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Introduction to the International Monetary Institute (IMI)

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

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

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Global Economy in the COVID-19 Crisis

Reflections on the Global Economy*

By STEVEN BARNETT*

Introduction

I would like to thank IMI for inviting me to speak today.

It is a pleasure for me to be here today. And, this is my first in-person event since coming to China.

On a personal note, I'm happy to be in Beijing, out of quarantine, and enjoying this beautiful Fall weather. And, I must confess, also enjoying going to malls, restaurants, and cafes.

I will make 5 points in my remarks. And, my personal experience is a segue to my first point.

A year ago, I couldn't imagine that I would be saying "happy to be out of quarantine." A personal and somewhat trivial reminder that: We are experiencing a crisis like no other. Which is my first point.

If my first point is a bit depressing, I promise I will end on a more optimistic note. My last and, I would highlight, main point is that the crisis is also an opportunity. An opportunity to build a better future for all people. An opportunity that we must seize.

Crisis like no other

Perhaps it goes without saying that the state of the global economy is not good. We are in a deep recession and experiencing a crisis like no other.

The size, breadth, and speed of the decline is extraordinary. In 2009, the world experienced the global financial crisis. It generated a historically large recession, with global growth around zero. Such low global growth is almost unheard of.

Until now. This year, we expect sharply negative growth. Our forecast published in June was for the global economy to shrink by nearly 5 percent this year.

All economies are feeling the impact. In emerging market and developing economies our June forecast was for growth this year of minus 3 percent.

China is a relative bright spot, with an emphasis on relative. It is the only major economy where we forecast growth in 2020 to be positive. Nonetheless, the economic impact of the pandemic in China has been large. Indeed, in the first half of this year growth was minus 1.6 percent.

As for advanced economies, our June forecast was for growth in 2020 of minus 8 percent.

The pandemic clearly has done enormous economic damage.

We do expect a broad-based rebound in activity next year. But, even with that, the global economy in 2021 will be substantially below the pre-crisis trend.

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*This is a speech draft by Steven Barnett at the Macro-Finance Salon (No. 157) and Seminar on World and China's Economy on September 22, 2020.

*Steven Barnett, Member of IMI International Committee, Senior Resident Representative of IMF China

Another reason this is a crisis like no other is the reason for the output decline. It is to a large extent a consequence of necessary measures to contain the virus. In other words, it is the result of policies.

This, obviously, is not the typical role of economic policy. Usually, in a downturn, we would think of governments trying to stimulate activity. Instead, this time, they were initially focused on virus containment, which required shutting down parts of the economy.

And, a final reason this is a crisis like no other relates to the significant amount of uncertainty about the outlook.

Aside from pre-existing sources of uncertainty, there is a large amount of uncertainty related to the virus. This includes:

- How long the pandemic and required lockdowns will last?
- How voluntary social distancing will affect spending?
- Whether displaced workers will be able to find new jobs, possibly in different sectors?
- How much economic scarring there will be? Scarring that could make it hard for shuttered businesses and unemployed workers to bounce back once the pandemic fades.

Policy response

My second point is that there has been an extraordinary policy response.

The public health response remains the top priority. This is needed to protect people, jobs, and economic activity. Across the world, countries have implemented exceptional measures to support individuals and workers. Going forward, all economies need to ensure that their health care systems have enough resources.

Second, supportive fiscal and monetary policies will need to continue until we can secure a safe and durable exit from the crisis. The goals include containing the economic fallout and then facilitating the recovery.

The good news is that around the world, countries have responded forcefully to the pandemic. We have seen large fiscal and financial sector measures deployed in a range of countries.

Central banks have taken strong actions. For example, in a number of countries, policy interest rates have been cut and are expected to remain at very low levels for several years. And, as one example of the extraordinary response we can look at the G10 (a group of 10 large advanced economy central banks) central banks. Their assets have increased by about US$ 6 trillion since mid-January. This is more than double the increase we saw during the two years of the global financial crisis. And, it is equivalent to about 15 percent of G10 GDP.

On the fiscal front, we have also seen a substantial response. And, since April, more than 2/3 of the countries have increased their fiscal support to deal with the economic fallout. We estimated that the announced fiscal measures globally are nearly 11 trillion US$.

On our web page (www.imf.org), we have a policy tracker that catalogues countries' policy responses.

While a lot has been done, efforts will need to continue.

Post-pandemic

Which brings me to my third point: The post-pandemic recovery. In thinking about the recovery, I will touch upon something new and something old.

Regarding the new, it is likely that the post-pandemic world will look different. Thus, a key challenge will be to pursue policies that support transformational change. Some sectors may permanently shrink, while others—such as digital services—will likely expand. Policies that facilitate the corresponding reallocation of resources will ensure that this transformational change is as smooth as possible.

Regarding the old, it is easy to forget that even pre-pandemic the global economy was facing significant challenges. These have not gone away. High on the list were, and are, goals such as: addressing climate change and fostering inclusive growth.

Another, more wonky but in my view extremely important is to boost medium-term growth. Prior to the pandemic, the global economy was struggling with a trend decline in global growth, largely reflecting declining gains in productivity. Thus, a key challenge remains the pursuit of economic reforms to boost productivity, which will be critical for ensuring continued gains in living standards.

Multilateralism

My fourth point is actually a continuation of my last argument on old challenges. But, it is so important that it gets its own point. This is the importance of multilateralism. The global scale of the crisis requires global solutions. Countries, therefore, must cooperate on multiple fronts.

One is on health. The international community needs to vastly step up efforts to support national initiatives. This includes removing trade restrictions on essential medical supplies; providing financial assistance and expertise to countries that need it; ensuring adequate funding for vaccines, so when ready, affordable doses are quickly available to all countries.

Beyond the pandemic, policymakers must cooperate to address underlying issues related to trade and technology tensions. This includes, for example, strengthening the rules-based multilateral trading system. Another area is climate change, where efforts need to be scaled up at the international level, ideally through means such as equitable carbon taxation.

Multilateral financial assistance is also necessary. We need to unite to help the poorest and most vulnerable economies, especially those struggling with high debt or dependent on hard-hit sectors. The G20's Debt Service Suspension Initiative (DSSI), for example, has been commendable. Greater private sector participation should also be strongly promoted. Beyond the DSSI, there is a need to fill gaps in the international debt architecture and think about more comprehensive debt relief for many countries.

The IMF, I would add, has moved with unprecedented speed. We have provided emergency financing to around 75 countries since the pandemic hit. We have also enhanced access limits to our emergency financing facilities and provided grant-based debt service relief to our lowest-income members.

Conclusion

My last and main pointis about the opportunity in front of us.

A common saying—sometimes attributed to Winston Churchill is: "Never let a good crisis go to waste." Of course, we never want to have a crisis. The economic, human, and social costs are too high. But, when we have one, we should use it.

So, this is my main message. "We can use the crisis as an opportunity to build a better future for all people." A message which I borrowed from Kristalina Georgieva, the Managing Director of the IMF.

In that spirit, and in conclusion, I will leave you with the hope the world uses this crisis to build a better future for all people.

Thank you.

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Minimizing the Social Cost of COVID-19*

By ANDREW SHENG AND XIAO GENG*

Efforts to turn an effective institutional response to the pandemic into a political or ideological battleground are misguided, at best. As the late Nobel laureate Ronald H. Coase showed, regardless of ideology or politics, each society must develop institutional arrangements that constrain individual freedom.

In 1960, the Nobel laureate economist Ronald H. Coase introduced the "problem of social cost": human activities often have negative externalities, so individual rights cannot be absolute. Institutions must intervene. There is no better example of this dynamic than the COVID-19 crisis.

While virtually every country has suffered as a result of the pandemic, some have done much better than others. Whereas some have reduced COVID-19 cases to near zero, others have had steadily climbing infection and death rates for months. As McKinsey & Company has noted, economic activity associated with discretionary mobility has returned to normal for the former group. Among the latter, such activity remains about 40% below the pre-pandemic level.

Not everyone is suffering equally. Low-paid workers with inferior access to medical care and less opportunity to stay home – say, because their jobs are classified as "essential" – are bearing the clinical and economic brunt of the crisis.

This puts everyone at risk. After all, even if a country contains the first wave of COVID-19 infections, it will remain vulnerable, as the virus continues to be imported from worse-performing countries. In other words, the social costs of inadequate institutional arrangements in some countries are spilling over to those with well-functioning institutions.

The first step toward addressing this problem is to identify which institutional arrangements are most effective for reducing the social costs of the COVID-19 crisis. This is not, as one might assume, just a matter of having strong institutions. The United States and the United Kingdom are institutionally robust, and both had weeks, if not months, to prepare before their outbreaks began, but both have had among the world's highest infection and mortality rates.

By contrast, East Asian countries were the first to be infected, meaning they had little, if any, time to prepare. And yet many of them are among the countries that have reduced COVID-19 cases to near zero. The difference comes down to attitudes: what role and responsibilities each society attributes to government, and to what extent it expects the community to act as a collective agent of the common good.

In the US, there is a long-standing emphasis on personal freedom. "Small government" is a commonly heard refrain, with many arguing that individuals acting as self-interested participants in markets and in social and political processes will naturally produce positive outcomes. Government intervention – even in the event of a pandemic – infringes on individual rights and, indeed, on the very meaning of being an American. Protests over shelter-in-place orders and mask mandates reflect this view.

This is very different from the prevailing mindset in East Asia. For example, many Western observers have attributed China's success in containing COVID-19 to its authoritarian regime,

*This article appeared in Project Syndicate on August 26, 2020.
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which supposedly infringed on individual freedoms, privacy, and economic efficiency in a way no democratic government ever could.

Coase's theory shows why that logic is flawed. As he explains, the market may be able to minimize social costs if all actors have full information and face near-zero transaction costs. But those conditions are unrealistic even in normal times.

During a pandemic, no individual can possibly receive comprehensive and current information on the virus. In fact, the very existence of asymptomatic carriers precludes the possibility of "full information." And, because the transaction costs of mask wearing, quarantining, testing, and contact tracing are high, making compliance a matter of individual choice will never be enough to contain the virus.

But Soviet-style centralized intervention is not feasible: agents of the state cannot observe every move every person makes and enforce every precautionary behavior at all times. And, contrary to popular belief, that is not what China has done. Instead, recognizing that fully voluntary action was inadequate, the state provided comprehensive and mandatory rules to facilitate individual and communal compliance, as well as fiscal and logistical support for implementation.

To illustrate, upon arriving in Shenzhen from Hong Kong, one of us headed to a designated hotel – equipped with medical staff conducting tests and monitoring temperatures – for a 14-day mandatory quarantine. On the way to the hotel, both the landlord and a community contact person got in touch, having been informed by the authorities to prepare for a new arrival from abroad.

From the airport to the quarantine hotel to home, every single individual – immigration officers, bus drivers, security screeners, medical personnel, and hotel staff – wore full personal protective equipment. Common areas were regularly disinfected. The state provided all needed resources.

Of course, a traveler would prefer to go home, rather than stay in a quarantine hotel for two weeks. But ostensibly high compliance costs for individuals do not outweigh the overall social costs of partial interventions. So, with institutional support and clear guidance – delivered via many channels, including social media – people have taken the necessary precautions. Responsibility for implementation has also been clearly delineated across government agencies.

The results – sharply reduced COVID-19 infections and deaths – speak for themselves. Other East Asian countries – such as Japan, Singapore, South Korea, and Vietnam – have achieved similar success, using very similar institutional approaches. In every case, the government intervened early, devised comprehensive rules and guidance, and provided the resources needed to apply relevant measures. And in every case, society was receptive to government intervention aimed at advancing the common good.

Crucially, these countries have very different cultures and political systems. Attempts to turn an effective institutional response to the pandemic into a political or ideological battleground are thus misguided, at best. The Coasian lesson is that, regardless of ideology or politics, each society must develop institutional arrangements that minimize social costs. After all, those suffering the consequences of others' decisions are unlikely to revel in their "freedom."

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Protecting Economic Muscle: Finance and the Covid Crisis*

By ALEX BRAZIER*

Introduction

I am grateful to Imane Bakkar, Alina Barnett, Kiman Bassi, Richard Button, Mai Daher, Lee Foulger, Dan Gray, Benjamin King, Philip King, Sophie Stone, Matt Waldron, and Danny Walker for their assistance in preparing these remarks.

These are immensely challenging and uncertain times for many of you. You have faced the reality of the economic numbers that hit the headlines: the precipitous fall in output, followed more recently by the beginnings of a normalisation in some sectors as public health measures have been eased.

The path followed by the economy in recent months has had more to do with epidemiology than economics. How the public health situation, and therefore the economy, evolve over the coming months and quarters remains to be seen.

The target of economic policy has been to minimise the longer-term 'scarring' of our economy's muscle; muscle that is made up of your and other businesses. The aim is to minimise the harm to our productive capacity – to allow output and employment to get as close as possible to their pre-covid paths, once public health measures are lifted fully.

Scarring could arise easily. To sustain employment and productive capacity through the virus disruption, wages, leases, interest, invoices and fixed costs need to continue to be paid even as revenues collapse. Many long-term viable businesses will face cash-flow shortfalls that, unless they can be bridged, will result in redundancies, business closures and scrapping of productive assets.

Signs of that are already evident. In scale, such upheaval could tear the muscle of the economy in a way that would be difficult to put back together. The scars could damage the economy's performance for a long time to come.[1]

To scale the issue, we identified in May that 60% of the 85,000 biggest businesses operating in the UK – businesses accounting for an estimated 75% of turnover in the economy – will face a cash-flow deficit this year if they want to maintain productive capacity.[2]

Policy measures have therefore been directed towards mitigating and financing these deficits.

On the monetary front, Bank rate has been cut to just 0.1%, and a programme of £300bn of asset purchases is underway, helping to support business cash flow by lowering the cost of servicing debts, as well as providing a stimulus to spending more broadly.

The fiscal policy response has been substantial.

The Coronavirus Job Retention Scheme, paying 80% of the wages of furloughed employees up to £2500, has helped to minimise corporate cash-flow deficits and maintain jobs. The Scheme has covered over 9m jobs and is estimated to cost £55bn.

VAT and other tax deferrals amounting to £50bn have eased immediate corporate cash flow pressures. And other business support measures costing up to £30bn have been put in place.[3]

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*This article appeared in BIS on July 23, 2020.

*Alex Brazier, Executive Director for Financial Stability Strategy and Risk, Bank of England, Member of the Financial Policy Committee

[1]See Portes (2020): The lasting scars of the Covid-19 crisis: Channels and impacts

[2]See May 2020 interim Financial Stability Report

[3]See Chancellor of the Exchequer: A Plan for Jobs 2020

Nevertheless, the scale of disruption means that, even after these powerful measures, we estimated in May that the 85,000 biggest businesses could have faced a cash-flow deficit of up to around £140bn this year if they were to preserve employment and productive capacity. And in addition, businesses will face the challenge of rolling over some £275bn of outstanding debts that are due to mature over the next year.

These businesses have buffers of cash amounting to around £90bn that can be drawn on to help meet their needs during the disruption. In the face of uncertainty they will be unwilling to draw them down completely.

So the preservation of economic muscle is reliant on raising external finance.

The monetary and fiscal policy responses have therefore been complemented with a financial response. That aims to support the financing of cash-flow deficits. It has centred on getting funding markets functioning and bank lending flowing. And as a result, progress has been made to protect economic muscle.

Financial response I: Support for market functioning

At the outset of the crisis in March, important funding markets seized up. Even the government bond market threatened to do so. The underlying cause of the seizure was not concern about the credit of the government; it was that some investors were forced, by their own circumstances, to sell their bond holdings.

Investors 'dashed for cash' as some faced calls to post cash margin against derivative positions that had moved against them and others faced challenges in rolling the repo financing of their bond holdings.[4]

The seizing of some markets was a blot on the financial system's response to the covid crisis. With international counterparts we will need to review carefully the causes of what happened with a view to ensuring markets are resilient in the future.[5]

As it was, two emergency responses were necessary. First, central banks around the world stepped in with huge purchases of government and corporate bonds to restore market functioning. In the UK, the Monetary Policy Committee is undertaking a £300bn programme of asset purchases.

Since central banks acted, markets have opened up again, allowing companies to raise finance. Britain's companies issued more than £7bn of new bonds since March.

A second response was also needed. The seizure of corporate debt markets meant that larger companies that normally enjoy market access were suddenly faced with uncertainty about access to that finance when it was most needed. They turned, as a precaution, to banks to bolster their cash positions.

What followed was not a run on the banks driven by fear about the banks, but a run to the banks driven by fear on the part of businesses about their own access to finance. In a complete contrast to what happened in the 2008 financial crisis, bank lending shot up. Net of repayments, banks lent £30bn in March – more than 30 times their normal monthly net lending flow as large companies drew on committed credit lines.

That threatened to overwhelm the capacity banks have to lend to the wider population of businesses.

The Covid Corporate Financing Facility (CCFF), owned by the Treasury and operated by the Bank of England, was designed to alleviate that pressure. By purchasing commercial paper, it offers to provide short-term loans – loans that will need to be paid back – to companies of investment grade standing before the virus disruption.

[4]See speech by Jon Cunliffe (2020): Financial System Resilience: Lessons from a real stress
[5]See letter from FSB Chair Randal Quarles to G20 Finance Ministers and Central Bank Governors: July 2020

It provides an alternative – backstop – source of finance for larger companies in the event that markets are disrupted. The Scheme has lent £19bn to 68 companies. More importantly, it has also authorised borrowing limits amounting to £80bn to 199 companies accounting for nearly 2.3 million jobs.

The knowledge that this backstop to funding markets is there removes the need for larger companies to run to the banks to insure themselves against market disruption. By standing ready to lend to larger companies, we have protected the space banks have to lend to the wider population of companies.

Financial Response II: Support for bank lending

The package of measures to support bank lending has gone much further than just protecting their capacity to lend.

Banks have been given the funding for new lending. The Term Funding Scheme with additional incentives for SMEs (TFSME), provides 4 year funding for banks, at rates very close to Bank Rate, to match any increase in lending. The scheme provides additional incentives for lending to small and medium sized businesses, with £5 of cheap funding for every £1 increase in such lending.

Crucially, the Government has provided banks with guarantees on new lending. The Coronavirus Business Interruption Loan Schemes guarantee 80% of new lending by banks. The Bounce Back Loan Scheme guarantees 100% of loans of up to £50,000 to small businesses. Banks are taking little risk with their own funds when they lend now.

With the space to lend, the funding to lend, and the credit guarantees to lend, banks have every assistance to help businesses finance cash-flow deficits. And unlike in the financial crisis, the banking system has the strength to lean into this crisis, to refinance existing loans and meet the demand for new ones.

Banks will face losses in coming months on loans made in the past as some businesses and households struggle to meet repayments. Due to the reforms of the past decade, banks have the buffers of their own shareholders' capital to absorb those losses on existing loans without cutting back on support for new lending.[6]

The final element of the support for bank lending has been to allow banks to use their buffers of capital without fear of regulatory actions. Buffers of capital are there to be used in stress to absorb losses while continuing to lend. We expect them to be used as needed.[7]

In fact, with government guarantees and funding in place, the prudent thing for banks – collectively – to do is lend. Failure to help the corporate sector finance its cash-flow deficit will result business failures and unemployment that create greater losses for banks on their existing loans. Those losses could far outweigh the small gains they might enjoy from protecting their balance sheets in the short run.[8]

So lend they have. Businesses have now raised – net of repayments – more than £50bn from banks since February.

More than £30bn of new lending has occurred through the 100% government guaranteed Bounce Back Loan Scheme. These 1 million loans are vital for many of the smallest businesses to bridge the disruption. But they do not help to finance the cash-flow deficit of medium and large sized companies that I described earlier.

[6]See May 2020 interim Financial Stability Report

[7]On 11 March, the FPC reduced the UK countercyclical capital buffer rate to 0% with immediate effect, and set out its expectation that it would maintain this rate for at least 12 months. Further to this, in the Q&A on the use of liquidity and capital buffers, the PRA set out its general expectation that any required rebuild of capital buffers would be gradual, and that banks would not be expected to restore their capital buffers in full until a significant time after the end of the current stress.

[8]See May 2020 interim Financial Stability Report

Banks have lent £25bn to these companies, net of repayments. Within that, there has been £12bn of lending approved through 55,000 loans under the CBILS scheme; a further £2.9bn through 428 loans under the CLBILS scheme.

Add to that at least £7bn of new bond issuance and £19bn lent through the CCFF and these companies have raised at least £50bn of new debt.

The financial system is well on the way to filing the financing needs of businesses.

By no means all the additional finance to preserve productive capacity has yet been delivered, particularly given the limited appetite many businesses may have to run down their cash buffers in the face of uncertainty.

Fuel must continue to be injected. And the fuel may need something extra to be added. That additive is equity.

The case for equity

There are at least three reasons for adding more equity finance to the mix.

First, half of the cash-flow deficit we have identified is accounted for by companies with net debt already more than four times their regular earnings.

Although the UK's corporate sector did not, as a whole, go into this crisis with a stretched balance sheet, a material subset of companies had levered up.

Rapid growth of leveraged lending – typically loans to non-investment grade firms that are highly indebted or are owned by a private equity sponsor – meant the share of debt owed by companies with debt more than 4 times their regular cash flow had increased from less than a quarter to more than a third.

These companies won't have much cash and will find it harder to raise new debt finance.

In effect, the economy entered this crisis with a weakness that may make it more prone to scarring.

The UK is by no means an outlier in this regard. In the United States, growth of leveraged lending was almost twice of that in the UK in recent years. The Federal Reserve has noted how this weakness in corporate balance sheets is likely to amplify the adverse effects of the virus disruption.[9]

There will be lessons to learn. We had warned about this since 2017 and ensured banks doing the lending could withstand the losses. When this is over and we can step back, we – and other central banks – will need to return to the question of whether unconstrained growth of corporate leverage in the good times puts the wider economy at greater risk of harm in the bad and, if so, whether measures are called for to limit the growth of corporate leverage.

From where they are today, these highly indebted companies may find equity to be the only – if any – source of finance to minimise the damage to their productive capacity.

This leads to the second motivation for equity.

Some of these companies may struggle. As will others who were already being challenged by underlying structural shifts in the economy, some of which have probably been accelerated in recent months.

A fifth of the companies facing cash-flow deficits had poor profit performance even before the virus disruption. It would always be tough for companies in that position to raise new finance to withstand the disruption.

These issues – debt and structural change – mean some companies will be forced to make cuts and some may fail or close. The number of paid employees has fallen by around 700,000 since

[9]See May 2020 Federal Reserve Financial Stability Report

February[10]. And we have seen announcements of plans for over 100,000 redundancies. Unemployment and business insolvencies will rise.

If we are to limit the extent of economic scarring, new muscle must be created to replace that which is lost. Businesses must be born and be able to grow, to seize new opportunities, create new productive capacity and new opportunities for employment. And that will require new equity.

The third motivation for more equity is that some companies who can bridge the virus disruption effectively with more debt could then consider their balance sheets overstretched.

During the crisis, debt is the natural – fastest – way to raise finance for most companies. That's why so much support has been provided to allow it to be raised. But it could leave an overhang.

That overhang won't be one that, at current interest rates, presents an acute problem. The share of companies with interest payments taking up a material fraction of revenues is likely to remain low.

But it could create a chronic issue for the economy in the longer term. Greater leverage could damage companies' ability to refinance and access new capital when dealing with future stresses. Government-guaranteed loans may need to be refinanced at higher rates in future.

Looking ahead to these possibilities, many prudent companies will want to repair their balance sheets, holding back on employment and investment to work the overhang off through time.

With enough companies in that position, what makes sense individually could be harmful collectively; it could drag future growth. So it is essential to give companies every means to repair and restructure balance sheets by issuing equity to repay debt.

With these three important motivations, the good news is that equity issuance is already strong. More public equity has been issued so far this year than at the same point in any year in the past decade.

But that issuance has all been by listed companies. On our estimates, the vast majority of the possible equity needed will be for companies not listed on a stock exchange.

And so the challenge is to give a wide range of businesses every opportunity to access growth capital. That's capital willing to invest in assets – like unlisted equity – that can't easily be traded and doesn't deliver a quick or stable return.

Unlocking more growth capital

Unlocking more growth capital is not a new challenge. Three years ago, the Treasury launched a review of what it called Patient Capital. Since then, many changes have been made.

The Pensions Regulator has clarified its guidance to funds. New funds, including British Patient Capital (a subsidiary of the British Business Bank), were established. And the Financial Conduct Authority now permits retail investors greater access to funds invested in illiquid assets.

There is more to do. And the need for more equity finance to minimise the scarring to the economy now creates a case for ambition. A range of authorities have a role to play.

Lots of attention tends to be given to schemes and ideas involving public money and the taxation of equity relative to debt. Those issues are for the Treasury and wider Government.[11]

Regulators have a role to remove distortions that discourage private investment in growth capital.

The Financial Conduct Authority is reviewing whether some of its rules set out in relevant Directives and Regulations could inhibit opportunities for equity issuers and investors.[12]

[10]Source: Office for National Statistics

[11]For example, The CityUK suggests the government could convert certain loans that SMEs are struggling to repay and which it has guaranteed into tax liabilities or other instruments that would be paid down only when companies had the resources to do so.

[12]See speech by Christopher Woolard (2020): The role of investment managers in the post Covid-19 recovery

And the Bank of England's Financial Policy Committee has been asked by the Government to examine whether there are changes to financial regulation that can improve the supply of growth capital.[13]

Banking regulation will not be where we focus. Banks, with their short-term fixed value liabilities – deposits – are not suited to investing in equity, and least of all equity from unlisted companies that isn't easily traded.

Financial institutions with longer-term liabilities – insurance companies and pension funds – are the natural investors in growth capital. They can absorb changes in its value without wider harm and nor do they need to rely on being able to trade out of their positions quickly.

But the shares of assets allocated to growth capital assets like unlisted equity can be small. UK insurance companies and pension funds together allocate only around 3% of their assets to unlisted equity. The collective investment funds, in which they and others invest, allocate only 2%.

There seem to be biases in the system. Even investors who should have the longest horizons seem to have a fetish for liquidity and an aversion to really illiquid growth capital assets.

Getting to the bottom of this should be the focus of our efforts.

Consider the £1.4 trillion of assets in UK investment funds. The mass of these – just over 85% by assets – are open ended[14], offering investors the opportunity to redeem their holding for cash each day by selling a slice of the funds' assets. Because they offer this, these funds aren't suited to investing in highly illiquid growth capital.

The alternative closed end fund structures issue a fixed number of shares, which can be listed on a stock exchange. Because investors 'redeem' by selling their share to another in the secondary market (and typically at a discount), the assets held in the fund do not need to be traded.

These funds are therefore more able to invest in truly illiquid growth capital. So it is no surprise that a bigger proportion of their assets is allocated to assets like unlisted equity. But these funds are much smaller.

An investor bias towards open-ended funds arises in part because some seem to offer the irresistible, but inconsistent, combination of a return from holding less liquid assets – like property and corporate credit – and at the same time the opportunity to redeem daily at little cost.

A liquid investment with illiquid returns: what's not to like?

Closed ended funds (and open ended funds with long notice periods) might be able to invest in truly illiquid growth capital and offer an even higher return. But not enough to compensate for the appropriate lack of a quick redemption offering.

The inconsistency in some open ended funds makes them look unduly attractive. Until of course the inconsistency is exposed, when investors rush for the exits and it hits the headlines.[15]

This had been the focus of a joint Bank of England-Financial Conduct Authority Review before the virus disruption. The need to meet a potential demand for new equity issuance makes that review now all the more urgent and important.

We had already concluded that open ended funds should align their redemption terms with the liquidity of their assets. Funds investing in less liquid assets should extend their notice periods or ensure redeeming investors receive only a 'quick sale' price for their share of the funds assets.[16]

The FCA has announced that it will "look to consult later this summer on finding a way in which funds could safely transition to a structure in which liquidity promises to investors are better aligned with the liquidity of fund assets".[17]

Properly and consistently implemented, changes like this will help to level the playing field.

[13]See Letter from the Chancellor of the Exchequer to the Governor of the Bank of England: Financial Policy Committee remit: Budget 2020
[14]Source: Association of Investment Companies, The Investment Association, and Bank calculations
[15]See December 2019 Financial Stability Report , and speech by Alex Brazier (2019): Stability, Agility, Opportunity
[16]See December 2019 Financial Stability Report
[17]See speech by Christopher Woolard (2020): The role of investment managers in the post Covid-19 recovery

With this would come the opportunity for both closed end funds and for open ended funds offering a longer redemption notice period to attract more investment. And that would open up the possibility of greater investment in growth capital.

The fund industry – through the Investment Association – has been working on a proposal for a Long-term Asset Fund (LTAF). Properly designed, such an open ended structure could in principle allow investment in truly illiquid assets. I look forward to seeing the next stage of their proposals soon.

If we can remove the current bias against the growth of closed ended and long-term asset funds, new opportunities for issuers and investors can be created. This won't a silver bullet – investment funds may face other obstacles to investing in unlisted equity and the needs of unlisted companies will vary depending on their current ownership structure and size. But it would certainly be a step in the right direction.

To reinforce it, we will also need to examine whether there are obstacles to insurance companies and pension funds making investments in unlisted equity, whether that's directly or through funds structures of the sort I described.

On the insurance side, there is little case for compromising on the resilience of insurance companies and protection of their policyholders. But we need to examine whether, within that level of safety, regulations strike the right balance in encouraging asset allocations to equity. The upcoming review – announced by the Chancellor – of certain Solvency II regulations may be a good opportunity to look at that issue. The Government expects to publish a Call for Evidence in the Autumn.[18]

On the pension side, it is notable that funds typically offer a daily price of their assets. That is not a requirement on funds but is a material hurdle to one fund breaking from the pack to make longer-term investments that cannot be priced daily. That hurdle has been highlighted by multiple industry bodies.[19] We will need to consider how this convention could be overturned.

Conclusion

These details of the financial system may seem academic when many businesses and families are struggling to cope, grappling with uncertainty and worrying about the future.

But finance is needed now to help you – the muscle of the economy – to finance cash-flow deficits to preserve employment and productive capacity.

While the financial system has been given every assistance to meet the needs of the wider economy and has made a good start, it needs to do even more if scarring of the economy is to be minimised.

And more equity will be needed: to help some companies through the disruption; to build new economic muscle to grow to replace that which is lost, and to help others restructure once the disruption is over and avoid the burden of debt hanging over investment and employment.

The pools of capital managed by our insurance companies, pension and investment funds are huge. When combined their assets amount to £5.2 trillion[20]. If just 1% more of that pool was allocated to unlisted equity, demand for £50bn of new issuance could be created.

[18]See Written Ministerial Update: Financial Services Update

[19]For example, see Investment Association: Putting investment at the heart of DC pensions, Law Commission: Pension Funds and Social Investment Summary and DC Investment Forum: Barriers to Innovation in DC

[20]Source: Investment Company Institute, Association of Investment Companies, ONS and Bank calculations

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Crisis Highlights Need for Banking Union*

By MARGARITA DELGADO*

The declaration by the French Foreign Minister Robert Schuman which kick-started the European project was commemorated on 9 May. Its 70th anniversary was celebrated in incongruous fashion, with people isolated in their homes because of Covid-19.

The health crisis has ravaged our economies, and above all, has had a dire human cost. Institutions are dependent) on in this uncertain environment to bring stability and support. Governments, regulators and the European Union have responded to this call. The European Central Bank has taken decisive action to help companies and people. The EU recovery fund demonstrates the European commitment towards citizens and businesses.

Crises have helped shape the European project. The banking union, the latest addition to the project, was created to address flaws in the design of the euro, revealed by the sovereign debt crisis, which threatened to break the single currency. Five years after its creation, the banking union has successfully safeguarded the euro's integrity but it has not been able to produce a truly integrated banking sector. The crisis has highlighted the importance of this second objective, yet some things stand in its way.

A fully-fledged banking union requires institutional change. It still lacks one of its three fundamental pillars, the European deposit insurance scheme. This would contribute to increased stability in times of stress. The banking union will not be a single financial system until a euro deposited in any institution has the same backing, regardless of the home country of the bank. The EDIS is necessary for this.

There are other hurdles that need to be overcome to reap the economic benefits of increased cross-border banking activities. First, cultural, institutional and regulatory obstacles perpetuate the ring-fencing of national banks, restricting or preventing the free movement of capital and liquidity across the euro area. It doesn't make sense that national governments remain liable for the losses of a failing bank, while the responsibility for supervision falls on pan-European institutions.

Second, the lack of harmonised regulation perpetuates an unlevel playing field. Banking regulation is common across the EU, but there are other rules that are critical in establishing a sufficiently uniform legal basis, in particular those covering the prevention of money laundering, fit and proper supervision, and bank insolvency. Third, to ease integration of the sector, supervisory expectations, which are key in assessing the business case of a hypothetical merger, need to be communicated more clearly.

The completion of the banking union and the implementation of the related capital markets union would enhance private risk-sharing channels across Europe, helping European companies and citizens overcome current and future crises.

Confronted with previous upheaval, Europe has always delivered and it will do so again. Robert Schuman's words 70 years ago remain pertinent today: 'Europe will not be made all at once, or according to a single plan. It will be built through concrete achievements which first create a de facto solidarity.'

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*This article appeared in OMFIF Commentary on August 14, 2020.
*Margarita Delgado, Deputy Governor of the Banco de España

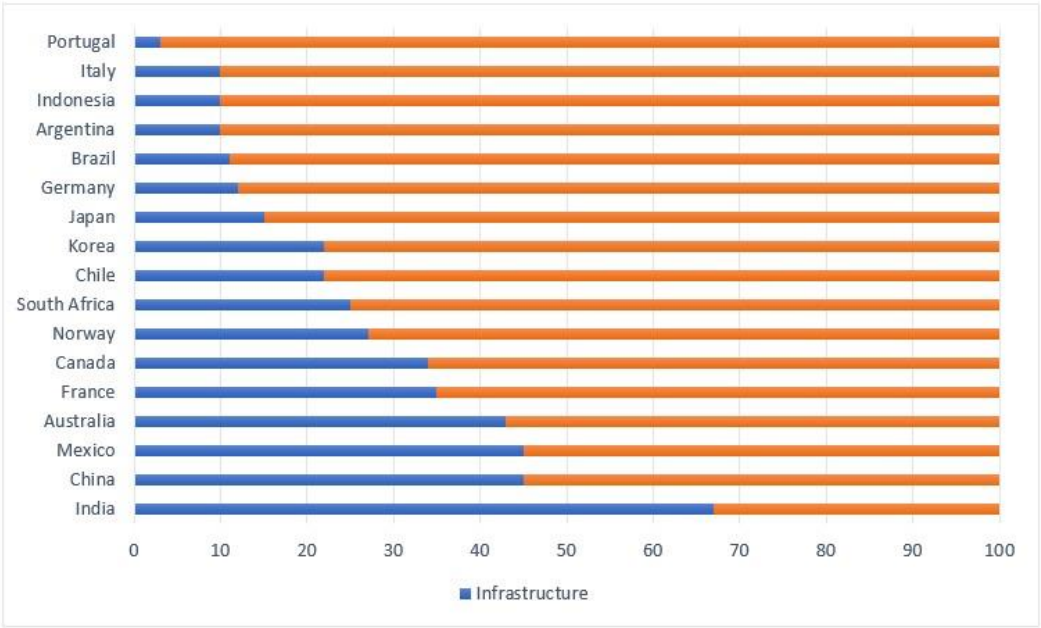
IMI International Monetary Review

Addressing Crisis Through Infrastructure*

By VIVIEN FOSTER*

Fiscal policy plays a major role in counteracting recession when monetary policy hits the zero-bound and the worst-hit sectors are not interest-sensitive. Infrastructure stimulus generally creates larger economic benefits, because it not only puts people to work, but also creates durable assets that can help boost long-term growth. Infrastructure investments formed a significant component of stimulus programmes following the 2008 financial crisis (see figure). This type of investment is frequently cited as a necessary element of Covid-19 recovery packages.

Infrastructure spending as a % of total stimulus packages, 2009



Source: IILS and OECD

Much discussion on infrastructure stimulus centres on the size of the 'multiplier', that is whether government spending crowds in or out private sector investment and consumption. The efficacy of infrastructure investments depends crucially on where and how these programmes are implemented.

Macroeconomic conditions determine a stimulus package's effectiveness. Infrastructure stimulus is more likely to succeed in a more closed economy, with a fixed exchange rate regime. It requires loose monetary policy, so that fiscal expansion is not offset by a reduction in net exports, exchange rate appreciation or monetary tightening.

Initial fiscal conditions matter. Countries can respond to crisis more aggressively if enough fiscal space exists before the upheaval. When initial conditions are healthy, fiscal expansion is less

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likely to endanger debt sustainability and hamper growth in the long term. When taxes are distortionary, debt-financed spending will be more effective in boosting employment and output than spending that is paid with higher current tax (see table).

Conditions affecting the effectiveness of infrastructure stimulus

Conditions	More effective	Less effective
Macro-economic conditions		
Exchange rate regime	Fixed exchange rate	Floating exchange rate
Openness to trade	Less open economy	More open economy
Public indebtedness	Low levels of public debt	High levels of public debt
Monetary regime	More accommodative	Less accommodative
Financing mechanism	Debt-financed investment	Tax-financed investment
Infrastructure characteristics		
Project appraisal process	Based on good governance	Based on weak governance
Timeliness of infrastructure	Shovel-ready projects	Projects with long lead time
Nature of infrastructure	Aligns with policy objectives	Misaligned with policy objectives
Level of decision-making	Coordinated decision-making	Multi-level jurisdiction

Source: World Bank

At the project level, the specific choice of infrastructure investments will have a major impact on its efficacy.

Infrastructure projects must be carefully appraised to ensure high economic returns and enhance growth. Whether or not the right projects will be selected depends on the quality of infrastructure governance arrangements that the country has in place. Well-chosen projects that target binding growth constraints should, in principle, contribute more to GDP than they do to indebtedness.

Projects need to be 'shovel ready' soon after the stimulus package is launched. Large infrastructure projects typically have significant construction lead times. They are usually not suitable for fiscal stimulus, because their construction impact may be too late to affect the recovery. Attention should focus on smaller-scale, less complicated projects, or those that are already underway and could be accelerated.

Initiatives must enhance the specific policy objectives of the fiscal stimulus package. Governments often pursue a variety of policy objectives through fiscal stimulus, including long-term growth, short-term employment, and wider social goals such as decarbonisation. In many cases, trade-offs will arise.

If the over-riding goal is long-term growth, then large projects such as dams, transport corridors, or fibre optic networks may be most relevant. For short-term employment impact, building efficiency retrofits and road maintenance are the more promising, because they require a low-level of labour specialisation and are geographically dispersed. Rural road maintenance projects could generate 200,000-500,000 annualised direct jobs for every $1bn spent in Latin America. As in the aftermath of the 2008 financial crisis, many countries are seeking to pursue a green recovery, for example by focusing on the development of renewable energy generation.

Infrastructure projects need to be coordinated across different levels of government to ensure that actions are mutually reinforcing. In countries with federalist systems, there is the risk that federal spending might push down state spending. Better coordination between central and local governments and an emphasis on localised decision-making could help avoid such an unproductive dynamic.

Infrastructure projects could form an important part of fiscal stimulus, particularly when macroeconomic conditions are supportive. But not all initiatives will be equally effective. Governments need to be smart about identifying high-quality projects that can meet policy goals.

These are important lessons to bear in mind as countries reach for stimulus packages to support the Covid recovery.

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China

Self-Reliance and Dual Circulation Applied to Finance

By HERBERT POENISCH*

This concept from the Mao era has been revived recently in view of the rising protectionism round the world, notably the USA and China. In China this has been supplemented by the 'dual circulation' theory. One circulation is the domestic one, the other the international one. In finance these circles have been largely separated by capital controls.

The present political tussle between the USA and China might spill over from trade to finance. China is preparing to beef up its own RMB based trade and finance infrastructure. It has become intimately linked within the present global financial network. This makes it very difficult to extricate itself in the short run and might lead to losses during the process.

This essay will outline the necessary steps which need to be taken in order to speed up the process and to minimise any fallout from possible US sanctions in the financial sphere. After general remarks which highlight the differences between the present global financial infrastructure and a possible Chinese replacement, the various areas where China needs to strengthen itself will be spelled out. These are enhanced internationalisation of RMB, greater utilisation of the China Interbank Payment System (CIPS) and cross-border usage of the Central Bank Digital Currency (CBDC). While each one can be advanced separately, there are substantial synergies and links.

1. General remarks

The present financial infrastructure based on USD has developed over the past 70 years and has reached global coverage, moving trillions of USD daily. As it is the global currency it not only serves to pay for goods, services and financial flows but also as a store of value for financials, non financials as well as individuals around the world. This infrastructure makes up a global intricate network of financial transactions which cannot be replicated in the short run. In addition, the US benign approach is different from China which attaches great importance to controlling the process. Finally, capital flows in USD are liberalised and thus a favourite tool for global savers and investors. The US has traditionally not paid any attention to USD held by foreigners, neither in cash as part of M0 nor as part of bank deposits in the wider monetary aggregates.

Worries about the impact of the Eurodollar market on US inflation were put aside already in the 1970s resulting in a benign FED policy. An unregulated Eurodollar market allows non US residents to trade in USD as well as obtain credit and issue securities. Some of the transactions are with US residents, either allowing non US residents to lend to the US as well as US residents to lend to outsiders. The result is a multilateral finance network as described by the BIS in a recent paper on USD funding.

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While it is hypothetical to speculate what US financial sanctions might look like, barring Chinese banks from USD funding would be such a measure as well as forbidding US banks to lend to and settle with Chinese banks. At present, the PBOC does not have access to FED swap arrangements and Chinese banks in the US do not borrow in the US federal funds market although they would be eligible. They rather fund themselves in the offshore USD, first and foremost in Hong Kong. The US could target this particular channel.

To meet these challenges, China has already set up a number of financial infrastructure elements which can be activated and expanded in the short run.

Judging by the contours which emerge of an RMB zone financial infrastructure, it will most likely be a hub and spokes model, with China in the middle and the various partners at the end of the spokes, with only minimal financial flows between them. There is also an emphasis on goods and services with financial flows severely restricted due to lack of financial hedging instruments as well as capital controls in place for the foreseeable future. Savers and investors will participate in Chinese financial markets but not likely in those of partner countries using RMB. In addition, offshore RMB business between non Chinese entities has not really taken off as it is still dominated by Chinese entities and intervention by Chinese authorities.

Given these preconditions a modest beginning with limited targets should be the most likely choice. Looking at the possible partners, the main trading partners such as Russia, Australia, Iran and other raw material suppliers should make it a priority to denominate and settle their trade with China in RMB. If the trade is not balanced, mechanisms have to found to supply or absorb the bilateral imbalances. A bilateral clearing mechanism for surplus and debtor countries would be very cumbersome reminding of the payment and settlement system after WW2, the European Payments Union (EPU).

A more elegant solution would be a multilateral system, where surpluses in RMB get invested either in official RMB reserves or offshore RMB lending and deficits in RMB are automatically supplied. Bilateral imbalances are bound to arise and the whole external clearing system in RMB has had imbalances over the past few years, first in favour of China's partners and lately of China. The first has led to a build-up up of RMB reserves by foreigners and the second one has led to a reverse flow of RMB to China. In the absence of a market clearing through financial flows between third parties, this would put a heavy strain on the Peoples Bank of China, ultimately affecting their monetary policy.

