptor*
1	0.01306	0.01414	0.92361	a0[1]
2	−0.09052	0.00993	−9.11647	a0[2]
3	−0.05483	0.00914	−5.99613	a0[3]
4	0.08526	0.00811	10.51614	a0[4]
5	0.09326	0.0274	3.40326	a0[5]
6	−0.18137	0.01081	−16.7801	a0[6]
7	0.06177	0.01871	3.30162	a0[7]
8	0.11363	0.01435	7.91636	a0[8]
9	1	0	0	A(1,1)
10	0.05053	0.02573	1.96348	A(1,2)
11	0.04123	0.02582	1.59703	A(1,3)
12	−0.13	0.04646	−2.79795	b0[1]
13	−0.02814	0.02096	−1.34273	b0[2]
14	−0.05728	0.01412	−4.0564	B(1,1)
15	0.07749	0.01134	6.83398	B(2,1)
16	0.00653	0.01314	0.49723	B(1,2)
17	−0.05578	0.01495	−3.7313	B(2,2)
18	−0.06344	0.0136	−4.66633	B(1,3)
19	0.04396	0.0108	4.0695	B(2,3)
20	−0.0399	0.01315	−3.03481	B(1,4)
21	−0.00578	0.01422	−0.40682	B(2,4)
22	−0.06009	0.0138	−4.35524	B(1,5)
23	0.04558	0.01165	3.9138	B(2,5)
24	−0.02747	0.01207	−2.27641	B(1,6)
25	−0.01661	0.0141	−1.17845	B(2,6)
26	0.16132	0.01117	14.44261	R0[1]
27	−0.02577	0.004	−6.44176	R0[2]
28	0.07895	0.0092	8.58245	R0[3]
29	0.20366	0.01051	19.36872	P(1,1)d
30	0.2336	0.0108	21.62118	P(2,1)d
31	−0.9707	0.00178	−545.342	Q(1,1)s
32	0.16568	0.01575	10.52097	V(1,1)s
SUMMARY STATISTICS				
Length of θ ($P_\theta + 1$)		32		
s_n		2.49596383		
AIC		2.50320344		
HQ		2.51133872		
BIC		2.52623326		

Note: All coefficients and tests are consistent with the final fit with a model specification of $L_u = 3$, $L_g = 1$, $L_v = 1$, $L_r = 1$, $L_p = 1$, $I_z = I_x = 1$, $K_x = 1$ and $K_z = 4$.
AIC, HQ, BIC denote the three information criteria: Akaike Information Criterion (Akaike, 1973), Hannan and Quinn Information Criterion (Hannan and Quinn, 1979), and Schwarz Information Criterion (Schwarz, 1978), respectively.
s_n denotes the objective value.

It is interesting that there is some strong evidence of a V-type heteroscedasticity (shown in Equation (9)) within the GARCH-leading term, and it is positive (0.166)

as shown in Table 3 (index number 32). The significance means there exists a leverage effect rather than a symmetric GARCH. We also document that an efficient procedure to test this effect should be treating the leverage as an add-on within the GARCH discipline, not some pre-determined asymmetric function, otherwise the leverage is highly likely to be washed away by high-order ARCH terms. We do not find any W-type heteroskedasticity.

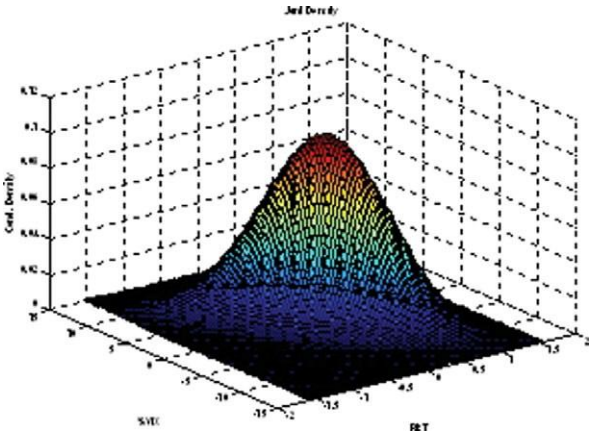

Fig. 3. Surface of bivariate one-step-ahead joint density.

5. Results

5.1 Contemporaneous relationship

The empirical one-step-ahead, bivariate, conditional density at the mean can be written as:

$$f\left(ret_t, \%VIX_t | ret_{t-1:4282} = \overline{ret}, \%VIX_{t-1:4282} = \overline{\%VIX}\right) \tag{12}$$

where ret_t defines the SPX daily return, $\%VIX_t$ defines the daily innovation (in terms of percentage change) of CBOE VIX; the $\overline{ret}$ and $\overline{\%VIX}$ calculate their unconditional means respectively. Function (12) contains an information set defined as of lagged returns and volatility innovations: $\Omega = \{ret_{t-1:4282} = \overline{ret}, \%VIX_{t-1:4282} = \overline{\%VIX}\}$. Therefore, conditioning on this particular information set in the function gives an in-sample one-step-ahead prediction of the bivariate conditional density. It embodies the sample information pertaining to the predictability of the price changes, the nature of the possible relationship between returns and volatility index, and the shape characteristics of the probability density of returns. Because the fitted conditional density is a generalized Hermite expansion

of 32 variables (including intercept) thanks to the GARCH-leading non-parametric optimization, it is difficult to describe all the parameters directly. Our strategy is therefore to examine features of the density by looking at marginal, low-order moments, and conditional moment functions and to interpret these features in view of the economic issues.

Figure 3 shows the three-dimensional surface of the one-step-ahead joint density as shown in Function (12). It suggests the fitted density is quite smooth over the dataset. No hump-shaped feature exists in the density function. Figure 4 depicts the contour plots of it demonstrating a downward-sloping shape; the downward tendency also gives us the intuitive impression that there is a rough negative risk-return correlation.

Given the joint density estimation as before, the marginal conditional density of ret_t is computed as:

$$f_{ret}\left(ret_t | ret_{t-1:4282} = \overline{ret}, \%VIX_{t-1:4282} = \overline{\%VIX}\right)$$
$$= \int f\left(ret_t, \%VIX_t | ret_{t-1:4282} = \overline{ret}, \%VIX_{t-1:4282} = \overline{\%VIX}\right) d\%VIX_t$$

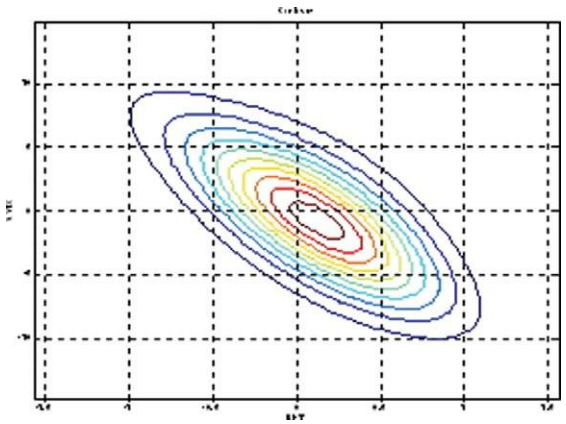

Fig. 4. Contours of bivariate joint density.

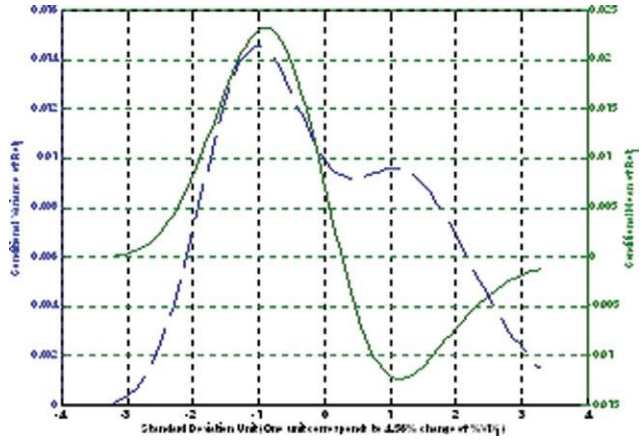

Fig. 5. Contemporaneous relationships.

