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

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Trade War or Truce?

Trump-Xi Meeting Declares a Trade War Truce, Paving Way for Further Talks*

By DONG JINYUE AND XIA LE *

The US-China relationship seems to get a favourable turn after a highly anticipated dinner on last Saturday between U.S. President Donald Trump and Chinese President Xi Jinping on the sidelines of the G20 summit in Argentina. In particular, Trump and Xi agreed to keep their trade war from escalating with a promise to halt the imposition of new tariffs for 90 days and intensify their further bilateral negotiations in the following months. That means, more agreements surrounding on forced technology transfer, intellectual property protection, non-tariff barriers etc. are expected to be achieved between the two countries in the following three months to avoid raising tariffs. Altogether, both sides believe that the principled agreement reached in the G20 meeting has effectively prevented the further expansion of economic and political conflictions between the two countries, benefiting financial markets and growth.

Described by Trump as "an amazing and productive meeting with unlimited possibilities for both the United States and China", more details of the negotiation results are summarized in the Statement from the Press Secretary Regarding the President's Working Dinner with China, including: (i) Trump has agreed that on January 1, 2019, US will leave the tariffs on USD 200 billion worth of product at the 10% rate, and not raise it to 25% at this time; (ii) China will agree to purchase a not yet agreed upon, but very substantial, amount of agricultural, energy, industrial, and other product from the US to reduce the trade imbalance; (iii) Both sides have agreed to immediately begin negotiations on structural changes with respect to forced technology transfer, intellectual property protection, non-tariff barriers, cyber intrusions and cyber theft, services and agriculture; (iv) If at the end of this period of time, the parties are unable to reach an agreement, the 10% tariffs will be raised to 25%. The meeting also discussed the denuclearization of North Korea.

US-China trade war is a truce not a breakthrough, more negotiations are expected

The results of the G20 meeting between the two presidents indicate a temporary truce of the long-lasting trade war between the two countries, in line with our expectation. At least, the positive sign is that real risk of a serious downside such as a meeting ending with recriminations or no agreement has been avoided, which will be supportive for RMB exchange rate and China's stock market in the short term.

However, we need to be positively cautious as further rounds of negotiations are still on the way.

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* This article appeared in BBVA Research on December 3, 2018.

* Dong Jinyue, China Economist,BBVA; Xia Le, Senior Research Fellow of IMI, Chief Economist for Asia, BBVA

Suggested by the US, these include forced technology transfer, intellectual property protection, non-tariff barriers, cyber intrusions and cyber theft, services and agriculture. These key demands from the US might be a long-term conflict that moves far beyond bilateral trade imbalance, and could not be solved in a dinner meeting. That means, the short term downside risk has been removed, but in the longer term, all these risks remain in place. Thus, from China side, we expect more opening-up policies to be essentially announced within the following three months to avoid reigniting the trade war.

The principled bilateral agreement provides more policy room for China

During the past months, Chinese authorities have been facing two battles at the same time: domestic growth slowdown and the trade war with the US. Given that the Trump-Xi meeting has made some achievement, the external pressure should be significantly released at the current stage. Thus, the authorities might get more efforts focusing on the domestic economy. In particular, an easing RMB exchange rate pressure after the Trump-Xi meeting will give the PBoC more monetary policy room for keeping a low interest rate to stimulate growth, instead of following the FED interest rate hike. On top of that, a temporary truce of the trade war will also give the investors more confidence on China's economy, pushing up their investment willingness and pacifying market sentiments. Altogether, we expect more opening-up measures will be announced in the following three months to achieve further bilateral agreements with the US; in addition, more monetary and fiscal easing measures to stimulate growth will also be implemented.

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America's Self-Defeating China Policy*

By ANDREW SHENG AND XIAO GENG *

US President Donald Trump may think that his approach to China amounts to putting "America first." Yet his policies will hurt not only China, but also the US and the rest of the world, not least by undermining leaders' ability to address shared challenges like inequality and climate change.

HONG KONG – Trade tariffs may be getting the most attention, but the conflict between the United States and China is actually being fought on multiple fronts, including exchange rates, technology, cyberspace, and even arms. This does not bode well for the world's capacity to confront shared challenges, from migration to climate change.

According to Bob Woodward, the doyen of Washington journalists, the modus operandi of US President Donald Trump's administration is "maximize aggression to conceal vital weaknesses." And, indeed, when it comes to China, Trump is betting that a hostile tone, backed by reckless but impressive threats, will divert American voters' attention from serious domestic problems ahead of November's midterm elections.

This short-sighted strategy contrasts sharply with the long game being played by the Chinese authorities. Though the Shanghai Composite Index has fallen far more than the Dow Jones Index, reaching its lowest level since November 2014, China is keeping the renminbi from depreciating so much that the US would label the country a currency manipulator.

Meanwhile, China is working to steel its economy from a hostile external environment, as it engineers a transition to a more innovative, inclusive, and sustainable growth model. To advance this effort, China's leaders are engaging the private sector, which, as Vice Premier Liu He recently acknowledged, accounts for more than 50% of tax revenues, 60% of GDP, 70% of technological innovation, 80% of urban employment, and 90% of new jobs and companies. China's leaders finally seem to have recognized that unless the country ends up in a full-blown war that threatens its national security, they have little reason to continue to subsidize state-owned enterprises at the expense of private firms.

In terms of limiting the potential for further instability, China's approach makes sense. The problem is that for many countries, domestic concerns – think of Brexit in the United Kingdom – are increasingly at odds with global imperatives.

After decades of globalization and technological progress, countries are more interconnected than ever, with policy decisions made in one country having far-reaching spillover effects. In this context, no one country can address key challenges such as climate change, rising inequality, and disruptive technology in isolation from others. Yet, just when the world needs cooperation the most, the US has largely withdrawn from the international stage.

To be sure, even if the US were exercising more global leadership, the ongoing shift from a unipolar to a multipolar world order would still proceed. This trend is being driven partly by demographics: developed countries are aging fast, while Asia, Africa, and Latin America have burgeoning populations that are both young and increasingly wealthy, implying both substantial dynamism and greater competition for resources.

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* This article appeared in Project Syndicate on October 30, 2018.

* Andrew Sheng, Distinguished Fellow of the Asia Global Institute at the University of Hong Kong.; Xiao Geng, Member of IMI Academic Committee, President of the Hong Kong Institution for International Finance, Professor at the University of Hong Kong.

But the Trump administration's penchant for antagonism, protectionism, and short-termism makes matters much worse. For example, tax cuts for corporations and the wealthy not only exacerbate inequality at home, but also fuel a global race to the bottom that undermines fiscal sustainability and increases inequality worldwide.

Similarly, while it is understandable that the US does not want to foot the bill for its allies' security, Trump's ham-fisted approach to pushing America's NATO allies to increase their defense spending is not helping. On the contrary, beyond weakening relations with America's closest allies, Trump's tactics have increased tensions with Russia, thereby increasing what economists call the "shadow price" of national security.

Then, of course, there are the Trump administration's trade policies, which will do much more than "punish" China. The case for liberalization has always focused on reducing the transaction costs of global trade, investment, and information flows. By blocking Chinese access to technology, under the guise of national security, the Trump administration increases these costs, not just for China, but also for other countries trying to use trade and technology to advance their growth and development.

The Trump administration's erratic use of sanctions compounds the problem by making it difficult to price transactions with countries that could be friends one day but deemed enemies the next. When the US unilaterally decided to withdraw from the 2015 Iran nuclear deal and re-impose sanctions, the European Union suddenly faced new barriers to trade with Iran. The EU must now attempt to circumvent US sanctions by establishing a "special payments system" with China and Russia.

So, after decades of increasing openness and globalization, the world is retreating into fragmentation. This will severely weaken global trade, thereby undermining economies' growth prospects, while preventing the world from confronting shared challenges. In fact, it could even exacerbate those challenges: for example, the ecological destruction and resource scarcity brought about by climate change is likely to fuel conflict and instability, spurring ever-more migration.

Trump may think that his approach to China amounts to putting "America first." Yet his policies will hurt not just China, but also the US, not to mention the rest of the world. The only way to avoid a universally damaging outcome is to change course, restoring mutually beneficial cooperation with China, which has published a white paper in support of precisely that outcome.

China's leaders recognize that, after decades of globalization, countries are too deeply intertwined, through both supply chains and knowledge networks, to go it alone. They also know that it is in countries' best interest not to try. Instead, they hope to continue to deepen their linkages with the international community, acting not as a disruptor, but as a responsible stakeholder committed to upholding global stability. The US should do the same.

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Trump's Trade Policies Backfiring*

By DESMOND LACHMAN *

Something is going very wrong with the US administration's effort to reduce the US trade deficit, a principal objective of President Donald Trump's 'America first' programme. Instead of declining according to plan, in the first two years of the Trump presidency, it has been increasing steadily. It now stands at its highest level in the past 10 years and shows every sign of rising.

It has been said of bloodletters of old that when their patients responded poorly to the first round of bloodletting, they simply upped the dosage in the mistaken belief that more bloodletting would do the trick.