There is no technological solution to the underlying economics, some countries being net creditors and others net debtors. Building the internationalisation of RMB on the Belt and Road Strategy as has been suggested is very problematic. Most of China's partner countries would run an external deficit with China and have to receive the RMB through either overdrafts, loans or swap arrangements. In the first case this would be like the Eurozone, with weaker economies running up debt through the TARGET system. This would be a drain on the Chinese money supply. In the second case, activating the swap agreements, China would be duplicating the IMF. In order to avoid this, the PBOC and its investment subsidiaries such as SAFE and CIC would invest the B&R currencies, like Cambodian Riel, Sri Lankan Rupee, Kazakh Tenge and may others.

If the system were to be run on solid trading partners, such as Australia, Korea, Russia and Iran more or less balanced bilateral and multilateral accounts would not compromise Chinese monetary policy. This would address the main concern, ie to get away from USD clearing for core Chinese imports. However, it would be a logical step and politically imperative to include the Belt and Road partner countries in an RMB zone.

2. Internationalisation of RMB

The process was introduced officially in 2009, has expanded rapidly until 2015 but largely

stalled since then. For RMB to serve as internationally accepted currency it has to fulfil three basic functions, denomination, settlement and store of value. The share of RMB in the SDR at close to 11% could serve as benchmark. This should not only apply to trading partners of China but also to third parties.

Regarding the first function, unit of account, a wide ranging infrastructure has already been set up, such as the RMB commodities futures (including crude oil, iron ore, rubber), the RMB gold futures but market activity has been modest. Countries such as Russia and Australia have started to denominate their raw material exports to China in RMB. Anecdotal evidence suggests that this process has not been widespread among the Belt and Road countries.

Regarding the second function, the PBOC 2019 RMB Internationalisation report and the IMI report a general upward trend in RMB settlements. However, other sources, such as SWIFT do not support this upward trend, reporting a share lower than 2% of global payments again. This might be due to some RMB transactions not passing through the SWIFT network.

While settlement in the current account has increased only modestly to RMB 6tr (USD 900bn) in 2019, capital account transactions made up the lion share amounting close to RMB 14tr (USD 2tr). For the whole year settlement in RMB advanced rapidly since the stagnation in 2016 and 2017. The main component is securities settlement making up 70% of the total RMB settlement. Settlement in RMB between China and neighbouring countries amounted to 18.5% of the total. Direct trade is conducted in RMB and partner currencies, such as MYR, KZT, SGD but also Cambodian Riel. RMB settlement between China and the Belt and Road countries made up 13.9% of the total. Outward direct investment in RMB decreased in 2019 which is surprising given the importance of B&R projects. This is explained by the predominance of USD financing in B&R projects.

Regarding the third function, store of value the picture is mixed. Official holdings of RMB is still less than 2% of total foreign exchange reserves as reported by the IMF, with the exception of Russia with 14%. However, private holdings of RMB instruments such as China Government securities and stocks have increased markedly by 50% with a net inflow of RMB 622bn (USD 90bn) in 2019. Foreign holdings of RMB financial assets increased by 30% to RMB 6.41tr (USD 900bn). However, they still make up only a small share of 7% of the Chinese Government Bond Market and 2.5% of the Chinese stock market.

Trading in foreign exchange markets, according to the 2019 BIS triennial forex survey, the RMB share of 4% was unchanged compared to the 2016 survey. Spot transactions of 34% are supplemented by swaps of 48% and forwards, highlighting the increasing role of RMB for financial transactions.

3. China Interbank Payment System

The CIPS is a RTGS linked to the CNAPS high value payment system and indirectly to China's monetary policy. There are now 33 direct participants and 968 indirect members, including foreign banks' Chinese affiliates. CIPS still uses the SWIFT messaging system and clearing and settlements through traditional correspondents' accounts. The volume of transactions is still very small, amounting to USD 5tr in 2019, compared to USD 120tr through SWIFT.

Political declarations to beef up the CIPS system and to replace the SWIFT codes with China generated codes and blockchain have been voiced in the Global Times among others. China has gained wide experience using advanced technology in its domestic payment system. However, there is no viable solution for cross-border payments in sight. As there is no trusted cross-border institution, there are 3 alternatives: trust in any centralised institution, trust in multiple intermediaries, like the correspondent accounts or trust in DLT solution, such as the Hash Time-Locked Contracts (HTLC). For solving this problem, technology will only be tangential compared

with the basic need for trust.

The present global system rests on two pillars, through internal clearing at global banks and the shrinking network of correspondents accounts. The credit risk has been reduced as only the prime international banks have access to the major clearing and settlements in USD such as FedWire and CHIPS. The liquidity risk is reduced by linking the payment system to the FED's monetary policy. The Herstatt risk has been reduced by the creation of the Continuous Linked Settlement Bank (CLS). The suboptimal system has operated smoothly during the GFC and the recent health crisis. It has processed smoothly the 10bn SWIFT messages amounting to a total of some 120tr USD in 2019. Reforming the inefficient cross-border clearing and payments is on top of the G20 agenda in 2020, according to the Financial Stability Board (FSB).

According to the April 2020 FSB report frictions in cross-border settlement occur due to fragmented data standards and lack of interoperability, different compliance requirements, data protection laws, outdated technology platforms, liquidity requirements in different currencies among others. The subsequent report on technological requirements by the Committee on Payments and Market Infrastructure (CPMI) spells out the technical solutions to meet the challenges of the cross-border payment system. A new payment infrastructure and arrangements is only one of the focus areas. The others are a joint public and private sector vision, regulatory and supervisory concerns, data quality and straight through processing as well as the existing infrastructure. The PBOC declared that it will cooperate with the FSB and CPMI to advance it cross-border payments plans.

Few countries have advanced their research into a new cross-border settlement system using digital central banks currencies. The first practical project on linking domestic digital currencies cross-border is the BOC-BOE-MAS initiative which resulted in the JASPER-UBIN design project on Enhancing cross-border settlement using DLT, driven by MAS and BOC. There are as yet few indications of what China might do with its CBDC for cross-border settlements. Therefore, a new RMB payment and settlement system for the foreseeable future might look as follows.

If China were to set up a new infrastructure and arrangements, there would need to be two steps. Replacing SWIFT codes is only the first step. The second one will be a new cross-border settlement system but not a cross-currency settlement system. The present Chinese cross-border settlement system in RMB is based on major Chinese banks (which can be called trusted intermediaries). They clear in house or amongst each other for cross-border settlement. They are the ones who perform RMB clearing and supply liquidity in the various offshore RMB clearing centres, such as Hong Kong, Singapore, Taiwan, London. Foreign banks join through traditional correspondent accounts. In addition, a similar bilateral clearing mechanism is in place in 8 neighbouring countries, such as Cambodia, Laos, Kazakhstan and Russia. This forms a network of bilateral settlements where the Chinese banks manage liquidity and credit risk. The currency of settlement is RMB, thus no need to include a foreign exchange market in the settlement process.

An enhanced role of the CIPS would not change the basic design, except for Chinese codes and application of DLT and blockchain for payment messages. China is committed to applying ISO 20022 as it is a member of ISO. This will enable through processing between indirect participants. The clearing will have to take place between members of the CIPS. The major risks such as credit and liquidity risks as well as Herstatt risk will be borne by the major Chinese banks. The clients will have to manage their foreign exchange risk as the system operates in RMB. For example Russian VTB receives RMB for oil exports to China. It will have to change these RMB for RUB to credit the Russian exporter. In B&R cases an importer will have to exchange local currency for RMB which will be cleared through CIPS.

Although operating hours have been extended to 8pm, this would cover the B&R countries in Asia, MENA as well as Africa but not the American continent. As China is active in Latin America

and Brazil a member of BRICS, time zones might give rise to risks. Opening an RMB clearing centre there would reduce the Herstatt risk.

4. Extension of the China Central Bank Digital Currency (CCBDC)

While the introduction of the domestic CCBDC which is expected in 2022 has been hailed as a major step towards replacing the international importance of the USD it is not quite clear how. As was indicated in China's contribution to the BIS paper 880 as well as the G30 paper, foreigners might be given access to e-RMB during their stay in China.

What bodes well for the domestic CCBDC such as offering a public payment infrastructure in addition to the duopoly of Alipay and WeChatpay, offering a retail CCBDC to replace M0 and possibly M1, installing a two tier structure through the banking system and applying controlled anonymity does not address cross border issues. China can enhance the role of the PBOC as trusted intermediary in an RMB zone. The PBOC would extend its CCBDC to partner countries, thus giving foreigners access to PBOC liabilities.

First of all a retail CBDC would not be suitable, but rather a wholesale CBDC. Secondly, regarding the payment system, the foreign member banks of CIPS need to be eligible to receive and trade in CCBDC. As countries are in different stages of development of CBDC, unlike the Jasper-Ubin project, the interoperability between countries' payment systems is a major obstacle. Thirdly, the present centralised system could be supplemented by a DLT system among the participating banks, Chinese and foreign. Finally, data protection and anonymity might differ from the Chinese practice.

The wholesale CBDC would be extended either by the PBOC or Chinese banks to the foreign member banks of the CIPS. While the credit risk of direct trading partners' major banks are well under control, adding another tier of indirect member banks from the B&R countries would make the system vulnerable to risk linked to through processing.

In order to provide enough CCBDC liquidity for the CIPS to run smoothly, the major Chinese banks would have to address the liquidity risk as they do now. CCBDC will be earned by foreign participants eg though exports to China or will have to be loaned to participants. Banks of partner countries could receive CCBDC liquidity from their respective central banks. These in turn could enter into swap agreements with the PBOC offering their local currencies in return. In the end, an RMB based system would be just like EU TARGET, where the weaker members run overdrafts which are a drain on the Euro area monetary policy. Disciplining countries in the RMB zone will be far more difficult than the formidable obstacles to doing so in the Eurozone.

Finally, the controllable anonymity applied in China might not be accepted by banks from partner countries. If DLT and blockchain technologies will be universally applied this might require more disclosure of banks' financial data than they might like. However, China could apply pressure to accept this disclosure for the privilege to participate in the RMB zone clearing.

Conclusions

While replicating the present USD clearing system will not be possible in short to medium term, Chinese authorities are well advised to enhance the pillars of the present RMB cross-border settlement system. This requires a greater use of RMB in denominating trade, investment and store of value. Secondly, the CIPS needs to be upgraded to clear the increasing volume of transactions which might be barred from USD clearing systems. Replacing the SWIFT codes is only a first step, and utilising advanced Chinese technology a second element in this process. There are many more issues to be addressed. Finally, a Chinese central bank digital currency can be used for cross-border payments but many related challenges have to be addressed and clarified first.

In the end, the technical advanced domestic circulation of finance might be applied to the second

circulation, the international financial relations of China.

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Financing China's New Stimulus Package: Monetization Is Not the Answer*

By DONG JINYUE AND XIA LE*

The authorities announced the details of fiscal stimulus package ...

The COVID-19 pandemic has tipped the global economy into a severe recession, which in many aspects led to losses greater than that during the 2008-2009 global financial crisis (GFC). Amid dislocations of the world economy, Chinese authorities announced the monetary and fiscal stimulus package in the recently concluded "two sessions".

Taking lessons from the contentious "4-trillion" stimulus package unveiled during 2008-2009 GFC, which was widely blamed for causing the debt overhang problem in the ensuing years, the authorities seemingly become more conservative this time in crafting the new stimulating measures. This time around, it is the fiscal easing, rather than the monetary loosening, that plays a leading role while monetary policy coordinates given that the nature of pandemic-driven crisis requires for more targeted measures to offset negative shocks.

In particular, this year's fiscal stimulus package includes below elements: (i) To expand fiscal deficit rate from 2.8% in the previous year to 3.6%, around RMB 1 trillion increasing; (ii) To issue special government bond with the scale at RMB 1 trillion; (iii) To increase tax cut and fee reduction scale to RMB 2.5 trillion, RMB 0.5 trillion increasing from the previous year ; (iv) To expand local government bond issuance to RMB 3.75 trillion to support infrastructure investment at local government level, increasing by RMB 1.6 trillion from the previous year; and (v) To use part of proceeds from local government bond issuance as seed funds to leverage bank lending, estimated at RMB 1.5 trillion (new increasing in 2020).

Altogether, the current fiscal stimulus package reaches RMB 5 trillion, around 5% of total GDP if we take into account the part (v). It is noted that the size of current fiscal stimulus is way below that of the "4-trillion" stimulus package during 2008-2009 GFC in terms of its share to GDP. In 2008, RMB 4 trillion accounted for 12.5% of China's then GDP. Moreover, many analysts estimated that the real size of "4-trillion" stimulus package substantially exceeded RMB 4 trillion and could amount to RMB 9 trillion (or 28% of GDP).

The authorities manifest that the unveiled policy initiatives should not be considered as one-off measures. Given great uncertainties surrounding the pandemic, the authorities believe that they need to reserve more fiscal room for further stimulus down in the road.

...while how to finance the fiscal stimulus package ignited drastic debate

The market was concerning how the authorities will finance these fiscal stimulus measures, in particular for the special government bond issuance, and whether these financing channels are sustainable. In June the central government clarified that the special government bond will be issued in the bond market, which, however, failed to quell the debate among Chinese economists and policymakers about whether China's government should monetarize its fiscal deficit by

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directly issuing treasury bonds to the central bank. The debate is still relevant and meaningful because more fiscal easing measures are likely to be implemented in the coming years if the Covid-19 pandemic lasts longer.

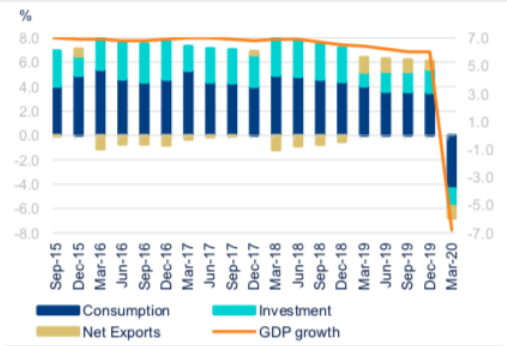
The debate about fiscal deficit monetarization was sparked by a speech in April 2020 by Mr. Liu Shangxi, who is heading the Chinese Academy of Fiscal Sciences, a think-tank affiliated to Ministry of Finance. In the speech he suggested that the central bank directly buy the newly issued government bonds in the primary market to finance the government's fiscal deficit. Since such behaviors are forbidden by China's Central Banking law, Mr. Liu also suggested the authorities amend the law.

However, Mr. Liu's suggestion of monetarizing fiscal deficit has been widely criticized. Many economists believed that it will undermine fiscal disciplines and sacrifice the independence of the central banking system. Although it seems like a low-cost solution to some acute problems, it will give rise to much more problems than answers in the long run. On the other hand, the supporters of fiscal deficit monetization contended that the boundary between fiscal and monetary policy is blurred in the context of modern central banking system. In the past both Chinese government and some authorities in advanced countries have already made some breakthroughs in shifting the fiscal obligations to the central banks. For example, several policy innovations in advanced economies including QE and yield curve control bear certain features of monetization. Moreover, at the beginning of 2000s China's authorities used the monetarization as one of the means to bail out its then bad-debt-laden banking system.

The pressure of fiscal deficit monetarization stems from significant shrinking fiscal revenue amid economic recession

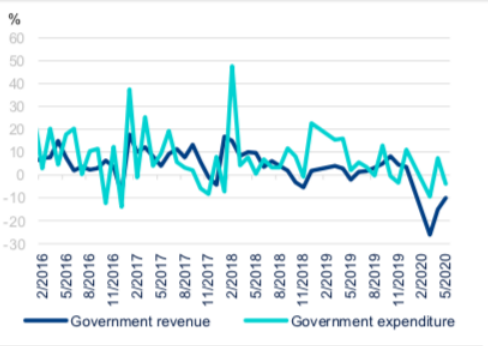
The root reason of such a debate is a significant narrowing of fiscal policy room, namely the dipping fiscal revenue and rising fiscal expenditure amid economic recession caused by COVID-19 pandemic. Actually, China's economic growth dipped to historical low at -6.8% y/y in Q1 2020, and the whole year growth is expected to be around 2.2% y/y by our estimation, a large plunge from the previous year's 6% growth. (Figure 1) The growth deceleration together with the ongoing unbalanced recovery will naturally lead to sliding fiscal revenue.

Figure 1. **CHINESE ECONOMIC GROWTH DIPPED TO HISTORICAL LOW IN Q1**



Source: CEIC and BBVA Research

Figure 2. **FISCAL REVENUE DECELERATED SIGNIFICANTLY IN THE FIRST FIVE MONTHS OF THE YEAR WHILE FISCAL EXPENDITURE INCREASED**

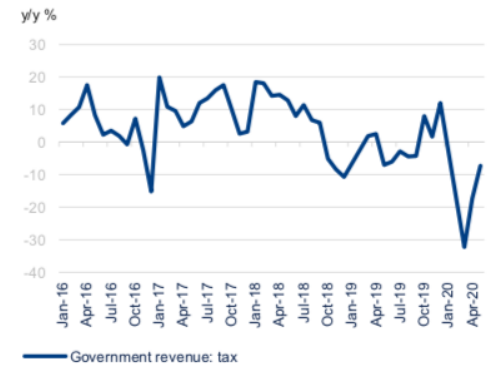


Source: BBVA Research and CEIC

In particular, China's year on year fiscal revenue growth in January to May dipped significantly to -17% y/y on average (Figure 2), while during the same period of time, fiscal expenditure decreased only by -1.9% y/y. That being said, the gap between the fiscal revenue and expenditure has largely expanded. More importantly, as fiscal easing measures being implemented after the "two sessions", government expenditure is anticipated to increase faster in the rest of months of

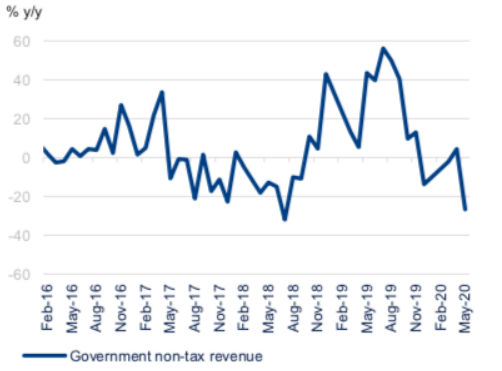
this year. While the overall tax income decelerated by -18.9% y/y in the first five months of 2020, the non-tax income also declined by -8% y/y on average during the same period of time. (Figure 3 and 4) In addition, China's social insurance scheme has also been problematic. The social insurance income- expenditure gap has been expanding with the aging population in the past decade. Thus, fiscal subsidies for the social insurance fund have been continuously rising over time to fill in the gap. (Figure 5)

Figure 3. **TAX REVENUE OF THE GOVERNMENT SHRANK BY -18.9% IN THE FIRST FIVE MONTHS**



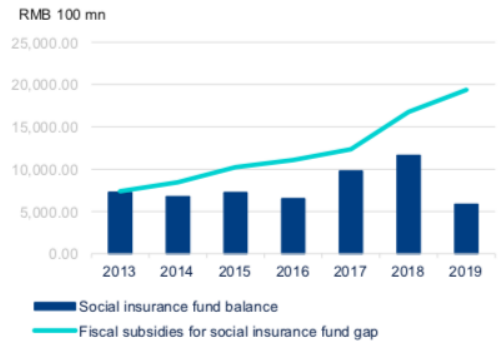
Source: CEIC and BBVA Research

Figure 4. **...WHILE NON-TAX REVENUE OF THE GOVERNMENT ALSO DECLINED SIGNIFICNATLY**



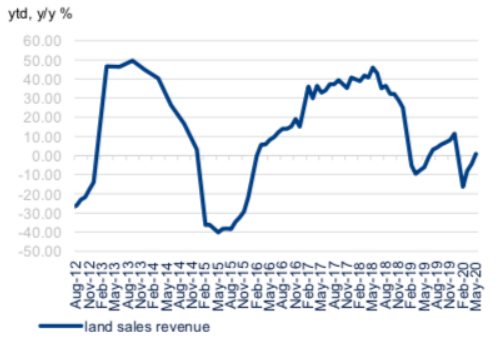
Source: BBVA Research and CEIC

Figure 5. **FISCAL SUBSIDIES FOR SOCIAL INSURANCE FUND INCOME-EXPENDITURE GAP HAS BEEN RISING OVER TIME**



Source: CEIC and BBVA Research

Figure 6. **LAND SALES REVENUE WHICH IS CRUTIAL TO LOCAL GOVERNMENT INCOME ALSO DECLINED**



Source: BBVA Research and CEIC

At the local government level, the land sales revenue which takes a large proportion of local government fund income and is critical to local government fiscal revenue, dropped to -4.5% y/y in the first five months of the year, a sharp decreasing compared with 11.4% growth in the previous year. (Figure 6)

However, fiscal deficit monetarization is not a policy choice yet

Although China's fiscal revenue at both central and local government level has been shrinking amid economic recession, it does not necessarily mean that the authorities have to adopt the extreme measure to finance the expanding fiscal deficit, such as fiscal deficit monetarization.

The disadvantages of fiscal deficit monetarization, i.e. central bank directly purchasing government bond in the primary market to finance the fiscal deficit, are obvious:

First, fiscal deficit monetarization undermines the well-established fiscal disciplines in China which was introduced and established in the past couple of decades. Under the normal circumstance, if the authorities finance the government bond in the bond market, they have to consider whether they have the ability to pay back the principals and interest rates. If the government substantially increases the government bond supply, it will be punished by the spiking market interest rates. As such, the fiscal authorities have to refrain themselves from spending beyond their means and carefully manage their balance sheets. According to China's own experience, such fiscal disciplines are of great help to anchoring the inflation expectation of the public and maintain financial stability.

Second, the conduct of fiscal deficit monetization is set to have a strong signal effect under the current circumstance, which could not only lead to large-scaled capital outflows and financial turmoil but also dampen the confidence of global recovery. Global investors always consider China's central government debt to be well managed and at a comparatively comfortable level despite the country's massive and opaque debt obligations at the local government level, the chunk of which were borrowed through the notorious local government financing vehicles (LGFVs). If China suddenly announces the monetization of its fiscal deficit, sensitive investors might jump to the conclusion that China's fiscal system is on the verge of debacle amidst huge shocks of the COVID-19 pandemic. The evaporation of investors' confidence is likely to exert a catastrophic impact on China's financial system.

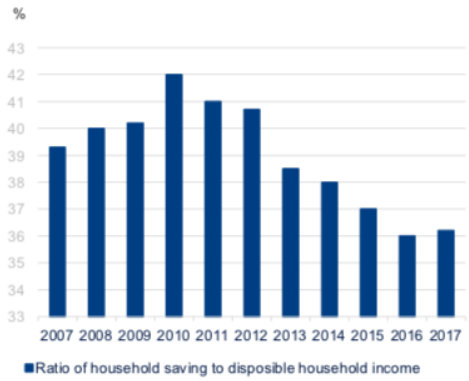
Indeed, there is a lot of room for the authorities to finance the fiscal deficit through conventional channels:

First, Chinese household deposit savings are high compared with those of other countries but the financial repression in China with limited investment choices forced Chinese households to put their savings in the bank deposit and housing market. (Figure 7 and 8) Actually, the demand of government bond in various terms and durations is strong among the individual investors due to its higher interest payment compared with deposit rate and its low risk. (Figure 9) Thus, financing the deficit through government bond issuance in the financial market is equivalent to transfer part of bank deposit to the government bond market, which could diversify households' investment choices and more importantly complete and smooth the government bond yield curve.

Second, issuing government bond by various terms and durations could attract international investors in Chinese onshore bond market and press ahead capital account opening reform and RMB internationalization. After all, amid global financial market turmoil, Chinese bond yield, with its absolutely higher yield than that of advanced economies and less sovereign risk, attracts global portfolio managers to invest in. Currently, the foreign investors' share of Chinese bond market only accounts around 1%. That being said, there will be plenty of room to attract capital inflow to domestic bond market.

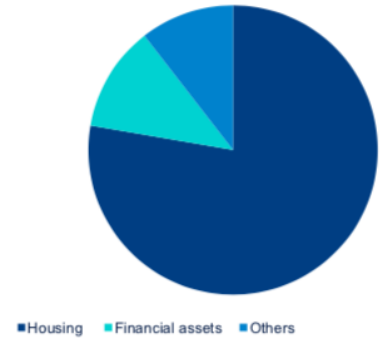
Above all, the ratio of China's central government bond to total public debt is very low at the current stage, making the room for central government bond issuance through the traditional bond market. (Figure 10)

Figure 7. **CHINESE HOUSEHOLD SAVINGS ARE HIGH COMPARED WITH OTHER COUNTRIES**



Source: CEIC and BBVA Research

Figure 8. **MOST OF CHINESE HOUSEHOLD SAVINGS ARE IN THE FORMS OF BANK DEPOSIT AND REAL ESTATE**

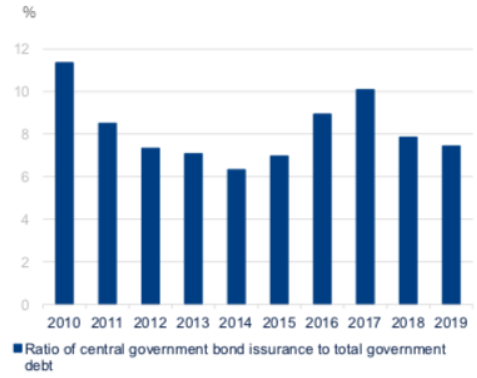


Source: BBVA Research and Southeast University of Finance and Economics, Survey and Research Center for China Household Finance

Figure 9. **TREASURY BOND YIELD HAS BEEN HIGHER THAN DEPOSIT RATE MOSTLY, DIVERSIFYING HOUSEHOULD ASSET ALLOCATION**

Source: CEIC and BBVA Research

Figure 10. **RATIO OF CENTRAL GOVERNMENT BOND ISSUANCE TO TOTAL PUBLIC DEBT HAS REMAINED LOW**



Source: BBVA Research and CEIC

Policy suggestions for fiscal deficit financing during crisis time

The authorities need to take some methodical steps to finance their fiscal stimulus package via conventional channels while control the public debt level and maintain financial stability over the longer term. Here are some policy suggestions:

First, the authorities should enhance the degree of transparency in the government fiscal deficit; in particular, by making the contingent LGFV debt more explicit. This will alleviate the problem of the soft budget constraint for local government financing and put the local government debt under public surveillance. In addition, it will help to reduce the systematic financial market risk. Actually, the authorities pushed forward the deleveraging for LGFVs in the past several years and have born some early fruits. However, the ballooning fiscal deficit for the counter-cyclical stimulus measures this year might raise the LGFV borrowing and other forms of local government debt issuance. Thus, controlling the implicit debt at the local government level still constitute a key challenge to the authorities.

Moreover, more fiscal transfer from the central government to local government should be conducted so as to reduce the spending burden of local government. Amid the global economic recession, increasing the ratio of central government fiscal deficit to total public debt could make the fiscal stimulus more targeted and more coordinated at the central government level. Local governments might have less incentive to implement relief measures in support of the COVID-19 affected enterprises and households. Instead, they are more willing to put the money in certain investment projects to pursue high local GDP growth as the officials' performance is always linked with GDP.

Second, the authorities at last decided to issue special government bonds of RMB 1 trillion with the term of 10-year. The Ministry of Finance should consider increasing the supply of short-term Treasury bonds such as one-year term or even shorter, which will help to cater to the diversified demands of households, enterprises and commercial banks. Moreover, the provision of treasury bonds with various tenors will contribute to completing the yield curve in the secondary bond market.

Third, from the perspective of special local government bonds, how to match these bonds with projects with reasonable return is the key to make the local government debt sustainable in the future. In our previous experience of local government debt overhang, the main reason leading to local government debt accumulation and continuous roll-over is that the local government debt always matched these bonds with low-return and long- term infrastructure projects. That means, without profitable projects, these local government special bonds will unavoidably become the long-term fiscal burden of local governments.

Finally, the authorities need to increase the SOEs' profit submission to the central to fill in the fiscal gap. Under China's system, SOEs are entitled to retaining the majority of their earnings even those profits stem from their actual monopolization in their respective sectors. Moreover, Chinese SOEs have easier access to external financing resources and government subsidies. Thus, it is the social responsibility of SOEs to support fiscal revenue amid growth slowdown. Some experts suggested that SOEs should submit their profits to the central government from the current 10%-25% (with different categories) to 30%. We believe that the proportion of profit submission could be increased to a higher level to offset the current shortfall of fiscal resources.

Altogether, regarding the method of financing the new stimulus package, the recent debate of fiscal deficit monetarization is far from a policy choice in view of China's current macroeconomic circumstances. China still has the room to fill the fiscal gap via the conventional financing channels. In so doing, the authorities will better balance the needs of short-term stimulus and the long-term financial stability as well as fiscal disciplines.

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The Economics and Politics of China's Currency Internationalization*

By DI DONGSHENG*

The starting point for the internationalization of the Chinese currency, the renminbi (RMB), can be traced back to the global financial crisis in 2008, or even earlier, due to what is perceived as the unfairness, irresponsibility and asymmetric distribution of costs among nations showcased in policy responses to the financial crisis. That crisis began with the misconduct of Wall Street, which created the bubble in the US real-estate market. The debacle was also a consequence of failure by the US public sector to supervise the financial markets and contain the formation of bubbles in the first place.

Kidnapped by such factors as political lobbying, personal connections and the idea in the financial sector that some institutions were "too big to fail," US policymakers bailed out most of the troublemakers through a surge in federal debt and a five-fold expansion in the US Federal Reserve's balance sheet in the name of quantitative easing (QE). Even more galling, none of the leaders of the financial groups responsible was held accountable. Since the US dollar is a global reserve currency, all savers around the world paid directly or indirectly for the bursting of this financial bubble. Central banks such as the European Central Bank (ECB), the Bank of Japan and the Bank of England also carried out similar quantitative easing programs and even policies of negative interest rates.

The real damage was faced by the peripheral countries of the global market system, which coped with high inflation and social turmoil in the following years. China, as the country with the world's largest foreign-exchange reserves, bore a large portion of the losses in relative purchasing power caused by the overprinting of dollars. In the face of such a drama, Zhou Xiaochuan, former governor of the People's Bank of China, proposed in an influential article that the RMB should go international. From then on, China's role began to change from a supporter of US dollar hegemony to a rebel against it.

After 12 years, we are now experiencing another global economic and financial crisis. The origins of the two are different, but the solution is the same. Starting from late September 2019, even before the Covid-19 pandemic broke out, the Fed's balance sheet rapidly expanded from US$3.72 trillion to US$4.2 trillion. Following the pandemic outbreak, it ballooned further to US$7 trillion within three months. The unique status of the US dollar endows American society with an exorbitant privilege known as "seigniorage," which means that the US can draw wealth directly from savers across the world. The internationalization of the RMB has grown from almost zero under these circumstances, with progress having been made through a series of steps.

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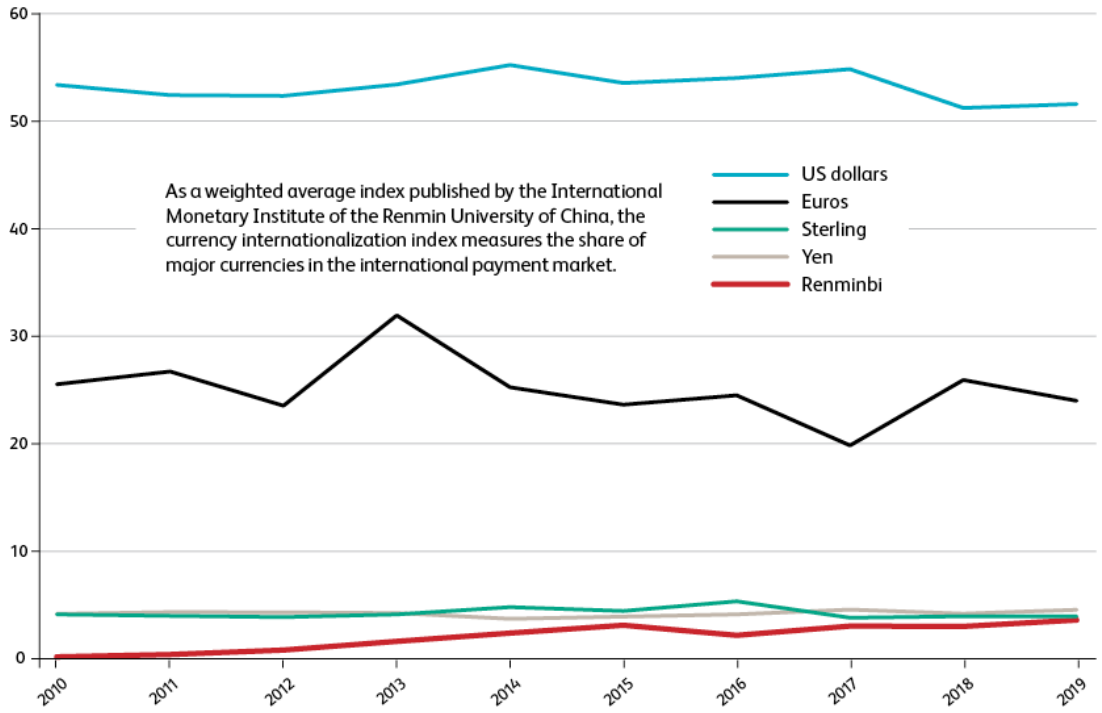
FIGURE 1 INTERNATIONALIZATION INDEX OF MAJOR CURRENCIES

Source: International Monetary Institute of Renmin University of China



As a weighted average index published by the International Monetary Institute of the Renmin University of China, the currency internationalization index measures the share of major currencies in the international monetary market. As shown in Figure 1 above, the US dollar occupies a dominant position, followed by the euro. The pound sterling and the yen belong to the third level. After 10 years of effort, the RMB is finally approaching the share of the pound and the yen. Compared with the US dollar, the share of the RMB still seems insignificant. Interestingly, the increase in the RMB's share is not at the expense of a decrease in the share of the US dollar. Considering the fact that the other several hundred currencies take only a few percentage in total, however, the achievement the RMB has made in just 10 years should not be regarded as a failure.

Internationalizing the RMB

In order to advance the internationalization of the RMB, the Chinese government, especially its central bank, has implemented a series of reforms that have loosened the artificial restrictions on the cross-border use of the RMB. For instance, exporters are allowed to increasingly use RMB in pricing and settlement; companies are allowed to use the RMB in cross-border direct investment; foreign governments and mainstream international financial institutions are allowed to purchase and hold Chinese government bonds; and the exchange rate of the RMB is allowed to float more widely than before on a daily basis. Increasingly, more capital account funds can enter and exit freely. In addition, interest rates can be determined more by the supply and demand in the market, and foreigners are allowed to invest in China's stock and bond markets, although with quota restrictions.

The internationalization of the RMB is benefiting directly from initiatives taken by the Chinese government. For example, through successful economic diplomacy, the RMB is included in the

International Monetary Fund's basket of Special Drawing Rights (SDR). Under the Chinese Foreign Exchange Trade System (CFETS) index — part of the central bank — the government aims to provide up-to-date information on the RMB through an index that defines the stability of the RMB against a basket of currencies rather than solely against the US dollar. Moreover, the Chinese government has developed the necessary financial market infrastructure, such as CIPS I and CIPS II, two phases of the cross-border payment system. The People's Bank of China is working on the development of its digital currency (DCEP) based on blockchain technology, which can bypass the US-supervised SWIFT system when necessary. Furthermore, China has established the Deposit Insurance System and Macro-Prudential Framework to ensure that the central bank can promptly respond to fluctuations and crises in a more market-oriented manner. The government has also developed several commodity exchanges and futures markets, with the formation of a crude oil-RMB-gold triangle. Since then, natural-resource exporting economies have been able to sell their products on the futures market in Shanghai to get RMB to invest in Chinese domestic financial markets or, if they want, to buy and ship gold from another market in Shanghai to their own country. The US dollar is no longer an indispensable bridge in the transaction process.

In addition, the commercial moves by several domestic and foreign business entities have also had a significant impact on the RMB's internationalization. For example, when third-party payment systems such as WeChat and Alipay expand to Europe and other regions, overseas Chinese and tourists can more easily use the RMB. What is more, some international institutions, such as Reuters and Morgan Stanley, have included Chinese financial asset prices into their emerging market stock and bond indexes and are gradually raising the weight of such assets. In sum, the profit-seeking behavior of these market players has facilitated the RMB's internationalization.

Where to Next?

There are fierce public debates on the strategy and path of internationalization for the RMB. Officials of the PBOC and scholars from Renmin University generally tend to support the internationalization of the RMB and the progressive liberalization of the capital account. In contrast, scholars from the Chinese Academy of Social Sciences and Peking University tend to oppose or be skeptical of RMB internationalization. A major debate between the two sides took place in 2012-2014, with the controversy centering on the following questions: First, would the benefits of the RMB's internationalization be commensurate with the costs and risks? Second, should traditional capital controls be replaced by a more market-oriented and macro-prudential framework in dealing with potential risks? And third, is the motivation coming from the overall interest of the country, or from lobbying by financial institutions, or even from personal ambition?

Memories of the Latin American debt crisis in the 1980s and the Asian financial crisis in the late 1990s have had a significant influence on the doubters. However, members of the International Monetary Institute (IMI), including myself, and officials from the PBOC, believe that since China has gone through the industrialization period and become the world's largest exporter, the cases of Mexico and Argentina in the 1980s or Thailand and Indonesia in the 1990s are no longer proper references. While skeptics of RMB internationalization are worried about risks, the promoters believe that the most significant risk lies in not taking any risk. As the world's second largest economy with a diversified industrial base, if China takes moderate risks, the benefits would be cost effective. On the other hand, the doubters maintain that many reforms should be completed prior to the internationalization of the RMB and the opening of the capital account. In response, advocates of internationalization insist that such prioritizing only exists in textbooks and classrooms, because without outside pressure, nobody would like to risk reforms and uncertainties;

the strategy“to propel reform by opening up”(以开放促改革) is always pragmatic and efficient. While the doubters believe that fluctuations in the exchange rate would cause the manufacturing sector to suffer huge losses, the scholars who advocate internationalization maintain that China's industry is undergoing transformation and upgrading and the sectors with low-profit margins account for only a small proportion of exports. As a result, if fluctuations in exchange rates were artificially eliminated to maintain a climate of fragile survival for certain domestic players, the risks and costs would be finally amassed in the hands of the government, potentially leading to a more significant loss of social welfare.

Pessimists are more likely to appear to be correct, while optimists, in fact, become more successful. The simultaneous fall in the Chinese stock market and the RMB exchange rate during 2015-2016 seemed to endorse the correctness of the doubters, because since then, the RMB internationalization index experienced stagnation, and did not reach a new high until three years later. But 2016 witnessed an apparent change in the path of RMB internationalization. Before 2016, the RMB's path was similar to that of the yen in the 1980s: to increase the local currency's share in international trade settlement and to use the Hong Kong financial market as an offshore yen market. In this way, Japan quickly promoted the internationalization of the yen and, by the mid-1990s, the yen's global share had reached its peak at 10 percent of the global currency market, but also led to the emergence of financial bubbles in Japan's asset markets, as it encouraged active exchange-rate and interest arbitrage between offshore and onshore markets. After the bubbles burst in 1992, Japan's economy fell into a prolonged downturn, and the yen's international share fell to about 4 percent.

In 2015, the dramatic fluctuation of the RMB exchange rate in the Hong Kong offshore market led to a high expectation of RMB depreciation, which attracted many US and European hedge funds to go to Hong Kong to short the RMB. The Chinese government then had to drastically raise the overnight borrowing costs of the RMB to curb the speculative wave, which it barely succeeded in doing. Since then, the scale of RMB deposits in the Hong Kong offshore market has remarkably shrunk. Consequently, China is aware of the lessons and shortcomings of the Japanese model. After 2016, the internationalization model of the RMB was changed into a multi-pronged mixed model, including commodity exchange denomination, RMB foreign direct investment (FDI), the availability of the Chinese debt market to foreign investors, the construction of the Shanghai financial center and the relaxation of access by foreign banks and brokers to Chinese financial markets. If the process of the RMB's internationalization before 2016 was a rush and a surge, it has been followed by a stable and steady road.

The Obstacles Ahead

To become one of the world's mainstream currencies, the RMB faces a series of difficulties. First, China will inevitably have to give up its double surplus in both the capital account and the trade account for the balance of payments. If a country wants to become an issuer of an international reserve currency, it must export its currency abroad through some forms of deficits, e.g., through foreign investment and credit (like the Eurozone) or through a continuous rise in the trade deficit (like the US). The former (the Eurozone pattern) means that China's annual FDI should reach more than US$200 billion, so as to export RMB meaningfully. If so, it would be a big challenge to protect its trillions of dollars of global assets without meddling in other countries' internal affairs. If the latter approach (the US one) is adopted, China would experience long-term deindustrialization, similar to the road the US took after the Second World War, which seems unacceptable in light of China's domestic politics.

Second, being an international mainstream reserve currency means a significant appreciation of the RMB and highly volatile exchange rates, both of which could put China's labor-intensive and

low-profit-margin industries out of business. Clearly, it entails time and political will to go through such a big adjustment.

Another obstacle lies in the perception of decision-makers on monetary and financial issues. The internationalization of the RMB requires further (though not complete) liberalization of the capital account. But sudden inflows of capital are likely to result in a substantial decrease in foreign exchange reserves or a dramatic appreciation of the RMB, or vice versa. Compared with the macro- and long-term benefits, are these risks and short-term costs worth bearing? Decision-makers are required to comprehensively and accurately weigh these factors. This is a real challenge, given the economic knowledge demonstrated by the leaders of most countries in the world.

Last but not least, as a newcomer in the field of international currencies, the RMB is subject to headwinds from the international monetary market, given the network characteristics of currencies. The marginal cost of the international monetary system can be zero or even negative. Take a businessman engaged in Sino-Russian trade as an example: he will find that, if he first exchanges rubles into US dollars and then into RMB, the total cost will be significantly lower than directly exchanging rubles into RMB. This counterintuitive phenomenon occurs because the US dollar is the hub of the global monetary market and, therefore, the volume of transactions between rubles and dollars or between the RMB and dollars is much larger than that between rubles and the RMB. Because the transaction activity and the transaction costs are highly interrelated and inversely proportional, more trades with a currency means lower transaction costs. As a result, the status of the currency with the largest share is hard for challengers to dislodge, even if the challengers' real economy is stronger and larger than that of the existing reserve currency, not to mention weaker challengers. For instance, the size of the US economy surpassed that of the UK at the end of the 19th century; nevertheless, it was not until the 1960s that the global share of the US dollar had exceeded that of the pound sterling.

The Global Currency Politics of RMB Internationalization

Further internationalization of the RMB may lead to more intensified competition and hostility between China and the US. When Chinese policymakers conceived and promoted the reforms related to the internationalization of the RMB in the past, they took a cautious attitude toward the US response. Before 2015, the author of this paper had interviewed think-tank experts and government officials from the US on the issue of the RMB's internationalization; the feedback was not positive. The main reasons given were that the RMB was issued by a government that lacked the rule of law, freedom and democracy — meaning that the RMB would find it difficult to gain the trust of capital markets and savers. But at the same time, they expressed some interest in seeing China attempt to internationalize its currency. In their opinion, it would be impossible for China to implement its previous mercantilist policies if the RMB went global.

