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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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Special Column for the 70th Anniversary of the Founding of P.R. China

China at 70: Free of Fear of Floating

By HERBERT POENISCH*

China can be proud of its achievements on its current anniversary. From a backward country ravaged by foreign aggression and civil war to the second largest economy, admired and emulated by its peers. One sign of national prowess is the strength of its currency. This year RMB is celebrating 10 years of going out into the world, the process of internationalization.

What started as a courageous idea has now become reality, accepted by authorities and markets alike round the world. The inclusion of RMB in the SDR basket in 2016 marks the recognition by authorities and the growing use of and investment in RMB marks the growing confidence of market participants. As President Xi calls it, the visible hand, the authorities partnering with the invisible hand, the financial market participants.

While China has grown into its global role by constant learning, a gradual approach following Chinese tradition, it has been held back by fear and trepidation during this process. One of these is the fear of floating, the other one the remaining capital controls. These two together should prevent the national currency being at the mercy of global markets. While the Chinese financial sector is underdeveloped, such caution is reasonable. The well-being of Chinese people should not be subject to the whims of powerful financial market players. However, in early August we saw a bold move on the exchange rate, letting it cross the 7 RMB/USD mark, due to suspension of intervention. Maybe this marks the dawning of a new era?

While many EMEs are afraid of this step, the so called 'fear of floating', Chinese fundamentals are different from other EMEs, which suffered from financial crises as a result. This article will revisit the underlying theories, 'fear of floating' as well as the 'original sin' against the background of EME countries' experience. This will be followed by recent RMB exchange rate developments and policy reactions. Periods of more market determination of the exchange rate have been interrupted by intervention and administrative measures such as the counter cyclical adjustment factor. If the RMB is to play a global role, it should follow the other SDR currencies and float freely even with some capital controls in place, unless extreme

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situations require intervention. Finally, it will be argued that Chinese fundamentals are different from other countries, allowing a more courageous exchange rate policy.

1. Theories of fear of floating and original sin

The theory which has been put forward in 2000 by Calvo and Reinhart follows various crises in EMEs between 1970 and 1999. Although declaring a floating regime, authorities clung on to an overvalued exchange rate, putting the adjustment burden on reserves and domestic monetary policy. They called it a crisis of credibility. A similar theory of crisis was put forward by Borio and Lowe, which stated that an overvalued exchange are was a main early warning indicator of crises, together with rapid credit expansion and rising asset prices.

The theory by Calvo and Reinhart1states that many EMEs have a mismatch in their national balance sheet, i.e. excessive borrowing in USD which is not matched on the asset side due to the domestic component of the money creation. Many of these countries are exporters of raw materials. Once an external shock arises, they resort first to using forex reserves for intervention, followed by domestic adjustment, mainly through raising interest rates. Once these have been exhausted, the exchange rate crashed with dire consequences for these economies. They tested their theory in 39 countries in Latin America, Asia and some advanced economies between 1970 and 1999.

Although the annual IMF Exchange and Trade Restrictions Report lists most countries as floating or managed floating, many of them have a sticky peg in reality, due to the fear of floating.

The factors which cause a fear of floating are substantial liabilities in foreign currency which become heavier after devaluation, the inflationary impact of a devaluation, latent capital flight and loss of the fragile credibility.

The importance of liabilities in foreign currency, the resulting mismatch in the national balance sheet has been addressed by the 'original sin theory'. This was put forward by Eichengreen, Hausmann and Panizza2 in 2003. Countries unable to borrow in their own currencies have resorted to borrowing in international currencies, first and foremost the USD.

Finally, the theory of banking crisis by Borio and Lowe3 highlights early warning indicators, either single ones such as the exchange rate, or a combination of variables such as rapid credit expansion and sticky exchange rate as signals. The characteristics of the exchange rate is that a crisis follows closely after the loss of the anchor.

While these theories hold true under restrictive circumstances, the recent reality has been defined by greater exchange rate volatility caused not only by asymmetric shocks, but reinforced by capital flows. EMEs have increasingly adopted inflation targeting regimes similar to advanced economies and learned to live with greater external volatility. Fear of floating has been replaced by truly managed floating.

In the recent period, capital flows associated with exchange rate fluctuations affect macroeconomic and financial stability through three main channels (i) exchange rate pass-through to inflation, (ii)export competitiveness, and (iii) domestic financial conditions4. Capital flows are known to change direction, necessitating domestic policy measures. Capital

[1]Calvo, Guillermo A and Reinhart, Carmen M (2000): Fear of Floating. Working Paper 7993 National Bureau of Economic Research (NBER), November www.nber.org/papers/w7993

[2]Eichengreen, Barry, Hausmann, Ricardo and Panizza, Ugo (2003): The Pain of Original Sin, Augusthttps://eml.berkley.edu

[3]Borio, Claudio and Lowe, Philip (2002): Assessing the risk of banking crises. In: BIS Quarterly Review, December www.bis.org/publications

[4] BIS (2019): Annual Report 2019, chapter II monetary policy frameworks in EME: inflation targeting, the exchange rate and financial stability. www.bis.org/publications

inflows into EMEs after the GFC and adoption of unconventional monetary policy in major advanced economies led to appreciation of local currencies. The tapering of extraordinary measures in advanced economies, such as raising interest rates from the lower bound, led to a reversal of capital flows and weakening of EME currencies.

Within this new environment, central banks have been constrained to apply the traditional monetary policy measures as these might have had an adverse cyclical impact on the domestic economy. In times of inflows, lowering interest rates and raising them during outflows had procyclical effects. Therefore, they resorted to macro prudential measures and capital control measures to manage the impact of greater exchange rate volatility and capital flow swings.

2. Recent exchange rate developments and policy reaction in China

The present inflation targeting scenario in EMEs has sharpened countries to manage exchange rate volatility and capital flow swings. China neither adopted a clear monetary policy regime nor clearly weaned itself from shadowing the USD. In the perception of forex markets, China still pegs to the USD, perhaps less rigidly than before. Therefore, the move to allow the RMB to cross the threshold of 7 RMB per USD in early August was a clear sign that China is ready to join other EME countries in accepting greater exchange rate volatility5. Yu and others cite reduced forex intervention and thus reject the accusation by the US administration of currency manipulation.

While China's resolve as well as the pain threshold has to be tested, it is a welcome step in line with other members of the SDR basket. The way has not been straight forward6following China's tradition of feeling stones while crossing the river.

The process started in 2005 when the RMB was delinked from the USD and pegged to an undisclosed basket of currencies. China announced a managed floating regime and the PBoC would announce a central parity rate, the usual fixing. Floating against the USD would be within a narrower band of +/-0.3% whereas within a wider band +/- 1.5% against the other major currencies. By 2014 the band was widened to +/- 2% against the USD. It also allowed currency forwards and swaps.

However, in reality the short term bilateral RMB/USD rate did not move much, reflecting heavy intervention. Thanks to current account surpluses, foreign exchange reserves rose from USD 800bn in 2005 to USD 4tr in 2014. During the USD appreciation following the GFC, the RMB even appreciated in nominal effective and real effective terms, feeding expectations of further strengthening. This led to capital inflows and carry trade, through indebtedness in USD markets. Chinese entities borrowed at historically low USD interest rates, expecting lower debt servicing and repayment burden.

When sentiments changed and higher USD rates were expected, the so called tapering, capital flows swung into substantial outflows in 2015. Very soon, the carry trade was reversed and foreign liabilities were repaid, reducing foreign indebtedness. In addition there were legal and illegal capital outflows based on the expected depreciation of the RMB. In August 2015 markets were surprised by an announcement supporting a market determined exchange rate, as the closing rate was to be the central parity next day.

As of end 2015 China started publishing the CFETS index as well as the SDR and BIS forex index as guidance for commercial banks functioning as market makers. The capital outflows continued, mitigated by capital flow measures and intervention until mid 2016. The RMB depreciated against the CFETS basket by 10% by then but remained stable afterwards until the end of 2017. McCauley and Chang Shu called this the golden period when peers and markets

[5] Yu Yongding (2019): RMB's bid for freedom. In Project Syndicate, September www.project-syndicate.org
[6]Das Sonali (2019): China's evolving exchange rate regime. In: IMF working paper WP/19/50 www.imf.org

gained confidence in China's own foreign exchange regime7. As a result, the co-movements between RMB and partner currencies became closer, the start of a RMB zone. However, this period was short lived when fear of floating took the better of Chinese authorities again.

In early 2017 guidance was put into banks' daily quotes to stem irrational depreciation expectations and counter pro-cyclical herding. Banks were asked to adjust their daily quotes by a counter-cyclical adjustment factor(CCAF). This factor continued to be used until recently, in addition to forex intervention during the period of rising trade tensions in 2018. It also reinstated a reserve requirement of 20% on banks' forward positions against depreciation herding.

Nevertheless, RMB continued to slide until intervention was suspended in August 2019 and the threshold of 7 RMB/USD was crossed. This was not followed by disorderly market conditions and herding, resulting in a depreciation spiral as some had feared. Thus fear has been overcome and peers and markets will gain confidence once the new regime becomes transparent. It is yet unclear what will replace the quasi exchange rate target, as monetary policy is pursuing a number of objectives, quantitative as well as some form of inflation targeting. Clarity and its pursuit will be beneficial for all.

3. Why China need not fear floating?

Different from other EMEs, China's fundamentals do not warrant such a preoccupation. Firstly, China is not a commodity exporter, which has to accept world prices. China's diversity of exports has allowed it to influence USD prices to such an extent as to positively affect global inflation. This might be changing due to domestic wage pressure which can no longer be absorbed by exporters.

There is no sign of misalignment of the exchange rate, either measured by the nominal effective nor real effective exchange rate8. The IMF has concluded that the real effective exchange rate is roughly right, thanks the China's prudent exchange rate policy. This is a clear repudiation of the US accusation of currency manipulator.

Foreign borrowing was accelerating after the GFC until tapering started in 2014. Non-bank foreign borrowing was replaced by domestic borrowing, thus reducing the currency mismatch in the national balance sheet. With foreign liabilities currently amounting to only 14.5% of GDP9 this well under control, given the ample foreign exchange reserves amounting to close to 20% of GDP. These are ample reserves which have been used until very recently to shore up the RMB. China's interest policy is decoupled from the international scenario thanks to capital controls. As a result China has never been forced to raise interest rates regardless of domestic priorities in order to defend the RMB. Economic cycles have converged since the start of the trade tensions and China is in the same position ad the US and the EU trying to stimulate the economy by various means.

The only concern is that because of declining current account surpluses, the short-term debt service coverage has declined from over 384%in 2015to 257% in 2018/10. This is still not a critical level.

The only major risk which has been flagged by the BIS and others is the rising credit to GDP ratio as well as the overall debt service ratio (DSR)11. However, as this is financed domestically

[7] McCauley and Chang Shu (2018): Recent RMB policy and currency co-movements. In: BIS working Paper 727, June, www.bis.org/publications

[8] BIS (2019): Effective exchange rates www.bis.org/statistics

[9] CEIC (2019): China Database www.ceicdata.com

[10] IMF (2019): IMF Country Report 19/266, Augustwww.imf.org/publications

[11]Aldasoro, Inaki, Borio, Claudio and Drehmann, Mathias (2018): Early warning indicators of banking crises: extending the family. In: BIS Quarterly Review, March www.bis.org/publications

behind a porous but still effective wall of capital controls, the threat for a currency collapse is remote.

Regarding the original sin, China is not in need to borrow externally to sustain domestic growth. In addition, thanks to the strategy of internationalisation of the RMB, foreigners are more than willing to purchase Chinese liabilities denominated in RMB. The holding of CGBs by foreigners has increased to 8%, which is still small by international standards, but at the same time not risky for the exchange rate in case markets unwind positions.

Overall, China is based on far more solid fundamentals which do not warrant a fear of floating nor the haunt of the original sin. This allows China to forge ahead with a foreign exchange regime corresponding to its economic position in the world and with the RMB status as part of the SDR basket. In addition, the strategy of internationalisation of the RMB will give China more leeway to free itself from the constraints suffered by other EMEs.

4. Conclusion: Requirements of a global RMB currency

There are basically two steps towards this goal, admitting a freely floating currency regime and installing a credible monetary policy regime. Both under the conditions of continued capital controls.

Of the 5 major currencies in the SDR basket only the RMB is not in the group of free floaters in the IMF Exchange and Trade Restrictions Report. It comes under crawl-like regimes with the comment managed floating in reality12. Now that regular intervention has been suspended, China should join the group of free floaters sooner than later. This would be a strong counter argument to US accusation of currency manipulator.

This does not mean that the bilateral exchange rate, notably to the USD does not matter. Countries' preferences differ, with Japan publically declaring where it would like to see its USD exchange rate. It would be part of a basket of currencies, such as the CETS basket. China's exchange rate policy on the way to free floating could be a composite regime, with a stabilised arrangement similar to Singapore.

However, the main policy thrust is domestic, such as inflation targeting, paying attention to food prices and housing prices. The bilateral exchange rates should be determined by markets, even given the financial account restrictions. The greater volatility and risks should be made clear to the public. Once partner currencies, in particular those of Belt and Road countries are convinced of such a strategy they will follow China by pegging to the RMB, as they did during the 'golden period' referred to above.

The second pillar will be a transparent and sustainable monetary policy regime, such as inflation targeting which can easily be verified, to dispel suspicions of hidden exchange rate target. This will still leave China with all the monetary policy levers necessary, supplemented by macro prudential tools as well as capital account measures, in case of disorderly market conditions. The emphasis will be shifted to the domestic scenario rather than to the foreign considerations presently. Thus China can assume the leading role among Belt and Road countries, a role long overdue due to its clout in trade and investment.

[12] IMF (2019): Annual Report on Exchange and Trade Restrictions 2018www.imf.org/publications

IMI International Monetary Review

The 10th Anniversary of RMB Internationalization and Future Path——Constructing A New Ecological Circle of RMB Internationalization under Financial Markets Opening

By E ZHIHUAN*

In the past decade, RMB, as an international settlement and reserve currency, have made progress during its internationalization amid combined efforts of policy-driven development and market traction. Looking ahead, the reversing of economic globalization and the resurgence of trade protectionism will present unprecedented challenges to international economic and financial situation. In response to the changing external environment, China has launched the second round of high-level financial opening since its entry into the WTO, involving banks, securities, funds, insurance, ratings agencies, third-party payment, and financial markets. With improving infrastructure and optimized supporting policies in the capital markets, interconnection between domestic financial markets and overseas markets has been enhanced, which could increase the linkage between domestic and external interest rates, and intensify exchange rate volatility. The dramatic adjustment of internal and external environment will then directly affect the development path of RMB internationalization.

The 10th anniversary of RMB internationalization: driven by both policies and the market

After the outbreak of the global financial crisis, the international financial markets generally recognized the institutional flaws of the current US dollar-centric international monetary system, and it is in urgent need of new public goods and solutions. The RMB has kicked off its internationalization process, which was driven by policies as well as the market. With the policy constraints on the offshore RMB business gradually relaxed, endogenous business demands in the offshore RMB market have increased, fulfilling RMB's status as an international reserves currency, and steadily elevating the degree of RMB internationalization.

1. Share of international payments has fluctuated, and the function as settlement currency is base for RMB internationalization

The cross-border use of RMB under the trade of goods was an important driver of early RMB internationalization. In November 2014, the RMB share as international payments currency reached 2.45%. In 2016, global RMB payments in value fell by 29.5%, with its share slipping from 2.31% in December 2015 to 1.67% at the end of December 2016, while global payments increased by 0.67% during the same period.

According to SWIFT, the RMB share as the fifth largest international payments currency stood at 2.07%, up from 1.60% in the same period last year, along with the US dollar, the euro,

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the pound and the yen. In April 2019, the Hong Kong RMB RTGS settlement amounted to 20.9 trillion yuan.

At present, cross-border use of RMB in the trade sector is completely liberalized, which indicates that the policy traction has given way to the development of the market itself, and the market adjusts according to changes in the RMB exchange rate and capital flows. Cross-border trade remains a substantial base for the continued promotion of the RMB internationalization.

2. RMB began to establish its status as international reserve currency

With the development of the offshore RMB market, Hong Kong, Singapore, Russia and other regions have taken the lead in allocation into RMB assets. In 2016, the RMB joined the International Monetary Fund Special Drawing Rights (SDR), and overseas central banks become more willing to hold RMB assets. In 2017, the European Central Bank announced to convert 500 million euros worth of its U.S. dollar reserves into the Chinese currency. In early 2018, the Deutsche Bundesbank planned to include the RMB in its foreign exchange reserves, while the French central bank also revealed that foreign exchange reserves are diversified into a limited number of international currencies, such as the RMB. Other central banks and related institutions are eager to learn more about the Chinese economy and the RMB exchange rate, to gather market intelligence for their allocation into RMB assets. At present, more than 60 central banks and monetary authorities in the world have included RMB in their foreign exchange reserves, which helped elevated the status of RMB as an international reserve currency.

In March 2017, the International Monetary Fund (IMF) released the currency composition of official foreign exchange reserves (COFER), separately identifying holdings in RMB for the first time. As of the third quarter of the year, the size of RMB foreign exchange reserves was US$107.94 billion, accounting for 1.12% of the total allocated foreign exchange reserves. As of the fourth quarter of 2018, the size of RMB foreign exchange reserves held by foreign central banks reached US$202.79 billion, accounting for 1.89% of the world's official foreign exchange reserves, higher than the 1.80% in the third quarter, and the highest since October 2016. The increasing proportion of RMB in global central bank's foreign exchange reserves reflects the continuously rising interests by foreign investors in holding RMB assets, which is conducive to the diversification of foreign exchange reserves.

In July 2017, the launch of Bond Connect successfully linked the domestic bond market with the Hong Kong market, providing a more convenient channel for overseas institutions to increase their holdings of RMB bonds, and encouraging foreign investors to allocate into RMB assets. As of March 2019, the outstanding amount of Chinese inter-bank bonds held by overseas institutions reached 1.76 trillion yuan, up 35.2% from the same period last year. Currently, more than 845 international investors have tapped China’s bond market through Bond Connect, and its services have expanded to 27 countries and regions around the world.

3. Function as an international pricing currency begins to take root

Enhancing RMB’s function as an international pricing currency is one of the most important goals of RMB internationalization. Over the past few years, RMB was increasingly used for transaction in commodities, and expanded its influence on commodity pricing, such as petroleum, etc. It is hoped that “Petro RMB” could be used to jumpstart the development of RMB internationalization, and explore the possibilities of organic integration between petroleum-related sectors and financial industries, in order to withstand the challenges related to the huge volatilities in international commodity price, secure resource availability and national

safety, and expand the use of RMB in petroleum pricing and transactions. In March 2018, crude oil futures contract was listed in Shanghai International Energy Exchange. These crude oil futures are priced in RMB, with net settlement and tax-free delivery features. Currently, the crude oil futures transactions in Shanghai accounted for around 6% of total crude oil futures transactions in the world, ranked number three, following WTI in New York and Brent in London.

When more and more countries choose to use RMB as the pricing and settlement currency for multilateral trade on crude oil, the demand and usage of RMB will increase notably. Meanwhile, the more active use of currency swaps) between central banks is also encouraged, which can facilitate the usages of RMB among both governmental and private organizations overseas.

The latest round of financial opening has four main characteristics

The objective of the latest round of financial opening is to create an all-rounded, multi-layered and widely covered high quality opening environment. Overall, it has the following characteristics.

1. Pre-entry national treatment and negative list are the main features of the financial opening agenda

In April 2018, President Xi announced four major opening up initiatives at the Boao Forum. The People's Bank of China (PBOC) then announced 11 financial opening measures. In 2019, the China Banking and Insurance Regulatory Commission (CBIRC) announced Detailed Rules for the Implementation of the Regulation of the People's Republic of China on the Administration of Foreign-funded Banks (Revised Consultation Paper). In May 2019, CBIRC announced 12 opening measures, including removing the shareholding limits in Chinese commercial banks held by a single Chinese bank or a single foreign bank investment, removing the total asset requirement of US$ 10 billion for foreign bank to set up a Chinese subsidiary bank and the total asset requirement of US$ 20 billion to set up a Chinese branch; abolishing the approval requirement for foreign banks to carry out RMB businesses and allowing foreign banks to engage in RMB businesses once they are allowed to do business. In the insurance sector, the opening measures allow offshore financial institutions to invest in the equity of foreign insurers in the Mainland or invest in the establishment of insurance institutions, abolish the requirement that foreign insurance brokers engaging in insurance brokerage operations in China should have operation for at least 30 years, and have total assets of no less than US$ 200 million. Obviously, the financial opening in the Mainland continues to follow the national treatment principle, gradually relaxing the shareholding and licensing requirements, and further shortening of the negative list. The shareholding limits of foreign financial institutions on all financial sectors that require a license have been fully relaxed, hopefully stimulating the interests of foreign financial institutions to actively participate in the financial opening in the Mainland.

Obviously, the national treatment principle and negative list are the main features of financial opening in the Mainland which will gradually lead to a level playing competition between domestic and foreign institutions. The State Administration of Foreign Exchange (SAFE) is now researching on the foreign exchange management framework for foreign investment companies according to the national treatment principle and negative list, which could help solidify the unified macro-prudential and micro-monitoring framework on cross-border capital movement.

2. The focus of capital markets opening has shifted from channel management to more connection between onshore and offshore capital markets

In the past, the Mainland relied on a number of channels to facilitate the opening up of capital markets. The establishment of Shanghai-Hong Kong Stock Connect and Shenzhen-Hong Kong Stock Connect provides the linkage between onshore and offshore capital markets. In June 2017, MSCI first included Mainland's A share into its emerging markets and world indices, with an initial weighting of 0.73%. It was a milestone of Mainland's equity market development which offers offshore investors the convenience in allocating RMB equity assets. In July 2017, the northbound Bond Connect started its operation, offering offshore investors a new channel to participate in the Mainland's bond market. Since the establishment of Bond Connect, roughly one-third of all new investment into the Mainland's bond market came from the Bond Connect. With the increasing connection between onshore and offshore equity and bond markets, it can better serve the needs of RMB asset allocation of foreign investors.

The increasing capital market connection can bring the benefits of building a rule-based, transparent, open, active and resilient multi-layer capital market system, facilitate more medium to long term foreign capital flows into the Mainland's capital markets, rationalize market structure, foster equity financing, price discovery and risk management role and function of the capital markets, as well as support the supply-side reform for onshore financial sector

3. Local currency businesses take priority in the opening up of onshore capital markets

The opening up of Mainland's capital markets should focus on local currency businesses first. Stability and orderly approach is of the most important for the financial market opening. In the opening up of the few unconvertible items of capital accounts, the Mainland authorities adopt the approach of launching policy initiatives once they are ready. Recently, Bloomberg announced the inclusion of onshore RMB bonds into the Bloomberg Barclays Global Aggregate Bond Index, with a phase-in period of 20 months. Currently, there are around US$ 5-6 trillion of assets tracking the three major bond indices globally. Some offshore investors tend to create an asset portfolio following a passive investment strategy. Following the incorporation of RMB bonds into these major indices, more foreign investors will adjust their asset portfolio to raise the share of RMB bonds. Assuming overseas investors will include and increase the share of RMB bonds up to 5% to 10% of their asset portfolio, as much as RMB 3-6 trillion of net capital inflows are expected. It is believed that there will be around 390 onshore bonds meeting the eligibility to be included in those global indices. Assuming Chinese bonds could account for around 5.5% of the Bloomberg Barclays Global Aggregate Bond Index (which represents a US$ 54 trillion global bond market), RMB bonds will become the fourth largest asset group following US dollar, Euro and Japanese yen bonds.

4. Free trade zone takes the lead in financial opening

During the process of financial market opening, the free trade zones in Shanghai and Hainan focus on the pilot scheme of financial opening and strongly supporting the development of international financial center in Shanghai. In addition, the Outline Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area also includes financial market opening and innovative measures, fostering the building of international financial hub, with the focus of specialty finance, including marine financing, technology financing, and aircraft leasing, etc., as well as supporting more cooperation between financial institutions in Guangdong, Hong Kong

and Macau to further develop offshore financial businesses, and gradually increase the scale and scope of cross-border RMB usage in the Greater Bay Area, etc.

New environment and challenges to RMB internationalization

Throughout the history of international currency development, a successful internationalization of a currency is inseparable from a robust economic scale, substantial international trade, as well as stable and dynamic financial markets. After ten years of development, the internationalization of RMB has made some progress, but it still lags behind the development of China's economy, trade, and investment. Therefore, there exists huge room for improvement of the internationalization. However, under the background of dramatic changes in the international financial landscape and China's further opening up in the financial sector, RMB internationalization faces unprecedented opportunities and challenges.

In term of opportunities, to fundamentally change the long-standing trade imbalance and massive trade deficits that plague developed economies, we must adjust the dominant position of the USD in the international monetary system. That provides a possibility for maintaining the stable position of RMB theoretically. The internationalization of RMB can offer a diversified choice for the USD-dominated international monetary system and provide Chinese solutions in promoting a more complete, stable, and fair international monetary system. Judging from the experience of US-Japan trade war, the US supported the appreciation of Yen and proposed that Yen should assume certain international monetary functions at that time. That move was to accelerate structural changes in the Japanese economy and fundamentally reduce Japan-US trade surplus. However, developed economies' trade deficits are inevitable with USD's international reserve currency status. The US has exported USD through trade deficits for a long time, while some of which returned to the US in the form of service surplus, and more returned to the US financial markets through capital investment. This is the global cycle of capital flows.

From the perspective of challenges, trade war embodies the "US first" trade protectionism, which will continue to ferment for a long time with profound economic and social roots. Global trade protectionism is to improve trade deficits ostensibly, but in essence, to curb the development of China's science and technology. It restricts the development of high-tech industries, China's opening-up, and even long-term relationship between China and the US. All those factors are objectively unfavorable to the RMB internationalization because they make Sino-US trade frictions unimaginably complex and serious.

With a closer connection to international markets, China's financial markets face more direct challenges due to the complex and volatile environment. While external risks are rising, the financial uncertainty in China's economic development is more significant. For example, total debt to GDP ratio continued to remain at high level of 277% to 284%; the task of reducing macro leverage is challenging; the risks of shadow banking, real estate finance and internet finance continue to rise. There is an urgent need to prevent and resolve financial risks, effectively control macro leverage, and improve the adaptability of financial structures. Moreover, it's also essential to stress the role of financial sector in serving real economy, comprehensively strengthen the construction of rigid restraint systems, as well as effectively prevent and control financial systemic risks. The ability to control China's internal and external financial risks is related to whether the RMB internationalization can develop steadily. The pace of RMB internationalization will be adjusted if there is a systemic shock, which will disturb the stability of the RMB exchange rate in the global financial markets.

Construct a new ecology of RMB internationalization in the open financial markets

In the new round of financial openness, the status of the RMB as a reserve currency will be further enhanced. To this end, it is necessary to carry out theoretical innovation and practical exploration in the theoretical and practical subjects of building a modern economic system, establish a conceptual framework of RMB internationalization based on the perspective of opening macroeconomics and finance, and create a new RMB internationalization ecosystem.

Firstly, the RMB internationalization is a long-term strategy. The basic path of RMB internationalization is to adhere to market-based exchange rate reform and stabilize the position of RMB in international monetary system. It provides diversified options and new public goods from emerging markets, which can solve the institutional defects of current USD-centric international monetary system. It also provides China solutions to promote a more stable and fair international monetary system. Chinese authorities should enhance the elasticity of the RMB exchange rate, improve global market's confidence in RMB assets, and create conditions step by step to establish a new function of RMB as a safe-haven currency.

Secondly, under the premise of ensuring economic security, we should meet the long term demands by all global investors for RMB assets. To this end, we will establish a benign interaction between domestic monetary finance and real economy under RMB internationalization framework, open capital markets steadily, improve the operating mechanism of financial markets continuously, and enhance the depth and breadth of RMB financial markets. In that way, new interaction between RMB exchange rate and the main price index of domestic capital markets can be gradually achieved, and the simultaneous decline in stocks and exchange rates can be avoided.

Thirdly, to create a new ecosystem for RMB internationalization, we will realize the combination of policy-driven and market-oriented system under the background of accelerating the opening up of China’s financial markets. Increasing the proportion of RMB in global reserves and foreign exchange transactions cannot be done at one go. It needs to be explored from different perspectives such as cross-border trade and investment, assistance for merchants on using RMB, and etc. In this way, it can be realized through coordinating trade, investment, and financial transactions, and forming a productive atmosphere for the international use of RMB.

Fourthly, the scale and structure of capital inflows and outflows will undergo continuous adjustment and optimization, as the demands for global asset allocation by some domestic entities rise continuously. For example, China's private sector holds foreign financial assets equivalent to only 27% of GDP (much lower than US's 129% and Japan's 147%). The factors affecting RMB internationalization are multifaceted, so bottom-line thinking is needed—we should carry out sand table exercise for major initiatives to discuss relevant policies and their possible market impacts in detail for controlling financial risks.

In short, the RMB internationalization means that China needs to undertake more international responsibilities in maintaining global financial stability and play a more active role in global financial governance. Therefore, we should pay attention to coordinate domestic and foreign policies, balance the interests of both domestic and foreign entities, and develop steadily and continuously the process of promoting the RMB internationalization.

IMI International Monetary Review

China's 40 Years of Opening-up: Evaluation and Prospects*

By PYEONGSEOB YANG, SUYEOB NA, MINSUK PARK, HANNA LEE, KOUN CHO AND YUNMI OH*

1. Introduction

The year 2018 marks the 40th anniversary of China's reform and opening policy. The opening of China to the outside world for the past 40 years started with the establishment of special economic zones, and was accelerated by its accession to the WTO, which has made an important contribution to the rising status of the Chinese economy in the global context. As China celebrates its 40th anniversary of reform and opening-up, it faces new challenges both internally and externally. Internally, there is a growing need to link China's opening to the outside world with domestic restructuring, while, externally, countries like the United States are pushing back against China's rise. To cope with such environmental changes, China is showing signs of embarking on a new opening policy. In the 25 years since the establishment of diplomatic relations between Korea and China, China has emerged as Korea's largest trading partner and second largest investment destination, and the influence of changes in China's foreign policy on the Korean economy and Korea-China cooperation is also growing. Therefore, this study comprehensively looks at China's opening policy over the 40 years of its reform and opening policy, and anticipates the direction of the opening policy which Xi Jinping will pursue in his second term. For this purpose, we identified major areas (regional opening strategy, foreign direct investment strategy, outward investment strategy, FTA strategy, and the U.S.-China trade relationship) to examine changes in the opening policy, going on to present countermeasures that Korea may take.

2. Major Issues and Prospects

China's regional opening policy started with special economic zones (SEZs) in the 1980s, and several coastal cities, coastal economic districts, provinces and autonomous regions were designated as windows opened to the outside world, pursuing both the gradual opening policy of so-called 'point(點)-line(線)-face(面)- omnidirectional(全方位)' and regional development. After joining the WTO, China promoted regional integration and balanced development by carrying out the Western Development Strategy, Rising of Central Regions Strategy, development of the northeast regions, and the establishment of free trade areas (FTAs), all at once. Since the launch of Xi Jinping leadership, regional opening policy is expected to focus on strengthening the opening platforms (for examples, FTAs and Hainan Free Trade Port); linking the Belt & Road Initiative, the Beijing Tianjin-Hebei Integration Plan, and the Yangtze River Economic Belt; and strengthening cooperation with the Hong Kong, Macao, and Taiwan regions.

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China's foreign direct investment policy has undergone a four-step change of foreign investment regime rearrangement → foreign investment encouragement → selective foreign investment attraction → negative list system experiment. Through these processes, China has continued to take steps to improve the foreign direct investment environment. In the future, the foreign investment environment will be further improved by the unification of foreign investment laws, the nationwide implementation of market entry negative lists (scheduled for 2019), and introduction of the safety review system for foreign investment. China's outward investment has progressed gradually through the stages of exploration (1979-1992), mediation (1993-2000), gradual growth (2001-2007), and large-scale development (2008-present).

China's outward investment remained very low even after the commencement of reform and opening policy, but owing to China's entry into the WTO and Chinese leadership's emphasis on overseas investment (走出去), outward investment began to grow rapidly in the 2000s. As a result, China's overseas investment recorded US$170.1 bn (non-financial) in 2016 and China emerged as the world's third largest foreign investor after the United States and the United Kingdom. In 2015, foreign reserves declined sharply, and in recent years, the regulations and supervision of foreign investment imposed by the Chinese government have been strengthened. In the future, risk factors of China's overseas investment include the negative reaction of Belt and Road countries to the B&R Initiative and tightening of China's controls on investment toward the U.S. due to the U.S.-China trade frictions, among others. On the other hand, the prospect of China's expanding overseas investment in related sectors due to the fourth industrial revolution policy of the Chinese government may serve as an opportunity for Korea.

The FTA strategy of China has been carried out in four stages: preparation to enter the international trade order (1991-2001), integration into the global economic system (2002-2006), full implementation of FTA strategy (2007- 2012), and acceleration of FTA network construction and upgrade (after 2013). China entered the global economic system with its accession to the WTO and started to build an FTA network centered on the Chinese economy. Since its launch in 2013, the Xi Jinping leadership has emphasized that establishing high-level FTAs and concluding trade agreements through negotiations are one of its most important strategies. As a result, China has completed 18 FTA agreements with 25 countries and regions as of November 2018. The Xi Jinping leadership is aware of the importance of the FTAs as a new platform for opening its doors to the outside world, and is trying to lead regional economic integration through the Korea-China-Japan FTA and RCEP. In addition to exploring ways to link the Belt & Road Initiative with these FTAs, China will respond to pressures regarding the new trade agendas (such as government procurement, environment, competition, and labor) by gradually enhancing the level of cooperation in FTAs that have been already signed.

The U.S. and China have continued to grow in their importance to each other in terms of economic reliance since the establishment of U.S.- China diplomatic relations in 1997 and China's accession to the WTO in 2001, while confrontation and conflicts have also broken out as the international status of China has grown as well. In particular, in 2017, the Trump administration imposed tougher commercial sanctions on China, which in turn actively responded to them, thus escalating the trade conflict between the two countries significantly. Future trade disputes between the two countries could be further intensified by factors such as the promotion of China's advanced technology development strategy and strengthening of regulations on China's overseas investment by the Chinese government.

3. Korea's Countermeasures

Since the inauguration of the Xi Jinping leadership, China's foreign policy has been aimed at creating an "open economic system." If China's foreign investment environment improves dramatically in the course of promoting this goal, China's new open-door strategy can serve as a

new opportunity for Korea. On the other hand, the open-door strategy in the second phase of the Xi government, including the Belt & Road Initiative, may stimulate major countries' vigilance against China. The trade frictions between the U.S. and China are recent examples of this, and also one of the risk factors for Korea. Therefore, it is necessary to understand the various risks caused by changes in China's open-door policy and its impact on Korea-China cooperation, and based on this, a comprehensive strategy regarding how to respond to these changes should be prepared in the context of Korea-China economic cooperation.

First, Korea should continue to keep pace with additional opening measures in line with China's regional opening strategy and establish proper strategies for Korea-China cooperation. In particular, Korea needs to focus on northern economic cooperation centered on the Korean Peninsula and Northeast Asia. Second, the foreign investment environment in China is expected to improve further, which is a positive factor for Korean companies' entry into China. Therefore, it is necessary to re-establish Korea's investment strategy in China in response to the change. The recent policy of China enlarging its service market opening may provide Korea with investment opportunities, and the potentials arising from market-opening measures in industries related to China's Made in China 2025 strategy should be thoroughly explored in order to seek cooperation between Korea and China in high-tech sectors. In preparation for the nationwide implementation of market entry negative lists, Korean companies seeking markets in China should also secure their competitiveness. Third, there is a concern that competition with Korea will intensify in third countries due to the expansion of China's overseas investment, but this could also be seen as an opportunity to strengthen cooperation between Korea and China in third countries. Therefore, it is necessary to seek ways to link the Belt & Road Initiative with Korea's new Southern and Northern economic cooperation strategies, and make efforts to attract Chinese companies to Korea. Fourth, Korea should utilize the second phase negotiations of the Korea-China FTA to coordinate differences between the two countries and to expand areas of mutual understanding during negotiations of the service and investment sectors within the Korea-China-Japan FTA. In addition, it is necessary to reflect change factors of China's FTA strategy into the second-phase negotiation of the Korea–China FTA, and to derive better results in the negotiation. Fifth, it is important to prepare for changes in trade relations between the U.S. and China, which may also affect trade disputes with Korea. If unfair trade practices between the two countries cause damages to Korean companies and related industries, trade remedies and WTO litigation can be actively pursued. Since the acceleration of China's opening-up due to trade pressures by the U.S. can serve as an opportunity for Korea, this needs to be considered during the second-phase negotiations of the Korea-China FTA, thus helping Korean companies to advance into the Chinese market in the future.

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Monetary Policy

Monetary Policy: 10 Years After the Financial Crisis*

By AGUSTÍN CARSTENS*

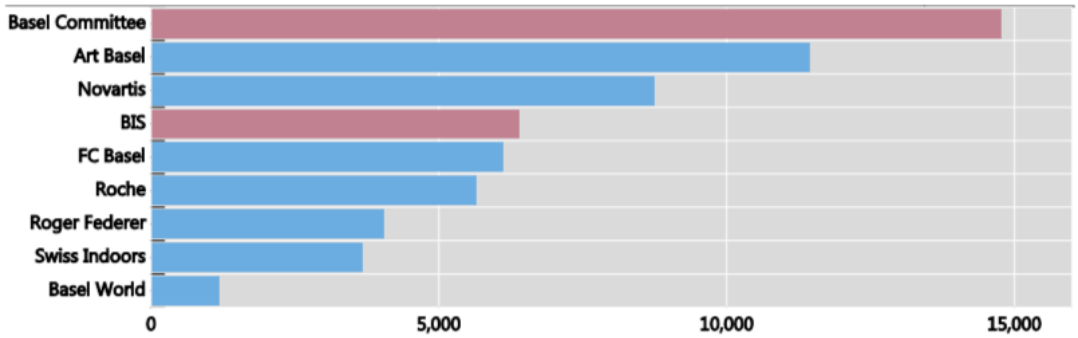
Introduction

The topic of my presentation this evening is "Monetary policy: 10 years after the financial crisis" – but first, I'd like to quickly introduce you to the work of the BIS.

The BIS is the world's oldest international financial institution, founded here in Basel in 1930. Basel was chosen as the location mainly for its excellent transport connections. But, as you all know, the city also has an illustrious history as a financial hub. The Swiss Bankers Association was founded here in 1912, and your own organisation, the Basler Bankenvereinigung, of course marked its centenary last year – belated congratulations to you all. We are looking forward to celebrating our 90th birthday next year, and hope to welcome you all to the anniversary exhibition we will open in June.

Some of our work has made Basel quite famous around the world. If you search for Basel in English-language media outlets, you'll find that the Basel Committee on Banking Supervision is the main reason Basel is in the news (Graph 1). I'm sure I don't need to explain the valuable work of the Basel Committee to this audience. After that comes Art Basel, which I myself have visited the last two years, Novartis and then the BIS, ahead of FC Basel and even – believe it or not – Roger Federer.

Mentions of Basel in English-language news in the past five years — Graph 1



Sources: Factiva; BIS analysis.

The BIS is known as the global bank for central banks. Our mission is to promote global monetary and financial stability through international cooperation. We do this in three main ways. First, we conduct economic research and analysis about real-world policy issues facing

*This speech was first delivered to the Basler Bankenforum on September 5, 2019.
*Agustín Carstens, General Manager of the BIS

authorities, focusing on the links between the real economy and the financial system, and taking a long-term and global view. Second, we provide banking services to our 60 member central banks, the wider central banking community and other international institutions. And, third, we act as a forum for discussion and cooperation among policymakers. We host meetings of central bankers in Basel on a continuous basis – the Board gathers every two months – and provide support to a number of standard setters, including the Basel Committee on Banking Supervision, the Committee on Payments and Market Infrastructures, and the Financial Stability Board.

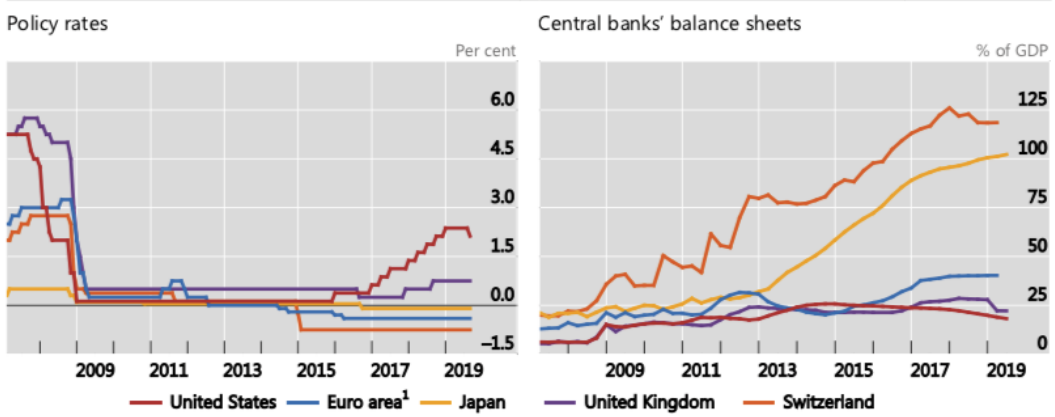
By providing a forum for central banks to engage in frank discussions and coordinate policy responses to the crisis, in terms of both monetary policy and financial regulation, the BIS was uniquely placed to observe and assess developments over the years since the Great Financial Crisis. In my remarks today, I will take stock and reflect on where we have come from, to chart where we are going. I will focus mostly on monetary policy, outlining the policy responses and what has been achieved in difficult circumstances. I will then highlight the current challenges and policy implications going forward.

Where did we come from? The crisis and policy responses

Let me start with where we came from. The failure of Lehman Brothers 11 years ago this very month was a critical juncture for the world economy. The ensuing panic and contagion across a wide range of financial markets was worsened by a broad loss of confidence in many types of financial institutions. Credit markets froze and liquidity dried up in critical segments of global financial markets. Without a timely and forceful policy response, we were looking down an economic precipice not seen since the Great Depression. Fortunately, that response came in unprecedented scale, scope and speed.

Central banks slashed policy rates, and provided liquidity to support interbank markets, intervening as needed to make sure specific segments of debt and securities markets were working properly. By doing this, central banks were performing their traditional role of lender of last resort. Given the size and complexity of modern financial systems, particularly the reliance on market-based funding, new types of interventions were needed, and on a larger scale than in the past. As a result, central bank balance sheets grew much larger than in normal times (Graph 2).

Forceful response: policy rates and central banks' balance sheets — Graph 2



[1] Deposit facility rate as policy rate.

Sources: National data; BIS calculations.

Central banks were not alone in their efforts. Large fiscal stimulus packages and far-reaching public guarantees for fragile banking systems gave critical support. The bank guarantees, in particular, were key in preventing default spirals and bank runs. As a result of these actions, the crisis was contained. Even though the major advanced economies experienced the sharpest economic contraction in post-war history, much worse outcomes were avoided and economies were stabilised.

Since then, monetary policy and financial regulation reforms have worked in tandem to lay the foundations for a sustained recovery. Aggregate demand was supported by continued monetary accommodation, through low and in some cases even negative interest rates, as well as a broad set of unconventional monetary measures. I'll come back to these shortly. At the same time, decisive regulatory and supervisory action promoted financial resilience. In particular, the Basel Committee agreed on comprehensive and wide-ranging reforms for internationally active banks, in the form of Basel III. These reforms went a long way in addressing the main fault lines that the Great Financial Crisis exposed in the banking system, including excess leverage, inadequate loss-absorbing capital and over-exposure to liquidity risk.

Central banks have learned a lot over the past decade about potential new ways of implementing monetary policy. The use of unconventional monetary policy tools was largely born out of necessity: partly to address disruptions in monetary policy transmission and partly to provide additional monetary stimulus once policy rates were constrained by the effective lower bound. Broadly speaking, these unconventional monetary policy tools can be divided into four types of measures: lending operations, asset purchase programmes, forward guidance and negative interest rate policies. Let me say a few words about each of them.

Lending operations were used early in the crisis to support market functioning. To make sure that liquidity was available to everyone who needed it, central banks expanded both the types of assets they accepted as eligible collateral for loans and the set of counterparties they lent to. In addition, to foster market confidence about the future availability of liquidity, loans were extended over longer periods. On the whole, these lending operations helped ease liquidity strains, restore the monetary transmission channels and alleviate pressures in bank funding markets. In doing so, they supported credit flows to firms and households. That said, there were some inefficiencies in the allocation of credit and concerns about potential disintermediation of some financial market segments.

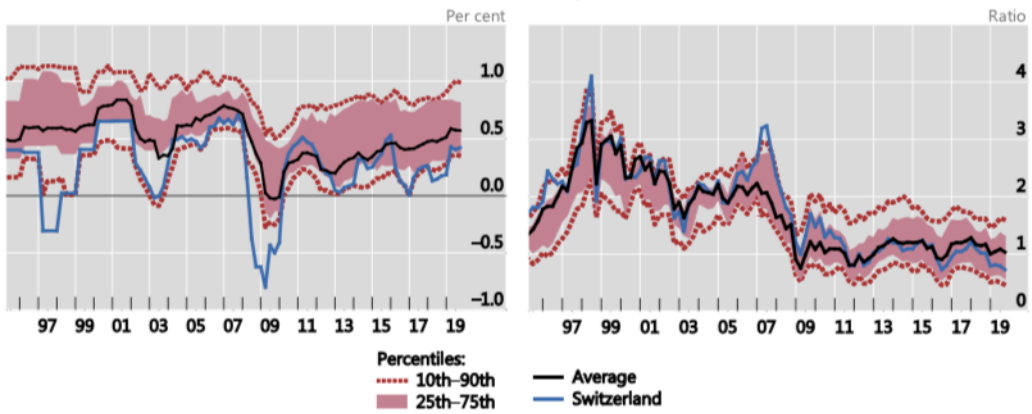
Asset purchase programmes played an important role in central banks' interventions. They aimed mainly to ease broad financial conditions by supporting asset valuations. The interventions covered a wide range of market segments, depending on the nature of disruption and the importance of the relevant asset class for monetary transmission. Most prominent were purchases of government bonds aimed at lowering long-term yields, although many programmes also focused on private securities. Asset purchases were generally very effective in lowering risk premia and easing market conditions. The large purchases of government securities did lead to concerns about safe asset scarcity and bond market functioning. But the introduction of securities lending programmes largely alleviated them. More significant side effects came in the form of financial spillovers to other countries as low yields in the major economies pushed investors to seek higher returns globally.

Central banks also used ***forward guidance*** to clarify their intentions regarding future policy settings and to communicate their commitment to pursue their mandates. Promising to keep rates at a certain level was crucial at times of heightened uncertainty about the economic outlook. Forward guidance also helped bring different unconventional monetary policy tools together into an overall package, making policymakers' strategic intentions clearer. Overall, forward guidance was quite effective in shifting down and flattening expected policy paths, as well as reducing

uncertainty. On the flip side, a key challenge has been to make clear that forward guidance partly depends on the economy's evolution, to avoid misinterpretation, which could generate unwelcome market reactions.

Finally, ***negative interest rate policies*** were implemented by a number of central banks to overcome the zero lower bound on interest rates. Reducing policy rates below zero can stimulate the economy by supporting credit and demand as long as they transmit to market rates. Recent experience has shown that borrowing and lending rates did decline, providing the desired expansionary stimulus. But concerns about negative customer reaction have prevented banks from lowering the return on deposits of households and small firms below zero. And that has also meant that, over time, such low rates can depress banks' net interest margins and their ability to build up capital – the foundation for sustainable lending. Low bank valuations reflect this profitability challenge (Graph 3).