Hopefully, the Trump administration will not intensify its import protection policy now that the first round of tariff increases has failed miserably to deliver the desired result. Instead, one must hope that Washington takes a time out from its march towards increased trade protection and tries to determine the real causes of the country's poor trade performance.

Mainstream economics would suggest there are at least three reasons why the US trade deficit is widening and will continue to do so despite increased import protection.

First, the US trade deficit is arithmetically the difference between what the US economy invests and what it saves. If the country saves less than it invests, it will have a trade deficit, which will rise to the degree that savings fall further short of the country's investment level.

By engaging in a large unfunded tax cut and going along with the Congress-approved public spending spikes, the Trump administration has eroded the country's level of public savings. It has done so by putting the country on a path of ever increased budget deficits, which the Congressional Budget Office estimates could exceed $1tn a year for as far as the eye can see. It should be little wonder then that the US trade deficit has kept rising.

Second, the dollar has kept strengthening. It has done so as the administration's expansive budget policy at this very late stage in the business cycle has forced the Federal Reserve to raise interest rates to contain inflation. That in turn has caused the dollar to rise by about 10% over the past year, which has had the effect of making US exports less competitive and imports cheaper.

Third, the Trump administration's seeming march towards a world trade war has roiled global financial markets and diminished world economic growth prospects. Global money has sought the safe haven of the dollar and in so doing has increased the US capital account surplus. Once again purely as a matter of arithmetic, with a floating exchange rate, any increase in the US capital account surplus has to be matched by an increase in the US trade deficit if the country's external accounts are to balance.

All of this would suggest that if the Trump administration is serious about wanting to reduce the US trade deficit, it needs to mend its ways and not go down the path of increased import tariff protection. A good place to start would be to revisit the country's inappropriately expansive budget policy, which is sapping the country's savings and is forcing the dollar ever higher.

However, with economics not being this administration's strong suit, I am not holding my breath for this to happen.

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* This article appeared in OMFIF Commentary on December 17 2018.

* Desmond Lachman is a Resident Fellow at the American Enterprise Institute. He was formerly a Deputy Director in the International Monetary Fund's Policy Development and Review Department and the Chief Emerging Market Economic Strategist at Salomon Smith Barney.

IMI International Monetary Review

Opening for US*

By MARK SOBEL*

Members of IMI International Committee share their views on the report delivered by General Secretary Xi Jinping to the 19th National Congress of the Communist Party of China in Beijing on October 18. The following are their comments on Xi's report.

Since early April, the renminbi has fallen 10% against the dollar, largely reflecting dollar strength. The causes lie in the cyclical and monetary policy divergence between the US and China.

However, there is an alignment of interests. Neither the US nor China wants the renminbi to fall against the dollar. Both want to pursue their domestic economic agendas without the complications of a falling renminbi. This could create an opening for unexpected co-operative action by the US Treasury and the People's Bank of China – a joint foreign exchange intervention operation to strengthen the renminbi – which might in turn facilitate co-operation in trade discussions.

US growth is firming on the back of a strong job market and tax cuts, and the Federal Reserve is raising interest rates. Chinese growth is slowing due to deleveraging and the effects of trade disputes between Washington and Beijing. In the light of this, China is now running accommodative monetary policies.

Thus, shifts in interest differentials between the US and China over the past months have favoured dollar placements. US trade rhetoric also exacerbates downward renminbi pressures.

While China wants to maintain monetary accommodation to support growth, Chinese words and actions also demonstrate a wish to curb renminbi depreciation. China has altered renminbi fixings to back appreciation, squeezed short sellers, called repeatedly for stability and intervened to support the currency.

Recently, the renminbi has come close to falling below Rmb7 per dollar. This level is perceived by some as psychologically critical – in this view, a sharp depreciation below that mark might trigger a surge in capital outflow and large downward renminbi move. It is also perceived by some as holding political significance – a rapid fall through that level could exacerbate trade frictions and claims China is engaged in currency manipulation or competitive devaluation.

At the same time, the PBoC has not drawn a line in the sand at Rmb7 per dollar, partly because the central bank wishes to avoid reserve drawdowns. Moreover, its focus is not just on the dollar but also on how the renminbi trades against a basket of its trading partners.

On the US side, bilateral deficits with China remain high, contrary to President Donald Trump's stated goals. Trump is frustrated by the renminbi's depreciation, seeing it as offsetting tariffs, further stoking trade threats.

US/China co-operation is not in vogue. The president has legitimate grievances with Chinese treatment of intellectual property rights and foreign investors, state ownership of the economy and large-scale subsidisation. But where the US and China share common interests, there can be potential benefits from co-operation.

On the plus side, given tensions between the US and China, a positive example of co-operation could help create a better climate between the two countries, particularly for trade discussions. It could underscore that China is not engaged in currency manipulation or competitive devaluation,

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* This article appeared in OMFIF Commentary on November 20, 2018.

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thus reducing market volatility. The US could begin adding renminbi to its reserves, which will perhaps be needed in the future as China's financial markets become more internationalised. Signs of co-operation would send a positive signal to financial markets.

On the minus side, the proposal does not address the fundamental drivers of current renminbi/dollar developments. The pressure for the renminbi to depreciate – including below Rmb7 per dollar – may be inexorable given continuing cyclical and policy divergence between the US and China, regardless of such intervention. Putting additional tariffs on China would further drive the renminbi down. Beijing could perhaps avert a renminbi fall with huge Chinese intervention or a tightening in monetary policy, but neither is seen as in its self-interest. Any operation might have only a short-lived impact and prove symbolic.

This idea is different than the 'countervailing currency intervention' proposal of Fred Bergsten and Joe Gagnon, both senior fellows of the Peterson Institute for International Economics. That proposal assumed a lack of US/China currency co-operation. But in the CCI approach, China could print renminbi to offset US purchases of the renminbi, it can control the main actors in the renminbi market (whether on the mainland or in Hong Kong), and the sight of two financial authorities blatantly at odds with one another would foster market volatility.

In addition to these considerations, any intervention would need to address key technical modalities. How much renminbi would the US and China buy? Would this be a one-time operation for the US? Would it be a joint Treasury-Fed operation? Usually, a public statement accompanies joint country action – how would the US and China articulate the operation's rationale?

There may be a window for unexpected US and Chinese foreign exchange co-operation to strengthen the renminbi. This might help promote broader co-operation, including on trade. This out-of-the-box proposal has obvious positives and negatives. Still, it is worth consideration by both sides, at least for a moment or two.

IMI International Monetary Review

The Fateful Arrest that Could Poison America's Relationship with China*

By DOUG BANDOW *

Amid controversy over a maybe yes/maybe no ceasefire in Donald Trump's trade war with China, the United States engineered the arrest by Canada of a top Chinese executive for allegedly busting U.S. sanctions on Iran. The detention sparked outrage in Beijing, which threatened Canada with "grave consequences" if Meng Wanzhou is not released.

Huawei Technologies Co. is one of China's international behemoths, a telecom firm that now sells more smartphones than Apple. The arrest of Meng, the founder's daughter and Huawei's chief financial officer, was not for committing a genuine crime against Americans, but rather for allegedly lying over Huawei's connection to another firm that did business in Iran. The Trump administration is determined to dragoon other nations into its anti-Tehran crusade.

Washington's use of its economic clout to coerce the rest of the world reflects extraordinary hubris. Americans would be outraged if another nation did the same to us.

In recent years, the United States has imposed sanctions on numerous nations, including Cuba, Iran, Iraq, Libya, Myanmar, Russia, Venezuela, and Yugoslavia. Increasingly Washington insists that the rest of the world follow America's lead or else. It seemed radical when the 1996 Helms-Burton Act targeted foreign firms trading with Cuba. Since then, secondary sanctions have become commonplace, the economic weapon of choice against Sudan (since lifted), North Korea, Syria, and Iran. Against that latter nation, Washington currently is using U.S.-dominated financial markets in an attempt to enforce essentially a total embargo.

Obviously, the purpose of secondary penalties is to magnify the impact of a boycott. In some cases, such as Iraq and North Korea, Washington has won UN Security Council support for multilateral penalties. In many instances, however, foreign governments dismiss what they see as shortsighted, counterproductive penalties—yet we press ahead anyway.

For instance, only in the U.S. do ethnic Cubans possess disproportionate political clout, based on Florida's importance in determining the outcome of presidential elections. Hence, six decades after imposing its embargo, Washington continues, alone, to isolate Cuba economically. Given the politics, the U.S. may still be doing so 60 years from now.

When international support is lacking, Washington threatens foreign businesses to expand its bans. Even the slightest error can lead to huge fines if companies do business in the U.S. Firms forced to choose between markets in America and much smaller, isolated states overwhelmingly pick the former, which requires complying with American restrictions. That turns a secondary boycott by the U.S. into a global squeeze, if not a full boycott.

Commercial restrictions have become all too common, perhaps because they are easy to apply and seem to offer a costless remedy to difficult foreign policy problems. Alas, they seldom achieve their alleged ends. Governments of target states almost never comply and only rarely offer to negotiate. Even then, positive inducements are required to clinch a deal. Foreign governments typically are too concerned about power and prestige to capitulate to threatening foreigners.

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* This article appeared on American Conservative on December 11, 2018.