However, since 2016, China-US relations have entered a clear downward trend. China initially held US public- and private-sector debt as reserves. But now China is gradually reducing its holding of US debt and starting to issue Chinese national debt to compete with the US for other international savers. Such a change might not have been made overnight, but the outbreak of the Covid-19 pandemic has dramatically shortened the transition time. In March and April 2020, the Trump administration called on China to take responsibility and pay the US for the costs of the pandemic — some US politicians and media even declared that the US should confiscate China's foreign-exchange reserves. Moreover, the US government quickly expanded its fiscal deficit by US$2 trillion within a month, while the Fed's balance sheet expanded from US$4.2 trillion to US$6 trillion over the same period through the purchase of new federal debt. From the perspective of China as a reserve country, the US government and the Fed are abusing the dollar's privileged

status to subsidize US financial institutions, local governments and ordinary families. The printing of dollars can be regarded as a soft default, and the possible confiscation of China's foreign-exchange reserves as a hard one, both exacerbating the call for "de-dollarization" in China.

Look Out, Euro

There is a possibility of complementarity between the Belt and Road Initiative and the internationalization of the RMB. China has trade deficits with some countries along the Belt and Road, and most countries are not eligible to participate in the US Fed's currency swap program, meaning they have been deeply hurt by the alternating dollar tides and shortages. The RMB's internationalization will provide excellent international liquidity support for their financial and monetary stability. A series of new international financial institutions endorsed by China will provide support both for the Belt and Road Initiative and RMB internationalization, such as the Silk Road Fund, the Asian Infrastructure Investment Bank, the New Development Bank and the BRICS forex reserve pool. Compared with their US and European counterparts, Chinese multinational companies are more able to take risks and are willing to enter the underdeveloped regions along the Belt and Road. Besides, the prices of industrial and high-tech products are more affordable for poor countries. With the further opening of the RMB capital account, the RMB digital currency together with electronic payment tools such as WeChat and Alipay will spread into all corners along the Belt and Road and provide financial services to billions of people who still have no bank accounts, while China's traditional companies and technology giants will restructure the financial and monetary outlook of peripheral regions with RMB instead of euro or US dollar credits.

What will the global monetary system look like in 15 or 20 years if China continues on its path of internationalizing the RMB? Today, the global real economy is basically divided into three parts: the US, the EU and East Asia, each accounting for one-quarter of the global economy, while the rest of the world accounts for the last quarter. Many scholars believe that the global monetary system should present a similar ternary pattern consisting of the US dollar, the euro and the RMB. Nevertheless, considering the winner-takes-all feature of currency markets, such a ternary pattern is neither stable nor reasonable. The rise of the RMB share in the global currency market is likely to take place at the expense of the share lost by the yen, the pound and the euro. This research estimates that the RMB internationalization index will go up to around 15-25 percent by 2035 if the Chinese government makes the RMB's internationalization a policy priority and the Chinese economy continues its current growth. By then, the partial or even entire euro share will be replaced by the RMB, because the RMB's advantage over the euro is clear: with a single treasury and bond market behind the RMB, it can provide global investors with a huge pool of assets, second only to the US treasury. Besides, China is now overtaking the eurozone in terms of economic size. Compared with the US dollar, however, the RMB lacks support from either a global military hegemony or a system of political allies. More importantly, China is less willing to accept a continuously widening trade deficit and a more virtualized economy. After all, the financial sector has far less political influence in Communist Party-led China than Wall Street enjoys in American politics.

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Towards a New Gold Standard? Or a Currency War with China?*

By PETER KOENING*

Rumors have it that the remaining months of 2020 may bring drastic and explosive changes in the world's financial system. But such "doomsday" rumors have been floating around every beginning of fall during the last few years. Why? – The US dollar is getting weaker and weaker. It is not quite on a free fall, but remains a major trading currency and a key world reserve currency. And for many economists that's difficult to understand.

However, it is unlikely that that the end of the dollar will come from one day to the next. That would not be good for the world economy, as still too many countries depend on the dollar.

Facts are, i) China's foreign exchange reserves have just increased to US$ 3.112 trillion equivalent, of which about US$ 1.3 trillion denominated in US-dollars – and in general forex-reserves continue to grow; ii) within short, possibly by the end of 2021, the Chinese yuan, or renminbi (RMB) could become the world's third largest reserve currency, after the US-dollar and the euro, surpassing the Japanese yen and the British pound, reported by CNBC; iii) according to Morgan Stanley , at least 10 regulators (i.e. Central Banks and similar forex regulating institutions) added the yuan to their reserves in 2019, bringing the total to 70 – and rising; and iv) according to the FED, the US economy could lose in excess to one third of its GDP up to the end of 2020 or mid-2021, while China's economy is expected to grow by 1.3% (IMF) in 2020, and by China's own estimate up to 3.5%.

Given the dismal covid-related world economy collapsing, and with China being the only major economy expected to grow this year, the number of yuan reserve holders may increase drastically by the end of 2020 and especially through 2021, suggesting that central banks around the world realize that for their financial stability, they must increase their yuan holdings significantly in the foreseeable future. This means shedding other reserve currencies, like the Japanese Yen, the British Pound, but especially the US-dollar. For example, Russia has dumped the dollar, reducing her dollar debt-holdings by 96%.

The Russian Trade Minister, Denis Manturov, called on his BRICS colleagues to increase their trading in local currencies instead of US dollars. Trade in national currencies is a key aspect of cooperation of the five-nation alliance that includes Brazil, Russia, India, China, and South Africa and it is an effective way to dedollarize their economies.

China and Russia and many of the Shanghai Cooperation (SCO) countries are trading for many years already in their local currencies, or in yuan, especially cross-border trading, but they are also promoting currency swap arrangements with other countries, eager to escape the iron fist of sanctions of the United States.

In an interview with *MarketWatch*, senior fellow Stephen Roach at Yale University and former chairman of Morgan Stanley Asia, says coronavirus may cause a dramatic decline of the US dollar in the near future – *"In a Covid era, everything unfolds at warp speed."* Roach also predicted an up to 35% drop of the dollar against major international currencies. He adds, given today's economic outlook, this might happen rather quickly.

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*This article first appeared in Global Research.

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Indeed, while western economies are struggling keeping afloat, China is preparing to launch a new international currency, the digital, gold-backed, possibly crypto-RMB as an international payment and reserve currency, completely outside the dollar-dominated SWIFT system. The new digital RMB money is currently tested in several Chinese cities with positive results.

The People's Bank of China – China's Central Bank – recently revealed plans to have its sovereign digital currency ready in time for the 2022 Winter Olympics. The international rollout could actually happen much earlier, possibly in 2021, or earlier if warranted by international monetary events. In any case, the new trading currency may very likely find an astounding attraction by many countries that are eager to dedollarize and get out from under the boot of threats of sanctions by Washington.

It is clear that any currency that will grow into a major international trading and reserve currency needs to be backed by a strong economy. Backing of a strong economy is fully commensurate with the yuan. China's economy today in real – and solid – output and long-term stability can easily be assessed as the world's strongest. Comparing for example the Chinese GDP with the US GDP is like day and night: The Chinese GDP consists by more than three quarters of tangible and solid production and construction of infrastructure, housing, transport, energy and so on; while the US GDP is largely, about two thirds, consumption and service industries. This undoubtedly distinguishes the yuan or RMB from fiat currencies, as are the dollar and the euro – which are backed by nothing. Simply put, China's economy and her currency attract a lot of international trust and confidence.

Unfortunately, these differences are not (yet) reflected by the undistinguished linear accounting of GDP, but they are recognized by international economic observers and analysts, including nations' treasurers around the world.

These are good reasons for the new digital RMB or yuan to grow fast as a primary trade and reserve asset for many countries. It will most likely far outrank Bitcoin, which is often heralded as a possibly the "new gold", or reserve currency.

Not only would the number of countries holding the Chinese currency in their reserve coffers increase rapidly, but the total amount of yuan reserve holdings might skyrocket faster than analysts expect, signaling clearly the end of the US-dollar hegemony. This might undoubtedly shift the global balance of economic power.

"Looking back years later, the two defining historic events of 2020 would be the coronavirus pandemic, and the other would be [China's] digital currency," Xu Yuan, a senior researcher with Beijing's University's Digital Finance Research Centre, told recently the South China Morning Post.

These developments are not ignored by Washington. And the US will not so easily give up its dollar hegemony which means largely control over the world's economy and financial flows. Although the times of total dollar-control of the world economy are irreversibly gone, Washington intends to slow down the power shift as long as possible. Though a hot war is not excluded, more likely is a ***currency war*.**

In line with the Great Reset announced by the World Economic Forum (WEF) and, in parallel, the IMF prediction of the Great Transformation (see this https://www.globalresearch.ca/imf-wef-great-lockdown-great-transformation/5721090and this https://www.globalresearch.ca/great-reset-revisited/5723573), a kind of currency revolution might be initiated, possibly introducing a major instrument for launching the Great Reset, alias Transformation.

As a hypothesis, Washington could instruct the IMF to return to some kind of a gold standard. It could take the form of a digital SDR-type currency basket intended to replace the dollar and the emerging digital yuan / RMB as trading and reserve currency. The current composition of the SDR

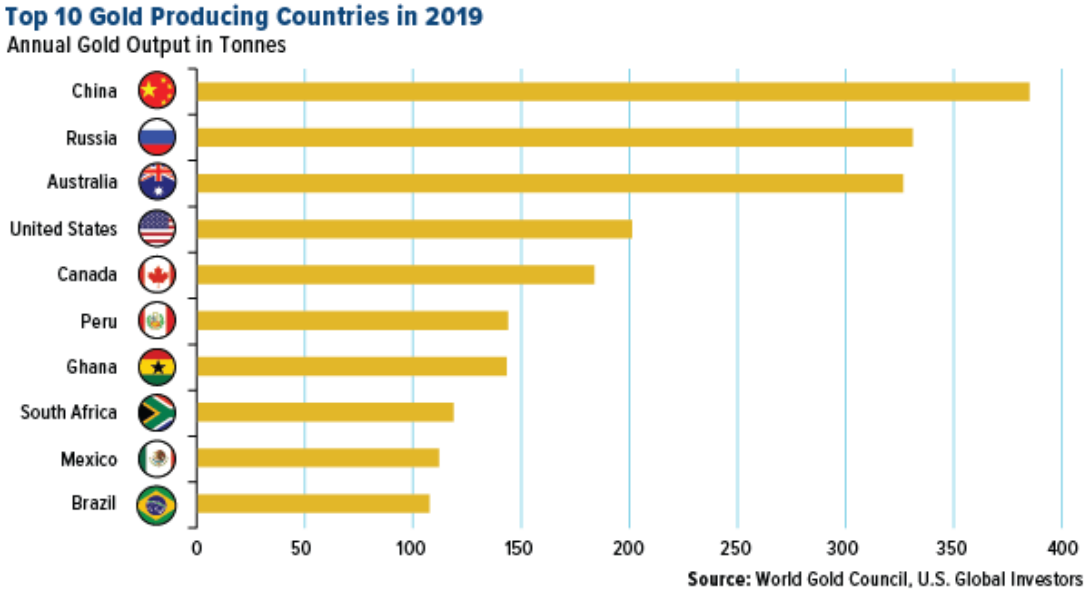
contains the five major international forex currencies, US dollar (41.73%), euro (30.93%), yuan (10.92%), yen (8.33%), and British pound (8.09%).

Although the yuan is vastly undervalued, especially as compared with the US-dollar and the euro, the yuan is finally present in the basket since 2017 and has thereby become an official international exchange and reserve asset. The respective weights in the SDR basket have last been set in 2016 and are valid for 5 years, meaning they are up for renegotiation and readjustment in 2021.

Continuing with the hypothesis of the new gold standard, it might well be that in the hypothetical new SDR-like currency gold would take a prominent role, one that overshadows the weakness of the US dollar. However, as was the case with the 1944 gold-standard, Washington-FED would insist on the value of gold in the basket being linked to the dollar – which would de facto disproportionately increase the weight of the dollar in the basket.

If such a deal would be accepted by the majority of countries – the US has still the sole veto right in the two Bretton Woods Institutions, IMF and World Bank – the hypothetical gold-based "SDR" would be a serious contender to the emerging internationalized digital yuan / RMB.

To forego such a situation, a possible currency war, China, as a holder of large direct and indirect gold reserves, may consider establishing a "gold commodity" market priced in yuan / RMB – and invite other large gold producers, like Russia, Venezuela, South Africa and others not in the US orbit, to join in an alternative currency, i.e. a yuan-denominated gold market, or a weighted average gold value of, say, the three major participants of the alternative gold commodity market.



This alternative currency denominated gold would be strengthened by the power of the respective economies which would back it.

In the end – as is already demonstrated today – international trust in the respective economies and their currencies – gold backed or not – will determine the outcome of a possible currency confrontation. China, already engaged in cross-border trading in local currencies and expanding yuan-trading arrangements internationally, for example, with currency swap measures in place with Russia, Iran and Venezuela, would be well placed to break the US-currency hegemony.

Finally, the goal is not to have one hegemon to replace another domineering power, but to establish a balanced world with several regional hubs or financial centers which would promote a monetary equilibrium that would gradually accompany progress of the Belt and Road Initiative

(BRI), the bridge that spans the world (see also https://www.globalresearch.ca/china-belt-road-initiative-bridge-spans-world/5695727), with increasingly equal access to vital resources for building peacefully a World Community with a Shared Future for Mankind.

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New Infrastructure Investment as a New Engine for Recovery of the Chinese Economy*

By JIHYUN JUNG*

Infrastructure investment is a stimulus measure commonly used by the Chinese government for economic recovery, and this year is no exception. However, a salient characteristic of this year's measures is that the Chinese government has formulated a new investment direction called "new infrastructure."

What is this new infrastructure investment emphasized by the Chinese government as a new growth engine? In April 2020, China's National Development and Reform Commission (NDRC) released an official report on the meaning and scope of the new infrastructure concept for the first time. According to the report, new infrastructure mainly consists of three aspects: information-based infrastructure such as 5G and IoT; converged infrastructure supported by the application of the internet, big data and AI, such as smart transportation and smart energy infrastructure; and innovative infrastructure that supports scientific research, technology development and product development. In other words, new infrastructure projects include both infrastructure based on scientific (information) and technological innovation related to new industries and new growth elements within the existing infrastructure, and serve as a signal that China will promote technologies related to 5G networks, IoT, AI, satellite internet, cloud computing, blockchain, data centers and smart computing centers to lead innovative growth.

Then what is new about new infrastructure, distinguishing it from existing infrastructure investments? In general, infrastructure investment intends to improve the production efficiency and social utility of the entire society, and has been mainly promoted by the government's financial input to reduce market failures and externalities rather than profit-seeking. This contributes in part to the stable growth of the economy, but its effect gradually decreases. On the other hand, new infrastructure investment closely linked to new industries and new growth factors can be expected to generate large profits, meaning it does not have to rely solely on government finances and can induce active investment by the private sector. The Chinese government's plan is to push for much of its investment in new infrastructure through private sector investment. In fact, as the Chinese government clarified the scope of new infrastructure and emphasized it as a future investment direction, Baidu, Alibaba and Tencent (BAT), China's three lead- ing Internet companies, announced a series of large-scale investment plans for building digital infrastructure such as data center construction, cloud computing, AI, blockchain, 5G networks, and IoT operating systems.[1] In pursuing these new infrastructure projects, the Chinese government is placing more emphasis on proper coordination and management on the part of the government to maximize investment efficiency, rather than the injection of policy funds.

New infrastructure projects are not a part of policy measures China has recently prepared to overcome the Covid-19 shock, but rather a policy that has been consistently mentioned since 2018 in order to improve the quality of the Chinese economy, upgrade its industrial structure, and strengthen the competitiveness of future industries. Of course, new infrastructure projects have

*This article first appeared in KIEP Opinions on July 23, 2020.

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[1]Tencent, whose net profit in 2019 was 93.3 billion yuan, announced it would invest 500 billion yuan (about $70 billion) over the next five years, Alibaba said it would invest 200 billion yuan over the next three years, half of its sales in 2019, and Baidu said it would invest 1.4 billion yuan.

increased in their pace and intensity due to the Covid-19 pandemic, but this rapid progress in the face of the Covid-19 shock was made possible because they are in line with existing policy directions. According to China's Ministry of Finance, the issuance of local government bonds, a major source of infrastructure investment, has increased 22.9% YoY to 3.5 trillion yuan (about $500 billion) in the first half of 2020, and local governments are actively pursuing their new infrastructure action plans for job creation, economic recovery and industrial development.

So will new infrastructure investment be able to lead the recovery of the Chinese economy? First of all, while estimates differ by research institutes, new infrastructure projects are expected to account for less than 10 percent of the total infrastructure investment. In particular, a significant portion of infrastructure investment in 2020 will be used to build transportation infrastructure such as high-speed trains. That is, it is hard to expect the new infrastructure investment to play a key role in China's economic recovery in the short term. However, the marginal efficiency of the new infrastructure investment is expected to be higher, so the growth rate of investment driven by new infrastructure projects will be much higher than for traditional infrastructure. In other words, new infrastructure investment is not likely to lead economic recovery in the short term, but it will contribute to China's competitiveness by promoting the digital transformation of the Chinese economy and the development of new industries in the medium-to-long term. These are the positive impacts of new infrastructure investment that the Chinese government hopes to see.

But these hopes on the part of the Chinese government will be realized only when the following problems are resolved. First of all, the majority of China's companies and regions are likely to invest in new infrastructure, as investment in manufacturing and real estate will be difficult to boost due to the reduced demand and excessive investment. Failure to balance these redundant investments with market demand for new industries can result in huge inefficiencies. This would result in a sharp divide from the Chinese government's plans to maximize investment efficiency through new infrastructure. Second, while social members generally share the benefits of infrastructure projects together, the benefits of new infrastructure projects can be excessively concentrated in technology innovation or ICT-related industries. Third, a small number of companies that have grown up in the winner-take-all structure of the digital economy could monopolize the supply of related goods and services. These problems will exacerbate China's economic inefficiency and costs.

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Monetary Policy

In the Face of An Unexpected Adversary: the Crucial Role for Central Banks*

By AGUSTÍN CARSTENS*

It is my pleasure to present to you this year's BIS Annual Economic Report, our 90th. I will give you a broad overview of its key messages and then hand the floor over to Claudio Borio, Head of our Monetary and Economic Department, who will speak in more detail on the prudential response to the pandemic. Finally, Hyun Song Shin, Economic Adviser and Head of Research, will dive deeper into explaining the centrality of central banks in the evolution of payment systems.

The shock of the Covid-19 pandemic has turned out to be a defining moment: the containment measures are inflicting an enormous economic blow, and the long-term effects will be profound.

Central banks have done their utmost. As lenders of last resort, they have reacted promptly, stabilising financial markets and working in concert with fiscal authorities to cushion the blow. By providing monetary accommodation, in some cases further expanding their toolkit, central banks have supplied dearly needed oxygen to the global economy, preserving more firms and saving more jobs that would otherwise have been lost during the lockdown.

While the global economy seems to be recovering, much remains to be done. The virus is far from defeated, and many countries, especially those with weaker defences, are still in the early phase of the struggle. The next tasks will be to address solvency, prepare for the recovery, and adjust the economy to the post-pandemic world.

As central banks grapple with these immediate dangers, they cannot ignore other priorities. For example, central banks continue to be essential in providing the foundations for safe and efficient payments, particularly in this era of rapid technological change.

An unexpected adversary

2020 will be a year for the history books. Early in January and February, near-term prospects seemed bright – until the Covid-19 pandemic struck. Around the world, output drops have been the largest since the Great Depression.

It is this global sudden stop that makes the crisis unique: the worldwide lockdowns have crippled both supply and demand, crushing the production of goods and services. Tourism, retail and travel have been particularly hard hit. Meanwhile, supply disruptions and the prevailing uncertainty have sapped investment. Moreover, central banks have faced this sudden stop in the context of some underlying vulnerabilities and limited policy space.

Pre-pandemic, during the prolonged period of easy financial conditions, vulnerabilities were

*This speech was given on the occasion of the Bank's Annual General Meeting in Basel on 30 June 2020.

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growing, particularly in the non-bank financial sector. I noted last year that these vulnerabilities could easily throw the global economy off track should a shock occur. Unfortunately, an unexpectedly brutal one did just that.

Tackling a crisis of this magnitude would have been a tall order under any circumstances. Nimbleness, boldness and decisiveness were called for. And central banks delivered. However, it has been quite challenging, given the limited monetary policy space available.

Bold and prompt responses

Crisis management is part of a central bank's job description. In some respects at least, the current episode has replayed a familiar script. The initial liquidity phase of the crisis saw the usual flight to safety. The US dollar strengthened, stock markets tanked, sovereign yields fell and corporate sector spreads spiked. Although underlying vulnerabilities amplified the turmoil, central banks knew what to do: engineer a swift and forceful liquidity response.

But, this time, aggravated by the oil price collapse, the crisis unexpectedly morphed into a scramble for cash. When markets threatened to freeze up, central banks quickly went beyond their traditional liquidity support for banks and provided large-scale direct support to markets, buying government debt and other securities on an unprecedented scale. These "all hands on deck" measures stemmed the liquidity and confidence crises.

Spillovers were again large. Emerging market economies (EMEs) saw a sudden stop in capital flows that was far more severe than during the Great Financial Crisis (GFC). Yet, with inflation expectations better anchored, EME central banks had scope to cut interest rates. Moreover, and for the first time, several intervened as market-makers of last resort in their domestic sovereign debt markets. Meanwhile, the Federal Reserve expanded the size of its swap lines, made them available to more countries, and offered a new repo facility as a source of liquidity.

The lender of last resort role needed to be adjusted in real time. Central banks bought private sector securities and expanded their purchase programmes to include low-rated paper. Working with fiscal authorities, central banks also funded businesses directly, expanding their balance sheets faster than in the GFC.

Yet even this Covid-19 crisis had a silver lining. Thanks to the post-GFC reforms, banks entered it in much better shape: more strongly capitalised and less exposed to funding strains. Thus, they were better placed to channel funds to the corporate sector, especially to smaller firms. In addition, financial authorities eased some regulatory requirements, making it easier for banks to lend.

For their part, fiscal authorities acted promptly and on a massive scale, often providing the bulk of the response to support households and businesses. Acting within their mandates, central banks supported these actions by lowering interest rates, facilitating public debt financing, providing monetary stimulus, establishing funding programmes through banks, and keeping markets liquid.

The purpose of all these actions has been clear: to support economic activity, especially to help firms avoid insolvency and resume operations with limited damage, and so limit job destruction.

Central banks have been successful, but risks remain

In many of their aims, central banks have succeeded. Financial markets have stabilised, equity markets have quickly recovered, and spreads have narrowed again. The corporate sector has resorted to new issuance on a generous scale. Even so, many challenges lie ahead.

Financial markets may have become too complacent – given that we are still at an early stage of the crisis and its fallout. The outlook for the world economy is still highly uncertain. At best, we have only just overcome the liquidity phase of the crisis in the countries that are now relaxing restrictions. In many others, the health crisis is still acute. And the epidemic could flare up again anywhere.

Importantly, the shock to solvency is still to be fully felt. In this stage, the heavy lifting is expected to come from fiscal authorities. Business insolvencies and personal hardship may well increase. When this happens, possibly triggered by cliff effects as initial fiscal support runs out and payment moratoriums expire, banks will find themselves in the eye of the storm.

Risks are especially high for emerging market and developing economies, which have already experienced a triple sudden stop: in domestic economic activity, in capital flows and, for several, in commodity exports and remittances. In many cases, weaker health systems and large informal sectors make matters worse. Their policy trade-offs are starker than those of most advanced economies, given tight external constraints and much more limited fiscal and monetary space. Above all, sovereign debt could be affected. Indeed, rating agencies have already started on a round of downgrades.

Many challenges ahead

As central banks respond to the crisis, they face many questions and trade-offs. Let me mention four.

First, when allocating funding, central banks have been forced to navigate within what is, in normal times, private sector territory. Venturing into new areas brings economic and political risks to the fore. For example, there may need to be painful but necessary downsizing in significant sectors. What is the most appropriate process for differentiating between viable and non-viable firms?

More generally, when central banks justifiably overstep boundaries that have traditionally defined their central roles, transparency may need to be enhanced and other safeguards put in place to ensure that their legitimacy is not eroded.

Second, with the crisis, interactions between monetary and fiscal policies have become even more prominent. Today, monetary and fiscal policies support each other. Central banks can lower interest rates, stabilise financial markets with liquidity support, and engage in quantitative easing and other unconventional monetary policy measures. For their part, fiscal authorities can provide stimulus.

In the process, central banks have smoothed the path for government finances. However, within the central bank mandate, this should only be a temporary expedient. Moreover, it should only be attempted by central banks with a credible record of accomplishment in adhering to their inflation mandates. Let us remember that these types of policy are only possible because of the credibility that monetary policymakers have built up over the years.

These actions, while necessary, may eventually threaten central bank independence and credibility. In particular, given the massive fiscal response and the significant increase in public debt that inevitably will follow, many voices will call for financing costs to be kept artificially low and to allow the inflation tax to shave the real value of sovereign debt, possibly supported by forms of financial repression. At the point when crisis management gives way to ensuring price stability, it will be critical that central banks remain independent to fulfil their mandates, and act in consequence.

Third, as soon as circumstances allow, central banks need to regain monetary policy space. Eventually inflation will come back. As the pricing power of firms and labour increases, supply-cost pressures will emerge, pushing up prices and possibly triggering second-round effects. Staying ahead of the curve will be essential, also because easy financial conditions will lead to greater vulnerabilities.

Finally, central banks need to continue to underpin financial stability. As regulators and supervisors, central banks must balance the use of buffers and the need to support the economy, with financial stability. Central banks also have to revisit the size and design of their financial

systems. For the second time in little over a decade, they have remedied the effects of vulnerabilities in non-bank parts of the financial system. They strengthened the banks post-GFC; now they need to help ensure that the non-bank financial sector optimally supports the real economy over the medium term.

Evolving payment systems require a solid foundation

Market dysfunction has been limited, despite the severity of this crisis. This shows that central banks perform essential anchoring roles for the monetary and financial system. This includes underpinning the resilience of financial market infrastructure and payment systems.

However, payment systems do present some longer-term challenges. Digital innovation is radically reshaping payment services. Technological advances have led to new payment methods and consumer interfaces. More recently, large non-bank providers have entered payment services. Some of these trends, such as contactless and online payments, have accelerated during the pandemic. These and many other innovations have reduced costs, improved convenience, and broadened access to payments.

However, technology can only do so much. As the issuers of money – which is, after all, the economy's unit of account – central banks have a key role to play in the provision of public goods. A key feature of payment systems is their two-tier structure: the private sector spearheads innovation, drawing on its ingenuity and creativity to serve customers better; and the central bank provides the solid foundation, primarily by enabling the finality of payments that settle on its balance sheet. As history indicates, and recent developments underline, the central bank's role is critical here as it underpins the public good aspects of the payment system for the economy at large.

Central banks have also embraced innovation in their roles as operators, catalysts and supervisors. In their role as operators, they provide public infrastructure, including access to central bank settlement accounts. They foster interoperability, by promoting standards and easy-to-use interfaces. This in turn helps to ensure a level playing field and so promote competition and innovation. In their role as supervisors, they boost efficiency by aligning private sector incentives and steering market structure towards the public good.

In addition, central banks have shown that they can themselves operate at the cutting edge of innovation, not least when directly providing services to the general public. This brings to mind central bank digital currencies (CBDCs). CBDCs could offer a new, safe, trusted and widely accessible means of payment. They could also spur continued innovation in payments, finance and commerce. If CBDCs are to fulfil their potential and promise as a new means of payment, their design and implications deserve close study and consideration. The BIS will continue supporting central banks in their CBDC research and design efforts, through the new BIS Innovation Hub, its committees, and broader analytical work.

Conclusion

Let me conclude.

Central banks have shown again their mettle when faced with a crisis, expanding their toolkit, reacting swiftly and forcefully to stabilise the financial system, and supporting credit flows to firms and households. In some cases, they have even adopted a wide array of prudential policy measures to buffer the impact of the shock. However, central banks are also fully aware of the challenges ahead. Some of these challenges extend beyond their mandate. Monetary policy alone cannot deliver higher sustainable economic growth in the context of price and financial stability. Growth-friendly fiscal policies and structural reforms continue to be urgently needed.

Fiscal policy could better support growth as well as financial stability. At the same time, it will

be essential to keep public finances on a sustainable long-term track. Structural reforms are vital as well. As damaging as it is, this crisis could be an opportunity to implement growth-boosting economic policies. Given that their resources are limited, governments should prioritise investment in sustainable growth – for instance, by fostering energy transitions to address climate change risks.

Global cooperation will continue to be of the essence, particularly in the rapid provision of large-scale liquidity facilities. International cooperation is also required to address longer-term problems such as the cost of cross-border payments, and to address the increased risks in the global financial system. Certainly, this will keep us busy in the years to come and the BIS will stay as relevant as ever.

Let me now hand over to Claudio Borio and Hyun Song Shin, who will elaborate on some of these issues and the special chapter of our Annual Economic Report.

IMI International Monetary Review

The Central Bank Balance Sheet as a Policy Tool: Past, Present and Future*

By ANDREW BAILEY*

Introduction

It's a great pleasure to be participating in the virtual Jackson Hole conference. Well done to the Kansas City Fed for keeping up the tradition – albeit we have to imagine the beauty of Jackson Hole is around us.

A tradition of the Jackson Hole conference is to encourage us to look forwards. This time is not only an opportunity to do just that, but in doing so to apply the lessons of the last few months, as well as the last decade or so since the financial crisis of 2007-09. I am going to do that through the lens mainly of monetary policy, but bringing in financial stability where relevant, with a particular focus on central bank balance sheets. My remarks are a summary of a paper being released today. It isn't a review of the record of monetary policy or the framework of policy, but it does cover a good deal of recent evidence and experience. The paper, and my remarks today, focus on the UK case, drawing on lessons from international experience.

Drivers of central bank balance sheets since the Global Financial Crisis

I will start with some brief scene setting points – apologies that they are pretty obvious ones, but they are important. There has been a large and sustained expansion of most central bank balance sheets in the past decade. This has come about in support of both monetary policy and financial stability objectives. These respective drivers of balance sheet growth are closely intertwined – never more so than in the response to the Covid crisis – but distinguishing the causes and consequences is important nonetheless.

Starting with financial stability, the Global Financial Crisis revealed banks had previously held insufficient high quality liquid assets, in part due to the inadequacy of the prudential regulation regime at the time. The changes since then, in regulation and in banks' approach to managing risk, have resulted in a significant increase in the demand for central bank reserves, a large part of banks' stock of high quality liquid assets. Thus, the level of reserves required by the banking systems in the major economies is persistently higher, though it is not straightforward to determine exactly how much higher. That depends on a number of factors that can change over time.

Second, monetary policy has also undergone a major shift over the past decade, towards using central bank balance sheets as a tool to provide monetary stimulus, through the purchase of assets, usually government debt.

These two reasons for increasing the size of central bank balance sheets coincided in time – i.e. the post- crisis response of regulation coincided with the greater use of quantitative easing. But it is nonetheless helpful to separate them analytically. A decade ago there would have been reason to think that the monetary policy need for increased central bank balance sheets would be shorter term, while the financial stability demand would be permanent. That distinction still stands, but the structural drivers of low equilibrium interest rates suggest the use of central bank balance sheets for monetary policy will be more long-lived than had been anticipated.

*This speech was given at Jackson Hole Economic Policy Symposium, 28 August 2020.

*Andrew Bailey, Governor of the Bank of England

Expansion of central bank balance sheets in response to Covid

Turning to the more recent period, the financial stability and monetary policy drivers of central bank balance sheet expansion were again deeply intertwined. Central banks faced an incipient financial stability shock together with a need for monetary policy to respond to an unprecedented – in scale and speed – economic downturn.

But the financial stability emergency differed from previous such events. The problem originated not primarily in the banking system, but in the non-bank sector – among funds, traders and corporates themselves. Central banks activated their traditional tools to inject liquidity into the banks via repo operations, and these played an important part in stabilising conditions. But they were not sufficient to get liquidity to non-banks quickly enough, or in sufficient scale. That also required large and aggressive asset purchase operations, what we call in the paper "go Big" and "go Fast". I am not going to say more on this, save that it raises very important points about market structures, the extent of self-insurance against liquidity shocks by non-banks, and the nature of central bank interventions. This is the subject of a review currently being undertaken by the Financial Stability Board.

The Covid crisis called on central banks to act in what has been the first big test of the post financial crisis world. Monetary policy has had to respond to an unprecedented shock. For many central banks, the main tool to date has been further Quantitative Easing, in unprecedented scale and pace of purchases. This has inevitably rekindled questions about exactly how QE works and whether its effectiveness is conditional on the state of the economy and the financial system – to what extent is its effectiveness state contingent? Moreover, looking across monetary policy and financial stability, it has re-emphasised the importance of central bank balance sheets as a direct tool of policy intervention, rather than primarily a passive by-product of the activity of setting the price of money and meeting the demand for reserves to satisfy the liquidity needs of the banking system.

So what is our latest thinking on the effects of QE and how it works? Viewed from the depth of the Covid crisis, QE worked effectively. Measuring this effect precisely is of course hard, since we cannot easily identify what the counterfactual would have been in the absence of QE. But QE clearly acted to break a dangerous risk of transmission from severe market stress to the macro-economy, by avoiding a sharp tightening in financial conditions and thus an increase in effective interest rates.

QE is normally thought to work through a number of channels: including signalling of future central bank intentions and thus interest rates; so called 'portfolio balance' effects (i.e. by changing the composition of assets held by the private sector); and improving impaired market liquidity.

The Monetary Policy Committee's decision on QE in March differed somewhat from previous rounds of purchases. A larger amount of purchases, £200bn, was announced as this was judged as necessary to support economic activity and ensure a sustainable return of inflation to target. And the purchases were to "be completed as soon as is operationally possible" to address the emerging financial market dysfunction.

In the paper we draw two lessons from the experience. First, it reminds us that the effect of QE can be state contingent. Consistent with that, second, the pace of QE purchases may be more important during a period of market dysfunction associated with a widespread shock to liquidity demand. Indeed, when the MPC voted to expand QE further in June, in more normal market conditions, the pace of purchases was reduced.

Standing back from the Covid crisis, and looking at the UK case, there indeed is some evidence that the impact of QE over the past decade has been largest at times of market dysfunction and

illiquidity. Of course the available event studies are very few in number. But, if this result proves robust, it suggests that "going big and fast" with QE is particularly effective in these conditions.

I should stress that while the liquidity channel of QE appears to have been particularly relevant in terms of impact at a time of market dysfunction, such as that observed in March, the different channels of QE impact are by no means mutually exclusive. It seems likely that each channel operates to at least some extent most of the time, with all of them affecting long-term interest rates and thus economic activity and inflation.

But this need not suggest that all the channels are equally powerful and persistent in all states of the world.

Implications for the future

What does this mean for central bank balance sheets looking forwards? Again, two points stand out, though I should emphasise their tentative nature. First, a balance sheet intervention aimed solely at market functioning is likely to be more temporary, in terms of the duration of its need to be in place. To be clear, the asset purchases announced by the MPC in March were a response to much more than just market functioning, in terms of the effects of Covid on the outlook for the economy and inflation. Second, if the effects of QE are more powerful in crisis states of the world, we may need to ensure that we have enough headroom in the future to repeat it. The determinants of QE unwind may therefore be more subtle than previously thought, and the Covid crisis offers a new lens through which to assess its role.

This leads to what may be regarded as the most speculative of the conclusions, but it strikes me as important as we look to the decade ahead. It follows from the state contingent nature of the effects of QE, and the argument for going "big and fast" in such situations, that the central bank balance sheet may have more of a counter-cyclical role and function than the evidence of the last decade alone would suggest, at least in certain circumstances. We need to work through what lessons this may have for the appropriate future path of central bank balance sheets, including the pace and timing of any future unwind of asset purchases. But one conclusion is that it could be preferable, and consistent with setting monetary conditions consistent with the inflation target, to seek to ensure there is sufficient headroom for more potent expansion in central bank balance sheets when needed in the future – to "go big" and "go fast" decisively.

That begs questions about when does the need for headroom become an issue? What are the limits? One way of looking at these questions is in terms of the stock of assets available for purchase. There is currently a large outstanding stock of government bonds which could be purchased. And if the state contingent effects of QE are driven by the need for holders of safe assets to exchange them for deposits, then it must always be possible for the central bank to purchase more assets. In other words, the central bank would need to own a high proportion of safe assets for that to become a constraint. But if negative shocks continue to arrive from time to time before any reversal of the stock of asset purchases takes place, and hence the stock owned by the central bank continues to rise, the odds of this situation arising go up. This effect may become more likely if the equilibrium real interest rate remains low for a prolonged period.

Expanding the range of assets purchased is another way for central banks to create more headroom. The Covid crisis has seen a further broadening of the range of assets that central banks stand ready to purchase. In part, this has reflected another objective of central banks and governments, given the scale of the crisis and its economic effects, namely to direct and target funds to the corporate sector, and thus supplement the more normal role of banks and financial markets. But it also reflected a need to act on a broad front in terms of ensuring liquidity gets to the places where it is needed. Where that requires larger purchases of a broader array of assets, it inevitably raises risk management questions for central banks.

So, I think the Covid crisis has demonstrated the need to ensure central banks have as many tools as possible in their box, of which expanded purchases of private sector assets is one, but given the issues it raises I would emphasise state contingency here in terms of when some tools may be more appropriate or necessary, given the severity or particular nature of the circumstances at the time.

The MPC has considered its prospective approach to QE unwind in recent years, and in June 2018 set out that the balance sheet would be unwound at a gradual and predictable pace, allowing reserves to fall back to a level demanded by banks through their participation in regular repo operations, and once the Bank Rate had risen to around 1.5%, thus creating more headroom for the future use of Bank Rate both up and down. The MPC keeps this approach under review, though I should make clear that it does not seem like an imminent issue in current conditions. But we are looking at the next decade at this conference, so who knows what will happen. We should keep the options to use all our tools as open as possible, so I would conclude that the appropriate policy mix going forwards over a decade may be more nuanced than previously thought. Either way, our actions will be guided by our remit of achieving low inflation with financial stability.

Conclusion

The Covid crisis to date has demonstrated that QE and forward guidance around it have been effective in a particular situation. It emphasises that we remain in a world where the choice of tool to use is more important than it has been at times in the past. And there is more nuance and flexibility within tools – thus, while QE relies more on stock effects when used in normal times, in a case of extreme market dysfunction the flow effect of the liquidity channel may come to prominence.

The MPC has moved on from that approach as market conditions have eased. In June we increased the stock of QE purchases, but at a slower pace. And in August we introduced forward guidance, stating that the Committee does not intend to tighten monetary policy until there is clear evidence that significant progress is being made in eliminating spare capacity and achieving the 2% inflation target sustainably. This important step is intended to ensure monetary conditions do not tighten prematurely when there are some initial signs of an economic recovery.

We also made clear that our box does include other tools, including the possibility of negative rates. We have used private sector asset purchases through the corporate bond programme, longer-term liquidity provision to banks with targeted lending incentives, and direct purchasing of newly issued commercial paper to supplement market-based lending channels. We are not out of firepower by any means, and to be honest it looks from today's vantage point that we were too cautious about our remaining firepower pre-Covid. But, hindsight is a wonderful thing when you have it.

In the decade ahead, I think we need to take on board the message the Covid crisis has reiterated, namely that our tools may be state contingent in their effects. And with that in mind, let's not ignore the need to manage central bank balance sheets to enable such state contingency to take effect. There are times when we need to go big and go fast.

Thank you.

IMI International Monetary Review

Monetary Policy in the Context of COVID-19*

By TIFF MACKLEM*

Introduction

Good morning. I am very pleased to be with you for my first public event as Governor of the Bank of Canada. The COVID-19 pandemic has upended many of our ways of doing things, including speaking in person to large groups. Fortunately, we can take advantage of technology so I can speak to every Canadian club and cercle canadien, and hear directly from your members right across the country. Thank you for the invitation.

COVID-19 is a human tragedy that has precipitated an economic catastrophe, the likes of which we have not experienced in our lifetimes. Entire sectors of the economy have been shuttered. More than 3 million people lost their jobs through April, while another 3.4 million were working less than half of their usual hours.

The pandemic is challenging millions of Canadians. It also poses challenges for those involved in setting economic policy. For roughly 30 years, Canada has been well served by monetary policy based on inflation targeting. Through this economic crisis, the inflation target remains our beacon. But structurally low interest rates and the scale of the COVID-19 shock are having a profound impact on how we implement our monetary policy framework.

Before we get to the question and answer period, I want to talk about the essential ingredients of this framework and the ways that the pandemic is affecting how we operate. I only have time to skim over some of these topics, so I hope we can have a fuller discussion later on.

The right framework

Our monetary policy framework is designed to deliver low, stable and predictable inflation. This is the best contribution we can make to Canada's economic welfare. That's because low, stable and predictable inflation lays the foundation for sustainable economic growth. And keeping inflation near to its target means the economy is running close to capacity with full employment.

It's important to note that our framework is set out in an agreement established with the government and renewed every five years. This sends an important signal that the democratically elected government and the Bank agree on our policy goal. And it gives the Bank the operational independence to pursue that goal. This enhances our credibility and gives Canadians more confidence that we will achieve the inflation target. We now have an established track record of success with inflation targeting, which reinforces its effectiveness.

As I said, the inflation target is really a beacon to guide our policy. By grounding our actions in our framework, we will always be working toward bringing the economy near capacity with full employment.

Policy and the pandemic

A successful inflation-targeting monetary policy framework has a number of core ingredients. Clearly, we need to agree on a measure of inflation to target. We need to assess how much demand is in the economy relative to its productive capacity or supply. We need tools to influence demand, or spending, and bring it in line with supply. We also need an outlook for the economy because it

*Remarks by Mr Tiff Macklem to the Canadian clubs and cercles canadiens, Ottawa, Ontario, 22 June 2020.

*Tiff Macklem, Governor of the Bank of Canada

takes time for our tools to affect spending and inflation. And because there are many unknowns, we need an understanding of the risks to the outlook.

These are the basic ingredients of inflation targeting. And COVID-19, combined with structurally low interest rates globally, is affecting all of them.

A measure of inflation

Let's start with our measure of inflation. Our target is the 12-month rate of change in Statistics Canada's consumer price index (CPI)-the most common and comprehensive inflation measure out there. We target the 2 percent midpoint of a 1 to 3 percent range for the annual inflation rate. But in any given month, the CPI can be quite volatile and not reflect its long-term trend. That's because prices of items such as fresh fruit and vegetables or gasoline can jump around a lot, affecting the CPI. So, we look at several specific measures of core inflation to get a better sense of the underlying trend in inflation.

Total CPI is weighted to reflect the buying patterns of the average Canadian household. In normal times, for example, Canadians spend a lot more on gasoline than on alcohol, so gasoline has a larger weight in the index.