Lower bank profitability — Graph 3

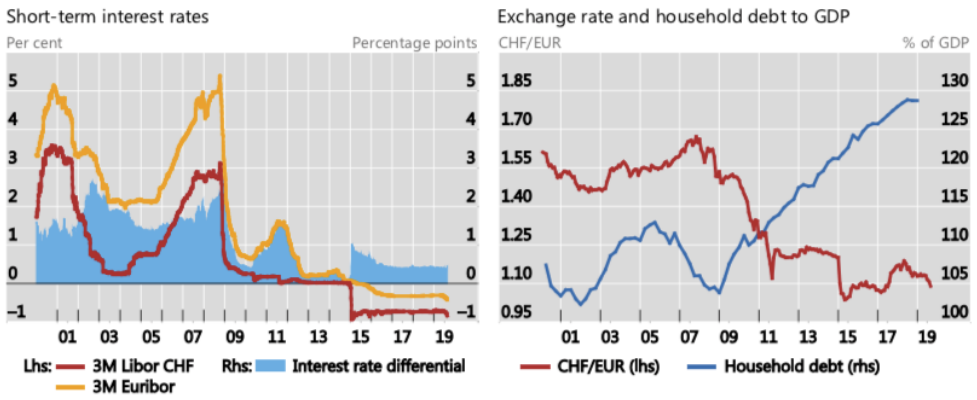


[1] Asset-weighted average of Australia, Canada, Denmark, the euro area, Japan, Norway, Sweden, Switzerland, the United Kingdom and the United States. [2] Asset-weighted average of Australia, Canada, the euro area, Japan, Sweden, Switzerland, the United Kingdom and the United States.

Sources: Refinitiv; BIS calculations.

Here in Switzerland, negative rates were a necessary part of efforts to contain the adverse effects of intense capital inflows. Large and sustained inflows tested the country's capacity to absorb them all without major undesired side effects. Thus when the Swiss franc appreciated strongly in 2011, the Swiss National Bank reduced interest rates to zero and imposed a minimum exchange rate floor against the euro. But as euro interest rates were pushed lower and into negative territory, the only way to contain the franc's overvaluation was to also impose negative interest rates. Coupled with occasional interventions in the foreign exchange market, the negative interest rate took pressure off the franc and prevented a sharp drop in inflation. This policy, along with the remarkable flexibility of Swiss companies and workers to adapt by increasing efficiency, has helped Switzerland to weather the storm. Our reading suggests that the Swiss National Bank has done an outstanding job in managing a very complex situation. That being said, the low interest rate level does pose challenges in terms of low returns on savings, financial strains for pension funds, insurers and banks, and continued debt build-up, particularly in real estate markets (Graph 4).

Navigating the crisis in Switzerland Graph 4



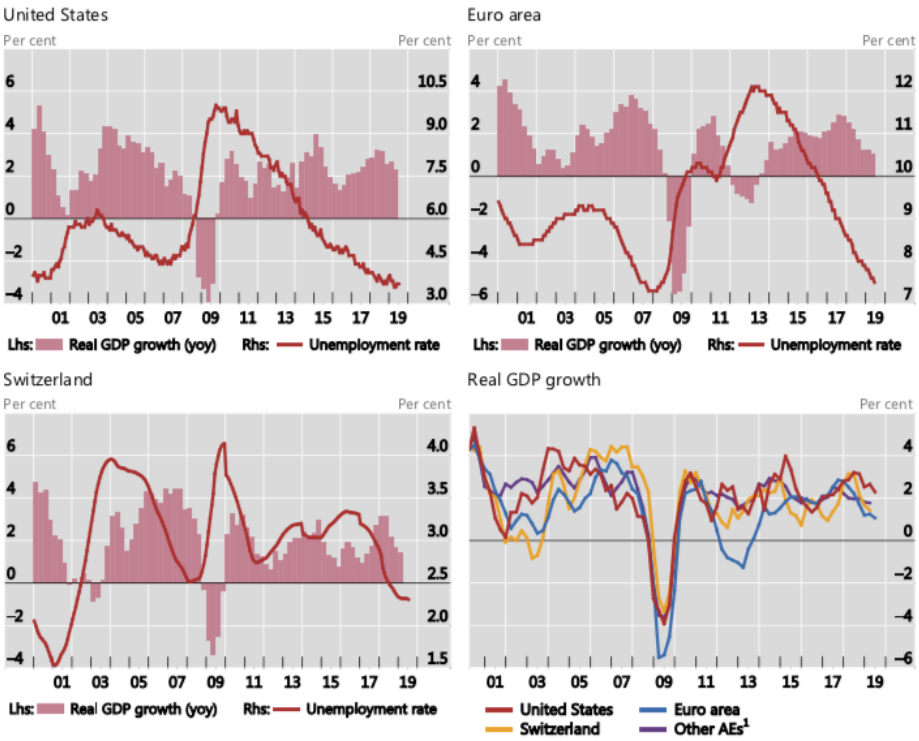
Sources: Datastream; national data; BIS total credit statistics; BIS calculations.

While all these unconventional monetary policy tools do have inevitable side effects, the overall consensus is that they helped central banks address the very difficult circumstances they faced at a time when conventional policy was not enough. The responsiveness of financial conditions to these policies first stabilised and then stimulated the economy. This supported market sentiment and staved off deflation risks. As such, these unconventional tools are valuable additions to central banks' toolbox. It is important to note that they are much more effective when they are deployed in conjunction with appropriate supervisory, prudential and fiscal policies, and as part of a broader policy framework that avoids unnecessary burdens on the central bank. I will return to this point later.

Where do we stand today? Outcome and challenges ahead

So where do we stand today, 10 years after the crisis? In many key respects, we have come a long way. In the major economies that bore the brunt of the crisis, economic growth has been restored, unemployment rates have been drastically reduced and the banking system's safety buffers have been greatly strengthened (Graph 5). The United States, which was the epicentre of the crisis, has now enjoyed its longest economic expansion in history, and its unemployment rate is the lowest in 50 years, with around 20 million jobs created over the last 10 years. In the euro area, growth has also recovered, although at a slower pace, and unemployment rates have steadily declined to pre-crisis levels. The picture is similar in Switzerland and across other major economies. At the same time, the banking system has been repaired and its resilience significantly strengthened. Capital ratios for most institutions are now much higher than before the crisis and above regulatory requirements. None of this could have been achieved without central banks' forceful actions.

Sustained recovery: real GDP growth and unemployment Graph 5

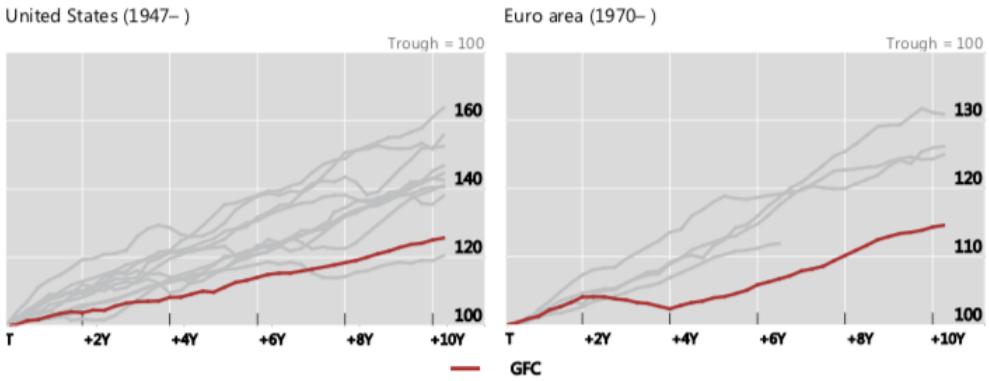


[1] Weighted average of Australia, Canada, Denmark, New Zealand, Norway, Sweden and the United Kingdom, based on GDP and PPP exchange rates.

Sources: National data; BIS calculations.

That said, this economic recovery has been less dynamic than previous rebounds (Graph 6). This is partly due to the scars left by the financial crisis, including the need to work off debt overhangs and reallocate resources from overextended sectors to more productive ones. This took time and underscores the lasting damage that financial crises can leave on the economy. Reducing their likelihood and potential costs remains a priority.

Less dynamic recovery: output recovery from the trough quarters of recessions Graph 6



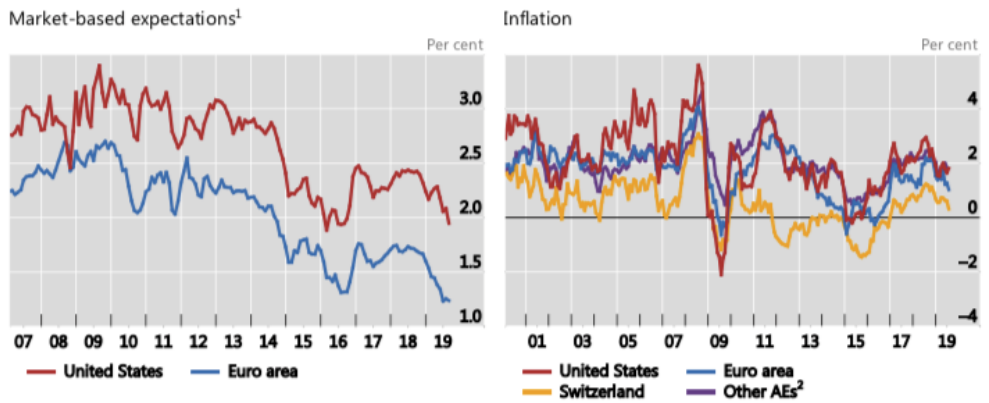
The graphs show the evolution of real GDP over the 10 years since the trough of each recession, as defined by the United States National Bureau of Economic Research and the CEPR Euro Area Business Cycle Dating Committee.

Sources: CEPR; NBER; national data; BIS calculations.

For monetary policy, navigating the current juncture is a difficult balancing act. Let me highlight four challenges in particular.

The first has to do with low inflation. Throughout the decade since the crisis, inflation has been remarkably subdued. On the one hand, we have been fortunate that outright destabilising deflation was avoided and that prices have been stable overall. Indeed, in Switzerland output growth has been solid against a backdrop of low and sometimes negative inflation. On the other hand, persistent undershooting of inflation targets and the greater likelihood of hitting the lower bound on policy rates in the future pose risks to the de-anchoring of inflation expectations (Graph 7).

Inflation expectations lower Graph 7



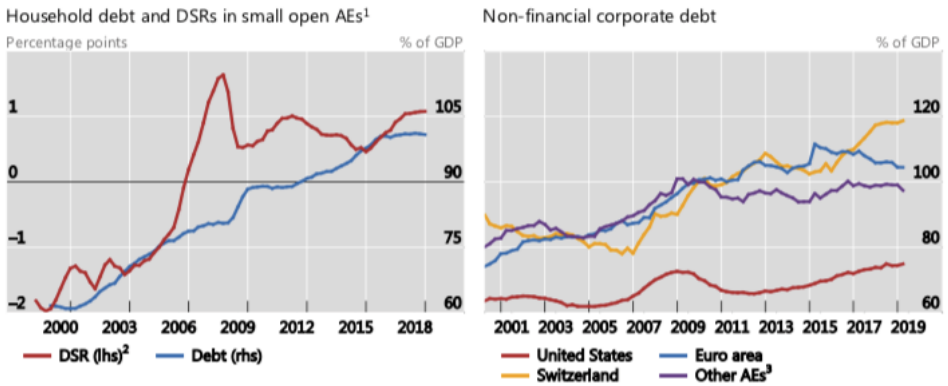
[1] Five-year five-year forward rates. [2] Weighted average of Australia, Canada, Denmark, New Zealand, Norway, Sweden and the United Kingdom, based on GDP and PPP exchange rates.

Sources: Bloomberg; national data; BIS calculations.

Not only has inflation been persistently low in many countries, but its relationship with key economic variables, notably output, has changed. Part of the reason for this lies in structural changes – including globalisation, digitalisation and the wage bargaining process – that have made inflation less responsive to domestic demand pressures. This has made it harder for central banks to steer inflation, at least in the short run and when overall price changes are small.

The second challenge is that ***high debt levels and the search for yield*** have left economies vulnerable to negative shocks (Graph 8). Countries that were not at the epicentre of the crisis, particularly small open economies like Australia, Canada, the Nordic countries and Switzerland, have seen sustained increases in household debt. Moreover, debt service ratios have increased even as interest rates have fallen. Corporate debt has also expanded significantly. Global non-financial corporate debt, including bonds and loans, has more than doubled over the past decade. There is also evidence of declining credit standards. In advanced economies, the share of bonds with the lowest investment grade rating in portfolios of mutual funds that hold investment grade corporate bonds has doubled to just under 50% in both the US and Europe. Credit spreads are also relatively compressed (Graph 9). The leveraged loan market has expanded rapidly and is now some $3 trillion in size. Structured products like collateralised loan obligations have surged, posing risks that could be amplified through the financial system if credit conditions deteriorate abruptly.

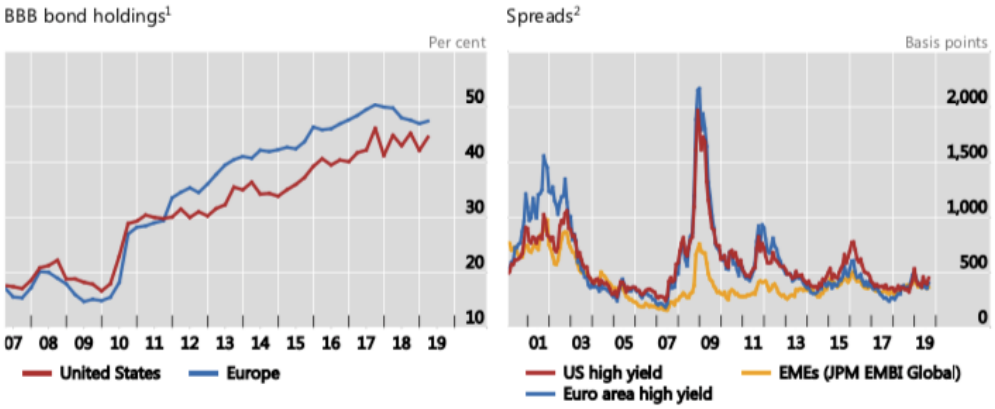
Vulnerability from high debt: household and corporate debt — Graph 8



[1] Simple averages for Australia, Canada, Finland, Norway, Sweden and Switzerland. [2] Difference between the debt service ratio (DSR) and the country-specific average. [3] Weighted average of Australia, Canada, Denmark, New Zealand, Norway Sweden and the United Kingdom, based on GDP and PPP exchange rates.

Sources: National data; BIS debt service ratio statistics and total credit statistics; BIS calculations.

Deterioration in credit quality: investment grade composition and risk spreads — Graph 9

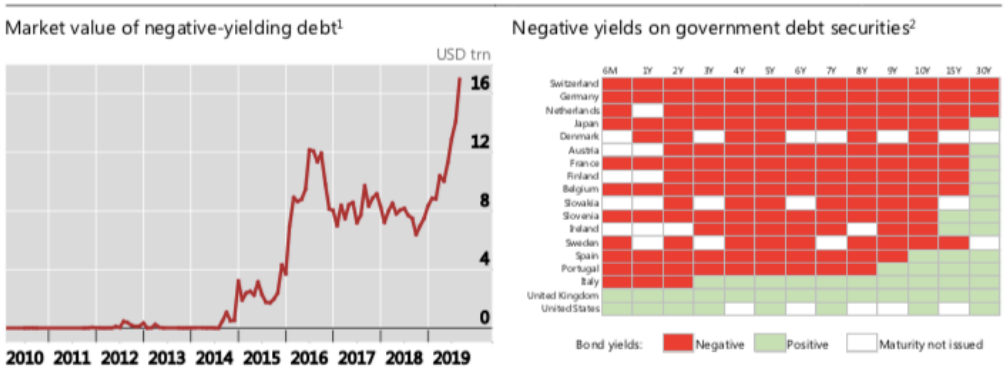


[1] Average percentage of investment grade corporate bond mutual fund portfolios invested in bonds with the indicated rating. [2] For the United States and the euro area, option-adjusted spread; for EMEs, stripped spread.

Sources: JPMorgan; Lipper; Merrill Lynch; Refinitiv; BIS debt service ratio statistics; national data; BIS calculations.

The third challenge central banks now face is that of ***limited policy room***. Interest rates, both short and long, are at historical lows in many countries. And the size of central bank balance sheets remains unprecedented. A key question is whether and to what extent unconventional monetary policy can be applied to provide additional stimulus if needed. Negative interest rates, in particular, are a prominent issue. So far, modestly negative rates have not led to major disruptions in market functioning. But with some $16 trillion of bonds now trading at negative yields – that's roughly a quarter of the global bond market, including government and corporate debt – the question is how much more rates can be pushed into negative territory, and whether the side effects outweigh the benefits (Graph 10). We have seen some of you here introducing negative rates on deposits exceeding large amounts, while negative mortgage rates have become a reality in Denmark. We have little experience with such situations, and so have to proceed cautiously and be mindful of potential side effects if these conditions persist.

Uncharted waters: total negative-yielding debt globally — Graph 10



[1] Based on Bloomberg Barclays Global Aggregate Negative-Yielding Debt Index. [2] As of 29 August 2019.

Sources: Bloomberg; BIS calculations.

Last, but definitely not least, is the current economic outlook. Apart from the high corporate debt that I mentioned before, weak bank profits in advanced economies and deleveraging in some major emerging market economies all pose a risk to the outlook. But at the top of the list is the uncertainty stemming from the return of protectionism and the resulting trade tensions. Trade wars have no winners, only losers. And the losers are not only consumers and companies in the countries engaged in the trade war, but also consumers and companies in the trading partners of those countries, and the trading partners of those trading partners. The ripples from a trade war spread very quickly.

Where do we go from here? Policy options

So that's where we stand today. The economic recovery has been sustained, and we are in much better shape today than 10 years ago. Central banks have done all that they could have – more than many could have imagined. Faced with a very challenging and fluid set of circumstances, monetary policy responded forcefully to ward off downside risks and keep the recovery on an even keel. And central banks have achieved this despite binding constraints on their instruments.

But monetary policy cannot overturn structural forces buffeting the economy. As vulnerabilities have developed again and growth momentum has become increasingly exposed to downside risks, monetary policy cannot be expected to single-handedly sustain growth as it has over the past decade. Running monetary policy close to its limits for too long increases the risks

from adverse side effects, not least in the form of accumulating financial imbalances that could weigh on macroeconomic performance in the future. Monetary policy can act as a backstop for growth. But other engines and policy levers will need to contribute. And from a long-run perspective, no engine is stronger or more durable than structural reforms.

Labour and product market reforms need to be pushed through to reinvigorate economic dynamism and reap the full benefits that new technologies offer. Efficient resource allocation – moving capital and labour from low-productivity firms and sectors to more productive ones – underpins the process of "creative destruction" that is vital for long-run growth. Declines in measures of firm creation and destruction, a proxy for the process of resource allocation, is a worrying sign in this respect. So too is the growth of so-called "zombie firms", firms whose profits cannot cover interest payments on debt.

On the financial front, Basel III is a milestone achievement. But its full benefits will only be realised if the reforms are implemented in a timely and consistent way. This will give stakeholders clarity and certainty, and reduce risks of regulatory fragmentation and cross-border competitive distortions.

In terms of other policy levers, fiscal policy can be a powerful tool to keep growth balanced. Provided that fiscal space is available, well targeted fiscal measures not only provide short-term stimulus, but also create incentives that support growth in the medium term, particularly if they boost innovation.

And in the face of growing vulnerabilities, it will be increasingly important to use macroprudential tools judiciously to mitigate risks in specific sectors of the financial system. The experience in many countries has shown how useful such measures have been for housing markets. And provided there is good coordination, macroprudential tools can be a powerful complement to monetary policy.

Finally, it goes without saying that maintaining the open global trade system that has fostered tremendous gains is of paramount importance.

Let me end by repeating the central message of this year's BIS Annual Economic Report: monetary policy cannot bear all the burden of sustainable growth. It's time to ignite all policy engines. Thank you for your attention.

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Challenges for Monetary Policy ⋆

By JEROME H. POWELL*

This year's symposium topic is "Challenges for Monetary Policy," and for the Federal Reserve those challenges flow from our mandate to foster maximum employment and price stability. From this perspective, our economy is now in a favorable place, and I will describe how we are working to sustain these conditions in the face of significant risks we have been monitoring.

The current U.S. expansion has entered its 11th year and is now the longest on record. The unemployment rate has fallen steadily throughout the expansion and has been near half-century lows since early 2018. But that rate alone does not fully capture the benefits of this historically strong job market. Labor force participation by people in their prime working years has been rising. While unemployment for minorities generally remains higher than for the workforce as a whole, the rate for African Americans, at 6 percent, is the lowest since the government began tracking it in 1972. For the past few years, wages have been increasing the most for people at the lower end of the wage scale. People who live and work in low- and middle-income communities tell us that this job market is the best anyone can recall. We increasingly hear reports that employers are training workers who lack required skills, adapting jobs to the needs of employees with family responsibilities, and offering second chances to people who need one.

Inflation has been surprisingly stable during the expansion: not falling much when the economy was weak and not rising much as the expansion gained strength. Inflation ran close to our symmetric 2 percent objective for most of last year but has been running somewhat below 2 percent this year.

Thus, after a decade of progress toward maximum employment and price stability, the economy is close to both goals. Our challenge now is to do what monetary policy can do to sustain the expansion so that the benefits of the strong jobs market extend to more of those still left behind, and so that inflation is centered firmly around 2 percent.

Today I will explore what history tells us about sustaining long, steady expansions. A good place to start is with the passage of the Employment Act of 1946, which stated that it is the "continuing policy and responsibility of the Federal Government . . . to promote maximum employment, production, and purchasing power." Some version of these goals has been in place ever since. I will divide the history since World War II into three eras organized around some well-known "Greats." The first era comprises the postwar years through the Great Inflation. The second era brought the Great Moderation but ended in the Great Recession. The third era is still under way, and time will tell what "Greats" may emerge.

Each era presents a key question for the Fed and for society more generally. The first era raises the question whether a central bank can resist the temptations that led to the Great Inflation. The second era raises the question whether long expansions supported by better monetary policy inevitably lead to destabilizing financial excesses like those seen in the Great Moderation. The third era confronts us with the question of how best to promote sustained prosperity in a world of slow global growth, low inflation, and low interest rates. Near the end of

⋆This speech was first delivered at "Challenges for Monetary Policy," a symposium sponsored by the Federal Reserve Bank of Kansas City, on August 23, 2019.

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my remarks, I will discuss the current context, and the ways these questions are shaping policy.

Era I, 1950–1982: Policy Breeds Macroeconomic Instability and the Great Inflation

Thelate1940s were a period of adjustment to a peacetime economy. As the 1940s turned to the 1950s, the state of knowledge about how best to promote macroeconomic stability was limited. The 1950s and early 1960s saw the economy oscillating sharply between recession and growth above 6 percent. Three expansions and contractions came in quick succession. With the benefit of hindsight, the lack of stability is generally attributed to "stop and go" stabilization policy, as monetary and fiscal authorities grappled with how best to modulate the use of their blunt but powerful tools.

Beginning in the mid-1960s, "stop and go" policy gave way to "too much go and not enough stop"—not enough, that is, to quell rising inflation pressures. Both inflation and inflation expectations ratcheted upward through four expansions until the Fed, under Chairman Paul Volcker, engineered a definitive stop in the early 1980s. Each of the expansions in the Great Inflation period ended with monetary policy tightening in response to rising inflation.

Policymakers came out of the Great Inflation era with a clear understanding that it was essential to anchor inflation expectations at some low level. But many believed that central bankers would find it difficult to ignore the temptation of short-term employment gains at the cost of higher inflation down the road.

Era II, 1983 through 2009: the Great Moderation and Great Recession

As the second era began, inflation was falling, and it continued to fall for about a decade. In 1993, core inflation, which omits the volatile food and energy components, first fell below 2.5 percent, and has since remained in the narrow range of 0.9 percent to 2.5 percent. Greater success on price stability came with greater success on employment. Expansions in this era were longer and more stable than before. The era saw two of the three longest U.S. expansions up to that point in history.

Anchored inflation expectations helped make this win-win outcome possible, by giving the Fed latitude to support employment when necessary without destabilizing inflation. The Fed was cutting, not raising, rates in the months prior to the end of the first two expansions in this era, and the ensuing recessions were mild by historical standards. And twice during the long expansion of the 1990s, the Federal Open Market Committee (FOMC) eased policy in response to threats to growth. In 1995, responding to evidence of slowing in the United States and abroad, the FOMC reduced the federal funds rate over a few months. In 1998, the Russian debt default and the related collapse of the hedge fund Long-Term Capital Management rocked financial markets that were already fragile from the Asian financial crisis. Given the risks posed to the U.S. economy, the FOMC again lowered the federal funds rate over a period of months until events quieted. The 10-year expansion weathered both events with no discernible inflation cost.

By the turn of the century, it was beginning to look like financial excesses and global events would pose the main threats to stability in this new era rather than overheating and rising inflation. The collapse of the tech stock bubble in 2000 and the September 11, 2001, terrorist attacks played key roles in precipitating a slowdown that turned into a recession. And the next expansion, as we are all painfully aware, ended with the collapse of a housing bubble and the Global Financial Crisis. Thus, this second era provided good reason for optimism about the Fed's ability to deliver stable inflation, but also raised a question about whether long expansions inevitably lead to destabilizing financial excesses.

Era III, 2010 and After: Monetary Policy and the Emerging New Normal

The third era began in 2010 as the recovery from the Great Recession was taking hold. My focus in discussing this era will be on a "new normal" that is becoming apparent in the wake of the crisis. I will fast-forward past the early years of the expansion and pick up the story in December 2015. The unemployment rate had fallen from a peak of 10 percent to 5 percent, roughly equal to the median FOMC participant's estimate of the natural rate of unemployment at the time. At this point, the Committee decided that it was prudent to begin gradually raising the federal funds rate based on the closely monitored premise that the increasingly healthy economy called for more-normal interest rates. The premise was generally borne out: Growth from the end of 2015 to the end of 2018 averaged 2.5 percent, a bit above the 2.2 percent rate over the previous five years. The unemployment rate fell below 4 percent, and inflation moved up and remained close to our 2 percent objective through much of 2018.

That brings us to 2019. Before turning to issues occupying center stage at present, I want to address a long-running issue that I discussed here last year: tracking the "stars" that serve as guideposts for monetary policy. These include u*, the natural rate of unemployment, and r*, the neutral real rate of interest. Unlike celestial stars, these stars move unpredictably and cannot be directly observed. We must judge their locations as best we can based on incoming data and then add an element of risk management to be able to use them as guides.

Since 2012, declining unemployment has had surprisingly little effect on inflation, prompting a steady decline in estimates of u*. Standard estimates of r* have declined between 2 and 3 percentage points over the past two decades. Some argue that the effective decline is even larger. Incorporating a lower value of u* into policymaking does not require a significant change in our approach. The significant fall in r*, however, may demand more fundamental change. A lower r* combined with low inflation means that interest rates will run, on average, significantly closer to their effective lower bound.

The key question raised by this era, then, is how we can best support maximum employment and price stability in a world with a low neutral interest rate.

Current Policy and the Three Key Questions

Let me turn now to the current implications for monetary policy of the questions raised by these three eras. The first era raised the question of whether the Fed can avoid excessive inflation. Inflation has averaged less than 2 percent over the past 25 years, and low inflation has been the main concern for the past decade. Low inflation seems to be the problem of this era, not high inflation. Nonetheless, in the unlikely event that signs of too-high inflation return, we have proven tools to address such a situation.

The second era's question—whether long expansions inevitably breed financial excesses—is a challenging and timely one. Hyman Minsky long argued that, as an expansion continues and memories of the previous downturn fade, financial risk management deteriorates and risks are increasingly underappreciated. This observation has spurred much discussion. At the end of the day, we cannot prevent people from finding ways to take excessive financial risks. But we can work to make sure that they bear the costs of their decisions, and that the financial system as a whole continues to function effectively. Since the crisis, Congress, the Fed, and other regulatory authorities here and around the world have taken substantial steps to achieve these goals. Banks and other key institutions have significantly more capital and more stable funding than before the crisis. We comprehensively review financial stability every quarter and release our

assessments twice a year to highlight areas of concern and allow oversight of our efforts. We have not seen unsustainable borrowing, financial booms, or other excesses of the sort that occurred at times during the Great Moderation, and I continue to judge overall financial stability risks to be moderate. But we remain vigilant.

That leaves the third question of how, in this low r* world, the Fed can best support the economy. A low neutral interest rate presents both near-term and longer-term challenges. I will begin with the current context. Because today's setting is both challenging and unique in many ways, it may be useful to lay out some general principles for assessing and implementing appropriate policy and to describe how we have been applying those principles.

Through the FOMC's setting of the federal funds rate target range and our communications about the likely path forward for policy and the economy, we seek to influence broader financial conditions to promote maximum employment and price stability. In forming judgments about the appropriate stance of policy, the Committee digests a broad range of data and other information to assess the current state of the economy, the most likely outlook for the future, and meaningful risks to that outlook. Because the most important effects of monetary policy are felt with uncertain lags of a year or more, the Committee must attempt to look through what may be passing developments and focus on things that seem likely to affect the outlook over time or that pose a material risk of doing so. Risk management enters our decision making because of both the uncertainty about the effects of recent developments and the uncertainty we face regarding structural aspects of the economy, including the natural rate of unemployment and the neutral rate of interest. It will at times be appropriate for us to tilt policy one way or the other because of prominent risks. Finally, we have a responsibility to explain what we are doing and why we are doing it so the American people and their elected representatives in Congress can provide oversight and hold us accountable.

We have much experience in addressing typical macroeconomic developments under this framework. But fitting trade policy uncertainty into this framework is a new challenge. Setting trade policy is the business of Congress and the Administration, not that of the Fed. Our assignment is to use monetary policy to foster our statutory goals. In principle, anything that affects the outlook for employment and inflation could also affect the appropriate stance of monetary policy, and that could include uncertainty about trade policy. There are, however, no recent precedents to guide any policy response to the current situation. Moreover, while monetary policy is a powerful tool that works to support consumer spending, business investment, and public confidence, it cannot provide a settled rulebook for international trade. We can, however, try to look through what may be passing events, focus on how trade developments are affecting the outlook, and adjust policy to promote our objectives.

This approach is illustrated by the way incoming data have shaped the likely path of policy this year. The outlook for the U.S. economy since the start of the year has continued to be a favorable one. Business investment and manufacturing have weakened, but solid job growth and rising wages have been driving robust consumption and supporting moderate growth overall.

As the year has progressed, we have been monitoring three factors that are weighing on this favorable outlook: slowing global growth, trade policy uncertainty, and muted inflation. The global growth outlook has been deteriorating since the middle of last year. Trade policy uncertainty seems to be playing a role in the global slowdown and in weak manufacturing and capital spending in the United States. Inflation fell below our objective at the start of the year. It appears to be moving back up closer to our symmetric 2 percent objective, but there are concerns about a more prolonged shortfall.

Committee participants have generally reacted to these developments and the risks they pose by shifting down their projections of the appropriate federal funds rate path. Along with July's

rate cut, the shifts in the anticipated path of policy have eased financial conditions and help explain why the outlook for inflation and employment remains largely favorable.

Turning to the current context, we are carefully watching developments as we assess their implications for the U.S. outlook and the path of monetary policy. The three weeks since our July FOMC meeting have been eventful, beginning with the announcement of new tariffs on imports from China. We have seen further evidence of a global slowdown, notably in Germany and China. Geopolitical events have been much in the news, including the growing possibility of a hard Brexit, rising tensions in Hong Kong, and the dissolution of the Italian government. Financial markets have reacted strongly to this complex, turbulent picture. Equity markets have been volatile. Long- term bond rates around the world have moved down sharply to near post-crisis lows. Meanwhile, the U.S. economy has continued to perform well overall, driven by consumer spending. Job creation has slowed from last year's pace but is still above overall labor force growth. Inflation seems to be moving up closer to 2 percent. Based on our assessment of the implications of these developments, we will act as appropriate to sustain the expansion, with a strong labor market and inflation near its symmetric 2 percent objective.

The Three Questions in the Longer Run

Looking back over the three eras, monetary policy has evolved to address new challenges as they have arisen. The inflation targeting regime that emerged after the Great Inflation has led to vastly improved outcomes for employment and price stability around the world. One result has been much longer expansions, which often brought with them the buildup of financial risk. This new pattern has led us to understand that assuring financial stability over time requires much greater resilience in our financial system, particularly for our largest, most complex banks.

As we look back over the decade since the end of the financial crisis, we can again see fundamental economic changes that call for a reassessment of our policy framework. The current era has been characterized by much lower neutral interest rates, disinflationary pressures, and slower growth. We face heightened risks of lengthy, difficult-to-escape periods in which our policy interest rate is pinned near zero. To address this new normal, we are conducting a public review of our monetary policy strategy, tools, and communications—the first of its kind for the Federal Reserve. We are evaluating the pros and cons of strategies that aim to reverse past misses of our inflation objective. We are examining the monetary policy tools we have used both in calm times and in crisis, and we are asking whether we should expand our toolkit. In addition, we are looking at how we might improve the communication of our policy framework.

Public engagement, unprecedented in scope for the Fed, is at the heart of this effort. Through Fed Listens events live-streamed on the internet, we are hearing a diverse range of perspectives not only from academic experts, but also from representatives of consumer, labor, business, community, and other groups. We have begun a series of FOMC meetings at which we will discuss these questions. We will continue reporting on our discussions in the FOMC minutes and share our conclusions when we finish the review next year.

I will conclude by saying that we are deeply committed to fulfilling our mandate in this challenging era, and I look forward to the valuable insights that will, I am confident, be shared at this symposium.

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Structural Changes in Financial Markets and Implications for Monetary Policy Implementation*

By SABINE MAUDERER*

Ladies and gentlemen,

Welcome to the Bundesbank's Regional Office. It's a real treat for me to speak to you today.

"When the going gets tough" - this conference title was wisely chosen by DZ Bank earlier this year.

Looking at the latest ructions in financial markets, the going has already got tough.

"Navigating the challenges" is the order of the day, and not just for market participants.

The same goes for policymakers - especially when it comes to fiscal policy or monetary policy.

As far as central banking is concerned, "navigating the challenges" is broad in scope. It includes drawing the right conclusions from financial market signals.

The relationship between monetary policy and financial markets is not a one-way street.

Stock and bond prices reflect expectations on future growth and inflation, but also on monetary policy.

These market expectations, in turn, provide valuable information for policymakers.

But things have become even more multi-layered. On the one hand we face increasing market complexity and changes. On the other hand we see new players, products and trading patterns.

To be honest, keeping tabs on the relevant changes is anything but easy. We have to keep asking ourselves which elements of change have an impact on monetary policy and which do not.

So what I am going to do is present some of these changes in the first part of my speech.

It would be a bit of a "long shot" to always call them "structural", since their longevity is not entirely clear.

Then I'll use the second part of my remarks to point out what these changes mean for monetary policy implementation.

Admittedly, I´ll give you rather a rough sketch than a finished painting, so some items might be left unresolved.

Fortunately, we will have the opportunity to delve a little deeper into some of the issues later on tonight.

But for starters, let's take a look at my selection of recent changes in financial markets.

A - STRUCTURAL CHANGES IN FINANCIAL MARKETS

I based my choice of changes on how strongly they impact on market dynamics.

The first change is a shift in the relative importance of banks and non-banks in the financial system. This is true for the euro area, but also on a more global level.

On the one hand we see a prospering asset management industry and growing financial markets. But on the other hand banks have been reducing the size of their trading books, partly as a result of stricter regulation.

This shift in market forces is not a major issue when times are good and markets are quiet.

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*This speech was first delivered at the DZ Bank International Capital Markets Conference on August 29, 2019.

* Sabine Mauderer, Member of the Executive Board of the Deutsche Bundesbank

But market liquidity can be a bottleneck in times of stress, when many investors are scrambling to square their positions at the same time.

In the past, banks had the balance sheet capacity to absorb a good deal of the assets on offer.

In terms of market functioning, there are strong indications that this kind of buffering mechanism cannot be relied upon anymore, at least not to the same extent.

Market liquidity may evaporate when it is needed most.

The second change is the rise of new players and products within the non-bank financial sector, alongside growing investment demand.

We observe two important developments sometimes framed as diametrically opposed forces: the very active world of high frequency trading (HFT) and the seemingly calm world of passive investment represented by exchange traded funds (ETFs).

The rise of these market players or strategies has a potentially far-reaching impact on how financial markets respond to new information.

HFT improves liquidity under normal market conditions, it would appear. But during cycles of market volatility, this positive effect on market liquidity seems to not only disappear, but even turn negative as a result of directional investment strategies.

The picture is just as mixed for ETFs. Their net effect on market liquidity in a "normal" market environment is positive. But their behaviour under financial stress might also warrant market liquidity concerns - particularly when leverage is part of the game.

Crucially, then, both HFTs and ETFs have a procyclical impact on market liquidity. And we have good reason to assume that their influence is here to stay.

Let us look at client needs now: Competition in the asset management sector has been a catalyst for new investment strategies in response to changing client needs. This is the third change.

Many investors want to combine search for yield with the desire to limit downside risks and volatility.

Among those who increasingly aim to earn (so-called) alternative risk premia are multi asset funds.

Multi asset funds have been around in various guises for quite some time now, but they have been attracting renewed interest in the current low yield environment.

Let's not forget that there are also other players with more explicit links to volatility. These include

- commodity trading advisors (CTAs) with momentum-driven strategies;
- funds that have volatility targets or (so-called) volatility caps and
- risk parity funds.
- Many of their approaches rely on systematic investment strategies.

These strategies promise outperformance or superior risk management by eliminating human bias. They largely lean on automated market data analysis.

But they also imply correlated investments. When volatilities are low, the strategies systematically increase riskier investment positions, and vice versa. Here too, procyclical influence on market liquidity is a central concern.

One factor which many, if not all, of these developments have in common is the relentless drive towards digitalisation.

Big data, machine learning and artificial intelligence have become indispensable for many market participants in the fields of forecasting, investment management and trade execution.

So in a nut shell, we see a lot of changes in the market. These changes will alter the information that is being sent to us. The overall question is how are we going to interpret these signals?

Just think about traditional benchmark rates and also the shape of the yield curve.

No matter which yardstick is taken:

A superficial reading may suggest that the US yield curve is sending strong warning signs about growth and inflation expectations.

In the same vein, the economic outlook implied by the Bund curve seems to look only marginally better.

For all the concerns which the yield curves continue to attract, there are many voices pointing to special factors which dilute the reliability of this indicator.

Increasing demand for high quality assets seems to play an important role - be it from large-scale institutional investors, market participants in need of collateral, or banks aiming to satisfy regulatory requirements.

The dampening impact of monetary policy on term premia is often mentioned as an influence factor as well. I will come back to this point shortly.

Turning to other segments, reliability concerns have also cropped up surrounding market-based inflation expectation indicators such as inflation swaps.

I will not go into an in-depth analysis, the jury is still out on what has been driving down longer-term market indicators.

All the related issues are being continually reassessed by the Eurosystem.

Another challenge is to correctly interpret volatility indices like the VIX.

Over the last years, we have seen rather long stretches of low volatility readings.

A common conclusion from these readings is that market participants expect smooth sailing ahead.

But we have to take into account that volatility targeting strategies and related products are a more important part of the game now.

Volatility readings could have been more suppressed than in prior periods. As a result, market participants face relatively more extreme spikes during a repricing of risk.

So we are talking about the abruptness and magnitude of index movements, rather than the movements themselves.

B - IMPLICATIONS FOR MONETARY POLICY IMPLEMENTATION

Now what is the impact of these changes on monetary policy implementation?

Just like asset management, monetary policy is about taking the right decisions.

That's why it matters a great deal to have a sound grasp of what economic indicators are actually telling us - including financial market indicators.

The yield curve has long been used by market participants to gauge markets' aggregated expectations on the economic outlook.

Getting a grip on inflation expectations touches on the core of our price stability mandate.

But market-based indicators of inflation expectations are just one set of indicators, which can be relevant in this context.

The notion of financial conditions is another factor that has gained in importance for central banks as a means of assessing their policy impact.

Consider that volatility is an important component of practically any measure of [risk and] financial conditions - and you'll see why there might be a problem.

Therefore, one important task for central banks is to separate market technicalities from fundamental information.

And that, in turn, is why central bankers also need to cross-check financial market signals against other indicators, monetary as well as real economic ones.

Inaccurate or incomplete information might lull us into complacency in one situation or drive us to take potentially unnecessary or premature action in another.

At this stage, let me briefly recap on how monetary policy itself impacts on financial market indicators.

Financial market prices play an important role for monetary policy transmission.

In this context, it is also important to understand the Eurosystem's concept of market neutrality for the public sector asset purchase programme (PSPP).

It implies that while we are looking to affect prices, we do not want to suppress the price discovery mechanism.

That is why a high degree of transparency around the asset purchases and close monitoring of their impact on liquidity and collateral availability are still fundamental pillars of the Eurosystem's concept.

Against this background, we also have to be aware of "informational feedback loops", also known as the "reflection problem".

Overall, concrete measures are the result of weighing the pros and cons with regard to achieving the price stability target.

CONCLUSION

Ladies and gentlemen,

Let me conclude with a few remarks on this assessment.

The task of the ECB's Governing Council, remember, is to achieve price stability in the euro area in the medium term.

Therefore, the inflation outlook is key for monetary policy decisions. One important element here are inflation projections which will be updated by ECB staff for the September meeting.

After the July meeting, the relevant Eurosystem committees have been tasked with examining different policy options for the case that the Governing Council sees need to act.

The questions they are exploring touch upon the set of policy instruments, their intensity and their timing.

And the Bundesbank is actively contributing to the discussions at all the relevant levels.

As always, a crucial part of decision making will be to correctly interpret financial market signals.

In a constant state of flux, we face the difficult task of filtering out the informational content of market indicators that is relevant for monetary policy.

They cannot be taken at face value, but should be treated as the raw material for monetary policy decisions.

And the word "raw" is certainly worth stressing here, because indicators have to be handled with a great deal of caution. They have to be qualified, quantified and cross-checked.

Thank you for your attention.

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Can Central Banks Talk Too Much*

By HYUN SONG SHIN*

I am happy to be at this conference on central bank communication. I was asked to address the question of whether central banks can talk too much. This is a timely question, with central bank accountability and transparency high on the policy agenda. Central bankers are giving more speeches, holding more news conferences and embracing new communication channels on social media. With so much going on, the onus is on clarity, simplicity and consistency. Andy Haldane gave an eloquent statement along these lines recently.[1]

However, communication is a two-way street. It is not just about talking. It is also about listening. Before the central bank can steer the economy, it needs to listen in order to learn where to steer the economy. However, the louder the central bank talks, the more likely it is to hear its own echo. In my earlier work with Stephen Morris,[2] we put it in more prosaic terms – that the signal value of financial market prices is impaired when market participants place too much weight on the central bank's pronouncements. Let me give you an example, so as to fix ideas. It comes from the very common task of inferring inflation expectations from market prices.

To set the stage, think of a defined benefit pension fund, whose pension obligations are linked to wages and hence faces inflation risk. The pension fund can hedge the inflation risk by buying inflation protection through an inflation swap. By entering the swap, the pension fund promises to pay a fixed nominal amount per year in return for a floating payment that depends on realised inflation.

In the past, when defined benefit pension schemes were common, the demand for inflation protection was not particularly price-sensitive, and there was a cushion of demand that pushed up the swap rate. A sizeable premium over expected inflation attracted inflation sellers.

Over time, as defined benefit pension schemes have become less common, the demand for long-dated inflation protection from this segment of the market has declined, squeezing the inflation risk premium and putting downward pressure on inflation swap rates more generally. As part of these developments, inflation swap rates have become more sensitive to short-term economic news, especially news emanating from central banks. This is so even for long-dated swaps that, in theory, should not be buffeted by short-term news.

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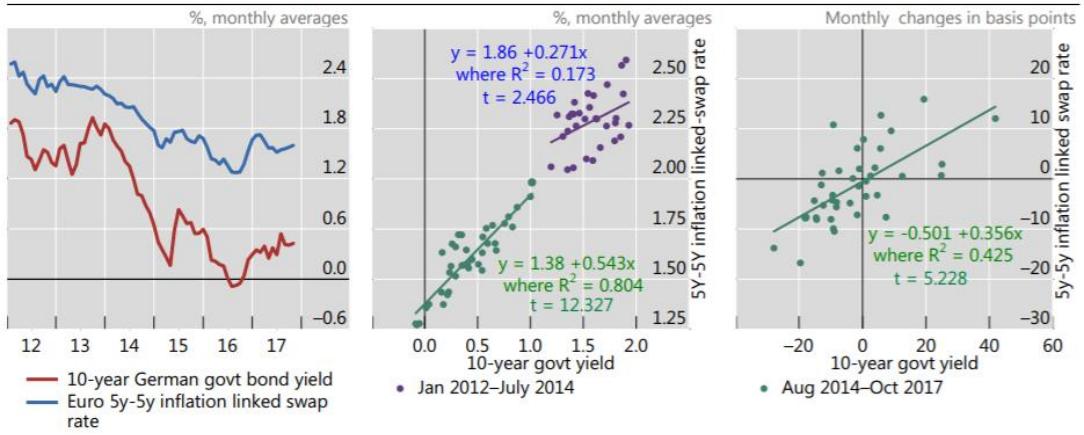
*This speech was first delivered at the ECB conference on "Communications challenges for policy effectiveness, accountability and reputation" on 14 November, 2017

*Hyun Song Shin, Economic Adviser and Head of Research

1 See A Haldane, "A little more conversation. A little less action", speech at the Federal Reserve Bank of San Francisco Macroeconomics and Monetary Policy Conference, 31 March 2017.

2 S Morris and H S Shin, "Central bank transparency and the signal value of prices", Brookings Papers on Economic Activity, no 2, 2005, pp 1–66.

Euro area five-year, five-year-forward inflation swap rate vs 10-year bund yield Graph 1



Sources; Bloomberg; Thomson Reuters; BIS calculations.

Most intriguingly, the inflation swap rate has begun to move in lockstep with the nominal yield itself. As I am at the ECB today, let me illustrate this with an example from the euro area. Similar results hold for the United States, and also when forward nominal yields are used (see Annex).

Graph 1, left-hand panel, plots (in blue) the five-year, five-year-forward inflation swap rate for the euro area, which is the cost of hedging inflation risk from year 6 to the end of year 10. It is a popular measure of medium-term inflation expectations. Notice how the five-year, five-year inflation swap rate fluctuates in lockstep with the 10-year nominal yield (in red). The two series come from quite different markets and ought to convey different information, and yet they have ended up conveying the same information. The scatter charts in levels (centre panel) and in one-month changes (right-hand panel) show how tightly bound the two series are.

One possible explanation for the co-movement – and there are others[3] – is that it reflects in part the impact of central bank forward guidance. If the central bank lets it be known that the inflation swap rate enters future monetary policy actions, market participants will anticipate easier monetary policy when the inflation swap rate falls and chase nominal yields down. This type of front-running may be so effective that the central bank need not follow through with any actions of its own. Signalling its contingent plan of action would be enough. This is an example of Odyssean forward guidance, as discussed by Benoît Cœuré in a recent speech.[4]

An open question is to what extent the decline in nominal yields has made the fixed payments

[3] For instance, one could argue (implausibly, in my view) that the neutral rate of interest jumps around at high frequency in such a way that it rises above the red line in periods when the blue line ticks up, but drops below the red line in periods when the blue line ticks down. A very different rationalisation is the Neo-Fisherian one, according to which nominal interest rates and inflation move to keep the real interest rate constant. See S Williamson, "Neo Fisherism: a radical idea or the most obvious solution to the low inflation problem?" Regional Economy, Federal Reserve Bank of St Louis, July 2016; and J Cochrane, "Do higher interest rates raise or lower inflation?" working paper, 2016.

[4] See B Cœuré, "Central bank communication in a low interest rate environment", speech at Bruegel event, Brussels, 31 March 2017; and C Evans, J Fisher, A Justiniano and J Campbell, "Macroeconomic effects of FOMC forward guidance", Brookings Papers on Economic Activity, spring 2012. See A Filardo and B Hofmann, "Forward guidance at the zero lower bound", BIS Quarterly Review, March 2014, pp 37–53 for a review of the impact of forward guidance.

received by inflation sellers more attractive to investors who value nominal bond-like payoffs. If so, this would be an additional element that binds the inflation swap rate with the nominal rate, and subject the swap rate to the same amplification forces that push around the nominal yield itself.

These developments should give us pause for thought when we approach the task of reading market signals. As commentators, we give a lot of weight to market signals. We personify the market and endow it with foresight. But the market is not a person. Prices are the outcomes of the interaction of many actors, and not the beliefs of any one actor. Speaking of the "market's expectation" is fine as a shorthand for market prices, but we should be wary of falling into the trap of taking the shorthand literally and thinking of the market as a person you can sit down and reason with.