Since the in-sample prediction nests the unconditional means of SPX return and the %*VIX* as its information set, so it is an intuitive guess that the one-step-ahead prediction of SPX return might not deviate from the unconditional tendency too much. And, provided the joint density, it should also be easy to calculate all the conditional moments accordingly.

The contemporaneous relationship between SPX return (denoted as ret_t) and the percentage change of VIX (denoted as $\%VIX_t$) is revealed by looking at the conditional mean and variance of ret_t given $\%VIX_t$ (along slices of the bivariate (ret_t, $\%VIX_t$) density). Figure 5 shows the first two moments of ret_t conditional on $\%VIX_t$. These are the mean and variance of ret_t univariate marginal density obtained by slicing the bivariate density show in Figure 3 along a line through (−15,15) on the $\%VIX_t$ axis parallel to the ret_t axis. The horizontal axis in Figure 5 is in standardized units (divided by the standard deviation) of the marginal conditional density of
$\%VIX_t$,

$$f_{\%VIX}\left(\%VIX_t | ret_{t-1:4282} = \overline{ret}, \%VIX_{t-1:4282} = \overline{\%VIX}\right)$$

The range of the horizontal axis in Figure 5 extends four standard deviations on either side (each unit corresponds to 4.56 change in values of %*VIX*). We focus particularly on curves within three standard deviation units because the moment functions become oscillatory outside this bound. The reason is that, for the data of %*VIX*, it is too rare for %*VIX* to exceed over three standard deviations change (12

or more change in value of %*VIX* happens less than 2 per cent of the time). Although we already impose trimmings to deal with outliers, yet the practical market situation should not be ignored after all. We choose a relatively less conservative bound of three standard deviation units because our dataset is moderately large enough. A more conservative limit, two standard deviations, could be chosen because %*VIX* already rarely exceeds this limit (less than 8 per cent of the time). Fortunately, the degree of freedom in daily data is still reasonable for a bigger bound without spurious fittings and most importantly, we can also look into the tail behaviour.

Generally speaking, Figure 5 depicts an intuitive and straightforward result that a decrease in %*VIX*(negative %*VIX*) means a positive mean return while an increase in *VIX*(positive %*VIX*) implies conditional losses. In addition, there are also some untraditional features that can be observed as follows.

First, it is very interesting to note that the direction of the conditional daily return (solid line) is related to the contemporaneous innovation of the implied volatility in a non-linear way, and there seems to be some threshold to define this non-linearity. Specifically, within the range of one standard deviation change of *VIX* (in absolute value), the conditional return is negatively and monotonically related to the %*VIX*. The relationship is very close to a linear correlation and the slope is −0.11, which means one *unit* change in *VIX* implies a 0.11 decrease in the conditional total return. But this relationship, however, reverts itself and becomes positive outside the bound of one standard deviation unit. So a hump-shaped curve exists and shows non-monotonicity. Our findings might provide some explanations for the conflicting results put forward by early literature in which different signs of linear relations are found using various methodologies. The reason is that a risk-return relationship may not be as simple as we might think: a linear model has a tendency to smooth the non-linearity by simply ignoring higher-order terms; pure nonlinear parametric models may not be flexible enough to accommodate heterogeneities or even to distort the truth due to unreasonable assumptions (for example, we must assume distributions for the errors), and ultimately prevent the model from revealing the true DGP. Our SNP model is a distribution-free non-parametric model which starts from a standard normal distribution and then adjusts the density function by higher moments or leading terms determined by the dataset, while balancing over-fittings by penalties and customized diagnostics. Advantages as such make the SNP discipline dominate parametric models by allowing the real dataset to play a role, and in the mean time, circumvent over-fitting problems typically found in non-parametric methodologies.

Our result also partly agrees with Linton and Perron (2003) which shows a

hump-shaped pattern of the risk premium, although our result turns out to be more smooth and less complex. It is possible that we could model short-term dynamics artificially well by simply expanding the conditional density function using higher-order Hermite polynomials. By doing so, a much complicated relationship might be derived and the non-monotonicity could be far more sensitive to innovations of the VIX. However, a complex relationship might not have much meanings for real trading strategies. Statistical relationships may not always apply in practice, especially when they are highly complicated. Traders may be more interested in summarizing a meaningful and aggregated relationship such that benchmarks of long/short positions could be made. Therefore, a simple but useful result might be preferred. In our results, we penalize some of the meaningless dynamics and focus more on thresholds at which the relationship reverts to different signs. We conclude that (empirically) the threshold is one standard deviation of the VIX innovation (in percentage terms). If the VIX innovation exceeds this bound (positive or negative), the correlation itself reverts to a positive one. Therefore, the contemporaneous risk-return behavior depends not only on the sign of risk metrics (sentiment shifts), but also on the magnitudes of the change. In other words, fear or exuberance (extreme innovation of VIX) does affect the conditional return, but the influence is non-monotonic and hump-shaped. On the one hand, very deep fear does not necessarily mean huge losses, instead, the loss may not be as bad as fears of normal levels, while on the other, exuberance does not correlate to big returns.

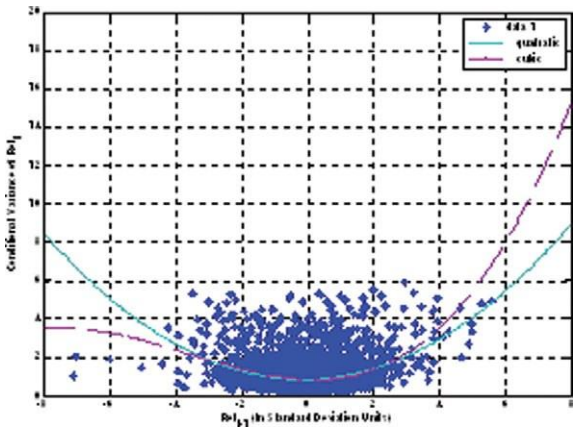

Fig. 6. Bivariate conditional variance.

Secondly, in Figure 5, there also exists a generally bigger positive expected return in the negative %*VIX* region, whilst on the positive region, a generally smaller

expected loss can be clearly observed. This asymmetry suggests that information pertaining to %*VIX* can actually help investors to reduce their losses and increase their total returns as well. More technically, when the daily %*VIX* enters the bivariate SNP system, it effectively carries information that can be used to hedge contemporaneous exposure to conditional loss (the so-called loss aversion), so that it mitigates the expected loss and more importantly, it even contains information about profiting over small (but frequent) positive %*VIX*.

Thirdly, it is also interesting to observe the second-order conditional moment of the total return (broken line in Figure 5). We find that positive %*VIX* correlates to a volatility moderation (to the right) relative to negative *VIX* innovations (to the left). The result is consistent to intuitive explanations of how traders treat different signs of VIX innovation. Less fear (or even exuberance) eases motives to stabilize total return fluctuations simply because the volatility in the upside conditional returns is only treated as sweeteners, but higher expected risk (measured by fear gauge) will intensify market turmoil and hence increase trader's motivation to foil conditional volatility of returns. In other words, investors do not consider a decrease in the implied volatility as a true market risk. The VIX's contemporaneous effect seems to mitigate the conditional variance of return only when %*VIX* is positive.