But these aren't normal times. Because of the pandemic, Canadians are spending much less on gasoline and air travel, and more on food purchased from stores. And until very recently, they weren't spending anything on haircuts. The implication is that the CPI isn't fully reflecting people's current inflationary experience. Bank staff have been working with Statistics Canada to better understand the implications of these shifts in spending patterns. As the economy reopens, many of these shifts will unwind. We will be working to look through temporary shifts while capturing any more enduring changes.

Supply and demand

The pandemic has also greatly complicated supply and demand. To see how, let's first consider the economy's capacity to produce goods and services. At the onset of the pandemic, Canadians were subject to necessary and strict containment measures to slow the spread of the coronavirus. Physical distancing practices and stay-at-home orders quickly made some types of work impossible. Most non-essential workplaces were closed, putting a stop to many jobs that cannot be done remotely. This resulted in a massive decline in supply.

Now, containment measures are being lifted, and this is restoring some degree of supply. However, continued physical distancing may mean workplaces cannot be as productive and many services will be very difficult to deliver. Further, the reopening is happening unevenly across the country, across industries and around the world. This will disrupt supply chains and affect both the volume and the prices of our exports. The coronavirus may lead to lower levels of immigration, limiting workforce growth. More generally, some industries won't reopen until we have a vaccine or at least very effective anti-viral medications. This suggests the economy's productive capacity will take a hit that will persist even after the containment measures are lifted.

On the demand side, consider the millions of Canadians who have either lost their jobs or seen their hours scaled back. This represents a very large drop in spending power across the economy. Fortunately, the government's fiscal measures have been scaled to replace the labour income lost throughout the economy, laying the foundation for recovery.

But spending has fallen sharply since the pandemic hit. As Deputy Governor Larry Schembri pointed out in a speech last week, this is not only because there have been fewer things to buy, but also because there has been a sharp drop in consumer confidence. Until people are back at work and feel more confident, they will remain cautious with their spending.

It will be crucial to understand how much supply and demand have been damaged by COVID-19, and how both will recover in the coming quarters. As the economy reopens, we should see very strong job growth. We should also see some pent-up demand giving a boost to spending. But not everyone's job will come back, and uncertainty will linger. As a result, we expect the quick rebound of the reopening phase of the recovery will give way to a more gradual recuperation phase, with weak demand. If, as we expect, supply is restored more quickly than demand, this could lead to a large gap between the two, putting a lot of downward pressure on inflation. Our main concern is to avoid a persistent drop in inflation by helping Canadians get back to work.

Policy tools

Let me now turn to our monetary policy tools. In normal times, we deliver or withdraw stimulus as needed by adjusting our target for the overnight interest rate. That one-day interbank interest rate generally doesn't affect consumers directly, except those with variable-rate mortgages. But changes in the overnight rate affect borrowing costs further out on the yield curve, which is where most consumers and businesses borrow.

At the onset of the pandemic, we could see that there would be a huge hit to confidence. So, back in March, the Bank rapidly lowered our policy interest rate to 0.25 percent. This action was not really expected to boost spending in the early days of the pandemic. Its immediate purpose was to help support confidence and provide some interest rate relief. But as more retail businesses reopen, low interest rates will help support spending.

The policy rate is now at its effective lower bound. Some central banks have taken their policy rates below zero. We feel that bringing that rate into negative territory could lead to distortions in the behaviour of financial institutions. However, the Bank has a number of other tools we can use to help stimulate demand.

The Bank has launched a series of purchase programs that involve buying different types of assets. We have launched programs to buy Canada Mortgage Bonds, commercial paper, bankers' acceptances, corporate bonds, and provincial and federal government debt.

We introduced these programs to make sure that key markets would function properly, and that credit would continue to flow. Credit is the lifeblood of market-based economies. During a crisis, it is imperative that central banks maintain access to credit in order to avoid a credit crunch.

When markets aren't functioning properly, the ability of monetary policy to provide stimulus also breaks down. But financial markets are now working considerably better. With this improvement, our asset-purchase programs are becoming a source of monetary stimulus.

The Bank has committed to buying at least $5 billion of Canadian government bonds a week until the recovery is well underway. As these large-scale asset purchases build up, they are delivering stimulus through a process that is often called quantitative easing, or QE.

Here's how it works. Purchases of government bonds help to lower their yields. With funding markets now functioning properly, our weekly purchases also make borrowing cheaper for households and businesses. For example, as our purchases lower the yield on five-year government bonds, this is being reflected in cheaper fixed-rate mortgages.

QE can also send a signal that our policy interest rate is likely to remain low for a long period. By giving more certainty about the path of short-term interest rates, this can help lower longer-term borrowing costs for households and businesses.

The Bank is also buying private assets, including corporate bonds. We started these purchases of corporate bonds because of strains in this market. To date, purchases have been limited, but market conditions have improved. This type of program also provides stimulus by providing liquidity, helping to narrow the difference between corporate and government bond yields. By

reducing the premium that corporations have to pay relative to governments, we are lowering interest rates for businesses. This is often called credit easing, or CE.

At our last interest rate announcement, on June 3, we indicated that with market functioning improved and containment restrictions easing, our focus is shifting to supporting output and employment. We also reiterated our commitment to continue large-scale asset purchases until the economic recovery is well underway. With market functioning restored, these purchases are working through more channels to deliver stimulus. Any further policy actions would be calibrated to provide the necessary degree of monetary policy accommodation required to achieve the inflation target.

Outlook and risks

The pandemic has created a fog of uncertainty, and this has greatly complicated our ability to generate a clear outlook for growth and inflation. The course of the coronavirus is the biggest source of uncertainty. Beyond that, we don't know how global trade and supply chains will evolve, or what will happen with domestic supply and demand. We don't know how consumer and business confidence will rebound, or whether the pandemic will lead to lasting changes in savings and spending habits.

With the economy at least stabilizing, we are starting to get some line of sight, and as more data arrive, we can begin to answer some of these questions. In our July Monetary Policy Report, we expect to be able to provide a central planning scenario for output and inflation, with a discussion of the main risks around that scenario. Going forward, we will assess incoming information relative to that scenario.

Currently, we expect growth to resume in the third quarter. The economy will get an immediate boost as containment measures are lifted, people are called back to work, and households resume some of their normal activities. But it will be important not to assume that these growth rates will continue beyond the reopening phase. The pandemic is likely to inflict some lasting damage to demand and supply. The recovery will likely be prolonged and bumpy, with the potential for setbacks along the way.

The message I want to leave you with is that while we are using different tools in these extraordinary times, our policy remains grounded in the same framework. The inflation target is our beacon that is guiding our actions as we help bring the economy from crisis, through reopening, to recuperation and recovery.

With that, let me stop and open the floor to your questions. I look forward to a good discussion.

IMI International Monetary Review

Digital Economy

An Update on Digital Currencies*

By LAEL BRAINARD*

It is a pleasure to participate in San Francisco's Innovation Office Hours. The Federal Reserve Bank of San Francisco is a leader of our engagement with the tech community. And the Federal Reserve's Innovation Office Hours serve as an important forum to engage on innovation in the financial system with financial institutions, fintechs, technology companies, nonprofits, and other stakeholders. We have benefited from learning about the work you are doing to promote healthy innovation in financial services and payments. This event covered a number of important topics, including regulatory technology, blockchain, cybersecurity, and digital banking. The breadth of topics and the range of participants speak to the scale and scope of technological innovation in financial services. It is a testament to widespread investments in technology that we are able to proceed with these kinds of engagements and maintain our operations seamlessly despite the unprecedented shock associated with the COVID-19 crisis.[1]

The COVID-19 pandemic is taking a tremendous toll on communities across America, especially households and small businesses with the least resources to weather the storm.[2] The COVID-19 crisis is a dramatic reminder of the importance of a resilient and trusted payments infrastructure that is accessible to all Americans. It was notable that after a sharp reduction in spending early in the COVID-19 crisis, many households increased their spending starting on the day they received emergency relief payments under the Coronavirus Aid, Relief, and Economic Security Act (CARES Act) and continuing for the following 10 days–especially households with lower incomes, greater income declines, and lower liquid savings.[3] The urgency with which the CARES Act emergency payments were spent underscores the importance of immediate and trusted access to funds for the many households and businesses that face cash-flow constraints. That is why the Federal Reserve remains committed to delivering on the FedNowSM Service, which will enable millions of American households and small businesses to get instant access to funds rather than waiting days for checks to clear.[4]

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*This speech was given at Federal Reserve Board and Federal Reserve Bank of San Francisco's Innovation Office Hours on August 13, 2020.

*Lael Brainard, Member of Board of Governors of the Federal Reserve System

[1]I am grateful to David Mills and Paul Wong as well as Melissa Leistra, Sonja Danburg, and Kathy Wilson of the Federal Reserve Board for their assistance in preparing this text. These remarks represent my own views, which do not necessarily represent those of the Federal Reserve Board or the Federal Open Market Committee.

[2]For information on the impact of COVID-19 on communities around the country, see Federal Reserve System, FedListens: Perspectives from the Public (Federal Reserve System, June 2020), https://www.federalreserve.gov/publications/files/fedlistens-report-20200612.pdf; and Claire Kramer Mills and Jessica Battisto, "Double Jeopardy: COVID-19's Concentrated Health and Wealth Effects in Black Communities, Federal Reserve Bank of New York," Brief (Federal Reserve Bank of New York, August 2020).

[3]Baker, Farrokhnia, Meyer, Pagel, and Yannelis (2020) examine a panel of households using a financial planning app and find that these households responded quickly to CARES Act stimulus payments; see Scott R. Baker, R.A. Farrokhnia, Steffen Meyer, Michaela Pagel, and Constantine Yannelis, "Income, Liquidity, and the Consumption Response to the 2020 Economic Stimulus Payments," NBER Working Paper Series 27097 (Cambridge, MA:National Bureau of Economic Research, May 2020), https://www.nber.org/papers/w27097.

[4]See Lael Brainard, "The Future of Retail Payments in the United States" (remarks at the FedNow Service Webinar, Washington, D.C. (via webcast), August

More broadly, banks, fintech companies, and technology firms are all exploring the use of innovative technologies to enhance payments efficiency, expand financial inclusion, speed up settlement flows, and reduce end-user costs. Digital currencies, including central bank digital currencies (CBDCs), present opportunities but also risks associated with privacy, illicit activity, and financial stability. The introduction of Bitcoin and the subsequent emergence of stablecoins with potentially global reach, such as Facebook's Libra, have raised fundamental questions about legal and regulatory safeguards, financial stability, and the role of currency in society. This prospect has intensified calls for CBDCs to maintain the sovereign currency as the anchor of the nation's payment systems. Moreover, China has moved ahead rapidly on its version of a CBDC.

With these important issues in mind, the Federal Reserve is active in conducting research and experimentation related to distributed ledger technologies and the potential use cases for digital currencies. Given the dollar's important role, it is essential that the Federal Reserve remain on the frontier of research and policy development regarding CBDCs. As part of this research, central banks are exploring the potential of innovative technologies to offer a digital equivalent of cash. Like other central banks, we are continuing to assess the opportunities and challenges of, as well as the use cases for, a CBDC, as a complement to cash and other payments options. There continues to be strong demand for U.S. currency, and we remain committed to ensuring the public has access to a range of payments options.

We have been conducting in-house experiments for the last few years, through means that include the Board's Technology Lab, which has been building and testing a range of distributed ledger platforms to understand their potential opportunity and risk. This multidisciplinary team, with application developers from the Federal Reserve Banks of Cleveland, Dallas, and New York, supports a policy team at the Board that is studying the implications of digital currencies on the payments ecosystem, monetary policy, financial stability, banking and finance, and consumer protection.

To enhance the Federal Reserve's understanding of digital currencies, the Federal Reserve Bank of Boston is collaborating with researchers at the Massachusetts Institute of Technology in a multiyear effort to build and test a hypothetical digital currency oriented to central bank uses. The research project will explore the use of existing and new technologies as needed. Lessons from this collaboration will be published, and any codebase that is developed through this effort will be offered as open-source software for anyone to use for experimentation.

The objectives of our research and experimentation across the Federal Reserve System are to assess the safety and efficiency of digital currency systems, to inform our understanding of private-sector arrangements, and to give us hands-on experience to understand the opportunities and limitations of possible technologies for digital forms of central bank money. These efforts are intended to ensure that we fully understand the potential as well as the associated risks and possible unintended consequences that new technologies present in the payment's arena.

Separately, a significant policy process would be required to consider the issuance of a CBDC, along with extensive deliberations and engagement with other parts of the federal government and a broad set of other stakeholders. There are also important legal considerations. It is important to understand how the existing provisions of the Federal Reserve Act with regard to currency issuance apply to a CBDC and whether a CBDC would have legal tender status, depending on the design. The Federal Reserve has not made a decision whether to undertake such a significant policy process, as we are taking the time and effort to understand the significant implications of digital currencies and CBDCs around the globe.

In addition to these experiments, the Federal Reserve continues to collaborate with and learn from other central banks. We are participating in the CBDC coalition of central banks. While each

6, 2020), https://www.federalreserve.gov/newsevents/speech/files/brainard20200806a.pdf.

country will make decisions on whether to issue and how to design a CBDC based on its own domestic legal framework and financial and economic context, we benefit from collaboration on CBDC research. Sharing lessons learned, jointly conducting experiments, and bringing diverse expertise to bear helps us make progress in developing potential approaches to address challenging hurdles, such as threats to cybersecurity, counterfeiting and fraud, and anti-money laundering, to name a few, as well as on shared goals, such as increasing the ease and efficiency of cross-border transactions. Since financial and payments systems share extensive cross-border linkages, a poorly designed CBDC issued in one jurisdiction could create financial stability issues in another jurisdiction. A cyberattack on a CBDC arrangement in one jurisdiction could create domestic financial stress, which could, in turn, affect linked economies or have broader effects if confidence in certain technologies or payment mechanisms is eroded.

More broadly, the Federal Reserve looks forward to increased international engagement on matters related to innovation and technological change that impact central banks and those we serve. Our new initiative with the Bank of International Settlement's Innovation Hub, through an innovation center at the Federal Reserve Bank of New York, will provide a useful venue for increased cooperation and exchange.[5]

Let me conclude by noting that innovation is central to our work. We remain committed to understanding how technological advances can help the Federal Reserve carry out our core missions, as well as how they are changing the ways that banks, payments, and financial markets operate. For example, we are leveraging machine learning, natural language processing, and other artificial intelligence tools to help us analyze data, and we are monitoring how financial institutions use these tools in their decision-making. We are expanding our use of cloud computing to enhance our operations, and we continue to enhance our cybersecurity tools to strengthen our cyber posture. These and other technologies are fundamentally changing every aspect of our work, and the Federal Reserve remains optimistic about the power of healthy innovation to improve the resilience, efficiency, and inclusiveness of our financial system when the appropriate safeguards are in place.

[5]Bank for International Settlements, "BIS Innovation Hub to Expand to New Locations in Europe and North America," news release, June 30, 2020, https://www.bis.org/press/p200630a.htm.

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Central Banks and the New World of Payments*

By HYUN SONG SHIN*

Introduction

This year's Annual Economic Report has a special chapter on "central banks and payments in the digital era". It follows in the footsteps of the chapters on cryptocurrencies and on big tech in finance in the previous two years. If you recall, those two chapters focused on what digital innovation meant for the nature of money and the payment system. There is also a strong technology theme this year, but our focus is broader. The special chapter this year highlights the central bank's role in the payment system.

Over the centuries, the institutional arrangements underpinning money and the payment system have evolved to keep pace with the changing needs of the day. Technology has carried us a long way on this journey, but the key theme of the chapter is that technology by itself is not sufficient to put in place a fast, efficient and cost-effective payment system. The underlying economics and the nature of competition in the payment system are important too. The good news is that new technology will help central banks put the pieces together more easily.

Before going into the details, I should put my remarks in the context of the pandemic, which, as Agustín notes, is a defining moment for the global economy.

Payments amid the pandemic

We chose the topic for the special chapter well before the pandemic, but the pandemic has served to highlight the importance of some of the main themes in the chapter. The crisis has highlighted how financial services need to be more inclusive and accessible in order to spur the recovery, and the central bank has an important role to play.

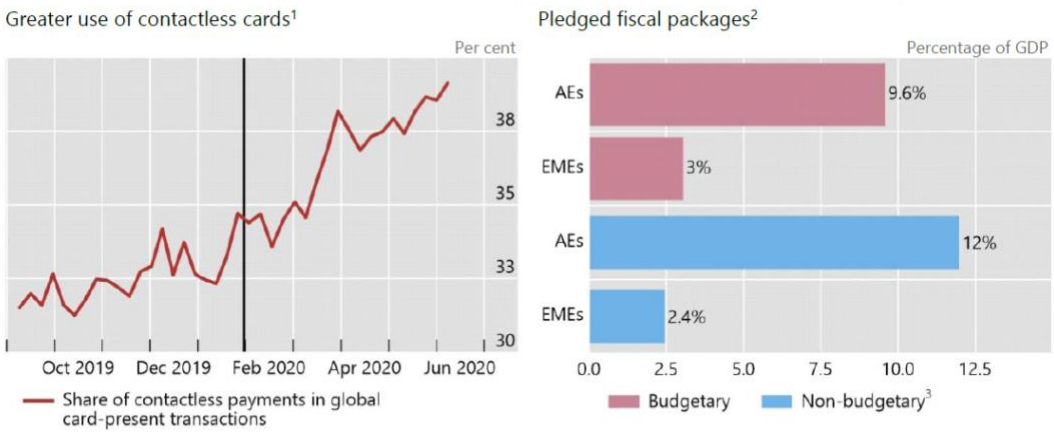
In some respects, the pandemic has accelerated trends that were already under way. One example is the use of contactless payments at the physical point of sale, such as in shops (Graph 1, left-hand panel). Both contactless payments, and remote payments for online transactions, were rising before the pandemic, but the pandemic has given them further impetus. Also worth noting is the use of cash. Its use for transactions has fallen, but the precautionary holding of cash has gone up. This is broadly consistent with past episodes of economic uncertainty.

One very important issue is the efficiency and timeliness of disbursement of government fiscal support to individuals and small businesses that have suffered most from the pandemic. As this slide shows (Graph 1, right-hand panel), governments around the world have reacted swiftly to put in place fiscal support measures, including direct transfers to households. Announced budgetary measures add up to 10% of GDP in advanced economies and 3% of GDP in emerging market economies. Funding and guarantees come on top on this, and they are of comparable magnitudes to budgetary measures.

*This speech was given on the occasion of the Bank's Annual General Meeting in Basel, 30 June 2020

*Hyun Song Shin,Economic Adviser and Head of Research of the BIS

Payments amid the pandemic Graph 1



The black vertical line in the left-hand panel indicates 30 January 2020, when the World Health Organization (WHO) declared the Covid-19 outbreak a "public health emergency of international concern".

[1] In many countries, transaction limits for contactless payments were raised in Q2 2020. [2] Estimates focus on government discretionary measures that supplement existing automatic stabilisers, which differ across countries in their breadth and scope. Advanced economies (AEs) = AU, CA, DE, ES, FR, GB, IT, JP and US; emerging market economies (EMEs) = AR, BR, CN, ID, IN, KR, MX, RU, SA, TR and ZA. For regions, weighted averages based on GDP and PPP exchange rates. [3] Includes equity injections, asset purchases, loans and debt assumptions and guarantees on loans and other contingent liabilities such as loans channelled through public financial agencies.

Sources: IMF, *Fiscal Monitor*, April 2020 and update June 2020; IMF, *World Economic Outlook*; a global card network; BIS calculations.

However, actually reaching the affected people has been another matter. Some countries have been able to harness technology to reach those in need swiftly – for example, through disbursement into e-wallets and direct payments to bank accounts. But the record has been mixed.

Shortcomings in payments

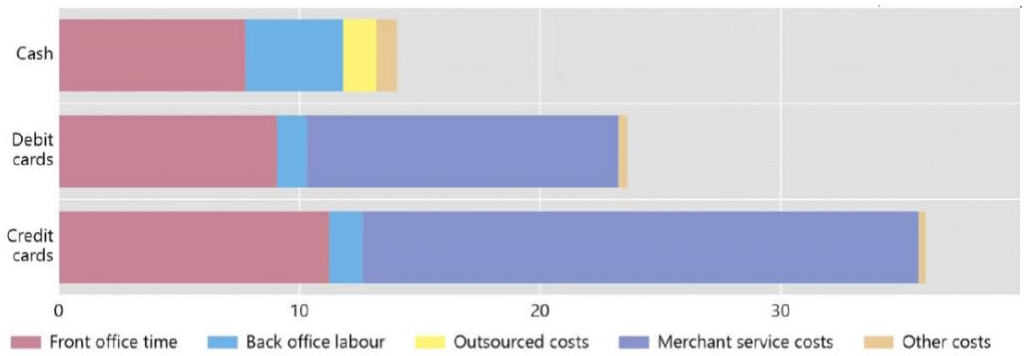
One problem is that not all those affected have access to bank accounts. And in some cases, even those who do have bank accounts have to wait for paper cheques to arrive in the post. In the future, central bank digital currencies, or CBDCs, could be a means of expediting this type of payment – I'll get to that later. All of this shines a light on the importance of the issues discussed in the special chapter.

Another issue is the cost of payment services. For credit and debit cards, it is mostly retailers and merchants that bear the costs, through charges to the card networks and to the banks. These charges (Graph 2) are shown here in purple, from a European Commission survey. Consumers do not see these charges, but they can add up for the economy as a whole.

Merchant service costs are important for card payments[1]

Marginal cost, EUR cents

Graph 2



[1] Data for Europe (AT, BE, DE, ES, FR, GB, IT, NL, PL and SE), 2015. The graph reflects a scenario in which merchants were asked to assess fixed or variable costs for accepting cash, debit card and credit card payments for a €25 transaction over a three- to four-year time horizon.

Source: European Commission, *Survey on merchants' costs of processing cash and card payments*, March 2015.

The economics of the payments marketplace

Technology has certainly helped to lower costs. That is the good news. But technology cannot solve everything. The costs also have to do with the underlying economics, and the nature of competition in payment services.

Payment services are a good example of an industry with strong network effects. This means that the more other users flock to a particular platform, the more attractive it is for a new user to join that same network. Social media and messaging are good examples of network effects. As we discussed in the special chapter last year, big tech firms with existing customer bases have entered payment services by using their advantage in access to user data. Once they reach a dominant position, they can create bottlenecks for external competitors, or raise fees for retailers.

In this respect, network effects might be a mixed blessing for users. On the one hand, network effects can generate a virtuous circle of greater user participation, lower costs and better services. But if all this leads to greater market dominance that eventually reduces competition, then the users may ultimately end up being worse off.

Let me explain with the example of competition between two full-service department stores, rather like these two (Graph 3, left-hand panel). You can see that one of them has become much more popular than the other one. The two department stores offer the full range of goods, but once inside you cannot access the goods sold by the other department store. This is rather like competition between two payment platforms. To use a different analogy, closed networks that exclude competitors are rather like a walled garden: it's very nice inside at first, but once inside you're cut off from the outside world, and you may get trapped.

Illustrating the economics of the payments marketplace Graph 3

Department stores: a model for platform competition?

Basel's *Marktplatz*, an open marketplace

Source: BIS elaboration.

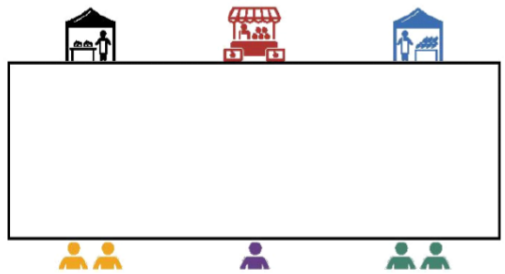
In contrast, imagine a town market that sets up on a public square – like the one on Marktplatz here in the centre of Basel, just in front of city hall (Graph 3, right-hand panel). Unlike the full-service department stores, when you are in an open market in the town square, a buyer can have access to all the sellers, without artificial barriers.

A marketplace, like the one below in Graph 4, brings together buyers and sellers (Graph 4, left-hand panel). The buyers come to the market because they expect sellers to be there, and sellers come and set up their stalls because they expect to find buyers there.

Shoppers enter, looking to buy cheese, which in turn makes the market more valuable to the sellers of cheese. The arrows indicate the mutually reinforcing nature of buyer and seller participation (Graph 4, right-hand panel). In the terminology of industrial organisation, there are strategic complementarities between buyers and sellers, where greater participation by one group brings greater participation by the other group.

The foundation of an open marketplace Graph 4

A market brings together buyers and sellers...



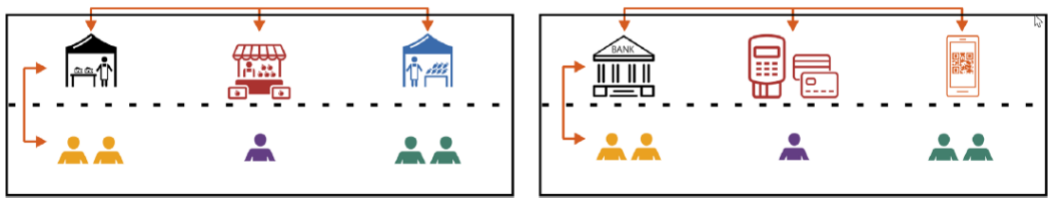
...with mutually reinforcing participation

Source: BIS elaboration.

The same effect holds for the buyers and sellers of fruit and vegetables, shown on the slide (Graph 5, left-hand panel). The sellers compete on the price and quality of their produce, and so you may think that sellers are worse off when there are many sellers. Importantly, this is a market for differentiated products, and buyers of cheese are also potential customers for vegetables. If buyers come for one good, but then also buy other goods, the sellers actually benefit from having each other in the same market.

An open market can support competition and innovation in payments Graph 5

There are also network effects between sellers... ...much like those between private PSPs



Source: BIS elaboration.

When the sellers provide differentiated products, the entry of new sellers can end up benefiting other sellers in spite of more competition. This is because they contribute to attracting more buyers. In this slide, the arrows at the top indicate the network effects between sellers.

These network effects mean that when all these buyers and sellers come to the market, they add to the bustling and vibrant nature of the market, which makes it attractive to other buyers and sellers to come. In this way, network effects generate a public good that benefits everyone. The strategic complementarities also hold between sellers, even though they compete against each other. What this means is that competition and a bustling market through better services can be made compatible.

Notice the contrast with the department stores. The important point is that the open market relies on rules and standards that preserve a competitive level playing field. The town square is a public space, where buyers and sellers can meet without artificial barriers. In return, the sellers have to stick to the standards laid down by the public authorities that allow the virtuous circle of greater participation and better services to take hold.

The analogy with the payment system is that the market stallholders are like payment service providers (PSPs) (Graph 5, right-hand panel), each offering their particular bundle of services that comes with basic payment functionality, such as e-commerce, messaging and social media. Just as the market stallholders have to stick to standards laid down by the town authorities, these payment service providers need to stick to various technical standards and data access requirements, including through open APIs, in order to allow a competitive level playing field. The key concept here is interoperability, where the services offered by payment service providers can "talk to" each other and work seamlessly for the user.

The role of central banks

In this context, the central bank can play the pivotal role as the operator of the underlying infrastructure, much as the town authorities operate the town market. It is the central bank that provides the public space through access to its settlement accounts. In that sense, the balance sheet of the central bank is a public space where the sellers of the payment services all interact.

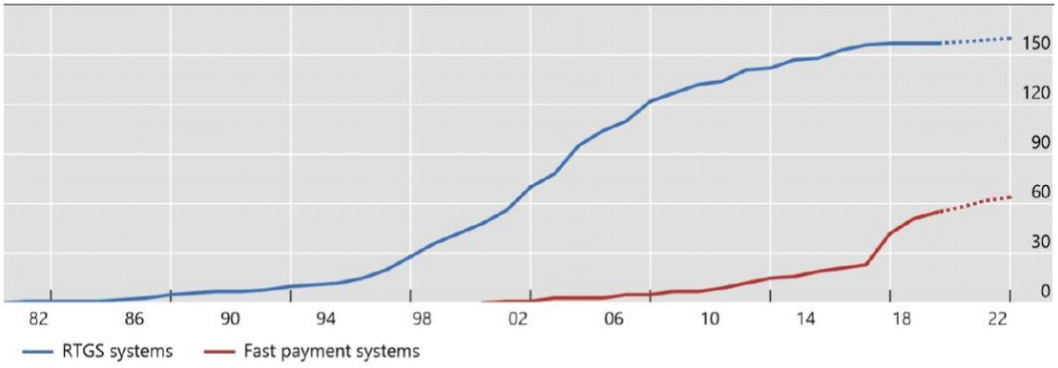
The central bank is well placed to play this role, as it issues money (which is, after all, the unit of account in the economy), as well as ensuring finality of payments through settlement on the central bank's balance sheet. Like the town market, the central bank can help safeguard this bustling payments marketplace, where the network effects can be channelled towards achieving a virtuous circle of greater participation, lower costs and better services.

This slide illustrates the role for the central bank as an operator of the underlying infrastructure (Graph 6, left-hand panel). As you see in the blue line, beginning in the 1980s central banks rolled out real-time gross settlement, or RTGS, systems for wholesale payments. These systems are now

very wellestablished. More recently, a growing number of central banks have played a key role in the development of retail fast payment systems, shown in the red line. Fast payment systems often allow settlement directly on the central bank balance sheet, or through public utilities overseen by the central bank. As you see in the red line, the diffusion of retail fast payment systems is following the same trajectory as the adoption of RTGS systems.

Diffusion of fast payments[1]

Number of countries Graph 6



[1] The dotted part of the lines corresponds to projected implementation.

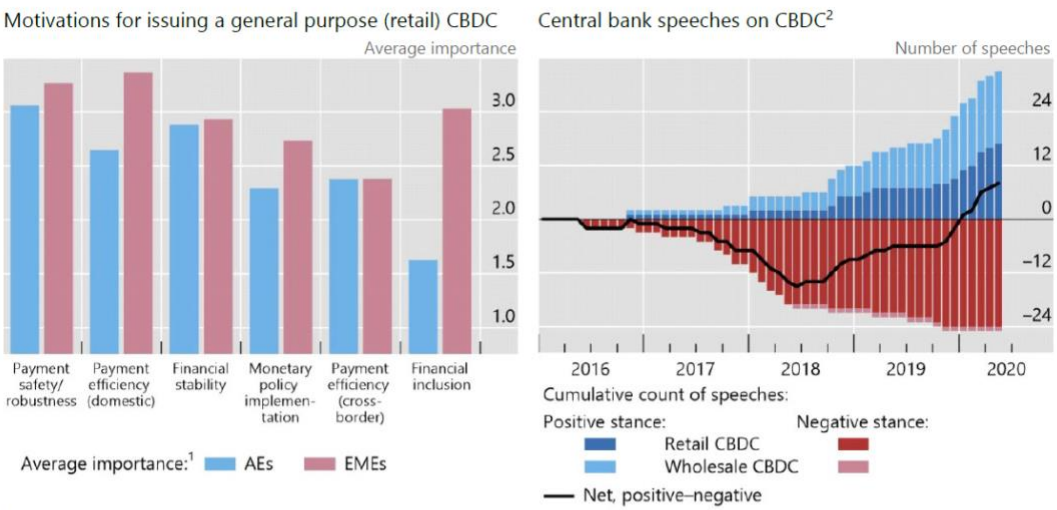
Sources: BIS, "Analysis of the 2018 Red Book statistics", November 2019; CPMI Survey; FIS, *Flavors of Fast report*, 2018; Instapay; national data.

Central bank digital currencies

Central bank digital currencies (CBDCs) can be seen in this broader context. CBDCs are another way in which central banks can play the role of the operator of the payment infrastructure. Wholesale CBDCs may be similar to existing central bank settlement accounts. But recent discussion has been about general purpose or retail CBDCs that give access to claims on the central bank to ordinary users, in electronic form.

The reasons for considering retail CBDCs are numerous and vary across jurisdictions. A survey last year of 66 central banks revealed that the safety and efficiency of domestic payments are the most important motivations (Graph 7, let-hand panel). Also, many cited the decreasing use of cash and the need for financial inclusion as a motivation.

CBDC: an increasingly likely option Graph 7



[1] 1 = not so important; 2 = somewhat important; 3 = important; and 4 = very important. [2] Search on keywords "CBDC", "digital currency" and "digital money". The classification is based on authors' judgment. The score takes a value of −1 if the speech stance was clearly negative or in case it was explicitly stated that there was no specific plan at present to issue digital currencies. It takes a value of +1 if the speech stance was clearly positive or a project/pilot was launched or was in the pipeline. Other speeches (not displayed) have been classified as neutral.

Sources: R Auer, G Cornelli and J Frost, "The rise of central bank digital currencies: drivers, approaches and technologies", forthcoming, 2020; C Boar, H Holden and A Wadsworth, "Impending arrival – a sequel to the survey on central bank digital currency", *BIS Working Papers*, no 107, January 2020.

In some respects, retail CBDCs represent an incremental step. Users already have access to cash, which is a direct claim on the central bank. However, in other respects, retail CBDCs represent a more far-reaching change in the nature of the relationship between central banks and society. For instance, no matter how the CBDC is designed, there has to be some kind of ledger that keeps track of transactions so that the central bank can honour its obligations to the rightful owner of the CBDC. In such a setting, safeguarding personal data would present new challenges. We may also expect CBDCs to have an impact on the functioning of the financial system, potentially leading to a much larger footprint of the central bank on the financial system itself. For all these reasons, the overall consequences of retail CBDCs will need to be weighed up carefully to gauge their likely benefits and costs.

Judging from the reports and speeches coming from central banks, the balance of opinion seems to be leaning more favourably towards CBDCs. Both wholesale and retail CBDCs have featured in a more positive light since late 2019, as shown here in the graph (Graph 7, right-hand panel). The number of central bank reports and speeches on retail CBDCs have generally turned more positive towards them, as indicated here by the blue bars going up relative to the red bars. At many central banks, there is work under way on the design and use cases for CBDCs. The BIS is supporting these discussions through the committees it hosts, through economic research and through the activities of the new BIS Innovation Hub.

Conclusion

If we look at the long arc of history, the social convention of money has undergone several key institutional changes. With the possible introduction of CBDCs, we may be at the cusp of another important step in the evolution of the relationship of the central bank with society.

Digital innovation has made central bank public goods more important than ever, and central

banks need to be at the cutting edge of technology to serve society.

We may expect these efforts to make our payment systems more efficient, faster and more widely accessible for the new, digital world.

October 2020
Vol.7, No.4

Asia's Unmatched Digital Payments Growth*

By BHAVIN PATEL AND KAT USITA*

In the race to issue the first central bank digital currency, Asia's unmatched growth in digital payments gives the region momentum for developing blockchain-powered payments systems. Central banks in Asia, aware of the inevitability of the payments evolution, are exploring ways to issue a CBDC. A retail CBDC could ramp up widescale payments digitalisation, which until now has been driven mainly by the private sector.

The introduction of digital payments in Asia aimed to fulfil intersecting goals: boosting retail sales, improving financial inclusion and facilitating remittances. These needs have prompted the development – and success – of various online banking solutions and mobile wallets. A retail CBDC would cater to these same objectives, improving existing digital payments ecosystems with a government-backed token.

China is a prime example of the mobile payments boom. A projected 32.7% of point-of-sale payments are made via mobile, double the figure in the UK (15.3%) and US (15.0%), as shown in the chart on page 8. The People's Bank of China reported a 36-fold increase in the volume of mobile transactions to 61bn in 2018 from 1.7bn in 2013. The country's two dominant mobile payments platforms, Alipay and WeChat Pay, account for 93% of these transactions. Their ubiquity, ease of use and convenience, coupled with their integration with other in-app services, have established them as key players in the Chinese payments system.

Both Alipay and WeChat Pay have sought to expand in neighbouring Southeast Asia, but face stiff competition from local players like GrabPay (Malaysia, Singapore and the Philippines) and GoPay (Indonesia). Mobile wallets succeeded in part because they originated from separate digital services for which there was already a high volume of transactions, providing a natural incentive for adoption. Alipay enabled mobile payments for ecommerce giant Alibaba. WeChat Pay facilitated transfers between contacts on a messaging app. GrabPay and GoPay are both offshoots of ride-hailing services Grab and Gojek.

Uptake of digital payments and services has accelerated in the last decade alongside improvements in telecommunications infrastructure. China, Japan, Singapore and South Korea, global leaders in 5G deployment, have high-quality digital infrastructure that encourages use of mobile wallets and other digital services. Southeast Asian countries like Indonesia, Malaysia, the Philippines, Thailand and Vietnam are not far behind, having had to scale up telecom infrastructure to connect fast-growing, smartphone-wielding populations.

The digital ecosystems in these countries facilitate – and, in turn, benefit from – remittance flows. The Asian Development Bank reports that remittance flows to Asia in 2018 were $302.1bn, 44% of the global figure. Migrant labour from the region represents 20.4% of the world total. International money transfer systems have grown in reach and volume of transactions to facilitate remittances, while mobile wallet providers find ways to integrate this service in their platforms.

Asia's digital transformation, pushed by organic demand for specific digital service platforms, created an ideal landscape for exploring digital currencies. The region's progress in developing CBDC reflect populations' preference for technology, convenience and digitalisation of services.

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*This article appeared in OMFIF Commentary on August 28, 2020.
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Kat Usita is Deputy Head of Research at OMFIF.

The PBoC's acceleration towards retail CBDC is part of a wider strategy to provide an alternative to the private sector payments methods that dominate the market. (See page 10). The central bank anticipates leveraging the established mobile payment solutions to disseminate its digital currency, as experiments indicate an integration of the PBoC's digital currency in the ewallets of WeChat and Alipay applications will be essential.

There are differences within Asia. The use of retail CBDC is imminent in China, and Cambodia is likely to follow suit in the next year. Meanwhile, Thailand and Singapore are experimenting with wholesale CBDC systems, and determining real business and commercial use cases.

Cambodia plans to create greater competition in its payments industry. It is building a backbone system, Bakong, to interoperate with incumbent payments service providers, leaving the public to decide which vendor to use.

Japan, still a heavily cash-based economy, has resumed its exploration of CBDC. The Bank of Japan announced plans to test the feasibility of a national digital currency. It is requesting input from the private sector and collaborating with several other central banks to create a working group.

Similarly, the Bank of Korea launched a CBDC pilot in April to study potential use cases in its payments system. The objective is to future-proof South Korea's payments systems and allow for contingency planning if there is ever a need to issue CBDC.

The rate of adoption and implementation is not homogenous through the bloc. Asia Pacific is ahead of most western countries in their digital currency plans, but many economies in the region are still transitioning towards to a more digital future.

Social media platforms are gaining prominence in countries like India. Cash use is declining amid the rise of ecommerce. Financial inclusion needs are growing, and consumer preferences are shifting to digital channels. These trends may require central banks to step in where the private sector dominates to provide digital money.

We expect many other countries in Asia to bring forward credible use cases for CBDC in the next few years. So far, China is the frontrunner.

October 2020
Vol.7, No.4

Innovation at Heart of Covid Economy*

By TIBOR SCHWARTZ*

As a result of the new socially-distanced reality, the digital economy could be relabelled the Covid economy. Investors are seeing an increasing pace of technological change, alongside a growing need to adopt and integrate innovation along all stages of the investment spectrum.

Early-stage technology opportunities are becoming more appealing, despite their high-risk, high-reward profile. Today, institutional and sovereign investors should view the digital economy and technological innovation as a vanguard against disruption and a champion for sustainability.

Before the pandemic, the pace of technological change had begun to restructure the foundations of the global economy. New technologies – such as data and energy storage, and renewable hydrogen infrastructure – are emerging to become tomorrow's utilities and infrastructure.

Institutional investors kept abreast of these technological, regulatory and consumer driven changes by adapting asset classifications.

The virus outbreak has highlighted the role of technological innovation as an essential connector as international borders are shuttered and commercial activity disturbed at an unprecedented scale.

Even as the full impact of Covid-19 is still being mapped out, investors, consumers and governments have an opportunity to target capital towards building a sustainable future.

Technological innovation is powering climate resilience, decarbonisation and decentralisation. Sustainability drives investment performance through enhanced growth, as well as lower operational costs and reduced regulatory and legal intervention risks, among others.

The scope of an investor's support should expand to a 'technology ecosystem' rather than individual technology enablers. For instance, the South Korean approach to prioritising investment in the 'hydrogen ecosystem' is inclusive of the production, storage and dispensation of renewable hydrogen. South Korea's plans for a hydrogen ecosystem could transform the domestic economy, and has strong export potential for hydrogen technology such as fuel cells.

To succeed and manage risk, institutional and sovereign investors must understand the level of continual process improvements that must occur to ensure the resilience of their investments in a constantly changing environment.

To build a sustainable business, technological innovation must be embedded across all 'life stages' of a company: maintenance, expansion and re-creation. As such, innovation doesn't just play a role in existing operations; it can play a positive, disruptive role in the latter stages as well.

Governments, through their fiscal stimulus post-Covid can support the shifting technological landscape to ensure long-term benefits. They can do this by providing regulatory certainty and early-stage funding to help business grow.

At QIC, we seek out innovations and innovators contributing to an investment environment to make the operations of a business fit for the future. All these ingredients can be combined to create growth and relevance for a reimagined, more sustainable future.

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*This article appeared in OMFIF Commentary on August 17, 2020.
*Tibor Schwartz is Senior Adviser, Asset Management at QIC Global Infrastructure.

IMI International Monetary Review

Research Report

RMB Internationalization Report 2020 for Press Release*

By INTERNATIONAL MONETARY INSTITUTE

Part I Preface

In 2019, the global economy was depressed, and China faced a more complicated and tough external environment. The "trade war" between China and the US was transforming into a "technology war" or "currency war", which struck China's industrial upgrading, trade and investment order. The US Commerce Department kept putting Chinese enterprises and colleges into the trade restriction blacklist; President Trump did not hesitate to resort to the International Emergency Economic Powers Act to restrict commercial activities; the US government joined hands with western allies to suppress Chinese enterprises such as Huawei to an extreme extent worldwide. The US Treasury even designated China as an "exchange manipulator" regardless of the facts. The trade negotiation teams on two sides held several rounds of high-level negotiations, and finally signed the Phase One Economic and Trade Agreement in early 2020.

Faced with the global political and economic changes never witnessed in the past century, China chose to accelerate financial opening up, firmly attracted overseas capital and financial institutions with its huge market scale and great market potential, and improved its capacity of optimizing factor allocation and its economic efficiency. In 2019, China's financial regulators announced around 30 policy measures for the opening up of many sectors including banking, security, insurance, credit, payment and financial market, and most of such policies have already been implemented. It was also in this year that the RMB-denominated Chinese government bond and policy-based bank bonds were included into the Bloomberg Barclays Indices. Among the three international stock market indexes, the S&P Dow Jones Indices' inclusion factor of A share reached 25%; the inclusion factor of FTSE Russell indices reached 15% after the second batch of the first phase was completed; MSCI's inclusion factors of the large-cap share, GEM share and mid-cap share of A share reached 20% respectively.