Experience has taught us that bond markets can move abruptly and "overreact" relative to the benchmark where the long-dated yield is the average of expected future policy rates. I discussed one of the possible mechanisms behind overreactions when I was last here in September. It was the mechanism driven by duration-matching by life insurers who chase long yields in an attempt to match the durations of their assets to their liabilities.[5] In one of the charts, I showed how total holdings by German insurers of ultra-long bonds (remaining maturity greater than 20 years) had more than quadrupled since 2008. This was at a time when long rates were falling sharply, so that the demand curve traced a downward-sloping relationship between yields and holdings. The more expensive long-dated bonds became, the more the insurance sector was drawn to them.

To an outside observer, this perverse demand response would appear as if market participants' preferences were changing with market prices themselves. Low rates beget low rates through the higher value placed on long-dated bonds, and high rates beget high rates due to the lower value placed on long-dated bonds. This perverse demand relationship gives greater impetus to the overreaction of bond markets.

If we accept that the empirical relationship between market-implied inflation expectations and nominal yields is endogenous, and is affected by central bank forward guidance, there are important monetary policy implications. When the bond market is subject to overreactions, central bank forward guidance becomes more potent, not least because of more vigorous front-running by market participants. However, this also means that the echoes of the central bank's forward guidance are also amplified, reverberating in an echo chamber of its own making. In the worst case, the central bank may end up in a feedback loop where acting on signals from the market could distort those signals further.

All of this raises the question of how the market interactions outlined so far will play out when central banks normalise monetary policy. The amplification channels that pushed rates down so effectively could equally work in reverse.

Some further evidence

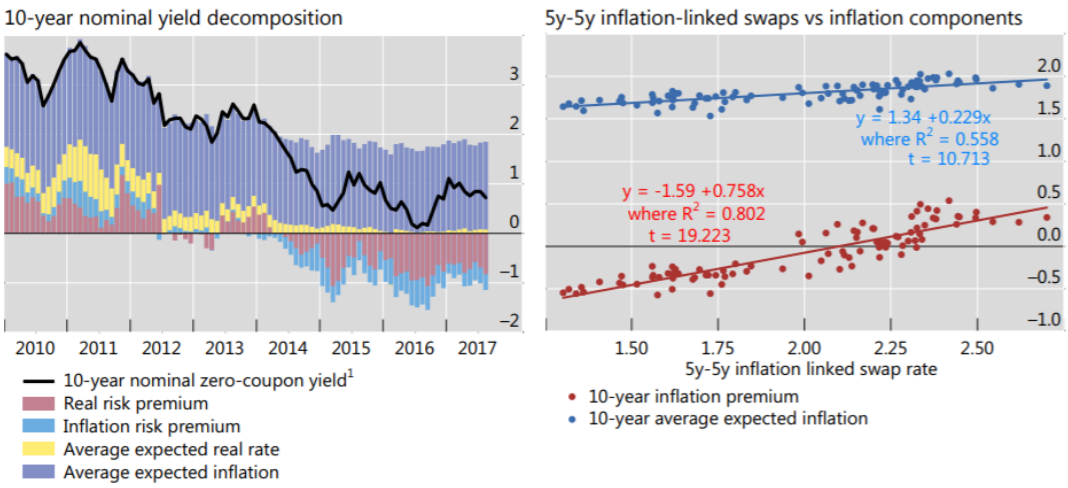
We should be modest about how much we understand about the underlying market mechanisms. We need to shed additional light on the key questions.

One way is through models of the term structure of interest rates that break out the nominal yield into its components. These models should always be taken with a grain of salt, but they are useful as a cross-check of market developments against the predictions of workhorse macro models used at central banks. According to these models, risk premia have been displaying some very odd behaviour lately.

[5] See H S Shin, "Is there a risk of snapback in long-dated yields?", speech at the ECB Annual Research Conference, 25 September 2017, www.bis.org/speeches/sp170925.htm.

Euro area nominal yield decomposition and five-year, five-year inflation-linked swap rates

In per cent; end-of-month figures from January 2010 to August 2017 Graph 2



[1] France, government zero coupon nominal yield.

Sources: P Hördahl, O Tristani and D Vestin, "A joint econometric model of macroeconomic and term structure dynamics", *Journal of Econometrics*, vol 131, no 1–2, 2006, pp 405–44; P Hördahl and O Tristani, "Inflation risk premia in the euro area and the United States", *International Journal of Central Banking*, vol 10, no 3, 2014, pp 1–47; Bloomberg; Datastream; BIS calculations.

Graph 2, left-hand panel, breaks down the nominal 10-year yield into two components: the real yield and the inflation component. Both are then broken down again into the part driven by expectations and the part driven by the risk premium.[6] Both the real term premium and the inflation risk premium are now deeply negative according to this model. Investors are now willing to pay to take on risk, even though they will lose money on average.

The inflation premium component – the inflation compensation not explained by expected inflation – has fallen a lot in recent years. This decline in the inflation premium chimes in with my earlier discussion on the reduced weight of inflation buyers in the swap market, such as through the diminished heft of defined benefit pension funds. In fact, we see from Graph 2 that the inflation premium turned negative in 2014, in tandem with the decline in the nominal 10-year yield.

The right-hand panel shows that the five-year, five-year inflation swap rate dances to the tune of the inflation premium (slope = 0.76) rather than expected inflation (slope = 0.23). If we take these results at face value, the information conveyed by the inflation swap market has less to do with expected inflation and more to do with other factors, including changes in the ecosystem of market participants in capital markets.

Can central banks talk too much?

So, what is the answer to the original question? Can central banks talk too much? I would broaden the question. Communication is a two-way street. There is the talking part, but there is also the listening part. A better question is: what is the best balance between talking and

[6] The decompositions are based on the references cited in the explanatory notes in Graph 2. They use time series and cross-sectional data on nominal and inflation-linked bonds, as well as macro and survey data.

listening?

My answer would be that there is something of a tradeoff. More of one implies less of the other. If central banks talk more to influence market prices, they should listen less to the signals emanating from those same markets. Otherwise, they could find themselves in an echo chamber of their own making, acting on market signals that are echoes of their own pronouncements.[7]

On the other hand, talking less is hardly a viable option. Central bank actions matter too much for the lives of ordinary people to turn the clock back to an era when silence was golden. Accountability demands that central banks make clear the basis for their actions.

Nevertheless, listening better is a skill that may have been underappreciated. Greater self-awareness of the central bank's outsized role in the financial markets is a good place to start in redressing the balance. Listening better with greater self-awareness would provide central banks space to take a more detached position and make more informed decisions.

How many times have we heard the argument that the market is pricing in this or that action of the central bank, and that any deviation would upset the market? This type of argument neglects how market participants have become conditioned to the manner in which they interact with the central bank. Jeremy Stein put it well in his last speech as a Fed Governor.[8] The more the central bank whispers in order not to upset markets, the more market participants lean in to hear better.

Predictability and gradualism may not be a virtue if market participants take them as a commitment not to pull the rug from under their feet while they build up leverage and risk-taking positions. Tobias Adrian and I argued in our 2008 Jackson Hole paper[9] that predictability and gradualism may have been enabling factors in the build-up of leverage before the Great Financial Crisis.

Even if there is a more desirable equilibrium to the "whisper equilibrium", the transition will be challenging. After all, the whisper equilibrium is an equilibrium precisely because market participants are leaning in to listen so intently, and the central bank feels it has no better response than to whisper.

Nor is it clear that the transition away from the whisper equilibrium to something more sensible becomes easier with time, as the risk of upsetting markets grows with the accumulation of risk-taking positions. In this respect, greater self-awareness in communication is a skill that central banks may need to deploy sooner rather than later.

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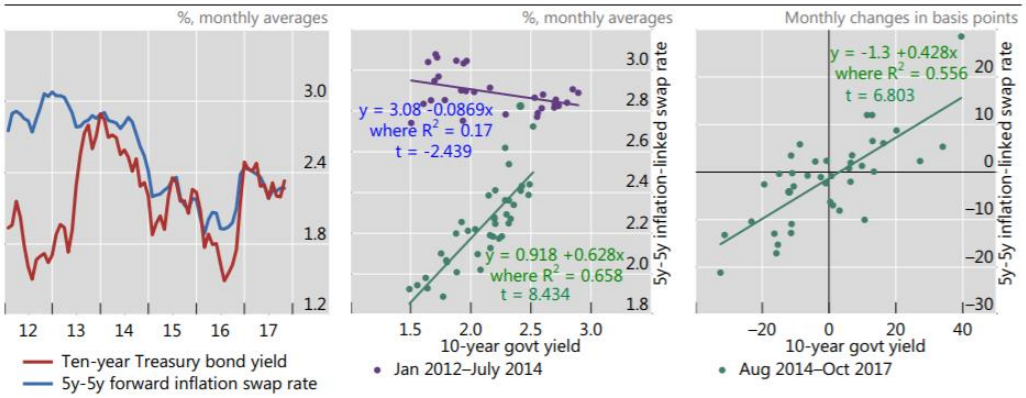
[7] For a formal model with this feature and a solution for the optimal weight on market signals, see S Morris and H S Shin "Central bank forward guidance and the signal value of market prices", paper for the 2018 American Economic Association meeting.

[8] See J Stein speech "Challenges for monetary policy communication", at the Money Marketeers of New York University, 6 May 2014.

[9] See T Adrian and H S Shin "Financial intermediaries, financial stability and monetary policy" in Maintaining stability in a changing financial system, proceedings of the Federal Reserve Bank of Kansas City Jackson Hole symposium, 2008. See also S Mallaby, "Why the Fed should surprise more", Wall Street Journal, 23 June 2017.

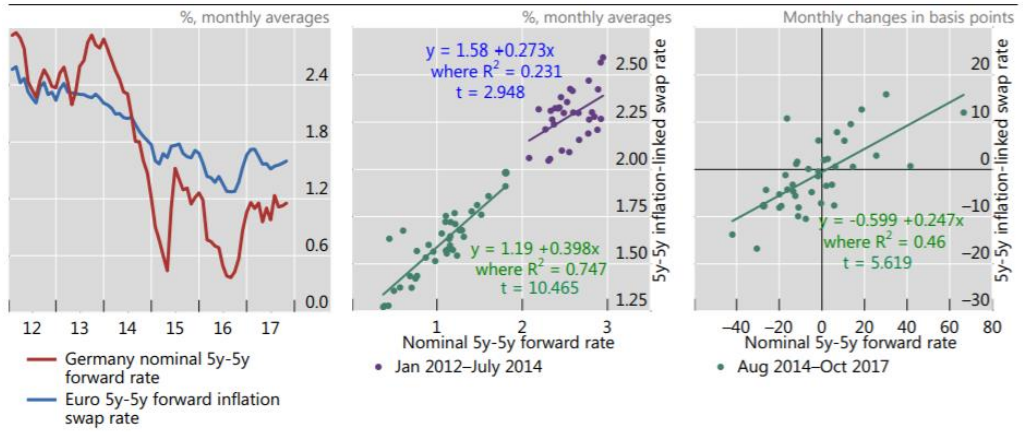
Annex: supplementary charts

US five-year, five-year-forward inflation swap rate vs 10-year Treasury yield — Graph A1



Sources; Bloomberg; Thomson Reuters; BIS calculations.

Euro area five-year, five-year-forward inflation swap rate vs bund yields — Graph A2



Sources: Bloomberg; Thomson Reuters; BIS calculations.

October 2019
Vol.6, No.4

Global Economy

Why Development, Welfare Should Trump Tariffs ⋆

By LIU JUN*

There is no point making a calculated guess on the US government's intention of repeatedly imposing sanction-like policies upon China, but the well-thought-out effects are definitely heading nowhere close to the expectation.

If the sorrows of the American people had a sliver of correlation with the growth of China's trade surplus and overall economic competitiveness, the real driver would have been lying elsewhere.

Delving deep into the root, it is the fundamental economic growth that really matters, not only in the industrial age but also in the digital era. The rationale is crystal clear from the perspectives of classical economics and political science.

The essence or one indispensable construct of electoral democracy, among others, is the well-grounded and well-rounded responsiveness to the electorates' appeals, particularly to those on economic benefits.

According to economics theories, demand can only be met with effective supply, which is mainly derived from economic development. When the US economy was marching north with a high single-digit GDP growth, let alone the strong double-digit ones, the goldilocks prosperity benefited all classes.

All walks of life shared the economic increment and the coffer of social welfare remained sufficient. Though there were disparities and predicaments in certain areas, they were easily absorbed by related parties.

Strong economic growth also enabled the enlargement of the middle-income group, the stable force of the society. With a GDP growth rate of 3 percent and above, the new wealth created was allocated to mass population in the form of welfare benefits or tax cuts, and hence the process of Pareto Improvement kicked in, where all parties involved became more or less better off in economic terms.

The politicians' task was then very straightforward, to readdress their campaign promises with well-devised strategies in order to strengthen their party's position for the next round of elections. The distinctions of right or left, conservative or liberal, etc, are no more than labels, whereas monetized benefits are concrete attributes to prove the party's policies show foresight and are correct.

A strong economy allows the incumbents to go either way to demonstrate how responsible and capable they are and how wise the people are to choose them to be the captain to sail the big boat through choppy waters, as what happened many times in modern American history.

⋆This article first appeared in China Daily on September 2,2019.

*Liu Jun, Member of IMI Academic Committee, Vice President, China Investment Corporation

However, entering into the new millennium, the US economy has been moderating substantially. Given that its deceleration actually took place even before the 2008 Great Recession started, the GDP growth rate has been below 3 percent for so long that it has become the normal.

The underperforming economy had lost its magic to satisfy the overall demand of the whole spectrum of its people, from the elite to the grassroots, and the economic increment is merely enough to keep the government running with tightened purse strings.

This harsh reality leads naturally to a makeshift political gimmick that resorts to redistributing the stock benefits among different social classes. As a result, it has gradually turned from a positive-sum game to a zero-sum one, the soil and temperature of which are just right for the resurgence of populism and nationalism.

Politicians can only direct the limited resources to satisfy specific concerns of their support groups and voters, with the hope that the pick-the-voter strategy will guarantee them another win. The new wealth is grabbed by the elites, or the so-called 1 percent, whereas the masses are left with little.

The middle-income group is shrinking and the social welfare system is in jeopardy. The happiness of one group is at the expense of the others – that is when social gaps emerge and enlarge.

Instead of political tricks, the steady economy growth, with a 3 percent plus bottom-line GDP growth rate empirically, would be the real solution to maintain overall social prosperity, healing social wounds without destroying the well-established ethnic, gender, religious structures, etc.

Otherwise, the slowly increasing pie will always be too meager to cover the ever-increasing needs of all different classes. As soon as the existing benefits of one class are redirected to another, no matter how small the proportion might be in comparison to the total, the discords will inevitably be sown. In lockstep, hostility and hatred will creep in and contaminate the society as a whole, the evidences of which have been often displayed in recent years across the world.

The trade tensions between the US and China today have diverted attention from the real issues that should concern the world, which are the economic development, welfare improvement, climate change and so on.

If those issues are addressed in a balanced and inclusive way, the others, including trade and technology conflicts, are just secondary in nature and solvable in practice.

Take the right path, make due efforts on wealth creation and economic growth, and then the current eyesores might not be as unbearable.

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Currency Wars and Dollar's Reserve Role*

By MARK SOBEL*

The daily deluge of President Donald Trump's tweets about unfair currency practices has raised questions about whether the dollar's reserve currency and financing roles boost the dollar and harm US trade accounts. Putting a positive spin on it, Trump said, 'Massive amounts of money from China and other parts of the world is pouring into the US for reasons of safety, investment and interest rates.' But the Washington Post noted recently that growing recession concerns had prompted the White House to discuss a currency transaction tax to cheapen the dollar.

One approach to determine if the dollar's reserve currency and financing roles harm US trade accounts is to examine the International Monetary Fund's current account 'norms' in its external sector report. A country's norm aggregates many factors: soundness of its policies, demographics, strength of institutions, net foreign asset positions, growth prospects and reserve currency status.

The Fund finds the US current account 'norm' is a deficit of almost 1% of GDP, versus the country's actual deficit of around 2.5%. The US, given its fiscal debt and deficits, should run more desirable policies, according to the IMF. That would boost national saving, pushing the US norm toward surplus. But the large deviation between the country's current fiscal stance and what is desirable explains much of the difference between the present deficit and the 'norm'. Part of the actual US deficit is explained by the counterpart to countries with surpluses greater than their norms.

The dollar's reserve currency role pulls down the US current account norm by around two percentage points of GDP in the deficit direction, much more so than any other country. This is because the depth and liquidity of US capital markets increase global dollar demand, strengthening the dollar and allowing the country to run larger current account deficits.

'Exorbitant privilege' refers to the dollar's reserve currency role allowing the US to run bigger external deficits. Proponents of this view argue the dollar's role allows the US to escape economic disciplines, harming the global economy.

But others suggest the dollar's reserve role is also an 'indestructible curse', insofar as it means that the US is prone to run persisting trade deficits, hurting domestic jobs and workers.

On balance, the country benefits from the dollar's reserve status. It derives substantial seigniorage. Financing costs are lower, especially for the Treasury. Americans are somewhat shielded from exchange risk.

How a currency transaction tax would weaken the dollar is unclear. Presumably, such an initiative would be a unilateral US act. In that regard, perhaps – as some have suggested – the country could tax foreign inflows or foreign earnings on US assets. Or one might contemplate capital controls.

On balance, the dollar's reserve and financial roles benefit the US, but the opposite could be true of currency transaction taxes. These could be particularly detrimental to the openness of the country's financial system. It is important, however, to remain mindful of the costs to American workers.

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*This article first appeared in OMFIF Commentary on September 11, 2019.

*Mark Sobel, US Chairman of OMFIF

The global economy faces enormous challenges. Focusing heavily on currency values or monetary policy is too narrow an approach. Monetary policy is already overburdened and cannot be the sole tool for stabilisation. A weaker dollar will not regenerate US growth, let alone when global demand is weak and the US remains a closed economy.

While the US is slowing, its relative performance is favourable. Euro area growth is falling and Germany may be headed toward recession. Italian uncertainties and the UK's departure from the European Union further cloud the outlook. Japan faces persistent low growth and inflation. China's sustainable growth rate is falling amid large domestic imbalances. The IMF, G7 and G20 need to co-operate to find a path to strong, sustainable and balanced growth.

The US should not cast doubt on the dollar's reserve and financing roles and the openness and depth of our capital markets. Doing so would add to market volatility. As the IMF 'norms' show, the country could improve substantially domestic economic policies, especially fiscal policy, to achieve an external position more in line with US underlying fundamentals. As a society, it needs raise the educational and skill levels of its workforce to enhance competitiveness.

The dollar appreciates on risk-off developments. Every time trade wars are heightened, the dollar rises. While the president is justified in criticising Chinese practices on intellectual property, statism and industrial policy, ending the trade wars would immediately reduce global economic uncertainties, reduce market volatility and curb dollar appreciation.

October 2019
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Capital Markets Look Beyond EU*

By DAVID MARSH*

Relations between the UK and the rest of Europe in the economic and financial sphere go back a lot further than UK membership of the European Community in 1973 – and will extend far into the future after the British depart. One field for co-operation that is vital for both sides is in financial regulation across and beyond the European Union.

At a seminar on 18 September at the UK Foreign and Commonwealth Office dealing with the shifting regulatory landscape, Prof. Otmar Issing, a former board member for economics at the European Central Bank, previously at the Bundesbank, will spell out the expected European transition after UK departure. In the past he has warned that UK withdrawal would prompt an inward-looking EU approach and intensify protectionism – an impression that the new European Commission under President-elect Ursula von der Leyen is anxious to dispel.

Many Europeans believe a strong reason for the British exit lies in a wish to return to a 'UK first' strategy including through lighter regulation to safeguard London's financial prowess. The view is decisively rejected in London. Since the 2008 crisis, UK policy-makers have said a stern-minded regulatory approach, not a 'light touch', is the key to maintaining confidence and investment. So both sides have much to prove.

There is joint interest in maintaining channels for cross-border trade and investment for sustainable and inclusive European growth. The UK wishes to understand, influence (if possible) and maintain robust links to the European capital markets union project aimed at improving access to growth finance for larger and smaller companies. This is a field where the City of London believes it has considerable expertise to apply post-Brexit.

Britain claims that joint action to improve capital market performance and mitigate risks will bolster stability and prosperity across Europe. In seeking to maintain two-way access across all sectors in Britain and the rest of Europe, UK regulators and market participants make the point that markets are global, not simply European. This is underlined by the dominance of international capital over trade flows and multiple initiatives linking European, Asian and North American stock exchanges and capital market participants. The (rejected) bid by the Hong Kong Stock Exchange for the London Stock Exchange emphasises the fungibility of international capital. So there is bound to be some tension between global and purely European considerations.

Despite President Donald Trump's go-it-alone tendencies, regulators and their political masters around the world generally are committed to a multilateral approach guided by shared values and common challenges. This is crucial for realising ambitions such as reinforcing sustainable finance or providing sufficient funds for infrastructure.

All these issues are germane to the wider issue of post-Brexit links between the UK and the biggest EU economy, Germany. In a speech in Berlin on 12 September, studded with references to Beatles' songs, at a conference commemorating the 100th anniversary of the British Chamber of Commerce in Germany, I put forward an audacious proposition. Just at the time when the Britons are leaving the EU, the British and Germans are becoming more like each other. 'Or

*This article first appeared in OMFIF Commentary on September 16, 2019.

* David Marsh is Member of IMI International Committee and Chairman of OMFIF.

perhaps we are swapping characteristics in that confused and generalised way in which we speak about different countries' national traits. These are psychological, psycho-social processes.'

OMFIF has described areas where the two countries can team up post-Brexit, in a report in March 2019 for the British embassy in Berlin. The report touches on banking and financial services, infrastructure and development finance, services, climate change and sustainability, cybersecurity, digitalisation and artificial intelligence, education and research, specialised manufacturing, pensions, savings and stock markets.

There is much that the UK and the rest of Europe can and will do together. The task will be, assuming departure takes place on or shortly after 31 October, to get on with it.

October 2019
Vol.6, No.4

Deepening EMU and the Implications for the International Role of the Euro*

By LUIS DE GUINDOS*

It is a great pleasure to be speaking today at the joint European Commission and ECB conference on financial integration in Europe.

The choice of the international role of the euro as the guiding theme represents a change in focus in the discussions on Economic and Monetary Union (EMU) reforms, from a post-crisis response to a broader agenda.

At the same time, Europe is facing new challenges, not least a return to fragmentation at the global level and the United Kingdom's departure from the EU, amid heightened political uncertainty.

In this context, I would like to give an overview of where we are in terms of European financial integration and draw lessons for the concrete policy actions that would promote integration.

Where do we stand on financial integration in Europe?

At the ECB, we analyse two dimensions of financial integration: price convergence across the euro area and quantity-based integration via cross-border activities.

The great financial crisis caused fragmentation along both of these dimensions. Since then, we have made great progress thanks to measures to reform EMU and the announcement of our Outright Monetary Transactions. These actions, together with a wide range of policy measures taken in the years that followed, put us back on the path towards greater integration.

However, this process has stalled somewhat in the last two years.

On the capital markets side, most of the recent positive developments in terms of financial integration have been driven by an overall reduction in price dispersion, rather than an improvement in holdings of non-domestic assets, or cross-border holdings.

Going beyond the aggregate figures, however, we see that the investment fund sector makes a positive contribution to integration by allowing investors to spread and diversify their asset holdings across countries. In 2017, investment funds held roughly 78% of all their holdings in bonds issued outside their own domicile. This is important because more cross-border holdings are needed to support consumption smoothing in the face of shocks and to enhance cross-border risk-sharing.

In banking markets the picture is also mixed. In general, we have seen a reduction in the cross-country dispersion of banks' funding costs and lending rates, pointing to some price-based integration.

In terms of quantity, however, integration is still fairly low as cross-border interbank lending remains stagnant and cross-border retail lending continues to be very limited.

More cross-border lending would be welcome as it could better insulate the domestic banking sectors from regional shocks, thus helping to sustain consumption or investment levels in the face of adverse shocks.

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*This speech was delivered at the occasion of the joint conference of the European Commission and the European Central Bank on European financial integration and stability on May 16, 2019.

*Luis de Guindos, Vice-President of the European Central Bank

These findings have implications for the EU's policy agenda.

First, cross-border financial integration still falls short of the potential for cross-border private risk-sharing we would like to see in the euro area. While the United States is an ambitious benchmark in this respect, it is interesting to note that 40% of shocks to GDP growth can be mitigated through diversification via capital markets in the United States. This compares with only 20% of shocks to GDP growth that can be smoothed in the euro area.

The capital markets union (CMU) agenda therefore needs to be pursued with renewed vigour to foster a deeper integration and development of markets.

Second, the banking union is still not a reality even though two of its three pillars have been put in place. Euro area-based banks have substantially reduced their cross-border claims since the crisis, and about 60% of banks' total exposures are to their home countries.

This is worrying at a time when the political momentum behind completing the banking union is fading. Importantly, this may lead banks to refocus their activities on their domestic markets as they anticipate that the banking union will remain incomplete, resulting in further fragmentation.

Renewed risks of fragmentation increase the need for European integration

Pursuing reforms through European projects is even more important in view of a possible return to fragmentation at different levels.

At the global level, a lack of commitment to fully implement internationally agreed standards may hinder international activity. Europe should be taking a leading role here and promoting an integrated and level playing field within its own borders and beyond by implementing the agreed reforms and maintaining a high-quality regulatory framework. This will provide confidence in the health and resilience of our markets and buttress Europe's credibility as a rule-maker.

From a global perspective, European capital markets are currently too small and too fragmented. The CMU agenda should therefore be geared towards creating the ecosystem needed to develop more vibrant European financial markets and intermediaries that are able to compete internationally. This means both promoting policies that help markets to increase their size and scope, and doing away with the barriers to the cross-border functioning of markets implied by differences in national policy concerning insolvency, taxation and other areas. Promoting a single rulebook in a wide range of areas, including consumer protection, anti-money laundering and accounting rules, is also key to the success of CMU. Regulatory consistency in a broad sense and a level playing field, as opposed to leniency, are crucial to render EU markets attractive.

At the European level, Brexit is an additional challenge which may lead to fragmentation as services could be provided in a more decentralised way. At the same time, EU27 capital markets are still subject to national rules and supervision, making for a patchwork of regimes which prevent the integration of markets and may open the door to regulatory arbitrage. As a response to Brexit, we need to develop truly European capital markets, and this makes progress on the CMU front even more urgent.

As the United Kingdom leaves the EU's regulatory and supervisory framework and develops a new one of its own, a different relationship between the two jurisdictions will need to be defined. It will need to balance the benefits of continued integration with the UK financial markets with the potential risks to financial stability, consumer and investor protection, and the integrity of the Single Market. This path will not be easy for either side as the lure of the flexible and light-touch regulation of the past can be strong, bringing with it the risk of divergence between EU and UK rules or a potential race to the bottom. And these considerations will also play out as we review the role of equivalence regimes in EU financial legislation.

European responses are the way forward

Turning to policy responses, the way forward is clear: we need to move away from national responses and promote European ones within the CMU and banking union agendas. Let me briefly emphasise five priority areas.

First, we need to complete the banking union's institutional architecture. In particular, we should ensure that the backstop to the Single Resolution Fund is fully operational, agree on a banking union solution to liquidity needs in resolution and define a clear path towards a European deposit insurance scheme (EDIS). A fully fledged EDIS would facilitate cross-border banking since depositor protection would be independent of a bank's location, and ensure that an increase in cross-border activity does not reduce the overall resilience of the system. This would provide the institutional framework for the cross-border risk-sharing that Europe needs.

Second, to facilitate cross-border activity and the emergence of pan-European entities, we need to put an end to national ring-fencing. Within the banking union, supervisors should be able to grant cross-border waivers for capital, liquidity and large exposures, provided that prudential safeguards are in place. This would lead to more efficient resource allocation and support the emergence of resilient cross-border banks able to provide credit across borders and to offer investors access to diversified products. It would also foster cross-border bank penetration, which would support the credit channel of private risk-sharing. Within CMU, a more level playing field would also enhance the capital market channel of risk-sharing.

Third, we need to mobilise the large existing pool of savings in Europe so it can be put to productive uses. Today, households keep 35% of their financial wealth in cash and deposits, around a third in insurance and pension funds, and the rest in shares, funds and bonds. Differences in saving behaviours - through banks or through pension funds - suggest that there is potential for savings to be allocated more efficiently within the banking union and for retail investors to participate more actively in capital markets. Fostering equity investment by addressing the debt-equity bias and improving financial literacy, for instance, would support the development of an equity culture in Europe, which would, in turn, help to finance innovation, growth and risk-sharing, while also increasing the return on savings for households.

Fourth, we need to continuously review the financial regulatory and supervisory framework to ensure that authorities can monitor and address potential financial stability risks. European firms are relying more heavily on corporate bonds for their financing than they did in the past, and both households and various financial intermediaries are increasingly holding corporate bonds via investment funds. This changing environment might entail new sources of risk as well as different transmission channels of financial instability. Robust prudential standards in the non-bank financial sector therefore need to be upheld, and changes to the financial structure need to be reflected in the supervisory framework to avoid risks developing beyond the watch of supervisors. The macro prudential toolkit will also need to be extended to the non-bank financial sector so that the authorities have the means to address risks at the system level.

Last but not least, we should not shy away from having an open discussion on the need for a European safe asset. If well designed, such a European asset could become the benchmark for investors in EU capital markets, reduce the incentives for capital flight on national bonds within the euro area and contribute to lowering risks on banks' balance sheets.

Deeper financial integration will strengthen EMU and ultimately enhance the international role of the euro

More developed and integrated banking and capital markets play a complementary role in financing the real economy by providing different sources of financing adapted to various

funding needs and stages of firm development. They also help to match borrowers and investors in an efficient way.

Efficient capital and banking markets also contribute to fostering cross-border private risk-sharing via the credit and capital channels, which reduces the need for public risk-sharing and enhances the resilience of EMU.

We therefore need to promote a European approach to financial integration so that we can complete both the banking union and the capital markets union. Achieving developed, integrated EU markets that are open and attractive to international investors would ultimately reinforce the role of the euro on the international stage.

October 2019
Vol.6, No.4

China

Why Sentiment Wields an Outsized Influence in China's Markets*

By LIU JUN*

Everyone is talking about liquidity. From the stock market crash in the last quarter of 2018, to the recent turmoil triggered by the freezing of redemptions on a fund run by Neil Woodford, a star UK stock picker, investors are worrying about the risks of not getting their money back.

Similar fears are testing nerves in China's interbank market, the main financing platform for financial institutions. The event that sparked panic was the announcement on May24 that the People's Bank of China was seizing Baoshang Bank, an Inner Mongolia-based lender, amid credit risk concerns.

The idiosyncratic problems faced by a little-known regional bank unexpectedly drove the overnight lending rate up by dozens of basis points, and the issuance of negotiable certificates of deposit — short-term liquid debt instruments — by second and third-tier banks came to a near halt.

The incident harks back to the liquidity shock of June 5 2013, when social media spread misleading information about a lending dispute between two banks.

Panic followed a relatively normal late-payment transaction and the term qianhuang, or "money famine", was coined. The ensuing liquidity crunch lasted more than three months and pushed up the overnight rate to a peak of more than 10 per cent.

There are multiple possible explanations for such an extreme reaction.

The first plausible cause would be if the supply of macroeconomic liquidity had fallen below a viable minimum. But this was not the case: PBoC data on the Aggregate Financing to the Real Economy — the volume of funds provided to the private sector by China's domestic financial system — show annual growth rates in double digits. Though the rate has fallen from a high of about 50 per cent in 2004 to a low of 11.2 per cent in 2019it is still ample to support GDP year-on-year growth —which declined to 6.2 per cent in the second quarter of this year, according to figures released on Monday.

A second possible explanation might be a collapse of market liquidity via a significant change in the interbank supply-demand relationship a market that represents the overwhelming majority of the institutional financing activities. Yet here, too, there has been no significant disruption. The dominant suppliers of liquidity are the commercial banks. In particular China's Big Four— Bank of China, China Construction Bank, Agricultural Bank of China and Industrial and

*This article first appeared in Financial Times on July 17, 2019.

*Liu Jun, Member of IMI Academic Committee, Vice President, China Investment Corporation

Commercial Bank of China — use their vast branch networks to suck up huge supplies of customer deposits.

On the receiving side are hundreds of banks: joint-stock lenders, city commercial and rural commercial banks and co-operatives. As the big banks turn on the tap the smaller ones are flooded with liquidity. And most individual savingsstill end up with the big banks, despite a behavioural shift among younger investors.

But the third explanation is potentially the most powerful. This centres on changes in what might be termed psychological liquidity and relates to market participants perception of factors ranging from the real supply-demand dynamic to the herd effect of market panic. Investors often overreact to negative events such as the Baoshang case— the subsequent psychological liquidity freeze can thus lead to a very real liquidity squeeze in the marketplace.

All developed economies exhibit these three dimensions of liquidity. But in China, the psychological element exerts outsized influence. The root cause lies in China's system of indirect financing.

Total bank assets amount to about Rmb270tn ($39tn) compared with just Rmb30tn ($4.4tn) for other financial institutions, according to the latest data. The commercial banks clearly determine whether liquidity is tight, neutral or loose. Given that they share the same business mix and have a similar blend of commercial shareholders with substantial state-owned stakes, their operating models and risk appetites are similar too. The systemic homogeneity naturally leads to parallel market behaviours — as dominant operators in the market, with no countervailing forces, it is easy to see how negative events can be over-interpreted.

A restructuring of China's financial system is imperative if its liquidity challenges are to be addressed. First, market financing facilities inequity and debt should be promoted in order to wean the economy off an overdependence on bank lending. A second natural priority should be the development of a multi-layered capital market to satisfy the various financing needs of companies at various stages in their life-cycles.

Until then, market participants need to be well diversified to avoid the one-way lurches that result from the current structure of financing.

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China Must Rethink Growth Model*

By MARK SOBEL*

The global press treats readers to a daily diet of US-alleged harmful Chinese trade and currency practices, as if this were the only Chinese economic story.

Last week, the International Monetary Fund released its 2019 China Article IV staff report. It offers a welcome respite from the press fare. Inevitably, it addresses trade and exchange rate issues, but frames them intelligently in the broader context of the enormous challenges facing China's growth model, urging a shift away from 'high speed' to 'high quality' growth.

For many years, China's growth has been investment-led, fuelled by massive credit allocation to state-owned enterprises. But credit growth became excessive, in part due to over-investment, the misallocation of capital and the rise of shadow banking, posing major economic and financial risks. Cracking down on shadow banking and leverage, however, caused a significant slowdown late last year and early into this year. Nevertheless, China is seemingly doubling down on its state-led growth model and SOE credit, in part to arrest slowing.

The IMF points to declining Chinese productivity growth, noting that by 2030, growth may moderate to 4% as the economy shifts to more consumer- and services-led growth, productivity converges toward the 'frontier' and the demographic kink kicks in. The economy is less successful now in combining labour and capital inputs, and more investment is needed to generate output.

To adjust its growth model and make its economy more sustainable and balanced, the IMF suggests China should focus on 'quality'. To deliver high quality growth, the country will face a daunting agenda.

Its fiscal debt is elevated, taking into account contingent liabilities. Fiscal space exists, but China will need to show restraint, while creating a more progressive tax system and knitting a better social safety net.

Leverage is excessive. Credit growth should be restrained in line with GDP growth. China should increase the market orientation of the financial system, cut back on the share of funds allocated to SOEs, and allow greater scope for private sector financing.

Structural reform is key. SOE reforms should be intensified, product markets liberalised and the services sector opened to greater competition.

The IMF believes the US allegations of Chinese currency manipulation are without merit. China's external position is broadly in line with fundamentals. The current account surplus is projected around 0.5% of GDP and the country has not been accumulating reserves in recent years.

The Fund backs greater renminbi flexibility, noting flexibility can be a shock absorber in the face of further trade tensions. That is a recipe for a weaker renminbi should US tariffs rise further.

But other IMF refrains might put a smile on US Trade Representative Robert Lightizer's face. The Fund observes that tackling the large role of the state, including industrial policy, requires progress. It notes that opening up China's economy is consistent with past IMF recommendations and would boost China's medium-term economic prospects.

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*This article first appeared in OMFIF Commentary on August 14, 2019.

*Mark Sobel, US Chairman of OMFIF

These admonitions align with the Fund's recommendations to give market forces a greater role in the economy, curb preferential credit allocation to SOEs and boost the private sector. A better safety net would reduce high saving and, all other things equal, tend to restrain current account surpluses. Further, the Fund references concerns, inter alia, about China's foreign investment regime, intellectual property protection and technology transfer policies.

The IMF predictably calls for all countries to support an open, transparent, multilateral, rules-based trade regime, and avoid bilaterally-managed trade.

The report's sensible thinking is unlikely to impact the US and China for the betterment of the global economy. One is somewhat reminded of the African proverb – when two elephants fight, it is the grass that suffers. China is already embarked on many of the Fund's recommended reforms and does not see itself as the aggressor in trade and currency wars. Washington will probably not be moved.

Be that as it may, the Fund's China Article IV helps put trade and currency wars into a more constructive perspective, which if heeded, would better facilitate understanding and progress.

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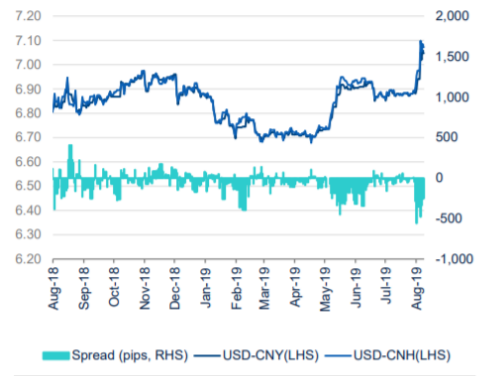
RMB Depreciation--This Time is Different*

By DONG JINYUE AND XIA LE*

RMB exchange rate plunged past 7 after Trump's recent tariff threat On August 5th, the CNY/USD fell past the important psychological level of 7 for the first time since 2008. The sharp depreciation came amid the renewed escalation of the China-US trade war after the US President Donald Trump threatened to impose a 10% punitive tariff on the remaining China's exports of USD 300 billion. On that day, the People's Bank of China (PBoC) set its daily mid-price of CNY at a level weaker than 6.9 and then allowed the CNY to slide during the trading time without any intervention. As a result, the CNY/USD tumbled -1.6% to 7.05 on August 5th. In the offshore market, the CNH exchange rate depreciated deeper than its onshore price. (Figure 1)

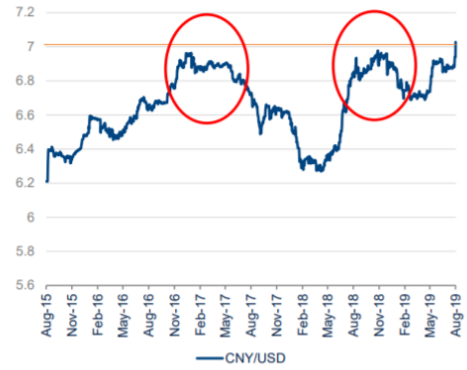
Throughout the week, the PBoC continued to fix a weaker mid-price and allow the CNY to hover around in the region above 7. The central bank's behaviors are quite different from two previous episodes in late 2016 and late 2018 when the market forces drove the CNY close to the level of 7 while the PBoC intervened heavily into the market to avert hitting the level of 7. (Figure 2)

Figure 1 **Both CNY and CNH exchange rate dipped beyond 7 and the discrepancy enlarged as well**



Source: BBVA Research and CEIC

Figure 2 **CNY to USD exchange rate plunged beyond 7, which has been an important psychological level**



Source: BBVA Research and CEIC

The policy motivations behind the sharp depreciation are multifold. First, it is in response to President Donald Trump's tariff threat. The currency appreciation implied that Chinese policymakers will take a tougher stance on the ever-escalating trade dispute with the US. In the past, China's authorities painstakingly kept the currency stable so as to alleviate President Trump's critique of currency manipulation. Second, through currency depreciation, China's authorities have released more policy room in case of further deterioration in external environment. Despite the significant slowdown in growth momentum, China has been refrained from using monetary policy easing to stimulate the economy. The concern of maintaining exchange rate stability is one of important reasons why the authorities are reluctant to loosen its monetary policy further. The break of the 7 level in the exchange rate has in essence rendered

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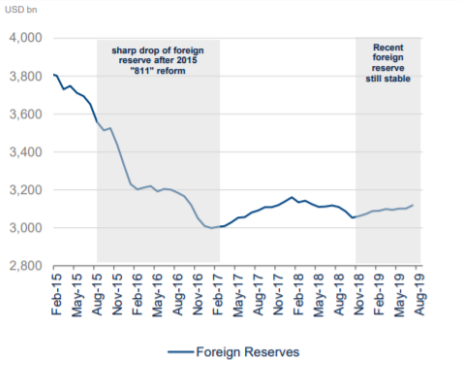
more policy room to the authorities. In future, they will have more freedom to use monetary policy tool to cushion the shock from trade tension escalation.

Will the depreciation lead to financial turmoil as in 2015?

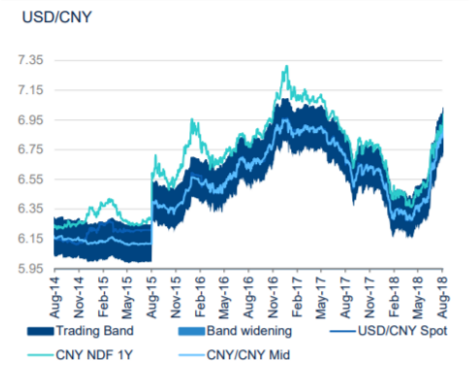
This time is different The sharp depreciation is reminiscent of the infamous episode of RMB devaluation four years ago. On August 11th 2015, the People's Bank of China (PBoC) attempted to introduce a market-based pricing mechanism of the RMB in a bid to offset the then intensifying growth headwinds through currency depreciation. The reforming efforts proved to be unsuccessful just in a couple of weeks after the devaluation itself caused unexpected financial turmoil. Massive capital outflows, primarily driven by market panic, led to a vicious circle of capital flight and currency depreciation. The PBoC finally had to roll back the short-lived pricing mechanism.

Figure 3 **The foreign reserve is more stable at the current stage than the aftermath of 2015 "811" reform**



Source: BBVA Research and CEIC

Figure 4 **This time the authorities kept the currency's pricing mechanism intact**



Source: BBVA Research and CEIC

In the aftermath of this unsuccessful reform, the RMB entered into a phase of persistent depreciation until January 2017. The onshore exchange rate depreciated from 6.20 in August 2015 to 6.95 early 2017. Over the same period, the PBoC lost almost 30% of its foreign reserves as a result of frequent market interventions. (Figure 3)

We would like to argue that the recent depreciation of the RMB, albeit past the psychological level of 7, is unlikely to lead to financial turmoil like in 2015:

First and foremost, this time the authorities kept the currency's pricing mechanism intact, in stark contrast to the case of 2015 when the authorities attempted to leave the pricing function to the anchorless market forces entirely. Now the authorities still have a great say in determining the mid-price (or opening price) of the RMB exchange rate. Moreover, the permissible trading range of the RMB exchange rate is defined as +-2% around the mid-price per day. That being said, the authorities can effectively confine the movement of the exchange rate in a desirable range every day, averting a self-fulfilling trend of currency depreciation witnessed in 2015. (Figure 4)

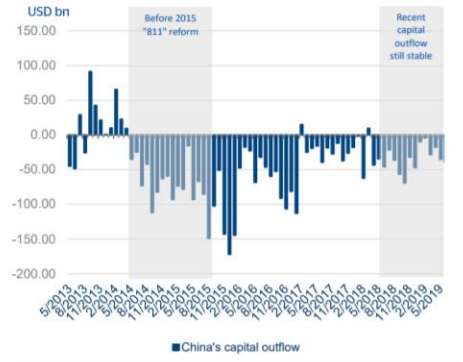
Second, the authorities have accumulated valuable experience over the past few years through their practice of maintaining FX market expectations. Since Monday of this week, the PBoC has significantly raised their voices to communicate to the market so as to manage investors' expectations and avoid market panic. Meanwhile, the authorities are now equipped with more tools to maneuver the exchange rate in both onshore and offshore market. In particular, the Ministry of Finance and the PBoC currently go to Hong Kong's offshore market regularly to issue RMB-denominated treasury bonds and central bank bills. Through the issuance of these

RMB products, the authorities could flexibly adjust the RMB liquidity in the offshore market and thereby stabilize the currency's offshore exchange rate.

Last but not least, China's authorities still maintain a tight grip of the country's capital account, making it almost impossible to see a large-scaled capital flight. The current situation is in stark contrast to the case in 2015 when the authorities substantially relaxed restrictions to allow capital to flow freely across the border. Since the currency devaluation of 2015, China's authorities have painstakingly been enhancing their monitor and management of the capital account. For the positive side, those capital account restrictions introduced in the aftermath of 2015 devaluation will effectively prevent the vicious circle of currency depreciation and capital flight. (Figure 5)

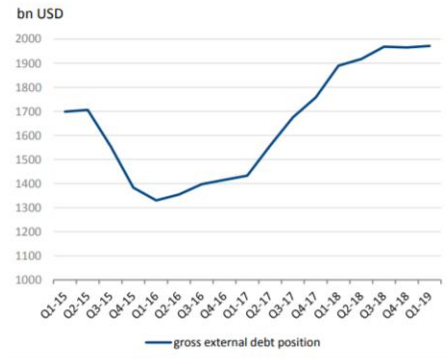
However, some challenges are still here. For instance, compared with 2015, Chinese foreign debt outstanding has been on the rise, which might trigger capital outflows when RMB exchange rate going down similar as in 2015. Together with the continuing economic slowdown, this gives policy makers more challenges to strengthen the capital control measures at the current stage. (Figure 6)

Figure 5 **Capital outflows remain manageable compared with 2015**



Source: BBVA Research and CEIC

Figure 6 **Chinese foreign debt which might trigger capital outflows is still of concern**



Source: BBVA Research and CEIC

RMB exchange rate outlook: All in all, we believe that the current depreciation of the RMB won't repeat the history of the currency devaluation in 2015 to plunge the country's financial system into turmoil. For the moment, China's authorities have no intention to initiate a bout of deep depreciation. That being said, the prospect of China-US trade talks will dictate the evolution of the RMB exchange rate in the short term.

We define two scenarios for the RMB exchange rate at end-2019: in the first scenario, if China-US trade war maintains the current situation, particularly, 10% tariff on the USD 300 billion goods without further escalation, the RMB exchange rate is expected to fluctuate around the level of 7.15 at end of this year; in the second scenario, the RMB exchange rate could further plunged to 7.4-7.5 if both sides further escalate the trade war in the second half of the year, such as to raise the tariff to 25% for all the Chinese exports to the US.

IMI International Monetary Review

U.S. Currency Wars with China: Past and Present *

By STEVE H. HANKE*

In a purely political move, the Trump administration (read: the U.S. Treasury) has branded China as a currency manipulator. This is an act of war. After President Trump announced that even more tariffs would be imposed on China, the markets took the value of the Chinese yuan down a notch or two. So, who was "manipulating" the yuan, Beijing or Washington? Well, it looks like Washington is engaging in yet another Asian currency war.

As it turns out, the United States has a long history of waging currency wars in Asia. We all know the sad case of Japan. The U.S. claimed that unfair Japanese trading practices were ballooning its bilateral trade deficit with Japan. To "correct" the so-called problem, the U.S. demanded that Japan adopt an ever-appreciating yen policy. The Japanese complied and the yen appreciated against the greenback from 360 in 1971 to 80 in 1995 (and 106, today). But, this didn't close the U.S. trade deficit with Japan. Indeed, Japan's contribution to the overall U.S. trade deficit reached almost 60% in 1991. And, if that wasn't enough, the yen's appreciation pushed Japan's economy into a deflationary quagmire.

Today, the U.S. is playing the same baseless blame game with China. And why not? After all, China's contribution to the overall U.S. trade deficit has surged to 47%.

America's recent declaration of economic war against China isn't the first time the U.S. has used currency as a weapon to destabilize the Middle Kingdom. In the early 1930s, China was still on the silver standard, and the United States was not. Accordingly, the Chinese yuan-U.S. dollar exchange rate was determined by the U.S. dollar price of silver.

During his first term, President Franklin D. Roosevelt delivered on his Chinese currency stabilization "plan." It was wrapped in the guise of doing something to help U.S. silver producers and, of course, the Chinese.

Using the authority granted by the Thomas Amendment of 1933 and the Silver Purchase Act of 1934, the Roosevelt Administration bought silver. This, in addition to bullish rumors about U.S. silver policies, helped push the price of silver up by 128% (calculated as an annual average) in the 1932-35 period.