5.2 Asymmetries of the conditional variance

Figure 6 depicts the marginal conditional variance function of total return against lagged return itself (also in terms of standard deviation unit). It is clear that the conditional variance function displays the conditional heteroscedasticity captured by traditional GARCH-family applications. As before, on the horizontal axis, one unit stands for one standard deviation corresponding to 0.95 change in lagged SPX returns.

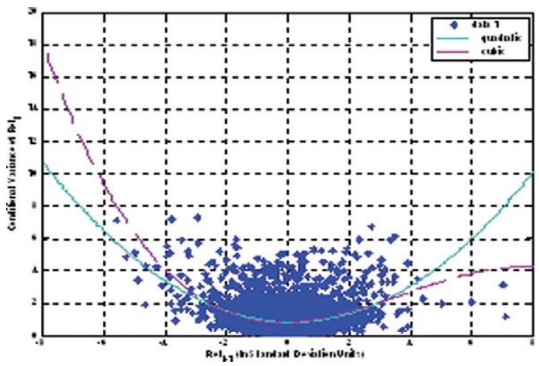

Fig. 7. Univariate conditional variance.

It should be noticed that even though the SNP estimation does not impose any form of symmetry towards the marginal conditional variance function of return, the plots generated from which shows a symmetric feature, as shown by the quadratic fitting.

However, the symmetry conflicts with the findings by Nelson (1989, 1991), Pagan and Schwert (1990), and others who find evidence of asymmetric properties in the conditional variance function. Literature names asymmetries of the sort the leverage effect after early studies by Black (1976) and Christie (1982). They both provide evidence that changes in the equity value of a firm affect the riskiness of the firm's equity. Recent evidence, for instance, Low (2004) uses a simple linear model to prove the significance of this effect. But tests of the leverage hypothesis by French *et al.* (1987) and by Schwert (1989, 1990) suggest that financial leverage could not be responsible for asymmetries of the magnitude reported in literature. Nevertheless, the consensus is that leverage effect is due to the asymmetry in conditional variance of returns.

The reason why our SNP model fails to capture this asymmetry is because our SNP constructs a joint density function in which the SPX daily return and the implied volatility change are considered simultaneously. Hence, the conditioning information set includes both past returns and %*VIX* as well. When we exclude the %*VIX* out of the system and use a univariate SNP model to estimate the return series, we get a univariate conditional volatility plot shown in Figure 7. And by doing so, evidence of asymmetry is also uncovered. Therefore, Figure 7 still confirms a rather mild leverage effect by noticing the quadratic fitting curve is higher on the left than on the right, which is consistent to previous findings (negative past return causes higher conditional volatility). However, almost all the other articles regarding leverage effect examine a marginal price process instead of considering multivariate cases. This difference suggests that introducing VIX in to the analysis is responsible for producing the symmetry seen in Figure 6.

We also note from Figure 6 that although the introduction of VIX contributes to the symmetry, this symmetry is not a real one in the sense that the %*VIX* finally makes the conditional variance tilting to the left which can be fit using a cubic fitting.

6. Monte Carlo Simulations and Robustness Tests

6.1 Monte Carlo description

We use Monte Carlo simulations to do the robustness check. The upper panel in Figure 8 plots the real SPX return series, while bottom panels show simulations (of

the same length) from bivariate ARCH-leading and GARCH-leading SNP models, respectively.

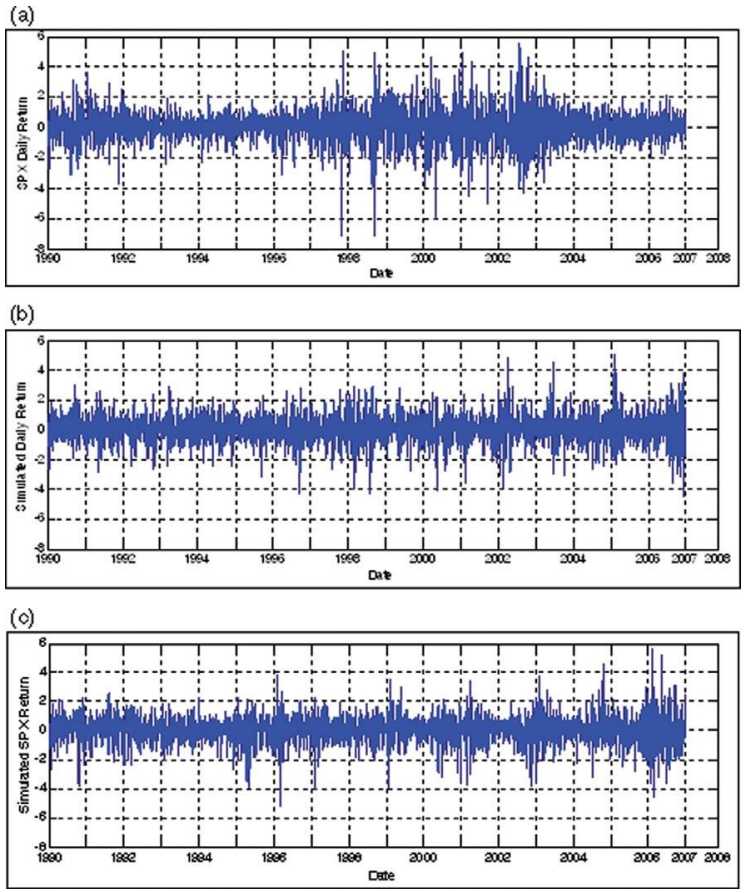

Fig. 8. (a) Real SPX return series; (b) ARCH simulated daily returns; (c) GARCH simulated daily return.

Simulations capture features as in the real return series, but are less volatile. This is due to the spline transformation for outliers. We can see the GARCH-leading model carries the volatility moderation between 1992 and 1996, a volatile period from middle 2002 to middle 2003 and around the year 2001.

Table 4 shows the first four moments of all series. They all show excess kurtosis and negative skewness, which are typical to financial time series. The GARCH-leading model gives a much higher kurtosis which is closer to the kurtosis from the real series.

However, we should also notice all kurtosis of simulated series cannot explain the

real one fully as observed in the financial market. A fundamental explanation is because the BIC is still conservative even when diagnostics kick in to determine a richer model. Therefore some temporary and abrupt fluctuations may be erased by the Schwarz penalty.

TABLE4

First four moments

	Real SPX daily return	*ARCH generator*	*GARCH generator*
Mean	0.032	0.037	0.031
Variance	0.995	0.808	0.781
Skewness	-0.101	-0.148	-0.199
Kurtosis	6.908	4.986	5.627

Despite its aggressiveness, researchers still prefer the Schwarz criterion, because evidence shows it does a good job in finding abrupt drops in integrated squared error which is the point at which one would like to truncate in Efficient Methods of Moments applications (Gallant and Tauchen, 1999; Coppejans and Gallant, 2002)

6.2 Robustness check

In order to check the validity of the SNP model, we construct the following model:

$$|RET_t| = \beta_0 + \beta_1|RET_{t-}1| + \beta_2 [RET_{t-}1 \; I \; (RET_{t-}1 <0)] + u_t \qquad (13)$$

This regression effectively passes a V-shaped line through the central cloud. The parameter β_2 is the asymmetry coefficient: the more negative is β_2, the steeper is the slope on the left half of the 'V'. If the hypothesis of the legitimacy of the SNP mode can be accepted, then the model itself must generate similar series in terms of identical conditional properties. In order to ensure that findings from this regression are also features of the fitted (GARCH-leading) SNP model, I fit the same regressions to the simulations generated from the bivariate SNP data generating process (DGP) and from the univariate SNP DGP. The first 50 actual observations from January 1990 to March 1990, are used as the initial conditions for both simulations, and simulations are of the same length as the original data.