By the end of 2019, the RMB Internationalization Index, a comprehensive indicator used to measure the use of RMB in international economic activities, reached 3.03, which grew by 13.2% year-on-year and maintained its orientation among global economic and trade structural changes and international currency landscape adjustments. A decade ago, RII was only 0.02, which almost means that RMB was not used in the international market at all. Now, RMB's share in international payment ranks sixth in the world[1], and RMB is a main currency for pricing and settlement in international trade, investment and financing, and a major international reserve currency.

In 2019, RMB internationalization showed the following features. First, RMB's use in financial pricing and settlement was strengthening and rebounding. While global trade shrank and China's import and export grew at a low speed, cross-border RMB receipt and payment under the current

*IMI Research Report No. 2002 [EN]

[1]Data from SWIFT indicates that RMB's share in the global payment market was 1.94% in December, 2019.

account rose against the trend to 6 trillion yuan. Denomination of RMB in commodity trade, including precious metal, crude oil and iron ore, made breakthroughs. RMB's share in global trade settlement reached 2.41%, up by 17.9% year-on-year. Second, international financial denomination and transactions remained the key driver of RII growth. In 2019, RMB's comprehensive share in international financial denomination and transactions reached 4.72%, growing by 15.2% on the basis of 2018. Foreign direct investment in RMB rose steadily, which had decisive significance; however, RMB direct investment and RMB international credit showed apparent seasonal fluctuations. Third, RMB's role as an international reserve currency was consolidated. Over 60 central banks worldwide have announced to directly or indirectly hold RMB-denominated assets. Statistics from the IMF indicate that at the end of 2019, the size of official RMB foreign exchange reserves reached 217.67 billion dollars, accounting for 1.96% of all official foreign exchange reserves. RMB's relative share in the SDR was 10.54%, slightly lower than RMB's weight of 10.92% in the SDR basket identified by the review in 2015.

RMB internationalization is the process in which RMB serves as an international currency in foreign economic activities, and develops into a main currency for pricing and settlement in international trade, investment and financing, and a major international reserve currency in several years. In the static sense, it is a status and outcome of RMB's use as an international currency; in the dynamic sense, it involves the whole process of RMB's becoming a main international currency. Against the backdrop that the US dollar dominates the global reserves while other major currencies catching up, RMB needs to undergo a long and tortuous process to ultimately achieve a monetary status that matches China's economic and trade strength. The International Monetary Institute of Renmin University of China issues the "RMB Internationalization Report" annually from 2012, faithfully recording the development footprint of RMB internationalization and conducting in-depth research of major theoretical issues and policy hotspots.

The theme of RMB Internationalization Report 2020 is "How does Shanghai develop into a global financial center". The report systemically demonstrates the necessity and urgency for Shanghai to develop into a global financial center. While revealing the logical relationship between the development of a global financial center and RMB internationalization, the research team chose different perspectives, such as the world and China, history and reality, opportunities and challenges, to carry out comprehensive and in-depth discussions on the model selection, basic conditions and development strategies for Shanghai to develop into a global financial center. We believe that high-quality economic development and high-level financial opening up will provide a solid basis and long-lasting momentum for RMB internationalization, and their inherent natures, including high efficiency, orderly development and inclusiveness will determine the future of RMB internationalization. Shanghai has developed a profound basis in financial deepening and innovative development since the Reform and Opening Up, and it is equipped with favorable conditions to become a scientific innovation center, an economic center, a financial center, a trade center and a shipping center. Therefore, Shanghai should take the opportunity of developing into a global financial center and shoulder the glorious responsibility of leading China's high-quality development and high-level opening up. The report stresses that in developing into a global financial center, Shanghai should stick to the model featuring synergetic development of "five centers", enable financial service to service the real economy, adhere to market-based and internalization reform and continue to improve its global competitiveness and influence. It should continuously improve the doing-business environment, gather high-caliber enterprises and talents, attract excellent global capital and superior resources, pursue scientific advances, lead global industrial upgrading and promote common development. It should leverage its fin-tech and pilot privileges to develop a financial regulation system that encourages innovation and balances risks,

so as to improve its capacity to handle speculation attacks and manage major risks, and develop into a global financial center with Chinese characteristics.

Previous studies show that issuing countries of main international currencies under the Jamaica international currency system, to certain extents, meet the following descriptions: they have strong comprehensive economic power, high trade statuses, stable currency value, high degree of free capital flow and strong macro management capacity. The historical experiences of sovereign currencies' internationalization indicate that though the dollar, the euro, the pound and the yen have chosen different internationalization paths and made varied internationalization achievements, they have shown surprising consistency during the process that they grew into an international currency. It should be noted that any emerging currency power is always based on strong economic strength and a high trade status. Countries that took the lead in the Industrial Revolution all became economic and trade powers. During this process, every country had their major cities developed rapidly, which developed into the economic, trade and financial centers of their countries, and later upgraded into major global financial centers as their currencies internationalized.

Countries that completed the industrial revolution first realized leapfrog economic development due to technological advances. On one hand, they improved their comprehensive economic power; on the other, they sharpened their trade competitiveness. Economic growth and international trade accumulated enormous wealth, created investment and financing needs, promoted development of the domestic financial market and financial institutions, and promoted the formation of domestic financial centers. Financial development further facilitated industrial growth and upgrading, and thus consolidated the country's position as an economic and trade power. Trade powers not only held large shares of global trade, but also had higher bargaining power. As a result, the currency of this country was more often used as the currency for denomination and settlement. Trade led foreign direct investment growth, and drove the development of other financial services, such as international settlement, insurance, credit and guarantee. When more non-residents entered the financial market of this country for forex trading, bond investment and financing, and other credit activities, they increased the use of this country's currency in international financial transactions, and at the same time raised the opening up level and global influence of this financial center. When non-resident investors were positive about a country's economic outlook, they had a stronger motivation to hold this country's currency. If non-resident investors could invest in safe assets or do risk hedging conveniently in this country's financial market, this country can improve its currency's role as an international foreign reserve currency and push forward the development of a global financial center.

We are now at the crucial stage of the fourth industrial revolution. By developing a global financial center, integrating multiple resources, and promoting scientific advances, economic growth, trade development and financial deepening, we might make up for the deficiency of RMB internationalization. Moreover, through the use of the aggregation effect, size effect and spillover effect of central cities, the development of a global financial center can lead China's high-quality economic development and high-level financial opening up, enhance overall economic strength, improve China's trade status and right of speech, and provide safeguard for long-term development of RMB internationalization.

Shanghai is equipped with favorable conditions and policy basis for developing into a global financial center. Shanghai has unique geographical advantages, and it used to be the top financial center in the Far East in history. In the 1980s, Shanghai was the largest economic center in China, and one of the first coastal Chinese cities opening up to the world. Shanghai has always been the frontline of China's financial reform and financial opening up, and it has continuously pushed forward the development of an international economic, trade and shipping center. The Regulations

of Shanghai Municipality on Promoting the Development of an International Financial Center approved in 2009 provided legal basis for Shanghai's financial internationalization. The Action Plan on the Development of Shanghai International Financial Center (2018-2020) makes clear that by 2020, Shanghai will develop into an international financial center that matches China's economic strength and RMB's international status. In the GFCI released in September, 2019, Shanghai surpassed Tokyo for the first time to become one of the top five international financial centers.

However, from the perspective of leading China's high-quality development and high-level opening up, Shanghai still faces many challenges to develop into an international financial center. First, Shanghai should learn from the experiences of London, New York, Frankfort and Tokyo, and push forward RMB internationalization through the development of a global financial center. Shanghai should stick to market-based and internationalization reform, and strive to sharpen its international competitiveness in areas of taxation, law-based governance, infrastructure and other sectors related to doing-business environment. As a key city in the Yangtze River Economic Belt, Shanghai should leverage its advantages in terms of geographical location, shipping, trade, finance, economy and scientific innovation, and gather high-caliber domestic and overseas enterprises to strengthen its status and influence. It must gather superior resources, strengthen the market functions, develop the "Shanghai price" with global leadership and improve the financial market's ability to allocate global resources.

Second, Shanghai should face up to its advantages and strive to transform its existing advantages into the accelerator of the international financial center development. Strong national economic strength, superior geographical location, complete financial infrastructure, market with strategic fintech foundations and national factors, and the pilot policies for FTZs are all advantages that Shanghai should make use of. For example, Shanghai should transform the rich fintech outcomes into new engines for financial upgrading, new paths for finance to serve the real economy, new opportunities for inclusive financial development and new instruments against financial risks, so as to develop Shanghai into a leading domestic fintech center with global competitiveness.

Third, we should stick to synergetic development of five centers, strive to innovate and develop Shanghai into a competitive global financial center with unique features. China's socialist system is stable and consistent, and we can gather strength to fulfill key tasks, therefore, Shanghai's development into a global financial center can be steady, progressive and controllable. Besides, the key national strategic support for Shanghai is unparalleled in any other central cities in the world. The Beijing-Tianjin-Hebei Regional Development, the Yangtze River Delta Development, the Guangdong-Hong Kong-Macau Greater Bay Area Development, the Belt and Road Initiative and other strategies provide financial service needs for Shanghai, and the synergetic development of five centers brings Shanghai comprehensive advantages. In the process of developing a global financial center, we should follow some basic principles, including maintaining long-term steady and high-quality economic development, attracting global resources with the enormous market and economic vitality, taking the development of a global RMB asset management center as a core task to improve China's right of speech and pricing power in the global financial system, sticking to market-based reform and enabling the market to play the decisive role in developing a global financial center, strengthening the government's role as a service provider, firmly pushing forward opening up, improving risk management capacity and holding the bottom line.

Since the beginning of 2020, the COVID-19 epidemic has stricken the global economy, international trade and the global financial market. The Fed launched the unlimited quantitative easing policy to tackle the extremely uncertain economic outlook, while China retained sufficient policy space and policy instruments in the 2020 Government's Work Report. Epidemy control and economic reopening vary from country to country. The IMF and market institutions generally

predict a sharp shrinking of the global economy, and China is highly likely to become the only G20 member country with a positive growth. Global industrial chain restructuring is more impacted by national interests and public health security, and traditional economic and trade activities are diverting to online cloud platforms, creating an increasing demand for new-type infrastructure such as 5G network and data centers. Recently, China ended the judicial proceedings with EU caused by the market economy status under the WTO framework. MOFCOM's public commercial information platform shows that the 3rd China International Import Expo will be convened in Shanghai in November, and now overseas cloud road show and domestic merchant road shows are cropping up. So far, the contracted exhibition area has exceeded over 90%, and the expo is officially open for domestic and overseas professional spectators to register.

The developing RMB internationalization will undoubtedly face more new twists and challenges. But no longer how long the dark night is, the sun will eventually rise. As long as we stay focused and keep our feet on the ground, we can always find the way out among the present dangers and difficulties. By forging ahead and facing up to the challenges, we can create opportunities among crises and open up new dimensions. As an ancient poem goes, from whichever direction the winds leap, I remain strong, though dealt many a blow. We will develop Shanghai into an international financial center, and push forward China's high-quality economic development and high-level financial opening up on all fronts. The future of RMB internationalization is bound to be promising!

Part II RMB internationalization index

2.1 The current situation of the RMB internationalization index

2.1.1. RMB internationalization is making steady progress, and the RII shows evident fluctuations.

In the past 10 years since the beginning of RMB internationalization, RMB's marketization has deepened and its global recognition has escalated; RMB internationalization has withstood whole-process tests and achieved major development progress. As we stepped into 2019, global economic development faced great challenges, with continued weakness in trade and investment, soaring financial vulnerabilities, a resurgent wave of interest rate cuts, rising sources of turbulence and risk points, and synchronous economic slowdown in both developed economies and emerging markets. Faced with the complicated and changeable international situation, China stuck to the new development philosophy, focused on supply-side structural reform, accelerated the opening up of the financial market, actively promoted high-quality development, stabilized economic and financial operation, made progress and improved quality of economic and financial operation, and thus laid a solid foundation for RMB internationalization and fostered new opportunities and momentum amidst risks. In general, RMB internationalization was stable with progress, trade settlement and direct investment in RMB realized steady growth, RMB's use in financial denomination and settlement strengthened significantly and RMB's status as an international reserve currency was further consolidated. At the end of 2019, RII was 3.03 (Figure 1), a year-on-year increase of 13.2%, which is on an upward trend. Compared with the previous trend of steady rises, the RII is showed more fluctuations and larger adjustments.

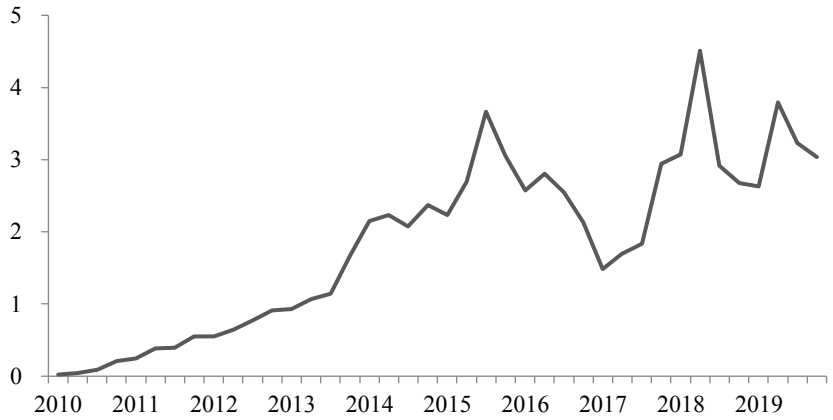

Figure 1 RMB Internationalization Index

2.1.2 RMB internationalization is rising among fluctuations under the capital and financial account

Over the past decade, the opening up of China's capital account made prominent progress, and the use of RMB under the capital account was more active. On one hand, international financial denomination and settlement became a main engine for RII's growth. In the 4th quarter of 2019, the comprehensive indicator of RMB usage in international financial denomination and settlement reached 4.72%, a qualitative leap forward on the basis ten years ago. On the other, international financial denomination and settlement was sensitive to market reactions which were the source of RII's fluctuations.

In 2019, the total volume of global RMB loans and deposits was depressed, with adjustments. The share of international RMB credit in the global market was 0.56%, down 4.71% on a yearly basis; RMB deposit volume in main offshore markets decreased by around 2.5% annually. The issuing scale of RMB- denominated global bonds fell back. RMB-denominated international bond and bill balance was 96.558 billion dollars, accounting for 0.38% of the global total and a decrease of 0.21% from 0.59% in 2015. As China accelerated its pace to integrate into the global economic system, RMB direct investment grew rapidly and aggregated 13.8 trillion yuan. In 2019, against the backdrop of continued global direct investment depression, RMB direct investment volume was 2.78 trillion yuan, a year-on-year increase of 4% against the global trend.

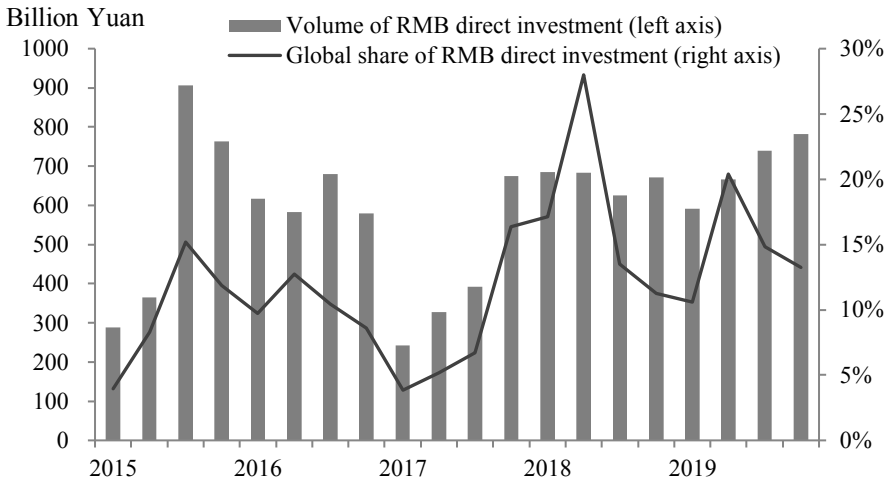

Figure 2 Global Share of RMB Direct Investment

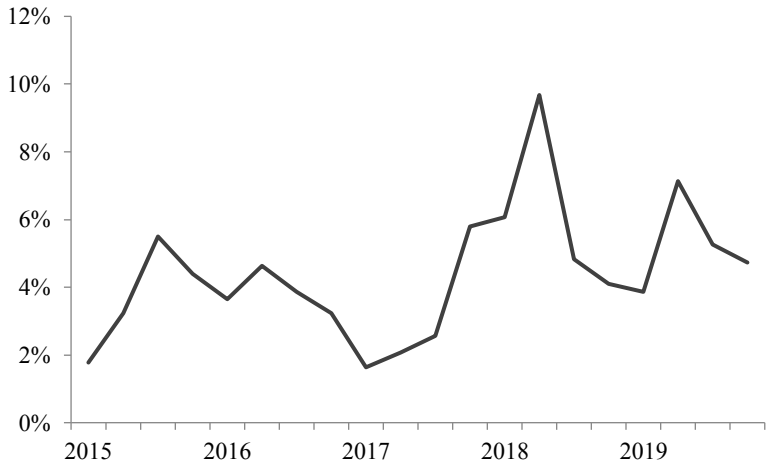

Figure 3 Comprehensive Indicator of RMB Use in International Financial Denomination and Settlement

2.2 Main impetuses for RMB internationalization

Over the past 10 years, due to the rise of China's economic strength and the deepening of Reform and Opening Up, RMB internationalization seized the historic opportunity of the changes of the global landscape, and developed steadily as a result of market actions and policy effects. RII kept an ascending trend. In 2019, China's economy kept growing steadily, financial opening up entered a fast track, policies and infrastructure for RMB cross-border use continued to improve, and global monetary policies began to shift. All these factors supported RMB internationalization to move forward.

2.2.1 China's steady economic growth provides a firm foundation for RMB internationalization

Despite the complicated domestic and overseas situation and growing destabilizing factors and uncertainties, China's economy grew steadily and showed strong resilience. GDP grew by 6.1%, ranking among the top in the world. As external demand volatility heightened, household consumption continued to upgrade, and remained the top driving force of economic growth for 6 consecutive years, contributing to 57.8% of economic growth and playing a more prominent role in stabilizing the economy and growth. China actively pushed forward industrial transformation and upgrading, high-tech manufacturing and the strategic emerging industry both grew by over 8%, the operating revenues of enterprises in the strategic emerging service industry, the science and technology service industry and the high-tech service industry all grew by 12%, and traditional driving forces was being replaced by new ones at a faster pace. In 2019, protectionism was on the rise globally, and the trade frictions between China and the US were severe. Against this background, China's foreign trade grew by 3.4%, disbursement of foreign capital added up to 941.5 billion yuan, ranking the top among developing countries and second in the whole world. Among global economic downturns and turmoils, China maintained its position as a flagship, achieved steady growth, continued to improve development quality, and showed strong resilience and vitality. This has granted RMB and RMB-denominated assets more global confidence and recognition, and infused strong strength into RMB internationalization.

2.2.2 The accerating opening up and international integration of China's financial system provides momentum for RMB internationalization

In 2019, following the principle of "early action and quick steps", China accelerated the two-way opening up of its financial industry and prudently pushed forward capital account convertibility to deepen RMB internationalization. China formulated the 11 new measures to accelerate the opening up of detailed financial sectors, RQFII cancelled the quota caps, and China's financial sector opened wider to the world to support overseas investors to participate in domestic financial transactions. More foreign-funded financial institutions have set up branches and carried out RMB business in China, and expanded the holdings of RMB-denominated assets. Standard & Poor's was permitted to enter the CIBM to conduct all categories of credit rating services, attract more overseas issuers and investors to enter China's market and meet the diversified needs of international investors to allocate RMB-denominated assets. At the same time, China's capital market integrated with the international market at a faster pace, MSCI, FTSE Russell, S&PDJI, Bloomberg Barclays Global Aggregate and other main international indicators were absorbed, their authority steadily improved and foreign capital thus rushed in to hold more RMB-denominated financial assets. By the end of 2019, the total holdings of RMB-denominated stocks and bonds in the hands of overseas institutions and individuals added up to 4.4 trillion yuan, a year-on-year increase of 52.4%. The opening up of China's financial sector further improved the degree of RMB's free use and expanded the range of RMB's use, and thus strengthened RMB's use in financial denomination and settlement.

2.2.3 The improvement of policies and infrastructure for cross-border and international use of RMB has removed barriers for RMB internationalization

International cooperation, central government policies, local innovation and sectorial exploration have jointly improved the feasibility and convenience of RMB's international use. First, deepening international cooperation has reduced the barriers for RMB's use overseas. Myanmar has officially recognized RMB as an settlement currency in international payment; Pakistan has allowed Standard Chartered Bank to establish local RMB settlement and clearing institutions; China has established and improved bilateral RMB cash transportation mechanisms with Mongolia, Laos, Russia and other countries. In 2019, China established RMB clearing banks

in Tokyo and Manila, and designated Mitsubishi UFJ Bank as the local RMB clearing bank to provide support for overseas RMB business. Second, policy improvement and system upgrading has supported overseas investors to participate in RMB transactions. The Ministry of Finance made clear the application procedures and documentations for overseas accounting firms to provide auditing services for panda bonds, the "T+3" settlement method was added to the settlement period of overseas institutional investors' bond transactions, and the primary market information platform of the Bond Connect was launched with an English channel. These factors have provided more feasible, transparent and convenient conditions for overseas institutional investors to participate in RMB financial transactions. Third, regional policy exploration and innovation has breathed new life into RMB's international use. The number of FTZs grew to 18 nationwide to strengthen pilot programs of cross-border RMB business, and FTZ development and RMB internationalization are becoming "golden partners". Guangxi Province is actively developing into a zone of financial opening up for ASEAN, it encourages the use of RMB and supports the development of offshore RMB business in ASEAN. The Guangdong-Hong Kong-Macau Greater Bay Area is orderly advancing the interconnectivity of the financial market and gradually expanding the scale and business of RMB cross-border use. Besides, Beijing is further expanding the opening up pilot programs of the service industry to support overseas investors to make RMB direct investments and use RMB in the transactions and transfers of the state-owned property right of domestic enterprises. The first cross-border RMB settlement business facilitation pilot program for foreign contracted project-related enterprises was launched in Beijing. Fourth, infrastructure for cross-border RMB settlement was improving. The number of participants of Cross-border Interbank Payment System (CIPS) kept growing, and by the end of 2019, the business of the system had covered 167 countries and regions, providing service for over 3000 corporate banking institutions.

2.2.4 The new wave of interest rate cuts has added to the appeal of RMB international investment

Since the latter half of 2019, global economic growth has faced great downward pressure. The FED cut interest rates three times, the ECB relaunched the Quantitative Easing policy, the negative interest rate dipped to a historical low of -0.5%, and over 40 central banks have jumped on the bandwagon of another quantitative easing. Against the background of low interest rates and quantitative easing globally, China's monetary policy stayed at a normal range, its interest rate and exchange rates remained strong, and RMB has become a safer and more profitable financial asset option for international capital. Especially amidst global financial turmoil, China's economy grew steadily, RMB-denominated assets began to show hedging features, and overseas entities and capital accelerated their pace to enter China's financial market. According to statistics of the IIF, the total volume of foreign capital flowing into China's stock and bond markets in 2019 was 134.41 billion dollars, accounting for 58% of the total inflow of foreign capital into emerging economies' capital market. In a word, RMB's appeal on the asset side is rising significantly.

2.3 Main barriers to RMB internationalization

RMB internationalization is an important part of China's Reform and Opening Up, and a key step for China's integration into the global economic and financial system. In 2019, RMB internationalization made steady progress, but slowed down generally and faced some external challenges and endogenous defects.

2.3.1. The external environment was more severe

In 2019, the international situation became more complicated and severe, with rising

unilateralism and protectionism, intensified trade frictions and growing geopolitical risks. Global trade growth underperformed economic growth, direct investment contracted for four consecutive years, and the external environment for China and RMB internationalization was intense and changeable. The US frequently suppressed China, which disturbed RMB's exchange rates and its use. In 2019, RMB's exchange rates and market sentiments were sensitive to China-US trade frictions, with the exchange rate fluctuations staying at around 4.44%, which was higher than the average of the previous year. From August to early September, as China-US trade frictions elevated, the US Treasury designated China as a currency manipulator, RMB's exchange rate against the dollar exceeded 7.18, and RMB's share in international payment once fell to the sixth from the fifth in the world.

2.3.2 Global currency competition grew more intense

Main currencies relied on low interest rates, or even negative interest rates to consolidate their monopoly in global liquidity supply. In 2019, as the FED cut interest rates three times, the growth of dollar liquidity supply (bonds plus credit) returned to 5.7% from 3.7% in Q1. With the negative interest rate, the euro became the first choice of global debt, and its liquidity supply growth stayed at around 9%. In contrast, RMB's overseas liquidity supply grew slowly, or even shrank due to the squeeze of main currencies such as the dollar and the euro. Besides, because of network externality, international entities have a strong path dependence on the main currencies including the dollar and the euro that cannot be broken through. In particular, the greater the downward pressure is, and the greater the turmoil in the international financial market is, the more stable the dollar's monopoly is. In the future, the key to RMB internationalization is how to break through the inertia of using main currencies including the dollar, develop the network effect of RMB and improve the global financial resource allocation capacity with Shanghai international financial center.

2.3.3 Offshore RMB market development is yet to deepen

In recent years, the driver of RMB internationalization has shifted from trade settlement to trade and finance, but the international circulation path is not smooth enough. RMB flowing out through trade and direct investment did not settle down and transform, but was exchanged for main currencies such as the dollars, and overseas RMB lacked channels for preservation and appreciation. The offshore market could have provided capital pools and investment and financing platforms for international use of RMB. However, it fell into a downturn after 2015. By the end of 2019, the volume of RMB deposit in Hong Kong was 632.207 billion yuan, down 35.6% on the basis of 2015. The markets in Taiwan, Singapore and Korea all declined to different extents, and as a result, overseas RMB dried up. In general, the international circulation path of RMB is incomplete, and the offshore market is yet to reinvigorate and develop.

2.3.4 Improving the financial management capacity is crucial

From the changes of RII we can find that financial transactions create a strong driving force, but also feature large fluctuations and high hidden risks. In a tough and complicated international environment, China must enhance financial risk prevention and settlement in order to accelerate financial opening up and push forward RMB internationalization. In the international use of RMB, there are motivations both for speculation and real trade, onshore and offshore markets resonate, prices directly impact the currency choices and capital flow of market players, and panic may sometimes occur. This requires China to have necessary risk assessment and handling capacity, a complete financial regulation system and internationally compatible expectation guiding capacity. In the future, improving the financial governance system and giving play to macro prudential

management are major safeguards for RMB internationalization, or even China's financial opening up.

2.4 Comparison between the international indicators of major currencies

This report draws up the internationalization indices of US dollar, euro, pound and yen in the same method as it draws up the RII (see Figure 4). In 2019, the US economy reversed after jumping at the beginning, household consumption slowed down, commercial investment stayed weak, financial deficit and government debt hit record highs, and the FED cut interest rates three times and relaunched quantitative easing. But as the barometer of the global crisis, the more volatile the international economic situation is, the high the international demand for the dollar is. Contrary to the US' economic downturn, the international index of the dollar was 50.85, down 0.22 on a yearly basis. The Eurozone was beset with economic and political troubles internally and externally, and was trapped in the negative interest rate territory. All member countries experienced synchronized economic slowdown, even though consumption and employment tended to perform well, external demand continued to shrink, dimming the development prospect. The international status of the euro bottomed out, its internationalization index was 26.28 an increase of 0.13 compared to the end of the previous year, showing a lack of recovery momentum. The Brexit process was full of twists and turns, the UK's politics and society fell into division never seen before, which heavily weighed on the economic prospect. UK's manufacturing and consumption plummeted, and uncertainties dragged on the pound's performance. The internationalization index of the pound was 3.92, wandering at a low level. Japan's economy lacked momentum due to shrinking external and internal demand and the yen's appreciation. The lack of external demand caused continuous decreases of export, the increase of consumption tax caused sluggish consumption growth, and investment and consumption confidence both took a hit. However, international turbulence encouraged risk aversion, and the international demand for the yen was passively pushed up. The internationalization index of the yen was 4.63, up 0.37 compared to the end of the previous year, and the international status of the yen was stable with progress.

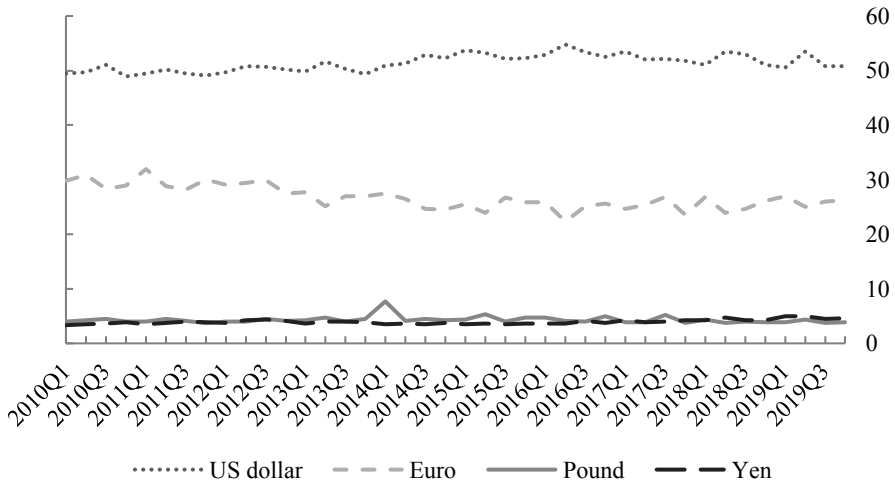

Figure 4 Changes of Internationalization Indices of Major Currencies

Part III Status Quo of RMB Internationalization

3.1. Cross-border Trade RMB Settlement

3.1.1 The Scale of RMB and the Ratio of Settlement both Stabilized and Increased

In 2019, RMB cross-border trade settlement grew steadily to 6.04 trillion yuan, 930 billion yuan higher than that of 2018, marking a year-on-year increase of 18.2%. RMB cross-border trade settlement represents 19.1% of China's trading volume of goods and services, registering a year-on-year increase of 4.3%.

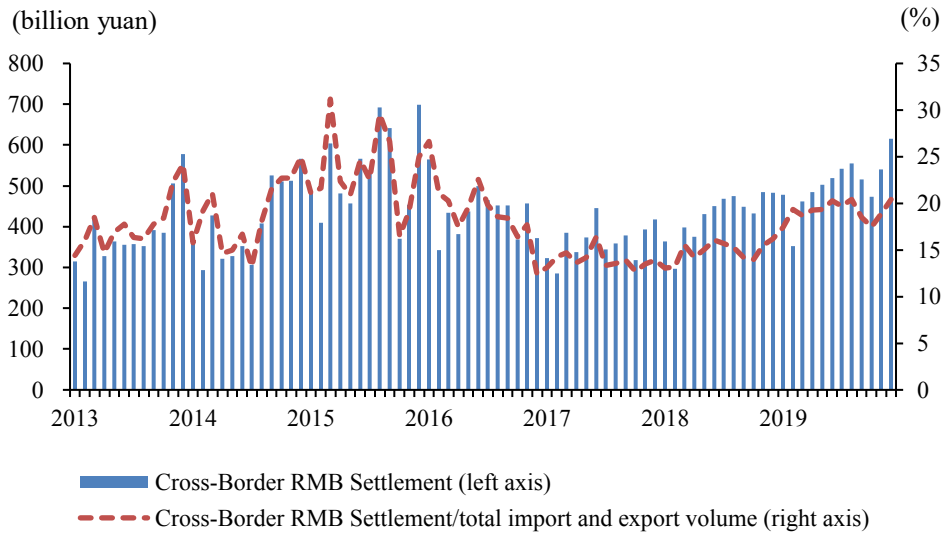

Figure 5: Trading Volume of Cross-Border RMB Settlement

Source: the People's Bank of China; State Administration of Foreign Exchange

3.1.2 Trade of Goods Makes up the Majority of Settlement and Trade of Service Grew Significantly

In 2019, cross-border trade of goods that were settled with RMB achieved a 16.1% year-on-year increase to 4.25 trillion yuan; the total sum accounted for 70.4% of the total cross-border RMB settlement in 2019. Trade of services settled with RMB was up by 23.4% to 1.79 trillion yuan; it made up 29.6% of the cross-border RMB settlement. From 2015 to 2019, the annual growth rate of trade of services settled with RMB over the past 5 years was 21.7%, significantly higher than the average annual growth rate of RMB settlement in cross-border trade.

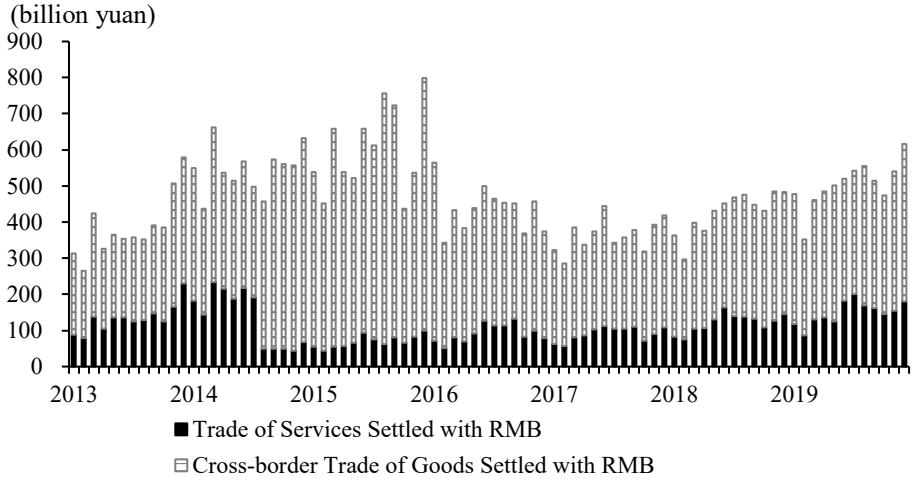

Figure 6 Trade of Goods and Services Settled with RMB

Source: People's Bank of China

3.1.3 Cross-border RMB Business Continued to Grow while Payments and Receipts Remained Basically Balanced

In 2019, the combined sum of cross-border RMB receipts and payments increased to 19.7 trillion yuan, up by 23%. The sum of cross-border RMB receipts and payments under the current account was 6 trillion yuan, a year-on-year increase of 18%, while that under the capital account was 13.6 trillion yuan, a year-on-year increase of 26%. The cross-border use of RMB that under capital accounts has become more active, making it the main driver for the growth of cross-border RMB receipt and payment business. In 2014, after expanding the trade RMB settlement to include receipts and payments of RMB settlement for capital financial transactions, surpluses and deficits tended to alternate in cross-border RMB receipts and payments due to the great volatility of financial transactions.After the receipts-to-payments deficit in 2016 and 2017, 2018 and 2019 witnessed a small receipts-to-payments surplus, as the ratio of cross-border RMB receipts to payments reaches 0.97. The total sum of receipts was 10 trillion yuan, and the total sum of payments 9.7 trillion yuan. The figures show that the scale of RMB outflow and backflow continued to expand, and the payments and receipts remained basically balanced.

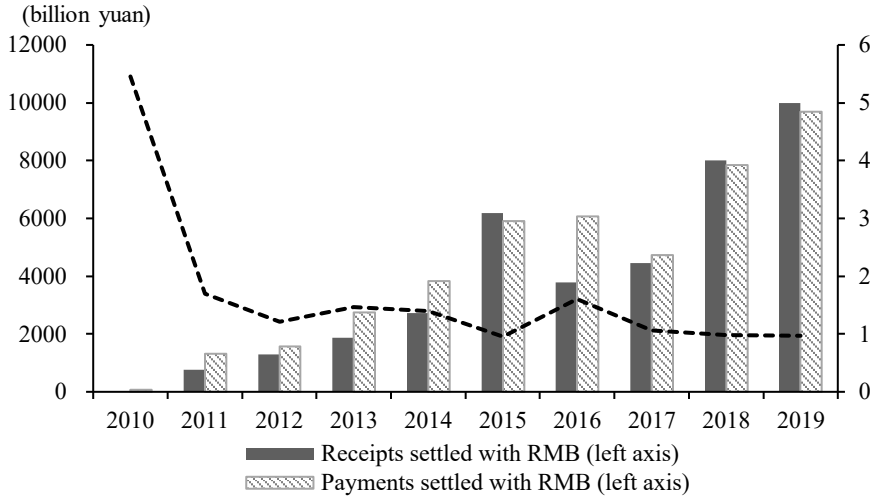

Figure 7 The Ratio of Receipts to Payments in Cross-Border RMB-settled Trade

Source: People's Bank of China

3.2 RMB-denominated Financial Transactions

3.2.1 RMB-settled ODI

3.2.1.1 ODI and RMB-settled ODI both Decreased

In 2019, China's ODI reached 674.4 billion yuan, down by 28.7% compared to 2018. RMB-settled ODI reached 0.76 trillion yuan, showing a steep drop of 347.9 billion yuan compared to 2018.

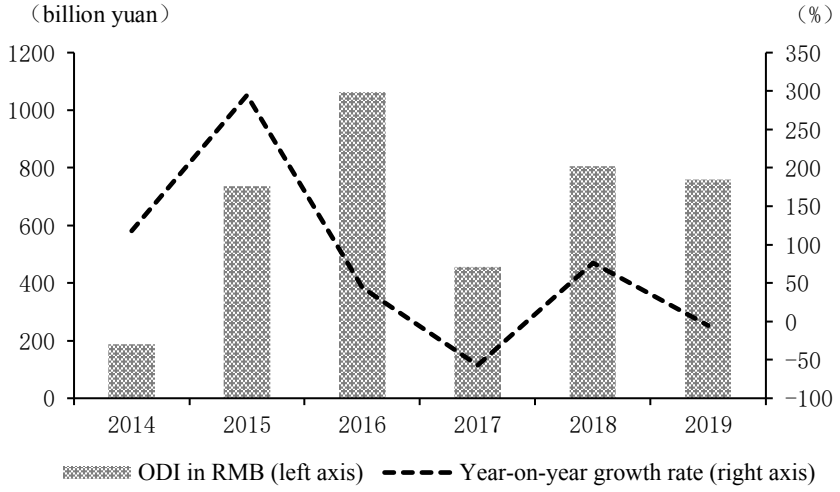

Figure 8 Outbound Direct Investment(ODI) in RMB

Source: People's Bank of China

3.2.1.2 Foreign Direct Investment(FDI) Decreases while RMB-settled FDI Rises

In 2019, FDI in China was 1073.8 billion yuan, showing a decrease of 30.5% from 2018. RMB-

settled FDI reached 2.02 trillion yuan, up by 8.6% from 2018.

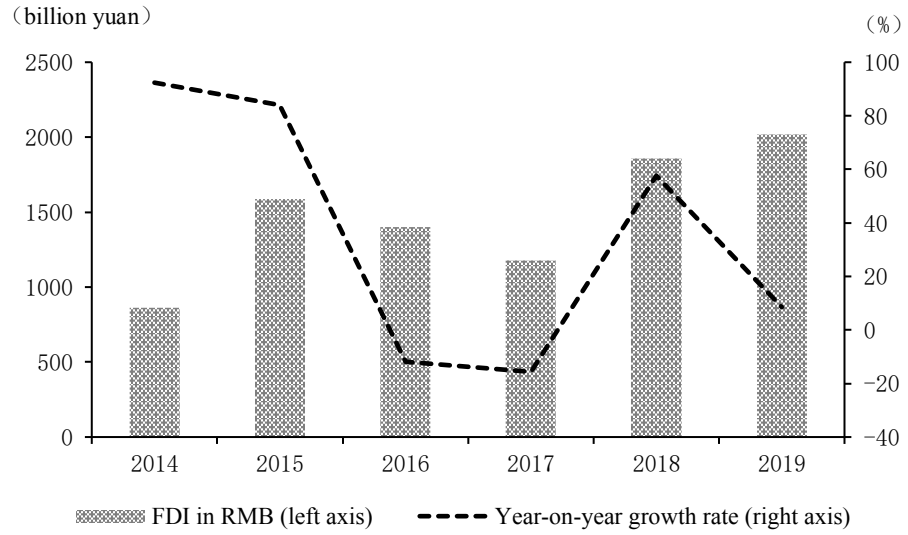

Figure 9 Foreign Direct Investment(FDI) in RMB

Source: People's Bank of China

3.2.2 Investment in RMB-denominated Securities

3.2.2.1 The Offshore RMB-denominated Bond Market has Developed Steadily, while the Panda Bond Issuance has Shrunk

In 2019, the dim sum bond issue reached 198.82 billion yuan, an increase of 159.34% over last year. The Ministry of Finance issued 17 billion yuan of national bonds and 9 billion dollars worth of dollar-denominated sovereign bonds abroad. Affected by changes in domestic and foreign monetary policies, the issuance of panda bonds has fallen sharply. In 2019, a total of 22 entities in the Chinese bond market issued 40 rounds of panda bonds, totaling 59.840 billion yuan and representing a significant decrease of 36.9% compared to 2018.

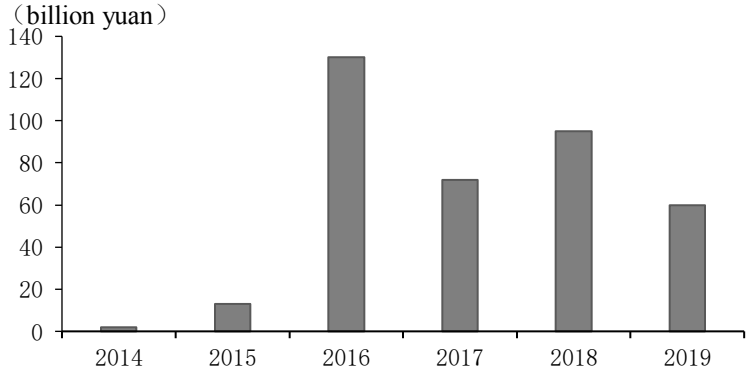

Figure 10 Issuance Details of Panda Bond

3.2.2.2 The Stock Market Financing Function was Enhanced, and the Capital Market was Accelerated in its Opening-up

In 2019, the stock market structure was further improved, with its financing function being enhanced. The Shanghai Composite Index, Shenzhen Component Index, and the Growth Enterprise Market Index all rose. The domestic stock market of various non-financial enterprises financed 347.8 billion yuan, down by 3.55% year-on-year.