* Doug Bandow is a senior fellow at the Cato Institute. A former special assistant to President Ronald Reagan, he is author of Foreign Follies: America's New Global Empire..

Another reason sanctions fail is that they hurt the wrong people—average folks most vulnerable to economic decline. For instance, one estimate, likely exaggerated, was that a half million Iraqi babies died from the ban on Iraq's oil sales; in contrast, dictator Saddam Hussein and his family didn't suffer. In fact, elites often profit from the increase in the state's economic role. Two decades ago, Yugoslav opposition leaders complained to me that the oppressive Milosevic government had manipulated sanctions; years later Cuban opposition leaders told me that communist officials had used the U.S. embargo as an excuse.

In response, the U.S. and other nations have increasingly tried "smart sanctions," targeting perpetrators and malefactors, especially government officials. However, while this approach is ethically more justifiable, evidence of its success remains sparse. No dictator has yet given in because he wanted to vacation in the West or been overthrown because his backers worried about the security of their Western investments.

Nevertheless, Washington continues to promiscuously impose sanctions. Today, Iran is the target du jour. The president appears lost under the sway of Saudi Arabia, which is a more disruptive, brutal, and destabilizing power than Tehran. He sacrificed a working denuclearization agreement for the fantasy of Iran's complete surrender.

America is virtually alone in reapplying sanctions against Iran. Washington's demands for renewed talks are impossibly high, essentially requiring Tehran to subordinate its foreign policy to Saudi Arabia as well as the U.S., something Washington would never agree to if the circumstances were reversed.

As is evident from Meng's arrest, imposing Washington's will on the rest of the world creates resentment and resistance. Even U.S. allies have tired of the blundering behemoth taking shortsighted measures and creating long-term damage, with nary a thought about the interests of anyone else.

After the president killed the Iran deal, European governments began exploring strategies to protect their businesses from U.S. controls. The purpose was to preserve the deal with Iran by continuing to deliver economic benefits to the Iranian people. Today, several European countries are working on both an alternative to the SWIFT global financial messaging network and a "special purpose" financial entity to process payments for commercial transactions involving Iran. The Europeans have also considered employing state banks and firms, daring Washington to sanction allied governments.

China and Russia are interested in these endeavors. Neither wants to cede control over their policies to the U.S. nor open their countries' firms to ruinous penalties. They are likely to cooperate with whatever the Europeans develop.

The Huawei case adds another dimension. Even if administration policy toward Iran was not so misguided, it should not become the tail that wags the dog. China matters far more than Iran, a weak middling power that does not threaten America or even Israel. In contrast, Beijing is the one potential peer competitor to the United States. Our bilateral relationship with them is the most important one on earth.

American relations with China already are frayed, given the trade war and other differences, especially over North Korea and control of East Asian waters. The administration's grievances against Beijing include the possibility of Huawei being used by the Chinese government to effectively conduct surveillance and intelligence. Washington has substantial leverage but must set priorities. Meng's arrest effectively raises the importance of complying with Washington's Iran sanctions. That inevitably will crowd out other potentially more important issues.

Moreover, the Huawei arrest is likely to stiffen spines in Zhongnanhai. Chinese officials want to deescalate the trade dispute and avoid penalties against Huawei, but nationalistic, politically sensitive leaders don't like to be pushed around. The failure of President Trump to raise the issue

when he met with China's President Xi Jinping is seen as a loss of face. The hardline Global Times called the arrest "despicable hooliganism" and "a declaration of war" against China. Chinese analyst Deng Yuwen warned that "if the U.S. makes an example of Huawei, the conservative nationalist forces in China and also the military will be very unhappy, and that will make it even more difficult to make compromises with the United States."

Indeed, China's leadership faces aroused public opinion, which tends to unite on issues of national pride. The regime fears and often accommodates public sentiments. The state-run China Daily editorialized: "The U.S. is trying to do whatever it can to contain Huawei's expansion in the world simply because the company is the point man for China's competitive technology companies." Some Chinese have expressed fear for investments in the U.S. while others have urged an economic boycott.

The regime might look for subtle means to retaliate. Indeed, one can imagine charges emerging in Beijing against U.S. technology firms and their executives. Chinese officials are unlikely to let a concern for justice get in the way of embarrassing the United States. Some American business executives are now expressing unease over traveling to China.

Washington's hubris is threatening America's foreign relationships and international authority. Meng's arrest is a stark declaration by the Trump administration that it expects to dictate to every other nation, no matter how powerful. China and other countries are ever less willing to comply. A backlash is certain. When it comes, it's likely to do far more than undermine American efforts to isolate Iran.

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Global Economy

Speedy Communication Needed ⋆

By DAVID MARSH* AND BEN ROBINSON

The European Central Bank needs quickly to inform financial markets and the general public how it will conduct reinvestments next year under its quantitative easing programme. Otherwise, the enormous complexity of the task now being considered is almost certain to provoke accusations of unfair treatment from different sides.

Germany's share of the ECB's capital key, which guides the QE programme, will rise by 1.2 percentage points to 26.8% – the largest increase for any country, reflecting strong economic and population growth over the five years since the previous recalculation. Italy's share will fall by 0.9 percentage points to 16.6%, the biggest decrease.

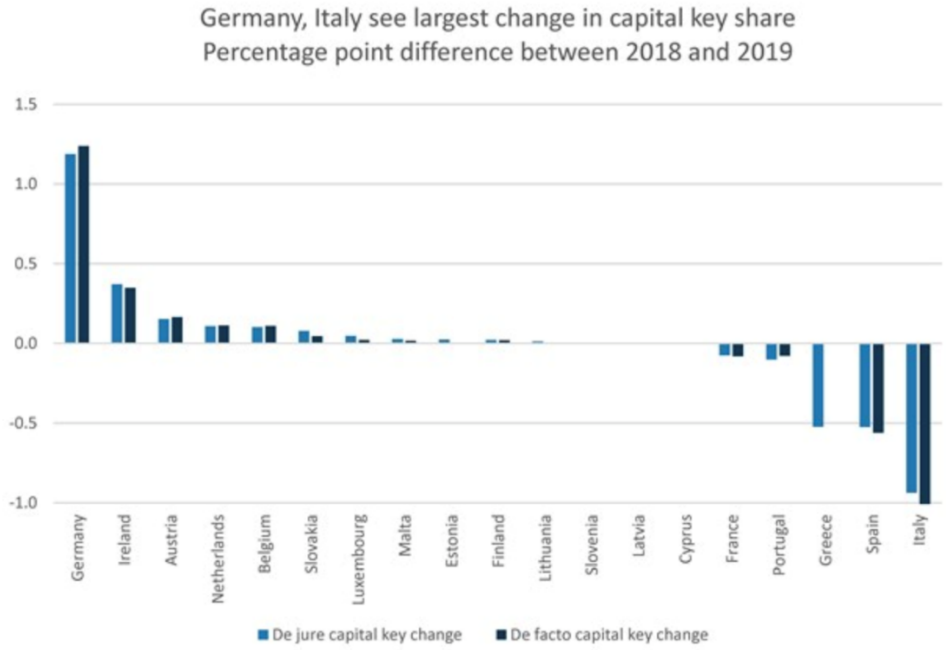
The recalibration matters for the ECB's reinvestment of maturing bonds in 2019, following the end of net purchases in December. The bank has pledged to maintain the overall size of its balance sheet by reinvesting maturing bonds bought under QE to keep the overall stock of assets stable at their end-2018 level.

Over the next few years, the stock of each country's public sector bonds must converge with its updated capital key share. The shift in economic weight towards northern states may heap political pressure on the ECB from southern countries that could claim they are facing discrimination. Fewer reinvestments seem likely to be made in their bonds relative to the more prosperous northern countries'.

The reality is still more complex – and what happens will depend on a baffling series of computations facing first the bank's various specialist committees and then eventually the ECB's decision-making governing council. Countries with larger bond markets, notably Italy, France, Spain and Germany, have purchased above their capital key share to compensate for the lack of available bonds in smaller countries like Estonia, Cyprus or Slovakia, as well as the ineligibility of Greek bonds owing to their low credit rating.

⋆ This article first appeared in OMFIF Commentary on October 25, 2018.

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

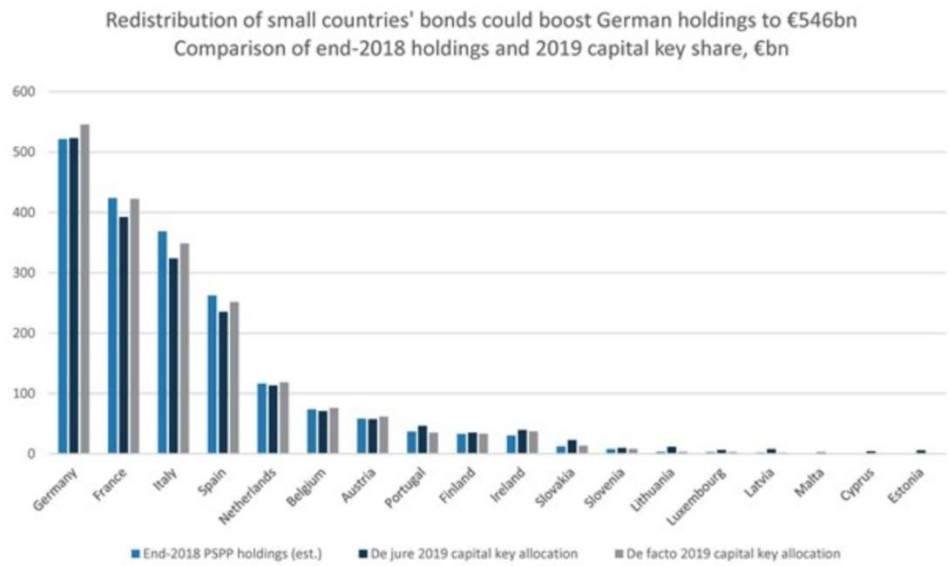


Sources: European Central Bank, OMFIF analysis

As a result, far more redemptions will need to be reinvested in German bonds than the strict capital key suggests.