Table 5 shows three regressions of SPX return allowing asymmetric leverage effects. All coefficients are statistically significant at the 1 per cent significance level. And in particular, all the simulations based on the GARCH-leading SNP models

(bivariate and univariate models) yield to similar features as the real SPX returns by observing the negativity of β_2(the dummy). These results support the GARCH-leading SNP model to be a powerful and precise estimate of the real data generating process. Comparing Panel B with Panel C, we find that the coefficient of the dummy from the univariate model is more negative than the one from the bivariate model. This is consistent with my previous results on the conditional variance that the introduction of VIX contributes to the symmetry. And when we eliminate the VIX from the system and estimate using the univariate SNP model the asymmetry is back and becomes more significant.

7. Conclusion

We use the bivariate semi-nonparametric (SNP) model developed recently by Gallant and Tauchen (2006) to study the contemporaneous relationship between the innovation of VIX and the expected SPX returns. We estimate the bivariate conditional joint density function using optimal Hermite expansion. The conditional density function is also subject to a possible leverage GARCH effect. We use the expectation of future market volatility as a source of risk (Chen, 2003, and Ang *et al.*, 2006). In our paper, this particular metrics of risk is calculated by the daily innovation in the implied volatility (the CBOE VIX).

We conclude that the contemporaneous risk-return behaviour depends not only on the sign of the risk metrics (sentiment shifts), but also on the magnitude of the change. In other words, fear or exuberance (extreme innovation of VIX) does correlate to conditional return, but the correlation is non-monotonic and hump-shaped. On the one hand, very deep fear does not necessarily mean huge losses, instead, the loss may not be as bad as fears of normal levels, while on the other, exuberance does not necessarily correlate with big returns.

Our result partly agrees with Christensen and Nielsen (2007) on negative and monotonic correlation but we argue that the negativity is subject to the magnitude of innovations of the expected volatility, and that positive relation also exists given dramatic changes of sentiment, so that a non-monotonic relationship seems to be a full story.

TABLE5

Estimates of coefficients for linear models

Variable	*Parameter estimate*	*Standard error*	*t-value*	*Pr* > | t |
Panel A: Estimates from SPX Daily Returns				
Intercept (β_0)	0.58344	0.01488	39.22	<0.0001
$\|RET_t - 1\|(\beta_1)$	0.10501	0.01820	5.77	<0.0001
Dummy (β_2)	0.15470	0.02094	−7.39	<0.0001
Panel B: Estimates from Bivariate SNP DGP				
Intercept (β_0)	0.57527	0.01341	42.91	<0.0001
$\|RET_t - 1\|(\beta_1)$	0.10312	0.01853	5.56	<0.0001
Dummy (β_2)	0.05489	0.02016	−2.72	0.0065
Panel C: Estimates from Univariate SNP DGP				
Intercept (β_0)	0.56957	0.01352	42.14	<0.0001
$\|RET_t - 1\|(\beta_1)$	0.09517	0.01787	5.33	<0.0001
Dummy (β_2)	0.09572	0.02038	4.70	<0.0001

Note: Panel A regresses the real dataset of SPX returns whilst datasets in Panel B and Panel C are Monte Carlo simulations based on Bivariate SNP and Univariate SNP data generating processes respectively.

However, our framework is not intended to be predictive or keen to show any form of causality, but merely to directly illustrate the conditional contemporaneous risk-return relation. And the relationship is also allowed to change conditional on the contemporaneous market condition and on how much the VIX increases or decreases. The paper can be thought of as an extension of Christensen *et al.* (2010) on the dimension of nesting not only the signs but also magnitudes of innovations as the information set. Our results partly agree with Linton and Perron (2003) but differ in the risk measures. We also show a hump-shaped pattern of the total returns relative to risk perceptions but it turns out to be more smooth.

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Appendix I: Seasonal Effect Adjustments

Adjustment Regressions for SPX Returns

	Location		Variance	
	Coeff.	S.D.	Coeff.	S.D.
Day of the week				
Monday	–	–	–	–
Tuesday	0.371	0.206	0.536	0.497
Wednesday	0.394	0.212	0.389	0.510
Thursday	0.358	0.212	0.622	0.510
Friday	0.345	0.212	0.572	0.509
No. of days since the preceding trading day				
GAP1	0.071	0.165	−0.302	0.396
GAP2	0.437	0.212	0.509	0.509
GAP3	0.750	0.121	0.672	0.292
Month or week				
Jan 1-7	0.028	0.132	−0.096	0.318
Jan 8-14	−0.529	0.121	0.100	0.292
Jan 15-21	0.022	0.127	0.131	0.305
Jan 22-31	0.057	0.106	0.080	0.255
Feb		–	–	
Mar	0.026	0.076	−0.030	0.183
April	0.052	0.077	−0.000	0.184
May	0.065	0.076	−0.125	0.181
June	−0.005	0.076	−0.238	0.181
July	−0.002	0.076	0.154	0.181
August	−0.064	0.075	−0.112	0.182
Sept	−0.052	0.077	−0.147	0.186
Oct	0.084	0.075	0.111	0.183
Nov	0.091	0.077	−0.122	0.187
Dec 1-7	0.144	0.121	0.247	0.292
Dec 8-14	−0.105	0.121	−0.610	0.292
Dec 15-21	0.129	0.121	0.022	0.292
Dec 22-31	0.160	0.113	−1.088	0.272
Trend				
Intercept	−0.373	0.223	−3.214	2.535
t	–	–	4.618	3.507
t^2	–	–	−3.897	2.490

Adjustment Regressions for Percentage Change of VIX

	Location		Variance	
	Coeff.	S.D.	Coeff.	S.D.
Day of the week				
Monday	–	–	–	–
Tuesday	−1.090	1.154	1.159	0.482
Wednesday	−0.923	1.184	1.137	0.494
Thursday	−0.484	1.184	1.269	0.494
Friday	−1.218	1.184	1.410	0.494
No. of days since the preceding trading day				
GAP1	1.315	0.921	−0.238	0.384
GAP2	1.720	1.184	1.329	0.494
GAP3	5.722	0.678	0.675	0.283
Month or week				
Jan 1-7	−0.561	0.739	0.128	0.309
Jan 8-14	0.293	0.679	0.661	0.283
Jan 15-21	−0.843	0.710	0.486	0.296
Jan 22-31	−0.126	0.593	0.120	0.248
Feb	–	–	–	–
Mar	0.106	0.424	0.362	0.177
April	−0.334	0.432	0.507	0.180
May	−0.201	0.426	0.097	0.178
June	−0.258	0.426	−0.074	0.178
July	0.310	0.427	0.200	0.178
August	0.268	0.423	0.178	0.177
Sept	0.186	0.431	0.281	0.180
Oct	0.100	0.423	0.328	0.177
Nov	−0.331	0.433	−0.148	0.180
Dec 1-7	−0.345	0.679	−0.179	0.283
Dec 8-14	−0.263	0.679	0.405	0.283
Dec 15-21	−0.729	0.679	0.191	0.283
Dec 22-31	0.625	0.632	0.332	0.264
Trend				
Intercept	0.479	1.222	0.377	0.519
t	–	–	0.305	0.492
t^2	–	–	−0.504	0.476

IMI International Monetary Review

National Characteristics, Government-Market Relationship and Development of Financial System*

By MA YONG* and CHEN YULU**

This study seeks to determine an effective boundary between government and market in light of modern financial theories. According to the findings of this paper, the relationship between government and market must be conceived of asunder the "continuous spectrum of change" resulting from economic development. In practice, an effective frontier between government and market not only transforms continuously with the process of economic development but also demonstrates significant contrasts internationally according to the different national characteristics existing in each country. Determining a frontier between government and market requires that the relationship between the two be embedded into a broader set of institutional environmental constraints that incorporate consideration of the dynamic processes and mechanisms of economic development. The key issue is that government and market act with regard to the principle of comparative advantage as they play their respective roles. (*JEL Classification:* G18, G21, G28)

1. Introduction

Few academics have effectively addressed the relationship between government and market. The conventional conception of the government's exogenous role and the value orientation of market efficiency maximization have led to the following dogma: the economy runs best when government intervention is at its lowest. This assumption has led to numerous misunderstandings on theoretical and practical issues, but in reality, both the configuration of the government's exogenous role and the maximization of market efficiency are not sufficiently supported by empirical evidence. In fact, regarding the relationship between government and market, it is not difficult to arrive at the erroneous finding after reflecting on the methodology behind mainstream economics, which derives the exogenous treatment of the government from the static methodology of dualism. This methodology not only excludes any possible compatibility between the government and the market but also

*IMI Working Paper No. 1502 [EN]
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neglects various considerations of the dynamic processes and mechanisms of economic development.