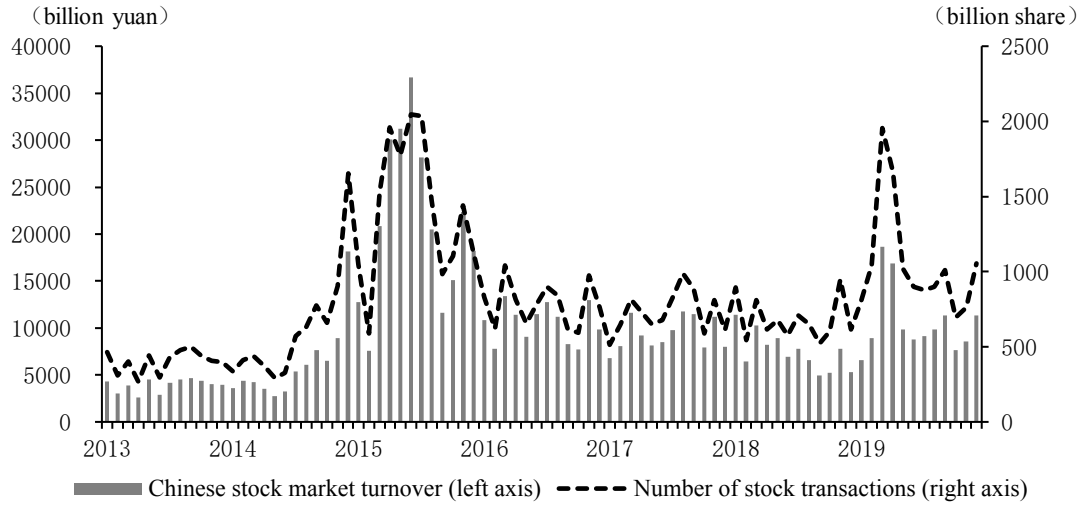

Figure 11 Chinese Stock Market Turnover

Source：CEIC

The capital market has accelerated its openning-up to the outside world.The Foreign Exchange Bureau lifted the restrictions on investment quotas for QFII and RQFII, and the CSRC clearly stipulated the timetable for lifting the restrictions on foreign equity ratios in advance. Interchange measures have been successively implemented including the Shanghai-London Stock Connect, the China-Japan ETF interconnection, and the Shanghai-Shenzhen-Hong Kong Stock Connect southbound investor identification codes. The first phase of the three major international mainstream indexes "NASDAQ A" of MSCI, FTSE Russell, and S&P Dow Jones has come to an end. The capital increase brought by A shares reached about 540 billion yuan.

3.2.2.3 The Development of the Derivatives Market Made New Breakthroughs

In 2019, the futures market has witnessed its rebound significantly. The cumulative trading volume of the national futures market reached 3.962 billion lots, a year-on-year increase of 30.81%, and the total deals reached 290.61 trillion yuan, a year-on-year increase of 37.85%. In 2019, the trading volume of RMB-denominated crude oil futures accounted 69278700 lots, and the holding volume was 14052640 lots, with a turnover of 30.95 trillion yuan, ranking third in the world and second only to WTI crude oil futures and Brent crude oil futures. Rio Tinto and Rizhao Port Group signed the first RMB business in spot trade, marking the beginning of the formation of RMB pricing model for iron ore. After crude oil futures, iron ore futures and PTA futures, rubber futures

were listed in Shanghai Futures Exchange and became the fourth foreign-oriented and RMB-denominated futures in China. The "Chinese price" in the fields of agricultural products, energy, precious metals, chemicals, etc. were recognized and widely used in the international market, which will promote RMB to gradually play an active role in line with the economic strength and international economic status of China in the global trading system.

Table 1 Turnover in the Inter-Bank RMB Interest Rate Derivatives Market (Unit: 100 million yuan)

Year	Number of transactions	notional principal (Unit: 100 million yuan)
2014	42978	40301
2015	64469	82071
2016	87018	98587
2017	137974	143462
2018	184560	210863
2019	237744	181529

Source: China Foreign Exchange Trade System

In 2019, the total deals in the inter-bank RMB interest rate derivatives market reached 18.6 trillion yuan, a year-on-year decrease of 13.4%. Problems restricted the development of RMB interest rate derivatives market including insufficient liquidity, homogenization of transaction subjects and demands, and inactive basis trading. Among the exchanges with the business of RMB interest rate derivatives, the Hong Kong Stock Exchange, Singapore Exchange, and Chicago Mercantile Exchange (CME) continued the rapid growth of the US dollar against the RMB (USD/CNH) since 2015. In recent years, with the two-way fluctuation of the RMB and the expansion of the cross-border use of the RMB, the exchange rate risk faced by Chinese companies has risen sharply. In the meanwhile, because the fluctuation of major currencies is much greater than the fluctuation of the RMB against the US dollar, the impact of cross-exchange fluctuations on the company is also much greater than the impact of the fluctuations of the RMB against the US dollar. Therefore, we should further accelerate the construction of the RMB foreign exchange futures and options market, increase the development and publication of exchange rate derivatives of more currencies, and provide a powerful risk management tool of the exchange rate.

3.2.2.4 RMB-denominated Financial Assets are Favored by International Investors

At the end of 2019, the balance of domestic RMB-denominated financial assets held by overseas institutions and individuals increased to 6.41 trillion yuan, representing a year-on-year increase of 32.2% and continuing its growth momentum since 2016. Among the RMB-denominated assets held by non-residents, securities account for the biggest share, followed by stocks, deposits and

loans. Although foreign residents has increased their holding of domestic RMB-denominated financial assets, the stock of RMB-denominated international bonds and notes as well as its proportion in the global stock of international bonds and notes have declined.

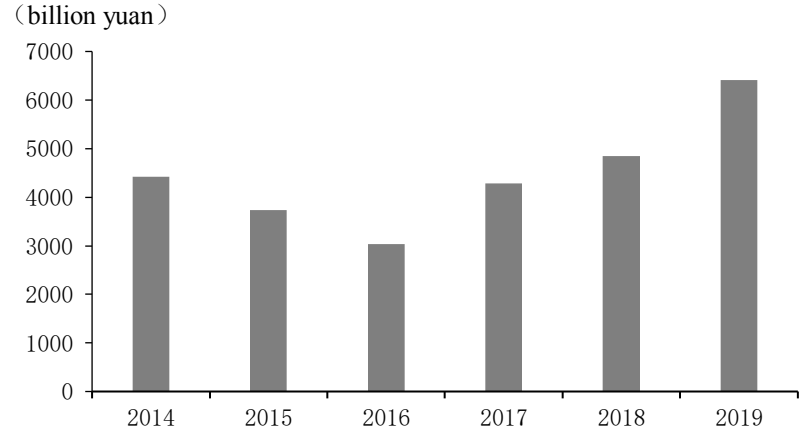

Figure 12 RMB-denominated Financial Assets Held by Overseas Institutions and Individuals
Source：CEIC

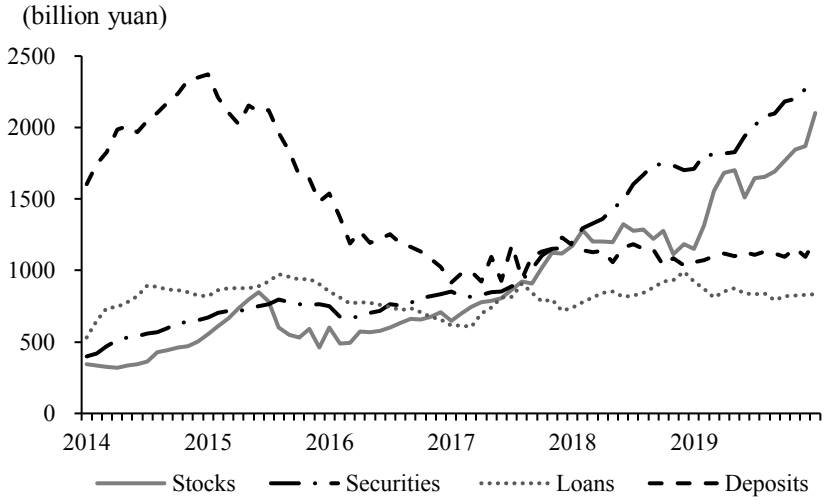

Figure 13 RMB-denominated Financial Assets Held by Overseas Institutions and Individuals
Source：CEIC

3.2.3 RMB-denominated Outbound Loans

In 2019, RMB-denominated overseas loans of domestic financial institutions reached 523.78 billion yuan, up by 3.2%. RMB-denominated overseas loans accounted for 0.351% of total loans by Chinese financial institutions, down by 0.02% compared to 2018.

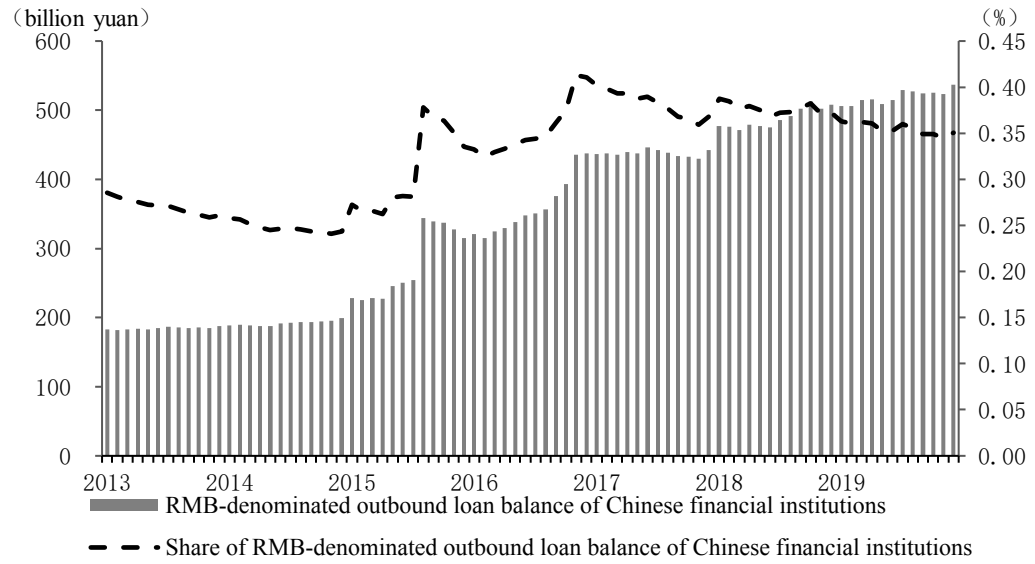

Figure 14 RMB-denominated Outbound Loan Balance and its Share of Chinese Financial Institutions

Source: People's Bank of China

3.2.4 RMB Foreign Exchange Trade

On September 16, 2019, the Bank for International Settlements (BIS) released a triennial survey of the global foreign exchange market. RMB serves as the eighth largest foreign exchange trading currency in the world, and mainland China ranks as the eighth largest foreign exchange trading center around the globe. The foreign exchange market turnover totaled 200.56 trillion yuan in 2019, an increase of 3.93% year-on-year.

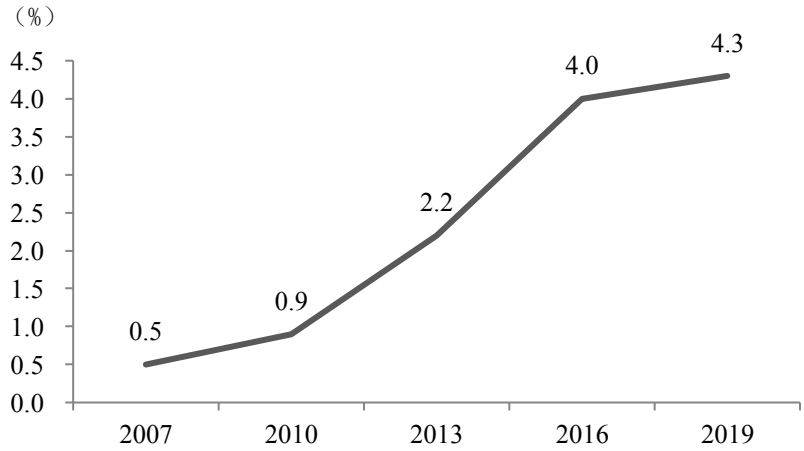

Figure 15 Proportion of Global RMB-denominated Foreign Exchange Transactions (%)

Source: BIS, Bank of China Research Institute

In 2019, foreign exchange spot transactions totaled 78.32 trillion yuan, a year-on-year increase of 6.56%; foreign exchange derivatives transactions reached 122.24 trillion yuan, a year-on-year increase of 2.32%, and the proportion in the foreign exchange market decreased to 60.95%; the inter-bank forex market transactions reached 172.18 trillion, a year-on-year increase of 4.34%; the bank-to-customer market transactions reached 28.38 trillion, a year-on-year increase of 1.54%. Among the foreign exchange derivatives, RMB forward foreign exchange forward transactions amounted to 2.63 trillion yuan, a year-on-year decrease of 26.01%; the total deals of foreign exchange and currency swap transactions reached 113.76 trillion yuan, a year-on-year increase of 3.15%; foreign exchange option transactions reached 5.86 trillion yuan,a year-on-year increase of 3.8%.

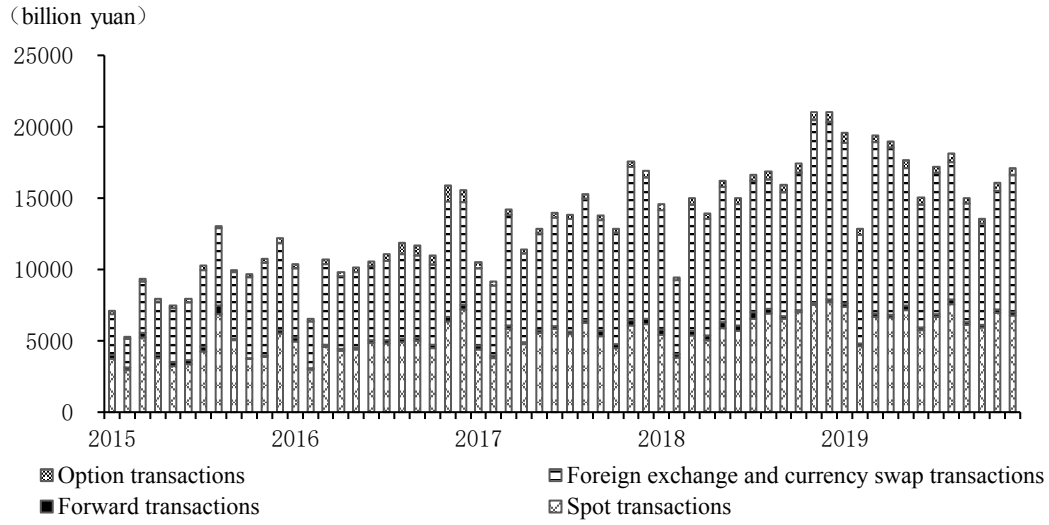

Figure 16: RMB Forex Market Transactions

Source: State Administration of Foreign Exchange

3.3 RMB in Global Foreign Exchange Reserves

As China's economic aggregate accounts for a significant increase in the world's economic aggregate, RMB assets are increasingly favored by central banks of all countries. The proportion of RMB in global foreign reserves keeps rising, and the global foreign exchange reserve management agencies have showed increasing willingness to hold RMB assets. As of the end of 2019, the scale of RMB global foreign exchange reserves increased to US$217.67 billion, an increase of US$14.59 billion from the end of 2018, accounting for 1.96% of foreign exchange reserves. This indicates that the reserve currency function of the RMB has been gradually improved.

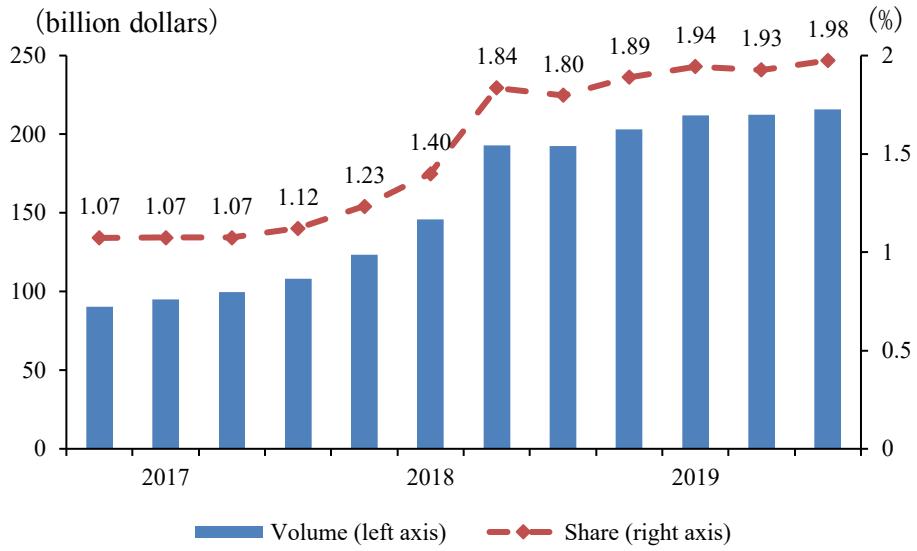

Figure 17 RMB's Size and Share in Official Foreign Exchange Reserves

Source: COFER, IMF

In 2019, the international appeal of the RMB continued to increase. On January 15, the share of the RMB in the foreign exchange reserves of the Iranian Central Bank reached 15%; on January 30, the Central Bank of Myanmar announced that it would include RMB as the official settlement currency for international payments; on May 30, the Czech Central Bank annouced that the RMB was listed as its reserve currency. In January 2019, the Russian Central Bank announced that the value of RMB held in the first half of 2018 increased from 23 billion dollars to 67 billion dollars, and the proportion of RMB in Russian foreign exchange reserves increased to 14.7%; in November 2019, the China Foreign Exchange Trading Center and the Moscow Exchange Group signed a memorandum of understanding in Shanghai, which further deepened the cooperation of the financial markets between China and Russia, and promoted the direct transaction price formation mechanism of RMB-to-Ruble and the settlement of bilateral currencies. According to incomplete statistics, more than 60 countries and regions have included RMB in their foreign exchange reserves.

3.4 RMB Exchange Rate

3.4.1 RMB Exchange Rate

In 2019, we continued to promote the market-oriented reform of exchange rate and improve the managed floating exchange rate system based on market supply and demand, adjusted by reference to a basket of currencies. We paid attention to the guidance of expectations, maintained the basic stability of the RMB exchange rate at a reasonable and balanced level, and allowed the exchange rate to play the role of adjustment of the macroeconomic and the automatic stabilizer of international balance of payments.

3.4.1.1 The Currency Exchange Rate against Major Countries is Depreciating

It was obvious that the exchange rates of the RMB against major international currencies depreciated. At the end of 2018, the central parity rate of RMB against the US dollar was 6.9762, down by 1.62% year-on-year; that against the European euro was 7.8155 with an appreciation of 0.41%; that against the Japanese yen was 6.4086 with a year-on-year depreciation of 3.43%; that against the pound was 9.1501 with a depreciation of 5.18%.

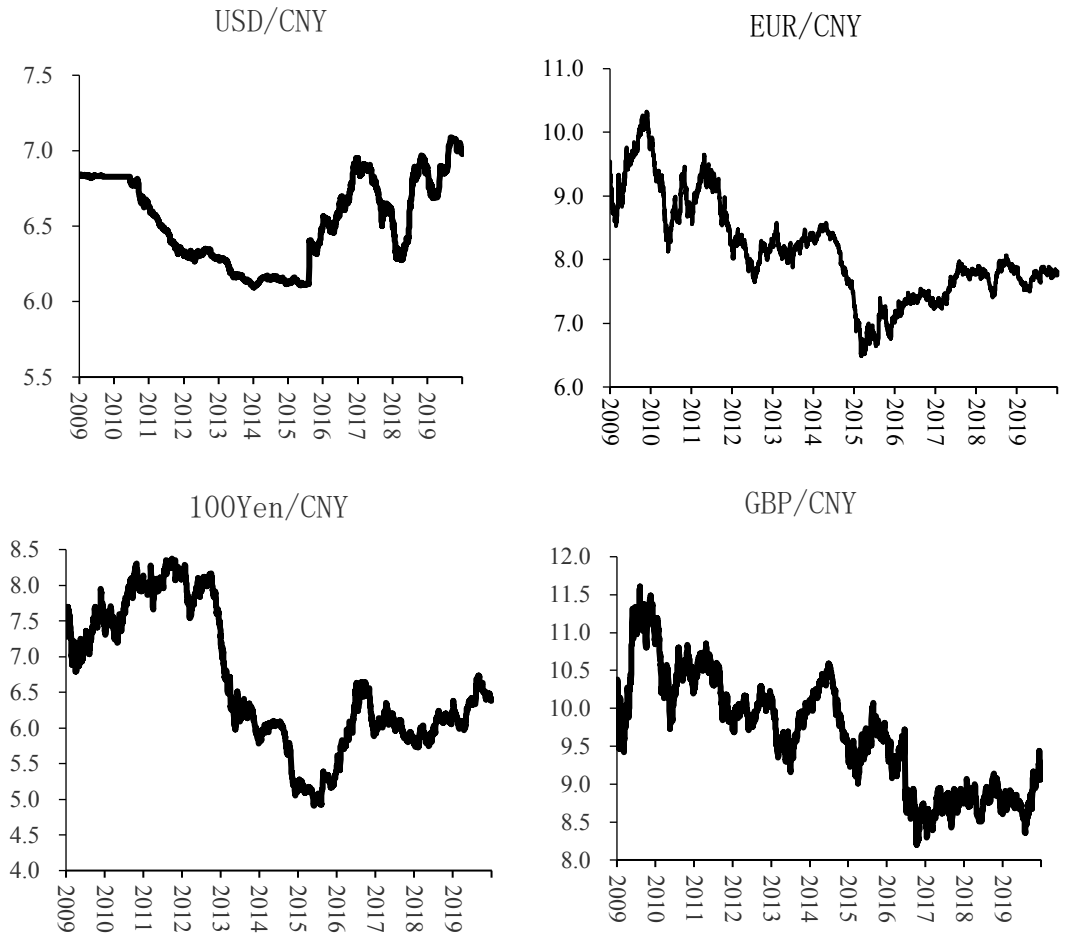

Figure 18 The Central Parity Rate of RMB against Major International Currencies(from 2009 to 2019)

Source: China Currency Network

3.4.1.2 The Real Effective RMB Exchange Rate Fell after Rise

According to the data of the Bank for International Settlements (BIS), the real effective RMB exchange rate in 2019 fell after rise, and it showed a trend of rebound at the end of the year. In December 2019, the nominal real effective RMB exchange rate index of RMB was reported at 114.41, a depreciation of 1.50% year-on-year. The real effective exchange rate index (with inflation factors deducted) was 122.24, up by 1.11%.

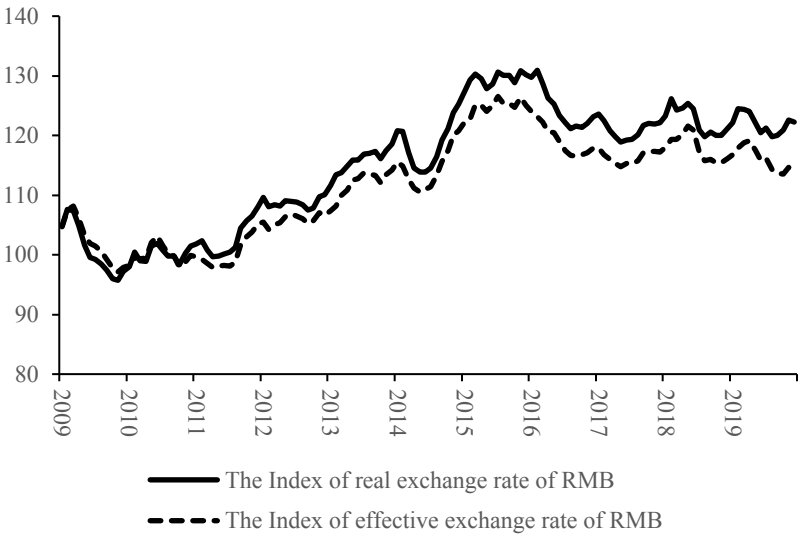

Figure 19 The Trend of the Effective Exchange Rate of RMB

Source: Bank for International Settlements

3.4.1.3 The RMB Exchange Rate Index Fell

At the end of 2019, the CFETS RMB exchange rate index released by the China Foreign Exchange Trading Center was 91.39, down by 2.03% year-on-year; the RMB exchange rate indices of the BIS currency basket and the SDR currency basket were 95.09 and 91.81, respectively, down 1.75% and 1.43% for the whole year.

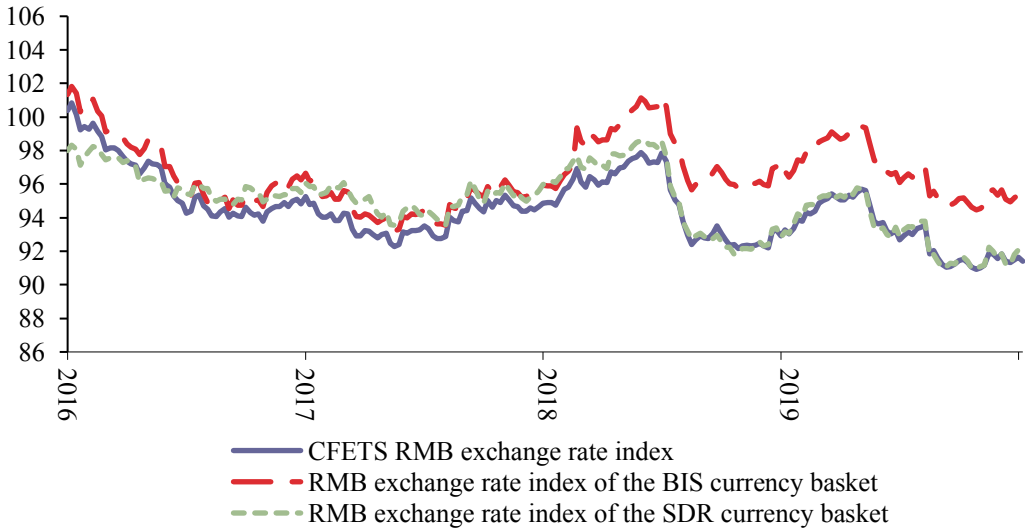

Figure 20 RMB Exchange Rate Indices

Source: CFETS

3.4.1.4 The Two-way Fluctuation of Offshore RMB

In 2019, the trends of CNY and CNH remained basically the same, showing two-way fluctuation. CNY and CNH reached the peak of the year on September 3rd and September 2nd, at 7.1785 and 7.1947, and closed at 6.9662 and 6.9617 on December 31st, up 1.46% and 1.33% from the end of the previous year. The average annual spread between CNY and CNH is 119 basis points, 9 base points lower than in 2018.

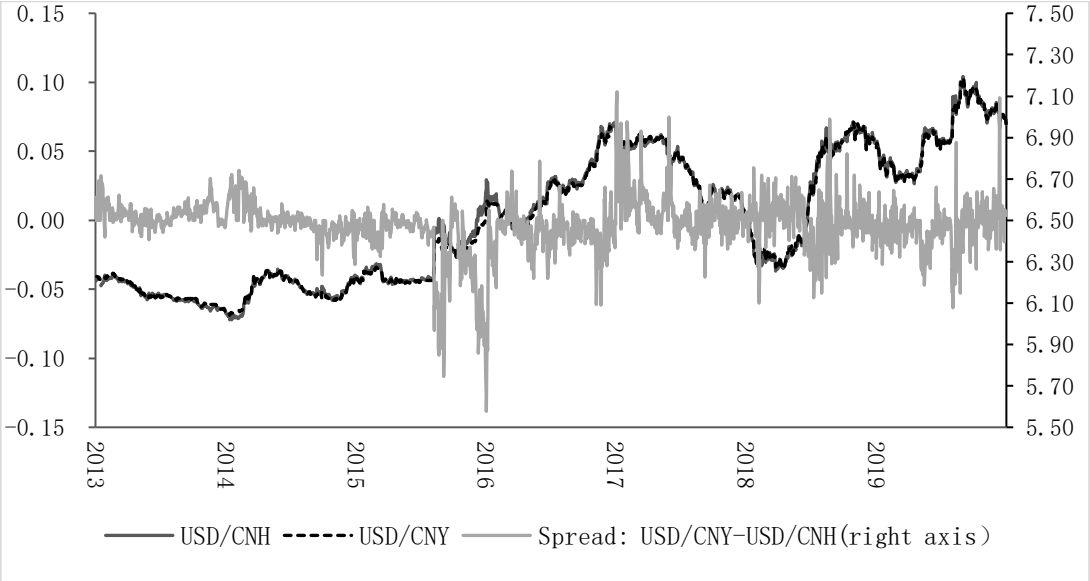

Figure 21 The Exchange Rates of CNY and CNH and Their Spread, 2012-2018

Source：Wind

3.4.1.5 RMB NDF Depreciation Narrowed

As of the end of December 2019, the 1-month, 3-month, 6-month and 1-year RMB NDF closing prices were 6.9655, 6.9765, 7.0070 and 7.0410, respectively. Compared with the same period in 2018, the exchange rate of RMB against the US dollar depreciated by 1.18%, 1.31%, 1.52% and 2.02% respectively in the four above-mentioned NDF transactions.

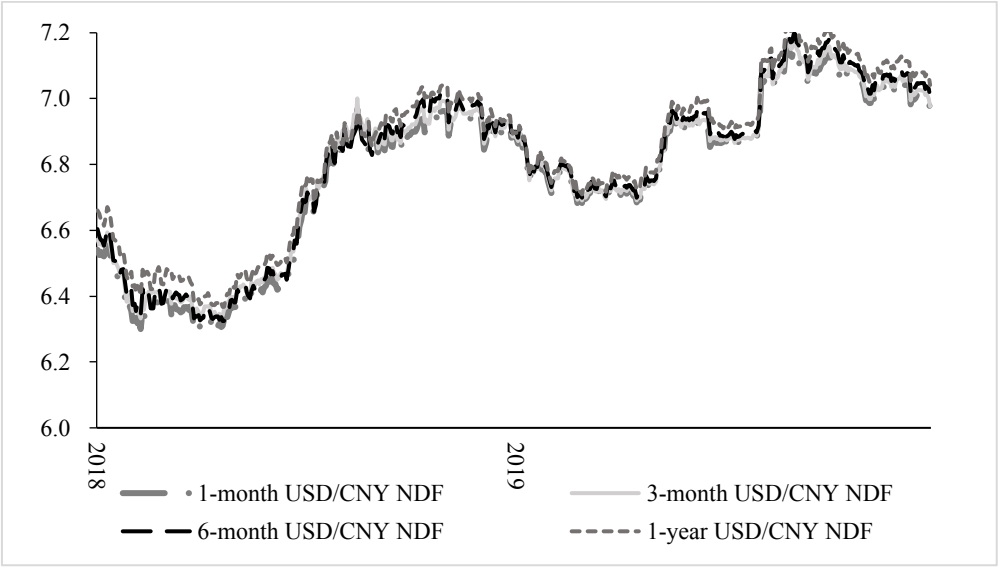

Figure 22 RMB NDF Daily Comprehensive Closing Price, 2018-2019

Source：Wind

Part IV The Goal and Path of Building Shanghai Global Financial Center

4.1 Strengthening Top-level Design and Institutional Innovation, and Building Shanghai Global Financial Center

We should further give full play to the institutional advantages of pooling resources to address major problems, strengthen top-level design and institutional innovation, and rely on the development strategy of the Yangtze River Economic Belt and the integrated development strategy of the Yangtze River Delta. Measures will be taken to coordinate the development of economy, technology, trade and finance, increase the efforts of reform and opening-up in the free trade zone, and take the marketization and internationalization as the core to build Shanghai into a global finance center with complete financial functions, coordinated development of five centers and strong comprehensive competitiveness. This will provide an endless source of new impetus for expanding the international use of RMB and breaking the bottleneck of RMB network effects.

We will uphold the principle of"prioritizing local currency", by taking the expansion of cross-border use of RMB as the facilitator, deepening institutional reforms, simplifying and optimizing the management system for the use of RMB under current accounts and direct investment. Measures will be taken to eliminate institutional barriers to facilitate the use of RMB, and improve the efficiency of cross-border outflow and the availability of overseas RMB, to enhance the ability to allocate RMB resources globally.

We will deepen the innovation of financial services in the free trade zone, encourage the development of industrial chain finance and attract the gathering of industrial enterprise headquarters, so as to enhance investment and financing functions and global resource optimization allocation functions, and fully support the development of Shanghai Trade and Shipping Center. Besides, we will continue to explore the mutual promotion and beneficial

supplementary mechanism of the construction of free trade zone and RMB internationalization, support the development of RMB cross-border trade financing, refinancing, cross-border two-way RMB capital pool and other businesses, and actively integrate into the global value chain, industrial chain and innovation chain. Efforts will be made to steadily move towards a strong investment country, continue to promote the use of RMB in direct investment, and pave the way for the industrialization of RMB internationalization.

Efforts will be made to implement overall planning and integration of the onshore financial market opening path and complete the negative list system to appropriately expanding the scope of participants, therefore accelerating the development of the RMB interest rate and exchange rate derivatives market, and achieving seamless connection between financial sub-markets. This will also provide an open, huge and efficient capital market for the internationalization of RMB as basis and support. We will strengthen onshore-to-offshore market pricing guidance and effectively straighten out the RMB international circulation path in order to create a fair competitive environment and market conditions for RMB cross-border financial transactions and asset management.

4.2 Enhancing Institutional Innovation and Competitiveness to Strengthen Shanghai's Functions of Global Financial Resource Allocation.

Measures will be taken to improve and optimize the reform of the financial institution system, by cultivating a large number of financial institutions with innovative capabilities and global competitiveness, and giving play to the aggregation and scale effects of financial centers.Taking high-quality development of the service economy as the starting point, the financial institutions should be committed to improving the professional level and promoting the integration and development of financial business innovation. We will establish and improve the internal risk identification, appraisal and evaluation system of the company, so as to strengthen Shanghai's functions of global financial resource allocation.

First, we will accelerate the cultivation of leading global financial institutions such as head brokers, big banks, and big asset management companies. Measures will be taken to increase RMB asset allocation capabilities, enhance RMB's pricing power, radiation and influence in global assets, and strengthen areas of weakness in developing global financial centers. At the same time, the construction of supporting services for law, credit reporting, rating, accounting and auditing should be further strengthened as well.

Second, we will cultivate a group of emerging local financial technology enterprises with advantages and encourage financial institutions to innovate and promote profound changes in the financial industry. Based on the characteristics and needs of different niche markets and customers, we will design suitable business models including the industrial chain, so as to provide targeted financial services for small and micro-sized enterprises, and science and technology enterprises. It is necessary to use the RMB Asset Management Center as the starting point to constantly enrich the types of RMB asset transactions; Efforts will be made to seekcooperation with online platforms, promote electronic transactions, and expand the market scale.

Third, we will gather and develop a group of asset management institutions with key market influence, and build international financial asset trading platforms. Efforts will be made to further

implement high-level financial opening-up measures, optimize access standards, attach importance to attracting non-bank foreign financial institutions, and increase the proportion of foreign financial institutions in the Shanghai global financial center. In addition, we will accelerate the introduction of a group of representative international financial institutions with its focus on wealth management companies, pension funds, and futures companies, to address the inadequacies of the financial market development in Shanghai.

4.3 Creating "Shanghai Price" and Mastering the Pricing Power of RMB Financial Assets

In order to enhance the core competitiveness of Shanghai global financial center, it is necessary to actively and steadily carry out the "last mile" of interest rate marketization reform, and firmly grasp the pricing power of RMB interest rate products. The barriers between the financial markets should be broken through and the financial market resources should be integrated, in order to actively promote the coordinated development of financial markets and jointly create the "Shanghai price".

First, we should continue to promote the market-oriented reform of interest rates, and establish a complete, efficient, and market-based RMB interest rate system. The first is to improve the benchmark interest rate mechanism, break through institutional barriers, use market forces to promote the linkage between SHIBOR and LPR, and establish smoother monetary policy transmission mechanism. The second is to improve the yield curve and establish a price transmission mechanism from the benchmark interest rate to each financial market, therefore providing pricing benchmarks for RMB assets. Measures will be taken to vigorously develop the derivatives market, strengthen the benign interaction between the spot market and the futures market and break the financial market segmentation, so as to realize price linkage across markets. Furthermore, we will actively develop new financial market forms, promote the development of insurance market, bill market, trust beneficiary right transfer market, etc., and guide the optimal allocation of short-term and medium-term funds.

Second, we will develop CFETS into a price indicator of the RMB foreign exchange market, regulate cross-border flow of funds, and provide benchmarks for financial institutions to target different currencies and adjust balance sheets.Continuous efforts will be made to enhance the function of the Shanghai foreign exchange market, increase the currency pairs of direct RMB transactions and expand the market level. We will also enrich the variety of derivatives, launch CTETS index-linked derivatives to meet the diverse foreign exchange transactions and risk management needs of enterprises, institutions, and government departments .

Third, we will improve marketization and standardization, and continue to build the RMB pricing benchmark for international commodity trade. Efforts will be made to expand the scope of member institutions of gold and commodity futures exchanges, provide more convenience and enrich product series.In addition, we will also strengthen the correlation between spot market and futures market transactions, allowing financial institutions to participate in market transactions and maintaining market liquidity.In this regard, the price discovery function and hedging function of "Shanghai Gold" and "Shanghai Oil" can be utilized to further enhance the international influence of "Shanghai Price".

4.4 Enhancing Taxation Reform and Innovation to Create an Internationally Competitive Taxation Environment

Shanghai should carefully summarize the taxation policies and practical experiences of tax collection and management in various SEZ over the past 40 years of reform and opening up, and creatively solve the system constraints including taxation, currency, trade, finance, customs and labor policies.Besides, Shanghai should also learn from the tax system practices and policies of international financial centers including London, New York, and Singapore, by attaching importance to the promotion role of government's "tangible hand", and giving full play to the positive role of taxation in attracting capital and talents and other production factors and promoting industrial upgrading. Under the premise of observing international rules and combating against harmful and malicious tax competition, we will innovate the tax system and formulate distinctive and competitive tax policies. Taking special tax incentives as an important starting point, we will target and implement special tax incentives for all kinds of SEZ, financial industries and high-tech industries , so as to focus on building a taxation model with relative competitiveness that is aimed at attracting headquarters and advanced manufacturing of multinational companies. Efforts should be made to stimulate the development of market players, form a tax environment that encourages innovation, and enhance market-based agglomeration, scale, and radiation effects in Shanghai.

By improving the tax system reform of "replacing the business tax with VAT", tax policies targeted for financial institutions and financial products are formulated. The financial business will be divided into core financial business, auxiliary financial business and export financial business, with certain VAT reduction and exemption being implemented for the key development of core financial business. Measures are taken to implement targeted tax preferential policies for financial innovation products and financial institutions, and set up pre-tax deduction items that are in line with the rules and characteristics of financial development. With reference to the practice of the "Guangdong-Hong Kong-Macao Greater Bay Area", an appropriate personal income tax rebate or special deduction system should be established to provide moderate personal income tax incentives for high-end financial talents to provide a good living and development environment for them. We will further optimize various tax and fee reduction measures from central and local governments , adopt digital technology, innovate tax collection and tax payment service models, so as to improve tax convenience and efficiency. Efforts will be made to accelerate the concentration of financial resources and reduce the obstacles to capital flow and distortion of resource allocation. Measures should be taken to make legislative and technical preparations for levying financial transaction taxes. It is feasible to explore the establishment of a certain percentage of financial transaction tax on the gross income of stocks, bonds and derivative financial products from financial institutions.

4.5 Improving the Internationalization Level of Financial Infrastructure and Building Credit Information Sharing Mechanism

In view of the high standard requirements of important global financial center, with the construction of the RMB clearing and payment system as the core, efforts should be made to improve the internationalization of the financial market infrastructure, further improve the legal system of the RMB clearing and settlement system, and strengthen the interconnection among

existing financial infrastructure. We will explore the formulation standards of new-type finance, and facilitate the interconnection of international and domestic standards for new products, new institutions, and new businesses in the financial sector, therefore providing ideas, formulation lists, and specific items for China to formulate national and industry standards.

Measures should be taken to formulate basic laws of the CIPS system and participant management methods, to clarify the access, access methods and other management requirements of participants both at home and abroad. Besides, we should strengthen the interconnection between the CIPS system and more financial market infrastructure both at home and abroad, and conduct research on services such as account and liquidity management to improve the efficiency and international competitiveness of CIPS system cross-border payment. We should give full play to Shanghai's advantages in leading the development of global financial technology, absorbing and drawing on international common standards, improving the financial standardization system, and enhancing China's influence in the formulation of international financial standards. Efforts should be made to establish Shanghai Financial Standardization Organization with the joint participation of banks, securities companies, insurance companies and other industry associations, and improve the multi-level financial standard system covering the whole country, industry, and organizations. Measures should be taken to actively participate in the formulation of international standards and establish normalized communication mechanism based on key contents including data collection, standard formulation, and information maintenance, in an aim to promote China's superior or distinctive standards, and increase China's influence.

Measures should be adopted to vigorously promote the construction of new infrastructures including 5G network, data centers, AI, to explore the construction of a unified financial cloud service platform with core technology. We should integrate data from all channels according to law to form data sharing mechanism covering departments in finance, taxation, industry and commerce, customs, courts and other departments. Furthermore, we should improve the financial credit information database, develop credit-reporting products and services required by multi-level financial markets and diversified financial entities.Shanghai will be built into the most influential global financial information center by taking the "Belt and Road" credit cooperation as an opportunity to strengthen credit information cooperation and exchanges with overseas financial center cities.

4.6 Coordinating and Innovating the Regulatory Model to Build a Global Financial Center with Chinese Characteristics

Functions in a crucial and special strategic position, Shanghai International Financial Center should further improve the financial supervision system with sound functions and efficient cooperation. On the context of adhering to the central government's major policies, Shanghai Headquarters of the People's Bank of China will take advantage of the macro-prudential management and top-level design of the macro-management. Besides, Shanghai Financial Work Bureau will take advantage of the supervision role of financial institutions within the jurisdiction according to the regulatory rules and operating rules, thus promoting block integration and improving the pertinence and efficiency of supervision. The cooperation of financial regulatory agencies should be strengthened to form three-dimensional local financial regulatory coordination

framework. Shanghai financial supervision department should be more active to give full play to its subjective initiative, by making full use of the first-trial right granted by the central government to the Shanghai Free Trade Zone. All types of market entities involved in the Shanghai International Financial Center should be included within the scope of supervision, leaving no gaps in supervision and loopholes in regulation. Shanghai should also establish emergency response mechanism for major financial emergencies, and quickly mobilize diversified administrative forces including finance, courts, procuratorates, political and legal commissions, public security, development and reform, economic and trade, finance, tax, industry and commerce etc., to ensure financial security and stable development of the financial market.

Measures should be taken to innovate the financial supervision model, build complete "supervision sandbox" framework and apply financial supervision technology, thus shifting from passive supervision to active supervision. Special rules and regulations should be formulated to clarify the rights, obligations and responsibilities of all parties including regulatory authorities, financial institutions and technology companies, therefore incorporating the development and application of financial regulatory technology into the legal framework. More use of big data, blockchain, cloud computing, artificial intelligence and other modern technical means should be realized to follow up the scientific and technological innovation of the regulated institutions in real time, and further improve the whole chain supervision before, during and after the event. The complete financial factor market and developed consumer market has allowed Shanghai to conditionally implement the "supervision sandbox". The establishment body and operation body of the "supervision sandbox" should be identified.We should first implement trials in some financial fields, conduct sufficient pre-test and post-tracking based on the data available, and explore the specific implementation and management mechanism of the "supervision sandbox". We should not only encourage financial innovation, but also protect the legitimate rights and interests of finance-related consumers.