Bizarre arguments contributed to the agitation for high silver prices. One centered on the fact that China was on the silver standard. Silver interests asserted that higher silver prices — which would bring with them an appreciation of the yuan against the U.S. dollar — would benefit the Chinese by increasing their purchasing power.

As a special committee of the U.S. Senate reported in 1932: "silver is the measure of their wealth and purchasing power; it serves as a reserve, their bank account. This is wealth that enables such peoples to purchase our exports." But, things didn't work as Washington advertised. They worked as "planned," however. As the dollar price of silver shot up, the yuan appreciated against the dollar. In consequence, China was thrown into the jaws of the Great Depression. In the 1932-34 period, China's gross domestic product fell by 26% and wholesale prices in the capital city, Nanjing, fell by 20%.

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*This article first appeared in Forbes on September 6, 2019.

*Steve H. Hanke, Member of IMI International Advisory Board, Professor of Applied Economics at the Johns Hopkins University.

In an attempt to secure relief from the economic hardships imposed by U.S. silver policies, China sought modifications in the U.S. Treasury's silver-purchase program. But, its pleas fell on deaf ears. After many evasive replies, the Roosevelt Administration finally indicated on October 12, 1934 that it was merely carrying out a policy mandated by the U.S. Congress. Realizing that all hope was lost, China was forced to effectively abandon the silver standard on October 14, 1934, though an official statement was postponed until November 3, 1935. The abandonment of silver spelled the beginning of the end for Chiang Kai-shek's Nationalist government. America's "plan" worked like a charm — Chinese monetary chaos ensued. This gave the communists an opening that they exploited — one that contributed mightily to their overthrow of the Nationalists.

Today's currency war with China promises to deliver what currency wars always deliver: instability and uncertainty. And with that, it's becoming clearer with each passing day that President Trump will not be the 2020 "Peace and Prosperity" candidate.

IMI International Monetary Review

Hong Kong's Real Problem is Inequality*

By ANDREW SHENG AND XIAO GENG*

A powerful, but oft-ignored factor underlying the frustrations of Hong Kong's people is inequality. And, contrary to the prevailing pro-democracy narrative, the failure of Hong Kong's autonomous government to address the problem stems from the electoral politics to which the protesters are so committed.

Since China regained sovereignty over Hong Kong on July 1, 1997, the city has prospered economically, but festered politically. Now, one of the world's richest cities is engulfed by protests, which have blocked roads, paralyzed the airport, and at times descended into violence. Far from a uniquely Chinese problem, however, the current chaos should be viewed as a bellwether for capitalist systems that fail to address inequality.

In times of crisis, it is easy for emotion to overwhelm reason, and for dramatic and deceptive narratives to take root. This tendency is exemplified by media reports that frame the unrest as a clash of cultures symbolizing a broader global struggle between autocracy and democracy, or references to a "fight between two civilizations," as Hong Kong legislator Fernando Cheung put it.

Such narratives often treat "democracy" as synonymous with improved welfare – a characterization that is not borne out by the facts. As the political scientist Francis Fukuyama has conceded, centralized, authoritarian systems can deliver economic outcomes that are superior to decentralized, inefficient democratic regimes. It is also worth pointing out that officials like Cheung are free to criticize China's government on the international stage.

Those who think that China's government will resort to a military-led crackdown forget Sun Tzu's dictum that winning wars without fighting is the "acme of skill." China's government is well aware that if Hong Kong becomes a political or ideological battleground, peace and prosperity will suffer in both the city and on the mainland. Given this, it is willing to go to great lengths to uphold the "one country, two systems" arrangement that forms the basis of its sovereignty over Hong Kong.

What China's government is not willing to do is consider independence for the city. Like a parent dealing with a frustrated teenager, China views the current upheaval as a family matter that must be resolved internally. The appeals of some Hong Kong protesters for outsiders like the United States to intervene are not only unhelpful; they fail to appreciate the long and destructive track record of US-led "democracy-building" efforts around the world, from Central America to Central Asia.

The reality is that Hong Kong is already operating as a living experiment in how the rule of law and electoral democracy can work within the Chinese context. The city ranks 16th in the World Justice Project's Rule of Law Index, right behind Japan and ahead of France (17th), Spain (21st), and Italy (28th). On electoral democracy, however, there are significant challenges, which have little to do with the mainland.

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*This article first appeared in Project Syndicate on August 27, 2019.

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A powerful, but oft-ignored factor underlying the frustrations of Hong Kong's people is inequality. Hong Kong's Gini coefficient – in which zero represents maximum equality and one represents maximum inequality – now stands at 0.539, its highest level in 45 years. By comparison, the highest Gini coefficient among the major developed economies is 0.411 (in the US).

This inequality is most starkly apparent in housing. The per capita residential space in Hong Kong is just 16 square meters (172 square feet), compared to 36 square meters (387 square feet) in Shanghai. Moreover, whereas nearly 45% of Hong Kong's residents live in public rental or subsidized housing, 90% of Chinese households own at least one home.

Yet, despite having fiscal reserves of more than HKD$1.2 trillion ($147 billion), Hong Kong's autonomous government has failed to address inequality, precisely because of the electoral politics to which the protesters are so committed. The city's Legislative Council – whose members are elected through a complicated process based on proportional representation – is too politically and ideologically divided to reach consensus.

Unable to push through tough reforms to subdue vested interests, as China's government is doing on the mainland, the Council is also vulnerable to the influence of real-estate developers eager to block measures that would lower prices, such as the allocation of land for more public housing.

Some companies are reportedly hoarding large amounts of unused rural land, either directly or through shell companies, precisely to constrain supply.

Hong Kong's protesters believe they haven't been heard. But it is the city's own elites, not China's government, who have failed them. Hong Kong's leaders were so thoroughly out of touch with ordinary people that the protest movement took them by surprise, despite signals from social media and the free (though adversarial) press.

This means that, beyond addressing concrete problems like high housing prices, Hong Kong will need to reopen channels of communication between the public and policymakers. This will not be easy – not least because the protest movement lacks any clear leaders. But some consensus on how to move forward as a community will be needed to ensure the government's legitimacy while it implements needed reforms.

It will take time for Hong Kong to recover from these months of upheaval. But all Chinese, from Beijing to Hong Kong, know that there are no quick fixes or decisive battles. Progress is a never-ending series of small steps, many of which must be made in difficult conditions. The only way to succeed is with humility, patience, wisdom, and a sense of shared destiny.

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Belt and Road Initiative

Role for Chinese Commercial Banks in the Belt and Road Initiative

By HERBERT POENISCH*

China's meteoric rise to become second economy in the world is not only a tribute to the size of China but also to the hard work of the Chinese population and the wise policy by the Chinese leadership.

In addition to a big manufacturing base, a major link in the international value added chain, China is now the major commercial power in the world, acting as major trading partner for more than 50 countries world wide. The partnership is not only on the export side but also on the import side. In addition, Chinese know-how and prowess is visible in more than 70 countries after President Xi Jinping launched the Belt and Road Initiative (BRI) in 2013.

While commerce has become mainly a private affair, with trading partners concluding agreements and exchanging goods, the BRI so far has been a government to government affair. The work is done by Chinese government linked enterprises financed by the policy development banks, first and foremost the China Development Bank (CDB) and the China Import and Export Bank (CMXB). It seems to be accepted that after the initial push, there is ample room now for other enterprises to join and financing being provided by the major Chinese as well as foreign commercial banks.

The article will first present historical examples of banks following trade and investment by previous global powers, the United Kingdom (UK) and the Unites States of America (US). In their cases the banks followed the flag, providing finance for trade and investment of their private companies. Thanks to this strategy, British banks still play a global role long after the demise of the British empire and US banks still enjoy a global role thanks to the US economic global predominance in the 20th century.

In the second part, the presence of Chinese banks in the current global environment will be scrutinised. How is their global presence organised, such as financing from the head office and their branches and subsidiaries abroad and how important are their cross border activities? Are they following the international banking model or have already turned into global banks? How do they rank among the other global banks in the Bank Internationalisation Index?

In the third part the Belt and Road strategy, in particular the financing side will be analysed. While the Chinese policy banks have shouldered the main burden of the BRI, the Chinese leaders have opened the door to a different business model, with financing provided by the commercial banks and private investors. This is not only confined to Chinese banks but could also involve foreign banks.

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Finally, if Chinese commercial banks were to play a bigger role in the BRI, what would that mean for the form of their participation. While there is no doubt about the top down leadership defining the BRI, the implementation could be an excellent business case for Chinese banks to show their prowess. They could seize the financial and reputational incentive when the policy banks reach their limitations. Would they simply act as agents of the Chinese government or would they participate in their own right? The latter would require the necessary safeguards, such as compliance with international standards such as due diligence and feasibility assessment.

The article will conclude, that Chinese commercial banks can and should pick up the challenge, showing the world, both the investment partners and critiques that they are not in game for political ends but for purely commercial reasons, providing finance for sound infrastructure projects.

1. Historical expansion of national banking systems

The recent history, ie over the past 300 years has seen the industrial revolution, rise in international trade followed by the emergence of international finance. The result was a cumulative process, that countries became first manufacturing powers, then trading powers and finally financial powers.

The dominant ones with a global outreach were the UK since 1800 and the US since 1900. They will provide the historical examples here. Other global powers before were the Dutch and the Spanish. Reaching further back, the Italian bankers in Florence and Genoa were the centres of the financial world, financing the Spanish expeditions to discover the New World.

There seems to be a pattern in development, the so called hegemonic cycle. Countries became vibrant manufacturers first following the industrial revolution. At this stage financing from banks was secondary to financing from equities. This development coincided with the age of imperialism, when countries reached out to far away territories as suppliers of raw materials and markets for finished products. The next stage was commerce, when the dominant powers became major traders of goods and raw materials. The expeditions were financed by private sources and enacted by private companies such as the East India Company. Colonial banks were established to finance trade, import of commodities and export of manufactures. The UK government was deeply divided over joining such endeavours.

During these two stages banks' growth was domestically determined. They provided financial services for the government and domestic merchants. Banking business was based on trust, which only existed among nationals, national legal norms and national courts. Once these conditions were established in the overseas territories, overseas banks, such as the Oriental Bank provided finance for those which were under their jurisdiction. The mother country provided political, economic and legal stability. Outside the British empire, they faced alien political, legal and cultural systems.

British colonies became bases for banking and finance, notably Australia, India, South Africa, but also Hong Kong and Singapore. Under Colonial Banking Regulations of the 1830s Royal Charters were given to newly established banks to operate in a limited geographical area. London was then and still is the paramount financial centre of the world. In a first phase, the overseas banks raised capital on the London Stock Exchange and financed their local lending by local deposits. They performed payment functions through issue of bills of exchange. Their reserves were Sterling balances in London. Keeping and moving balances in Sterling in London was the only accepted global means of payment.

From mid 19th century until WW1 London accumulated huge reserves which had to be recycled through capital exports. Its financial network acquired unique financial expertise and housed the major financial institutions, banks, insurances and brokers and determined standards

and rules for the financial industry, providing a fair and transparent environment for the legal and accounting profession until today. During the apex of London's power, foreign funds flowed into London and foreigners were allowed to issue securities, with banks acting as brokers.

Once Britain's manufacturing and commercial power was eclipsed by the US in the first half of the 20th century, funding for global financial operations in London became inadequate. Attempts were made to restore the UK Sterling to its previous glory, such as the return to the gold standard, which failed. Thus foreigners did not put trust into Sterling but the newly rising USD which was more useful in acquiring real resources. The final blow was dealt to Sterling by the financial realities of the WW2.

After WW2 the world financial locations remained the same, London and the offshore centres, but soon the world currency changed.

By the mid 20th century the US had become the major world manufacturing power, but not yet the commercial power nor financial power. US banks were domestic institutions based on domestic funding and lending. World shipping, commerce and finance was still based in London.

The rise of US commerce began after WW2 when the surplus production of US goods, together with provision of finance to major trading partners under the Marshall plan necessitated some financial underpinning. The Marshal plan itself was operated by trading partner governments without US banks playing any major role. US banks started playing a global role when the recycling of trade surpluses from the US became a major task.

US banks followed the UK model, concentrating their lending on US corporations who were eager to go out into the world purchasing raw materials and setting up and/or acquiring operations abroad. Another major engine for US internationalisation were the overseas wars the US got involved in. First the Korean war and then the Vietnam war. As a result, the US became not only a major commercial power but also a financial power as USD flooded the world. US banks imported funds and channeled them back into domestic operations. From 1950 to 1990 the number of overseas branches increased from 95 to 1000.

From the 1960s onwards USD surpluses did not return to the US but stayed outside as Eurodollars due to US regulations. London snatched the moment and attracted these funds thanks to its superior financial infrastructure mentioned before. This offshore activity was not perceived as danger for the highly regulated world financial system. Before long, US banks set up in London, working next to the established UK banks to put this liquidity to good use. US banks set up in other countries served only US manufacturing and trading interests. However, the network covering the globe became available to foreigners to use advanced US banking services as well as new financial techniques. US banks were there to do business and compete with local banks.

After the Great Depression, for most of the 20th century US banking was separated into commercial and investment banking as a result of the Glass-Steagall Act in 1933. As from 1971 floating exchange rates expanded new financial techniques through financial speculation and hedging activities, as well as new techniques for liquidity and risk management, such as derivatives. All this financial expansion occurred on the basis of the global role of the USD. At this stage banks were riding the wave of financial expansion, but they were soon eclipsed by the financial markets.

Similar to developments in the UK, manufacturing and commerce declined, opportunities for productive investment declined, while financial instruments offered high rates and capital gains, corporations channeled large amounts into the financial markets. Commercial banks sought to keep their share by financial engineering which failed after the repeal of the separation of the Glass-Steagall Act in 1999, ending in the financial crisis of 2008.

What are the main lessons from UK and US banks' globalisation. Firstly banks follow manufacturing but mostly commercial interests for their own nationals. Secondly, as countries' manufacturing and commerce sectors decline, banks play a major role in propagating finance for its own sake, money to make money. Finally, banks stay within a well defined regulatory, legal and accounting environment. Having global standards and obeying them, such as the Basel capital standards helps their standing with shareholders. The stock markets are the masters of global banks who punish excessive risk taking.

2. Chinese banks' cross-border operations

While traditionally Chinese banks confined themselves to major financial centres, such as London, New York, Hong Kong, Singapore and Tokyo, since the 'going out' by enterprises and banks has been declared a strategy by the Chinese leaders in 2008, a rush by Chinese enterprises and commercial banks has swept the world. They participate in mergers with and acquisitions of established institutions, setting up branches (preferred) or subsidiaries and representative offices, subsequently called affiliates. In the case of China, lending is done through all four categories of affiliates.

A case in point for mergers and acquisition is the purchase of Standard Chartered Bank operations by Industrial and Commercial Bank of China (ICBC) in Argentina with branches in Latin America. A case for a branch is Bank of China (BOC) in Singapore. A case of wholly owned subsidiary is the Bank of China (UK) in London, incorporated in the UK and supervised by the BoE. Lending through representative offices are initiated there and booked through other affiliates.

While the number of affiliates has been disclosed with pride by Chinese banks, the volume of their overseas business has been shrouded in mystery, even more so their cross-border RMB business. Therefore their actual claims and liabilities will be taken from the balance of payments published by SAFE and the BIS locational banking statistics (LBS), also published on the SAFE website. China does not report data for the consolidated statistics (CBS). The LBS shows both series, lending from banks resident in China (including policy banks) and from China registered banks worldwide in close to 50 jurisdictions reporting to the BIS. It can be assumed that lending from China on the claims side is performed by Chinese owned banks which conduct cross-border business. Foreign owned banks in China receive cross-border funds from their head offices which count as liability for China.

As a recent BIS study shows, Chinese banks lend globally through their affiliates rather than through the head office. While advanced country banks lend 60% of their cross border lending from their head offices, the EME owned banks lend mainly from their affiliates. This is not reflected in the balance of payments, as this is compiled on a residency base. The statistics therefore show the following picture.

Table 1 shows the balance of payments of China, the financial account item 'other investments' in particular. This includes finance other than direct investment (which creates ownership), portfolio investment and derivatives. Over the past 5 years, since the inception of the BRI, banks resident in China increased their cross border net assets, except in 2017 when Chinese entities were encouraged to repatriate funds from abroad.

Table 1: China Balance of Payments, other investment flows, in bn USD

	2014	2015	2016	2017	2018
Total	-2788	-4340	-3167	+519	-770

Assets	-3289	-825	-3499	-1008	-1984
Liabilities	+502	-3515	+332	+1527	+1214

Source: SAFE data, in total +equals inflows and -equals outflows, assets -equals increase in assets, capital outflows, liabilities +equals increase in liabilities, capital inflow www.safe.org.cn

The BIS locational banking statistics which are based on a territorial principle and thus comparable to the BOP show the following picture of stocks in Table 2 (China has been a reporter only since 2016).

Table 2: BIS locational banking statistics, outstanding at year end, in bn USD

	2016	2017	2018
Total	-86	-281	-182
Assets	894	998	1116
Liabilities	980	1279	1298

Source: BIS banking statistics table CN5 www.bis.org/statistics

Even before China became a reporter to the BIS, China always received more funds from abroad than it sent abroad. This was due to borrowing by Chinese banks in the international interbank market and borrowing from their head office by foreign owned banks resident in China. Interbank funds make up about half of claims and liabilities of cross border business. There is no breakdown into intra-bank financing which would show the importance of funding from head office.

The picture changes again when looking at the cross-border business by Chinese owned banks worldwide (in 50 countries and regions reporting to the LBS). As shown in Table 3, Chinese banks are net lenders to the world reflecting their business model mentioned earlier, mainly lending from branches.

Table 3: BIS locational banking statistics, outstanding at year end, in bn USD

	2016	2017	2018
Total	+163	+94	+192
Assets	1732	1981	2177
Liabilities	1569	1884	1985

Source: BIS banking statistics table CN7 www.bis.org/statistics

One can combine tables 2 and 3 to obtain the cross border lending and deposits from branches of Chinese banks in the 50 countries and regions reporting to the LBS. They include the main finance hubs and offshore locations, such as Hong Kong, Singapore, London, Tokyo, New York.

Table 4: Offshore lending of Chinese owned banks, year end in bn USD

	2016	2017	2018
Assets	838	983	1061
Liabilities	589	605	687

Source: BIS statistics, tables CN5 and CN7 combined www.bis.org/statistics

China operates the largest bank operations of their overseas affiliates, making up 64% of all business of all EME owned banks. Others are banks from BRICS countries and Singapore.

Turning finally to the Bank Internationalisation Index 2018 compiled by AIF of Zhejiang University, the big five Chinese commercial banks top the list of largest overseas asset and list

of biggest overseas profits. In the list of globally active banks BOC is in place 6, ICBC in place 11, CCB in place 21, COCOM in place 24 and ABC in place 25.

To sum up, the global spread of Chinese banks and their total international lending are a solid bases for increased support for the BRI during its second phase.

3. The opportunities from the Belt and Road Initiative

The Belt and Road Initiative (BRI) was initiated by President Xi Jinping in 2013. The first BRI Forum took place in 2017 and the second one in 2019. While the thrust of this initiative was welcome by most recipient EME, on the donor side there was hesitation to join. The main reason was that the details such as terms and conditions of finance, return on investment, viability were not disclosed.

3.1 BRI first phase

In the first phase it was a government to government agreement where commercial criteria did not matter much. The call during the first Forum for foreigners to join was left unheeded. The Chinese government used their policy banks, first and foremost the CDB and CMXB to finance the projects. The ownership of the projects was also opaque and left the impression that China was in charge and might take over the whole project at some stage.

This impression was reinforced by the design of the project management. The CDB and CMXB set up various funds to initiate, plan, procure, finance, build, and possible run the projects. One example is the China Eurasia Economic Cooperation Fund under the leadership of the CMXB also with the participation of the BOC. Other funds are for China-ASEAN regional cooperation, China-LatAm cooperation, China-Arab cooperation, China-African cooperation. Other donors are the Silk Road Fund, State Administration for Foreign Exchange and Buttonwood as sovereign wealth funds. The way of handling projects, whether confined to one country or to a number of countries such as economic corridors was like a multinational development bank. The members of the funds are in charge of all aspects of projects until the handover to recipient governments.

These funds resemble established financing vehicles. The are like closed end funds with members owning a certain share in the fund. The total value of the fund can increase or decrease depending on the return on investment. However, they are not quoted on exchanges. Funds based on lending resemble a syndicated loan vehicle. There are also mixed funds with an equity component as well as a lending component. The bottom line is that Chinese public funds are at risk.

Although the figures available so far for 2017 are USD 110bn by the CDB and USD 80bn by the CMXB, the total amount disbursed by these banks cannot be measured precisely. Do these figures include funding for Chinese government linked enterprises domestically, such as the China Communication and Construction Company? Do they include trade finance extended to the funds by the CMXB to purchase Chinese machinery and equipment? The Chinese commercial banks also got involved, the ICBC with some USD 160bn in non-concessionary loans, the BOC with USD 100bn also non-concessionary loans, and also CCB and ABC with smaller amounts. It was a rather safe bet for them as implicit government guarantees did not call for risk assessment of the funds' projects. However, market sources of finance were not tapped and foreigners were reluctant to join these opaque project management structures.

Over the years, the assessment of the financial viability of the projects, the risk-return profile on investment, other commercial considerations and debt limitations of the borrowers have raised criticism abroad and rethinking by Chinese authorities. Any government spending came under scrutiny in the drive to reduce the debt financing in the Chinese economy. The BRI projects boosted economic growth by exporting Chinese know-how, machinery and equipment

and prevented the downsizing of certain industries. Unfortunately it was part of the debt-financed economy, where the credit risk as well as other risks were borne by Chinese policy and commercial banks. The latter are already burdened by risky domestic lending to SOE and sub-national governments.

In the end a modern world class infrastructure such as China has built over the past few years under the BRI is desirable but the ability to pay by recipients is as uncertain as ever. Very often officials in recipient countries signed on the dotted line without much scrutiny.

3.2 BRI second phase

During the second BRI Forum the tone changed radically, calling the initiative investable and bankable (para 18 of the communique). Details go even further (para 30 of the communique) when national and international financial institutions are invited to join, calls to mobilize private capital and local currency financing are added. During history major infrastructure projects abroad were mostly financed by private funding. The same is true for modern times.

Former PBoC Governor Zhou Xiaochuan in his speech at the BRI Forum 1 called for a market oriented approach, sustainable, a mutually beneficial investment and financial system. Solid finance should rest on two legs, public financing as well as private financing. Public financing consists of the budgetary financing, lending from the development banks, the sovereign wealth funds and bonds issued by banks (Silk Road Bonds) and the borrower governments. Private financing consists of loans from commercial banks, capital market financing through bonds and equity. Securitisation of loans would turn BRI loans into investable products.

Looking at the public financing, from the Chinese side, creativity has been used to avoid direct financing from the budget. There are still unexplored possibilities through special tax regimes for Chinese companies participating in the BRI as well as write off facilities for banks and companies.

The official bond issues for RBI in RMB have been modest, although the domestic RMB bond market is the second largest in the world. Domestic issues such as by participating banks and companies have be earmarked as Silk Road bonds which have already become an asset class. Foreigners should be able to issue Panda bonds in the domestic market. So far only the governments of Philippines and Malaysia have been allowed to issue such bonds. There are still 70 countries out there to tap this market. This would help the internationalisation of RMB as declared one of the BRI objectives.

It is thus surprising that financing in USD is predominant in bilateral (CDB, CMXB) as well as multilateral finance (such as AIIB). The existing swap agreements have hardly been utilised. BRI recipients could use these to obtain RMB while offering their currencies, their collateral or guarantees for a project during a specified period of time.

Turning to private financing, this potential has to be developed and will be subject to detailed discussion in part 4 below as far as commercial banks are concerned. Commercial loans, both domestic and cross border with adequate risk assessment are the mainstay financing vehicle. This can be complemented by private bond and equity issues. BRI project capital market instruments should become an asset class and receive investors' analysis and assessment. In order to receive the support of private investors the BRI related projects should be transparent, with as much information publically disclosed as needed. Under the present model it is not clear what counts as a BRI project and financial details are scarce.

3.3 New BRI project model

Moving from the government model to a market based model, the host countries need to play the key role, with financial feasibility being on par with technical and environmental feasibility.

The crucial part will be to identify investible projects following the criteria stipulated in the BRI communique and establish good governance for the project implementation. Projects need

to be put forward by the host countries with estimates of their financial viability as well as the broader economic and social impact. The registry would be the Belt and Road Secretariat in China with posting chosen project details on the website yidaiyilu for transparency. The Secretariat would give brand recognition to projects.

A neutral institution needs to check the impact of the projects on all the UN Sustainable Development Goals (SDG). It has been suggested that the UN regional economic commissions might perform such a task. Once these projects are identified and prioritised, the beneficiaries call for tenders and explore financing methods, public or private or a mixture of them. The market should be clear about the BRI projects and various risks, such as credit risk, market risk, environmental risk and operational risk. Once the BRI brand is established they also carry reputational risk.

At the same time the host countries can nominate technical and financial partners from their countries or foreign institutions to participate in the tender process. This bottom up approach will ensure a transition to a market driven approach, away from top down guidance. This will certainly complicate the transition for Chinese companies as they have been used to do the whole project, from the design, the engineering, providing the machinery and equipment, the qualified cadres, to monitoring the implementation and the after sales service. In some cases they continued to run the project after completion, prompting the 'what is there for us' from the host countries.

Once the projects have been identified, the partners chosen by the beneficiaries in the tender process and the compliance with SDG been certified, a project management office (PMO), set up either in China or in the host country should issue a prospectus with the technical, financial, environmental and social aspects. This will serve as bases for issuing bonds or equities, either onshore in China or abroad. The beneficiary of the project itself will be the issuer. The PMO will be responsible for implementing the project, monitoring the work progress as well as settling of financial obligations. It is also the responsible to flag any irregularities to the owners.

Ownership of the project could be an individual existing company in the host country, such as a power company, a port or airport, a railway or a telecom company. Alternatively a new company, such as a joint venture between the Chinese and local firm can be established. If the project is of wider economic importance the host government can act as owner. The owner will supervise the work of the PMO, particularly any cost and time overruns. It should be clearly stated what happens in such cases, avoiding the impression that China might take over. In addition, the local owner is accountable to the local population for any grievances such as crowing out. At present they are easily directed at any Chinese partners, the companies or the banks.

Once the project has been finished, the PMO will prepare a comprehensive report on all technical and financial aspects, which will be approved by the owner at handover. This will also specify any follow up servicing, maintenance as well as further duties of the contractor to run the project. It should avoid the impression that China continues to run the projects.

4. Role of Chinese commercial banks in BRI projects

Remembering the history of banks going overseas, the UK and US banks in particular, there are parallels with the present situation for Chinese banks but also differences.

4.1 Legal, regulatory and business environment

The UK and US banks ventured abroad during the maturing manufacturing and commercial stages in the hegemonic cycle. They felt safe to venture abroad because the overseas jurisdictions, such as the British Empire and US hegemony defended their business interests. They found laws and regulations as in their home countries, they applied their risk management

and accounting standards. In the subsequent years their home standards became the standards of the host countries and later global standards for businesses and banking. The Basel banking standards which were drafted under UK and US guidance and adopted globally are the pinnacle of global banking regulations.

Chinese banks still differ from global banks as they have not fully adopted international standards. When they venture out they will need to follow these standards. However, they bring their business practices with them in order to minimise their credit risk. In a sense they benefit from international banking standards while institutionalising their business practices. A case in point are the various China regional banking associations, such as the BRICS, the SCO (Shanghai Cooperation Organisation), the ASEAN, the Central and Eastern European (CEEC) , the African and Arab interbank associations. Chinese led agreement within these groups ensures that Chinese banks will not be surprised by any unexpected national regulations.

At this point it is unclear whether Chinese banks will comply fully with international standards or rather shape their business environment with the 'Chinese way of doing things'. This covers areas such as personnel management as well as business practices as well as profitability requirement. Regarding personnel, the cadres sent abroad from head office often do not all have necessary international experience. Regarding business practices, it is the mutual understanding between banks and clients which overrules hard fact analysis. Regarding profitability, the purpose of Chinese banks is not only profitability but also non-economic functions. In a domestic environment this would be social harmony and in an international environment spreading Chinese goodwill. Lack of transparency would also count as a Chinese characteristics.

Best banking practices are, on the other hand, as stipulated by the HKMA in a circular in 2017. They include corporate governance, proper incentives, disclosure, assessment and feedback, system monitoring such as AML/CFT, understanding local business practices, compliance and control. Chinese bank leaders have deplored on numerous occasions that Chinese banks going abroad do not fully meet these requirements.

The process of adopting these standards in China is well on the way, with both bank management and bank regulation and supervision pulling in the same direction. Banks going out to finance BRI projects have to beef up their management, risk assessment as well as corporate control.

Lending to BRI countries is particularly challenging as about half of them are below investment grade. It would be embarrassing if Chinese banks were to be seen to be cherry picking, ie lending only to the best risks. The common goal is to serve the globalisation of the Chinese economy by world class banks providing world class line of products. During this transition period Chinese banks have the following choices for providing finance.

4.2 Financing options for Chinese banks

Financing of BRI projects by Chinese commercial banks is well under way. BOC reported total lending of USD 130bn at the end of 2018. However, it is not clear what this includes?

The first one is supporting the BRI initiative mainly through domestic lending to the major Chinese corporations. They preserve the leverage between state owned banks and government linked enterprises. These are informal channels or through their common factual authority, the Communist Party of China (CPC). They have ways to serve the common goal and share the risks. The same logic applies to banks when joining the various existing BRI funds.

To tap local bond markets Bank of China has already issued Silk Road Bonds. Apart from issuing their own bonds, banks can also help BRI projects by acting as brokers for BRI borrowers, governments and companies in the RMB bond market and issuers on the Shanghai

and Shenzhen stock exchanges. Investment grade borrowers such as the Governments of Philippines and Malaysia have already received authorisation to issue Panda bonds.

The second way is to go out and finance BRI projects through their affiliates. The BOC is leading with 545 affiliates abroad, followed by ICBC with 419, CCB with 30 and ABC with 17 (figures for 2017). While most of these are in advanced economies and their presence is limited to half the BRI countries, already nearly half of their foreign lending is through affiliates. They use a mixture of business models, international banking model where branch lending is funded from the head office as well as global banking model, where the funding comes from local deposits.

If their affiliates were to play a bigger role in financing BRI projects, the internal control mechanisms have to be improved. Similar to the domestic situation where lending by the branches is tightly controlled by the head office, affiliates abroad are constrained by head office control, both formal and informal through personal links. Risk management capacities of affiliates need to be improved. This includes knowledge of local legal situation and business practices.

As there is no separation of commercial banks and investment banks in China, the provision of long term loans by commercial banks is most likely to be in the form of syndicate loans with the CDB and the CMXB rather than from individual banks. Banks' contributions should be non-concessional. These loans can be off-loaded from the balance sheet through securitisation. Chinese banks have experience in setting up special vehicles, such as for wealth management. They should set up BRI securitisation vehicles off balance sheet. These SPV buy the BRI loans from commercial banks, securitise them in various tranches and sell to Chinese as well as international investors under the BRI brand. This process is similar to the CDO and requires new expertise.

Chinese banks can become partners in the swap agreements when BRI countries provide their currencies, or collateral and guarantees issued outside China in return for Chinese bank loans. Korea has already entered into such arrangements with Chinese banks.

Other ways commercial banks can help financing for the host countries is to arrange funds raising through issuing Panda bonds and equity in the Chinese capital markets. Issuers should be world class projects such as the Gwadar Port in Pakistan, the Bole airport in Ethiopia, the SGR in Kenya and the ECLR in Malaysia. They would qualify for issuing Silk Road Bonds and listing on stock exchanges, but will Chinese investors, apart from commercial banks and foreign investors be willing to invest in BRI financial instruments?

Investment grade borrowers among the BRI countries and low risk projects, such as mentioned above can obtain private finance. Other countries will require specially designed support to share the credit risk. More than half the BRI governments have not obtained investment grade status. They will have to resort to the current government financing model. Even there, the swap agreements of weak currencies have not been utilised and collateral and guarantees by these countries have not been accepted by Chinese banks.

Thus during transition to the new ways of financing, both models, public and private will be used as required by the host governments and the investors. There will be opportunities for Chinese banks to participate but many projects will be rejected for market financing on risk grounds.

5. Conclusion

Judging by the historical experience of banks' globalisation, they have ventured abroad only for their nationals in an environment of calculated risks. The adoption of global banking regulations has reduced the risks for modern banks to venture abroad. However, business

environment and business practices as well as national legal norms do differ and pose challenges.

Chinese banks are already well represented abroad and active, offering nearly half of their cross border lending from their affiliates abroad. Their lending already goes beyond pure trade financing. They have thus acquired valuable experience which could be put to good use for financing projects in the BRI second phase.

The second phase of BRI is defined by investable and bankable projects. Different from the previous government to government finance in the first phase, projects should be proposed and operated by host countries, inviting finance from public as well from private sources. Chinese banks are able to provide various instruments of such private financing and should increasingly contribute.

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Digital Economy

Increasing Innovation and the Future of Money and Payments*

By AGUSTÍN CARSTENS [*]

The raison d'être of central banks is to safeguard the stability of the monetary system. That is, to protect the value of money and to ensure the smooth operation of the payment system, the means by which we transfer money. Throughout history, Germany and German ingenuity have played no small part in reshaping this system. The Deutschmark was an anchor of monetary stability. And inventions by German engineers in the 1960s paved the way for today's smartcards.

While we have seen bursts of innovation to the monetary system before, this time feels different. Innovation is rampant and entrepreneurs are trying to improve not only the way we pay but also money itself. With a noticeable reduction in the use of cash in some countries, interest in and experimentation with digital currencies is growing. As the debate intensifies, some suggest that central banks should issue them sooner rather than later. Yet, as the monetary system is the backbone of the financial system and wider economy, we need to understand the full consequences of any new developments. One does not rip out the old infrastructure before knowing how the new mode of transport works in all circumstances. Adopting untried technology that ultimately proves unreliable could seriously endanger public trust in the currency.

Central banks are leading from the front when it comes to the future of the monetary system. In payments, central banks are embracing new technologies to meet the challenges of today and tomorrow. Key trends are the need for speed and globalisation, while still maintaining reliability.

A delay of a day or more used to be acceptable in payments; today, it seems like an eternity. On their mobile phones, consumers now get instant satisfaction or feedback from email and social media. Accordingly, mobile payments solutions and faster systems for retail payments are emerging in response to demand. They generally allow people to receive funds within seconds, anytime and anywhere. One example is the Eurosystem's new TARGET Instant Payment Settlement service, or TIPS. The system allows retail payment service providers to offer funds transfers in real time around the clock. For large-value and high-priority payments, so-called real-time gross settlement systems have been speeding up transfers since the 1980s. The Bundesbank's Elektronische Abrechnung Frankfurt, or Electronic Access Frankfurt, was an early version of these systems.

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Globalisation is increasing the demand for better and faster cross-border payments. Most of these flows still rely on an intricate web of bilateral relationships between commercial banks, known as correspondent banking. But multicurrency systems are emerging. They provide settlement of more than one currency within one jurisdiction or across multiple jurisdictions.

Turning to money, economics textbooks say that money is what money does. Money serves as a means of payment, a unit of account and a store of value. But not all monies are equal. Cash is public money, issued by the central bank. But when I pay for my groceries with a credit or debit card and, increasingly, with my mobile phone, I use private money. That is, the liabilities of a commercial bank, and increasingly in some countries, the phone company or a big tech firm.

This distinction is important for the current debate about a future monetary system with central bank digital currencies. This debate is not really about convenience and digitalisation. Convenient digital payment options already abound. Many people already use one or more cashless payment systems through their mobile phones, paying with private money. Indeed, this is the cutting edge of innovation.

The debate is partly about the potential decline in the use of cash, and what central banks should do about it. In some countries, demand for cash has dropped as consumers and retailers have embraced electronic means. Two examples are Sweden and Denmark, where stores and restaurants are increasingly reluctant to accept paper money. Instant mobile payment solutions are gaining ground rapidly. But this can make it harder for some groups in society to pay.

But for most countries, cash is still in high demand. The amount of cash in circulation has actually increased over the last decade in tandem with the volume of electronic payments. In Germany, nearly half of goods and services are still paid for in cash, according to a Bundesbank study, although cards are now slightly more popular for everyday purchases. Consumers trust cash and appreciate its simplicity. They find it useful to educate children about how to handle money, they like the way it allows them to control their finances and they worry that the elderly, in particular, may struggle in a world without cash. In the short term, there is no urgency to come up with a substitute for cash. Things may change in the future, however, and central banks want to be prepared.

A report last year by two of the central bank committees based at the BIS identified two main varieties of central bank digital currencies. A wholesale variety would be restricted to financial institutions and used for interbank payments and other settlement transactions. A retail variety would be accessible to everyone. Both types can be based either on digital tokens or on accounts.

A retail digital currency might mean that anyone could open a bank account directly with the Deutsche Bundesbank, as part of the Eurosystem. This would let ordinary people and businesses make payments electronically using central bank money. Or they could deposit money directly in the central bank, and use debit cards issued by the central bank itself.

In terms of technology, it would be easier to replicate the attributes of cash - if so desired - with digital tokens than with accounts. Tokens have a long monetary history, from stones and shells through to cigarettes. But the technology behind digital tokens is still broadly untested, whereas the technology for an account-based central bank digital currency has been available for decades. So far, central banks have generally chosen not to provide such accounts. Why not? The answer lies in one of the other major issues underlying the debate: the impact on the financial system.

The current system has two tiers. The customer-facing banking system is one tier, and the central bank is the other. The two tiers work together. If a customer buys something from a shop, the bank debits the customer's account and credits the shop's account. When the customer and the shop have different banks, the two banks settle the payment through the central bank. The central bank debits the account of the customer's bank and credits the account of the shop's bank.

At the moment, these settlement accounts are the only form of electronic central bank money. Only commercial banks have access to them. The debate is whether to widen access beyond the current circle of commercial banks. There are several aspects here.

Banks play an important role as provider of financial services to citizens and businesses. Imagine that the Bundesbank (or, for that matter, the ECB) were to offer deposit accounts to everyone and then issue debit cards and mobile phone apps to make payments with. In such a scenario, the central bank would be taking on the customer-facing business, opening up a new line of work.

Safety could be an important reason to deposit money in the central bank. In times of uncertainty, more customers would prefer to have deposit accounts at central banks, and fewer at commercial banks. A shift of funds from commercial banks to the central bank could be gradual at first. But the trickle could turn into a flood.

If bank deposits shift to the central bank, lending would need to shift as well. So, in addition to the deposit and payments businesses, the central bank would be taking on the lending business. The central bank would need to meet business owners, interview them about why they need a loan, and decide on how much each should receive. Another new business line.

Is this the kind of financial system that we would like to have? Perhaps this thought experiment has gone too far. For instance, the central bank could make do without a lending operation if it sends customer deposits to the commercial banks by opening central bank accounts at commercial banks. In effect, the central bank lends to commercial banks so that they could lend on to customers.

However, the bigger issue has to do with the division of labour between commercial and central banks. The central bank is a public institution charged with ensuring that inflation is under control, the economy runs smoothly and the financial system is sound. Commercial banks are private businesses that thrive by attracting and serving customers. Making profits is a key motivation. They tend to have more staff than central banks because serving customers is resource-intensive.

There are historical instances of one-tier systems where the central bank did everything. In the socialist economies before the fall of the Berlin Wall, the central bank was also the commercial bank. But we cannot hold up that system as an example of better customer service. Less dramatically, publicly owned banks in many economies are hardly paragons of efficient allocation of funds or of good service.

A token-based digital currency may be less prone to this structural shift from the commercial banking sector, as the outstanding amount of currency can be fixed. However, there would then be the question of whether these tokens would command a premium over bank deposits. Would such a premium fluctuate over time with shifts in uncertainty and financial conditions? Offering higher interest rates on commercial bank deposits may be enough to hold funds during quiet times. But it's uncertain whether it would work during periods of tumult and the inevitable "flight to safety", as I mentioned earlier.

We know from historical experience that in times of financial stress, money moves away from banks that are perceived as risky towards banks that are perceived as safer. Money flows from privately owned banks to publicly owned ones, in emerging markets from domestically owned banks to foreign-owned ones, and generally from weakly capitalised banks to strongly capitalised ones. In such scenarios, imagine that depositors also have the choice of putting their money in a digital currency of the central bank or in a central bank deposit account directly. A premium could open up, where one euro of deposits in the commercial bank buys less than one euro's worth of central bank digital currency.

Last but definitely not least, the introduction of central bank digital currencies would change the environment in which central banks conduct monetary policy. This is, of course, the main tool that central banks have to influence the economy. The basic mechanics would stay the same: the central bank would still use its balance sheet to control short-term interest rates. But digital currencies would change the demand for base money and its composition in unpredictable ways. They might also modify the sensitivity of the demand for money to changes in interest rates.

Furthermore, if a digital currency is in demand, it would mean a larger central bank balance sheet. This may require the central bank to hold extra assets such as government securities, loans to commercial banks or international reserves. Purchasing these could interfere with the functioning of key markets or dry up liquidity. At least in a transitional period, these changes have the potential to completely up-end the way that monetary policy affects the economy. This is not something that central banks take lightly.

The Committee on Payments and Markets Infrastructures (CPMI) at the BIS last year surveyed central banks to take stock of current work and thinking on issuing digital currencies. More than 60 central banks participated, representing countries covering 80% of the world's population. Seventy per cent of central banks are working on this issue. Most are looking at both retail and wholesale varieties of digital currencies.

But only about half have moved on to the next stage of actively testing the idea. These central banks are examining the benefits, risks and challenges of potential issuance from a conceptual perspective. Only a couple are experimenting with the different possible technologies, in "proofs of concept" or pilot projects.

If we go one step further and ask central banks whether they plan to issue a digital currency, the picture is quite telling. Very few central banks think it is likely that they will go there in the short to medium term, be it retail or wholesale. Research and experimentation have so far failed to put forward a convincing case. In sum, central banks don't see today the value of venturing into uncharted territory.

As the saying goes: first weigh up, then weigh in. Central banks are proceeding cautiously and weighing up all relevant issues. We will flash the warning light if needed. Central banks embrace innovation; in the few cases where they put the brakes on, it's for a good reason. We have to make sure that innovations set the right course for the economy, for businesses, for citizens, for society as a whole. This is what we are doing now.

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Money and Private Currencies: Reflections on Libra*

By YVES MERSCH*

In 1787, during the debates on adopting the US Constitution, James Madison stated that "[t]he circulation of confidence is better than the circulation of money". It's telling that Madison chose to use public trust in money as the yardstick for trust in public institutions - money and trust are as inextricably intertwined as money and the state. Money is an "indispensable social convention" that can only work if the public trusts in its stability and acceptability and, no less importantly, if the public has confidence in the resolve of its issuing authorities to stand behind it, in bad times as well as in good.

Madison's 18th century remark on the link between money and trust has lost none of its relevance in the 21st century. The issue of trust in money has resurfaced in the public debate on privately issued, stateless currencies, such as bitcoin, and their promise to serve as reliable substitutes for public money. Today's conference is neither the place nor the time for me to repeat my past statements on the shortcomings of cryptocurrencies[1] and why they do not fulfil the basic tests of what constitutes "money".

Instead, I will today talk about Libra, Facebook's newly announced private currency. It is scheduled for release in the first half of 2020 by the very same people who had to explain themselves in front of legislators in the United States and the European Union on the threats to our democracies resulting from their handling of personal data on their social media platform.

There are three key questions here. First, how does Libra differ from other private currencies and from public money? Second, what legal and regulatory challenges does it pose? And third, in the light of its mandate, what position should a central bank like the ECB take towards Libra?

The remainder of my speech will be dedicated to these three questions, not with a view to conclusively answering them, but merely to raise awareness of some of the risks of Libra, to question its main premises and, in the process, to highlight the perils of entrusting the smooth processing of payments, the savings of citizens and the stability of the global monetary and financial systems to unaccountable private entities with a questionable track record in matters of trust.

So let me turn to my three questions.

First, how is Libra different from other private currencies and from public money?

Despite the hype surrounding it, Libra is, in some respects, no different from other, established private currencies. Similar to cryptocurrencies, Libra will be issued through a public ledger running on a form of blockchain technology. And similar to e-money, Libra will be distributed to end users electronically in exchange for funds denominated in fiat currencies.

But there are some notable differences that are extremely concerning. Libra's ecosystem is not only complex, it is actually cartel-like. To begin with, Libra coins will be issued by the Libra Association - a group of global players in the fields of payments, technology, e-commerce and telecommunications. The Libra Association will control the Libra blockchain and collect the digital money equivalent of seignorage income on Libra. The Libra Association Council will take decisions on the Libra network's governance and on the Libra Reserve, which will consist of a basket of bank deposits and short-term government securities backing Libra coins. Libra-based payment services will be managed by a fully owned subsidiary of Facebook, called

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Calibra. Finally, Libra coins will be exclusively distributed through a network of authorised resellers, centralising control over public access to Libra. With such a set-up, it is difficult to discern the foundational promises of decentralisation and disintermediation normally associated with cryptocurrencies and other digital currencies. On the contrary, similarly to public money Libra will actually be highly centralised, with Facebook and its partners acting as quasi-sovereign issuers of currency.

You may be wondering what the problem is with Libra's centralisation. If public money is also centralised, why should Libra be any different?

What the advocates of Libra and other private currencies conveniently gloss over is that, because of its nature as a public good, money has traditionally been an expression of state sovereignty. It is no coincidence that, throughout history, sovereign actors have underpinned all credible and durable currencies. This historical fact, affirmed in G.F. Knapp's state theory of money and in the Chartalist school of economic thought, has had a lasting impact on orthodox perceptions of the concept of money as a public good and has found its way into statutory definitions of legal tender.

When it comes to money, centralisation is only a virtue in the right institutional environment, which is that of a sovereign entity and a central issuance authority. Conglomerates of corporate entities, on the other hand, are only accountable to their shareholders and members. They have privileged access to private data that they can abusively monetise. And they have complete control over the currency distribution network. They can hardly be seen as repositories of public trust or legitimate issuers of instruments with the attributes of "money".

The high degree of centralisation that is Libra's hallmark, and the concentration of its issuance and distribution networks, are not the only features inhibiting trust. Despite its audacious global currency aspirations, Libra lacks a global lender of last resort. Who will stand behind it in a liquidity crisis situation? Libra is also devoid of the equivalent of a deposit guarantee scheme to protect its holders' interests during a crisis. Moreover, the limited liability of the Libra Association members raises serious questions about their resolve to satisfy the claims of Libra holders with their full faith and credit, as central banks do with public money. Finally, the fact that Libra is backed by a basket of sovereign currency-denominated assets appears to defeat the very purpose of its issuance as a private currency. Why bank on a proxy when one can put one's trust in the genuine article? And how will the potential volume of payment transactions settled in Libra affect the monetary aggregates of its underlying currencies, their objectives and intermediate targets?

Let me now turn to my second question, on some of Libra's legal and regulatory challenges.

By straddling the divide separating currencies from commodities and payment systems, digitalised private currencies inevitably raise legal and regulatory questions. Libra is no exception. To keep my speech short, I will only address three of these challenges, but rest assured that there are many more.

The first challenge concerns Libra's fundamental legal nature. The choice is, essentially, whether to treat Libra as e-money, as a financial instrument or as a virtual currency. Libra does not appear to qualify as e-money, as it does not embody a claim of its holders against the Libra Association. If Libra were to be treated as a transferable security or a different type of financial instrument, both the Libra Association and any other entities engaged in providing investment services through Libra coins would fall within the remit of the Markets in Financial Instruments Directive (MiFID II). Alternatively, if Libra were to qualify as a virtual currency then, under the Fourth Anti-Money Laundering Directive, both Calibra and its authorised resellers would become subject to the Directive's anti-money laundering and counter-terrorism financing obligations, and to its registration requirement. Given the different regulatory implications of

Libra's legal characterisation, regulatory intervention is essential, to either confirm Libra's classification under one of the existing legal and regulatory frameworks, or to create a dedicated regime adjusted to its specificities.