In reality, the government and the market are both products of allocated resources, and whether there exists a substitution or complementary relationship between the two depends on the characteristics, scope and nature of the institutions under their influence. Therefore, a proper understanding of the relationship between government and the market requires the reconstruction of a dynamic theory of comparative advantage. The implication is that the efficiency of the government and the market in resource allocation varies according to time, location and resources, which requires determining an effective frontier between the two under a dynamic path of optimization.

Aside from the above-mentioned theoretical questions, we must also consider some of the unique features of the financial system, such as the effect of externalities, spillover, and contagion as well as self-realization mechanisms. These characteristics have led to the difference in the degree and method of government intervention in financial systems compared with government intervention under normal market conditions. For typical government-dominated countries like China, a clarification of the relationship between the government and the market in the country's process of financial transformation is valuable.

Based on the above considerations, this paper aims to introduce the concept of "national characteristics", characterize the relationship between government and the market with a set of institutional constraints and incorporate considerations on the dynamic processes and mechanisms of economic development to systematically reconstruct the compatibility theory and the "effective frontier" between government and the market. This theory will help researchers overcome the theoretical dilemmas and practical questions facing the economics community.

2. Government Intervention in Financial Operations: Why Is It Important?

The government plays a key role in the operation of the financial system. Theoretically, the role of government in the financial system is derived from the following facts: first, the financial system possesses the attributes of quasi-public goods due to its externality effect, which justifies government intervention; second, the failure of the financial system has more severe consequences than that of other sectors due to its complexity. In this context, the self-regulatory and corrective mechanisms of the financial markets alone can hardly prevent the distortion and failure of the financial system, as evidenced in the recent global financial crisis.

An efficient and stable financial system can promote the efficient allocation of

resources through price discovery, risk allocation and corporate governance. In this manner, the efficiency and stability of the financial system affects the availability of credit, financing capacity, trading costs and the marginal capital return of every firm. The implication is that the efficiency and stability of the financial system will influence the real economy with its spillover effects. From the micro perspective, unregulated and undisciplined financial activities may cause the distortion of micro-level information and incentive mechanisms, thereby undermining the effectiveness and stability of the financial markets. From a macro perspective, an efficient and stable financial system depends on an effective financial infrastructure and corresponding institutional frameworks, which are only effectively provided by public agencies. Given that the financial system may cause negative externalities on a large scale, maintaining efficient and stable market conditions implies that the government should assume the responsibility of correcting market distortions where market failure or inefficiency has been detected.

The repeated eruption of the financial crises has indicated how unrestrained market forces have led chaos and inefficiency in the market. Prior to the recent global financial crisis, the guiding philosophy of Neoliberal economic theory was to restrict government intervention and ultimately replace it with market mechanisms. This policy is derived from the belief in the superiority of the unregulated market, which is grounded in the theory of the effective market hypothesis (Malkiel, 2003). According to the radical version of this theory, market-based self-regulation and income distribution possess a "self-evident" rationality and the government is an "intruder" in the market. The dilemma of the Neoliberal theory is that it can neither ensure long-term economic stability nor contain risks. There is no evidence supporting the thesis that rebuilding confidence, reshaping balance sheets and re-initiating economic growth occur through market-based self-repair. Each of these requirements for rebuilding the economy may only be accomplished by government institutions. For instance, the government has played a leading role in the three major areas of the recent global financial crisis rebuilding: acting as a lifeboat for financial system; providing direct stimulus to the economy to offset the slump in consumer demand; and designing national and global regulatory mechanisms to avert the eruption of a similar crisis in the future. In fact, in the aftermath of the systemic financial risks and crises, no alternative private financial market solutions have been identified to replace government intervention. Government policies strive to assist private credit markets in surmounting difficulties resulting from the crisis, preventing major fractures in the chain between the financial system and the rest of the economy thereby maintaining the normal operation of the financial system and

the economy as a whole.

The theory of the relationship between government and the market and the systemic risks arising from an unregulated market must also be reviewed. Of course, conceding the key role of the government in economic and financial systems does not mean that the government should take over the fundamental role of the market in the allocation of resources, but it does allow for a demarcation of an effective frontier between government and the market according to the principle of comparative advantage to ensure the long-term efficiency and stability of economic and financial development. The common concern about "whether government can outsmart the market" is fundamentally irrelevant because this concern presumes the antagonistic and substitutive relationship between government and the market, neglecting the possibility of coordination and complementarity between the two. The latter happens to be the key issue under the spotlight of our discussions.

3. Frontier between Government and the Market in Financial Development: From the General Pattern to the "National Characteristics"

The validity of a given theory or policy depends on whether it can effectively link general patterns with a country's particular "national characteristics" to achieve the transition from theory to practice. "National characteristics" include not only the country's resources in the general sense but also its social environment, cultural sensibilities and political system, all of which are closely related to the operation of the financial system (Chen Yulu, Ma Yong, 2013). These factors largely determine the development of a country's financial system.

Based on the philosophy above, in determining the effective frontier between government and the market, consideration must be given to the country's basic patterns of institutional choice and development process as well as its economic foundation, political structure, cultural background and institutional framework to create a framework of an effective financial system. For the convenience of illustration, it is assumed that a country's economic and financial systems will sequentially experience the following development stages: stage A, B and C, each of which corresponds to the following optimal levels of government intervention denoted as g_A^*, g_B^* and g_C^*. A represents a developing economy with the lowest level of economic development and the most primitive financial system; B represents an emerging market stage featuring a moderately developed economy and an imperfect financial system; C corresponds to the stage of a developed economy featuring sophisticated market mechanisms and a complex financial system.

The efficiency and stability of the financial system are poor in stage A due to the low levels of economic development and the imperfect market mechanisms, which result in market gaps and failures. Hence, government intervention is necessary to foster the immature market, offset market gaps and increase the efficiency of resource allocation. Therefore, direct government intervention is essential at this stage. With the preliminary establishment of market-based financial mechanisms in stage B, market-based regulation can play a fundamental role, but a certain degree of government intervention remains necessary to compensate for the defect of market mechanisms, including the imperfection of the financial system, the insufficiency of market competition and the incompletion of institutional mechanisms and potential market distortion from both the micro and macro level. Thanks to the sophisticated market and advanced financial system present in stage C, market mechanisms are able to allocate resources in a highly efficient manner, and the government only needs to make moderate intervention in certain instances of "natural failure" of market mechanisms, such as areas with significant positive externalities, to strengthen market mechanisms by improving their institutional design and providing effective regulation with a view to safeguarding the efficient and stable operation of those market mechanisms.