4.7 Improving Financial Governance Mechanism and Enhancing the Ability to Manage Major Risks

The global financial center has attracted financial institutions from all over the world. It is necessary to pay full attention to the mismatch problem between current financial sector regulatory framework in China and the comprehensive operating model of international financial institutions. Measures should be taken to further optimize the supervisory responsibilities of the Financial Stability Board as well as the "PBoC, China Banking Regulatory Commission（CBRC）and China Securities Regulatory Commission (CSRC) ", strengthen policy coordination, improve policy linkage, avoid regulation gaps or overlapping regulatory issues, so as to jointly create an open, transparent, and efficient regulatory environment. We should not only supervise traditional financial risks, but also monitor and evaluate the risks of new financial forms such as third-party payment platforms, digital currencies, Internet finance, etc., A wider range of regulatory information and data sharing should be realized by involving multiple forces to combat "money laundering", terrorism-related financial transactions, and illegal cross-border financial activities, in order to jointly maintain the smooth operation of the global financial system.

As a growing global financial center, Shanghai tends to be more vulnerable to the impact of

international economics and finance, therefore making it an urgent need to improve the two-in-one management framework of "micro-regulation+macro-prudence" for cross-border capital flow. Measures should be adopted to make full use of financial technology and build powerful financial risk monitoring system. We should also timely supplement and improve the risk management policy toolbox, and build major risk management mechanism. First, we should further strengthen supervision of global systemically importane financial institutions and follow the abnormal flow of funds within financial holding companies across institutions, markets, and borders in a timely manner. We should be adept at identifying financial risks nested in complex transaction structures, and flexibly use policy tools to effectively respond accordingly. Second, we should attach great importance to and effectively respond to the trend of RMB speculation. We should continue to deepen the reform of the marketization of both RMB interest rates and exchange rates, to establilsh price coordination mechanism for interest rates and exchange rates. Besides, it will also help to consolidate Shanghai's role as a global RMB asset pricing center, to guide offshore prices with onshore RMB prices. During this process, we can also consider establishing an RMB stabilization fund to ensure the stability of the RMB exchange rate and provide support for the promotion of RMB internationalization. Third, measures should be taken to further improve the system and mechanism to fully prepare for major risks in the non-traditional economic and financial fields including earthquakes, plagues, hackers, and terrorist attacks, to ensure the normal operation of financial infrastructure and financial markets.

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Working Paper

Bilateral Swap Agreement and Renminbi Settlement in Cross-Border Trade*

By SONG KE AND XIA LE*

Abstract: *This research empirically examines the impact of China's renminbi (RMB) bilateral swap agreements (BSAs) on the usage of the currency in cross-border trade transactions. By using a unique dataset from SWIFT including cross-border settlement messages of 91 countries/regions between October 2010 and November 2015, we confirm that the signing of a RMB BSA helps to increase the number, value and proportion of the RMB settlement in cross-border trade. Our results are robust with respect to the choice of different models, including multi-level mixed model, two-stage regression model, and difference-in-difference model. In addition to justifying the effectiveness of China's BSA-signing strategy to promote the RMB usage in trade settlement, our results clarify that the signing of those RMB BSAs is not purely for China's political ends as some scholars claim.*

Keywords: RMB; bilateral swap agreement; cross-border trade; SWIFT

Introduction

The rise of China's currency, the renminbi (RMB), is a significant development in the international monetary system in the aftermath of the 2008-2009 global financial crisis. Almost starting from scratch, the RMB has managed to substantially increase its market share in international trade and financial transactions over the past several years (BIS 2016). Interestingly, the RMB internationalisation is a government-driven process, in stark contrast to some historical precedents of internationalised currencies such as the USD and Japanese Yen whose internationalisation journeys were primarily driven by market forces (Frankel 2012).

As part of the authorities' efforts to push for the international use of the RMB, the People's Bank of China (PBoC), China's central bank, actively pursued signing RMB-denominated Bilateral Swap Agreements (BSAs) with other central banks (Eichengreen and Kawai 2015; Park 2016) The first RMB BSA was signed between the PBoC and the Bank of Korea in December 2008. As of end-2017, the PBoC had 36 outstanding RMB-denominated BSAs with other central banks, amounting to a total value of around 3.3 trillion yuan, equivalently USD 500 billion. The RMB

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BSAs generally have a three-year maturity and are renewable although some of them were not renewed at their expirations (Appendix 1).

A BSA is a swap line established between two central banks. It allows one party of the agreement to exchange a certain amount of its local currency for foreign currency funds from the counterparty at a pre-set or market exchange rate. Traditionally, BSAs function as a backstop liquidity facility so that a central bank is able to secure its access to foreign currency funding during times of market stress. A salient example in this respect is that the US Federal Reserve signed a number of temporary BSAs during the 2008-2009 global financial crisis, with the objective of helping the counterparty central banks to tackle the liquidity squeeze of the USD in their financial markets. In October 2013, the US Federal Reserve made five of the temporal BSAs into permanent standing arrangements, e.g. BSAs with the Bank of Canada, the Bank of England, the Bank of Japan, the European Central Bank, and the Swiss National Bank.

A series of studies have been conducted to investigate the effectiveness of those temporary BSAs signed by the Federal Reserve at the height of global financial crisis while results are mixed. Taylor and Williams (2009) find no impact of these temporary BSAs on alleviating the drain of USD liquidity in the counterparties' financial markets. On the other hand, McAndrews, Sarkar, and Wang (2008) and Rose and Spiegel (2012) find certain evidence that these BSAs helped stabilise market condition during the crisis period.

Differing from the ones signed by the US Federal Reserve, the PBoC's BSAs have a clear objective of facilitating the RMB internationalisation through promoting the currency's usage in the settlement of cross-border trade transactions (PBoC 2012). Toward this end, the RMB BSAs are designed to provide RMB funding to foreign importers so that they can pay in the RMB for their exports from China.

Compared with the existing literature about the US BSAs, research about the effectiveness of China's BSAs remains scant. This is mainly due to the lack of information, in particular the countrywide data of trade transactions settled in the RMB. The PBoC has such data but it has never made them available to the public.

A few recent studies assess the effectiveness of the RMB BSAs via certain indirect evidence in the absence of information about the RMB trade settlement. The results are mixed. Zhang et al. (2017) find a significantly positive effect of China's BSA signing on bilateral tradewhile McDowell (2019) questions the effectiveness of these RMB BSAs in terms of promoting crossborder trade settlement in the RMB.

It is noted that a RMB BSA can also play its role as a backstop liquidity facility to the offshore market of its signing counterparty. As such, the existence of a RMB BSA can help to encourage foreign importers and banks to more actively use the currency in settling trade transactions if they believe that a BSA is crucial to the stability of the RMB offshore market. We call it 'confidence channel' through which a BSA is able to promote the use of the RMB in trade transaction settlement.

In essence, the effectiveness of the RMB BSAs needs to be assessed on the basis of relevant data. We have access to a unique dataset from SWIFT which provides the countrywide RMB settlement data. It enables us to fill the gap in the literature by empirically examining the impact of a RMB BSA signing on the RMB use in cross-border trade settlement.

Our results confirm that the signing of a RMB BSA helps to increase the number, value and proportion of the RMB settlement in cross-border trade. Our results are robust with respect to the choice of different regression models which are adopted to address a number of potential biases relating to the OLS model.

The rest of the paper is organised as follows. In the next section, we briefly introduce the backgrounds of RMB BSAs, especially against the backdrop of the RMB internationalisation. We then present our main results in the following section. The final section concludes.

Background and data

The RMB internationalisation and PBoC's BSA signing

The Chinese authorities set out to push for the internationalisation of its currency in the aftermath of the 2008-2009 global financial crisis (See Chen and Cheung 2011; Cheung, Ma and MaCauley 2011). Toward this end, China's authorities launched its hallmark Pilot Program of RMB Settlement of Cross-Border Trade Transaction Settlement and expanded it in the following years to cover the entire China to enable the currency to perform the functions of 'unit of account' and 'medium of exchange' in international trade (Frankel 2012).

At the beginning stage, one practical and fundamental obstacle to use the RMB in trade settlement is the lack of the RMB funding outside China, preventing foreign importers from settling trade transactions with Chinese exporters in the RMB. The problem fundamentally stems from the inconvertibility of the currency under the capital account, making it impossible for the RMB funds to freely flow out of China. To address this problem, the PBoC seeks to sign more BSAs with other central banks and use them as a channel to provide the RMB funding to foreign importers which might have interest in participation of the RMB trade settlement.

The central Bank of Egypt (CBE), which signed a BSA of RMB 18 billion with the PBoC in December 2016, illustrates how the BSA functions to help an Egyptian importer to obtain RMB funding for the trade settlement as shown in Figure 1(CBE 2017).

First, the CBE and the PBoC activate the currency swap in advance, after which each party puts its local currency swap fund at the account within itself and under the name of the counterpart (CBE deposits in the Egyptian pounds, EGP; PBoC in the RMB). i.e the CBE provides to China EGP. It opens an account on behalf of China in the EGP within the central bank, and the PBoC provides in exchange the RMB for the same amount. It opens an account in the PBoC on behalf of the CBE. Second, a domestic importer who imports goods from China applies for an RMB loan to a domestic bank. Third, the domestic bank applies to the CBE for an RMB loan. After the review process, the CBE notifies the domestic bank of the approval for the RMB loan. Subsequently, the CBE requests the PBoC to transfer RMB fund from the CBE's account within the PBoC into the domestic bank's account with a corresponding bank in China. Fourth, the domestic bank directs the corresponding bank in China to transfer the RMB funds into a Chinese exporter's account, and the corresponding bank in China provides the RMB funds to the Chinese exporter. Fifth, the domestic importer repays the RMB loan at its maturity date. The domestic bank notifies the CBE of the repayment and transfers the RMB into the CBE's account within the PBoC through the corresponding bank in China.

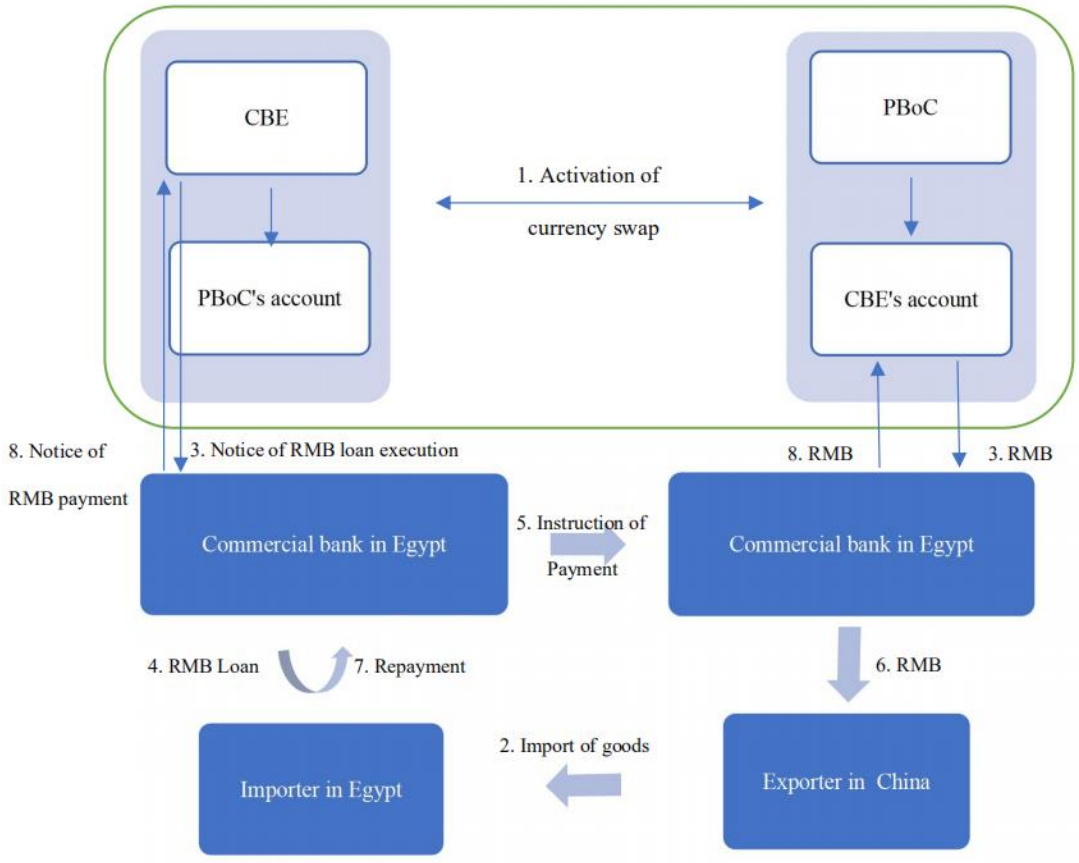

Figure 1. China FX currency swap agreement illustration from an importer perspective in Egypt. Data source: CBE 2017.

The trade-oriented nature of these RMB BSAs also reflects the PBoC's selection of its BSA partners. Previous research studies, including Garcia-Herrero and Xia (2015) and Liao and McDowell (2015), find that the PBoC put emphasis on its trade relationship with the potential candidate although some other factors, including political relationships and societal institutional characteristics, also play a role in the singing of BSAs. Moreover, according to Lin,Zhan, and Cheung (2016), the size of BSAs between the PBoC and other central banks positively correlates with the bilateral trade intensity as well as the presence of a bilateral free trade agreement.

Despite the fast-growing number of BSAs, the information about the real use of these RMB BSAs is scarce. The PBoC sporadically reports relevant information. In its 2010 annual report, the PBoC disclosed that BSAs of about RMB 30 billion were used in the year compared to the then outstanding BSAs of RMB 803.5 billion (PBoC2011). The PBoC (2015) reports that, as of end-2014, the usage of RMB BSAs amounted to RMB 96.5 billion among which RMB 80.7 billion was initiated by the other central banks. The figures were small relative to the then total outstanding BSAs of around RMB 3 trillion.

News media also report the use of the RMB BSAs on a case-by-case basis from time to time. Generally, these reported cases are related to the traditional function of a BSA in providing liquidity to the counterparty rather than the specific use of the RMB trade settlements. For example,

the Hong Kong Monetary Authority (HKMA), Hong Kong's de facto central bank, was reported to use the BSA with the Chinese mainland in October 2011 to meet local banks' liquidity demand for the currency. At the beginning of 2016, the Argentinian government announced that it would obtain a certain number of the RMB funds through its BSA with China.

Some scholars express their doubt about the effectiveness of BSAs. Takatoshi (2011point out that the actual impact of the RMB BSAs might be limited due to China's still-closed capital account. McDowell (2019) tries to get more information about the real use of these RMB BSAs by sending inquiries to 35 central banks which have BSAs with China. Based on the limited responses from the central banks, McDowell (2019) concludes that these RMB BSAs are rarely being tapped.

The conclusion of McDowell (2019) deserves more scrutiny. Indeed, we believe that the effectiveness of the RMB BSAs should not solely be assessed on the basis of their amount. It is noted that the BSAs with the PBoC are not the only channel through which foreign importers have access to the RMB funding for trade settlement. Since the inception of the RMB internationalisation, China's authorities have gradually loosened their grip on the capital account to allow RMB funds to flow out of China and thereby develop offshore RMB markets. Apart from the BSA channel, foreign importers can obtain the RMB funds from those offshore RMB markets as well.

It means that a RMB BSA can be tapped for the purpose of stabilising the offshore market under the central bank's jurisdiction. Indeed, the HKMA used its BSA with the PBoC in 2011 for stabilising its offshore RMB market, which is also the largest one in the world. As such, the existence of a RMB BSA can help to reinforce the confidence of foreign banks and importers in using the RMB in their transaction settlement since the BSA will enable their central banks to have additional capacity to stabilise their offshore RMB markets.

All in all, the effectiveness of the RMB BSAs should be examined empirically. Unfortunately, there is scant literature in this respect. The research of Zhang et al. (2017) is an exception, which finds a significantly positive effect of swap agreements on trade. In their benchmark model, the signing of a RMB BSA would improve bilateral trade values between China and its partners by around 30%. However, Zhang et al. (2017) don't touch upon the BSA's direct impact on the RMB usage. To fill this gap in existing literature, our research directly focusses on the impact of the BSA signing on the use of the RMB in trade settlement.

SWIFT data

Our empirical investigation of the RMB settlements largely hinges on the availability of relevant data. Fortunately, SWIFT, or the Society for Worldwide Interbank Financial Telecommunication, provides a unique dataset of cross-border settlements denominated in the RMB which has been used by some previous research to examine the progress of the RMB internationalisation (Batten and Szilagyi 2016). As the world's largest electronic payment system, SWIFT has a standardised bank-to-bank messaging system to facilitate fund transfer among its member banks. Every message in the SWIFT system represents a fund flow between two member banks.

In particular, Batten and Szilagyi (2016) report that SWIFT classifies its data of message in a number of ways based on the type of financial product, relationship of counterparties (e.g. bank to bank versus bank to customer) as well as the currencies used in the transactions, which make it possible to measure to what extent the RMB has advanced on different dimensions towards a real international currency, including as a unit of account, a medium of exchange for market transactions, and a store of value for saving.

We only use part of transaction data in Batten and Szilagyi (2016), i.e. MT 700 (confirmations of the issuance of a trade documentary credit) which corresponds to trade invoicing. These

aggregated data are bundled into monthly maturities for the period from October 2010 to November 2015. For each type of message, we have all transactions denominated in each SWIFT currency. Therefore, we are able to construct three variables for each type of message: (1) the number of transactions denominated in the RMB; (2) the value of transactions denominated in the RMB; and (3) the proportion of RMB denominated value to the total value for each country.

Empirical results

First of all, we divide our country/region samples into two groups, one with a RMB BSA signed during the period from October 2010 to November 2015 and the other without BSA. In particular, the PBoC signed a RMB BSA with the ECB in October 2013. Therefore, we treat the Eurozone members which joined the currency union before October 2013 as in the first group. Table 1 summarises some characteristics of the two country/region groups.

Table 1. Descriptive statistics.

	No swap agreement	With swap agreement	*T*-test for equality
# of countries	49	42	
GDP	52.99	59.55	-0.20
Population	62.96	40.28	0.78
Distance	7,815	7,433	0.45
Import (%)	10.33	10.59	-0.21
Export (%)	15.65	12.74	1.38

Note: This table shows the descriptive statistics of the sample countries/regions in our paper. *** represents significance level at 1%.GDP is in billion international dollar, population is in million, and distance is in kilometres.

Performance with and without a BSA

We then focus on the first group of countries/regions and make a direct comparison between the periods with and without BSAs. For each country/region, we simply separate the window without BSA from window with BSA for the whole sample period and directly compare (1) the number of transactions denominated in the RMB; (2) the value of transactions denominated in the RMB; and (3) the proportion of RMB denominated value to the total value for each country/region, with the MT 700 message. The sample we use is all the countries/regions that have a BSA with China. There are 42 countries/regions altogether, but Hong Kong SAR, Malaysia, Singapore, and South Korea are dropped out of the sample since their BSAs cover the whole sample period which makes it impossible for us to compare. Therefore, the final sample consists of 38 countries/regions. The results are shown in Table 2.

Table 2.RMB BSA signing and its impact.

		Time without swap	Time with swap	Paired *t*-value for (log) diff	Signrank*z* value for (log) diff
# of obs.		38	38		
1.Number of RMB transactions	Mean	5.40	8.20	3.42***	
	Median	0.38	1.47		3.34***
2. RMB value of transactions	Mean	1.44	2.647	3.98***	
	Median	0.595	1.173		3.20***
3. RMB proportion of transactions	Mean	0.016	0.026	1.35	
	Median	0.001	0.003		2.32**

Notes: This Table shows the different measures of cross-border trade in time periods with swap and without swap. **and *** represent the significance level at 5% and 1%, respectively.

In Table 2, we show that in the MT 700 message, the mean number of RMB denominated transactions is 5.40 for the 'without swap' window, and it is 8.20 per month after a RMB swap is signed with China. The log difference is significant at 1%. The median also exhibits significant increase. Similar patterns can also be found for the value of RMB denominated transactions. For the proportion of RMB denominated value, although the mean change is insignificant, the median change is significant at the 5% level which might be due to the skewness of distribution among different countries. In short, the RMB-settled transactions indeed experienced a significant increase after the country/region signed a swap with China.

OLS results

We further use OLS to test the relationship between the BSA signing and the RMB-settled transactions. Specifically, we use the following regression:

$$Y_{im} = \alpha + \beta Swap_{im} + \gamma Control_{im} + \varepsilon_{im}$$

where Y_im contains the three target variables: the number of transactions denominated in the RMB, the net number of transactions denominated in the RMB, as well as the ratio of RMB-denominated transactions to total transaction value for country/region *i*, month *m*. $Swap_{im}$ is a dummy variable which equals 1 if country/region *i* has already signed a RMB swap agreement with China in month m, and 0 otherwise. $Control_{im}$stands for a group of control variables and sources whose definitions are detailed in Appendix 2. In this model, we use all the 91 sample countries/regions. The results are shown in Table 3.

Table 3.OLS regression results.

	1 Number of RMB transactions	2 Number of RMB transactions	3 RMB value of transactions	4 RMB value of transactions	5 RMB proportion of transactions	6 RMB proportion of transactions
Swap	83.45***	32.97***	2.323***	1.524***	0.0392***	0.0309***
	[10.77]	[9.40]	[21.45]	[13.71]	[12.30]	[12.11]
ImEx		21.12***		0.934***		0.0495***
		[8.74]		[5.47]		[5.64]
Openness		4.158***		0.192***		0.00425***
		[8.23]		[6.95]		[9.00]
Population		-2.720***		0.237***		-0.00135*
		[-3.14]		[6.17]		[-1.85]
GDP		4.535***		0.530***		0.00617***
		[7.58]		[17.40]		[9.03]
Bank		-0.610***		-0.00963***		-0.000267***
		[-7.09]		[-3.77]		[-3.07]
Time FE	No	Yes	No	Yes	No	Yes
_cons	3.628***	-1.398	1.050***	-2.128***	0.0162***	-0.0215***
	[15.31]	[-0.77]	[29.90]	[-19.98]	[14.61]	[-6.94]
N	6,552	5,400	6,552	5,400	6,552	5,400

Notes: In this Table, we provide OLS regression results where dependent variable $Y_{im}$is one of the three target variables:number of RMB transactions, RMB value of transctions, and RMB proportion of transctionsfor country/region i, month m. $Swap_{im}$ is a dummy variable which equals 1 if country/region i has signed the swap line contract with China in month m, and 0 otherwise. * and*** represent the significance level at 10% and 1%, respectively.

In Table 3, the null hypothesis is that the signing of BSA has no impact on the counterparty country/region's transactions in the RMB. If the null hypothesis is true, then the coefficient of $Swap_{im}$ should not be significantly different from zero. In Table 3, we can see that all the coefficients of $Swap_{im}$ are significantly positive, indicating that the signing of BSA actually promotes the RMB's use in trade settlement.

However, the results in Table 3 are subject to at least the following biases. First, we are using the data where observations within one country/region or one year are clustered, and the use of a single level model may cause problems. We therefore need to use multilevel models. Second, the choice of signing the BSA with China might not be an exogenous decision. The level of RMB settlement in the past may be an important factor driving the signing of a BSA with China. This endogeneity problem is not considered in the OLS results. Third, the number of transactions in the RMB, the net amount in the RMB, as well as the ratio of RMB transaction value for country/region i, month m may not be a stationary series, which could distort the previous OLS results.

Multi-level mixed model

To address the concern of clusters, we adopt the multi-level mixed model for random coefficients for both the countries and for the calendar years. Mixed models are characterised by containing both fixed and random effects. The fixed effects are analogous to standard regression coefficients and are estimated directly. The random effects are not directly estimated but are summarised in terms of their estimated variances and covariances. Random effects may take the form of random intercepts or random coefficients. In our analysis, we adopt the random intercept models and the results are shown in Table 4. The definitions of the variables in Table 4 are exactly the same as in those in Table 3.

Table 4. Random coefficient models.

	1 Number of RMB transactions	2 Number of RMB transactions	3 RMB value of transactions	4 RMB value of transactions	5 RMB proportion of transactions	6 RMB proportion of transactions
Swap	0.159***	0.130***	0.474***	0.444***	0.012***	0.0125***
	[3.30]	[2.79]	[3.94]	[3.51]	[2.85]	[4.35]
ImEx		0.295**		0.808**		0.0405***
		[2.09]		[2.13]		[4.58]
Openness		-0.00457		0.099		0.00229
		[-0.07]		[0.63]		[0.76]
Population		-0.0467		0.0436		-0.00344
		[-0.45]		[0.20]		[-0.81]
GDP		0.339***		0.759***		0.00874**
		[4.09]		[4.24]		[2.55]
Bank		-0.0066		-0.0181		-0.000141
		[-1.08]		[-1.36]		[-0.55]
Random coeff. for						
Country	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
Constants	0.626**	1.449***	1.449***	-0.62	0.022***	-0.0094
	[5.25]	[6.03]	[6.03]	[-1.17]	[3.27]	[-0.93]
N	6552	5400	6552	5400	6552	5400

Notes: In this Table, we provide the estimation results for the mixed models, in which the coefficients are a mix of fixed parameters and random variables. We allow varying intercepts for countries/regions and for different years. The variable names are defined in Appendix 2. **and *** represent the significance level at 5% and 1%, respectively.

We can see that in Table 4, the coefficients of swap dummies in all the six specifications are signifcantly positive, which is highly consistent with previous results. This result rejects the null hypothesis that the BSA adoption has no impact on the RMB trade settlements, showing that even

after controlling for the possible impact of country-level and time-level clustering, the adoption of the BSA with China will promote the use of the RMB in trade settlement.

Endogeneity of BSA signing

In order to account for possible endogeneity of the event of BSA signing, we adopt the following Probit model:

$$\boldsymbol{prob}(\mathbf{1}_{im}) = \gamma_i + \theta_i X_{im} + u_{im}$$

where the dependent variable is a dummy which equals 1 if country/region i has a signed BSA with China in month m, and 0 otherwise. The X_{im}contains a number of explanatory variables, which are used in previous studies to predict the BSA signing (see Garcia-Herrero and Xia 2015; Liao and McDowell 2015; Lin,Zhan, and Cheung 2016). These explanatory variables include: (1) *Distance* between country/region i and China, (2) *Voice and Accountability*, reflecting perceptions of the extent to which a country/regions's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media, (3) *Political Stability*, which measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism, (4) *Government Effectiveness*, which reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies, (5) *Regulatory Quality*, which reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development, (6) *Rule of Law*, which reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, and the likelihood of crime and violence, as well as (7) *Control of Corruption*, which reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as 'capture' of the state by elites and private interests. In addition to these exogenous political factors, we also include the one-period lagged value of the number of transactions in the RMB, the net amount in the RMB, as well as the ratio of the RMB settlement. The results of the Probit model are exhibited in Table 5.

Table 5. The factors determining the signing of BSAs.

Panel A: Probit results

	(1)	(2)	(3)
Number of RMB transactions $_{t-1}$	0.00247***		
	[9.66]		
RMB value of transactions $_{t-1}$		0.0924***	
		[16.20]	
RMB proportion of transactions $_{t-1}$			1.783***
			[10.83]
Distance	-0.420***	-0.366***	-0.396***
	[-11.56]	[-10.04]	[-10.59]
Voice and Accountability	0.134***	0.0557	0.0252

	[3.73]	[1.56]	[0.72]
Political Stability	-0.00563	0.0219	-0.0795**
	[-0.18]	[0.68]	[-2.53]
Government Eeffectiveness	0.955***	0.687***	0.936***
	[10.25]	[7.20]	[10.00]
Regulatory Quality	-0.400***	-0.159**	-0.180**
	[-5.35]	[-2.12]	[-2.43]
Rule of Law	0.0413	0.0359	0.0713
	[0.38]	[0.32]	[0.66]
Control of Corruption	-0.364***	-0.334***	-0.353***
	[-5.00]	[-4.51]	[-4.82]
constant	2.647***	1.973***	2.359***
	[8.25]	[6.06]	[7.08]
# of observations	6,458	6,458	6,458

Panel B: Marginal effects

	(1)	(2)	(3)
Number of RMB transactions $_{t-1}$	0.0006***		
	[9.88]		
RMB value of transactions $_{t-1}$		0.0225***	
		[17.18]	
RMB proportion of transactions$_{t-1}$			0.447***
			[11.10]

Panel C: Probit models considering one control variable at a time

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Number of RMB transactions $_{t-1}$	0.00343***	0.00358***	0.00346***	0.00288***	0.00313***	0.00312***	0.00319***
	[12.35]	[12.72]	[12.13]	[10.34]	[10.90]	[11.03]	[11.20]
Distance	-0.368***						
	[-11.67]						
Voice and Accountability		0.196***					
		[10.80]					
Political Stability			0.188***				
			[10.17]				
Government Effectiveness				0.301***			

				[15.68]			
Regulatory Quality					0.258***		
					[13.06]		
Rule of Law						0.247***	
						[13.78]	
Control of Corruption							0.201***
							[12.04]
Constant	2.363***	-0.897***	-0.869***	-0.985***	-0.970***	-0.939***	-0.914***
	[8.52]	[-44.77]	[-43.96]	[-45.26]	[-44.76]	[-45.21]	[-45.05]
N	6,458	6,458	6,458	6,458	6,458	6,458	6,458

Notes: This table provides results for a probit regression: $\boldsymbol{prob}(\mathbf{1}_{im}) = \gamma_i + \theta_i X_{im} + u_{im}$,,where dependent variable 1_imequals 1 if country/region i has the swap line with China in month m, and 0 otherwise. X_{im} is the set of explanatory variables described in Appendix 2. **and*** represent significance level at 5% and 1%, respectively.

The results from Panel A, Table 5 confirm our concerns that the selection of RMB BSA partners is indeed endogenous, since the estimated coefficients for all three lagged variables (number of RMB transations, RMB vaule of transcations, RMB proportion of transctions) are significantly positive. Panel B of Table 5 shows the marginal effect. For example, one percent increase in the total number of RMB denominated transactions leads to 0.11% higher in the probability that country/region i will sign a BSA with China. The results from other specifications are highly consistent, confirming the endogeneity of the events.

In Panel C of Table 5, we show the same Probit model running on the control variables separately. We can see that some of the inconsistent signs of the coefficients in Panel A, Table 5 come from the multicollinearity between the political factors. If we run the Probit model on individual control variables separately, all the political factors have a significantly positive coefficient. The results show that the political reasons are among the major driving forces that increase the probability of signing a BSA with China.

Non-stationarity of variables

Another concern that we have is the possible non-stationarity of the series. In order to test the stationarity, we limit our sample to countries/regions with a BSA in our sample. Moreover, Argentina, Belarus, and Indonesia are dropped out of the sample since they move from no swap to with swap, causing complexity. Also, Hong Kong SAR, Singapore, and Malaysia have a 'with swap' status throughout the sample time. To be consistent with the later results, these three countries/regions are dropped out. So there are 28 countries/regions in this sample. We first calculate the monthly mean values of the number of transactions in the RMB, the value in the RMB, as well as the proportion of the RMB settlement across different countries/regions, and form a time-series. Subsequently, Dicky-Fuller test is used in the three variables' series to test the stationarity. We can see from Panel A of Table 6 that the null hypothesis of non-stationarity cannot be rejected, indicating that the existence of non-stationarity is indeed a valid concern.

Table 6. Stationarity of variables.

Panel A: Raw values

MT 700	*Number of transactions*	*RMB value of transactions*	*RMB proportion of trasactions*
Z(*t*)	-1.96	-2.11	-2.52
p-value	0.302	0.238	0.110

Panel B: Abnormal values

MT 700	*Number of transactions*	*RMB value of transactions*	*RMB proportion of transactions*
Z(*t*)	-4.68	-4.13	-4.42
p-value	0.000	0.001	0.000

Notes: In this Table, we check the potential trend by using the Dicky-Fuller test in Panel A. In panel B, we check the abnormal values for the RMB number,value and proportion of transactions. The abnormal values in transactions, net amount and percent are defined as: $ab\_value_{im} = value_{im} - value_{bm}$,where $value_{bt}$is the benchmark RMB number, value and proportion of transactions in month *t*. $value_{im}$ is their value for country/region *i* in our sample in month *m*.

We adopt the following methodology to tackle the non-stationarity: First, we choose all the countries/regions with no BSA with China in the sample period and calculate the cross-sectional mean of the number of transactions in the RMB, the value in the RMB, as well as the porportion of the RMB settlement as a benchmark, which captures the trend of the RMB settlement, but is free of the impact of signing a BSA with China. Then, we define the abnormal value as:

$$ab\_value_{im} = value_{im} - value_{bm}$$

where $value_{bm}$is the benchmark transactions, net amount and percent in month *m*. $value_{im}$ is the benchmark transactions, net amount and percent for country/region *i* in our sample in month *m*. ab_value_{im} is the abnormal value, which is the difference between $value_{im}$ and $value_{bm}$. We then calculate the time-series of ab_value_{im} by taking the mean across different countries/regions in month *m*. Panel B of Table 6 shows the Dick-Fuller test results of the time-series of the abnormal values of the three target variables. The results show that, in all cases, the null hypotheses of non-stationarity are rejected, and we prove that the abnormal values do not suffer from a non-stationarity problem.

Difference-in-difference model

One way to deal with the parallel-trend possibility is to apply a difference-in-difference regression, which requires weaker assumptions. For each country/region i that signs a BSA with China, we adopt a 24-month window before and after the BSA is signed. Our control group contains all the countries/regions in our sample that have no BSA at all. For each country/region in the test group, we select the country/region which is most similar to the test group country/region in terms of the average GDP in the 48-month window. We run the following difference in difference regression:

$$Y_{im} = \alpha + \beta Test_{im} + \gamma Swap_{im} + \theta Test_{im} * Swap_{im} + \varepsilon_{im}$$

whereY_{im}contains the three target variables: log(*number of RMB transactions*+1), log(RMB value of transactions+1), as well as RMB proportion of transactions for country/region i, month m.

$test_{im}$ is a dummy variable which equals 1 if country/region i has signed the swap line with China, and 0 for the control group. $Swap_{im}$ is a dummy variable which equals 1 if country/region *i* has signed the swap line contract with China in month *m*, and 0 otherwise. We can see that the interaction term of $test_{im}$ and $Swap_{im}$ are significantly positive in all the three settings, implying that after controlling for the possible common trend, the countries/regions that have signed a BSA with China show significant increase in the number of RMB transactions, net amount of RMB transactions, as well as percentage of RMB transactions. The results from the difference-in-difference regression are highly consistent with the previous ones.

Table 7. Difference-in-difference regression.

	Number of RMB transactions	*RMB value of transactions*	*RMB proportion of transactions*
Test	0.316***	1.082***	0.00651**
	[6.48]	[8.02]	[2.44]
Swap	0.0662	0.322***	0.00599*
	[1.42]	[2.72]	[1.73]
*Test*Swap*	0.308***	0.350*	0.00891*
	[3.80]	[1.75]	[1.95]
Constant	0.419***	1.068***	0.0101***
	[13.66]	[13.30]	[4.96]
# of observation	3,536	3,536	3,536

Notes: In this Table, we run the following difference in difference regression: $Y_{im} = \alpha + \beta Test_{im} + \gamma Swap_{im} + \theta Test_{im} * Swap_{im} + \varepsilon_{im}$,where Y_{im}contains the RMB number, value and proportion of transactions for country/region *i*, month *m*. $test_{im}$ is a dummy variable which equals 1 if country/region *i* has signed the swap line contract with China, and 0 for the control group. $Swap_{im}$is a dummy variable which equals 1 if country/region *i* has signed the swap line contract with China in month *m*, and 0 otherwise. *, **, and *** represent the significance level at 10%, 5% and 1%, respectively.

IV regression results

We now apply the instrumental variable regression to control for both endogeneity and non-stationary concerns. Given the endogenous nature of the variables, we follow Lin, Zhan and Cheung (2016), and consider the political and institutional variables discussed in Table 4 as the exogeneous factors, and use the following regression.In the first stage, we run the following probit model:

$$Swap_{im} = \alpha_1 + \beta_1 Y_{im-1} + \gamma_1 EF_i + \epsilon_{im}$$

where$Swap_{im}$is a dummy variable which equals 1 if country/region *i* has signed the swap line contract with China in month *m*, and 0 otherwise.$Y_{im-1}$is the one-period lagged abnormal values of the target variables (*number of RMB transactions*, *RMB value of transctions*, and *RMB proportion of transctions* for country/region *i*, month *m*), $EF_i$is the political and institutional variables discussed in Table 4, and ϵ_{im} is the error term.

The second stage includes the following regression:

$$Y_{im} = \alpha + \beta \widehat{Swap}_{im} + \gamma Control_{im} + \varepsilon_{im}$$

whereY_{im} contains the abnormal values of the three target variables: *number of RMB transactions*, *RMB value of transctions*, and *RMB proportion of transctions* for country/region *i*, month *m*. $\widehat{Swap}_{im}$ is the fitted value from Stage 1 regression. The control variables include the imports and exports as a percentage of GDP in country/region *i*, month *m*, the degree of openness of country/region *i*, as well as the GDP and population of country/region *i*, month *m*. The results are shown in Table 8.

Table 8. Detrended results.

	1	2	3	4	5	6
	Number of RMB transactions	*Number of RMB transactions*	*RMB value of transactions*	*RMB value of transactions*	*RMB proportion of transactions*	*RMB proportion of transactions*
Swap	12.22***	10.67***	37.88***	31.52***	3.824***	1.020***
	[7.59]	[7.10]	[7.34]	[7.03]	[22.44]	[4.66]
ImEx		0.295***		0.725***		0.0261***
		[3.32]		[2.75]		[3.43]
Openness		-0.00301		0.114*		0.00127
		[-0.15]		[1.83]		[0.71]
Population		-0.0398		-0.144		-0.00611*
		[-1.00]		[-1.21]		[-1.75]
GDP		0.117***		0.371***		0.00860***
		[3.51]		[3.71]		[2.96]
Bank		-0.00147		-0.00949***		-0.000139*
		[-1.54]		[-3.27]		[-1.69]
Time FE	No	Yes	No	Yes	No	Yes
_cons	-5.484***	-5.112***	-16.69***	-14.71***	-1.764***	-0.500***
	[-7.29]	[-7.14]	[-6.92]	[-6.90]	[-19.75]	[-4.85]
Swap						
Number of RMB transactions$_{t-1}$	0.0693***	0.073***				
	[7.61]	[7.20]				
RMB value of transactions$_{t-1}$			0.0221***	0.0242***		
			[7.36]	[7.20]		
RMB proportion of transactions$_{t-1}$					0.185***	0.690***
					[20.31]	[4.71]
Instruments	Yes	Yes	Yes	Yes	Yes	Yes
_cons	0.529***	0.630***	0.525***	0.658***	0.493***	0.595***

	[19.80]	[14.77]	[20.23]	[14.18]	[36.39]	[13.84]

Notes: In this Table, we run the following regression: $Y_{im} = \alpha + \beta\widehat{Swap}_{im} + \gamma Control_{im} + \varepsilon_{im}$,where Y_{im}contains the abnormal values of the three target variables: RMB number, value and proportion of transactions for country *i*, month *m*. $Swap_{im}$is a dummy variable which equals 1 if country/region*i* has signed the swap line contract with China in month m, and 0 otherwise. we use IV regression with a set of explanatory variables described in Appendix 2. *, **, and *** represent significance level at 10%, 5% and 1%, respectively.

Table 8 shows highly consistent results with those from Table 3. Even after controlling for the endogeneity and non-stationarity problems, in all the six settings, the coefficients of $\widehat{Swap}_{im}$ are significantly positive, implying that the signing of a BSA will significantly promote the RMB denominated transactions in international trade.

Size of the swap line

Up to now we have been considering the swap line as a binary variable. But the size of the swap line may also have an effect as well. In order to check the possible impact of size of the swap line, we used the size of the swap line signed between country/region *i* and China, scaled by the GDP of country/region *i* in the year the swap line is signed, to capture the size. And then we run the following regression:

$$Y_{im} = \alpha + \beta Size_{im} + \gamma Control_{im} + \varepsilon_{im}$$

where Y_{im} contains the three target variables: *number of RMB transactions*, *RMB value of transctions*, and *RMB proportion of transctions* for country/region*i*, month *m*. $Size_{im}$is the size of swap line for country/region *i*, month *m*, as defined above. The results are shown in Table 9.

Table 9.Size of the swap line.

	1	2	3	4	5	6
	Number of RMB transactions	*Number of RMB transactions*	*RMB value of transactions*	*RMB value of transactions*	*RMB proportion of transactions*	*RMB proportion of transactions*
Size	2278.7***	1008.4***	19.67***	21.59***	0.799***	0.638***
	[13.53]	[9.85]	[15.68]	[13.84]	[16.46]	[11.35]
ImEx		-22.46**		1.478***		0.0468***
		[-2.38]		[4.06]		[4.94]
Openness		19.24***		0.531***		0.0126***
		[10.38]		[8.84]		[10.85]
Population		6.358***		0.645***		0.00538***
		[3.56]		[7.20]		[2.67]
GDP		4.306***		0.541***		0.00681***
		[3.76]		[7.92]		[3.89]
Bank		-2.494***		-0.0520***		-0.00116***
		[-9.60]		[-8.74]		[-5.54]
Time FE	No	Yes	No	Yes	No	Yes

_cons	-23.16***	-0.0849	1.667***	-1.050***	0.00774***	-0.0187***
	[-8.72]	[-0.02]	[22.96]	[-3.96]	[6.07]	[-3.12]
N	2,160	1,896	2,160	1,896	2,160	1,896

Notes: In this table we provide results of the regressions where it is accounted for the size of the swap line.**and*** represent the significance level at 5% and 1%, respectively.

The results in Table 9 are highly consistent with those in Table 3, meaning that the size of the swap line may also promote the international settlement between China and the target country/region.

Conclusions

To push forward the internationalisation of its currency, the Chinese authorities have deployed a large number of initiatives to increase the international use of the RMB, among which is that China's central bank, the PBoC, has actively signed the RMB-denominated BSAs with other central banks.

Our research is among the first which empirically examines the effectiveness of RMB BSAs. Thanks to the unique data provided by SWIFT, we are able to directly investigate the impact of the BSA signing on RMB-denominated transactions rather than the general bilateral trade.

Our results confirm that the signing of a RMB BSA helps to increase the number, value and proportion of the RMB settlement in cross-border trade. Our results are also robust with respect to the choice of different regression models which are adopted to address a number of potential biases related to the OLS model.

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Appendices

Appendix 1. China's bilateral local currency swap agreements, as of end-2017.