The actual, 'de facto' share of German public sector bonds bought so far is 26.7%, some 1.1 percentage points above its strict capital key share. Factoring in the recalibration of the capital key, Germany's de facto share will rise to 27.9%. This suggests more than €24.2bn worth of additional reinvestment in German bonds will have to be made after December 2018 to ensure the stock of its bonds matches this de facto capital key share. That compares with just €1.6bn of reinvestment according to the strict capital key share.

Whether the ECB can find enough German bonds in which to reinvest to fulfil this allocation is an important consideration. By the end of December, almost €522bn of German bonds will have been purchased. This is starting to push up against the ECB's restriction on purchases of more than 33% of any issuer's outstanding bonds.



Sources: European Central Bank, OMFIF analysis

Additional purchases via reinvesting redemptions of other countries' maturing bonds will add to the strain. The ECB has not yet decided – let alone announced – how it will conduct reinvestments. The governing council may yet decide to increase the issuer limit to avoid this constraint. However, this is likely to meet political resistance.

A more positive effect of the 'de facto' capital key deviation reflects the position in Italy. The required drop in ECB holdings of Italian bonds will be lower than it would be using the de jure capital key allocation.

Italian bonds will have been overpurchased by more than €26bn by end-2018 according to the country's strict capital key share. To match Italy's reduced 2019 capital key, the Banca d'Italia would have to reduce its holdings of Italian debt by almost €45bn. However, the need to make up for under-purchases in countries with smaller bond markets means that this figure is closer to €21bn.

While still a large reduction for a country planning to expand debt issuance in the next budget, the impact will be less severe than it might otherwise be.

Italy may complain that its capital key share will fall to 16.6% from 17.5% next year. Yet the actual share of its bonds that will be purchased in the ECB's reinvestment is likely to be closer to 17.8% – larger than its current de jure figure, but smaller than its current de facto share of 18.8%.

Many other technical issues need to be clarified, for example on changing the maturities of reinvested bonds.

Replacing maturing Italian debt with longer-dated securities would help flatten the yield curve and be more stimulative than reinvesting in bonds with a similar maturity profile. This could strengthen the capital position of Italian banks, which own large shares of Italian government debt, and which should benefit from rising prices.

Theoretically such flexibility would also allow German reinvestment in short-maturity bonds, raising long-term interest rates and benefiting the country's large and restless population of savers for whom QE has been economically damaging.

To an extent this has already happened since 2017 when investment in assets yielding below the ECB deposit rate of minus 0.4% was allowed. This has led to a rapid fall in the weighted average

maturity of Germany's public sector purchase programme bond holdings.

The ECB is unlikely to announce a decision on these issues when the governing council meets later today. The December meeting will be the crucial moment for providing guidance on the future of QE. This will be an important market-moving moment. The sooner the ECB clarifies the rules, the better.

January 2019
Vol.6, No.1

Global Momentum Abating *

By DAVID SKILLING*

The global economy is slowing. There are many contributing factors, including weaker performance in Europe and China, growing trade tensions and the impact of a strong dollar. These headwinds are unlikely to disappear soon.

In late September President Donald Trump imposed a 10% US tariff to $200bn of Chinese imports. Sino-US economic relations are likely to continue to deteriorate, the bilateral trade deficit will continue to expand, and dollar strength will constrain world trade growth.

But looking across small advanced economies – helpful indicators for the health of the world economy – suggests this is more a moderation in economic momentum than a marked slowdown. The global economic recovery endures, even if it is not as synchronised or strong as at the start of 2018.

Small advanced economies continue to outperform larger economies in spite of their exposure to a more complex international environment. GDP growth across the group – which includes Switzerland, Norway, Ireland, Singapore, Denmark, Sweden, the Netherlands, Austria, Hong Kong, Finland, Belgium, New Zealand and Israel – was 2.9% in the year to the second quarter, a pace they have maintained since the third of quarter of 2016. This is well ahead of average GDP growth in the G7 (2.2%) and the European Union (2.1%).

Eight of the 13 small advanced economies are growing at a rate of 2.8% or higher. Multiple small economies have been at or above 3% growth for several quarters. They are responding effectively to emerging challenges. The UK, in comparison, grew at just 1.3% on the back of costs and uncertainties related to its imminent EU departure.

Nonetheless, recent small economy data confirm a softening in the global economy. On an annualised basis, GDP growth in the second quarter of this year slowed to little above 2%. Monthly merchandise trade data show a continuing growth slowdown since the start of 2018, in line with dynamics in world trade growth, although small economy export growth remains robust (more than 8% in dollar value terms in July).

This slowing should be kept in context. Although economic momentum is off the peaks of 2016 and 2017, it is stronger than it has been for much of the post-crisis period. Business and consumer confidence, export growth, industrial production, and purchasing managers' index readings across small economies are generally solid and compare well to larger economies.

There is some geographic variation. The two small economies with the weakest quarterly GDP growth readings in the second quarter were Singapore and Hong Kong, reflecting their acute exposure to Sino-US tensions. The escalating trade dispute is clearly having an impact, although it is not yet systemic.

The general resilience of small economies heavily exposed to the machinations of the world economy suggests the global recovery remains in good shape, though risks remain. Aside from tensions between Washington and Beijing, policy-makers must grapple with continuing euro area challenges (such as in Italy) and pressures from a strong dollar on emerging markets, to give but a few examples. A decade on from the collapse of Lehman Brothers, markets should not be complacent about financial risks, from record levels of debt as a share of GDP around the world,

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* This article appeared in OMFIF Commentary on December 6, 2018.
* David Skilling is Director of the Landfall Strategy Group, a Singapore-based economic advisory firm.

to stretched US equity markets and market distortions from the hunt for yield. As interest rates move up, stress is likely to emerge.

That small economies are travelling reasonably well is an encouraging signal on the health of the global economy. But these economies understand from experience that storms can appear quickly, and there is an emerging consensus that a recession will occur by 2020. An economic, financial or political shock may have an outsized effect on the global economy if it interacts with already slowing global growth. Small advanced economies are a good place to watch for changing global weather.

January 2019
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US Faces Twin Deficit Crisis*

By DESMOND LACHMAN

It would be an understatement to say US President Donald Trump has failed to deliver on his campaign promise to close the US trade deficit and promote domestic manufacturing jobs. The country's trade deficit has widened steadily over the past two years, reaching a record high of almost $1tn annually.

With his administration's budget and trade policies, the deficit will probably continue widening for the remainder of his first term. This might come as a surprise to Trump. But anyone who has taken an introductory course in international economics knows the main determinant of trade deficits is not the level of a country's import tariffs, but whether the country saves enough to finance its investment. If a country reduces its savings and increases its investment level, its trade deficit will widen, as has happened for US over the past two years. A strengthening dollar makes it more difficult to export and cheaper to import. Another basic economics lesson is that with a floating exchange rate, an increase in a country's capital account surplus will necessarily be matched by a widening in its current account deficit.

There is every reason to expect that, over the next two years, the US trade deficit will exceed $1tn per year. Among the main reasons for this is the Trump administration's budget policy, which holds out the prospect of a major decline in the country's savings level. That policy includes an unfunded tax cut that the Congressional Budget Office estimates will increase public debt by $1.5tn over the next 10 years. It also includes support of a Congress-approved $300bn increase in public spending over the next two years.

As a result of Washington's expansive budget policy at this late stage in the economic cycle, analysts expect that over the next two years the US budget deficit will rise to a peace-time high of more than $1tn. This makes it probable that the US will face a twin deficit problem – an outsized budget deficit and an outsized trade deficit –previously seen in the 1980s during Ronald Reagan's presidency.

Another reason to fear the US trade deficit will widen in the year ahead is that a strengthening dollar will discourage exports and incentivise imports. Already over the past year, the dollar has appreciated by around 10%. This will probably continue in the period ahead, as US monetary policy becomes increasingly out of sync with that of its major trade partners. Expansive budget policy is forcing the Federal Reserve to keep raising interest rates to prevent economic overheating. Meanwhile, the European Central Bank and Bank of Japan are continuing to provide support to their economies. In the process, they are increasing the relative attractiveness of US financial assets.