With the increasing sophistication and perfection of market mechanisms through each of the described stages of economic development, or A, B and C, the degree of government declines, i.e.: $g_A^* > g_B^* > g_C^*$. Through this process, government intervention will gradually evolve from direct intervention to increasingly indirect intervention. Furthermore, if we see a country's economic development as a process of continuous transformation, as a market economy evolves from its preliminary stage T_1 to an advanced stage T_n, i.e., in the process of $T_1 \to T_2 \to T_3 \to ... \to T_{n-1} \to T_n$, multiple compatible levels of optimal government intervention exist $g_1^* \to g_2^* \to g_3^* \to ... \to g_{n-1}^* \to g_n^*$ and satisfy the condition: $g_1^* > g_2^* > g_3^* > ... > g_{n-1}^* > g_n^*$. The following demonstrates the variation in the level of optimal government intervention:

$$\{(T_1, g_1^*), (T_2, g_2^*), (T_3, g_3^*), ..., (T_{n-1}, g_{n-1}^*), (T_n, g_n^*)\}$$

Satisfying: $g_1^* > g_2^* > g_3^* > \ldots > g_{n-1}^* > g_n^*$

The level of government intervention decreasing over the course of market-based operation is a long-term tendency. In reality, in the event of a temporary fracture of the market mechanisms as a result of a sudden shock to the economy, such as an economic or financial crisis, the government must intervene immediately to offset the inadequacy of market forces caused by the slump of the market factors. With the gradual recovery of market mechanisms after the sudden shock, the government will return to its long-term tendency (as shown by Figure 1).

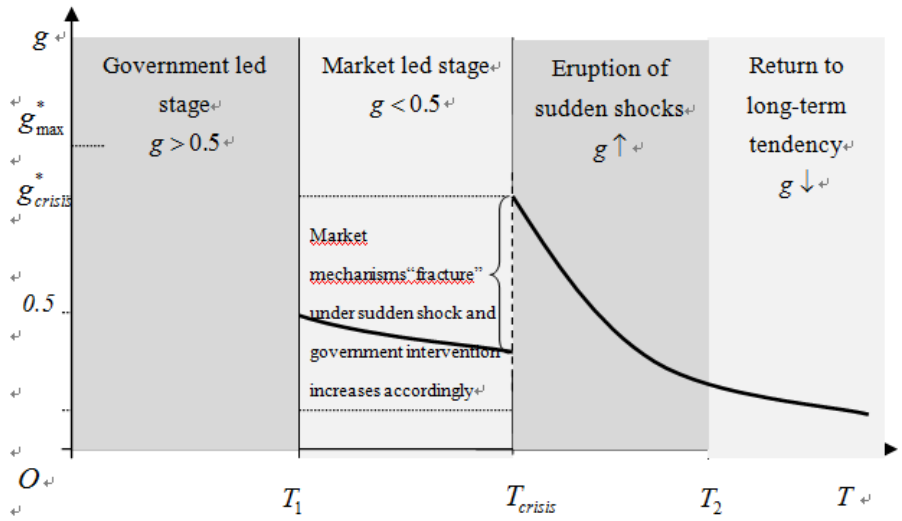

Figure 1: Continuous Economic Transformation and Dynamic Evolution of the "Government-market" Relationship

As a general depiction of the evolution of "government-market" relationship through continuous economic transformation, Figure 1 demonstrates the entire process from high-level government intervention to low-level intervention, including the interruptions caused by sudden shocks. In reality, key points in this figure vary greatly by country. In other words, if the degree of government intervention decreases with the increase in the role of the market during a country's economic transformation, what ultimately determines the optimal dynamic between the government and the market is the country's "national characteristics", which are universally correlated to the country's economic foundation, political structure, cultural environment and institutions.

First, with regard to a country's economic foundation, assuming all other factors

are constant, the better a country's economic infrastructure and market network, the more efficient market information transmission and processing become and the more likely deals will be clinched. This provides for greater space for the effective functioning of the market and a smaller likelihood that government intervention will be necessary. Levine (2002) partially verified this conclusion when he discovered that in countries with higher per capita income and more advanced economic and financial systems, there is a smaller share of government involvement in the banking and financial system.

Second, in terms of the effect of a country's political framework, countries in which individualism and democratic decision-making systems prevail tend to allow market mechanisms to play a key role, while countries where collectivism and central decision-making prevail tend to have greater government intervention. Generally, the supreme authority of the government will become increasingly involved in a country's economic and financial development (Li Yiqi, 2005). This has been proven by the empirical study of 78 countries by Ma Yong (2012) .

Thirdly, from a country's cultural context, it is generally less costly and more efficient to organize and allocate resources through market-based means.

Lastly, in economies with well developed institutions, such as a clear property system and a fair judicial system, as it is easier to guarantee the rights and interests of market stakeholders with contracts, the efficiency of market-based resource allocation is high and there will be greater space for the market to play its role. This is one of the key propositions of the "law and finance" theory. As indicated by La Porta et al. (1987, 1998) and Levine (2002), countries ruled by a common law judicial system appear to be more effective at protecting investors, which allows the market to play a dominant role in regulating the financial system. Due to their weak protection of market mechanisms, however, countries using civil law generally require greater government intervention.

In addition to the influence of a country's "national characteristics" on the optimal "government-market" relationship, a country's "government-market" frontier for each stage in the process of economic development and institutional transformation will be subject to the influence of the "government-market" frontier existing in the previous stage of its development. According to the successful experience of China, if the adjustment of the "government-market" frontier follows a gradual pattern of transition and the introduction of incremental reform has taken account of the country's national characteristic, it will likely be successful. Contrarily, if the adjustment of the "government-market" relationship follows a radical change in the process of the country's economic transformation and incremental reform deviates

from the country's national characteristics, such reforms will likely fail as occurred in Russia (the former USSR) and some countries in Eastern Europe and Latin America such as Hungary, Romania, Bulgaria, Brazil and Argentina. The historical "government-market" frontier adjustment pathway of selected countries are illustrated in Figure 2[4].

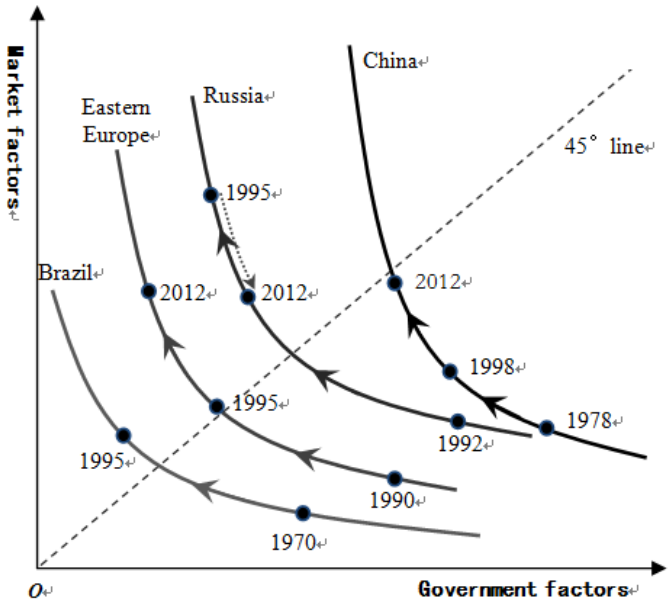

Figure 2: The Adjustment Pathways of the "Government-market" Frontier in Selected Countries

Under the general equilibrium perspective, the government-market relationship is no longer antagonistic but characterized by an optimal dynamic relationship. For some countries, determining the frontier between government and the market may follow the general pattern of institutional development and proceed from a country's political, institutional and cultural background. Zhang Jie (2005) also suggests that a different institutional combination corresponds to different types of market economies and institutional arrangements and that a market combination effective in one country may not be also effective in another. Hence, a country should create its own economic system according to local conditions. In addition, determining an effective frontier between the two must take the country's changing economic status

[4] In this diagram, we have referenced Djankov *et al.* (2003) for information on Russia and Eastern Europe prior to 1995.

into account.