Partner Economies	Swap line size	Effective Date	Expiration Date	Duration (year)
South Korea	RMB 180 bn/KRW 38,000 bn	12 Dec. 2008	Dec. 2011	3
renewed	RMB 360 bn/KRW 64,000 bn	11 Oct. 2011	Oct. 2014	3
renewed	RMB 360 bn/KRW 64,000 bn	11 Oct. 2014	Oct. 2017	3
renewed	RMB 360 bn/KRW 64,000 bn	11 Oct. 2017	Oct. 2020	3
Hong Kong SAR	RMB 200 bn/HKD 227 bn	20 Jan. 2009	Jan. 2013	3
renewed	RMB 400 bn/HKD 490 bn	22 Nov. 2011	Nov. 2014	3
renewed	RMB 400 bn/HKD 505 bn	27 Nov. 2014	Nov. 2017	3
renewed	RMB 400 bn/HKD 470 bn	22 Nov. 2017	Nov. 2017	3
Malaysia	RMB 80 bn/MYR 40 bn	8 Feb. 2009	Feb. 2012	3
renewed	RMB 180 bn/MYR 90 bn	8 Feb. 2012	Feb. 2015	3
renewed	RMB 180 bn/MYR 90 bn	17 Apr. 2015	Apr. 2018	3
Belarus	RMB 20 bn/BYR 8,000 bn	11 Mar. 2009	Mar. 2012	3
renewed	RMB 7 bn/BYR 16,000 bn	10 May 2015	May 2018	3
Indonesia	RMB 100 bn/IDR 175,000 bn	23 Mar. 2009	Mar. 2012	3
renewed	RMB 100 bn/IDR 175,000 bn	1 Oct. 2013	Oct. 2016	3
Argentina	RMB 70 bn/ARS 38 bn	2 Apr. 2009	Apr. 2012	3
renewed	RMB 70 bn/ARS 90 bn	18 Jul. 2014	Jul. 2017	3
renewed	RMB 70 bn/ARS 175 bn	18 Jul. 2017	Jul. 2020	3

Iceland	RMB 3.5 bn	10 Jun. 2010	Jun. 2013	3
renewed	RMB 3.5 bn/ISK 66 bn	11 Sep. 2013	Sep. 2016	3
renewed	RMB 3.5 bn/ISK 66 bn	21 Dec. 2016	Dec. 2019	3
Singapore	RMB 150 bn/SGD 30 bn	23 Jul. 2010	Jul. 2013	3
renewed	RMB 300 bn/SGD 60 bn	7 Mar. 2013	Mar. 2016	3
renewed	RMB 300 bn/SGD 60 bn	7 Mar. 2016	Mar. 2019	3
New Zealand	RMB 25 bn/NZD 5bn	18 Apr. 2011	Apr. 2014	3
renewed	RMB 25 bn/NZD 5bn	25 Apr. 2014	Apr. 2017	3
renewed	RMB 25 bn/NZD 5bn	19 May 2017	May 2020	3
Uzbekistan	RMB 0.7 bn/UZS 167 bn	19 Apr. 2011	Apr. 2014	3
Mongolia	RMB 5 bn/MNT 1000 bn	6 May 2011	May 2014	3
renewed	RMB 10 bn/MNT 2000bn	20 Mar. 2012	Mar. 2015	3
renewed	RMB 15 bn/MNT 4.5 tn	21 Aug. 2014	Aug. 2017	3
renewed	RMB 15 bn/MNT 5.4 tn	6 Jul. 2017	Jul. 2020	3
Kazakhstan	RMB 7 bn/KZT 150 bn	13 Jun. 2011	Jun. 2014	3
renewed	RMB 7 bn/KZT 200 bn	14 Dec. 2014	Dec. 2017	3
Thailand	RMB 70 bn/THB 320 bn	22 Dec. 2011	Dec. 2014	3
renewed	RMB 70 bn/THB 370 bn	22 Dec. 2014	Dec. 2017	3
renewed	RMB 70 bn/THB 370 bn	22 Dec. 2017	Dec. 2020	3
Pakistan	RMB 10 bn/PKR 140 bn	23 Dec. 2011	Dec. 2014	3
renewed	RMB 10 bn/PKR 165 bn	23 Dec. 2014	Dec. 2017	3
UAE	RMB 35 bn/AED 20 bn	17 Jan. 2012	Jan. 2015	3
renewed	RMB 35 bn/AED 20 bn	14 Dec. 2015	Dec. 2018	3
Turkey	RMB 10 bn/TRY 3 bn	21 Feb. 2012	Feb. 2015	3
renewed	RMB 12 bn/TRY 5 bn	26 Sep. 2015	Sep. 2018	3
Austrilia	RMB 200 bn/AUD 30 bn	22 Mar. 2012	Mar. 2015	3
renewed	RMB 200 bn/AUD 40 bn	30 Mar. 2015	Mar. 2018	3
Ukraine	RMB 15 bn/UAH 19 bn	26 Jun. 2012	Jun. 2015	3
renewed	RMB 15 bn/UAH 54 bn	15 May 2015	May 2018	3
Brazil	RMB 190 bn/BRL 60 bn	26 Mar. 2013	Mar. 2016	3
United Kindoms	RMB 200 bn/GBP 20 bn	22 Jun. 2013	Jun. 2016	3
renewed	RMB 350 bn/GBP 35 bn	20 Oct. 2015	Oct. 2018	3
Hungary	RMB 10 bn/HUF 375 bn	9 Sep. 2013	Sep. 2016	3
renewed	RMB 10 bn/HUF 416 bn	12 Sep. 2016	Sep. 2019	3

Albania	RMB 2 bn/ALL 35.8 bn	12 Sep. 2013	Sep. 2016	3
EU	RMB 350 bn/EUR 45 bn	8 Oct. 2013	Oct. 2016	3
renewed	RMB 350 bn/EUR 45 bn	27 Sep. 2016	8 Oct. 2019	3
Switzerland	RMB 150 bn/CHF 21 bn	21 Jul. 2014	Jul. 2017	3
renewed	RMB 150 bn/CHF 21 bn	21 Jul. 2017	Jul. 2020	3
Sri Lanka	RMB 10 bn/LKR 225 bn	16 Sep. 2014	Sep. 2017	3
Russia	RMB 150 bn/RUB 815 bn	13 Oct. 2014	Oct. 2017	3
renewed	RMB 150 bn/RUB 1325 bn	22 Nov. 2017	Nov. 2020	3
Qatar	RMB 35 bn/QAR 20.8 bn	3 Nov. 2014	Nov. 2017	3
renewed	RMB 35 bn/QAR 20.8 bn	2 Nov. 2017	Nov. 2020	3
Canada	RMB 200 bn/CAD 30 bn	8 Nov. 2014	Nov. 2017	3
renewed	RMB 200 bn/CAD 30 bn	8 Nov. 2017	Nov. 2020	3
Suriname	RMB 1 bn/SRD 0.52 bn	18 Mar. 2015	Mar. 2018	3
Armenia	RMB 1 bn/AMD 77 bn	25 Mar. 2015	Mar. 2018	3
South Africa	RMB 30 bn/ZAF 54 bn	10 Apr. 2015	Apr. 2018	3
Chile	RMB 22 bn/CLF 2200 bn	25 May 2015	May 2018	3
Tajikistan	RMB 3 bn/TJS 3 bn	3 Sep. 2015	Sep. 2018	3
Morocco	RMB 10 bn/MAD 15 bn	11 May 2016	May 2019	3
Serbia	RMB 1.5 bn/RSD 27 bn	17 Jun. 2016	Jun. 2019	3
Egypt	RMB 18 bn/EGP 47 bn	6 Dec. 2016	Dec. 2019	3

Appendix 2. Variable definitions and sources.

Variable	Definition	Source
Swap	A dummy variable which equals to 1 if the country/region has signed a RMB swap line agreement with China, and equals to 0 otherwise.	People's Bank of China
Distance	The log value of the distance between China and the host economy (capital-to-capital)	http://ksgleditsch.com/data-5.html
Bank	the number of commercial bank branches per 100,000	The World Bank. https://www.worldbank.org/en/publication/gfdr/data/global-financial-development-database
GDP	The log value of an economy's nominal gross domestic production in current US dollars	World Economic Outlook Databases, IMF
Population	The log value of an economy's population	World Economic Outlook Databases, IMF
ImEx	The ratio of an economy's imports and exportswith China to its total imports and exports (%).	Direction of Trade Statistics, IMF
FTA	A dummy variable which equals to 1 if China and the counterparty have a Free Trade Agreement, and equals to 0 otherwise.	China's Ministry of Commerce
Openness	The Chinn-Ito Financial Openness Index measures a	http://web.pdx.edu/~ito/Chinn-

	country/region's degree of capital account openness. A higher index number means more capital account openness.	Ito_website.htm
Voice and Accountability	Reflects perceptions of the extent to which a country/region's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.	Worldwide Governance Indicators, World Bank http://info.worldbank.org/governance/wgi/index.aspx#home
Political Stability	Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism.	Worldwide Governance Indicators, World Bank http://info.worldbank.org/governance/wgi/index.aspx#home
Government Effectiveness	Reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.	Worldwide Governance Indicators, World Bank http://info.worldbank.org/governance/wgi/index.aspx#home
Regulatory Quality	Reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	Worldwide Governance Indicators, World Bank http://info.worldbank.org/governance/wgi/index.aspx#home
Rule of Law	Reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	Worldwide Governance Indicators, World Bank http://info.worldbank.org/governance/wgi/index.aspx#home
Control of Corruption	Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as 'capture' of the state by elites and private interests.	Worldwide Governance Indicators, World Bank http://info.worldbank.org/governance/wgi/index.aspx#home

IMI International Monetary Review

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

By ZHOU YINGGANG, CHENG XIN AND WANG YIMING*

Abstract:*Using an innovative network approach, this study constructs new indices of Renminbi (RMB) internationalisation 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 Initiative (BRI). 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 has initiated the marketisation reform of its currency and proposed to build the modern Belt and Road.*

Keywords:RMB; spillover; financial network; the Belt and Road Initiative

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, the People's Bank of China has endeavoured to improve the cross-border use of Renminbi (RMB) and open the financial market such as the interbank bond market. Following the milestone inclusion of RMB into the 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% 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 payments with a share of 1.22% in March 2019, according to the Society for Worldwide Interbank Financial Telecommunications (SWIFT).[2] In contrast, a survey by the 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 internationalisation reports based on the international use of RMB. The annual RMB

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[1]The IMF has released reserves held in RMB since the fourth quarter of 2016.
[2]The SWIFT has released the RMB InternationalisationTracker monthly since 2011, reporting the RMB share as international payments currency.
[3]The 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 2019.

Internationalisation Report by the China Construction Bank covers statistics overseas, including the growth of RMB assets and RMB offshore deposits, RMB offshore bond issuance, and so forth. The International Monetary Institute (IMI) of Renmin University of China compiles a quarterly RMB Internationalisation Index (RII) based on several international use of RMB. In this paper, we construct new indices of RMB internationalisation 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 (e.g. 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 (Fratzscher and 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 by studying 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 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 Initiative (BRI). 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 has exerted intensifying spillover effects oncurrencies across the globe and regions, such as the BRI.

Secondly, we further compile a series of RMB impact indices based on the spillover networks estimated recursively using the VAR models following 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 internalisation reports or indices which are released at most at the monthly frequency, our indices track RMB's relative importance as an anchor currency on daily frequency.

More importantly, we show that the growing impacts of RMB are related to the developments in RMB's marketisation 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 the marketisation reform of its currency on 21 July 2005, driving other currencies to move in the same direction ever since. Meanwhile, the onshore RMB has taken the central position of the network among the Belt and Road related currencies since the BRI was proposed in 2013. Our findings highlight that RMB has become increasingly important since China initiated the marketisation reform of its currency and proposed to build the BRI.

The rest of this paper is organised as follows. First, it describes the data. The following section discusses the empirical methodology. Then, it presents the index of RMB empirical findings. The final section concludes.

Data

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

[4]A network describes a collection of nodes and 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.

Data of G20 currencies

The G20 is the premier forum for international cooperation on the most important aspects of the international economic and financial agenda. It 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, the European Union (EU), France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Turkey, the UK and the US.

To construct exchange rate spillover network for currencies of G20 members, we collect daily exchange rates of all 18 related currencies from Datastream. First, three RMB exchange rates are the onshore Chinese yuan (CNY), CNY central parity (CNYM), and offshore RMB in the Hong Kong SAR (CNH) per US dollar. Second, seven major developed market currencies are the US Dollar Index (DXY), the Euro (EUR), the Pound sterling (GBP), the Australian dollar (AUD), the Canadian dollar (CAD), the Japanese yen (JPY) and the Korean won (KRW). Third, nine currencies for emerging markets include the Argentine peso (ARS), the Brazilian real (BRL), the India rupee (INR), the Indonesian rupiah (IDR), the Mexican peso (MXN), the Russian ruble (RUB), the Saudi Arabia riyal (SAR), the South Africa rand (ZAR), and the Turkish lira (TRY). Except for the DXY, all other exchange rates of the currencies are their prices in terms of the US dollar.

Our sample starts on 1 January 1999 when the Euro became legal tender for members of the European Monetary Union and ends at the end of 2018. Our subsamples start on 24 June 2005 when the China Foreign Exchange Trading System started to announce the CNY central parity (CNYM) and on 2 March 2011 when the CNH exchange rate was 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 5,215 daily observations, the CNY and the CNYM are negative on average, suggesting the general trend of appreciation against the US dollar 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 US dollar since March 2011. All the standard deviations of all three RMB exchange rate changes are smaller than other currency counterparts, except for the SAR. 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 exchange rate changes are generally higher than other currency counterparts of developed economies, 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.

Data of the currencies related to the BRI

Announced in 2013, the BRI has strengthened China's connectivity with 66 countries scattering along the ancient Silk Road. Meanwhile, the BRI 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

[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 the 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 the VAR analysis and particularly for recursive variance decompositions.

and Oceania, have signed cooperation documents with China on the BRI. We refer these 126 countries as participating countries. By the end of 2018, China's direct investment in the countries involved in B&R surpassed 90 billion dollars, realising a turnover of 400 billion US dollars in foreign contracted projects in these countries. Besides, 11 Chinese-funded banks have set up 76 first-grade institutions in 28 countries involved in B&R, and 50 banks from 22 countries involved in B&R have opened seven corporate banks, 19 branches, and 34 representative offices in China. All these efforts have potentially contributed to the promotion of 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 Road and participating in the BRI.

To construct exchange rate spillover network among the currencies of the countries along the Belt and Road, we dismiss the countries which had implemented a fixed exchange rate system since July 2005, according to the regime classification of Ilzetzki, Reinhart, and Rogoff (2017) and the IMF's annual report on the 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 rates. Finally, we collect daily currencies exchange rates data for 26 countries from Datastream.

Besides the onshore the Chinese yuan (CNY), we collect 25 currencies, including the Mongolian tugrik (MNT), the Singapore dollar (SGD), the Malaysian ringgit (MYR), the Indonesian rupiah (IDR), the Thai baht (THB), the Vietnamese dong (VND), the Philippine peso (PHP), the Kazakhstan tenge (KZT), the Uzbekistan som (UZS), the Kyrgyzstan som (KGS), the Indian rupee (INR), the Pakistan rupee (PKR), the Sri Lanka rupee (LKR), the Russian ruble (RUB), the Moldova leu (MDL), the Polish zloty (PLN), the Czech krone (CZK), the Hungarian forint (HUF), the Iranian rial (IRR), the Turkish lira (TRY), the Syrian pound (SYP), the Israeli new shekel (ILS), the Yemen rial (YER), the Georgia larry (GEL), and the Egyptian pound (EGP). These 26 currencies cover countries which jointly account for 88.47% of population and 81.26% of GDP for the 66 countries along the Belt and Road. 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 a general trend of depreciation against 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 exchange rate of CNY is relatively stable among currencies for countries along the Belt and Road. 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.

[6]Ilzetzki, Reinhart and 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.

Table 1. Summary statistics of daily exchange rate changes.

	Mean (‰)	Std. (‰)	Min (‰)	Max (‰)	Skew	Kurt	JB test	ADF (none)	ADF (drift)	ADF (trend)	Nobs
(A) Exchange rate changes of G20 currencies											
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
(B) Exchange rate changes for major currencies of countries along the Belt and Road											
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: (A) reports the summary statistics of two-day rolling average exchange rate changes for currencies of G20 members from 5 January 1999 to the end of 2018. (B) reports the summary statistics of two-day rolling average exchange rate changes for currencies of countries along the Belt and Road from 22 July 2005 to the end of 2018. The Jarque-Bera tests 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 JB tests, 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 BRI. Following the same criteria above, we select 45 currencies among the currencies of the 126 participating countries, which account for 81.77% of the population and 77.09% of GDP for the 126 countries participating the BRI, including the Chinese yuan (CNY), the Mongolian tugrik (MNT), the Korean won (KRW), the Singapore dollar (SGD), the Malaysian ringgit (MYR), the Indonesian rupiah (IDR), the Thai baht (THB), the Vietnamese dong (VND), the Philippine peso (PHP), the Kazakhstan tenge (KZT), the Uzbekistan som (UZS), the Kyrgyzstan som (KGS), the Indian rupee (INR), the Pakistan rupee (PKR), the Sri Lanka rupee (LKR), the Papua New Guinea kina (PGK), the New Zealand dollar (NZD), the Russian ruble (RUB), the Moldova leu (MDL), the Polish zloty (PLN), the Czech krone (CZK), the Hungarian forint (HUF), the Dominican peso (DOP), the Chile peso (CLP), the Costa Rica colon (CRC), the Uruguay new peso (UYU), the Iranian rial (IRR), the Turkish lira (TRY), the Syrian pound (SYP), the Israeli new shekel (ILS), the Yemen rial (YER), the Georgia larry (GEL), the Tanzania shilling (TZS), the Kenya shilling (KES), the Seychelles rupee (SCR), the Egyptian pound (EGP), the Algerian dinar (DZD), the Tunisian dinar (TND), the Libya dinar (LYD), the Mozambique meticala (MZN), the Zambian kwacha (ZMK), the Madagascar franc (MGA), the South African rand (ZAR), the Nigeria nile (NGN), and the Fiji yuan (FJD). We omit the summary statistics for this sample to save space.

Econometric methodology

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

VAR-based network

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

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

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).

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

Correspondingly, the generalised impulse response and the generalised 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,

$$GIR_j^h = \sigma_{jj}^{-\frac{1}{2}} A_h \Sigma e_j, for\ h = 0,1,2,\cdots, \qquad (3)$$

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

where $\Sigma = \{\sigma_{ij}, \mathrm{i}, \mathrm{j} = 1,2,\cdots,\mathrm{n}\}$ 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 generalised impulse response analysis as well as generalised variance decomposition was introduced by Pesaran and Shin (1998). The appeal of the generalised version of impulse response analysis and variance decompositionis order-invariant as opposed to the Cholesky-based impulse response analysis and variance decomposition which are sensitive to ordering.

Although both the generalised impulse response and forecast error variance decomposition 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 generalised impulse response instead of variance decomposition for two mainreasons. 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 generalised impulse response for each currency using Equation (3). Firstly, the entries in the impulse response matrix are weights 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 discuss these in detail below.

Structure 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), where $GIR^h_{i\leftarrow j}$ being the *i*-th element of $GIR^{h=0}_j$. 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 do not vary a lot in case of G20 currencies, otherwise we estimate mutual spillover network using Equation (7) in case of BRI related currencies.

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

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

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 labelled '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 set Ω.

Similarly, the average inward spillover effects from others to *i*-th currencyis shown in Equation (9),

$$FR_i^{\Omega} = \frac{\sum_{j\neq i} S_{i\leftarrow j}}{N}, for\; i \in \Omega, j \notin \Omega (9)$$

where N is the number of currencies in the set Ω.

Finally, we define net spillover effect as the difference between 'TO' and 'FR' as shown in Equation (10) which is labelled 'NET' in the last row of the spillover matrix.

$$NET_i^{\Omega} = TO_i^{\Omega} - FR_i^{\Omega}, for \;\; i \in \text{ALL}. \quad (10)$$

Following Yang and Zhou (2017), we estimate the above impulse response matrix recursively in 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[9] of RMB spillovers over the course of RMB internationalisation rather than flow effect 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.

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.

Network 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 summarise dynamic interactions among two-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 variables in Equation (1).
[8] Ω is subset of the set *ALL* defined in Equation (1).
[9] See D'Amico and King (2013) for the differences between stock and flow effects of QE.

Table 2. Results of generalised 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 generalised impulse response among exchange rate changes of major G20 currencies using Equation (6). The endogenous variables are two-day rolling average exchange rate changes from 5 January 1999 to the end of 2018.

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 changesby 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 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 present 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 edge. Therefore, the location of a node for a currency implies its relative network importance.

[10]One standard error shock of CNY is historical volatility of CNY's exchange rate changes, which is about 0.86 ‰.

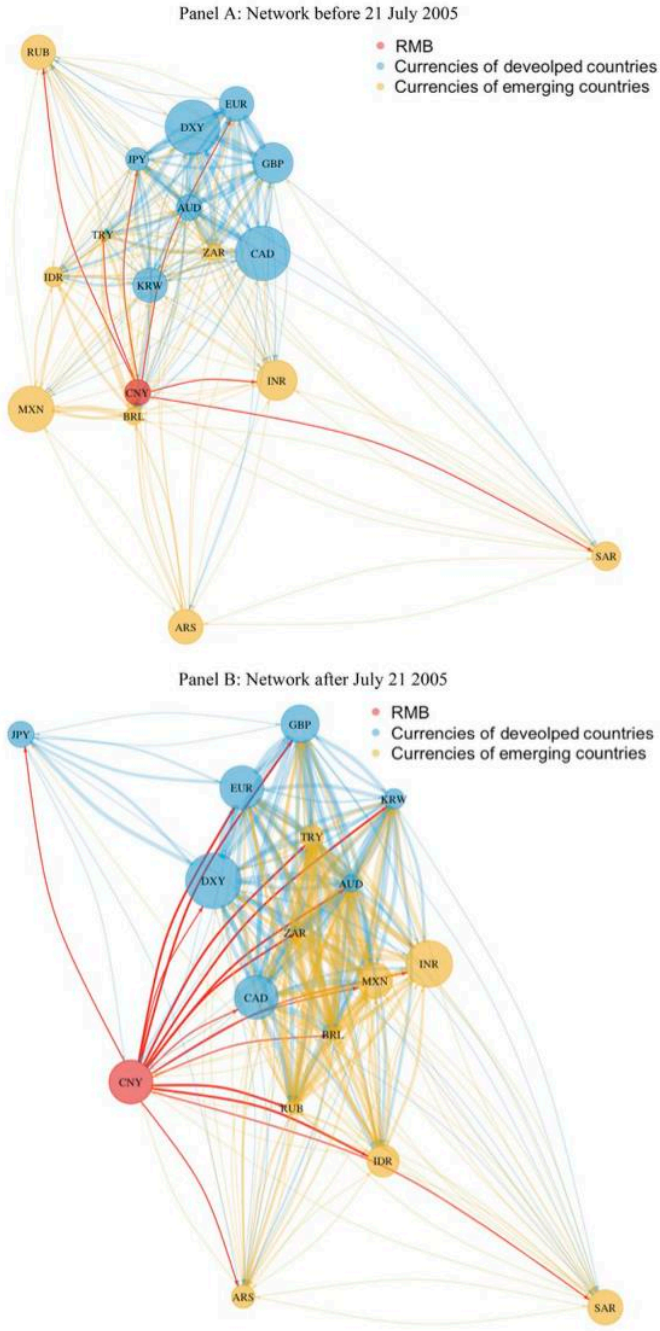


Figure 1. Spill-over networks among the major G20 currencies.

Notes: This figure represents spill-over networks of currencies for G20 members estimated using Equation (6). The sizes of dots are calibrated correspondingly to their net spill-over indices. The edges of nodes point to the currencies which receive positive spill-over effect. Besides, the width and length of edges are also weighted. The spill-over effect is greater with a wider and shorter edge. Therefore, the location of a node for a currency implies its relative network importance. Panel A shows a spill-over network of G20 currencies which is estimated using data from 5 January 1999 and ends on 20 July 2005. Panel B shows a spill-over network of G20 currencies which is estimated using data from 20 July 2005 to 1 January 1999.

Panel A of Figure 1 shows a spillover network of G20 currencies which is estimated with data starting from 5 January 1999 and ending on 20 July 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 reflects the financial-economic, political and military position of the US.

Panel B of Figure 1 shows a spillover network of G20 currencies which is estimated with data from 20 July 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.

Results on RMB spillover dynamics

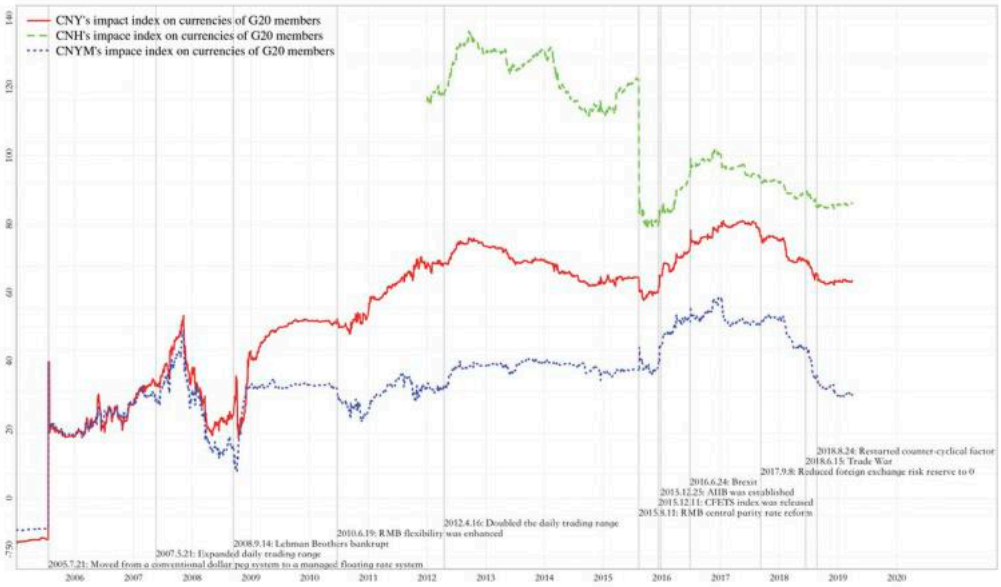
To further explore time-varying spillover intensity, we construct CNY impact index by estimating recursively with an expanding sample using Equations (1), (3) and (7)-(10).[11] We also construct RMB impact indices for CNH and CNY central parity.

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 21 July 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 11 August 2015, when the central bank of China exerted an 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 marketsand 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 of CNY's impact on the currencies of developed markets while a slight increase of CNY's impact on emerging market currencies. The difference indicates that the influence of the CNY central parity reform is far more complicated than we thought.

[11]For recursive estimation, the initial sample period is 5 January 1999 to 1 January 2005 and the final sample period is 5 January 1999 to the end of 2018.

Panel A: Dynamics of impact indices of CNY, CNH and mid-price on G20 currencies.



Panel B: Dynamics of CNY's impact indices on G20 currencies.

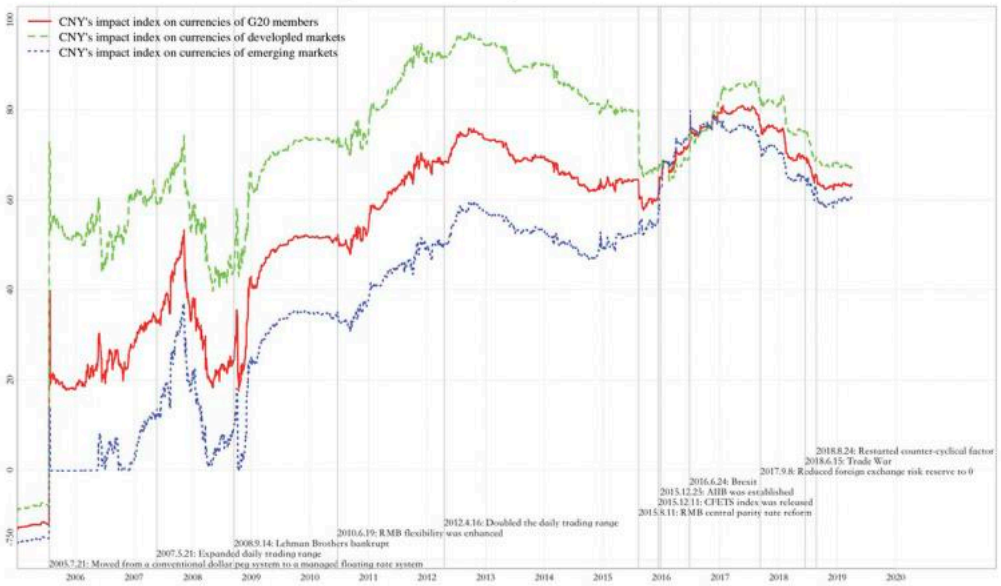


Figure 2. Dynamics of the RMB's impact indices on G20 currencies.

Notes: This figure displays dynamics of the RMB's impact indices for currencies of G20 members. Panel A shows the dynamics of the CNY, CNH and CNY central parity's impact indices on currencies of all G20 members. Panel B shows the dynamics of the 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 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 after seven trading days when the Chinese central bank initiated the reform to managed floating regime.

CNY's impact index is significantly negative before 21 July 2005. But specifically, CNY had a positive but limited influence impacts on JPY, EUR, INR, RUB, SAR and TRY, which is in line with our intuition, as shown in the first column of Table 3. Besides, since 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 turn to be positive for most of the other currencies, especially for currencies of developed markets which results in a positive overall net spillover index.

Secondly, we show the interactions between CNY and other currencies before and after seven trading days when the Chinese central bank launched the reform of the RMB central parity price on 11 August 2015, in the seventh to 12th columns. When the People's Bank of China initiated a currency reform on 11 August2015, RMB's midpoint immediately fell by 1.9%, the biggest single-day drop in the RMB's modern history,[12] the global currency market has braced for RMB weakness.[13]Before the reform, CNY's impact indices had become significantly positive with a net spillover effect on the developed marketcurrencies 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 after seven trading days when the foreign exchange risk reserve requirement was reduced to 0 on 8 September 2017. As shown in the last six columns, CNY's net spillover index decreased a little bit.

[12]See The battle of midpoint, *Economist*, 15 August 2015.
[13]See *Financial Times*, 21 September 2015.

Table 3. Results of the CNY's impact index on G20 currencies around some events.

Period	5 Jan. 1999/20 Jul. 2005			5 Jan. 1999/28 Jul. 2005			5 Jan. 1999/10 Aug. 2015			5 Jan. 1999/18 Aug. 2015			5 Jan. 1999/7 Sept. 2017			5 Jan. 1999/15 Sept. 2017		
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 spill-over indices of the CNY for sub-samples as shown in the first row of the table and the mutual spill-over effect is estimated using Equation (6). TO_{CNY}^{Ω} represents the CNY's outward spill-over effect on currencies in the set Ω as shown in Equation (8). FR_{CNY}^{Ω} represents the CNY's inward spill-over effect from currencies in the set Ω as shown in Equation (9). NET_{CNY}^{Ω} represents the CNY's net spill-over 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 members of G20. ALL = {ED, EM}.

The indices of RMB impact on the currencies related to the BRI

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 CNY's impact indices on the BRI's related currencies.

Network results

First, we estimate a VAR model with lag of 2 using two-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 Equations (7)-(10) is presented in Table 4. For the full sample which starts on 22 July 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 generalised impulse response matrix for the major currencies of countries 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 generalised impulse response for currencies of countries along the Belt and Road estimated using Equation (7). The endogenous variables are two-day rolling average exchange rate changes from 22 July 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 which is estimated with data from 22 July 2005 to 7 September 2013, before the BRI was proposed. The red dot which represents the onshore RMB lies on the periphery of the network before the BRI. Panel B of Figure 3 shows the spillover network which is estimated with data from 8 September 2013 to the end of 2018. Since the BRI was proposed, the onshore RMB has taken the central position of the network, indicating a leading role in the BRI's related currencies. Moreover, we observe that the currencies in the same region cluster together, which is in line with our intuition.

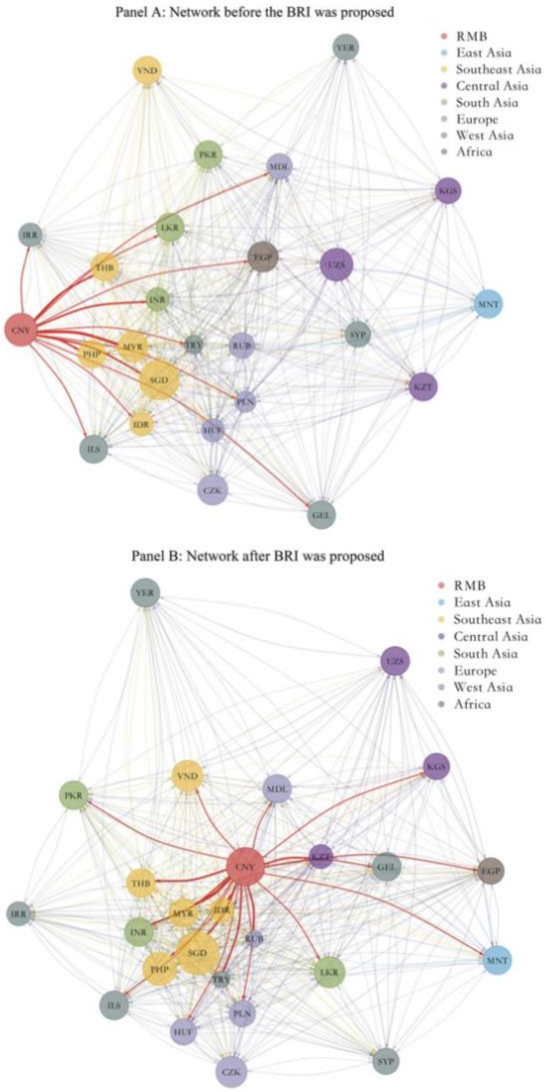


Figure 3. Spill-over networks among currencies of countries along the Belt and Road.
Notes: This figure represents spill-over networks for currencies of counties along the Belt and Road estimated using Equation (7). The sizes of dots are calibrated correspondingly to their net spill-over index. The edges of nodes point to the currencies which receive positive spill-over effect. Besides, the width and length of edges are also weighted. The spill-over effect is greater with a wider and shorter edge. Therefore, the location of a node for a currency implies its relative network importance. Panel A shows a spill-over network of the 26 currencies which is estimated using data from 22 July 2005 and ends on 7 September 2013. Panel B shows a spill-over network of the 26 currencies which is estimated using data from 8 September 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 BRI was proposed as shown in Panel A. Thereafter, CNY moved to the centre of the network as shown in Panel B.

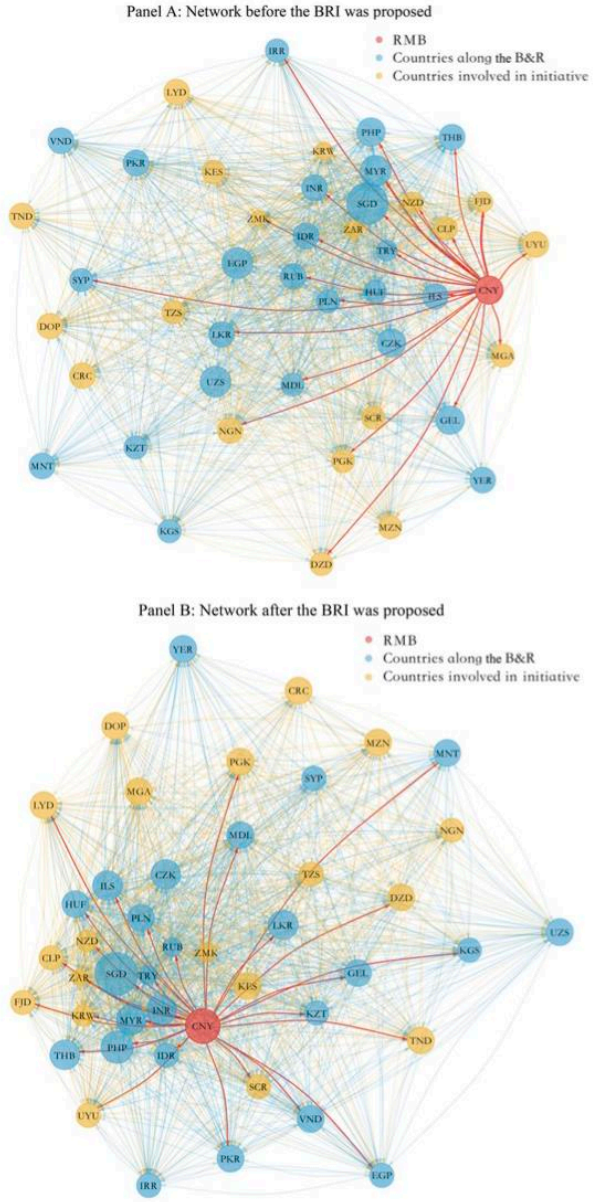


Figure 4. Spill-over networks for currencies of participating countries of the BRI.

Notes: This figure represents spill-over networks for currencies of counties participating the BRI estimated using Equation (7). The sizes of dots are calibrated correspondingly to their net spill-over index. The edges of nodes point to the currencies which receive positive spill-over effect. Besides, the width and length of edges are also weighted. The spill-over effect is greater with a wider and shorter edge. Therefore, the location of a node for a currency implies its relative network importance. Panel A shows a spill-over network of the 45 currencies which is estimated using data from 22 July 2005 and ends on 7 September 2013. Panel B shows a spill-over network of the 45 currencies which is estimated using data from 8 September 2013 to the end of 2018.

Results on RMB spillover dynamics

We further construct CNY's impact index on the currencies of 25 countries along the Belt and Road and 44 countries participating in the BRI by estimating recursively with an expanding sample using Equations (1), (3) and (7)-(10). To control the impact of major anchor currencies, we use the two days rolling of the DXY and exchange rate changes of EUR, JPY, and GBP as control variables in Equation (1). For recursive estimation, the initial sample period is 22 July 2005 to 1 January 2009 and the final sample period is from 22 July 2005 to the end of 2018.

Panel A of Figure 5 shows the dynamics of CNY's impact indices on the BRI's related currencies. The red and greenlines represent the CNY's impact indices on the currencies of countries along the Belt and Road, and currencies of countries participating in the BRI respectively. While the blue line represents CNY's impact indices on the Euro and currencies of countries participating in the BRI. 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 the Asian Infrastructure Investment Bank (AIIB) was established, and when the BRI was first written into the UN General Assembly resolution.

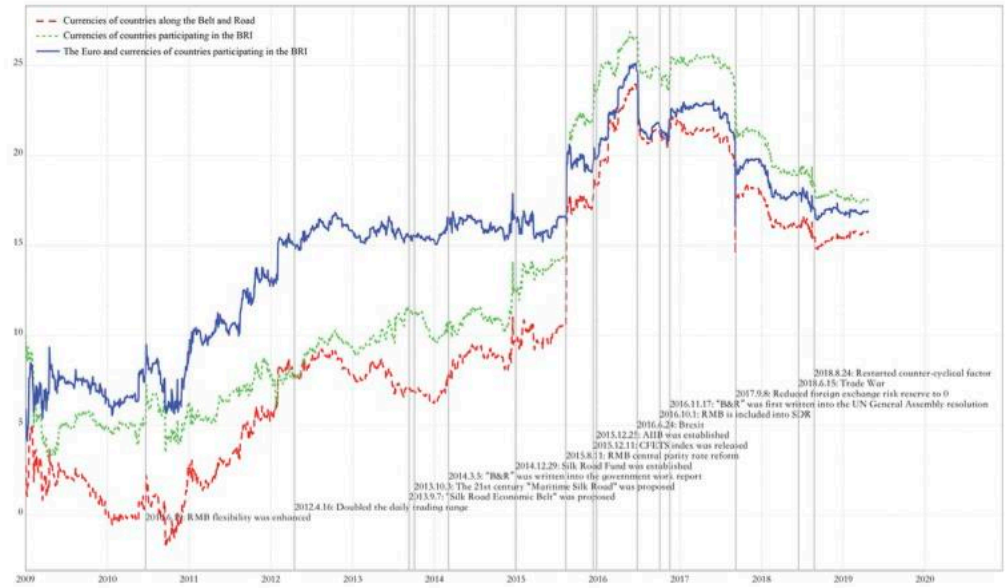


Figure 5. Dynamics of RMB impact indices on major currencies of countries related to the BRI.
Notes: This figure displays dynamics of the RMB's impact indices for currencies of countries along and participating in the BRI. The red dashed line represents the CNY's index regarding currencies for countries along the Belt and Road, the green dotted line represents the CNY's index regarding currencies for countries participating the BRI, the blue solid line represents the CNY's index regarding the Euro and currencies of countries participating in the BRI.

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 currencies of countries along the Belt and Road increased sharply on 11 August 2015. In line with the decreased impact of CNY on G20 currencies, the impact of CNY on the currencies of countries along the Belt and Road decreased one day before 8 September 2017 when the foreign exchange rate reserve requirement was reduced to 0. Indeed, the impact of RMB marketisation reform is subtle. It is worthwhile to further explore the balance of maintaining RMB stability, increasing the marketisation of RMB, and improving the international influence of the RMB.

To take a closer look at the dynamics of RMB index on the 44 currencies for countries participating the BRI, we display the interactions between CNY and other currencies in Table 5 on six dates around three events. To save space, we put 44 currencies into nine 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 BRI 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 when the PBOC exerted an RMB central parity rate reform on 11 August 2015, as shown in the following six columns. Thirdly, CNY's net spillover index decreased sharply two 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.

[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 Africa currencies.

Table 5. Results of the impacts of the CNY on the BRI related currencies around some events.

Period	6 September 2013			16 September 2013			10 August 2015			18 August 2015			4 September 2017			7 September 2017		
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 spill-over indices of CNY for sub-samples as shown in the first row of the table and the mutual spill-over effect is estimated using Equation (7). TO^{Ω}_{CNY} represents the CNY's outward spill-over effect on currencies in the set Ω as shown in Equation (8). FR^{Ω}_{CNY} represents the CNY's inward spill-over effect from currencies in the set Ω as shown in Equation (9). NET^{Ω}_{CNY} represents the CNY's net spill-over 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.

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 and 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 the SDR basket as a freely usable currency instead of a free convertible currency. It indeed seems to be a puzzle when RMB implements considerable influence globally under a rather tight capital control.

However, CNH is much less regulated and is de facto fully convertible for it is being freely traded outside the Chinese mainland, such as in the Hong Kong SAR and Singapore. In regard to 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 2 March 2011, when the data for CNH is available, and ends by the end of 2018.

Table A in Appendix shows the spillover network among onshore RMB (CNY), JPY, GBP, EUR, and the DXY estimated using Equation (6). Table B in Appendix shows the spillover network among offshore 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 DXY, EUR, GBP, and JPY 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. As regards convertibility, the net spillover effect of CNH is even larger, which is 5.37 basis point.

Conclusions

Using daily exchange rate data, we construct a mutually anchoring network among the G20 currencies and major currencies related to the BRI. Based on the generalised impulse response analysis, a series of RMB impact indices are constructed to measure RMB's relative importance as an anchor currency from the perspective of networks. We show that the impact of RMB has increased substantially since the PBOC 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 BRI 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 proposed to build the modern Belt and Road.

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Appendix

Table A. Results of generalised impulse response matrix for five currencies in the SDR basket.

	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	

Notes: This table reports the results of generalised impulse response among exchange rate changes of five currencies in the SDR basket estimated using Equation (6). The endogenous variables are two-day rolling average exchange rate changes from 2 March 2011 when CNH is available, to the end of 2018.

Table B.: Results of generalised impulse response matrix for CNH and other four currencies in the SDR basket

	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	

Notes: This table reports the results of generalised impulse response among exchange rate changes of CNH and other four currencies in the SDR basket estimated using Equation (6). The endogenous variables are two-day rolling average exchange rate changes from 2 March 2011 when CNH is available, to the end of 2018.

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