A second challenge is to ensure that the relevant EU and Member State regulatory and supervisory authorities can assert jurisdiction over Libra and its network. But how can this be done when the entities behind Libra are located outside the EU? One way would be to require national custody of a share of the Libra Reserve funds equivalent to the amount of Libra in circulation in any given EU Member State. But there may be other ways to ensure effective public control over Libra and its network, and these are worth exploring. Ensuring that payment systems are safe and accessible and exercising control over the financial market infrastructures that underpin our economies will remain public good objectives. And the conditions under which collateral or settlement finality are accepted will remain prerogatives of the regulatory or legislative authorities.

The third challenge is the need for cross-border cooperation and coordination. Because Libra will be used across borders, it is a matter of international interest. Its global nature would also call for a global regulatory and supervisory response to avoid regulatory arbitrage, ensure consistency of outcomes and guarantee the efficiency of public policy responses to Libra. There are welcome signs that the global community is already working together to mitigate Libra's risks. Both the G7 and the Committee on Payments and Market Infrastructures have evaluated Libra, with an emphasis on its potential use in money laundering and terrorist financing. Further work is expected by the G20, the Financial Stability Board and other fora with a stake in the stability of the global monetary and financial system.

Finally, I would like to say a few words about the ECB's general stance towards financial innovations such as Libra.

The ECB's Treaty-based tasks include defining and implementing the single monetary policy and promoting the smooth operation of payment systems. In the context of monetary policy, the ECB takes a close interest in market innovations that could directly or indirectly affect the Eurosystem's control over the euro or shift some of its monetary policy to third parties. Depending on Libra's level of acceptance and on the referencing of the euro in its reserve basket, it could reduce the ECB's control over the euro, impair the monetary policy transmission mechanism by affecting the liquidity position of euro area banks, and undermine the single currency's international role, for instance by reducing demand for it.

In the context of the smooth operation of payment systems, the ECB takes a close interest in market innovations that seek to replace the euro with alternative settlement currencies or create new and autonomous payment channels. Although some of Libra's aims are legitimate, reductions in cross-border fund transfer costs and other efficiency gains can also be obtained through established instant payment solutions. The Eurosystem recently launched the TARGET Instant Payment Settlement service, or TIPS - a pan-European, 24/7 settlement service for instant payments. By operating in central bank money, and by being embedded in TARGET2, TIPS provides a high-performance payment solution that is safer and more economical than questionable, market-based retail payment innovations.

Let me conclude here.

In the field of money, history bears testament to two basic truths. The first is that, because money is a public good, money and state sovereignty are inexorably linked. So the notion of stateless money is an aberration with no solid foundation in human experience. The second truth is that money can only inspire trust and fulfil its key socioeconomic functions if it is backed by an independent but accountable public institution which itself enjoys public trust and is not faced with the inevitable conflicts of interest of private institutions.

Of the various forms that money has taken throughout history, those that have best fulfilled their purpose and proven the most credible have invariably benefited from strong institutional backing. This backing guarantees that they are reliably available, that their value is stable and that they are widely accepted. Only an independent central bank with a strong mandate can provide the institutional backing necessary to issue reliable forms of money and rigorously preserve public trust in them. So private currencies have little or no prospect of establishing themselves as viable alternatives to centrally issued money that is accepted as legal tender.

The stance of central banks towards modern forms of money is bound to evolve with time, and central bankers have embraced technological developments in the field of money and will continue to explore helpful new innovations. But the rise of cryptocurrencies and other forms of privately issued instruments that can only fulfil some, but not all, of the functions of money is unlikely to fundamentally upset the two truths I just described. If anything, it will serve as a useful reminder of central banks' pivotal role as responsible stewards of public trust in money, and stress the need for vigilance towards phenomena capable of undermining public trust in the financial system.

I sincerely hope that the people of Europe will not be tempted to leave behind the safety and soundness of established payment solutions and channels in favour of the beguiling but treacherous promises of Facebook's siren call.

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Working Paper

Does Aggregate Insider Trading Predict Stock Returns in China*

By HE QING, CHEN BINGQIAN AND WEN JING *

This paper studies the information content of aggregate insiders' transactions in their own firms in China by analyzing approximately 28,000 open market transactions from July 2007 to December 2014. The evidence suggests that publicly available information about aggregate insiders' transactions cannot predict future stock returns. However, the ability of aggregate insiders' transactions to predict future stock returns is positively associated with the strength of corporate governance. Results from vector autoregressive (VAR) models and examination of profitable strategies corroborate these findings.

Key Words: Insider transactions; Market return; China

1. Introduction

With the rise of the Chinese economy, China's capital market increasingly attracts overseas participants. However, there has been strong evidence that the extraction of private benefits by corporate insiders is ubiquitous in the Chinese capital market. Insiders are able to undertake a variety of undisclosed transactions or manipulate information disclosures to benefit themselves at the expense of outside investors (Jiang et al., 2010;Morck et al. 2000; He et al. 2016).

In order to strengthen investor protections, the China Securities Regulatory Commission (CSRC) and other regulatory authorities have made considerable progress on regulating insiders' transactions. Provisions regarding insiders' transactions were stipulated in the Securities Law of the People's Republic of China (Securities Law), which was proposed on December 29, 1998, and amended further several times.1 Nonetheless, inadequate legal institutions weaken the efficacy of regulation. In view of the difficulty of monitoring corporate insiders' transactions, on August 15th, 2007, the CSRC declared the Rules on the Management of Shares Held by the

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[1] The Securities Law was proposed on December 29, 1998; implemented on July 1, 1999; and amended first on August 28, 2004 and again in late 2005.

Directors, Supervisors, and Senior Management Officers of Listed Companies (RMSHLC, No.56 [2007] CSRC) and required compliance from all listed companies. According to this regulation, corporate insiders are required to report their firm's share transactions to their companies no later than the second business day after a transaction. The transaction information is disclosed immediately on the stock exchange's web platform.

China's mandatory disclosure of insiders' transactions aims to improve the information environment, and hence enhance investor protection in an emerging market economy. Numerous evidence shows that insider transactions are informative (Jaffe, 1974; Seyhun, 1986; Rozeff and Zaman, 1988). Corporate insiders, by virtue of their job function, have access to privileged information about future cash flows and discount rates that are not reflected in stock prices. The disclosure of their transactions helps investors to incorporate various information (i.e., firm-specific or economy-wide factors), into stock prices, and then accelerate price discovery (Hirschey et al, 1990, Huddart et al., 2001). Seyhun (1988, 1992) shows that the aggregation of insider transactions can predict market returns for the subsequent two months. Fidrmuc et al. (2006) show that firms experience a significant abnormal return after an insider's trade of a firm share. Recently, Brochet (2013) investigates the profits of insider trading after SOX2 and find that the mean abnormal returns for purchases and sales are 1.89% and -0.11%, respectively, over a 3-day window following insider transactions.

If the China's mandatory disclosure system works, we should have the following expectations. First, it provides a platform for the market and regulatory agencies to monitor the behavior of corporate insiders. By disclosing their transactions, the ensuing market reactions and regulatory interventions are expected to discipline insiders' behavior. Hence, insiders are less likely to use private firm-specific information to trade firm shares in the security market. Illegal insider trading or the expropriation of minority shareholders should be mitigated. Second, to the extent that noise trading is a market-wide phenomenon in China,3 information-related trading by corporate insiders can uncover mispricing in their own firms, contributing the discovery of fundamental values.

To examine this, we investigate the information content of aggregated trading by corporate insiders in their firms, and address the prediction power of aggregated insider trading over future market returns. The rationale is that if the regulation functions well, then the mispricing observed by corporate insiders is primarily caused by publicly available information, such as changes in economy-wide activity, rather than pure firm-specific information. Subsequently, when the market recognizes changes in economy-wide activity, most security prices will also change. As corporate insiders trade prior to changes in security returns, their transactions contain a forecast component of the market return. A positive relationship between aggregate insiders' transactions and subsequent market return should be expected (Seyhun, 1988).

Using approximately 28,000 open market sales and purchases by insiders from July, 2007 to December, 2014 in China, we investigate the degree to which market returns are predicted by aggregate insider transactions. We find that multi-week aggregate insider trading data could only provide modest evidence on the predictability on future stock returns. We do not find any significant relation between aggregate insider trading activity in a given week and the market returns for the subsequent 8 weeks. However, the evidence shows that aggregate insider trading can predict the future stock returns of private companies. In firms with a less concentrated

[2] The Sarbanes–Oxley Act of 2002, more commonly called Sarbanes–Oxley, Sarboxor SOX, is a United States federal law that set new or expanded requirements for all U.S. public company boards, management and public accounting firms.

[3] Noise traders can drive stock prices away from their fundamental values (Black, 1986).

ownership structure and less deviation between control and cash flow rights, future market returns remain predictable after the disclosure of insider trading information. Results from vector autoregressive (VAR) models and examination of profitable strategies corroborate these findings.

Combining the findings from our analysis, we conclude that corporate insiders generally do not trade on the basis of economy-wide information. The mandatory disclosure scheme only plays a rather limited role in regulating insiders' behavior. Corporate insiders still have ample opportunities to make self-serving transactions or obtain other private benefits through privileged information. On the other hand, the strength of the prediction power of aggregate insider trading for future market returns is negatively related with expropriation risk. More specifically, in firms characterized by less expropriation risk, insiders are more likely to be observed and to trade based on economy-wide information. While, in firms with greater expropriation risk, insiders are more likely to selectively report their transactions and make self-serving transactions. Hence, they are less likely to trade on the basis of mispricing caused by economy-wide information. In this sense, the mandatory disclosure of insiders' transactions does not effectively correct corporate insiders' misconduct. Many constraints, such as weak law enforcement and weak corporate governance, limit the impact of the mandatory disclosure of insider trading on regulating corporate insiders' behavior.

Although this study investigates the prediction power of China's insider transactions for future market returns, China has most of the typical features of emerging market countries; so understanding China can help us understand emerging markets in general. For example, similar to most underdeveloped economies, outside investors in China have few rights against insiders' expropriations (Firth et al., 2009). The legal systems are weak and law enforcement is inefficient, which is the case in many emerging countries. Ownership structures remain highly concentrated, which facilitates corporate insiders' misconduct at the expense of minority investors. Our study shows that, in an emerging market, public disclosure of insider transactions is not able to regulate insiders' behavior. Comprehensive reform limiting expropriation risks in an emerging market is necessary.

Our study also relates to previous studies on market timing. There is growing evidence on the predictable nature of expected returns to the market. For example, Keim and Stambaugh (1986) suggest that the expected risk premiums seem to change over time in a way that is, at least partially, explained by variables that reflect asset price levels. At the firm level, the three-factor model of Fama and French (1992, 1993) indicates that firm-specific factors, such as size and book-to-market equity (B/M), help explain the cross-sectional variation in expected stock returns. Our results show that expropriation risk is an important pricing factor in emerging markets.

The remainder of this paper is organized as follows. Section 2 provides a literature review and develops some testable hypotheses. Section 3 describes the methodology and data summary statistics. The main empirical results of this study are presented in Section 4 and the conclusions are in Section 5.

2. Institutional setting and hypotheses development

2.1 Institutional setting

With the rise of the Chinese economy, improving the corporate governance of Chinese companies, as part of the government's efforts to develop the financial market, has become a top priority. Since the establishment of the stock markets in the early 1990s, China has promulgated various laws and regulation systems to aid in corporate monitoring. Because most listed firms were converted from one or several large state-owned enterprises, which then became the controlling shareholders after listing, the potential problem of insiders' expropriation of minority

shareholders have been a major concern in the Chinese stock market. On July 1, 1999, the Securities Law of the People's Republic of China (Securities Law) was promulgated by the Chinese regulatory authorities, to protect the interests of minority shareholders. Section 4, Chapter 3 of the Securities Law stipulates several ordinances to regulate the transactions of corporate insiders. Insiders are not allowed to trade their shares on the basis of undisclosed, privileged information. Article 74 defines an insider as a person or corporation directly or indirectly connected with a listed firm.[4] Article 75 further defines insider information as any undisclosed news that may influence the price of shares such as major changes in a company's equity structure, security for debts, distribution of dividend, business guidelines, and major investments, among others. The CSRC regulates the exchanges, and is responsible for the enforcement of the insider trading laws. Nevertheless, these regulations have proven to be far from efficient in curbing expropriation by corporate insiders. Insider dealing, which relies on using private material information to trade for profit, is prevalent across Chinese listed corporations (Howson, 2012).[5] Weak legal institutions have substantially lowered the costs of law violations. At the same time, outside investors and regulatory authorities face exceedingly high costs to obtain and analyze insiders' transactions.

On August 15th, 2007, the CSRC released the RMSHLC to regulate insiders' transactions. The rules are basically in line with insider trading regulations in the U.S.[6] Corporate insiders must inform their companies within two business days of a transaction. In turn, the corporation reports this transaction immediately to its stock exchange, which then disseminates this information on its own web platform. Any person or corporation who makes false statements or fails to make timely notifications will be fined by the stock exchange.

2.2 Hypothesis development

Corporate insiders, by virtue of their job function, have advance knowledge of future cash flows and discount rates that is not reflected in stock prices (Seyhun, 1986, 1988; Fidrmuc et al., 2009; He and Rui, 2016). Information-related trading by corporate insiders may be in response to either firm-specific or publicly available information (i.e., industry-wide or economy-wide factors) (Seyhun, 1988). If insiders trade only on firm-specific information, then their transactions should not contain any information related to changes in economy-wide activity. In contrast, if part of their transaction is due to changes in economy-wide factors not yet reflected in a firm's stock prices, then a positive relationship between aggregate insider trading and subsequent market return should be expected. The extent to which corporate insiders trade on the basis of economy-wide factors depends on the costs and benefits of exploiting their privileged information. If regulation and corporate governance increases the cost of trading in firm-specific information, then insiders prefer to exploit economy-wide information.

Using U.S. data, Seyhun (1988, 1992) provides empirical evidence and shows that the market index rises following increases in aggregate insiders' purchases and falls following increases in aggregate insiders' sales. Aktaset al.(2008) provide further evidence that price discovery is hastened on insider trading days. The paper proposes that some insiders' transactions are due to

[4] The Securities Law gives examples of corporate insiders, such as directors, supervisors, managers and shareholders who hold not less than 5% of the shares in a company; people who are able to obtain material information concerning company trading; staff members of the regulatory authority; and relevant administrators.

[5] A noticeable example is the enforcement action taken by the CSRC against Zhejiang Hang Xiao Steel Co. (stock market code 600477). Its stock price rose 150% in the 5 weeks following its announcement of winning a large infrastructure contract with Angola in March 2007. The insiders who purchased the company's stocks before the announcement and sold them afterward received a profit of US$5 million.

[6] Section 403 of SOX requires insiders to report their holding within two business days of their transaction.

changes in economy-wide information. However, in most emerging market countries, the legal system and law enforcement are weak. This poor investor protection discourages informed trading and leads to a deficient information environment (Morck et al., 2000).7 Although China has adopted mandatory disclosure of insiders' transactions, this regulation is not well enforced. Insiders are often observed using firm-specific information to trade in the stock market for their own benefit without incurring penalties. (Howson, 2012; He and Rui, 2016). Hence, we expect that insiders are less likely to use economy-wide information when deciding their transactions. The potential relation between insiders' transactions and stock market returns is muted.

A further insight into insiders' transactions is obtained by considering the expropriation risk of the firm. If insiders obtain benefits from extracting private benefits through a wide range of self-serving transactions at the expense of outside minority shareholders, then the expropriation risk affects insider trading. More specifically, in firms characterized by less expropriation risk or better investor protection, insiders are more likely to trade based on their observation of economy-wide information. As a result, the relation between aggregate insider transactions and market returns is predicted to be positively related to investor protection.

To measure the extent of investor protection at the firm level, we rely on three alternative indicators for corporate governance. First, following La Porta et al. (1998) and Bebchuk and Roe. (1999), we use the percentage of the shareholding of the principal shareholder as the measurement of ownership concentration. A concentrated ownership structure facilitates the transfer of resources away from firms for corporate insiders' own benefit through tunneling, particularly when investor protection is weak. For example, they can transfer assets on preferential terms to other firms in which the controlling shareholder also has a large stake (Johnson et al., 2000). They can also selectively report or withhold valuable firm-specific information to dilute the interest of minority shareholders by purchasing firm shares at a preferential price (Morck et al., 2000; Du et al., 2012). As outside investors fail protect themselves against insiders' self-serving transactions (La Porta et al., 2000), a concentrated ownership structure can help insiders manipulate corporate information, and leads to a camouflaged information environment. As a result, ownership structure concentration is expected to weaken the relationship between aggregate insider trading and subsequent market returns.

Second, we consider the ownership type of listed firms. Since China started its open up policy in 1978, the government has stimulated its economy by relaxing control over state-owned enterprises (SOEs). Meanwhile, a large number of private or foreign enterprises have also emerged and contribute to Chinese economic growth. The mixed ownership types provide us a valuable opportunity to investigate the impact of shareholders' identities on expropriation risk. Boycko et al. (1996) posit that SOEs primarily serve politicians' interests rather than maximizing firms' profits or their market value in that politicians are often observed promoting employment and regional development through corporate financial resources, ultimately to ensure the success of their political career. Numerous studies provide empirical evidence supporting this argument (e.g., Shleifer and Vishny, 1994; Shleifer, 1998; Fan et al., 2007; Fogel et al., 2008). In addition, politically connected firms are less transparent than similar unconnected firms (Leuz et al., 2003; Leuz and Oberholzer-Gee, 2006). Corporate insiders in politically connected firms may hide or obscure reported benefits with the purpose of misleading investors to gain at their expense (Chaney et al., 2011). Based on this, we should expect aggregated insiders trading in SOEs to convey little market-wide information. And hence, a weak relationship between aggregate insider trading and portfolio returns in SOEs is expected.

[7] Using cross-country data, Brochetet al. (2013) shows that the relation between aggregate insider trading activities and subsequent market returns differs substantially across countries.

Finally, we use the ratio of control to cash flow rights as an alternative indicator to measure expropriation risk. The existing literature suggests that the less the controlling shareholder is driven by monetary incentives, the more likely he or she pursues the private benefits of control (Bebchuk and Roe, 1999; La Porta et al., 2002). These problems are more prevalent in emerging market countries where pyramiding and cross-holdings are widely used. Controlling shareholders usually have larger control rights than cash flow rights. The separation of control and cash flow rights exacerbates the entrenchment of the controlling shareholder. Entrenched shareholders can withhold information or selectively disclose information to camouflage their self-serving behavior (Morck et al., 2000; Fernandes and Ferreira, 2009). So, we expect a more pronounced relation between aggregate insider trading and subsequent portfolio returns in firms with less separation between control and cash flow rights.

3. Data and summary statistics

3.1 Data

Under RMSHLC, directors, senior officers, and supervisors are required to report their transactions. The collected information is disseminated to the public through the Disclosure of Interests-Integrity Records of Listed Corporation, an online platform run by the stock exchanges. The records provide information on stock code, insiders' identities, volume and prices of transactions, and transaction dates. Mandatory disclosure was implemented on June 1, 2007. We draw insider transaction data for all A-share stocks from the online platforms of the Shanghai and Shenzhen stock exchanges from July 1, 2007 to December 31, 2014. Stock returns and corporate governance variables are drawn from the China Corporate Governance Research Database (CCGRD) developed by the GTA Information Technology Co.

Following the literature (Seyhun, 1986), only open market purchases and sales by corporate insiders are considered in this paper. Panel A in Table 1 shows that our sample has a total of 27751 records of transactions by corporate insiders in 1556 public firms made up of 19432 sales and 8271 purchases. The purchase-to-sale ratio is 0.3, which is much smaller than the insider purchase-to-sale ratio of 0.7 in the U.S. market (Seyhun, 1986). This implies that corporate insiders in China are more likely to be net sellers.

During the sample period, the average value of sales transactions is RMB 2,033,000, much larger than the average purchase transactions of RMB 1,050,000. The median sales transaction is RMB 430,000 while the median purchase transaction is RMB 110,000. Consistent with the findings in Fidrmuc et al. (2006), the results show that the average number and value of insiders' sale transactions are larger than those of their purchase transactions. On average, there are only 0.86 (1.89) purchases (sales) in each firm, per year, compared with 2.77 (4.74) purchases (sales) in the U.S. The number of reported insider transactions in China is much smaller than in the U.S.

To proxy for the insiders' ability to extract private benefits at the expense of minority shareholders, we use three alternative proxies for corporate governance. The variable named Concentration represents the percentage of the largest shareholding. State is a dummy variable that equals 1 if the largest shareholder is government related and is 0 otherwise. Separation represents the extent of separation between control rights and voting rights (the ratio of control to cash flow rights). Following Giannetti and Simonov (2006), we set the ratio of control to cash flow rights equal to 1 if no shareholder holds more than 20% of the voting rights.8

Panel B of Table 1 reports the summary statistics of our main proxy for corporate governance. In general, our sample firms display a large cross-sectional variation in all proxies for corporate governance. The mean and median of Concentration are 35.79 and 34.35, with a range of 4.08 to

[8]Faccio and Lang (2002) suggest holding 20% of the voting rights is sufficient for control.

86.32. This suggests that shares of most listed firms are highly concentrated. The government still plays an important role in the Chinese capital market. A substantial proportion of firms (42%) are still controlled by government or government-related agencies. Not surprisingly, over the sample period, both the mean and median of Separation are larger than 1. This suggests that agency problems due to separation between ownership and control are prevalent.

To examine whether insiders' transactions are related to our main proxy for corporate governance, we sort companies into several groups using corporate governance variables and then analyze the differences for insiders' trading. Panel C of Table 1 reports the distribution of insiders' open market transactions by corporate governance variables. First, we classify insiders' transactions into two groups using State, and analyze the difference of insiders' transactions between state firms and non-state firms. There are 8625 transactions in state firms compared to 18282 transactions in non-state firms. The average value traded per transaction in non-state firms is also much larger than for state firms. Second, using the average of ownership concentration in the sample, we group insider transactions into ownership concentration quintiles. Ownership concentrations for the groups are as follows: Group 1 less than 20%9; Group 2 20-36%, Group 3 36-48%, and Group 4 greater than 48%. In line with the literature, this classification ensures that each group of firms has more than 4000 insider transactions while still maintaining a large variety of ownership structure. Interestingly, the value of shares traded per purchase decreases significantly from 2261 in Group 1 to 968 in Group 2, and then increases to 741 in the highly concentrated ownership group (Group 4). Finally, we sort companies into two groups using separation. We also find that the average value per purchase in firms without separation is 992, which is larger than that of firms with separation between cash flow rights and control rights. These results indicate that corporate insiders in firms with better corporate governance are more likely to conduct a larger transaction per purchase.

Table 1. Summary Statistics for All Insiders' Trades and Net Trades

[9] The company is considered to be widely held when all shareholders hold less than 20% of the votes (Faccio and Lang, 2002; Giannetti and Simonov, 2006).

Pane A: All trades

	No.firms	N	Ave.trades	Number of transactions			Value of transactions		
				Median	Mean	Std.	Median	Mean	Std.
Buys	1288	8271	0.86	10000	98228	723565	110	1050	4070
Sells	1367	19432	1.90	29193.5	136501	588302	430	2033	7081
Total	1556	27751	2.39	.	.	.	.	.	.

Panel B: Descriptive statistics of corporate governance variables

	Total Obs.	Mean	Std.	Min.	p10	Median	p90	Max.
State	4984	0.42	0.49	0	0	0	1	1
Concentration	4984	35.79	14.42	4.08	17.47	34.35	54.15	86.32
Separation	4984	1.22	0.63	1.00	1.00	1.004	1.77	15.72

Panel C: Transactions by ownership type, ownership concentration and separation

	No. Sales	No. Purchases	Ave. Value of Sales	Ave. Value of Purchases	No. Trades
Ownership type					
State=1	4882	3743	1664	338	8625
State=0	14050	4232	2126	1362	18282
Ownership Structure					
Group 1	3546	1173	2142	2261	4719
Group 2	8705	3703	2176	968	12408
Group 3	4621	1816	1730	698	6437
Group 4	2576	1593	1941	741	4169
Separation					
Separation=1	6343	2559	2227	992	8902
Separation>1	13105	5726	1939	866	18831

Note: Table 1 reports the descriptive statistics for all trades and net trades (value in thousands of RMB). In Panel A, No.firms is the number of firms, N is the number of transactions, Ave.trades denotes the average number of trades per firm per year (2007.7.1 to 2014.12.31, roughly 391 weeks). Panel B reports the descriptive statistics of the three proxies for corporate governance – *Concentration*, *State* and *Separation*. Panel C reports the descriptive statistics for insider transactions grouped by ownership type, ownership concentration and separation.

3.2 Aggregate insider trading activity

Weekly data are used in this study to examine the relationship between aggregate insider transactions and market returns. The net number of insider transactions in firm i and week t, $NH_{i,t}$, is defined as follows:

$$NH_{i,t} = \sum_{j=1}^{J_{i,t}} H_{t,j} \quad (1)$$

where t=1,2,…, 386 denotes the number of weeks from June 1, 2007 to December 31, 2014. $J_{i,t}$denotes the total number of transactions by insiders in firm i and week t, and$H_{t,j}$ equals 1 if transaction j is a purchase and -1 if transaction j is a sale. To ensure that each firm has the same weight in the aggregating insider transaction measure, we standardize $NH_{i,t}$ by

subtracting the mean and dividing by its standard deviation over 386 weeks. Specifically, the standardized aggregate insider transactions in group k and in week t, $SANE_t^k$, is defined as

$$SANE_t^k = \sum_{i=1}^{I_k}\left((NH_{i,t} - \overline{NH_i})\left(\frac{}{s(NH)_i}\right)\right) \quad (2)$$

where I_k is the number of firms in group k. We see that

$$\overline{NH_i} = \sum_{t=1}^{386}\frac{NH_{i,t}}{386} \quad (3)$$

Then we can write

$$s(NH_i) = \left[\sum_{t=1}^{386}\frac{(NH_{i,t} - \overline{NH_i})^2}{385}\right]^{\frac{1}{2}}. \quad (4)$$

Figure 1 plots the time pattern of $SANE_t^{All}$ for all firms from July 1, 2007 through December 31, 2014. The $SANE_{All}^t$series appears to be stationary and positively correlated.

Figure 1. Weekly Standardized Aggregate Net Transactions by Executives (SANE) – All firms (July 1, 2007 – December 31, 2014)

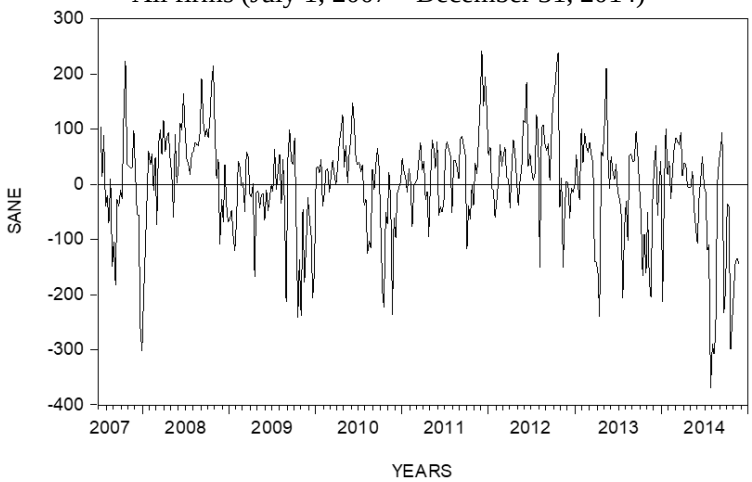


Table 2 reports the statistical properties of the standardized aggregate net number of transactions by corporate insiders (SANE) for all firms and for all firm groups. The means of SANE are zero in our construction. Variable SANE for all firms has a standard deviation of 96.14, much larger than the standard deviations of each firm group. The serial correlation coefficients of SANE show patterns of geometric decay. The Box-Pierce-Q statistics suggest that a third-order autoregressive model (AR(3)) is appropriate for most of our series.10 In addition, Table 2 also reports cross-correlations of aggregate insider trading for different firm groups. The cross-sectional correlation coefficients of the standardized aggregate net number of transactions among the corresponding group are generally positive, varying from 0.44 to 0.61, but are relatively smaller than those between firm groups and for all firms. This suggests that insiders from different firm groups are less likely to trade the stock of their firms at the same time. It

[10] The higher-order serial correlation coefficients are insignificant.

provides first-hand evidence that insiders in different firms do not seem to react to the same economy-wide factors.

Table 2. Statistical Properties of the Standardized Aggregate Insider Trading

Panel A: All firms

							Serial Corr. Coef.			
Variable	Std.	Min.	p10	Median	p90	Max.	lag1	lag2	lag3	lag4
SANE	96.07	-369.86	-136.82	14.19	98.30	241.88	0.63*	0.44*	0.28*	0.12*

Panel B: Statistical and time series properties for SANE by *State*

					Cross-Sectional Corr. Coef.		Serial Corr. Coef.			
Group	Std.	Min.	Median	Max.	$SANE_{2,2}$	SANE	lag1	lag2	lag3	lag4
$SANE_{2,1}$	42.23	-199.72	4.60	145.32	0.55	0.82	0.51*	0.32*	0.20*	0.12*
$SANE_{2,2}$	66.36	-279.47	10.20	188.34		0.93	0.61*	0.43*	0.30*	0.12*

Panel C: Statistical and time series properties for SANE by *Concentration*

					Cross-Sectional Corr. Coef.				Serial Corr. Coef.			
Variable	Std.	Min.	Median	Max.	$SANE_{1,2}$	$SANE_{1,3}$	$SANE_{1,4}$	SANE	lag1	lag2	lag3	lag4
$SANE_{1,1}$	21.17	-82.33	4.01	65.61	0.61	0.51	0.48	0.77	0.48*	0.35*	0.24*	0.09
$SANE_{1,2}$	45.72	-168.28	6.75	154.74		0.59	0.55	0.91	0.54*	0.40*	0.24*	0.11*
$SANE_{1,3}$	28.18	-140.33	3.92	85.75			0.44	0.78	0.45*	0.29*	0.22*	0.05
$SANE_{1,4}$	22.35	-108.16	2.66	58.17				0.72	0.38*	0.18*	0.08	0.08

Panel D: Statistical and time series properties for SANE by *Separation*

					Cross-Sectional Corr. Coef.		Serial Corr. Coef.			
Group	Std.	Min.	Median	Max.	$SANE_{2,2}$	SANE	lag1	lag2	lag3	lag4
$SANE_{3,1}$	30.20	-105.02	4.15	80.45	0.67	0.83	0.48*	0.38*	0.22*	0.10
$SANE_{3,2}$	73.15	-277.16	11.83	196.98		0.97	0.60*	0.40*	0.25*	0.12*

Note: Table 2 reports the statistical and time series properties of the standardized aggregate net number of transactions by executives (SANE, $SANE_{i,j}$). Refer to Equations (1)-(4) for the computation. In Panel A, SANE is the standardized aggregate net number of all transactions. In Panel B, transactions are divided into two groups based on *State*, where $SANE_{2,1}$ is the standardized aggregate net number of transactions of government-related shareholders and $SANE_{2,2}$ otherwise. In Panel C, all transactions are divided into four groups: firms in Group 1 have the largest shareholdings as less than 20%; Group 2, between 20% and 36%; Group 3, between 36% and 48%; and Group 4, greater than 48%. Variable $SANE_{1,j}$ (j=1, 2, 3, 4) is the standardized aggregate net number of transactions of group *j*. Likewise, in Panel D, transactions are grouped based on *Separation*, where in SepGroup1, the *Separation* value is equal to 1 and in SepGroup2 it is higher than 1. Variable $SANE_{3,j}$ (j=1, 2) is the standardized aggregate net number of transactions for group *j*. The mean of SANE, $SANE_{i,j}$ is zero by definition, and therefore not reported in the table. There are 386 weekly observations for each series. The cross-sectional correlation coefficients and serial correlation coefficients of SANE, $SANE_{i,j}$ are also reported. The serial correlation coefficient of orders 1-4 are denoted by lag1-lag4. Serial correlation coefficients of higher orders are not significant, and thus not reported. Significance is denoted by *(star) at the 5% level.

4. Empirical results

4.1. Main results

To examine the relationship between aggregate insider transactions and stock market returns, we conduct a series of multivariate regression analysis. The dependent variable is the one-week excess market return, RME, defined as the difference between the weekly return for the market portfolio and the 7-day repo rate.[11] To proxy for the market portfolio, we use equally weighted portfolios of all Chinese listed firms.[12] The independent variables are the lagged terms of SANE. As most regressions contain serially correlated residuals, we include an error model with a significant moving average term at the 4th lag.[13] The market return and the one-week risk-free rate during the same period are obtained from CSMAR.

If the mandatory disclosure of insiders' transactions works, then insiders ought to trade primarily based on their observations of changes in economy-wide activity before other market participants; a positive relationship between current insider trading and future excess market return is expected.

The results are shown in Table 3. In Model (1), the independent variable is the one-week lagged term of SANE. The results show limited prediction power for aggregating insider trading. Although the coefficient for SANEt-1 is positive, it is statistically insignificant at conventional confidence levels. Model (2) includes lagged terms of SANE for up to four weeks. The coefficient for SANEt-1 is still insignificant, while both coefficients for SANEt-3 and SANEt-4 are insignificantly positive. Model (3) includes lagged terms of SANE for up to eight weeks. The estimated coefficients are basically unchanged.[14] These results suggest that corporate insiders are less likely to trade based on economy-wide information.[15] Consistent with our hypothesis, the mandatory disclosure of insider transactions has a marginal contribution to the improvement of the information environment.

[11] The 7-day repo rate is often used as a benchmark interest rate (Green, 2005).

[12] We also use the value-weighted portfolios of all Chinese listed firms to measure market returns, and obtain similar results.

[13] For reasons of space, the estimates of the error model are not reported, but are available upon request.

[14] We also include more lagged terms of SANE, but all coefficients are statistically insignificantly different from zero.

[15] We also conduct additional tests to examine the sensitivity of the results. First, we use the value-weighted market portfolio to measure excess market return. Second, we include more lagged terms of SANE. Third, we exclude a few outliers. Similar results are obtained.

Table 3. Regression of Excess Market Return against Standardized Aggregate Insider Transactions

Constant	$SANE_{t-1}$	$SANE_{t-2}$	$SANE_{t-3}$	$SANE_{t-4}$	$SANE_{t-5}$	$SANE_{t-6}$	$SANE_{t-7}$	$SANE_{t-8}$	R^2
3.0868	0.0179								
(2.2630)	(0.0236)								0.0015
2.5706	0.0117	-0.0178	0.0033	0.0449					
(2.2549)	(0.0302)	(0.0349)	(0.0349)	(0.0303)					0.0092
2.4311	0.0121	-0.0161	0.0045	0.0553	-0.0106	-0.0022	-0.0020	-0.0443	
(2.2683)	(0.0306)	(0.0354)	(0.0355)	(0.0355)	(0.0355)	(0.0357)	(0.0356)	(0.0310)	0.0200

Note: Table 3 reports the OLS regression results of the excess weekly returns to the equally weighted market returns (RME) against the lagged values of the weekly standardized aggregate net number of transactions by executives (SANE) in Panel A. Excess market return is defined as the actual return to the market portfolio minus the return on the contemporaneous risk-free rate. The standard deviation of estimated coefficients are shown in parentheses. All estimated coefficients and the standard deviations are multiplied by 1,000. White heteroscedasticity robust standard errors are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

The previous discussion suggests that corporate insiders in China are able to selectively report their transactions or to hide their transactions for their own benefit. Hence, they are less likely to trade based on the effect of economy-wide shocks. In firms characterized by better corporate governance, insiders have fewer opportunities to expropriate the benefits of minority shareholders. Hence, insiders are more likely to observe and therefore to trade on economy-wide information. The prediction power of aggregate insider trading is expected to be positively related to the strength of corporate governance. The tests presented next examine this hypothesis.

We sort companies into several groups using three corporate governance variables and analyze the prediction power of aggregate insider transaction in each group. The results are exhibited in Table 4. Panel A reports the prediction power of insider transactions up to eight weeks ahead, separating the transactions into government and non-government firms. As predicted, there is no significant positive relation between aggregate insider trading and the excess returns for the group of state firms. In contrast, the estimated coefficient for SANEt-4 is positive and significant at the 5% level for the non-state firms. In Panel B, the relation between aggregate insider trading and subsequent market returns is examined separately by aggregating insider transactions by firms with different levels of ownership concentration. We find that aggregate insider trading is positively and significantly related with the portfolio returns of firms in both the diversified group (Group 1) and the highly concentrated group (Groups 3 and 4). A possible explanation is that the concentrated ownership structure allows the controlling shareholders to expropriate the interests of minority shareholders. However, when the percentage of controlling shareholdings is above a certain threshold, the company is more likely to operate as a private firm. The interests of controlling and minority shareholders are essentially aligned. The controlling shareholders have more incentive, and sufficient voting powers, to intervene in daily corporate operations, which benefits all shareholders (Jensen and Meckling, 1976). In Panel C, we divide companies into two groups using separation. Consistent with our expectation, the estimated coefficient for SANEt-4 is positive and significant at the 5% level in the separation=1 group. However, we do not find any significant relation between aggregate insider trading and subsequent returns in the separation>1group. This suggests that corporate

insiders are more likely to expropriate the benefits of minority shareholders in firms where the controlling rights are larger than the cash flow rights. Hence, their transactions are less likely to convey economy-wide information.

Table 4. Regression Results by Groups

Panel A: Regression results by *State*

Constant	$SANE_{t-1}$	$SANE_{t-2}$	$SANE_{t-3}$	$SANE_{t-4}$	$SANE_{t-5}$	$SANE_{t-6}$	$SANE_{t-7}$	$SANE_{t-8}$	R^2
State=1									
3.0887	0.0364								
(2.2634)	(0.0561)								0.0003
2.6083	-0.0013	0.0210	0.0545	0.0177					
(2.2595)	(0.0650)	(0.0717)	(0.0716)	(0.0652)					0.0052
2.3427	0.0117	0.0205	0.0491	0.0460	-0.0115	0.0472	-0.1282*	-0.0066	
(2.2710)	(0.0664)	(0.0738)	(0.0737)	(0.0734)	(0.0724)	(0.0721)	(0.0719)	(0.0656)	0.0165
State=0									
3.0878	0.0232								
(2.2632)	(0.0335)								0.0019
2.5631	0.0210	-0.0351	-0.0142	0.0839**					
(2.2509)	(0.0420)	(0.0481)	(0.0481)	(0.0422)					0.0141
2.4543	0.0164	-0.0318	-0.0009	0.0842*	-0.0085	-0.0286	0.0496	-0.0938**	
(2.2598)	(0.0426)	(0.0488)	(0.0490)	(0.0490)	(0.0489)	(0.0495)	(0.0495)	(0.0433)	0.0260

Panel B: Regression results by *Concentration*

Constant	$SANE_{t-1}$	$SANE_{t-2}$	$SANE_{t-3}$	$SANE_{t-4}$	$SANE_{t-5}$	$SANE_{t-6}$	$SANE_{t-7}$	$SANE_{t-8}$	R^2
Group 1									
3.0870	0.0638								
(2.2636)	(0.1071)								0.0009
2.5232	0.0115	-0.0308	-0.0968	0.3127**					
(2.2461)	(0.1234)	(0.1330)	(0.1322)	(0.1237)					0.0171
2.4374	0.0129	-0.0350	-0.0406	0.3799***	-0.1876	-0.0309	0.0157	-0.1634	
(2.2576)	(0.1246)	(0.1352)	(0.1362)	(0.1369)	(0.1369)	(0.1382)	(0.1368)	(0.1266)	0.0298
Group 2									
3.0893	0.0290								
(2.2636)	(0.0496)								0.0009
2.5660	-0.0200	0.0077	0.0674	0.0491					
(2.2533)	(0.0592)	(0.0652)	(0.0652)	(0.0594)					0.0107
2.3804	-0.0259	0.0043	0.0702	0.0541	0.0206	-0.0093	-0.0300	-0.0539	
(2.2720)	(0.0598)	(0.0659)	(0.0667)	(0.0667)	(0.0669)	(0.0674)	(0.0667)	(0.0609)	0.0168
Group 3									
3.0910	0.0364								
(2.2640)	(0.0804)								0.0005
2.5623	0.0325	-0.0201	-0.1552	0.2429***					
(2.2420)	(0.0893)	(0.0956)	(0.0963)	(0.0904)					0.0206
2.3236	0.0131	0.0140	-0.1439	0.2547**	-0.0596	-0.0394	0.0884	-0.1126	
(2.2593)	(0.0914)	(0.0985)	(0.0981)	(0.0984)	(0.0985)	(0.0983)	(0.0986)	(0.0921)	0.0275
Group 4									
3.0871	0.0826								
(2.2627)	(0.1015)								0.0017
2.6418	0.1027	-0.1402	0.2193*	-0.1237					
(2.2501)	(0.1090)	(0.1161)	(0.1163)	(0.1093)					0.0132
2.3776	0.1382	-0.1583	0.2252*	-0.1225	0.0498	0.1162	-0.2542**	-0.1614	
(2.2432)	(0.1093)	(0.1169)	(0.1171)	(0.1166)	(0.1163)	(0.1165)	(0.1164)	(0.1096)	0.0404

Panel C: Regression results by *Separation*

Constant	$SANE_{t-1}$	$SANE_{t-2}$	$SANE_{t-3}$	$SANE_{t-4}$	$SANE_{t-5}$	$SANE_{t-6}$	$SANE_{t-7}$	$SANE_{t-8}$	R^2
Separation=1									
3.0887	0.0354								
(2.2640)	(0.0752)								0.0006
2.5519	0.0124	-0.0582	-0.0040	0.1828**					
(2.2503)	(0.0867)	(0.0931)	(0.0932)	(0.0872)					0.0133
2.4182	0.0219	-0.0620	0.0158	0.2098**	-0.0711	0.0181	-0.0535	-0.0997	
(2.2652)	(0.0874)	(0.0938)	(0.0960)	(0.0961)	(0.0960)	(0.0964)	(0.0944)	(0.0885)	0.0226
Separation>1									
3.0875	0.0250								
(2.2627)	(0.0310)								0.0017
2.5867	0.0158	-0.0159	0.0123	0.0408					
(2.2581)	(0.0385)	(0.0441)	(0.0442)	(0.0387)					0.0064
2.4174	0.0155	-0.0141	0.0130	0.0482	0.0027	-0.0120	0.0085	-0.0620	
(2.2723)	(0.0388)	(0.0446)	(0.0446)	(0.0446)	(0.0447)	(0.0450)	(0.0451)	(0.0395)	0.0164

Note: Table 4 reports the regression results by firms in different groups. Panel A provides regression results grouped by *Concentration*. Firms in Group 1 have the largest shareholdings as less than 20%; Group 2, between 20% and 36%; Group 3, between 36% and 48%; and Group 4, greater than 48%. Variable $SANE_{1,j}$ (j=1,2,3,4) is the standardized aggregate net number of transactions of group *j*. In Panel B, $SANE_{2,1}$ is the standardized aggregate net number of transactions of government-related shareholders, and $SANE_{2,2}$ is otherwise. Likewise, in Panel C, transactions are grouped based on *Separation*, where in SepGroup1 separation is equal to 1 and, in SepGroup2, larger than 1. Variable $SANE_{3,j}$ (j=1,2) is the standardized aggregate net number of transactions for group *j*. White heteroscedasticity robust standard errors are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

4.2 Alternative specifications

In this section, we conduct various tests to examine the sensitivity of the results. First, additional measures of aggregate insider trading are computed. The aggregate net number of insiders transaction in firm i and week t, $NQ_{i,t}$, is defined by the standardized product of $H_{t,j}$ in Equation (1) and the number of trade shares following Equation (4) to compute standardized aggregate net shares by executives (SANQ). The aggregate net value of insiders trading in firm i and week t,$NV_{i,t}$, is defined by the standardized product of $H_{t,j}$ in Equation (1) and the value of trade shares following Equation (4) to compute standardized aggregate net values by executives (SANV). Panel A and Panel B of Table 5 report the empirical results for SANQ and SANV, respectively, and similar results are obtained. There is no forecasting ability for aggregate insider trading in the sample of all firms. However, aggregate insider trading is able to predict future stock returns in non-state firms, diversified ownership or highly concentrated firms, and firms without separation between control and cash flow rights. These findings suggest that our empirical results are not sensitive to different definitions of insider trading activities.

So far, we have documented a strong relationship between stock returns and aggregate insider trading in relatively better governed firms. Seyhun (1992) shows that both changes in business conditions and stock price movements deviating from the expected value based on fundamentals can explain the prediction ability of aggregate insider trading. To examine which contributes to

the forecasting ability of aggregate insider trading, we include several variables related to changes in future real economic activity as additional predictors of stock returns. Specifically, we use the future growth rates of GDP and industrial production as two measures of future real economic activities and include past stock returns as an additional variable. As weekly data for GDP and industrial production are not available, we use the next quarter growth rate of GDP and the next month growth rate of industrial production. The relationship between aggregate insider trading and subsequent stock returns is examined first by all firms, and then separately by each firm group. The empirical results are reported in Panel C of Table 5. Interestingly, the coefficients of GDP are negative and significantly different from zero in all specifications. This suggests that the future growth rate of GDP is negatively related to excess stock returns. A possible explanation is that stock prices are not driven by the economic or business conditions in China's stock market (Morck et al., 2000). We also find that past stock returns are a significant predictor of future excess stock returns. The coefficients of RME t-2 are positive and statistically significant at the conventional level across all specifications. Consistent with the corresponding simple regression in Table 3, Panel C of Table 5 shows that aggregate insider transactions have no marginal explanatory power in the sample of all firms. In contrast, aggregate insider trading is positively related with excess stock returns for non-state firms, diversified ownership or highly concentrated firms, and firms without separation between control and cash flow rights. Including future economic activity and past stock returns as additional explanatory variables does not affect either the magnitude or significance of the coefficients of aggregate insider trading. This suggests that movements of insiders' transactions are not influenced by the expectation of future economic activity. Hence, the prediction ability of aggregate insider trading is not attributed to the expectation of future real economic activity.