A further factor likely to contribute to dollar strengthening is the global financial market turmoil caused in part by the uncertainty engendered by Trump's 'America first' trade policy. As often happens in times of global turmoil, investors are likely to repatriate capital to US safe havens. As a matter of arithmetic, under a floating exchange rate regime as the US capital account surplus strengthens, its external current account and trade account deficits must be expected to widen.

Judging by past behaviour, it would be too much to expect Trump will assume responsibility for the country's disappointing trade conduct under his watch. Ultimately, his economic policies risk returning the US to the debilitating twin deficit problem of the 1980s.

* This article appeared in OMFIF Commentary on November 5, 2018.

IMI International Monetary Review

Proposals for New Brexit Statecraft

By JOERGEN OERSTROEM MOELLER*

After the failure of the European Union Salzburg summit to agree UK Prime Minister Theresa May's Chequers plan for withdrawal, the chances that Britain will leave without a deal have risen significantly. The sooner policy-makers on both sides realise this the better.

Relations between the Britain and the remaining 27 members of the union will further sour if this struggle to craft a deal (which would be unlikely, in any case, to pass through the UK Parliament) is allowed to drag on. The consequences for a future Europe under pressure to prosper in an increasingly unpredictable world economy could be disastrous.

What is needed is a totally different statecraft mapping out how this outcome can be turned into a partnership that both parties can accept. Instead of devoting resources to solve issues with little chance of success, Britain and the EU should turn to matters of mutual beneficial interest. It seems to me, based on my long experience in diplomacy, that too many negotiators and politicians on both sides have overlooked that one of the keys to a successful negotiation is first to agree whether they actually want to clinch a deal. Thereafter the sides start to find out where they are in agreement and then move to build on a solid base.

Britain must realise that it was not asked to leave; it decided to leave. It cannot put forward terms for a future relationship that let it keep some of the advantages of membership while jettisoning those it dislikes. Observing the debate in Britain and in particular comments by Brexiteers, there is the risk of a 'stab in the back' myth emerging. The view that Britain was pushed out because the EU rejected 'reasonable' demands that were shared by other member states is gaining ground. The echo of Britain putting forward the only sensible deal, while the EU is looking for revenge, is heard. In this prism, the 'Britain had no choice' narrative comes out on top. The string of political decisions taken by British politicians over several years leading to this calamity is conveniently put aside. It is repressed that the EU defended its fundamental principles when confronted with former Prime Minister David Cameron's 'new terms' and is doing likewise in the Brexit talks. There is no acknowledgment by the UK that it signed an accession treaty in 1973 with which it never felt comfortable.

Brussels must accept that it is not a crime for a member country to decide that the EU's governing principles are no longer compatible with views about its future place in the world. If Britain concludes that it may be better off out than in, let it try. In the EU vocabulary, Britain will be a third country and an agreement on that basis is called for. The EU must come to terms with the fact that Britain will not be like other third countries. It is a soon-to-be-former member state that for decades shared burdens and benefits with other members and contributed to European integration. It is also an adjacent country with strong economic, political and military links to the remaining members. Neither side should forget that, since 1973, Britain's economy has been integrated with the EU and an abrupt disruption will be costly for all.

The mistake was to prioritise exit terms above the future relationship. This was not necessarily doomed to failure, but as is now clear it embedded risks of confrontation. Approaching negotiations the other way around might have created a better atmosphere, as the two parties might have realised how much they need one another. There may still be time to turn a potential political catastrophe into a workable relationship anchored by mutual interest.

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China

Is China Cooling *

By STEVE H. HANKE [*]

Chinese stocks have taken a hit in the past few weeks. The Shanghai Composite Index has tumbled by over 9% in the past thirty days, and for the year, the Index has shed 25%. This weakness in the equity markets reflects an anticipation that China's economy might be cooling down.

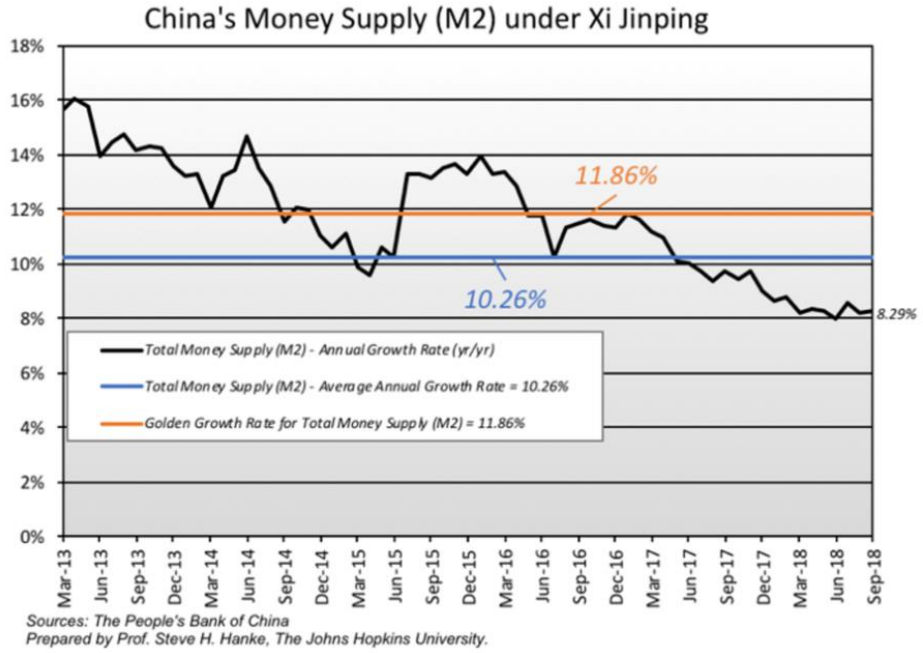
Well, is a cool down in the cards? To answer that question, we must look at the money supply, broadly measured. Indeed, for me, a monetary approach to national income determination is what counts. The relationship between the growth rate of the money supply and nominal GDP is unambiguous and overwhelming. For example, just consider that in China from 2003-2017, the money supply grew at an annual rate of 14.92% and nominal GDP grew at a 14.67% annual rate.

So, what is China's monetary temperature? Let's first determine the "golden growth" rate for the money supply, and then compare the actual growth rate in China to the golden growth rate. To calculate the golden growth rate, I use the quantity theory of money (QTM). The income form of QTM states: MV=Py, where M is the money supply, V is the velocity of money, and P is the price level, and y is real GDP (national income). Calculations:

Golden Growth Rate = Inflation Target + Average Real GDP Growth - Average Percent Change in Velocity
Golden Growth Rate = 3.00% + 7.03% - (-1.83%) = 11.86%

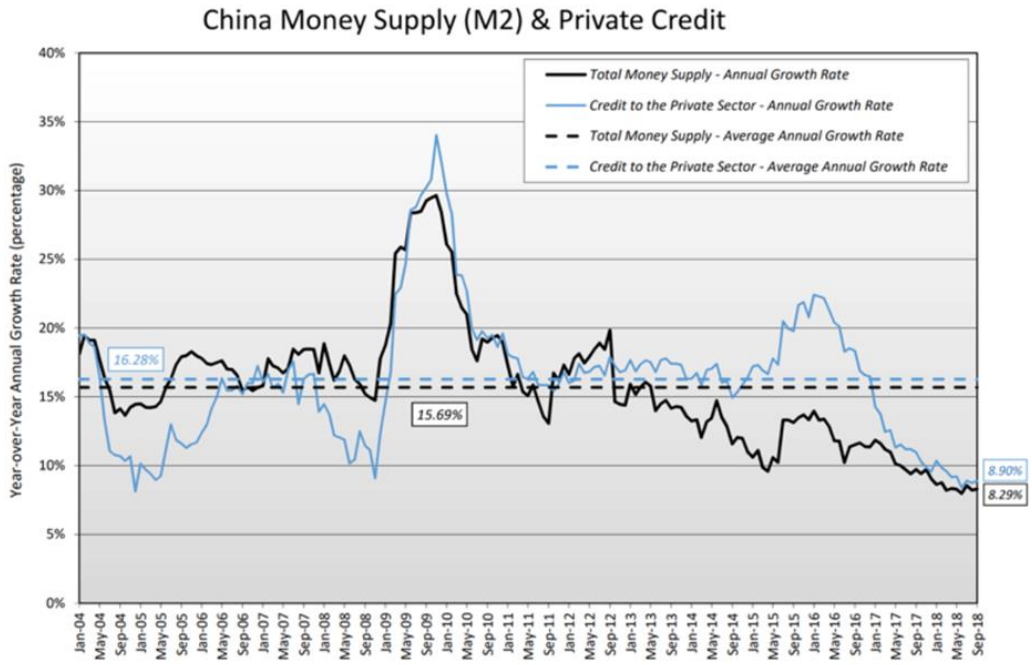
So, the growth rate of money supply (M2), which has been 10.26%, has lagged behind the golden growth rate (see my calculations and the chart below). This suggests an undue tightness on the part of the People's Bank of China.

* This article appeared on Forbes.com on October 29, 2018.
[*] Steve H. Hanke, Member of IMI International Advisory Board, Professor of Applied Economics at the Johns Hopkins University.



Sources: The People's Bank of China
Prepared by Prof. Steve H. Hanke, The Johns Hopkins University.