4. Dual Priorities: Nurturing the Development of a Financial System and Optimizing the "Government-market" Relationship in Developing Countries

If recent rounds of financial crises have revealed the failure of the hands-off approach to managing financial markets in developed countries, the priorities for handling the relationship between government and the market in developing countries are twofold : enhance effective government intervention when needed, and withdraw from inappropriate and excessive intervention.

Implementation of effective supervision over the financial industry remains to be one of the most challenging of the government's responsibilities. Financial regulation must ensure that banks and other financial institutions be able to serve as the medium of exchange between savings and investments while preventing the financial system from becoming a source of economic instability. This requires regulation to ensure that each individual financial institution meet regulatory standards and prevent systemic risks. An important lesson made evident by the recent round of financial crises is that stricter regulatory standards should be created for certain financial institutions and the rate of executive compensation in financial institutions should create a long-term incentive to maintain the health of the financial system.

Financial supervision must consider the impact of financial institutions because systemic financial stability itself is a public good, and the supply of public goods should always enjoy priority over private claims of profit maximization. Additionally, in order to ensure that financial development serve the real economy rather than become isolated from the real economy, financial supervision must seek a reasonable balance between encouraging effective innovation and preventing excessive innovation.

In addition to the above-mentioned areas where supervision should be enhanced, another equally important question is how to phase out distorting interventions. This is particularly important for developing countries (i.e., transition economies). The key issue for minimizing the impact of distorting interventions is understanding the limits of the power of government. Judging by the pattern of economic and financial operations, given that financial institutions' low-level operational activities generally involve the application of specialized knowledge, information and skills, the government frequently does not have adequate knowledge to effectively intervene in the low-level operations of many enterprises in the corporate credit and financial sectors. On the other hand, relevant government financial policies and regulations at

the macro level must maintain a reasonable balance between the efficiency and stability of the financial system. Although moderate financial regulation is favorable to creating a smooth economic transition, excessive regulation in the long-term will create financial constraints, which will bring about severe damages to the development of the financial system. Furthermore, China's experience indicates that the gradual selective withdrawal of the government in economic and financial sectors is key to ensuring a successful transition toward an increasingly market-based system. In addition, Justin Yifu Lin (2011) suggests that a pragmatic and a gradualist model of government exit from the economy is a strategy successfully adopted by Vietnam, Mauritius and other economies that have successfully transitioned to a more market-based economic system.

As indicated in the experience of several Latin American and Southeast Asian countries, when the government is free from legal and institutional constraints, officials often aim to expand their authority by creating new positions or engaging in rent-seeking activities (Stigler, 1971; Buchanan, 1987). Through this process, official create redundant positions and political agencies that compete for the same regulatory rights. These activities not only consume significant resources but also compromise market efficiency and disrupt effective operation of the country's market mechanisms. Obviously, under a "government-market" framework based on efficiency and stability, the expansion of the government frontier for rent-seeking is an ineffective expansion policy. A favorable institutional framework usually includes transparency requirements, economic incentives and regulatory restraint mechanisms. These institutional constraints aim to narrow the government's ability to engage in rent-seeking activities, increase the cost of rent-seeking and enhance government accountability.

Most developing countries cannot rely entirely on market forces for management of their immature financial systems; meanwhile, their transformation also entails the consensus and synergy of various key players in the economy. Of course, the fundamental position and role of the market must be recognized while the government maintain its ability to respond to various uncertainties on the basis of compensating for, promoting and improving market mechanisms in order to achieve a stable economic transition. Hence, developing countries confronted with a dual priority to strike a balance between government and the market.

5. Concluding Remarks

The recent global financial crisis may be characterized as the peak of an era in which the respect of the market guided economic theory and policymaking. This era

began from the economic stagnation of the 1970s. However, Neoliberals failed to deliver the ultimate solution to ensure economic prosperity, and the defects of market mechanism have made a comeback after a temporary period of disguise and latency. In fact, the key question regarding the ideal level and degree of government intervention remains to be determined, and the fight between supporters of government intervention and advocates of the free market persists.

Voltaire famously suggested that "a long dispute means that both parties are wrong and this quote may accurately depict the debate on relationship between government and the market. Over the years, discussions of the relationship between government and market have generally been based on the methodology of dualism, encouraging both sides to choose between the two alternatives. As a matter of fact, long-term economic development and the associated institutional transformation are a continuous "spectrum of transformation" (Justin Yifu Lin, 2011), which indicates that the relationship between government and the market must be considered on a dynamic continuum. In practice, the relationship between government and the market not only transforms continuously over the course of economic development but also demonstrates significant differences with regard to the national characteristic in different countries and economies.

No fixed optimal pathway or single static optimal solution exists for the effective frontier between government and market. Instead, the effective frontier between government and market is subject to multiple equilibrium pathways and combinations.

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IMI News

EuroRMB Seminars in London and Frankfurt

From October 13 to 16, IMI executive director Ben Shenglin, deputy director Tu Yonghong, and academic committee member Zhao Xijun led the IMI research team to London and Frankfurt, in order to present RMB Internationalization Report 2014: RMB Offshore Market Construction. This is the first time that China's think tank started European road show on RMB internationalization issues. It attracted much attention both at home and abroad.

On October 14, the London seminar was co-organized by IMI, Bank of Communications (London), and Official Monetary and Financial Institutions Forum (OMFIF). David Marsh, managing director of OMFIF; Dave Ramsden, chief economic adviser at British Treasury and other experts attended the conference. They discussed about the impact of RMB internationalization on European business and financial services, and long-term goals of RMB internationalization and its future opportunities.

On October 15, the Frankfurt seminar was held at the Goethe University, jointly organized by IMI, Bank of Communications (Frankfurt Branch) and Goethe University. The event was attended by Rainer Klump, vice president of Goethe University Frankfurt and academic committee member of IMI; Wolfgang Koenig, executive director of House of Finance in Goethe University; etc. Participants discussed about the prospects and challenges for RMB internationalization, RMB offshore business at Chinese banks, and the experience and lessons from the internationalization of Deutsche Mark.

IMI Lectures

South Korea's Experience of the Capital Market Development

On October 17, Mr. Jae Hoon Yoo, chairman of Korea Securities Depository, visited IMI and delivered a speech entitled "South Korea's Experience of the Capital

Market Development", pointing out that developing countries should effectively use market instruments in an orderly way and chose the fittest policies to improve the market performance by introducing South Korea's experience of capital market development. Zhang Chengsi, director of the Monetary Finance Department, presided over the lecture.

Macro-Finance Salon

Macro-Finance Salon (No. 12): Systemic Risk and Macro-Prudential Regulation

On October 19, the Macro-Finance Salon (No. 12) was held in Room 602 of Culture Square. Nicholas Beale, the chairman of Sciteb, an innovative international strategy and search firm, and visiting scholar of Isaac Newton Institute, was invited to give a keynote speech. Deputy director and council member of IMI Tu Yonghong presided over the salon. Other attendees include Zhang Zhixiang, former director general of International Department of PBoC and former Executive Director for China in IMF; Wu Zhifeng, director of Latin America Department, Research Institute of China Development Bank; Zhao Xijun, associate dean. Mr. Beale illustrated the way to discern individual risk and systemic risk through graphs and models, and emphasized that the uncertainties in model parameters and probability distributions should be noted when analyzing specific cases.