Table 5 Regression Results of Alternative Specifications

Panel A: Regression of excess market return against SANQ

Constant	$SANQ_{t-1}$	$SANQ_{t-2}$	$SANQ_{t-3}$	$SANQ_{t-4}$	$SANQ_{t-5}$	$SANQ_{t-6}$	$SANQ_{t-7}$	$SANQ_{t-8}$	R^2
Overall									
2.3910	-0.0117	0.0048	0.0126	0.0672	-0.0147	0.0023	-0.0208	-0.0375	
(2.2702)	(0.0368)	(0.0425)	(0.0426)	(0.0427)	(0.0426)	(0.0430)	(0.0431)	(0.0380)	0.0188
State=1									
2.3008	-0.0593	0.0888	0.0233	0.0705	0.0378	-0.0017	-0.1391*	0.0185	
(2.2635)	(0.0700)	(0.0759)	(0.0760)	(0.0756)	(0.0750)	(0.0746)	(0.0739)	(0.0688)	0.0233
State=0									
2.4179	-0.0032	-0.0139	-0.0241	0.1188**	-0.0263	-0.0031	0.0337	-0.0933*	
(2.2655)	(0.0495)	(0.0571)	(0.0571)	(0.0578)	(0.0577)	(0.0586)	(0.0590)	(0.0517)	0.0240
Group1									
2.4681	-0.0205	-0.0626	-0.0122	0.3650**	-0.1195	-0.0570	0.0747	-0.2554*	
(2.2613)	(0.1301)	(0.1408)	(0.1415)	(0.1420)	(0.1420)	(0.1489)	(0.1483)	(0.1401)	0.0296
Group2									
2.3347	-0.0483	0.0207	0.0582	0.0744	0.0072	-0.0062	-0.0422	-0.0383	
(2.2774)	(0.0654)	(0.0710)	(0.0714)	(0.0719)	(0.0719)	(0.0719)	(0.0719)	(0.0667)	0.0126
Group3									
2.2770	-0.0104	0.0309	-0.1273	0.2352**	0.0048	-0.0229	0.0428	-0.0356	
(2.2701)	(0.0993)	(0.1044)	(0.1042)	(0.1041)	(0.1045)	(0.1044)	(0.1044)	(0.0997)	0.0177
Group4									
2.4254	-0.1713	0.0568	0.3261*	-0.0189	0.0951	0.0066	-0.3846**	-0.2185	
(2.2531)	(0.1723)	(0.1750)	(0.1808)	(0.1814)	(0.1811)	(0.1825)	(0.1796)	(0.1755)	0.0324
Separation=1									
2.3828	-0.0082	0.0162	-0.0114	0.1317**	0.0094	-0.0382	-0.0626	-0.0276	
(2.2657)	(0.0578)	(0.0622)	(0.0622)	(0.0621)	(0.0619)	(0.0632)	(0.0637)	(0.0592)	0.0219
Separation>1									
2.3440	-0.0236	-0.0019	0.0255	0.0741	-0.0039	0.0159	0.0183	-0.0953	
(2.2751)	(0.0572)	(0.0629)	(0.0631)	(0.0638)	(0.0643)	(0.0637)	(0.0636)	(0.0586)	0.0152

Panel B: Regression of excess market return against SANV

Constant	$SANV_{t-1}$	$SANV_{t-2}$	$SANV_{t-3}$	$SANV_{t-4}$	$SANV_{t-5}$	$SANV_{t-6}$	$SANV_{t-7}$	$SANV_{t-8}$	R^2
Overall									
2.3548	-0.0137	0.0051	0.0209	0.0679	-0.0203	0.0081	-0.0209	-0.0282	
(2.2694)	(0.0362)	(0.0419)	(0.0421)	(0.0420)	(0.0419)	(0.0423)	(0.0425)	(0.0372)	0.0196
State=1									
2.2837	-0.0792	0.0936	0.0472	0.0651	0.0254	-0.0062	-0.1101	0.0308	
(2.2633)	(0.0673)	(0.0733)	(0.0735)	(0.0731)	(0.0724)	(0.0720)	(0.0710)	(0.0660)	0.0234
State=0									
2.3928	0.0026	-0.0175	-0.0227	0.1299**	-0.0329	0.0107	0.0224	-0.0842	
(2.2642)	(0.0498)	(0.0577)	(0.0577)	(0.0584)	(0.0582)	(0.0591)	(0.0596)	(0.0519)	0.0253
Group1									
2.3957	-0.0099	-0.0913	0.0051	0.3814***	-0.1054	0.0048	0.0238	-0.1977	
(2.2625)	(0.1291)	(0.1407)	(0.1419)	(0.1424)	(0.1423)	(0.1477)	(0.1467)	(0.1375)	0.0280
Group2									
2.3038	-0.0399	0.0083	0.0825	0.0789	0.0092	-0.0196	-0.0389	-0.0199	
(2.2741)	(0.0646)	(0.0704)	(0.0706)	(0.0710)	(0.0709)	(0.0712)	(0.0713)	(0.0659)	0.0156
Group3									
2.2589	-0.0119	0.0340	-0.0908	0.2408**	-0.0246	-0.0209	0.0624	-0.0215	
(2.2693)	(0.0972)	(0.1023)	(0.1025)	(0.1025)	(0.1030)	(0.1028)	(0.1025)	(0.0977)	0.0185
Group4									
2.4073	-0.1880	0.0957	0.3108*	-0.0023	0.0794	0.0114	-0.3579**	-0.2026	
(2.2540)	(0.1682)	(0.1710)	(0.1752)	(0.1761)	(0.1759)	(0.1771)	(0.1752)	(0.1713)	0.0314
Separation=1									
2.3582	-0.0072	0.0157	-0.0031	0.1427**	-0.0183	-0.0220	-0.0602	-0.0143	
(2.2655)	(0.0574)	(0.0619)	(0.0621)	(0.0620)	(0.0618)	(0.0632)	(0.0634)	(0.0588)	0.0223
Separation>1									
2.2974	-0.0292	-0.0005	0.0418	0.0695	0.0142	0.0059	0.0201	-0.0811	
(2.2732)	(0.0558)	(0.0614)	(0.0616)	(0.0621)	(0.0625)	(0.0621)	(0.0619)	(0.0569)	0.0166

Note: Table 5 reports the regression results of excess market return against standardized aggregate net shares by executives (SANQ) in Panel A and the results against standardized aggregate net values by executives (SANV) in Panel B. White heteroscedasticity robust standard errors are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

4.3 A vector autoregressive (VAR) analysis

To ensure that our empirical results of the simple regression are not spurious, we use the vector autoregressive (VAR) model to examine the interdependence between excess market

return and aggregate insider trading in a multi-equation model.16 Our empirical results show that aggregate insider trading is able to predict stock returns in firms with better investor protections. Thus, we use Granger causality tests and examine whether there is causality running from aggregate insider trading to market returns in these firms. In addition, we use impulse response functions to capture the speed of the reactions of variables to shocks.

Table 6 presents the results of the Granger causality tests by all firms, and separately by each firm group. In the full sample, significant Granger causality was not observed from aggregate insider trading to market returns. Consistent with our hypothesis, the results seem to suggest that insiders are less likely to incorporate economy-wide information in their transactions. However, market returns depend significantly on lagged aggregate insider trading in non-state firms, diversified ownership or highly concentrated firms, and firms without separation between control and cash flow rights. It appears that aggregate insider trades contain more information in firms with a better governance structure.

Table 6. Granger Causality Tests

Group	Null Hypothesis	Prob.
Overall	SANE does not Granger Cause RME	0.257
Group1	SANE does not Granger Cause RME	0.035**
Group2	SANE does not Granger Cause RME	0.567
Group3	SANE does not Granger Cause RME	0.039**
Group4	SANE does not Granger Cause RME	0.020**
State=1	SANE does not Granger Cause RME	0.338
State=0	SANE does not Granger Cause RME	0.056*
Separation=1	SANE does not Granger Cause RME	0.029**
Separation>1	SANE does not Granger Cause RME	0.140

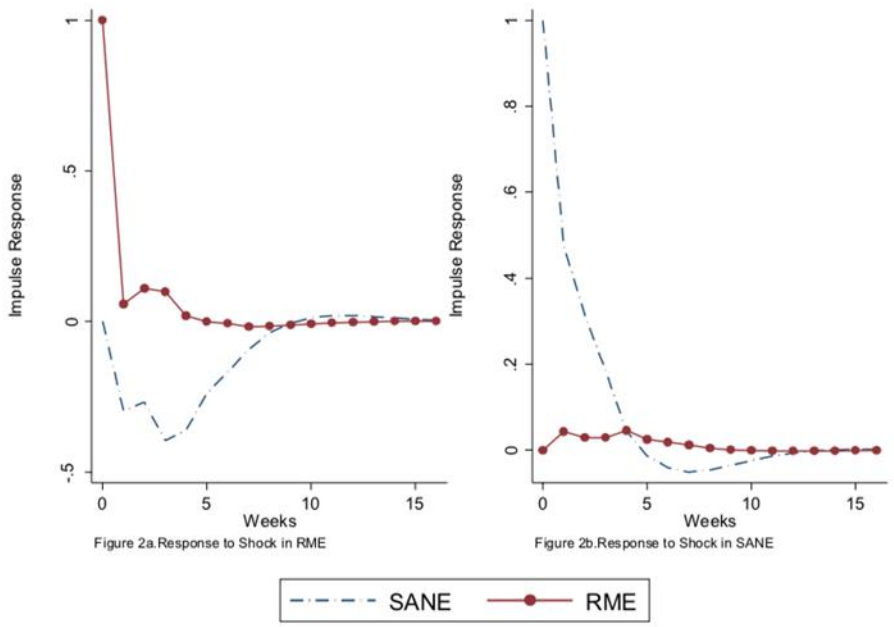
Note: Table 6 reports the Granger causality tests on the relationship between SANE and RME. The sample firms are grouped by three dimensions. First, by whether the firm is state-owned, if yes, we have State=1, otherwise State=0. Second, by ownership concentration. Firms in Group 1 have the largest shareholdings as less than 20%; Group 2, between 20% and 36%; Group 3, between 36% and 48%; and Group 4, greater than 48%. Third, by separation of control and cash flow rights. The ratio of control to cash flow rights is equal to one if no shareholders have more than 20% voting rights. White heteroscedasticity robust standard errors are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

The impulse response functions, as shown in Figure 2, represent the lagged responses of SANE and RME to an exogenous shock in all firms. Figure 2a shows the normalized impulse responses to a positive shock in market returns. The week 1 coefficient of the response to this shock in SANE is -0.2964. The coefficient drops below 10% in absolute value in week 7 and continues to become smaller. Figure 2b displays the responses of market returns to a one standard deviation shock in net insider transactions. The signs of the coefficients show that a positive innovation in aggregate insider transactions is followed by an increase in stock returns. However, the magnitude of the response is relatively small. The week 1 and week 2 coefficients

16 As weekly data for real economic activities, e.g., GDP and industrial output, is not available, the VAR model only includes aggregate insider transactions and market returns.

are 0.0439 and 0.0295, respectively. Market returns in the following weeks exhibit virtually no response to these shocks.

Figure 2. Impulse Response Function



Note: Figure 2 shows the lagged response of SANE and RME to an exogenous shock. Figure 2a shows the normalized impulse responses to a positive shock in market returns. Figure 2b displays the responses of market returns to a one standard deviation shock in net insider transactions.

Figure 3a(i)-h(i) (i=1, 2) then exhibit the impulse response functions for different firm groups. Similar to Figure 2a, the signs of the coefficients in all firm groups show that a positive shock in returns is followed by a decrease in aggregate insider trading. However, for the response of market returns to a positive shock to aggregate insider trading, the magnitudes differ significantly across firm groups. Although we observe a shock in aggregate insider trading in both state firms and non-state firms, the week 1 coefficient in non-state firm, 0.4865, is much larger than that in state firms, where the coefficient is 0.3417. The response is also much larger for the full sample. For the impulse response with different ownership concentrations, similar results are obtained. The week 1 coefficients in Group 1 and 4 are 0.2188 and 0.2604, respectively, while the coefficient in Group 2 is 0.0204, and exhibits virtually no response. The results also show that the market response to a positive innovation in aggregate insider trading in firms without separation between control and cash flow rights is much larger than for firms with this separation. The week 1 coefficients are 0.4550 and 0.2801, respectively. This suggests that the latter has less prediction power for subsequent stock returns. These results corroborate the findings using simple regression analysis and Granger causality tests.

Figure 3. Impulse Response Functions by Firm Groups

State=0

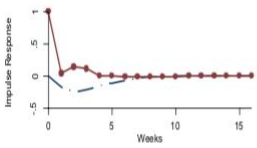


Figure 3a1.Response to Shock in RME

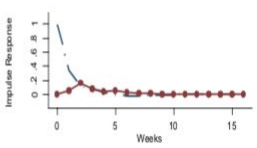


Figure 3a2.Response to Shock in SANE

State=1

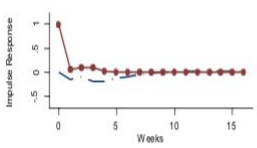


Figure 3b1.Response to Shock in RME

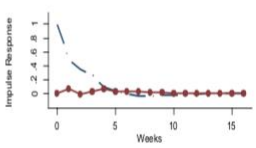


Figure 3b2.Response to Shock in SANE

Group1

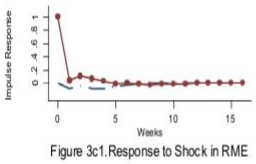


Figure 3c1.Response to Shock in RME

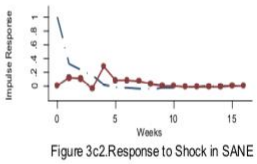


Figure 3c2.Response to Shock in SANE

Group2

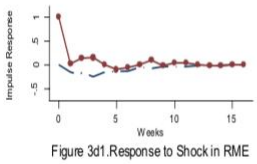


Figure 3d1.Response to Shock in RME

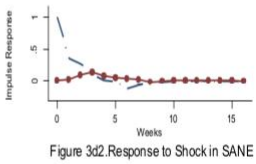


Figure 3d2.Response to Shock in SANE

Group3

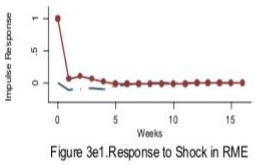


Figure 3e1.Response to Shock in RME

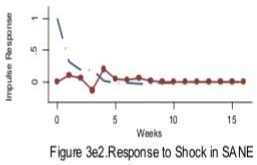


Figure 3e2.Response to Shock in SANE

Group4

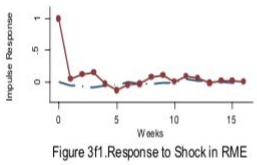


Figure 3f1.Response to Shock in RME

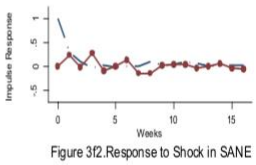


Figure 3f2.Response to Shock in SANE

Separation=1

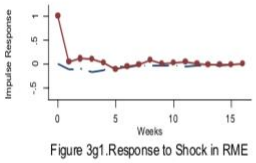


Figure 3g1.Response to Shock in RME

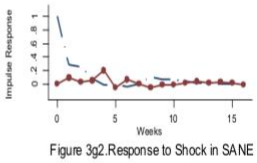


Figure 3g2.Response to Shock in SANE

Separation>1

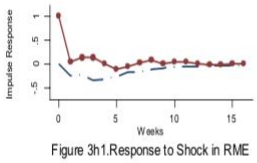


Figure 3h1.Response to Shock in RME

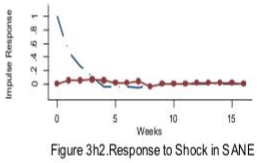


Figure 3h2.Response to Shock in SANE

Note: Figures 3a(1)-3b(2) compare the lagged response of SANE and RME to an exogenous shock between state firms and non-state firms. Figures 3c(1)-3f(2) compare the impulse response across firms with different levels of ownership concentration. Figures 3g (1)-h (2) compare the impulse response between firm groups with different levels of control and cash flow right separation.

5. A simple prediction test

While our regression analysis shows the prediction ability of aggregate insider trading, its economic significance is not addressed. In this section, we attempt to examine whether the relationship between aggregate insider trading and market return could be used to construct a profitable trading strategy.

For each week, we estimate SANE. When SANE falls below zero, we obtain a down signal; otherwise we obtain an up signal. Given a down prediction, we short sell a market (portfolio) index, while we buy a market (portfolio) index when an up signal is obtained. The profitability of this strategy is the difference of the average equally weighted market (portfolio) returns during the up- and down-predicted weeks. More specifically, we examine whether the average market (portfolio) returns during up-predicted weeks exceed those of the down-predicted weeks. Table 7 uses the signal of aggregate insider trading to forecast the stock market up to eight weeks ahead. For various forecasting intervals, in the full sample, the average market return in up-predicted weeks exceeds that of the down-predicted weeks, however, the difference is statistically insignificantly different from zero. This suggests that future market returns are not predictable after the release of aggregate insider trading information.

However, we find that our trading strategy become profitable, to some extent, in the group of firms with better corporate governance. For an 8-week-ahead forecasting interval, the average portfolio return in non-state firms during up-predicted weeks exceeds that of down-predicted weeks by 1.61%. The value is significant at the 1% confidence level. In contrast, the difference is not statistically significant for any forecasting intervals in state firms. We also find that the profit is significantly positive in several forecasting intervals for firms with diversified or highly concentrated ownership and firms without separation between control and cash flow rights. For other types of firms, differences for all forecasting intervals are smaller and statistically insignificant.

Consistent with our previous findings, Table 7 suggests that the prediction power of aggregate insider trading, to a certain extent, can be used to construct a profitable strategy. For firms with better corporate governance, the magnitude of predicted return is large and economically significant.

Table 7. Weekly Average Excess Returns to Strategy Based on Past Aggregate Insider Trading Information

Group	Forecasting Horizon: # weeks ahead							
	1	2	3	4	5	6	7	8
Overall	0.0037	0.0032	0.0028	-0.0002	0.0025	0.0024	0.0002	-0.0025
	(1.22)	(1.04)	(0.88)	(-0.07)	(0.81)	(0.77)	(0.05)	(-0.81)
State=1	0.0061	0.0041	0.0023	0.0020	0.0028	0.0031	0.0005	-0.0033
	(1.81)	(1.23)	(0.69)	(0.55)	(0.95)	(1.05)	(0.17)	(-1.09)
State=0	0.0023	0.0045	0.0027	0.0024	0.0039	0.0087	0.0057	0.0161
	(0.44)	(0.87)	(0.53)	(0.46)	(0.77)	(1.64)*	(1.08)	(3.00)***
Group1	-0.0047	-0.0031	0.0015	0.0023	0.0053	0.0002	0.0049	0.0098
	(-0.91)	(-0.56)	(0.29)	(0.44)	(1.00)	(0.04)	(0.88)	(1.69)**
Group2	0.0026	0.0048	0.0032	0.0047	-0.0051	-0.0037	-0.0009	0.0010
	(0.78)	(1.54)	(0.99)	(1.59)	(1.74)	(1.24)	(0.29)	(-0.33)
Group3	-0.0020	-0.0032	-0.0015	0.0044	-0.0012	0.0001	0.0010	0.0089
	(-0.41)	(-0.64)	(-0.29)	(0.86)	(-0.24)	(0.01)	(0.19)	(1.65)*
Group4	0.0020	0.0002	0.0056	-0.0062	0.0042	0.0022	0.0178	0.0106
	(0.36)	(0.04)	(1.11)	(-1.28)	(0.85)	(0.44)	(3.63)***	(2.13)**
Sep=1	0.0021	0.0016	0.0032	0.0050	0.0036	0.0030	0.0069	0.0050
	(0.66)	(0.52)	(1.04)	(1.71)**	(1.10)	(0.84)	(2.10)**	(1.55)*
Sep>1	0.0027	0.0043	0.0032	0.0005	0.0027	0.0019	-0.0009	-0.0034
	(0.90)	(1.34)	(1.02)	(0.14)	(0.86)	(0.60)	(-0.28)	(-1.03)

Note: Table 7 exhibits the predictability of a strategy based on past aggregate insider trading information for weekly excess returns. The sample firms are grouped by three dimensions. First, whether the firm is state-owned, if yes, we have State=1, otherwise 0. Second, the ownership concentration. Firms in group 1 have the largest shareholdings less than 20%; group 2, between 20% and 36%; group 3, between 36% and 48%; group 4, greater than 48%. Third, separation of control and cash flow rights. The ratio of control to cash flow rights equal to one if no shareholders have more than 20% voting rights. White heteroscedasticity robust standard errors are in parentheses. ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels.

6. Conclusions

In this paper, we examine the relationship between past aggregate insider trading and future stock returns. On the whole, our empirical results show that net aggregate insider trading activity in a given week is not able to predict the returns of the market portfolio for the subsequent eight weeks. It shows that China's insiders do not trade their shares merely based on their assessment of the mispricing in their own firms' securities. Although the CSRC requires corporate insiders to report their transactions of firm shares, there are various ways to selectively report transactions or hide certain transactions for private benefit.

However, aggregate insider trading in non-state firms, diversified ownership or highly concentrated firms, and firms without separation between control and cash flow rights can predict future stock returns. In firms with less risk of expropriation, insiders' transactions are more likely to be scrutinized, and so they tend to trade their own firms' stocks based on the

mispricing due to economy-wide factors. When the market recognizes changes in economy-wide activity, the prices of the portfolio stocks will change.

We checked the robustness of our results using alternative measures of aggregate insider transactions, and additional explanatory variables for control, e.g., past stock returns and proxies of future real economic activity. Our results remain qualitatively unchanged. The results also suggest that the prediction ability of aggregate insider trading is not attributed to the expectation of future real economic activity. The VAR analysis and simple prediction test results reinforce our argument that better corporate governance strengths the prediction power of aggregate insider trading for future market returns.

Our results have a number of policy implications for regulators in emerging markets. Learning from developed countries, most emerging market economies have implemented and enforced insider trading laws to regulate the transactions of corporate insiders. However, these reforms have not resulted in substantial improvement. Many of these countries, like China, lack investor protections. The market regulator alone is not enough to mitigate insiders' abuse. To circumvent insider trading laws, corporate insiders are more likely to obtain private benefits through undisclosed self-dealing instead of trading in the secondary market. A comprehensive strengthening of the enforcement of regulations to limit the expropriation risks in emerging markets is necessary.

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Measuring the Importance of Renminbi in the Exchange Rate Spillover Networks: New Indices of RMB Internationalization*

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With an innovative network approach, this study constructs new indices of Renminbi (RMB) internationalization and presents strong evidence of RMB's growing influence globally and regionally. We identify networks of exchange rate spillovers and examine time-varying spillover intensities among RMB and world major currencies of G20 members as well as currencies related to the Belt and Road. Shocks from RMB generate intensifying spillovers across currency networks. The role of RMB in the networks has increased steadily over time. Our findings highlight that RMB has become increasingly important since China initiated market reforms of its currency and the proposal of building the modern Belt and Road.

JEL Classifications: G01; G15; G32

Keywords: RMB; spillover, financial network, Belt and Road

1. Introduction

The international status of a currency is dependent on the country's economic status and influence in the world (Chinn and Frankel, 2007; Meissner and Oomes, 2008). China is now the world's second largest economy with its GDP accounting for more than 15% of the global GDP. Moreover, China has become the largest country in terms of trade with its imports and exports accounting for 11% of the global trade. In the recent years, People's Bank of China has endeavored to improve the cross-border use of RMB and open financial market such as interbank bond market. Following the milestone inclusion of RMB into Special Drawing Right (SDR) basket in October 2016, a question naturally raised is whether RMB plays a growing role in the global and regional economy and financial system.

According to COFFER data of the International Monetary Fund (IMF), the Chinese yuan's share of currency reserves increased to 1.89 percent in the fourth quarter of 2018, ranking the fifth among all allocated reserves.[1] RMB is also the fifth most active currency for domestic and international payments by value with a share of 1.89% and the eighth most active currency for cross-border payment with a share of 1.22% in March 2019, according to Society for Worldwide

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[1]IMF has released reserves held in RMB since the fourth quarter of 2016.

Interbank Financial Telecommunications (SWIFT)[2]. In contrast, the survey by Bank of International Settlements (BIS) shows that RMB accounted only 4.0% of the turnover of foreign exchange and OTC derivatives trading while the US dollar remained the dominant trading currency constituting 88% of all trades in April 2016[3]. Meanwhile, some Chinese institutes have released RMB internationalization reports based on the international use of RMB. The annual Renminbi Internationalization Report by China Construction Bank covers statistics overseas RMB assets growth, RMB offshore deposits growth, RMB offshore bond issuance, and so on. The International Monetary Institute (IMI) of Renmin University compiles a quarterly RMB Internationalization Index (RII) based on several international use of RMB. In this paper, we construct new indices of RMB Internationalization by measuring the importance of RMB in the exchange rate spillover networks. Our study extends the growing literature to show the increasing importance of RMB using exchange rate data (for example, Shu, He and Cheng, 2015) and makes several contributions.

Firstly, we measure the mutual impacts between major currencies using a network approach since the global major currencies anchor mutually with each other (Balasubramaniam et al., 2011; Fratzscher&Mehl, 2013). A network approach enriches our understanding of financial systems (Allen and Babus 2009)[4]. Diebold and Yilmaz (2014) propose intuitive spillover measures based on forecast error variance decompositions of VAR models and define weighted, directed networks accordingly. Yang and Zhou (2017) extend this approach to study volatility spillovers across countries and asset classes. With this novel empirical method, we use daily exchange rate changes to identify the time-varying network structure of spillovers that link the RMB, including its mid-price, the on-shore and off-shore prices, with major global currencies as well as major currencies along the Belt and Road. With intensifying mutual spillover effects, the world is embracing a more multipolar monetary system. More importantly, RMB has played an important role in the multipolar monetary system since RMB exerted intensifying spillover effects on currencies across the globe and regions, such as the Belt and Road.

Secondly, we further compile a series of RMB impact indices as the RMB's network spillovers from the VAR models recursively extended from Diebold and Yilmaz (2014). These indices show whether spillover from RMB to other currencies has intensified steadily over years. In other words, these indices show RMB's relative importance as an anchor currency among all the currencies in the network. Moreover, the centrality of RMB in the network has grown steadily over the years, suggesting increased systemic importance of RMB. Compared with other RMB internalization reports or indices which are released at most in monthly frequency, our indices track RMB's capacity to drive the exchange rate changes of other currencies moving in the same direction in daily frequency.

More importantly, we show that the growing impacts of RMB are related to developments in RMB's marketization reform in recent years and the progress of building the modern Belt and Road. In particular, the RMB's impact indices experienced a sharp jump when China launched market reform of its currency on July 21, 2005, and drive other currencies to move in the same direction ever since. Meanwhile, the on-shore RMB has taken the central position of the network among the Belt and Road's related currencies since the Belt and Road initiative was proposed in

[2]SWIFT has released the RMB Internationalization Tracker monthly since 2011, reporting the RMB share as international payments currency.

[3]BIS has conducted a triennial survey of foreign exchange and OTC derivatives trading on major currencies since 1995 and on RMB since 2007. The most recent survey was conducted in 2016.

[4]A network describes a collection of nodes and the links between them. In the international monetary system, the nodes of the network represent exchange rate markets, and the links represent direct or indirect relationship between two currencies.

2013. Our findings highlight that RMB has become increasingly important since China initiated market reforms of its currency and the proposal of building the modern Belt and Road.

The rest of this paper is organized as follows. Section 2 describes the data. Section 3 discusses the empirical methodology. Section 4 presents the index of RMB empirical findings. Section 5 concludes.

2. Data

We use two sets of data to estimate the global and regional impacts of RMB. One is the currency data of the Group of Twenty (G20 countries) to proxy for the global exchange rate market. The other is the currency data of major countries along the Belt and Road and countries participating in building the modern Belt and Road.

2.1 Data of G20 currencies

G20 is the premier forum for international cooperation on the most important aspects of the international economic and financial agenda, which brings together the world's major advanced and emerging economies which jointly account for around 90% of global GDP, 80% of global trade, and two thirds of the world's population. The G20 comprises Argentina, Australia, Brazil, Canada, China, EU, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Turkey, UK and USA.

To construct exchange rate spillover network for currencies of G20 members, we collect daily exchange rates of all 18 related currencies from Data stream. First, three RMB exchange rates are the onshore Chinese Yuan (CNY), CNY central parity (CNYM), and offshore RMB in Hong Kong (CNH) per US dollar. Second, seven major developed market currencies are US Dollar Index (DXY), Euro (EUR), Pound Sterling (GBP), Australian Dollar (AUD), Canadian Dollar (CAD), Japanese Yen (JPY) and Korean won (KRW). Third, nine currencies for emerging markets include Argentine Peso (ARS), Brazilian Real (BRL), India Rupee (INR), Indonesian Rupiah (IDR), Mexican Peso (MXN), Russian Ruble (RUB), Saudi Arabia Riyal (SAR), South Africa Rand (ZAR), and Turkish Lira (TRY). Except for the US dollar index, all other exchanges rates of the currencies are their prices in terms of the US dollar.

Our sample starts on January 1, 1999 when the Euro became legal tender for member of European Monetary Union and ends at the end of 2018. Our subsamples start on June 24, 2005 when the China Foreign Exchange Trading System started to announce CNY central parity (CNYM) and March 2, 2011 when the CNH exchange rate is available. Following Forbes and Rigobon (2002), we compute two-day rolling-average of log differences of exchange rates to control for the fact that currency markets of different countries do not operate during the same trading hours[5].

Summary statistics on two-day rolling-average exchange rate changes are reported in Panel A of Table 1. With 5215 daily observations, CNY and CNY central parity are negative on average, suggesting the general trend of appreciation against the USD for the full sample. For the subsample, all three RMB exchange rate changes are positive on average, suggesting the general trend of deprecation against the USD since March 2011. The standard deviations of all three RMB exchange rate changes are smaller than other currency counterparts, except for Saudi Arabia Riyal. Among three RMB exchange rate changes, the mid-price is the least volatile while the CNH is the most volatile, suggesting that the offshore market is less regulated and thus may provide additional and distinct information. In contrast, the skewnesses and kurtosises of RMB

[5]Similarly, Yang and Zhou (2013) use two-day changes of CDS spreads to study credit risk spillover. Although two-day averaging obscures some lead/lag effects, most lead/lag relations are still captured by lags in VAR analysis. Compared with using weekly exchange rate changes to address nonsynchronous trading issue, the benefit of two-day averaging is to keep as many observations as possible for VAR analysis and particularly recursive variance decompositions.

exchange rate changes are generally higher than other currency counterparts of developed markets, suggesting more extreme events in the Chinese currency. This is probably due to China's exchange rate policy changes in recent years. Jarque-Bera tests indicate that all daily changes of exchange rate are not normally distributed. Also, ADF tests show that all exchange rates are stationary in the first differences.

2.2 Data of the currencies related to the Belt and the Road

Announced in 2013, the Belt and Road Initiative has strengthened China's connectivity with 66 countries scattering along the ancient Silk Road. Meanwhile, the Belt and Road initiative is an open platform for all parties that are willing to contribute to global connectivity. So far, a total of 126 countries, including countries in America and Oceania, have signed cooperation documents with China on the initiative. We refer these 126 countries as participating countries. By the end of 2018, China's direct investment in the B&R countries surpassed 90 billion dollars, realizing a turnover of 400 billion dollars in foreign contracted projects in these countries. Besides, 11 Chinese-funded banks have set up 76 first-grade institutions in 28 B&R countries, and 50 banks from 22 B&R countries have opened 7 corporate banks, 19 branches, and 34 representative offices in China. All these efforts have potentially contributed to the promotion of the Renminbi (RMB) as an international or regional currency. This is why we further construct the indices of RMB Impact on the currencies of the countries along the Belt and the Road and participating in the B&R initiative.

To construct exchange rate spillover network among the currencies of the countries along the B&R, we dismiss the countries which had implemented a fixed exchange rate system since July 2005, according to regime classification of Ilzetzki, Reinhart & Rogoff (2017) together with IMF's annual report on exchange rate arrangement and exchange restrictions[6]. We also dismiss the countries without legal tender at all, with a falling exchange rate, and/or with too much missing data in their exchange rate. Finally, we collect daily currencies exchange rates data for 26 countries from Data stream.

Besides the onshore Chinese Yuan (CNY), we collect 25 currencies, including Mongolian Tughrik (MNT), Singapore Dollar (SGD), Malaysian Ringgit (MYR), Indonesian Rupiah (IDR), Thai Baht (THB), Vietnamese Dong (VND), Philippine Peso (PHP), Kazakhstan Tenge (KZT), Uzbekistan Som (UZS), Kyrgyzstan Som (KGS), Indian Rupee (INR), Pakistan Rupee (PKR), Sri Lanka Rupee (LKR), Russian Ruble (RUB), Moldova Leu (MDL), Polish Zloty (PLN), Czech Krona (CZK), Hungarian Forint (HUF), Iranian Rial (IRR), Turkish Lira (TRY), Syrian pound (SYP), Israel New Shekel (ILS), Yemen Rial (YER), Georgia Lari (GEL), and Egyptian Pound (EGP). These 26 currencies cover countries which jointly account for 88.47% and 81.26% of population and GDP for the 66 countries along the B&R. Similarly, we compute two-day rolling-average of log differences of exchange rates to address nonsynchronous trading issue.

Panel B of Table 1 reports summary statistics of two-day rolling-average exchange rate changes of major currencies along the Belt and Road. Except for CNY, SGD, THB, PHP, CZK, and ILS, exchange rate changes for most currencies are positive on average, suggesting the general trend of depreciation against the USD. Among all the sample currencies, CNY is the least volatile. Moreover, the skewnesses and kurtosises of VND, KZT, UZS, KGS, IRR, SYP, YER, GEL, EGP exchange rate changes are much higher than that of CNY, suggesting that the

[6]Ilzetzki, Reinhart & Rogoff (2017) provide a comprehensive history of monthly exchange rate regime classification for 194 countries and territories over 1946-2016. They classify 194 countries into 6 major group according to the flexibility of their currencies, including the countries with a fixed exchange rate system, crawling peg regime, managed floating regime, freely floating regime, freely falling regime, and/or too many missing data.

exchange rate of CNY is relatively stable among currencies for countries along the B&R. Besides, Jarque-Bera tests indicate that all daily changes of exchange rate are not normally distributed. Also, ADF tests show that all exchange rates are stationary in the first differences.

Table 1 Summary Statistics of Daily Exchange Rate Changes

Panel A: Exchange Rate Changes ofG20 Currencies

	Mean (‰)	*Std (‰)*	*Min (‰)*	*Max (‰)*	*Skew*	*Kurt*	*JB test*	*ADF (none)*	*ADF (drift)*	*ADF (trend)*	*Nobs*
CNY	-0.04	0.86	-10.14	14.05	0.31	36.28	241***	-49.71*	-49.79*	-49.84*	5215
CNYM	-0.04	0.84	-10.14	17.22	1.97	67.43	906***	-48.37*	-48.45*	-48.50*	5215
CNH	0.02	1.61	-13.20	22.25	1.35	29.32	60***	-35.20*	-35.20*	-35.28*	2044
DXY	0.01	3.50	-22.11	16.06	-0.07	4.76	1***	-51.28*	-51.27*	-51.27*	5215
EUR	0.01	4.31	-28.14	20.17	-0.02	4.78	1***	-51.67*	-51.67*	-51.66*	5215
GBP	0.05	4.20	-25.88	58.20	0.88	14.23	28***	-52.96*	-52.96*	-52.97*	5215
AUD	-0.03	5.52	-47.33	48.51	0.57	10.44	12***	-52.94*	-52.93*	-52.94*	5215
CAD	-0.02	3.98	-28.97	29.14	0.05	7.46	4***	-51.60*	-51.60*	-51.63*	5215
JPY	0.00	4.47	-29.78	23.41	-0.13	5.35	1***	-52.47*	-52.47*	-52.46*	5215
KRW	-0.01	4.55	-78.27	65.54	-0.54	44.27	370***	-52.68*	-52.67*	-52.67*	5215
ARS	0.70	7.89	-64.54	186.35	10.86	217.32	10083***	-52.90*	-53.31*	-53.37*	5215
BRL	0.22	7.63	-88.30	76.47	0.41	17.18	44***	-52.01*	-52.05*	-52.05*	5215
INR	0.10	2.68	-19.34	27.67	0.42	11.44	16***	-51.32*	-51.38*	-51.39*	5215
IDR	0.11	5.23	-59.65	60.05	-0.32	25.29	108***	-53.06*	-53.08*	-53.08*	5215
MXN	0.13	4.82	-28.16	54.73	1.03	13.68	26***	-51.85*	-51.89*	-51.89*	5215
RUB	0.22	5.78	-86.62	116.62	1.90	56.46	624***	-53.54*	-53.60*	-53.62*	5215
SAR	0.00	0.15	-3.26	4.03	2.47	237.64	11969***	-59.33*	-59.33*	-59.32*	5215
ZAR	0.17	7.42	-59.19	73.77	0.43	8.40	6***	-52.75*	-52.78*	-52.77*	5215
TRY	0.54	8.42	-99.37	265.18	9.25	272.61	15869***	-56.65*	-56.90*	-56.91*	5215

Panel B:Exchange Rate Changes for Major Currencies along the Belt and Road

	Mean (‰)	Std (‰)	Min (‰)	Max (‰)	Skew	Kurt	JB test	ADF (none)	ADF (drift)	ADF (trend)	Nobs
CNY	-0.05	1.03	-10.14	14.05	0.57	23.24	60***	-40.44*	-40.53*	-40.91*	3507
MNT	0.23	3.09	-34.38	29.26	-0.13	21.09	48***	-36.49*	-36.66*	-36.71*	3507
SGD	-0.06	2.44	-15.06	18.07	0.08	6.25	2***	-43.45*	-43.47*	-43.53*	3507
MYR	0.02	2.94	-18.53	13.97	-0.15	6.01	1***	-41.02*	-41.01*	-41.06*	3507
IDR	0.11	3.38	-38.74	41.94	0.30	29.40	102***	-39.50*	-39.54*	-39.57*	3507
THB	-0.07	2.55	-24.48	46.05	2.77	68.65	634***	-43.54*	-43.57*	-43.63*	3507
VND	0.11	1.30	-6.20	34.64	13.34	294.19	12494***	-41.81*	-42.09*	-42.10*	3507
PHP	-0.02	2.38	-11.83	11.38	0.14	4.35	0***	-39.45*	-39.45*	-39.60*	3507
KZT	0.29	5.37	-52.51	153.59	14.10	322.52	15035***	-43.28*	-43.41*	-43.49*	3507
UZS	0.57	7.97	-7.75	379.75	42.34	1861.51	505775***	-40.96*	-41.16*	-41.24*	3507
KGS	0.15	3.11	-27.56	54.68	6.19	113.64	1811***	-39.68*	-39.77*	-39.78*	3507
INR	0.14	3.17	-19.34	27.67	0.35	8.58	5***	-42.27*	-42.34*	-42.34*	3507
PKR	0.24	2.19	-21.94	37.00	3.43	63.58	543***	-41.82*	-42.32*	-42.33*	3507
LKR	0.17	1.66	-11.82	22.18	2.38	41.25	217***	-37.73*	-38.08*	-38.17*	3507
RUB	0.25	6.58	-86.62	116.62	1.64	45.96	271***	-42.01*	-42.06*	-42.09*	3507
MDL	0.09	3.07	-18.04	25.82	0.82	11.77	12***	-37.37*	-37.39*	-37.40*	3507
PLN	0.03	6.41	-54.12	41.05	0.34	8.00	4***	-41.35*	-41.35*	-41.35*	3507
CZK	-0.03	5.38	-37.98	28.46	0.27	6.57	2***	-42.10*	-42.10*	-42.12*	3507
HUF	0.09	6.59	-43.46	40.40	0.23	6.14	1***	-42.33*	-42.33*	-42.33*	3507
IRR	0.44	8.97	-24.92	411.42	37.39	1574.44	361662***	-41.18*	-41.27*	-41.29*	3507
TRY	0.39	6.80	-66.81	113.36	1.95	43.76	245***	-44.13*	-44.28*	-44.35*	3507
SYP	0.65	11.43	-52.35	537.57	37.86	1633.63	389378***	-40.21*	-40.34*	-40.40*	3507
ILS	-0.06	3.62	-17.74	25.06	0.19	6.20	2***	-41.91*	-41.92*	-41.93*	3507
YER	0.08	2.00	-27.81	77.67	28.92	1136.78	188326***	-38.16*	-38.21*	-38.20*	3507
GEL	0.11	3.55	-33.98	69.17	4.07	86.17	1020***	-38.79*	-38.82*	-38.88*	3507
EGP	0.32	7.01	-37.81	261.80	27.80	957.29	133522***	-34.07*	-34.12*	-34.17*	3507

Notes: Panel A reports the summary statistics of 2-day rolling average exchange rate changes for currencies of G20 members from January 5, 1999 to the end of 2018. Panel B reports the summary statistics of 2-day rolling average exchange rate changes for currencies of countries along the Belt and Road from July 22, 2005 to the end of 2018. The JB test and the Augmented Dickey Fuller (ADF) values are also reported. *, ** and *** denote rejection of the null hypothesis at the 10%, 5% and 1% level, respectively. The null hypothesis for

Jarque–Beratest, and the ADF tests is that the series is normally distributed, and that the series has a unit root. Nobs denotes the number of observations.

We also construct exchange rate spillover network among the currencies of the countries participating the B&R. Following the same criteria above, we select 45 currencies among the currencies of the 126 participating countries, which account for 81.77% and 77.09% of the population and GDP of the 126 countries participating the B&R, including RMB (CNY), Mongolian Tughrik (MNT), Korean Won (KRW), Singapore Dollar (SGD), Malaysian Ringgit (MYR), Indonesian Rupiah (IDR), Thai Baht (THB), Vietnamese Dong (VND), Philippine Peso (PHP), Kazakhstan Tenge (KZT), Uzbekistan Som (UZS), Kyrgyzstan Som (KGS), Indian Rupee (INR), Pakistan Rupee (PKR), Sri Lanka Rupee (LKR), Papua New Guinea Kina (PGK), New Zealand Dollar (NZD), Russian Ruble (RUB), Moldova Leu (MDL), Polish Zloty (PLN), Czech Krona (CZK), Hungarian Forint (HUF), Dominican Peso (DOP), Chile Peso (CLP), Costa Rica Colon (CRC), Uruguay New Peso (UYU), Iranian Rial (IRR), Turkish Lira (TRY), Syrian pound (SYP), Israel New Shekel (ILS), Yemen Rial (YER), Georgia Lari (GEL), Tanzania Shilling (TZS), Kenya Shilling (KES), Seychelles Rupee (SCR), Egyptian Pound (EGP), Algerian Dinar (DZD), Tunisian Dinar (TND), Libya Dinar (LYD), Mozambique Metical (MZN), Zambian Kwacha (ZMK), Madagascar Franc (MGA), South African Rand (ZAR), Nigeria Nile (NGN), and Fiji Dollar (FJD). We omit the summary statistics for this sample to save space.

3. Econometric methodology

We employ a two-pass procedure to describe spillovers across various currencies and their network structure and time variation.

3.1 VAR-based network

Our starting point is the vector autoregressive model of Sims (1980):

$$\Delta R_t^c = \mu + \sum_{i=1}^{l} B_i \Delta R_{t-i}^c + C\Delta X_t + e_t \qquad (1)$$

where ΔR_t is a vector of two-day rolling-average exchange rate changes and ΔX_t is a vector of exogenous variables. Under certain assumptions (Pesaran and Shin, 1998), a vector autoregressive model can be rewritten as the infinite moving average representation as shown in Equation (2).

$$\Delta R_t^c = \mu + \sum_{h=1}^{\infty} A_h \varepsilon_{t-h} + \sum_{h=1}^{\infty} G_h \Delta X_{t-h} + e_t \qquad (2)$$

Correspondingly, the generalized impulse response and the generalized forecast error variance decompositions of the effect of a shock in the j-th currency at time t on i-th currency is given by Equation (3) and (4) respectively,

$$GIR_{i\leftarrow j}^h = \sigma_{jj}^{-2} A_h \Sigma e_j, for h = 0,1,2,\cdots, \qquad (3)$$

$$GVD_{i\leftarrow j}^h = \frac{\sigma_{ii}^{-1} \sum_{l=0}^{h} (e_i' A_h \Sigma e_j)^2}{\sum_{l=0}^{h} e_i' A_h \Sigma A_h' e_j}, for h = 0,1,2,\cdots, \qquad (4)$$

where $\Sigma = \{\sigma_{ij}, \mathrm{i,j} = 1,2,\cdots,\mathrm{n}\}$ is the variance–covariance matrix of the error term in Equation (1), A_h is the coefficient matrix in Equation (2), and e_i is an $\mathrm{n} \times 1$ selection vector with unity as its i-th element and zeros elsewhere.

The generalized impulse response analysis as well as generalized variance decomposition were introduced by Pesaran and Shin (1998). The appeal of generalized version of impulse response analysis and variance decompositions order-invariant as opposed to Cholesky-based impulse response analysis and variance decompositions which are sensitive to ordering.

Although both, the generalized impulse response and forecast error variance decompositions can be used to define weighted, directed, and time-varying networks (Diebold and Yilmaz, 2014; Alter and Beyer, 2014; Yang and Zhou, 2017), we identify networks of exchange rate spillovers

using generalized impulse response instead of variance decomposition for two main reasons. Firstly, the elements of variance decomposition are not additive and comparable directly. The entries in the variance decomposition matrix are variance shares ranging from 0% to 100%. They are weights measuring how much innovation of each currency contributes to the variance of the total n-step-ahead forecast error of another currency and thus are the intensity of each currency in explaining the variation of another currency. However, the weights are not additive and comparable directly because the variation of different currencies may be quite different. Secondly, we cannot infer the exact direction of change for each currency in response to the change of CNY from the variance decomposition because all its elements are positive. In contrast, using impulse response analysis, we can detect the direction and magnitude of each currency changes, namely appreciates or depreciates, in response to one unit change of RMB exchange rates.

Therefore, we identify weighted and directed networks of exchange rate spillovers by estimating the generalized impulse response for each currency using Equation (3). Firstly, the entries in the impulse response matrix are weights that measuring how much the change of each currency leads to the variation of another currency. Secondly, the impulse response matrix is generally asymmetric, thereby suggesting that spillover effects between currencies are directed. For example, if the ij-th element of the matrix (the i-th currency's variation derived by the j-th currency's innovation) is greater than that of the ji-th element, we can argue that there is a directional net spillover effect from the j-th currency to the i-th currency. Thirdly, the network dynamics can be traced by making impulse response analysis at different points of time. We will discuss these in detail below.

3.2Structure and Dynamics of Spillover Networks

Following Diebold and Yilmaz (2014) and Alter and Beyer (2014), we construct the spillover network of exchange rates based on impulse response analysis as follows:

	ΔR_1	ΔR_2	..	ΔR_N	*FROM*
ΔR_1	$S_{1\leftarrow 1}$	$S_{1\leftarrow 2}$	..	$S_{1\leftarrow N}$	$FR_1 = \frac{\sum_{j\neq 1} S_{1\leftarrow j}}{N-1}$
ΔR_2	$S_{2\leftarrow 1}$	$S_{2\leftarrow 2}$	..	$S_{2\leftarrow N}$	$FR_2 = \frac{\sum_{j\neq 2} S_{2\leftarrow j}}{N-1}$
…	…	…	..	…	…
ΔR_N	$S_{N\leftarrow 1}$	$S_{N\leftarrow 2}$	..	$S_{N\leftarrow N}$	$FR_N = \frac{\sum_{j\neq N} S_{N\leftarrow j}}{N-1}$
TO	$TO_1 = \frac{\sum_{i\neq 1} S_{i\leftarrow 1}}{N-1}$	$TO_2 = \frac{\sum_{i\neq 2} S^H_{i\leftarrow 2}}{N-1}$	..	$TO_N = \frac{\sum_{i\neq N} S^H_{i\leftarrow N}}{N-1}$	
NET	$NET_1 = TO_1 - FR_1$	$NET_2 = TO_2 - FR_2$	..	$NET_N = TO_N - FR_N$	

In the spillover matrix, column variables are the origin of spillovers while row variables are the spillover receivers. The element in row i and column j, which denoted as $S_{i\leftarrow j}$, is the quantitative measure of potential spillover effects of j-th currency on i-th currency. It is computed as the average cumulated response of i-th currency in the following week, as shown in Equation (6). With Equation (6), $S_{i\leftarrow j}$ measures how much the i-th currencies change with one standard error shock to the j-th currencies. We can either compute $S_{i\leftarrow j}$ as the average cumulated response of i-th currency in the following week in percentage of the initial shock to

j-th currency (Alter and Beyer, 2014), as shown in Equation (7). With Equation (7), $S_{i\leftarrow j}$measures how much the i-th currencies change with one-unit change of the j-th currencies. We estimate mutual spillover network using Equation (6) if the endogenous variables don't vary a lot in case of G20 currencies, otherwise we estimate mutual spillover network using Equation (7) in case of B&R related currencies.

$$S_{i\leftarrow j} = \frac{GIR_{i\leftarrow j}^{h=0} + \sum_{h=0}^{1} GIR_{i\leftarrow j}^{h} + \sum_{h=0}^{5} GIR_{i\leftarrow j}^{h}}{3}, \text{for } i,j \in ALL^{7} \quad (6)$$

$$S_{i\leftarrow j} = \frac{GIR_{i\leftarrow j}^{h=0} + \sum_{h=0}^{1} GIR_{i\leftarrow j}^{h} + \sum_{h=0}^{5} GIR_{i\leftarrow j}^{h}}{3 * GIR_{j\leftarrow j}^{h=0}}, \text{for } i,j \in ALL \quad (7)$$

We further average up off-diagonal pairwise spillover intensity on each column and each row to represent the outward and inward spillover effect for each currency which is labeled "TO" and "FR" in the spillover matrix respectively. Specifically, the average outward spillover effect from j-th currency to others is shown in Equation (8),

$$TO_j^{\Omega} = \frac{\sum_{i\neq j} S_{i\leftarrow j}}{N}, for\ i \in \Omega, j \notin \Omega^{8} \quad (8)$$

where N is the number of currencies in the setΩ.

Similarly, the average inward spillover effects from others to i-th currency is shown in Equation (9),

$$FR_i^{\Omega} = \frac{\sum_{j\neq i} S_{i\leftarrow j}}{N}, for\ i \in \Omega, j \notin \Omega \quad (9)$$

where N is the number of currencies in the setΩ.

Finally, we define net spillover effect as the difference between TO and FRas shown in Equation (10) which is labeled "NET" in the last row of the spillover matrix.

$$NET_i^{\Omega} = TO_i^{\Omega} - FR_i^{\Omega}, for\ \text{i} \in \text{ALL}. \quad (10)$$

Following Yang and Zhou (2017), we estimate the above impulse response matrix recursively each period with an expanding sample after the initial sample period. In contrast to rolling sample spillovers in Diebold and Yilmaz (2014), our recursive estimation of spillovers can better capture the stock effect of RMB spillovers over the course of RMB internationalization rather than flow effect[9] on the days when the central bank of China reformed the RMB exchange rate regime. Moreover, the recursive estimates are not sensitive to the window length and the outcome of the recursive estimation is a sample of spillover estimates which are updated in a Bayesian matter.