Further evidence of tightness is shown in the chart below. Both the money supply (M2) and private credit growth rates have plunged and are way below their trend rates of growth.



Sources: The People's Bank of China and calculations by Prof. Steve H. Hanke, The Johns Hopkins University.
Note: The averages for the money supply and private credit are calculated over the period from Jan-04 through Sep-18.

China is cooling. There is no doubt about it. No wonder the Chinese stock markets have been rattled. Investors anticipated cooling of the Chinese goes beyond China's boundaries. China has

been the biggest contributor to world growth for some time. If China cools, the world economy cools, a bit. And that's not all, China is a big driver in the commodity markets. These sensitive markets have obviously anticipated a Chinese cool down. If you think the Chinese stock markets have taken a beating this year, just take a look at some of the metal markets.

Let's use the QTM to make some bench calculations to determine what the "golden growth" rate is for the money supply. This is the rate of broad money growth that would allow the People's Bank of China to hit its inflation target. I have calculated the golden growth rate from 2013 to the present-that's the period in which President Xi Jinping has been in power.

According to my calculations, the average percent real GDP growth from March 2013 to September 2018 was 7.03%, the average growth in Total Money Supply (M2) was 10.26%, and the average change in the velocity of money was -1.83%. Using these values, and the People's Bank of China's inflation target of 3.00%, I calculated China's golden growth rate for Total Money (M2) to be 11.86%.

IMI International Monetary Review

Belt and Road Boosting Economic Globalization *

By TU YONGHONG *

The hope is, through connectivity of policies, infrastructure, trade, capital and culture, participating countries can work together better

Information technology, such as computers and the internet, have helped reduce the barriers of time and space, making the world more closely connected and speeding up globalization. Countries' economic and social development are also now closely related.

The world is experiencing changes as the United States' deglobalization approach and China's globalization policies and practices are having a huge influence on the global economy.

The 2008 global recession showed that the international economic and monetary order has big flaws. The global financial system that was dominated by the developed countries triggered huge financial asset bubbles. The benefits of economic globalization have reached only certain groups of people and are not shared by the whole world. In addition, global economy and trade have reached troughs.

Meanwhile, the new technology reform, represented by technologies such as big data, cloud computing and artificial intelligence, has already begun. Based on these new technologies, restructuring of the global industrial chain and development of global economic cooperation are underway.

Global economic cooperation is at a crossroads. At this crucial time, China has put forward plans to push ahead economic globalization through the Belt and Road Initiative.

The hope is that the BRI, through the connectivity of policies, infrastructure, trade, capital and culture, will help all participating countries use their own advantages to work together better. It aims for the mutual prosperity of developing and developed countries alike. The practice in the five years since the BRI was proposed has shown that China's plan caters to the wishes of people in most countries in the world, and so the BRI has won extensive support.

Countries involved in the BRI that hope to participate in the new international industrial specialization need to strengthen financial cooperation and work out financial support systems. They should make efforts in four areas and create a new kind of international financial cooperation system.

First, organizations like the Asian Infrastructure Investment Bank should be used to push countries to make efforts toward financial cooperation policy, mainly supporting areas such as construction, transportation, electricity and telecommunication infrastructure.

Second, based on the Silk Road Fund, the governmental funds of countries involved in the BRI should jointly support the application of new technologies and increase value-added production.

Third, the cooperation of unofficial financial platforms should be strengthened, such as by establishing a multinational consortium of banks, and standards should be worked out in such areas as financial technology development, risk management and a payment and clearing system, to uplift the ability of finance to serve the real economy.

The fourth area where effort is needed is in pushing forward the reform of the international monetary system and increasing the use of the yuan in international trade, transactions and official reserves, to reduce the weaknesses and risks of the world financial system.

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* This article is published by China Daily Africa Weekly on October 26, 2018.

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China's Four Traps *

By ANDREW SHENG AND XIAO GENG

During its 40 years of reform, China has mastered learning by doing, engaged in bold policy experimentation, and become steadily more integrated into global economy. It will need to bring all of this experience to bear, as it attempts to avoid the pitfalls that could derail its effort to achieve high-income status.

HONG KONG – On the 40th anniversary of the launch of China's "reform and opening up," the country is well on its way to recapturing its former status as the world's largest economy, having made substantial progress toward modernizing its agricultural sector, industry, defense systems, and scientific capabilities. But four major traps lie ahead.

The first is the middle-income trap. With a per capita annual income of around $9,000, China remains significantly below the threshold for high-income status, set at around $12,000-$13,000 by the World Bank. Only a few countries in history have managed this leap during the last half-century.

A major reason is that reaching high-income status demands a strong network of modern institutions that define individuals' rights and obligations, enable market exchange and non-market interactions, and enforce the rule of law by resolving disputes fairly. While China has been working to develop its institutions for four decades, it still has a long way to go.

Second, China may become ensnared in the so-called Thucydides Trap: when an established power (Sparta in Thucydides' time; the United States now) fears a rising power (Athens then; China now), war becomes inevitable. With US President Donald Trump's administration targeting China with trade measures that are clearly designed to reduce China's access to markets and technology, this outcome seems increasingly plausible.

The third potential trap is what Joseph Nye calls the Kindleberger Trap. Charles Kindleberger, an architect of the Marshall Plan, blamed the breakdown of the international order in the 1930s on America's failure to match its provision of global public goods to its new geopolitical status as the world's dominant power. If China does the same, according to Nye, chaos could erupt again, especially at a time when the US is withdrawing from global leadership.

Finally, there is the climate-change trap. High-income countries in general, and great powers in particular, consume a disproportionately large share of resources. But China's economy and influence are growing at a time when, as dire warnings by bodies like the Intergovernmental Panel on Climate Change demonstrate, that is not really an option. China's leaders thus have an additional imperative to support international cooperation and adopt forward-thinking policies that account for environmental realities.

Avoiding these four traps will be extremely difficult. China's leaders must navigate complex and conflicting pressures, as they seek to address domestic economic inequalities, manage relations with an insecure and isolationist US, cooperate effectively with the rest of the world, and pursue effective climate action.

The good news is that China's governance system – characterized by centralized policymaking and decentralized experimentation and implementation – has proved well-suited to rapid decision-making in times of crisis. Over the last four decades, the Chinese model has proved more practical and efficient than democratic systems, which have often been paralyzed by dysfunctional and

* This article appeared in Project Syndicate on November 26, 2018.

polarized politics. Its success in guiding China to high-income status will be determined largely by four factors – talent, competition, public goods, and accountability – all of which the country has managed to harness effectively in the past.

Adhering to thousands of years of tradition, China has devoted considerable resources to the identification, selection, and grooming of administrative and technical talent. This has been essential to China's ability to develop the strong state capacity needed to manage large-scale public projects. As China confronts the four traps, its ability to develop and retain human talent will be vital to success.

China has also effectively used competition among individuals, companies, cities, and provincial bureaucracies to ensure that all stakeholders are contributing to productivity and GDP growth. But China's markets have developed faster than its regulatory framework, so that now policymakers must close loopholes and resolve weaknesses that are undermining fair competition. At the same time, they need to tackle the consequences of those loopholes and weaknesses, such as corruption, pollution, excessive debt, and overcapacity.

This is the other side of the public-goods challenge: while China has plenty of experience delivering physical infrastructure, it has been less successful in delivering soft infrastructure, such as competition rules, accounting standards, tax systems, and regulatory norms. China will not achieve high-income status unless and until this changes.

When it comes to accountability, China has an indirect and imperfect system that is poorly understood by outside observers. Chinese leaders earn their legitimacy not by winning the most votes, but by delivering results such as economic prosperity and progress on implementing reforms. As China's global influence grows, international pressure will become another mechanism for accountability.

The challenge China faces in this area relates to some of the tradeoffs Chinese leaders have made in their pursuit of results. In particular, monopoly is on the rise, with Internet platforms that provide social benefits in the form of low transaction and communication costs (Alibaba, Tencent, and Baidu) securing massive market share. That, together with policy subsidies, has created monopoly rents that are subject to capture by small interest groups.

This escalating market concentration – which, to be sure, is not limited to China – can lead to worsening inequality of income, wealth, and opportunities. China's leaders will thus have to make significant progress toward addressing it in the coming decades.

During its 40 years of reform, China has mastered learning by doing, using dynamic markets as a guide for price signaling and problem-solving. It has engaged in bold policy experiments, such as the creation of special economic zones. And it has become steadily more integrated into the global economy. As it attempts to avoid the pitfalls that lie ahead, it will need to bring all of this experience to bear.

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Market Rescue*

By HONG HAO *

Shanghai reeks of calls to "bailout", and is attempting to stage a technical rebound. The series of speeches by top policy makers, the accompanying array of new policies to stem the hemorrhage, and more importantly, the swiftness of the rollout of these policies all suggest the resolve to "rescue" the market. For instance, it only took four days for the People's Congress to change the corporate law to make ways for stock repurchase by listed companies. Brokers are disallowed from forced selling those shares pledged but cannot meet margin calls, and they are readying funds to relieve those "worthwhile" companies of which shares are heavily pledged.

Will it work?