Macro-Finance Salon (No. 13): Trends and Challenges in Reserve Management

On October 26, the Macro-Finance Salon (No. 13) was held in Room 801 of Mingde Main Building, Renmin University of China. Dr. Marlene Amstad, regional consultant of Bank for International Settlements, lecturer at the University of Bern and consultant of the Federal Reserve, was invited as the guest speaker. Mr. Zhang Zhixiang, former director general, International Department of PBoC and former executive director for China in IMF, presided over the forum. Doctor Marlene Amstad shared her research on the trends and challenges of reserve management and her analysis was focused on three aspects: optimal scale, asset composition and management framework.

Macro-Finance Salon (No. 14): Currency, Internationalization and Yield Curve—Research on RMB Issues

On November 1, the Macro-Finance Salon (No. 14) was held at Renmin University. Doctor Yuksel Gormez, economic counselor and senior economist of Central Bank of Turkey, was invited as the guest speaker. He delivered a speech entitled "Currency, Internationalization and Yield Curve—Research on RMB Issues". Zhao Xijun, associate dean of School of Finance, Renmin University and member of the academic committee of IMI, and Song Ke, assistant director of IMI, attended the forum. Ben Shenglin, executive director and council member of IMI, presided over the forum.

Macro-Finance Salon (No. 15): Development and Study of Inclusive Finance

On Nov. 23, the Macro-Finance Salon (No. 15) was held in Culture Square. Mr. Jiao Jinpu, director general of Financial Consumer Protection Bureau, PBoC, was invited to deliver a speech entitled "Development and Study of Inclusive Finance". Prof. Tu Yonghong, deputy director of IMI, Mr. Wu Zhifeng, senior research fellow of IMI, and Mr. Song Ke, assistant director of IMI, attended the event. Prof. Ben Shenglin, executive director of IMI, presided over the salon.

Macro-Finance Salon (No. 16): Analysis on Counter-cyclical Policy

On Nov. 30, the Macro-Finance Salon (No. 16) was held in Renmin University of China. Dr. Liu Jun, executive director and vice president of China Everbright Group, was invited to deliver a speech on the theory and practice of "counter-cyclical policy". Mr. Wei Benhua, former deputy-in-bureau of the State Administration of Foreign Exchange, Ms. E Zhihuan, deputy general manager of Economics & Strategic Planning Department of Bank of China (Hong Kong), Mr. Chen Qiqing, director of Macroeconomic Department of Party School of the CPC Central Committee, and Mr. Song Ke, assistant director of IMI attended the salon. Mr. Zhang Zhixiang, former director general of International Department of PBoC, presided over the salon.

Macro-Finance Salon (No. 17) and Premiere of *The New Capitalism*

On December 17, the Macro-Finance Salon and Premiere of The New Capitalism was held by IMI and China Citic Press in Run Run Shaw Conference Center, Renmin University. With his new book The New Capitalism, Xiang Songzuo,

deputy director of IMI and chief economist of Agricultural Bank of China, attended the event and had a dialogue with audiences about current economic issues. Guests attended include: Wei Benhua, former deputy-in-bureau of the State Administration of Foreign Exchange; and Zhang Jie, director of IMI and associate dean of School of Finance of Renmin University. Ben Shenglin, executive director of IMI and professor of Zhejiang University, hosted the event.

Macro-Finance Salon (No. 18) and the 1st RMB Era Forum

On December 20, Macro-Finance Salon (No. 18) and the 1st RMB Era Forum was held in Culture Square. The forum focused on the Shanghai-Hong Kong Stock Connect Program, analyzed the performance of the program and the interest rate fluctuation in the global market, and discussed the future changes of the capital market. Prof. Tu Yonghong, deputy director of IMI; Prof. Zhao Xijun, associate dean of School of Finance of Renmin University and other experts participated in the forum. Mr. Zhang Zhixiang, former director general, International Department of PBoC and former executive director for China in IMF, presided over the forum. Prof. Zhao Xijun gave a report entitled "the influence of the Shanghai-Hong Kong Stock Connect Program on RMB internationalization" in which he stressed that the program can utilize the advantages of Shanghai and Hong Kong and facilitates RMB internationalization.

IMI Academic Committee Member Rainer Klump Appointed as President of University of Luxembourg

Professor Rainer Klump, member of IMI Academic Committee, has just finished his tenure as vice-president of the Goethe University Frankfurt. He has been appointed as president of University of Luxembourg, beginning since January 1, 2015. IMI research team, who went to Europe to release RMB Internationalization Report 2014, brought the congratulation letter from Prof. Chen Yulu, president of Renmin University of China, expressing the warm congratulations on his appointment and the anticipation of promoting further cooperation between the two universities.

Presentation on IMF World and Regional Economic Outlook

On October 23, the Presentation on IMF World and Regional Economic Outlook was held by IMF and IMI in Renmin University. The Presentation was attended by Alfred Schipke, IMF senior resident representative for China; Romain Duval, head of the Regional Studies Division of the Asia Pacific Department at the IMF; Tu Yonghong, deputy director of IMI; and Song Ke, assistant director of IMI. Zhang Zhixiang, former director general of International Department of PBoC and former executive director for China in IMF presided over the presentation.

Columbia University Scholars Visit IMI

On November 6, Joan Kaufman, director of the Columbia Global Centers | East Asia, and Marcos Troyjo, co-director of the BRICLab at Columbia University visited IMI and attended the economic consultation seminar. Other attendees include Zhao Xijun, associate dean of School of Finance, Renmin University; Di Dongsheng, associate professor of School of International Studies; and Song Ke, assistant director of IMI. Mr. Zhang Zhixiang, former director general, International Department of PBoC presided over the conference. Mr. Zhao Xijun celebrated the substantial results achieved by the cooperative training projects between School of Finance and SIPA of Columbia University.

Seminar on Prospects of New International Development Institutions

On November 13, Seminar on Prospects of New International Development Institutions was held in Renmin University of China. The Seminar was attended by Alfred Schipke, IMF senior resident representative for China; Henry Chan, board member of Uygongco Corporate in Philippines; and Zhang Youyi, Guo Jin, and Liu Jiye from the Eco-economy Strategy Institute of Development Research Center of the State Council. Zhang Zhixiang, former director general, International Department of PBoC and Former Executive Director for China in IMF presided over the presentation.

The 1st Wealth Management Outlook Forum and Press Conference of "China Wealth Management Report 2014"

On November 29, the 1st Wealth Management Outlook Forum and Press Conference of "China Wealth Management Report 2014" was held in Renmin University of China. The event was co-organized by School of Finance and IMI of Renmin University, Development Committee of Qingdao Pilot Project of Wealth Management and Financial Reform, and Qingdao Financial Department. The forum was attended by Chen Yulu, president of Renmin University; Zhuang Yumin, professor of Renmin University; Ji Zhihong, director general of Financial Market Department of PBoC; Ben Shenglin, executive director of IMI. Guo Qingwang, dean of School of Finance, presided over the lecture. President Chen said that wealth management will embrace a new era of global prosperity and China's wealth management is propelled by all-round, diversified wealth demand.

2014 China Financial Forum and the 5th *Financial Studies* Forum

On December 6, 2014 China Financial Forum and the 5th *Financial Studies* Forum was held in Run Run Shaw Conference Center in Renmin University of China. Pan Gongsheng, deputy-governor of PBoC; Zhang Jianming, deputy secretary of party committee of Renmin University; Lu Lei, director of the Research Bureau of PBoC; Ji Zhihong, director general of Financial Market Department of PBoC; etc. attended the forum. Ji Zhihong presided over the forum. This forum would lay a solid foundation for the building of a financial think tank.

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.
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Journal Title: International Monetary Review 国际货币评论
Frequency of Publication: Quarterly

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