4. The Indices of RMB Impact on the G20 Currencies

We estimate the spillover networks of the exchange rate changes among the G20 currencies and construct the RMB global and regional impact indices.

4.1Network Results

Schwarz's Bayesian Criterion suggests an optimal lag of k=2 for all the model specifications under consideration. Thus, a 17-variable VAR model with lag of 2 are estimated to summarize dynamic interactions among 2-day rolling average changes of the 17 exchange rates. We construct spillover network of the major currencies of G20 members using Equation (6) and present it in Table 2.

[7] *ALL* is a set which contain all endogenous variable in Equation (1).

[8] Ω is subset of the set *ALL* defined in Equation (1).

[9] See D'Amico and King (2013) for the difference between stock and flow effects of QE.

Table 2 Results of generalized impulse response matrix for G20 Currencies

	CNY	AUD	CAD	JPY	KRW	GBP	EUR	DXY	ARS	BRL	INR	IDR	MXN	RUB	SAR	ZAR	TRY	FROM
CNY	0	2	1	1	2	1	2	2	0	1	2	1	1	1	0	2	1	1
AUD	7	0	38	1	23	29	31	32	2	25	21	12	28	19	4	34	21	20
CAD	4	27	0	0	13	18	18	21	2	15	12	6	20	14	1	20	12	13
JPY	3	2	1	0	1	5	13	19	1	-2	-2	3	-6	-1	2	1	-3	2
KRW	6	22	18	2	0	14	14	15	1	15	19	10	18	11	1	20	12	12
GBP	5	21	20	4	10	0	28	30	2	10	10	4	11	10	1	17	10	12
EUR	5	23	19	11	9	27	0	43	1	9	10	4	10	11	1	18	11	13
DXY	4	19	18	13	8	23	35	0	1	8	8	4	9	9	1	15	8	12
ARS	3	4	4	0	2	4	3	3	0	8	4	0	6	4	0	3	5	3
BRL	4	32	27	-3	18	17	17	19	6	0	19	14	41	21	2	32	27	18
INR	4	11	9	-1	10	7	7	8	1	8	0	5	11	8	0	10	7	7
IDR	5	14	11	2	12	7	7	7	0	11	11	0	11	8	0	11	9	8
MXN	4	23	22	-6	15	13	11	12	3	24	17	7	0	17	3	25	17	13
RUB	6	19	20	0	10	13	15	15	3	16	15	6	21	0	2	20	13	12
SAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ZAR	9	42	36	2	25	28	32	32	3	29	23	9	38	25	-1	0	30	23
TRY	5	28	23	-3	16	17	22	22	4	28	18	8	29	18	-1	35	0	17
TO	5	18	17	1	11	14	16	18	2	13	12	6	15	11	1	16	11	
NET	3	-2	4	-1	-2	2	3	6	-1	-6	5	-2	3	-1	1	-6	-5	

Notes: This table reports the results of generalized impulse response among exchange rate changes of major G20 currencies using Equation (6). The endogenous variables are 2-day rolling average exchange rate changes from January5, 1999 to the end of 2018. CNY represents onshore Chinese Yuan. DXY represents US Dollar Index. EUR represents Euro. GBP represents Pound Sterling. AUD represents Australian Dollar. CAD represents Canadian Dollar. JPY represents Japanese Yen. KRW represents Korean won. ARS represents Argentine Peso. BRL represents Brazilian Real. INR represents India Rupee. IDR represents Indonesian Rupiah. MXN represents Mexican Peso. RUB represents Russian Ruble. SAR represents Saudi Arabia Riyal. ZAR represents South Africa Rand. TRY represents Turkish Lira.

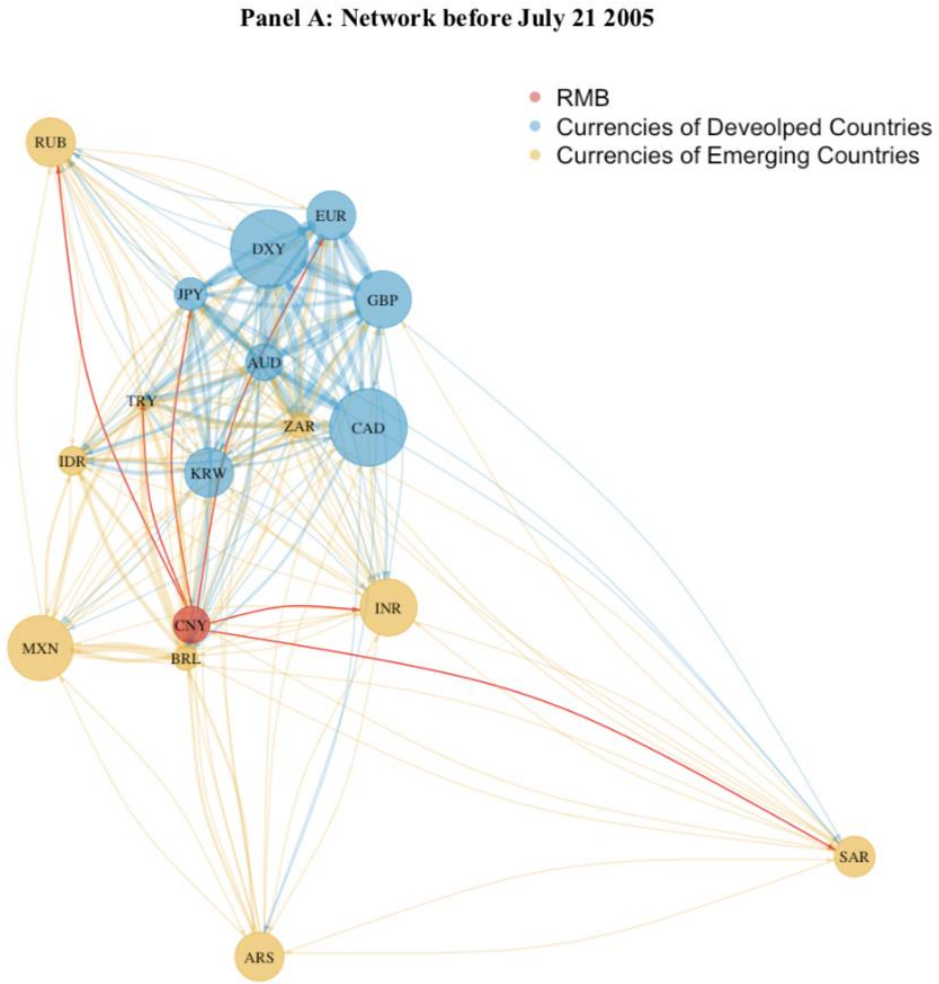
First, column currencies are the origin of spillovers while row currencies are the spillover receivers. For example, the first column displays the strength of CNY's influence on other currency. With one standard error shock of CNY change[10] , ZAR, AUD, KRW, and RUB change by 9 bps, 7 bps, 6 bps, and 6 bps respectively. On the other hand, one standard error shocks of ZAR, AUD, KRW, and RUB changes lead to CNY changes by 2 bps, 2 bps, 2 bps, and 1 bps respectively.

To quantify how important a currency in the spillover network is relative to others, we follow Diebold and Yilmaz (2014) to calculate net spillover index as shown in the bottom row of Table 2. The net spillover effects on the USD, CAD, EUR, CNY and GBP are 6 bps, 4 bps, 3 bps, 3 bps, and 2 bps respectively.

We also estimate spillover networks for sub-samples and presents the interactions between currencies using graphs as shown in Figure 1. The sizes of dots are calibrated according to their net spillover magnitudes. The edges of nodes point to the currencies which receive positive spillover effect. Besides, the width and length of edges are also weighted. The spillover effect is greater with a wider and shorter the edge. Therefore, the location of a node for a currency implies its relative network importance.

Figure 1 Spillover Networks among the Major G20 Currencies

[10]One standard error shock of CNY is historical volatility of CNY's exchange rate changes, which is about 0.86 ‰.



Notes: This figure represents spillover networks of currencies for G20 members estimated using Equation (6). The sizes of dots are calibrated correspondingly to their net spillover index. The edges of nodes point to the currencies which receive positive spillover effect. Besides, the width and length of edges are also weighted. The spillover effect is greater with a wider and shorter the edge. Therefore, the location of a node for a currency implies its relative network importance. Panel A shows a spillover network of G20 currencies which estimated using data starts from January 5, 1999 and ends on July 20, 2005. Panel B shows a spillover network of G20 currencies which estimated using data starts from July 20, 2005 and ends on January 1, 1999.

Panel A of Figure 1 shows a spillover network of G20 currencies which estimated with data starting from January 5, 1999 and ending on July 20, 2005. The blue dots which represent currencies for developed markets gather together. It suggests that the mutual interactions among currencies for developed markets were more active and intense. The yellow dots which represent currencies for emerging markets are on the periphery of the network, indicating that emerging market currencies had relatively smaller impact on others. The red dot which has positive net spillovers effects on six currencies, is CNY. During the sample period, the US dollar had a significant impact on other G20 currencies, as the US dollar has been the world's major currency

and fulfilled its role as an 'anchor currencies' which reflecting the financial-economic, political and military position of the United States.

Panel B of Figure 1 shows a spillover network of G20 currencies which estimated with data from July 20, 2005 to the end of 2018. During the sample period, the US dollar still played the largest net spillover effect on other currencies. But the situation has changed radically. The relative importance of the US dollar has declined substantially due to the rise of other currencies, especially the rise of RMB. It indicates that the world is indeed embracing the trend towards a multipolar international monetary system (Dailami and Masson, 2009).

4.2 Results on RMB Spillover Dynamics

To further explore time-varying spillover intensity, we construct CNY impact index by estimating recursively with an expanding sample using Equation (1), (3) and (7)-(10)[11]. We also construct RMB impact indices for CNH and CNY central parity.

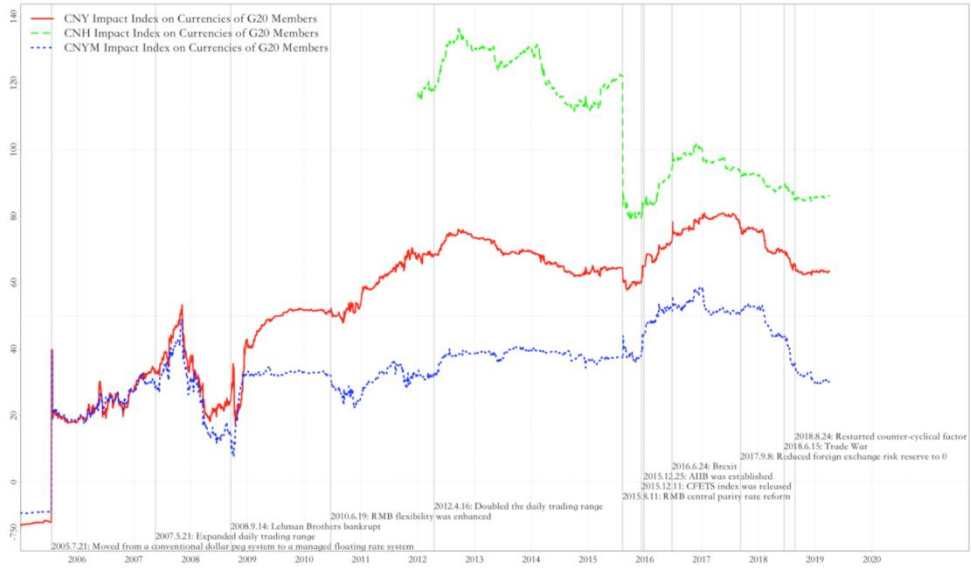
Panel A of Figure 2 shows the dynamics of CNY, CNH and CNY central parity's impact indices. At the very beginning, the impact index of CNY on G20 currencies is negative, suggesting that CNY has no capacity to drive other currencies to move in the same direction. However, CNY's index soared to the positive value on July 21, 2005, when the central bank of China launched the transition of RMB regime from a conventional dollar peg system to a managed floating rate system. The index became volatile during the financial crisis in 2008 and then went on an upward trend. The dynamic of CNY central parity's index is similar to that of CNY but without much gain in overall influence. The impact index of CNH on G20 currencies is much bigger than that of CNY and CNY central parity. Arguably, offshore markets for a currency provide an important dimension when measuring the regional and global influence of that currency (He and McCauley, 2012). Interestingly, both the impact indices of CNY and CNH dropped sharply on August 11, 2015, when the central bank of China exerted RMB central parity rate reform. In contrast, the index of CNY central parity increased a little bit in the following days.

We further calculate the impact indices of CNY on the currencies of developed and emerging markets and display them separately in Panel B of Figure 2. Although the pattern of dynamics for both indices are quite similar to that of the impact index on G20 currencies, we observe an apparent drop on CNY's impact on the currencies of developed markets while a slight increase on CNY's impact on emerging market currencies. The difference indicates that the influence of CNY central parity reform is far more complicated than we thought.

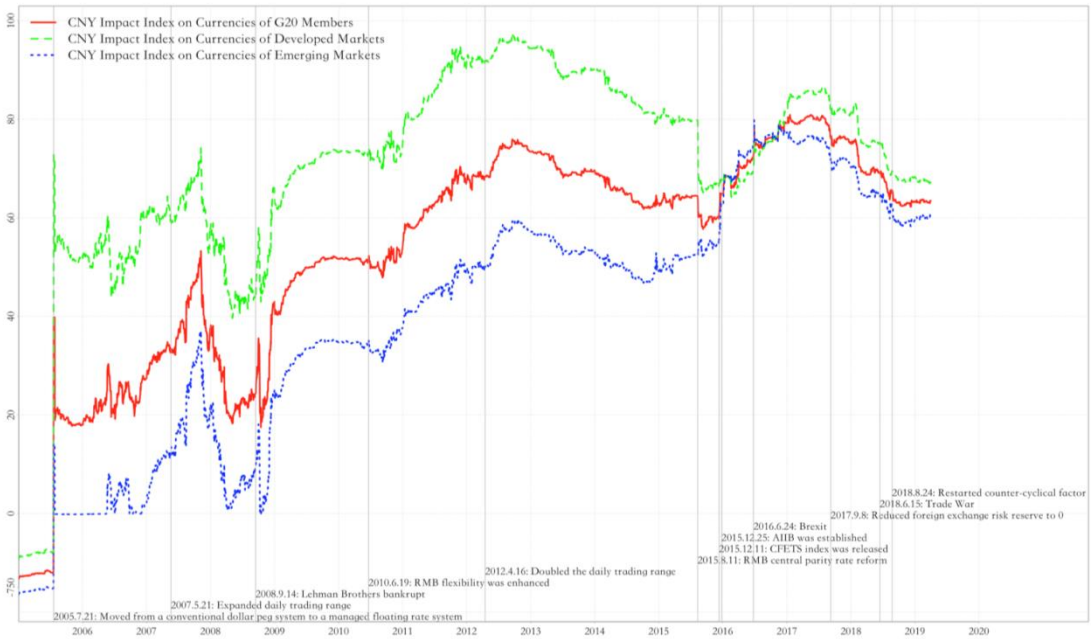
[11] For recursive estimation, the initial sample period is January 5, 1999 to January 1, 2005 and the final sample period is January 5, 1999 to the end of 2018.

Figure 2 Dynamics of RMB Impact Index on G20 Currencies

Panel A: Dynamics of Impact Indices of CNY, CNH and Mid-price on G20Currencies



Panel B: Dynamics of CNY Impact Indices on G20Currencies



Notes: This figure displays dynamics of RMB impact index for currencies of G20 members. Panel A shows the dynamics of CNY, CNH and CNY central parity's impact indices on currencies of all G20 members. Panel B shows the dynamics of CNY's impact indices on currencies of all G20 members, developed markets and emerging markets.

To take a closer look at the dynamics of RMB's impact indices, we display the interactions

between CNY and other currencies in Table 3 on six dates around several important events.

Firstly, we show the interactions between CNY and other currencies before and seven days after the Chinese central bank initiated the reform to managed floating regime. CNY's impact index was significantly negative before July 21, 2005. But specifically, CNY had a positive but limited influence impacts on JPY, EUR, INR, RUB, SAR and TRY, which in line with our intuition, as shown in the first column of Table 3. Besides, since the RMB was under a fixed exchange rate regime, the currency exchange rates of other countries had no influence on CNY. As shown in the second column, the inward spillover effects on CNY are almost zeros. After seven days of the reform, earth-shaking changes have taken place. As shown in the fourth column of the Table, CNY's outward impacts turned to be positive for most of the other currencies, especially for currencies of developed markets which resulted in a positive overall net spillover index.

Secondly, we show the interactions between CNY and other currencies before and seven trading days after the Chinese central bank launched the reform of the RMB central parity price on August 11, 2015, in the seventh to twelfth columns. When the People's Bank of China (the Chinese central bank) initiates currency reform on August 11, 2015, the Renminbi (RMB)'s midpoint immediately fell by 1.9%, the biggest single-day drop in the RMB's modern history,[12] global currency market has braced for renminbi weakness[13]. Before the reform, CNY's impact indices had become significantly positive with a net spillover effect on the developed market currencies of about 80% and a net spillover effect of about 53%. Seven trading days after the reform, CNY's net spillover effect on the currencies of developed markets decreased dramatically from 80% to 67%. In contrast, its net spillover effect on the currencies of emerging markets increased a little bit. On average, the CNY's impact indices decreased due to the reform.

Finally, we show the interactions between CNY and other currencies before and seven trading days after the foreign exchange risk reserve requirement was reduced to 0 on September 8, 2017. As shown in the last six columns, CNY's net spillover index decreased a little bit.

[12] See The battle of midpoint, *Economist*, August 15th, 2015.
[13] See *Financial Times*, September 21, 2015.

Table 3 Results of the Impacts of CNY on G20 Currencies around Some Events

Period	1999-01-05/2005-07-20			1999-01-05/2005-07-28			1999-01-05/2015-08-10			1999-01-05/2015-08-18			1999-01-05/2017-09-07			1999-01-05/2017-09-15		
Ω	TO_{CNY}^{Ω}	FR_{CNY}^{Ω}	NET_{CNY}^{Ω}	TO_{CNY}^{Ω}	FR_{CNY}^{Ω}	NET_{CNY}^{Ω}	TO_{CNY}^{Ω}	FR_{CNY}^{Ω}	NET_{CNY}^{Ω}	TO_{CNY}^{Ω}	FR_{CNY}^{Ω}	NET_{CNY}^{Ω}	TO_{CNY}^{Ω}	FR_{CNY}^{Ω}	NET_{CNY}^{Ω}	TO_{CNY}^{Ω}	FR_{CNY}^{Ω}	NET_{CNY}^{Ω}
AUD	-327	0	-326	76	0	76	133	2	131	118	2	116	120	3	117	118	3	116
CAD	-363	0	-363	-9	0	-9	53	2	51	45	2	43	68	3	65	67	3	64
JPY	504	0	504	144	1	143	50	1	48	40	1	39	62	2	60	64	2	61
KRW	-869	0	-869	92	1	91	74	1	72	76	2	75	102	3	98	99	3	95
GBP	-1644	0	-1644	34	0	34	81	2	79	69	2	66	98	4	94	94	4	90
EUR	229	0	229	23	0	23	101	3	98	75	2	72	78	3	74	78	4	75
DXY	-302	0	-302	13	0	13	83	4	79	65	3	62	72	5	67	72	5	67
ARS	-200	0	-200	0	0	0	8	0	8	9	0	9	56	1	56	54	1	54
BRL	-3176	0	-3176	-127	0	-127	74	1	73	68	1	67	76	1	75	75	1	74
INR	50	0	50	32	6	27	73	4	69	80	5	75	66	6	60	65	6	58
IDR	-2935	0	-2935	1	0	1	65	1	64	71	1	70	72	2	70	71	2	69
MXN	-1120	0	-1119	6	0	6	52	1	51	54	1	53	72	2	70	70	2	67
RUB	369	0	369	7	0	6	98	1	96	104	2	102	115	2	113	110	2	108
SAR	5	3	2	0	27	-27	1	6	-6	1	7	-6	1	9	-8	1	10	-9
ZAR	-2106	0	-2106	63	0	63	71	1	70	71	1	70	139	2	137	132	2	130
TRY	2305	0	2305	-14	0	-14	48	1	47	52	1	52	79	1	78	76	1	75
ED	-396	0	-396	53	0	53	82	2	80	70	2	67	86	3	82	85	3	81
EM	-757	0	-757	-4	4	-7	54	2	53	57	2	54	75	3	72	73	3	70
ALL	-599	0	-599	21	2	19	66	2	64	62	2	60	80	3	77	78	3	75

Notes: This table reports the outward, inward and net spillover indices of CNY for subsamples as shown in the first row of the table and the mutual spillover effect is estimated using Equation (6).TO_CNY^Ω represents CNY's outward spillover effect on currencies in the set Ω as shown in Equation (8). FR_CNY^Ω represents CNY's inward spillover effect from currencies in the set Ω as shown in Equation (9). NET_CNY^Ω represents CNY's net spillover effect on currencies in the set Ω as shown in Equation (10). The first column displays currencies which belong to set Ω. ED is a set for currencies of developed markets. ED = {DXY, EUR, GBP, AUD, CAD, JPY, KRW}. EM is a set for currencies of emerging markets. EM = {ARS, BRL, INR, IDR, MXN, RUB, SAR, ZAR, TRY}. ALL is a set for currencies of member of G20. ALL = {ED, EM}.

5. The Indices of RMB impact on the currencies related to the Belt and Road

Similarly, we estimate spillover networks of the exchange rate changes among the currencies of countries along the Belt and Road and participating countries in building the modern Belt and Road, and construct the CNY's impact indices on the Belt and Road's related currencies.

5.1Network Results

First, we estimate a VAR model with lag of 2 using 2-day rolling average changes of the 26 exchange rates for the currencies of countries along the Belt and Road. The spillover network among the 26 currencies using Equation (7)-(10) is presented in Table 4. For the full sample which starts on July 22, 2005 and ends by the end of 2018, the net spillover index for CNY is 18% while that of SGD is 26%, which indicates that SGD plays a leading role in the region while CNY takes the second place.

Table 4 Results of Generalized Impulse Response Matrix for the Major Currencies along the Belt and Road

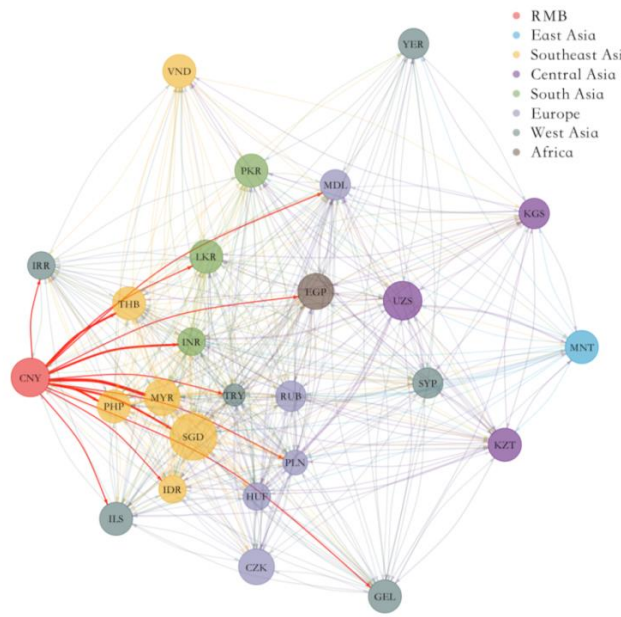
	CNY	MNT	SGD	MYR	IDR	THB	VND	PHP	KZT	UZS	KGS	INR	PKR	LKR	RUB	MDL	PLN	CZK	HUF	IRR	TRY	SYP	ILS	YER	GEL	EGP	FROM
CNY	0	0	16	12	6	9	2	7	1	0	0	5	0	2	2	1	2	0	1	0	2	0	3	1	2	0	3
MNT	2	0	-3	0	1	1	-1	-9	6	0	4	-2	1	-5	0	6	3	-2	1	-1	0	2	-3	-4	3	2	0
SGD	44	0	0	48	22	25	0	36	0	-1	-2	26	1	1	9	3	18	14	17	0	12	0	17	2	0	0	12
MYR	85	-2	118	0	45	46	9	75	5	-1	-2	46	4	9	16	6	19	11	19	1	15	0	26	1	1	1	22
IDR	57	-4	84	68	0	41	13	72	2	-1	4	44	3	18	13	5	21	11	16	0	18	0	20	0	5	1	21
THB	51	-1	55	41	25	0	6	33	2	0	-2	28	1	3	8	1	9	5	9	1	8	0	11	4	2	-1	12
VND	7	-1	3	4	2	3	0	4	1	0	0	3	1	2	1	2	0	0	0	0	2	0	1	-1	-1	0	1
PHP	33	-4	63	54	35	27	8	0	1	-1	-3	45	8	12	7	0	18	11	15	1	13	0	14	0	-1	0	14
KZT	41	12	12	25	13	13	20	9	0	1	26	4	-2	9	18	4	12	0	7	0	5	0	11	0	3	1	10
UZS	-32	1	-10	-6	-1	-2	8	-3	6	0	3	1	3	0	-4	-5	-2	4	0	1	-1	1	-8	4	25	1	-1
KGS	8	3	7	4	1	0	9	1	8	0	0	-3	0	7	2	2	3	-5	0	0	2	0	0	-3	3	0	2
INR	42	-3	73	55	35	35	8	68	2	0	-8	0	11	18	12	6	23	7	19	1	18	0	17	2	0	0	18
PKR	2	2	5	5	4	4	4	10	1	0	1	8	0	7	1	2	0	2	1	0	0	0	-1	1	-2	0	2
LKR	6	-3	6	6	6	2	2	8	1	0	2	10	2	0	1	0	4	4	2	1	1	0	2	-8	1	0	2
RUB	54	3	108	76	40	43	19	47	20	-1	-4	54	2	14	0	20	40	30	38	-1	28	0	24	-4	0	1	26
MDL	15	6	13	6	1	0	4	-1	3	0	1	6	4	5	5	0	3	1	4	0	2	0	2	6	5	-2	4
PLN	13	-1	76	30	18	16	2	42	4	0	-5	33	-1	20	15	5	0	79	73	0	27	0	26	-1	4	1	19
CZK	0	-1	25	6	2	0	-2	6	-1	1	-7	2	6	11	5	0	39	0	32	0	7	0	11	-3	1	0	6
HUF	4	4	78	30	9	17	-1	33	1	0	-7	30	0	8	15	4	69	63	0	-1	30	-1	34	-7	4	-2	17
IRR	-6	1	16	22	3	24	15	19	0	1	-3	24	4	5	4	3	3	2	3	0	1	1	7	-3	2	0	6
TRY	45	-1	121	55	39	39	22	69	1	0	-11	59	-2	9	26	6	59	37	70	0	0	1	47	-3	7	3	28
SYP	-3	32	17	9	8	2	-5	17	0	1	-4	2	-10	26	0	2	3	10	3	1	2	0	-3	-1	10	0	5
ILS	11	-5	46	25	12	10	-6	18	2	-2	-3	18	-1	3	6	2	15	13	19	0	12	0	0	2	0	-1	8
YER	-1	1	2	-1	0	3	-1	1	1	0	-2	0	1	-20	1	3	-1	-1	-2	0	-1	0	1	0	0	0	-1
GEL	20	-2	7	9	2	7	2	6	5	2	-4	0	-6	6	6	8	5	6	4	0	6	1	0	0	0	0	4
EGP	14	3	-6	1	3	-2	2	4	2	1	-1	5	2	14	2	-6	2	0	-5	0	2	0	-3	0	9	0	2
TO	21	2	37	23	13	15	6	23	3	0	-1	18	1	7	7	3	15	12	14	0	9	0	10	-1	3	0	
NET	18	2	26	1	-7	3	4	9	-7	1	-3	0	-1	5	-19	0	-4	6	-3	-6	-19	-5	2	0	0	-2	

Notes: This table reports the results of generalized impulse response for currencies of countries along the B&R estimated using Equation (7). The endogenous variables are 2-day rolling average exchange rate changes from July 22, 2005 to the end of 2018.

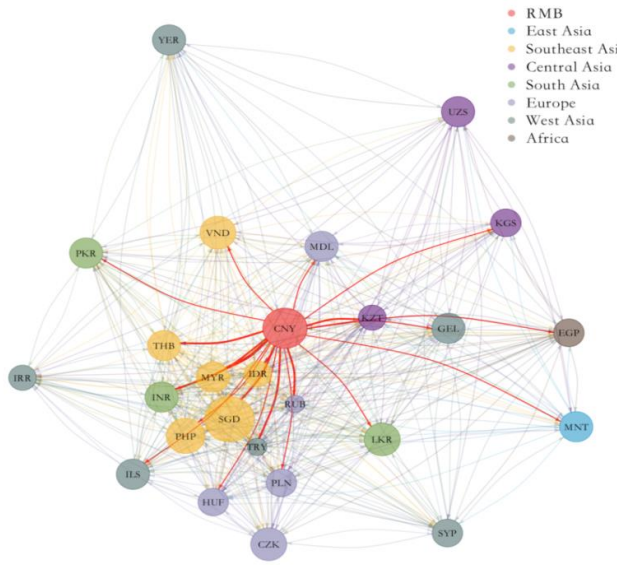
We also estimate spillover networks for sub-samples and plot the interactions among the sample currencies in Figure 3. Panel A of Figure 3 shows the spillover network estimated with data from July 22, 2005 to September 7, 2013, before the Belt and Road initiative was proposed. The red dot which represents the on-shore RMB lies on the periphery of the network before the Belt and Road initiative. Panel B of Figure 3 shows the spillover network estimated with data from September 8, 2013 to the end of 2018. Since the Belt and Road initiative was proposed, the on-shore RMB has taken the central position of the network, indicating a leading role in the Belt and Road's related currencies. Moreover, we observe that the currencies in the same region cluster together, in line with our intuition.

Figure 3 Spillover Networks among Currencies of Countries along the Belt and Road

Panel A: Network before the Belt and Road Initiative Was Proposed



Panel B: Network after Belt and Road Initiative Was Proposed



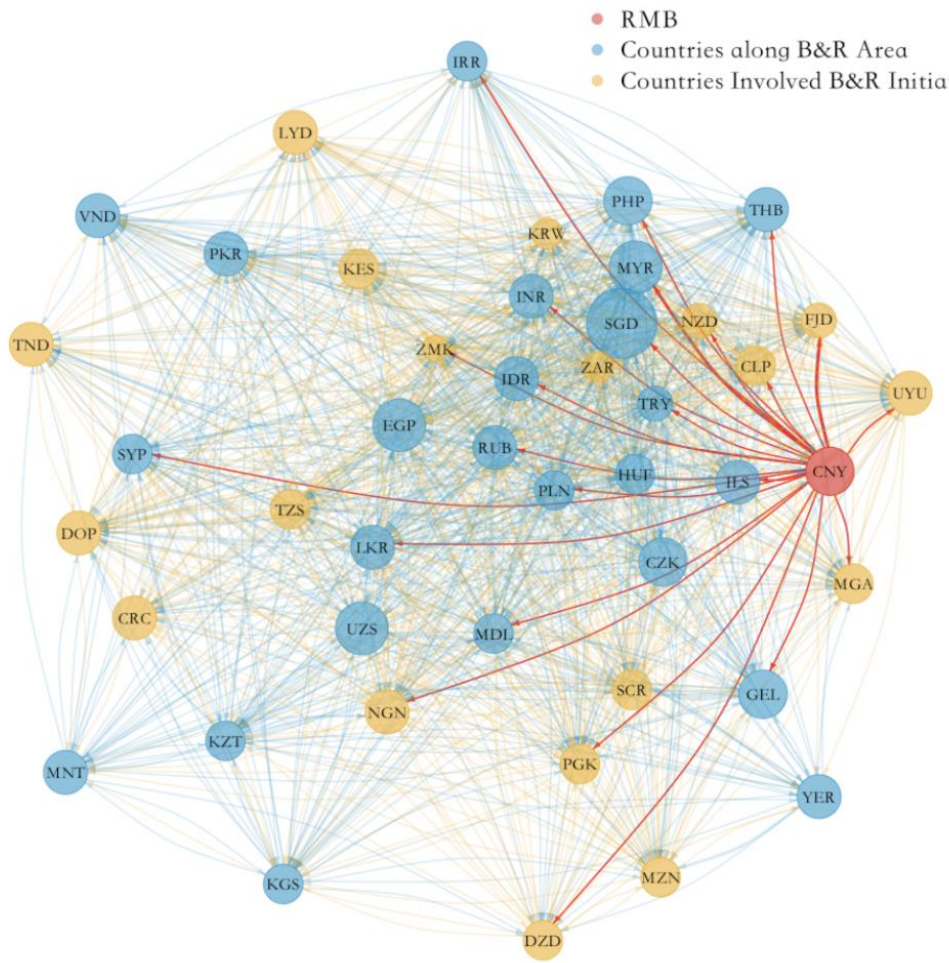
Notes: This figure represents spillover networks for currencies of counties along the B&R estimated using Equation (7). The sizes of dots are calibrated correspondingly to their net spillover index. The edges of nodes point to the currencies which receive positive spillover effect. Besides, the width and length of edges are also weighted. The spillover effect is greater with a wider and shorter the edge. Therefore, the location of a node for a currency implies its relative network importance. Panel A shows a spillover network of the 26 currencies which estimated using data starts from July 22, 2005 and ends on September 7, 2013. Panel B shows a spillover

network of the 26 currencies which estimated using data from September 8, 2013 to the end of 2018.

Figure 4 plots the spillover networks of the two sub-samples for 45 currencies of participating countries in building the modern Belt and Road. Similarly, CNY lies on the periphery of the network before the initiative was proposed as shown in Panel A. Thereafter, CNY moved to the center of the network as shown in Panel B.

Figure 4 Spillover Networks for Currencies of Participating Countries the B&R Initiative

Panel A: Networkbefore the Belt and Road Initiative was Proposed



Notes: This figure represents spillover networks for currencies of counties participating the B&R initiative estimated using Equation (7). The sizes of dots are calibrated correspondingly to their net spillover index. The edges of nodes point to the currencies which receive positive spillover effect. Besides, the width and length of edges are also weighted. The spillover effect is greater with a wider and shorter the edge. Therefore, the location of a node for a currency implies its relative network importance. Panel A shows a spillover network of the 45 currencies which estimated using data starts from July 22, 2005 and ends on September 7, 2013. Panel B shows a

spillover network of the 45 currencies which estimated using data from September 8, 2013 to the end of 2018.

5.2 Results on RMB Spillover Dynamics

We further construct the CNY impact index on the currencies of 25 countries along the B&R and 44 countries participating in the B&R initiative by estimating recursively with an expanding sample using Equation (1), (3) and (7)-(10). To control the impact of major anchor currencies, we use the two days rolling of US Dollar Index and exchange rate changes of EUR, JPY, and GBP as control variables in Equation (1). For recursive estimation, the initial sample period is July 22, 2005 to January 1, 2009 and the final sample period is from July 22, 2005 to the end of 2018.

Panel A of Figure 5 shows the dynamics of CNY's impact indices on the Belt and Road's related currencies. The red, green, and blue lines represent the CNY's impact index on the currencies of countries along the Belt and Road, and countries participating in the B&R initiative, as well as participating countries and Euro, respectively. Except for some small ups and downs, the CNY's impact indices are generally on the rise, especially on days when China Foreign Exchange Trade System (CFETS))released RMB exchange rate index, when Asian Infrastructure Investment Bank (AIIB) was established, and when the B&R initiative was first written into the UN General Assembly resolution.

Figure 5 Dynamics of RMB Impact Index on Major Currencies Related to the Belt and Road Initiative

Notes: This figure displays dynamics of RMB impact index for currencies of countries along and participating the B&R initiative. The red line represents CNY's index on currencies for countries along the B&R, the green line represents CNY's index on currencies for countries participating the B&R initiative, the blue line represents CNY's index on currencies for countries participating the B&R initiative and Euro.

Noticeably, in contrast to the sharp decrease of the impact indices of CNY on G20 currencies and especially currencies for developed markets, the impact indices of CNY on the B&R related currencies increased sharply on August 11, 2015. In line with the decreased impact of CNY on G20 currencies, the impact of CNY on the B&R related currencies decreased one day before

September 8, 2017 when the foreign exchange rate reserve requirement was reduced to 0. Indeed, the impact of RMB marketization reform is subtle. It is worthwhile to further explore the balance of maintaining RMB stability, increasing the marketization of RMB, and improving the international influence of the RMB.

To take a closer look at the dynamics of RMB's index on the 44 currencies for countries participating the B&R initiative, we display the interactions between CNY and other the B&R related currencies in Table 5 on six dates around three events. To save space, we put 44 currencies into 9 groups according to their locations of countries since we have observed a spatial clustering effect of currencies and calculate CNY's outward, inward and net spillover indices on currencies of nine regions[14].

Firstly, the impact index of CNY didn't change much the day before the R&B initiative was proposed and seven trading days after, as shown in the first six columns. Secondly, CNY's net spillover index increased for all regions except for Oceania and Europe after seven trading days of the 811 reform, as shown in the following six columns. Thirdly, CNY's net spillover index decreased sharply 2 days before the foreign exchange rate risk reserve requirement was reduced to 0, as shown in the last six columns, especially for currencies of Southeast Asia.

Table 5 Results of the Impacts of CNY on the Belt and Road Related Currencies around Some Events

Period	2013-09-06			2013-09-16			2015-08-10			2015-08-18			2017-09-04			2017-09-07		
Ω	TO^{Ω}_{CNY}	FR^{Ω}_{CNY}	NET^{Ω}_{CNY}	TO^{Ω}_{CNY}	FR^{Ω}_{CNY}	NET^{Ω}_{CNY}	TO^{Ω}_{CNY}	FR^{Ω}_{CNY}	NET^{Ω}_{CNY}	TO^{Ω}_{CNY}	FR^{Ω}_{CNY}	NET^{Ω}_{CNY}	TO^{Ω}_{CNY}	FR^{Ω}_{CNY}	NET^{Ω}_{CNY}	TO^{Ω}_{CNY}	FR^{Ω}_{CNY}	NET^{Ω}_{CNY}
East Asia	-20	0	-19	-19	0	-19	-4	0	-4	11	0	11	32	1	31	31	1	30
Southeast Asia	41	3	37	41	3	37	45	3	42	58	5	53	55	7	48	57	7	50
Central Asia	-22	-9	-13	-22	-9	-13	-16	-4	-12	-11	-3	-8	12	-2	14	-8	0	-8
South Asia	19	1	19	19	1	19	15	0	15	21	1	20	17	1	16	15	1	14
Oceania	44	1	43	44	1	43	49	1	48	46	1	45	36	2	34	36	2	34
Europe	7	1	7	7	1	7	13	0	12	18	1	17	20	1	20	19	1	18
America	-4	0	-4	-4	0	-4	-4	0	-4	3	0	3	12	0	12	10	0	10
West Asia	7	0	8	7	0	7	9	0	9	13	0	13	17	1	15	9	1	8
Africa	-7	0	-7	-7	0	-7	-2	0	-3	6	0	6	7	0	7	4	0	4
ALL	7	0	7	7	0	7	11	0	11	18	1	17	21	1	20	18	1	16

Notes: This table reports the outward, inward and net spillover indices of CNY for subsamples as shown in the first row of the table and the mutual spillover effect is estimated using Equation (7). TO_CNY^Ω represents CNY's outward spillover effect on currencies in the set Ω as shown in Equation (8). FR_CNY^Ω represents CNY's inward spillover effect from currencies in the set Ω as shown in Equation (9). NET_CNY^Ω represents CNY's net spillover effect on currencies in the set Ω as shown in Equation (10). The first column displays currencies in a specific area which belong to the set Ω.

[14] Specifically, we classify CNY, MNT, and KRW as East Asia currencies, SGD, MYR, IDR, THB, VND, and PHP as Southeast Asia currencies, KZT, UZS, and KGS as Central Asia currencies, INR, PKR, and LKR as South Asia currencies, PGK, NZD, and FJD as Oceania currencies, RUB, MDL, PLN, CZK, and HUF as Europe currencies, DOP, CLP, CRC, and UYU as America currencies, IRR, TRY, SYP, ILS, YER, and GEL as West Asia currencies, TZS, KES, SCR, EGP, DZD, TND, LYD, MZN, ZMK, MGA, ZAR, and NGN as TZS, KES, SCR, EGP, DZD, TND, LYD, MZN, ZMK, MGA, ZAR, and NGN currencies.

6. Robustness Check

Capital control is our main concern when we evaluate the importance of RMB as a potential anchor currency because the capital account openness of China is far below the average according to Chinn, Menzie D. and Hiro Ito (2006). Besides, being included in the SDR basket doesn't naturally lead to the free convertibility of RMB. Actually, RMB is the only IMF reserve currency that isn't fully convertible, and RMB is included into SDR basket as a freely usable currency instead of as a free convertible currency. It indeed seems to be a puzzle when RMB implement considerable influence globally under rather tight capital control.

However, CNH is much less regulated and is de facto fully convertible for it is being freely traded outside of mainland China, such as in Hong Kong and Singapore. With CNH, we are able to check the influence of convertibility of RMB by comparing the performance of CNY and CNH among the currencies in the SDR basket. The sample period starts from March 2, 2011, when data for CNH is available, and ends by the end of 2018.

Table A in the appendix shows the spillover network among on-shore RMB (CNY), Japanese yuan (JPY), Pound Sterling (GBP), Euro (EUR), and US Dollar index (DXY) estimated using Equation (6). Table B in the appendix shows the spillover network among off-shore RMB (CNH) and other four currencies estimated using Equation (6). CNY's outward spillover effect is the least, which is 3.07 basis point, whereas the counterparts of the US dollar, Euro, Pound Sterling, and Japanese yuan are 21.68, 16.99, 11.97, and 7.85 basis points respectively. However, CNY is ranked the second among the five currencies in terms of the net spillover effect due to limited inward spillover effect on CNY. We believe that the modest outward spillover effect of RMB comes from its considerable use globally as RMB has become the fifth active currency as an international payment and a reserve currency. On the other side, the limited inward spillover effect on CNY may be due to the relatively tight capital control of the Chinese central bank. We observe a similar pattern in CNH. With convertibility, the net spillover effect of CNH is even larger, which is 5.37 basis point.

7. Conclusions

With daily exchange rate data, we construct a mutually anchoring network among the G20 currencies and major currencies related to the Belt and Road. Based on the generalized impulse response analysis, a series of RMB impact indices are constructed to measure RMB's relative importance as an anchor currency from the view of networks. We show that the impact of RMB has increased substantially since the central bank of China launched the transition of RMB regime from a conventional dollar peg system to a managed floating rate system in July 2005. Besides, CNY's impact on major currencies related to the Belt and Road initiative has increased steadily since it was proposed in 2013. Our findings highlight that RMB has become increasingly important since China initiated market reforms of its currency and the proposal of building the modern Belt and Road.

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Appendix

Table A. Results of generalized impulse response matrix for 5 currencies in SDR basket

This table reports the results of generalized impulse response among exchange rate changes of 5 currencies in SDR basket estimated using Equation (6). The endogenous variables are 2-day rolling average exchange rate changes from March 2, 2011 when CNH is available, to the end of 2018. CNY represents on-shore Chinese Yuan. DXY represents US Dollar Index. EUR represents Euro. GBP represents Pound Sterling. JPY represents Japanese Yen.

	CNY	JPY	GBP	EUR	DXY	FROM
CNY	0	1.55	2.94	2.64	3.11	2.56
JPY	3.75	0	3.36	12.2	18.61	9.48
GBP	7.77	4.33	0	23.01	26.62	15.43
EUR	5.61	11.8	21.9	0	38.4	19.43
DXY	5.37	13.71	19.69	30.12	0	17.22
OUT	5.63	7.85	11.97	16.99	21.68	
NET	3.07	-1.63	-3.46	-2.44	4.46	

Table B: Results of generalized impulse response matrix for CNH and other 4 currencies in SDR basket

This table reports the results of generalized impulse response among exchange rate changes of CNH and other 4 currencies in SDR basket estimated using Equation (6). The endogenous variables are 2-day rolling average exchange rate changes from March 2, 2011 when CNH is available, to the end of 2018. CNH represents off-shore Chinese Yuan. DXY represents US Dollar Index. EUR represents Euro. GBP represents Pound Sterling. JPY represents Japanese Yen.

	CNH	JPY	GBP	EUR	DXY	FROM
CNH	0	2.45	4.98	5.06	5.6	4.52
JPY	5.73	0	3.36	12.15	18.52	9.94
GBP	11.94	4.31	0	22.91	26.47	16.41
EUR	11.69	11.78	21.86	0	38.24	20.89
DXY	10.24	13.69	19.65	30.03	0	18.4
OUT	9.9	8.06	12.46	17.54	22.21	
NET	5.37	-1.88	-3.95	-3.35	3.81	

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Put-Call Ratio Predictability of the 50ETF Option*

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This paper investigates the predictive power of the put-call-ratio (PCR) implied by China's 50ETF option on the 50ETF return and its variance. By using simple partitional regressions, the relationship between the PCRs and 50ETF returns are tested. This study conducts tests and their robustness based on different horizons, market conditions, moneyness status and time to maturity. Empirical results indicate that the PCR is a strong forward-looking indicator of the variance of 50ETF return. A robust and negative correlation is detected. A significant linear correlation between the PCR and 50ETF return only exists during the market crash. This study shows evidence that the PCR as seen in common trading practices may be misused and indicates a potential way of using it.

JEL Classification: E32; G11; G14; G15

Keywords: 50ETF, option, put-call ratio, partitional OLS

1. Introduction

Among world's Top-20 most-traded index derivatives in 2015, index options occupied 8 seats, in which 4 seats belonged to the ETF-index options[1]. And in 2016, index options accounted for 12 seats, in which ETF-index still took 4 seats among them. Therefore, the ETF-index option is playing a crucial role in the market of financial derivatives. In November 1998, the first ETF option tracking MidCap SPDRs was listed in US. And soon afterward, a number of ETF options tracking major indices were listed worldwide. On February 9th, 2015, an index option on the SSE 50ETF[2] was introduced in China and listed in the Shanghai Stock Exchange (the SSE). After about over 30 months of development, the SSE 50ETF option market has attracted enormous attention due to its fast expansion: 202,013 new trading accounts were opened in 2016, increased by 147.70% than that was in 2015; the average market value was 5.857 billion yuan, increased by 243%[3]. The average daily trading volume and year-end open interest of the 50ETF option increased about 200% in 2016, and the SSE 50ETF option market ranked 5th. among all ETF option markets worldwide[4]. Stylized facts of the 50ETF and international index option markets are shown in Table 1.

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[1] The data is from)
Acworth (2016).

[2] The SSE 50ETF is an exchange-traded fund that tracks the SSE50 Index. And in this paper, we use the notations of "SSE 50ETF" and "50ETF" interchangeably.

[3] For more details, see the official release by the SSE: "Shanghai Stock Exchange Stock Option Market Development Report (2016)".

[4]The data is from Option Market Development Report (2015, 2016) and Liu(2016).

Table 1. Trading Volume Comparison between Top 5 ETF Index Options

Rank	ETF Index Option	Jan-Dec 2016	Jan-Dec 2015	%Change
1	SPDR S&P 500 ETF Options	671,661,453	655,942,274	2.40%
2	iShares Russell 2000 ETF Options	140,662,647	138,135,687	1.80%
3	Powershares QQQ ETF Options	111,873,109	120,174,871	-6.90%
4	iShares MSCI Emerging Markets ETF Options	87,941,483	78,473,551	12.10%
5	SSE 50ETF Option, Shanghai Stock Exchange	79,069,347	23,269,976	239.79%

Notes: Data of SSE50 options is from WIND database, other data is from FIA 2016 Volume Survey.

Such rapid growth in the liquidity and market size require a close examination of how to extract and interpret information from variables of 50ETF option contracts. Among which, one major topic is to predict the price patterns that could guide trading practices. And among all indicators that can potentially describe the market, the put-call ratio (PCR) that calculates a relative open-interest position of put options as per call options is considered to be one of the most intuitive and straightforward variables. It is straightforward to understand and widely believed to be informative since it is based upon market information and reflects investors' sentiment. Therefore, institutional investors who trade in Chinese index option market frequently adopt the PCR as a forward-looking indicator of the stock price. Literature seems to reach a consensus that a negative correlation can be found between the PCRs from stock index options and the stock market return (Pan and Poteshman, 2006, Chang, Hsieh and Lai, 2009, Billingsley and Chance, 2009).