Our quantitative analysis shows that the amount of shares pledged and the percentage of total market capitalization pledged have been rising since early 2015, even though the stock market bubble burst only managed to put a fleeting dent in the share-pledge practice. The percentage of the market pledged rose until March 2018, and then began to fall sharply (Figure 1). It appears that as the market plunge accelerated, margin calls on shares pledged increased – it was like stepping on the gas pedal.

Figure 1: China's shares-pledge problem.

Source: Wind, BOCOM Int'l

That said, given that the entire emerging market has been under pressure since late January, and that the percentage of market pledged has been rising in tandem as the market recovered from the 2015 crash, it is unlikely that these share-pledged loans are the reason for the bear market, although it must have aggravated it. Meanwhile, the surging volatility in the US market has not helped – the consequence of the colliding economic down cycle in China and the peaking cycle in the US ("The Colliding Cycles of the US and China", 20180902).

Will the swift changes of corporate law allow easier share repurchase work? Our analysis suggests the answer is unclear. We compare listed companies' net cash on balance sheet with their

* This article appeared in the author's WeChat public account (ID: Honghaochinastrategy) on November 14, 2018.

* Hong Hao, Senior Research Fellow of IMI, Managing Director and Head of Research, BOCOM International)

current liabilities. If net cash is positive, the companies will have the ability to buy back shares in the open market. We find that the listed companies only have 325 billion yuan of net cash, or 12.3% of the corresponding companies' free-float market cap, but less than 1% of the entire market's capitalization of over 40 trillion yuan. This figure has fallen from just over 400 billion yuan, but the percentage remains stable – a result of a falling market (Figure 2). As such, the net cash that can be deployed for share buyback is limited, despite the change of law. It could help those companies with some excess cash, but these companies are strong in their own right, and thus probably less prone to support their own shares.

Figure 2: Listed companies have limited net cash for share repurchase.

Year	2015	2016	2017	6/30/2018
Number of listed companies	2,799	3,026	3.464	3.556
Number of companies with data integrity	2,752	2,969	3.402	3.484
Number of companies with excess cash	569	685	712	577
Number of companies with excess cash in main board market	214	261	307	269
Number of companies with excess cash in SME board market	161	198	184	132
Number of companies with excess cash GE board market	194	226	221	176
Total market value of companies with excess cash (billion yuan)	80,877	84,600	82,166	67,294
Total market value of companies with data integrity (billion yuan)	456,328	433,874	479,058	428,613
The proportion of the total market value of companies with data integrity	17.7%	19.5%	17.2%	15.7%
Net cash of companies with excess cash	**2,955**	**4,031**	**3,973**	**3,252**
Circulation market value of companies with excess cash	32,567	32,823	31,670	26,445
Net cash / circulation market value of companies with excess cash	**9.1%**	**12.2%**	**12.5%**	**12.3%**

Source: Wind, BOCOM Int'I

In sum, these tactics are likely to support the subdued market sentiment. But they have not touched the essence of the issue that the China's stock market has been confronted with – the stock market has not always been an inclusive pursuit to give the hoi polloi the opportunity to participate

in wealth creation via the growth of listed companies. Instead, it has been a game of "rip-off", of the rich over the poor, the haves over the have-nots, the insiders over the outsiders. And the Chinese retail investors, often in good spirit, nickname such a game "harvesting chives" (because chives grow fast and can be harvested over and over).

In recent history, there have been two great bull runs in the Chinese stock markets – one from mid-2005 to late-2007, and another from mid-2014 to mid-2015. The fundamental reason for these bull markets is that there was structural change prior to the inception of these bull markets - to include retail investors in the pursuit of wealth creation: in 2005, it is the stock ownership reform to resolve the status of the restricted shares held by the state; and in 2014, the significant growth of margin lending, rightly or wrongly, let a great many soar from rags to riches, and then back to earth.

The reason why the Chinese favors property as an asset class over stocks, and property has done exceedingly well is not just because property is the most legitimate way to take on leverage, even for a working class. It is because property is probably the only fair game that has been consistently letting the most number of people participate in wealth creation. It started from the housing reform in 1998, when the state transferred significant wealth to the masses through selling state-owned property titles at a token price.

In our report titled "the Market Bottom: When and Where" more than two years ago (20160604), we re-defined the market bottom as relative to a long-term economic growth rate. We showed that a log-linear relationship between the Shanghai Composite and the implicit GDP growth target implied by China's Five-Year-Plan since 1986 (Figure 3). Interestingly, the time when Shanghai touched its bottom twice in the past, 2005 and 2014, coincided with the structural changes we discussed above. In this report two years ago, we wrote that the theoretical market bottom should be around 2,450, should the historical relationship persist.

Figure 3: Shanghai is at its long-term trend line. The ann. compound rate of the rising trend = GDP target.

Source: Bloomberg

On October 19, 2018, the Shanghai Composite plunged to 2,449.197 before it rebounded. In the past two years, we documented a mysterious force that has prevented the Shanghai Composite to arrive at its theoretical bottom, and had presented our findings to top policy makers (Figure 4). Recent public filings showed that the "National Team" had left the market.

Figure 4: Mysterious force in 2016. Now Shanghai is oversold, but its bottom tends to be protracted.

Source: Bloomberg, BOCOM Int'l

After the First Session of the Twelfth National People's Congress on March 17, 2013, Premier Li Keqiang commented while answering questions from the press: "sometimes stirring vested interests may be more difficult than stirring the soul". It is a candid and vivid assessment of the challenges that the Chinese market is facing. With the short-term policy tactical maneuvers, the Chinese market will attempt to heal, albeit hampered by overseas volatility. But before we see structural changes that "stir the soul", the return of the great bull market remains elusive.

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Peering into China's Local Government Debt*

By DONG JINYUE AND XIA LE

Introduction

Market concerns over China's local government debt have recently heated up again as tightening credit conditions made a number of local government financing vehicles (LGFVs) delay their repayment. Moreover, some LGFVs have to cancel their planned bond issuances, further dampening investors' sentiments towards the financial soundness of China's local governments.

Indeed, the pace of LGFVs debt accumulation has contributed substantially to the rise of China's overall debt level in the aftermath of the 2008-2009 global financial crisis (GFC), which, to a large extent, led to the downgrading of China's sovereign rating by some international rating agencies in 2017.

In this report, we attempt to answer a number of questions regarding China's local government debt, including: (i) what's the total size of China's local government debt; (ii) why the local government debt has grown to today's level despite the central government's clamping-down efforts; (iii) whether the risks associated with local government debt are still manageable; and (iv) how can the authorities solve this debt problem.

What's the total size of local government debt?

It is always a challenging task to provide an aggregate figure of local government debt in China, mainly due to the fact that the central government, local governments and the market have quite different views about the nature of certain forms of debt. This has led to a wide range of estimates for the total size of local government debt. (Table 1)

Similar to some others' estimates, our estimate of local government debt can be classified into two parts: the explicit debt mainly includes the part of local government borrowing which has been acknowledged by the central government, standing at RMB 16.5 trillion at end-2017 while the implicit debt includes the LGFV debt and part of the Public-Private-Partnership (PPP).

It is noted that LGFVs are in essence special-purpose vehicles which are established by local governments to finance infrastructure projects. Part of LGFV debt has been acknowledged by the central government as the explicit debt of local government. We consider this part of LGFVs debt as local government borrowing. For the rest of LGFV debt which hasn't been acknowledged by the central government, we believe that local governments still have the obligation for its payment and therefore expect the central government to acknowledge it in future. For the moment, we classify it into the implicit debt of local governments.

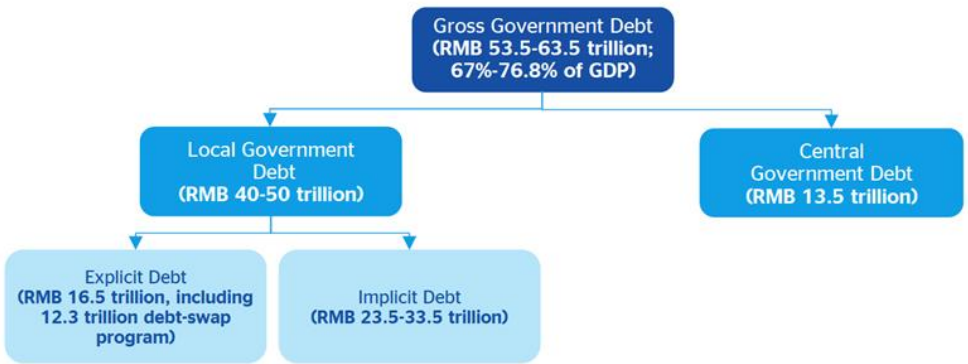
In total, we estimate that the local government debt (including both explicit and implicit part) stands at a range of RMB 40-50 trillion at end-2017. Thus, together with the RMB 13.47 trillion of central government debt, China's total government debt reached RMB 53.5-63.5 trillion, or 67%-76.8% of GDP. (Chart 1)