In essence, this study emphasizes on the option market predictability. It helps us to learn whether and how investors who possess valuable private information might use derivatives to execute trades based on that information (Ge, Lin, Pearson, 2016). This is consistent with a recent booming in the studies focusing on extracting information from the option market. They resort to various measurements such as price-based implied volatility (Xing, Zhang, and Zhao, 2010; Cremers and Weinbaum, 2010) or corporate events (Jin, Livnat, and Zhang, 2012; Lin and Lu, 2015; Chan, Ge, and Lin, 2015; Hayunga and Lung, 2014) in order to predict future stock returns.

However, research on the PCRs in the 50ETF option market is almost absent whilst lots of Chinese brokers publish reports implying the existence of some correlation. Most institutional reports are only descriptive rather than quantitative. Hence, this paper is motivated to fill this gap and to reveal a definite, if there is any, between the PCRs and 50ETF returns. It is after all possible that this relationship exhibits some complexity when its underlying (the Chinese A-share stock market) is highly volatile, and direct investments into the 50ETF option market confront heavy regulations. Therefore, we are also motivated to test higher moments influence and justify robustness if there is any. In addition, identifications of the index option market behavior in special periods such as the market crash show insights for policy makers and market participants.

The contribution of this paper is threefold: Firstly, the PCR implied by 50ETF option contracts is examined and tested for the effectiveness of forecast. In most of the testing periods, we find no evidence that the PCR can unconditionally predict any direction of the 50ETF price. This is different from international experience documented in past literature. Therefore, our results indicate a potential misuse of the 50ETF PCRs in trading practice. Secondly, we find a significant, negative and robust correlation between the PCR and next-day variance of 50ETF return. Thirdly, and most importantly, this study is among the very first few studies to

comprehensively answer the question of what exactly the relationship between the PCRs and the underlying returns in Chinese 50ETF option market. This study therefore fills the blank of research on Chinese index option market. Our research points out the potential misuse of the popular PCR strategy by traders in Chinese option market and providing with a correct way of using it — to trade on variance.

The rest of the paper is structured as follows: Section 2 is a brief literature review and hypothesis development; Section 3 describes variables and the dataset; Section 4 outlines the methodology; Section 5 presents empirical results; Section 6 concludes the paper.

2. Literature review and hypothesis development

Past literature shows a consensus that a correlation does exist between the stock index option and stock market, and that information typically flows away from the option market into the underlying stock market due to the forward-looking feature of the option contracts. A study by Easley, O'Hara and Srinivas (1998) indicates that option volume by itself can be informative and shows the option market is a venue for information-based tradings. It also shows both positive and negative option volumes have predictive power for stock price movements (Blau and Wade, 2013; Chakravarty, et al., 2004). Therefore, a trading volume-based PCR is sensible to be chosen to be some forward-looking indicator. Blau, Nguyenb and Whitbyc (2014) compared two commonly used ratios, the PCR and OSR (Option-to-Stock Volume Ratio), and found that PCR contained more information on predictability about future stock returns at daily level while OSR performed well at weekly and monthly levels. Similarly, Bandopadhyaya and Jones (2011) and Weir (2015) found better explanatory power in the PCR than VIX for variations caused by non-economic factors and the PCR was more responsive than VIX. And Pan and Poteshman (2006) reveal the information content of the PCRs for options that were deep out-of-the-money. By using the same model, Chang, Hsieh and Lai (2009) investigate the information content of options trading in the TAIEX option market. Their results showed that option volume (PCR), as a whole, carried no valid information on TAIEX spot index return. More generally, a study by Billingsley and Chance (2009) examines the predictive power of the PCRs in both the CBOE and the OEX, and argues the PCR can be used to predict the direction of the market. Many recent works in this field tend to support this argument (Connors and Alvarez, 2012; Houlihan and Creamer, 2014; Mehta and Patel, 2014; Blau and Brough, 2015; Wu, et al., 2016). But there does exist some disagreement (Zhou, 2003).

Institutional reports in this area are mostly descriptive and trade-oriented. Various PCR calculations are widely adopted in trading practices. Founder Securities Research (2015) analyzes the China 50ETF with autoregressive regression models on stock returns and finds that the residuals which cannot be explained by past returns might be attributed to non-economic factors such as emotional factors, of which PCR is among the most suitable ones. Large falls in the values of the PCRs signal the market touches the bottom. But since the history of 50ETF options is short and academic research is absent, so most published research stays on various qualitative analyses about the possible impact of 50ETF option on the stock market. The China SSE 50ETF Investment Guidelines (2004) compiled by Huaxia Fund Management Co., Ltd. summarizes its role as providing investors with ways to reduce market risk in bearish condition, and the "Review of the 50ETF on the First Anniversary" complied by Shanghai Stock Exchange in 2016 concludes three points: First, the 50ETF options enhanced the size and improved the liquidity of the underlying constituent securities. Second, the 50ETF options reduced the volatility of the underlying securities and improved the pricing efficiency. Third, the 50ETF options would not attract funds away from spot market but into it instead.

To sum up, in contrast to a large number of verified results in mature markets, academic research on Chinese index option market is mostly absent. By assuming a specific correlation does exist between the PCRs derived from 50ETF option contracts and the 50ETF returns, and according to empirical results by Pan and Poteshman (2006), Chang, Hsieh and Lai (2009), Billingsley and Chance (2009) and Connors and Alvarez (2012), this relationship is linear and negative. We develop three hypotheses:

H1: There is a negative correlation between the future return of the 50ETF and the current PCR of 50ETF options.

The "reversal effects" is stressed by Connors and Alvarez (2012) and Houlihan and Creamer (2014), which is supported by Pan and Poteshman (2006), Chang, Hsieh and Lai (2009). It means extremely low or high values of PCR contain more information than otherwise. To be specific, extreme PCRs represent an intensive sentiment that may influence the market. Therefore, the lower (or higher) the PCR is, the more likely the spot price is to reverse. Weir (2015) quantifies two important thresholds that significantly reflect investors' sentiments: less than 0.6 and more than 1.0. Additionally, PCR deviating from its MACD (moving average convergence/divergence) line of different rolling windows is also a useful trading indicator. Similar thresholds are calculated by Founder Securities Research Report (2015), which states that if the PCR falls to 0.3 from a higher position signals a market bottom. To examine this argument, we put it into the second hypothesis:

H2: The correlation between the next-day return of 50ETF and the current PCR is significantly stronger at extreme values.

Results from Houlihan and Creamer (2014) and Mehta and Patel (2014) suggest that PCRs can predict directional moves of the underlying assets regardless of different market conditions. Thus, the correlation between option PCRs and the underlying returns is significant and robust. As for the Chinese market, the event of stock market crash in the summer of 2015 and the recovery afterward just stay in the middle of the two-and-half-year-long history of the 50ETF options. And this happens to provide us with a sample to examine the stability of the PCR predictability. And this robustness forms our third hypothesis:

H3: The correlation is stable under different market conditions

3. Dataset and variables

The full dataset of SSE 50ETF option contracts is drawn from the WIND database. It consists of all SSE 50ETF option contracts on a daily basis, including types of option (call/put), option characteristics (strike price and time to maturity), transaction prices, trading volume, and open interests. The time is from 9th. February 2015 to 31th. August 2017, and this covers all 626 valid trading days and 65,170 option contracts. Data of the price (or value) as per unit of SSE 50 ETF is also collected from the WIND database. The daily return of the 50ETF, R_t, is calculated in the form of log return as follows:

$$R_t = \ln(P_t) - \ln(P_{t-1}) \quad (1)$$

where P_t denotes the closing price of the 50ETF on date t. Among several approaches to calculate the PCR, this study adopts the open interest approach[5] by Fodor, Krieger and Doran (2011):

$$PCR_t = \frac{P_t}{C_t} \quad (2)$$

[5]We also tried the trading volume approach but found results are highly noisy.

$$PCR_t' = \frac{P_t}{P_t + C_t} \quad (3)$$

where P_{it} and C_{it} are the numbers of open interests of all put and call options respectively (not ruling out any maturity or moneyness). The above two expressions are all widely used in past literature. In this study, we adopt the first expression and also tried the second one for robustness.

This study divides the full sample into subsamples based on the stock market crash in 2015. According to the Special Report of Tsinghua Financial Review, China's A-share stock market went through a quick booming and a sharp crash after reaching the peak on June 15th, 2015. The chronology of the crash is from 15th. June to 26th. August. We hence divide the subsamples as follows:

Phase 1 (before the crash): 9th. February, 2015 to 12th. June, 2015;

Phase 2 (after the beginning of the crash): 15th. June, 2015 to 31st. August, 2017;

Phase 3 (during the crash): 9th. February, 2015 to 26th. August, 2015;

Phase 4 (after the crash): 27th. August, 2015 to 31st. August, 2017.

For the purpose of reliability and robustness tests, Phase 1 and 3 are constructed to have an overlap before the market crash (Phase 2 and Phase 4 follow a similar feature). Then, by comparing regressions from Phase 1 and Phase 3 (or Phase 2 and Phase 4), the influence from the stock market crash can be detected.

All variables used in this research are listed in Table 2. Basic descriptive statistics of the dependent and independent variable as well as the control variables are listed in Table 3.

Table 2 Symbol and Explanation of Used Variables

Variables	Symbol	Explanations
Put-call Ratio	PCR	Open interests of put options divided by open interests of call options
Control variables	X_t	Variables that may contain explanatory power on dependent variables other than independent variables
Return	$R_{t+\tau}$	Return of 50ETF on the t+τ trading day
Control 1	Dummy×near maturity PCR	Interaction term between a dummy variable and the near-mature PCR: dummy variable=1 when there are options mature on next trading day near-mature PCR=PCR calculated by options matured on next trading day
Control 2	Volume	Daily closing 50ETF trading volume
Control 3	$R_{-5,-1}$	Past five-day 50ETF cumulative return
Control 4	$R^{+1}{}_{SCI}$	Next-day Shanghai Composite Index (SCI) return

Notes: Other mentioned but not adopted variables are given explanations in the context.

Table 3. Basic Descriptive Statistics of Adopted Variables

Panel A: Independent Variable					
	PCR	PCR: Phase1	PCR: Phase2	PCR: Phase3	PCR: Phase4
Mean	0.7978	0.7766	0.8010	0.6637	0.8346
Standard Deviation	0.1977	0.0977	0.2086	0.1793	0.1864
Lowest	0.3324	0.6073	0.3324	0.3324	0.3849
Highest	1.3830	1.0654	1.3830	1.065	1.3830
Panel B: Dependent and Control Variables					
	R_t	Control 1	Control 2	Control 3	Control 4
Mean	0.0003	0.0391	19.6922	0.0012	0.0001
Standard Deviation	0.0175	0.1821	0.9427	0.0386	0.0175
Lowest	-0.1052	0.0000	18.1703	-0.2452	-0.0887
Highest	0.0809	1.3576	22.9367	0.1666	0.0560

Notes: Basic descriptive statistics of independent and dependent variables are listed.

Table 3 suggests that the number of call-option open interests is higher than that of put option in general, and this is consistent with main stream literature. After the start of the market crash, volatility of PCR increases and the full-sample statistics is dominated by the after-crash part.

4. Methodology

4.1OLS Regressions

We follow a simple OLS approach implemented by Pan and Poteshman (2006) as follows:

$$R_{t+\tau} = \alpha + \beta PCR_t + \gamma X_t + \varepsilon_{t+\tau}, \tau = 1,2,\dots,T \quad (4)$$

where $R_{t+\tau}$ denotes the daily logarithmic return of the 50ETF index on date t+τ; X_t denotes control variable(s); PCR_t denotes the Put-Call-Ratio implied by the 50ETF options on date t, which is the information variable extracted from daily option under the framework of Pan and Poteshman (2006). The null hypothesis is that the 50ETF and its options are in separate equilibrium and that the information variable PCR has no predictive power at all, that is to say, for all $\tau = 1,2,\dots,T$, $\beta = 0$. Second order moment of the return is analyzed with a similar model:

$$R^2_{t+\tau} = \alpha + \beta PCR_t + \gamma X_t + \varepsilon_{t+\tau}, \tau = 1,2,\dots,T \quad (5)$$

where $R^2_{t+\tau}$ denotes the squared logarithmic return of the 50ETF index on date t. Both daily and monthly returns are adopted.

4.2 Partition and Rolling Window

Pan and Poteshman (2006) showed that forecast power of PCR indicator is mainly reflected in its high-valued and low-valued cases. To study the predictive power of PCR in different value intervals (or with different deviation degree from the benchmark), and to facilitate statistical comparisons among different cases, we extend the four-partition regression model adopted by Low (2004) to a six-partition one. PCR values are separated into six partitions based on their deviation degree from the mean value (sample mean or rolling-window mean).

Specifically, deviation degree of PCR is measured by the number of standard deviations (denoted as sd) it deviated from the mean value. Six partitions are: slightly positive-deviated partition (denoted as P^{slight}) where mean<PCR<mean+1sd (PCR in this partition is denoted as PCR^{+}); ordinarily positive-deviated partition (denoted as $P^{ordinary}$) where mean+1sd<PCR<mean+2sd (PCR is denoted as PCR^{++}); extremely positive-deviated partition (denoted as $P^{extreme}$) where PCR>mean+2sd (PCR is denoted as PCR^{+++}); slightly negative-deviated partition (denoted as N^{slight}) where mean-1sd<PCR<mean (PCR is denoted as PCR^{-}); ordinarily negative-deviated partition (denoted as $N^{ordinary}$) where

mean-2sd<PCR<mean-1sd (PCR is denoted as PCR^{-}) and extremely negative-deviated partition (denoted as $N^{extreme}$) where PCR<mean-2sd (PCR is denoted as PCR^{--}). All partitioned variables are defined as follows: taking PCR^{+++} as an example, PCR^{+++} defines the extreme values of PCRs if and only if they are larger than and outside two standard deviations of the rolling mean of the PCRs. Hence, the six-partition regressions are:

$$\begin{gathered}(P^{extreme})R_{t+1} = \alpha^{+++} + \beta^{+++}PCR_t^{+++} + \varepsilon_{t+1}^{+++} \\ (P^{ordinary})R_{t+1} = \alpha^{++} + \beta^{++}PCR_t^{++} + \varepsilon_{t+1}^{++} \\ (P^{slight})R_{t+1} = \alpha^{+} + \beta^{+}PCR_t^{+} + \varepsilon_{t+1}^{+} \\ (N^{slight})R_{t+1} = \alpha^{-} + \beta^{-}PCR_t^{-} + \varepsilon_{t+1}^{-} \\ (N^{ordinary})R_{t+1} = \alpha^{--} + \beta^{--}PCR_t^{--} + \varepsilon_{t+1}^{--} \\ (N^{extreme})R_{t+1} = \alpha^{---} + \beta^{---}PCR_t^{---} + \varepsilon_{t+1}^{---}\end{gathered} \tag{6}$$

To better detect PCR deviations from a relatively flexible and updated benchmark, rolling windows with lengths of 20 and 5 consecutive trading days are adopted, which represent 1 calendar month and 1 calendar week, separately. To avoid potential look-ahead bias. PCRs are divided into the mentioned six partitions based on the rolling means and the rolling standard deviations of the rolling window just prior to the date when PCR is calculated. For example, the partition that PCR on date t belongs to is decided by its deviation degree from the rolling mean and rolling variance of the window starts from day t-5 and ends on day t-1.

4.3 β-coefficient difference

To compare the predictive power of PCR in different partitions, we adopt the coefficient comparison model used by Low (2004). To test the statistical significance of differences between the slopes of the following two regressions:

$$R_{t+1}^{(1)} = \alpha_1 + \beta_1 PCR_t^{(1)} + \varepsilon_{t+1}^{(1)} \tag{7}$$

$$R_{t+1}^{(2)} = \alpha_2 + \beta_2 PCR_t^{(2)} + \varepsilon_{t+1}^{(2)} \tag{8}$$

We then rewrite the above models to check for the stability of the coefficients:

$$\begin{pmatrix} R_{t+1}^{(1)} \\ R_{t+1}^{(2)} \end{pmatrix} = \alpha_2 \begin{pmatrix} 1 \\ 1 \end{pmatrix} + \alpha_d \begin{pmatrix} 1 \\ 0 \end{pmatrix} + \beta_2 \begin{pmatrix} PCR_t^{(1)} \\ PCR_t^{(2)} \end{pmatrix} + \beta_d \begin{pmatrix} PCR_t^{(1)} \\ 0 \end{pmatrix} + \begin{pmatrix} \varepsilon_{t+1}^{(1)} \\ \varepsilon_{t+1}^{(2)} \end{pmatrix} \tag{9}$$

where α_d and β_d stand for (α_1-α_2) and (β_1-β_2), respectively. Specifically, to compare the difference of beta in different partitions, we pool the observations in the belonging partitions together and generate four regressors: a) a constant term which equals 1; b) a dummy variable which equals 1 if the observation belongs to the first partition and equals 0 if it belongs to the second partition; c) a PCR variable which without further calculation; d) a variable which equals PCR if the observation belongs to the first partition and equals to 0 if it belongs to the second partition. We regress the pooled next-day return as the dependent variable on these four variables and check the significance of α_d and β_d.

5. Empirical Results

5.1 PCR Predictability on 50ETF Return

We regress the next-day returns of the 50ETF fund on full-sample as well as six-partition subsamples of current PCRs. Six partitions are all based on the sample mean and standard deviation. Results are shown in Table 4.

Table 4. Results of Six-partition Regressions of 50ETF Return on 50ETF Options PCR

Regression	Constant	PCR	PCR^{---}	PCR^{--}	PCR^{-}	PCR^{+}	PCR^{++}	PCR^{+++}	D-W test	White test	R^2
$N^{extreme}$	0.1181 (0.47)		-0.3316 (-0.46)						2.32	6.29**	0.0176
$N^{ordinary}$	-0.0083 (-0.23)			0.0080 (0.11)					1.24	28.35***	0.0002
N^{slight}	0.0098 (0.66)				-0.0116 (-0.56)				1.73	16.18***	0.0015
P^{slight}	0.0032 (0.23)					-0.0032 (-0.21)			1.73	3.83	0.0002
$P^{ordinary}$	0.0212 (1.04)						-0.01840 (-0.97)		1.16	0.14	0.0133
$P^{extreme}$	0.0397 (0.84)							-0.0316 (-0.86)	1.26	3.03	0.0416

Notes: This table reports results of regressing the next-day 50ETF daily return on both the whole-sample of current-day PCR and the six partitions of the current-day PCR. Six partitions are divided according to the deviation degree from the sample mean: extremely negative-deviated (<mean-2 standard deviations (sd, the same below)), ordinarily negative-deviated (>mean-2sd, <mean-1sd), slightly negative-deviated (>mean-1sd, <mean), extremely positive-deviated (>mean+2sd), ordinarily positive-deviated (>mean+1sd, <mean+2sd), slightly positive-deviated (>mean, <mean+1sd). t-statistics are in parentheses. One, two and three asterisks (*) respectively indicate the t-values are significant at the 0.1, 0.05 and 0.01 level. White correlated t-statistics and GLS are also adopted and none of the coefficients are significant.

Coefficients of both full-sample PCRs and six-partition PCRs are all insignificant with R^2 below 0.05. For the four-partitioned sample according to negatively/positively deviated for less/more than 1 standard deviation, there is still no concrete evidence. Diagnostics such as Durbin-Watson (DW) and White tests for autocorrelation and heteroscedasticity all tell potential problems of misspecification. The GLS and heteroscedasticity-consistent t-tests are then adopted to address the issue. But results stay the same[6]. Such a result as the PCR does not provide any forecast power on the next-day return is inconsistent to Pan and Poteshman (2006) that proves otherwise in the US market, but consistent to the findings in TAIEX options by Chang et al. (2009).

It is possible that PCRs fluctuate greatly throughout the whole time period but cluster in some shorter intervals. Therefore, the mean and standard deviation of the full sample may be inadequate to diagnose short-term fluctuations. So in the next step, we take 5- and 20-day rolling windows to identify short-run dynamics. The regression results are shown in Table 5.

[6]The results of GLS and heteroscedasticity-consistent t-values are omitted but available upon request.

Table 5 Results of Six-partition Regressions of 50ETF Return on 50ETF Option PCR —Rolling Windows of 20, 5 Trading days

Six-partitions	20-day rolling window				5-day rolling window			
	OLS-Slope (β)		GLS		OLS-Slope (β)		GLS	
	t-statistics	White-corrected t-statistics	t-statistics	R^2	t-statistics	White-corrected t-statistics	t-statistics	R^2
PCR^{+++}	0.0090 (1.05)	0.8	1.06	0.0140	0.0171** (2.09)	1.57	3.07***	0.0426
PCR^{++}	-0.0003 (-0.05)	-0.04	-0.06	0.0000	0.0092 (1.41)	1.44	1.42	0.0195
PCR^{+}	-0.0008 (-0.10)	-0.11	-0.10	0.0000	-0.0268*** (-3.66)	-2.49**	-3.69***	0.1035
PCR^{-}	-0.0138 (-1.63)	-1.33	-1.65*	0.0203	-0.0091 (-1.18)	-0.91	-1.19	0.0112
PCR^{--}	0.0085 (0.86)	0.53	0.86	0.0057	-0.0023 (-0.22)	-0.15	-0.22	0.0004
PCR^{---}	0.0504** (2.19)	1.23	2.24**	0.0944	0.0580*** (4.01)	2.59**	4.07***	0.1956

Notes: This table reports results of regressing returns of 50ETF on six partitions of 50ETF option PCRs based on their deviation degree from the rolling means. All partitions show autocorrelation in D-W tests while all partitions except PCR^{+} in 20-day and PCR++ in 5-day rolling windows show heteroscedasticity in White tests. OLS t-statistics are in parentheses. To address autocorrelation and heteroscedasticity, GLS t-statistics and White corrected t-statistics are adopted. One, two and three asterisks (*) respectively indicate the t-values are significant at the 0.1, 0.05 and 0.01 level.

The results of six-partition regressions, without control variables, show that we are unable to find significant predictive power from most of the partitions. However, there are still some significant results. First, some slopes of extremely high and low[7] PCRs (denoted as PCR^{+++}) are positive and the shorter the length of the rolling window, the more significant the slope coefficient is, which means extreme PCR values are predictive. Second, extremely low PCRs are more predictive than extremely high PCRs, according to the β-difference test. However, such pattern in extreme cases does not hold in other partitions, where the results are unstable and hard to summarize. Almost all partitions show autocorrelation in D-W tests and heteroscedasticity in White tests. To address autocorrelation and heteroscedasticity, GLS t-statistics and White corrected t-statistics are adopted. The results are robust. The results mean that extremely high or low PCR provides significant positive predictive power[8] to the next-day return of 50ETF but the degree of deviation should be more than 2 standard deviations.

Besides regressions of the next-day return, +τ-day returns are also examined in order to investigate longer periods of information content. Considering that the regression results of rolling windows no shorter than 20 days are not significant, we only extend the predictability horizon to 20 days (τ=1,2,...,20) and test both full-sample PCRs and the extremely high and low PCRs in 5-day rolling windows, finding that full-sample PCRs are insignificant in any τ while

[7]The notation "extremely low/high PCR" represents PCRs that are negatively/positively deviated from the rolling means for more than 2 rolling standard deviations, for the purpose of simplifying the presentation, the same below.

[8] Positive predictive power (predictability) means PCRs and 50ETF returns move in the same direction while negative predictive power (predictability) means PCRs and 50ETF returns move in contrary direction.

extremely low PCRs show positive predictive power on +1, +2, +14 and +20 days, and extremely high PCRs show positive predictive power on +1, +5 and +10 days. The results are reported in Table 6.

Table 6. Test of PCR Predictability Horizon on 50ETF Return

+τ Days ahead	All PCR		Extremely low PCR (PCR^{---})		Extremely high PCR(PCR^{+++})	
	Slope coefficient	t-Statistic/ GLS z-statistic	Slope coefficient	t-Statistic/ GLS z-statistic	Slope coefficient	t-Statistic/ GLS z-statistic
1	0.0034	0.97/0.97	0.0580***	4.01/4.07	0.0171**	2.09/2.11
2	0.0031	0.86/0.87	0.0532***	3.70/3.76	0.0003	0.04/0.04
3	0.0011	0.30/0.30	-0.0140	-0.80/-0.81	0.0036	0.45/0.45
4	0.0016	0.46/0.46	-0.0029	-0.17/-0.17	0.0067	1.06/1.07
5	0.0015	0.43/0.43	-0.0198	-1.46/-1.49	0.0122*	1.69/1.71
6	0.0039	1.09/1.09	-0.0173	-1.24/-1.26	0.0011	0.19/0.19
7	0.0035	0.96/0.96	-0.0015	-0.12/-0.12	-0.0105	-1.65/-1.67*
8	0.0025	0.70/0.70	0.0115	0.90/0.92	0.0043	0.74/0.75
9	0.0025	0.69/0.69	-0.0058	-0.44/-0.44	0.0022	0.26/0.26
10	0.0033	0.91/0.92	-0.0023	-0.19/-0.20	0.0206**	2.23/2.26
11	0.0032	0.89/0.89	0.0078	0.54/0.55	0.0002	0.03/0.03
12	0.0021	0.58/0.59	-0.0110	-0.73/-0.74	-0.0026	-0.40/-0.40
13	0.0030	0.84/0.84	0.0107	0.74/0.75	0.0040	0.55/0.56
14	0.0042	1.17/1.18	0.0251*	1.67/1.69	0.0132	1.56/1.58
15	0.0038	1.06/1.06	0.0109	0.74/0.76	0.0016	0.20/0.20
16	0.0033	0.91/0.91	-0.0051	-0.42/-0.42	-0.0060	-0.89/-0.90
17	0.0044	1.23/1.23	0.0171	1.37/1.40	0.0060	0.77/0.78
18	0.0031	0.86/0.86	0.0088	0.72/0.73	0.0041	0.53/0.54
19	0.0037	1.03/1.04	0.0151	1.46/1.48	0.0024	0.30/0.30
20	0.0032	0.87/0.87	0.0163*	1.85/1.88	-0.0087	-1.12/-1.13

Notes: This table reports results of regressing returns of 50ETF on all 50ETF option PCRs and the subsample of PCRs that are negatively and positively deviated from 5-day rolling means for more than 2 rolling deviations (presented as extremely low and extremely high) on an extended horizon from +1 to +20 days. One, two and three asterisks (*) respectively indicate the t-values are significant at the 0.1, 0.05 and 0.01 level. If the asterisk is on the t-statistic or z-statistic, it means that the significance exists only on the corresponding regression.

Thus the predictive power of PCRs only contains in extreme cases and the extremely low PCRs are more indicative. Also such predictive power is concentrated on the next-day return but not robust for longer period.

To further investigate the predictive power of extreme PCRs in a 5-day rolling window and make sure the univariate regression results are not dominated by other factors other than the PCR, control variables are added. Similar to Chang et al. (2009), we adopt an interaction term between a dummy variable and the near-maturity PCR as the maturity control. The dummy variable takes the value 1 if there are one or more options about to mature on the next trading day, otherwise it takes the value 0. The near-maturity PCR is calculated by options that will

expire in the next trading day. For liquidity control, we add in the daily closing 50ETF trading volume. For reversal control, we add in the past five-day 50ETF cumulative return $R_{-5,-1}$. And we also add in the next-day Shanghai Composite Index return to control the correlation between the stock market and the option market. Table 7 shows the results of regressions of extremely low PCRs under a 5-day rolling window with the above control variables.

Table 7. Predictability from Extremely low PCR in 5-day Rolling Window Regressions with Control Variables

PCR	Dummy×near maturity PCR	Volume	$R_{-5,-1}$	R^{+1}_{SCI}	R^2
0.0591***	-0.0025				0.20
(3.97)	(-0.38)				
0.0650***	-.00356	0.0000			0.21
(4.12)	(-0.53)	(1.11)			
0.0561***	-0.0039		0.05719		0.21
(3.06)	(-0.55)		(0.71)		
0.0637***	-0.0071	0.0000	0.0964		0.23
(3.37)	(-0.95)	(1.43)	(1.14)		
0.0630***		0.0000			0.21
(4.14)		(1.05)			
0.0551***			0.0467		0.20
(3.04)			(0.60)		
0.0605***		0.0000	0.0714		0.22
(3.25)		(1.21)	(0.89)		
0.0559***				0.08641	0.20
(3.78)				(0.76)	
0.0571***	-0.0029			0.0898	0.21
(3.77)	(-0.43)			(0.78)	
0.0629***	-0.0037	0.0000		0.0651	0.22
(3.85)	(-0.55)	(0.96)		(0.55)	
0.0550***	-0.0043		0.0540	0.0836	0.21
(2.98)	(-0.60)		(0.66)	(0.69)	
0.0626***	-0.007	0.0000	0.0920	0.0511	0.24
(3.25)	(-0.95)	(1.31)	(1.07)	(0.42)	
	-0.0010	0.0000	0.1779**	0.1065	0.10
	(-0.37)	(0.32)	(2.02)	(0.81)	

Notes: This table reports results of regressing next-day returns of 50ETF on extremely low 50ETF option PCRs in 5-day rolling windows with four control variables: expiration dummy interacting with PCR, the daily closing trading volume of 50ETF, the five-day accumulated 50ETF return, and the next-day Shanghai Composite Index (SCI) return. t-statistics are in parentheses. One, two and three asterisks (*) respectively indicate the t-values are significant at the 0.1, 0.05 and 0.01 level.

From the results in Table 6, we find that the extremely low PCRs in the 5-day rolling window still has strong predictive power in all of the regressions and the R^2 are all above 20%. Thus, these controls have no impact on PCR's next-day return predictability since none of them are significant. The case of extremely high PCRs shows similar results and both cases are robust under G

LS regression[9].

5.2 Predictability on Squared 50ETF Return

Literature tends to link the PCR to a reflection of market sentiment. Therefore, there is a possibility that the "sentiment" would not directly affect the 50ETF return but its variance instead. This section extends our investigation to examining the second-order moment of return (R_t^2) to see potential nonlinearity. Regressions on the full-sample as well as six-partition subsamples are repeated but with a different dependent variable. Results are reported in Table 8.

Table 8. Results of All Regressions of 50ETF Squared Return on 50ETF Option PCR—Rolling Windows of 20, 5 trading days

Six-partitions	20-day rolling window				5-day rolling window			
	OLS-Slope (β)		GLS	R^2	OLS-Slope (β)		GLS	R^2
	t-statistics	White-corrected t-statistics	t-statistics		t-statistics	White-corrected t-statistics	t-statistics	
PCR^{+++}	-0.0012** (-2.11)	-1.46	-2.14**	0.0548	-0.0015*** (-3.14)	-2.23**	-3.17***	0.0912
PCR^{++}	-0.0006*** (-3.12)	-3.28***	-3.14***	0.0650	-0.0004** (-2.18)	-1.81*	-2.2**	0.0454
PCR^{+}	-0.00056* (-1.95)	-2.20**	-1.97**	0.0392	-0.0015*** (-3.98)	-2.09**	-4.01***	0.1202
PCR^{-}	-0.0013*** (-3.70)	-2.81***	-3.73***	0.0958	-0.0012*** (-4.27)	-3.29***	-4.30***	0.1289
PCR^{--}	-0.0027*** (-6.25)	-3.63***	-6.30***	0.2336	-0.0021*** (-4.26)	-2.74***	-4.30***	0.1415
PCR^{---}	-0.0070*** (-4.71)	-2.80***	-4.82***	0.3257	-0.0045*** (-4-18)	-2.23**	-4.25***	0.1975

Notes: This table reports results of regressing squared return of 50ETF on both the whole-sample and six-partition All partitions show autocorrelation in D-W tests while all partitions except PCR^{+} and PCR^{++} in 20-day rolling windows show heteroskedasticity in White tests. OLS t-statistics are in parentheses. To address autocorrelation and heteroskedasticity, GLS t-statistics and White corrected t-statistics are adopted. One, two and three asterisks (*) respectively indicate the t-values are significant at the 0.1, 0.05 and 0.01 level.

Regressions in Table 8 shows strong and robust significance of the PCR as a forecast of the future short-term index variance. All coefficients of the PCRs are negative, indicating a fact that the lower the PCR, the higher the R_t^2 on the next trading day. We also find that for both 5- and 20-day rolling windows, higher deviation from the rolling mean implies higher R^2 and higher coefficients in terms of absolute value. By conducting β-tests, low partitions show higher significance (and higher absolute value of coefficients) than high partitions of the same deviation. Evidence shows the predictive power is asymmetric and low PCRs contains more information, especially for the extreme cases. Results from the model using 20-day rolling window show better performance (higher R^2, R^2 of PCR^{---} in 20-day rolling window reaches 32.57%, the highest among all models) than the 5-day rolling window scenario.

As the R_t^2 can be interpreted as a measure of the realized variance, we then find that the more optimistic the market is (PCR decreases), the higher the variance will be. Such optimistic sentiment may translate into future stock market risk, which might help explain the fact that the

[9]The cases of extremely high PCRs and GLS results are omitted but available upon request.

lower the PCR is, the more predictive power it has. When control variables are added, the above results remain stable and robust[10]. Predictive power on (t+τ)-day ahead returns is also. Predictability horizons are 1 to 20 days (τ=1, 2, ..., 20) and the results are reported in Table 9:

Table 9. Test of PCR Predictability Horizon on Squared 50ETF Return

+τ Days ahead	All PCR		Extremely low PCR (PCR^{---})		Extremely high PCR(PCR^{+++})	
	Slope coefficient	t-Statistic/ GLS z-statistic	Slope coefficient	t-Statistic/ GLS z-statistic	Slope coefficient	t-Statistic/ GLS z-statistic
1	-0.0015***	-8.52/-8.54	-0.0070***	-4.71/-4.82	-0.0012**	-2.11/-2.14
2	-0.0015***	-8.3/-8.31	-0.0062***	-5.22/-5.33	-0.0015**	-2.52/-2.55
3	-0.0014***	-7.75/-7.76	-0.0032***	-3.65/-3.73	-0.0015**	-2.51/-2.54
4	-0.0014***	-7.28/-7.29	-0.0031***	-3.44/-3.52	-0.0004	-1.03/-1.04
5	-0.0013***	-6.93/-6.94	-0.0017***	-3.40/-3.47	-0.0004	-1.04/-1.05
6	-0.0012***	-6.52/-6.53	-0.0010*	-1.89/-1.93	-0.0006	-1.55/-1.57
7	-0.0012***	-6.2/-6.21	-0.0024***	-3.39/-3.46	-0.0005	-1.28/-1.30
8	-0.0012***	-6.06/-6.07	-0.0040***	-5.07/-5.17	-0.0005	-0.89/-0.90
9	-0.0011***	-5.62/-5.63	-0.0026***	-3.43/-3.50	-0.0005	-0.80/-0.81
10	-0.0011***	-5.63/-5.64	-0.0020**	-2.61/-2.67	-0.0005	-0.74/-0.75
11	-0.0011***	-5.85/-5.86	-0.0016**	-2.31/-2.36	-0.0005	-1.01/-1.02
12	-0.0011***	-5.73/-5.74	-0.0002	-0.52/-0.53	-0.0005	-0.89/-0.91
13	-0.0010***	-5.40/-5.41	0.0000	0.08/0.08	-0.0004	-0.75/-0.76
14	-0.0010***	-5.32/-5.33	-0.0004	-1.19/-1.22	0.0000	-0.04/-0.04
15	-0.0010***	-5.18/-5.19	-0.0003	-1.17/-1.20	-0.0002	-0.51/-0.52
16	-0.0009***	-4.92/-4.93	0.0001	0.25/0.26	-0.0005	-0.94/-0.96
17	-0.0009***	-4.86/-4.87	0.0001	0.34/0.34	-0.0004	-0.77/-0.78
18	-0.0009***	-4.82/-4.83	0.0001	0.22/0.23	-0.0007	-1.28/-1.30
19	-0.0009***	-4.91/-4.91	0.0000	-0.01/-0.01	-0.0007	-1.61/-1.63
20	-0.0010***	-4.95/-4.96	-0.0023**	-2.13/-2.17	-0.0015	-1.89/-1.91

Notes: This table reports results of regressing returns of 50ETF on all 50ETF option PCRs and the subsample of PCRs that are negatively and positively deviated from 5-day rolling means for more than 2 rolling deviations (presented as extremely low and extremely high) on an extended horizon from +1 to +20 days. One, two and three asterisks (*) respectively indicate the t-values are significant at the 0.1, 0.05 and 0.01 level. If the asterisk is on the t-statistic or z-statistic, it means that the significance exists only on the corresponding regression.

The significant predictive power of all PCRs last for at least 20 days but decrease gradually. Predictive power of extremely low PCRs lasts for 11 days while that of extremely high PCRs lasts for only 3 days. All significant coefficients are negative, similar to the case of one-day ahead prediction.

These results inspire us to investigate the predictive power not only on daily level but also on monthly level for potentially stable outcome. Using the same six-partition framework under the 20-day rolling window. Monthly returns of the 50ETF and monthly PCRs of 50ETF options are

[10]Omitted but available upon request.

introduced as new dependent and independent variables. The coefficients of the six partitions (from PCR^{+++} to PCR^{---}) are: -0.0016 (insignificant), -0.0163 (99% significance), 0.0218 (99% significance), -0.0249 (99% significance), -0.0157 (99% significance) and -0.0693 (99% significance). The R^2 (from PCR^{+++} to PCR^{---}) are: 0.15%, 12.81%,12.11%, 15.58%, 9.67% and 45.02%. Hence, the results are consistent to the daily cases where significant predictive power only applicable in the extremely low PCRs. And, for the lowest partition (PCR^{---}), monthly PCR can explain more than 45% of the variance of the return.

Compare with the results from previous sections, PCRs of the 50ETF options is better used to predict the variance of the 50ETF return, rather than the 50ETF return. And this is consistent with the treatment of PCRs as market sentiment by academia. In addition, we follow the study by Gang et al. (2014) that discusses the relationship between stock return and the VIX and regress the second order of Chinese volatility index (iVX^2) on monthly R_t^2 of 50ETF[11]. Empirical results show a very significant coefficient (the t-value is 17.89). This implies the iVX is highly correlated with PCR but in a nonlinear way.

5.3 Predictability Before and After the Stock Market Crash

Chinese stock market has gone through a severe crash in the summer of 2015. The start of the crash coincides with the beginning of a sharp falling after months of consecutive run-ups. 15th. June, 2015 is the date when the market reached the peak. 26th. August is the end of the third stage defined in the Special Report of Tsinghua Financial Review. Our study separates the whole sample into two sets of divisions: Phase 1 and Phase 2, Phase 3 and Phase 4. Such division enables us to compare predictability of the PCR under different market conditions. Both regressions of 50ETF return and R_t^2 are summarized in Table 10.

[11]iVX is the combination of implied volatility of different options that aims at predicting the next 30-day volatility of 50ETF. iVX^2 is adopted as it corresponds to the square of return, both of which are in a form of second order moments.

Table 10. Predictability in Different Phases of the Market Crash

	PCR	All PCR			Extremely low PCR			Extremely high PCR		
	Phases	Slope (β)	GLS z-statistic	R^2	Slope (β)	GLS z-statistic	R^2	Slope (β)	GLS z-statistic	R^2
R_{t+1}	Phase1	-0.0193 (-0.86)	-0.87	0.01	-0.0036 (-0.16)	-0.21	0.00	-0.1227 (-1.54)	-1.70*	0.21
	Phase2	0.0045 (1.28)	1.29	0.00	0.0626*** (3.87)	3.94***	0.22	0.0207** (2.58)	2.61***	0.0712
	Phase3	0.0147 (1.02)	1.03	0.01	0.1113*** (3.09)	3.27***	0.36	0.0738* (1.70)	1.80*	0.1522
	Phase4	-0.0002 (-0.06)	-0.06	0.00	0.0266* (2.00)	2.04**	0.08	0.0023 (0.35)	0.36	0.0016
R^2_{t+1}	Phase1	-0.0012* (-1.66)	-1.68*	0.03	-0.0003 (-0.36)	-0.38	0.01	-	-	-
	Phase2	-0.0016*** (-8.11)	-8.13***	0.11	-0.0095*** (-3.75)	-3.90***	0.37	-0.0013** (-2.06)	-2.08**	0.0555
	Phase3	-0.0037*** (-4.68)	-4.72***	0.14	-0.0079*** (-4-08)	-4.23***	0.38	-	-	-
	Phase4	-0.0005*** (-5.00)	-5.02***	0.05	-0.0009** (-2.43)	-2.57***	0.26	-0.0004* (-1.87)	-1.89*	0.0494

Notes: This table reports results of the regressions of whole PCR and extremely low and high PCRs (Return: in 5-day rolling windows, squared return: in 20-day rolling windows) in the full interval and 4 phases: before/after the beginning of the market crash, before/after the ending of the market crash. Pase1: 2015.2.9~2015.6.12, Phase 2: 2015.6.15~2017.8.31, Phase3: 2015.2.9~2015.8.26, and Phase4: 2015.8.27~2017.8.31. t-statistics are in parentheses. One, two and three asterisks (*) respectively indicate the t-values are significant at the 0.1, 0.05 and 0.01 level. Two cases in extremely high PCRs are omitted due to lack of observations.

As shown in Table 10, the predictability of extremely low PCR on 50ETF return is not robust while the predictability on squared return is robust. The most important result comes from comparisons between Phase 1 and Phase 3 (as well as phase 2 and phase 4), which shows that even only few more observations from the market crash period are added, the insignificant result of 50ETF return is turned into a highly significant one in regressions of extreme high or low PCRs. The result of the whole sample is dominated by the period of the stock market crash, once the period of the market crash is included in the sample, the results are likely to be significant and with high coefficients. However, PCR's predictive power on squared return is robust across all phases.

It is notable that August 26$^{th.}$ 2015 is merely the end of the sharpest falling period, but not the true end of the market crash (there is no such definition). In addition, there are two adjustments on open position limitation instituted by China Securities Regulatory Commission (the CSRC, China's securities and derivatives regulatory authority)[12]. To better analyze the results after the stock market crash, we repeat the regressions on the three phases of limitations and the coefficients of PCR^{---} under loose limitation (2015.2.9~2015.9.8), strict limitation

[12] During the severe market fluctuations, the CSRC authorized the SSE to temporarily limit the opening position of the 50ETF option from maximum 50,000 contracts per day to no more than 5,000 contracts per day (effective on September 8th, 2015 until August 8th, 2016). On August 8th, 2016, the SSE once again loosed the limit to no more than 10,000 contracts, which is effective till now.

(2015.9.9~2016.8.8) and medium limitation (2016.8.9~2017.8.31) are 0.1113 (99% significance, t-value=3.09), 0.0355 (insignificant, t-value=1.56) and 0.01 (insignificant, t-value=0.63). By contrast, results of squared return are robust during all different limitations.

Thus, we can deduct that the major contributor of PCR's positive predictive power on next-day 50ETF return concentrates in the sharp falling period during the stock market crash. After the market crash, such obvious positive predictability of extremely low PCRs vanishes. However, PCR's positive predictive power on next-day 50ETF squared return is robust under different market conditions.

Additionally, results using another form of PCR (PCR') show no material differences in all tests above but only minor numerical differences, which can also be viewed as a form of robustness check. The results are omitted here but available upon request.

6. Conclusion

This paper investigates the predictive power of the put-call-ratio (PCR) implied by Chinese SSE 50ETF option contracts on the return of the SSE 50ETF. Using partitioned and conditional OLS regressions, relationship between the PCR and the 50ETF are estimated and tested on different time horizons. Empirical results indicate that PCR predicts the variance of the 50ETF return, rather than 50ETF return itself.

First, in most of the testing periods, we find no evidence that the PCR can unconditionally indicate any direction of the 50ETF price. This is different from documented literature. Therefore, our results indicate the possible misuse of the 50ETF-PCR towards predicting the 50ETF price. Although during the stock market crash a significant and positive correlation emerged very shortly, it is only applicable between the next-day 50ETF returns and extremely low PCRs of 50ETF options. Such a positive correlation only holds during the sharp falling period of the market crash but far from a general rule. And by detailed work on deviation partitions and time period segmentations, we find that the PCR fails to provide robust predictability on future 50ETF returns.

Second, there is a robust, significant and negative correlation between the PCR and one-step-ahead return variance of the 50ETF index (daily and monthly). This significant forecasting power is especially stronger in low PCR values and during the market crash. And it is stable and robust under other market conditions.

To conclude, this study is among the very first research on the relationship between the PCRs and the returns of 50ETF. Our results show, unlike literature on this topic targeting developed option markets, the PCR predicts the variance of 50ETF return rather than the 50ETF return itself. The optimistic sentiment of the market indicates higher variance. We fill in the blank by issue a research on the 50ETF PCR. This research points out the wide misuse of the PCRs in China while providing a correct way of using it - trade on variance.

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IMI News

- On July 6 to 7, the 2019 International Monetary Forum was held, organized by School of Finance and China Financial Policy Research Center of Renmin University, and co-organized by IMI, with the theme "High-quality Development and High-standard Financial Opening-up". The topics centered on Financial Supply-side Reform and Financial Risk Prevention, Fiscal Reform and the Two-pillar Macro-control System, Asset Management and Wealth Management Subsidiaries of Banks, Renminbi Internationalization and High-standard Financial Opening-up, and Fintech.
- On July 20, the Macro-finance Salon (No. 127) and seminar on "Viewing the Future Development of Crypto-currency from Libra" was held in Renmin University of China. This event was held by School of Finance, Renmin University of China, and organized by IMI and Banking Research Center of RUC. The seminar was hosted by Ben Shenglin, Co-director of IMI, Founder and Dean, Zhejiang University Academy of Internet Finance, and International Business School. Zhuang Yumin, Dean, School of Finance, RUC, delivered opening speech. Mu Changchun, Di Gang, Qu Qiang, Yao Yudong, Chen Daofu, Yang Tao, Du Xiaoyu, Zhao Xijun, Tan Songtao, Tu Yonghong, Wang Fang, Song Ke and other guests attended the seminar and round-table discussion.
- On July 22, the Macro-Finance Salon (No. 126) was held at Mingde Building, Renmin University of China. Wang Bin, IMI Research Fellow and Chief Macroeconomy Analyst in the Department of Investment Banking of ICBC, gave a keynote speech entitled "Building an Index Research on Real-Time Monitoring of Changes in Corporate Financing Conditions". Zhong Zhengsheng, Chairman and Chief Economist of Monita Research and Managing Director of Caixin Think Tank, along with Chen Jing, Liu Hongwei, Tian Xinming, Yao Yueyue and other IMI research fellows attended the salon and participated in the seminar. Zhang Yu, IMI Research Fellow and Chief Macro Analyst of Hua Chuang Securities chaired the meeting.
- On September 16, the Macro Finance Salon (No.128) and the launch of the new book De-dollarization: The revolt against the dollar and the rise of a new financial world order, sponsored by the IMI and the Department of Money and Finance in the School of Finance, co-sponsored by the Renmin Center For China's Foreign Strategy Study, was held in Conference Room 209 of Mingde International Building. Gal Luft and Anne Korin, co-director of the IAGS, delivered keynote speeches. Subsequently, Ding Yifan, Tu Yonghong and Xu Qinhua made comments on the keynote speeches. Zhang Lirong and Zhong Zhengsheng attended the meeting and participated in the seminar. The meeting was chaired by Di Dongsheng, associate dean of School of International Studies of Renmin University.
- On September 23, Macro-Finance Salon (No.129) was held at Renmin University. Mr. Li Xunlei, vice president of China Chief Economist Forum and chief economist of Zhongtai Securities, delivered a keynote speech titled "China Economy Outlook and Policy Choice under the Global Economic Turmoil". Participants include Chen Weidong, Guan Tao, Qu Fengjie, Song Yongming, Xue Jun, Zhang Jiqiang and Zhao Xiaoqiang. The Salon was hosted by Zhang Jie, director of IMI and professor of School of Finance, Renmin University.

- On September 29, Tao Xiang International Finance Lecture (No. 17) was successfully held in Renmin University of China. Dr. E Zhihuan, chief economist of Bank of China (Hong Kong), delivered a speech on the theme of "Internationalization and Strategic Prospect of Chinese Banks". Tu Yonghong, deputy director of IMI and Professor of School of Finance and Economics chaired the lecture. Also present were: Wang Fang, deputy director of IMI and professor of School of Finance and Song Wei, associate professor of School of Finance, etc.

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