* This article appeared in BBVA Research on October 9, 2018

Table 1 Estimations of government debt in China by different institutions

Institutions	Methodology	Results for end-2017 estimation
Ministry of Finance, China	Only considers the explicit debt of local government	Local government debt balance RMB 16.5 trillion; central government treasury bond RMB 13.4 trillion; total government debt RMB 29.9 trillion.
Bank for International Settlements (BIS)	Considered estimated implicit local government debt of RMB 8.9 trillion.	RMB 38.8 trillion for total government debt, and 25.4 trillion for local government debt, among which, implicit local government debt is RMB 8.9 trillion.
International Monetary Fund (IMF)	Except for the central government debt and explicit local government debt announce by MOF, also included estimation of implicit local government debt RMB 19.1 trn, including LGFV, debt related to local government fund and some contingent debt.	RMB 46.4 trn for total government debt; implicit local government debt RMB 19.1 trn; total local government debt 33 trn. (for end-2016)
Chinese Academy of Social Sciences, Zhang and Zhu (2018)	Calculated province-level local government debt based on the local auditing office information, urban investment bond, PPP etc.	Local government debt amount: 42.2 trn, including: RMB 18.6 trn for explicit local government debt; RMB 23.6 trn for implicit local government debt
Haitong Securities, Jiang (2018)	Estimated local government implicit debt from three perspectives: (i) investment-end (ii) funding perspective and (iii) entities of fund raising	Estimated implicit local government debt: RMB 33 trn from the perspective of fund raising; RMB 30.6 trn from perspective of funding entities.
Chinese Academy of Social Sciences, Xiao (2018)	Instead of using the direct method, this paper estimated local government implicit debt in an indirect way which is from asset-end. It calculates the local government debt by using the total usage of funds minors the government-owned funds.	Estimated implicit local government debt: RMB 38 trn.

Chart 1 China's public debt structure, including the estimation of China's local government debt (End-2017)



Source: BBVA Research

The evolution of China's local government debt

The history of local government financing vehicles can date back to late 1990s. Under China's judicial system, local governments are subordinate agencies of the central government and have long been forbidden to borrow from financial institutions or capital market directly. However, some local governments in late 1990s started to establish some special-purposed vehicles to obtain financing for their local infrastructure projects. These special-purposed vehicles were the first generation of local government financing vehicles (LGFVs). Generally, the size of local government debt was limited in 1990s.

The fast accumulation of local government debt started with China's famous 4-trillion stimulus package, which were unveiled in response to the 2008-2009 Global Financial Crisis (GFC). To finance the infrastructure projects contained in the stimulus package, local governments, with the central government's acquiescence, established numerous LGFVs to borrow funds from financial institutions and capital market.

Soon the authorities started to realize the risks associated with the fast rise in local government debt and attempted to curb the borrowing of local governments. In June 2011, the State Council promulgated new measures on regulating LGFVs, aiming at clearing off the illegal LGFVs and prohibiting local governments' pledges on LGFVs. It is noted that at that moment the central government refused to acknowledge that local governments have any payment obligations for the LGFVs borrowing. Instead, the central government urged local governments to withdraw their explicit or implicit financial supports for LGFVs.

However, the implemented tightening measures failed to stop further accumulation of local government debt. To meet the stringent growth target, local governments had no other way to boost local economies but to borrow more to invest in infrastructure projects. Consequentially, the growing size of local government debt poses increasing risks to the financial stability.

In 2013, the authorities stepped up their tightening efforts to urge the local governments to build up the early warning mechanism for their debt. More importantly, in October 2014, China's State Council promulgated a set of new rules to regulate local government debt (called as No. 43 Document). Chief among them is the central government's "no-bailout" principle towards debt obligations of local governments.

At the same time, the central government had to change their previous stance and acknowledged that part of LGFV debt is indeed local government debt. The central government set out to help local government control the debt size and alleviate associated risks. In 2015, the central government announced a debt-swap program, which aimed to swaps local government debt of 12.3 trillion for equivalent amount of municipal bonds by end-2018. Through this program, local governments not only can roll-over part of their debt but also lower their interest rate costs. Now the debt-swap program is closed to meet its pre-set target.

However, it seems difficult for local governments to wean off their addiction of debt-borrowing. After the promulgation of 2014's No.43 document, local governments started to embrace the projects of public-private partnerships (PPP) in infrastructure investment. Unfortunately, the majority of Chinese PPP projects are in essence upgraded version of LGFVs as the final stakeholders and risk-takers are still local governments. In these PPP projects, the private partners are just being invited to participate so that the projects are qualified to borrow from financial institutions.

Vulnerabilities and risks associated with local government debt

Ballooning local government debt is subject to a number of vulnerabilities.

The majority of local government debt, either in the form of LGFV borrowing or PPP, are invested in long-term infrastructure projects. It led to a maturity mismatch for the liability and asset sides of the LGFV or the project company of PPP. Moreover, the viability of many infrastructure projects is questionable in terms of their capacity to generate enough cash flow to pay back interest and principals.

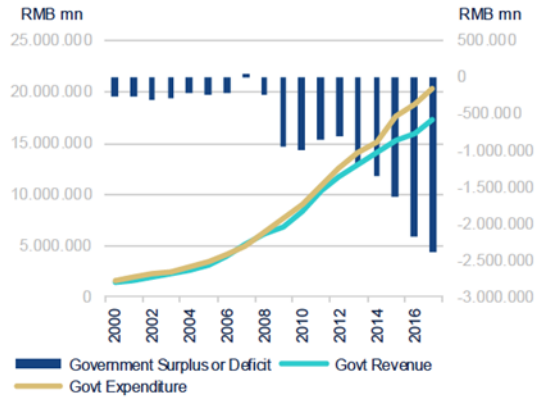
As such, local government debt is subject to grave roll-over risks. The change of credit condition could have a significant impact on the sustainability local government debt. As domestic credit condition has become tighter due to the authorities' efforts to control financial leverage, the pressure on local government debt is mounting.

Meanwhile, the financial fundamentals of local governments have become worse as well. As a result of growth slowdown and the tax reform of replacing business taxes with value-added taxes,

the growth of tax revenues has slowed over the past few years. (Chart 2 and 3) In addition, land sale revenues, which constitute a lion's share of local government fiscal revenues, have become increasingly unstable in recent years due to the authorities' stepped-up efforts to clamp down housing bubbles. Moreover, as the FED interest rate normalization proceeds, high interest rate environment in emerging market may also add extra burden for local government repayment.

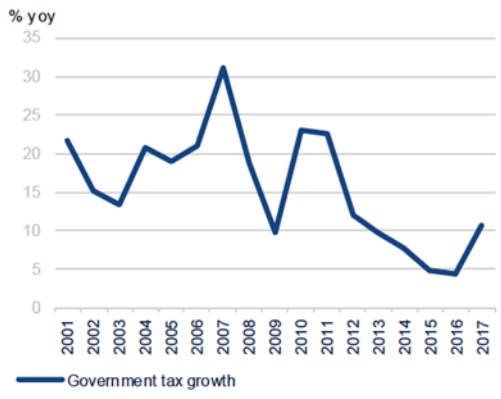
(Chart 4) All in all, the deteriorating financial situation of local governments means that their debt-servicing capacity has weakened.

Chart 2 Government deficit has been expanding over time



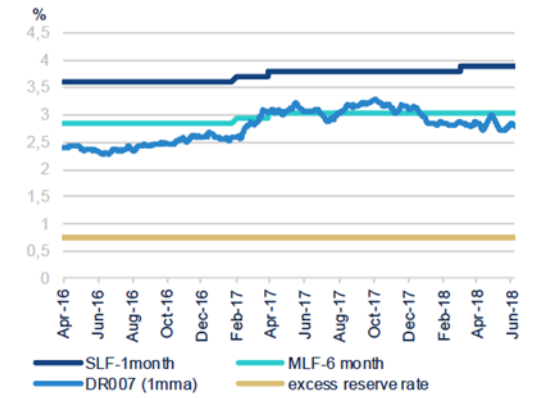
Source: BBVA Research and CEIC

Chart 3 Tax growth has slowed due to the economic slowdown and tax reform



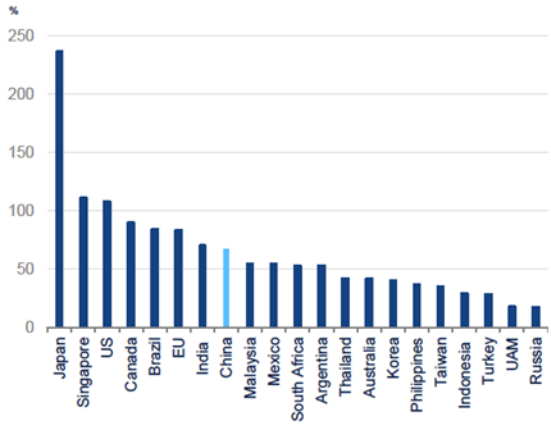
Source: BBVA Research and CEIC

Chart 4 High interest rate environment gives local government debt extra burden



Source: BBVA Research and CEIC

Chart 5 Global comparison of public debt to GDP ratio: end-2017 (Other countries are IMF estimates)



Source: BBVA Research and CEIC

The market prime concern about local government debt is its sustainability. It is true that some local governments are unable to solve their debt problem by themselves. It means that certain forms of financial support or even bail-out from the central government are imperative. Indeed, under the current administrative structure, the central government has obligations for the debt borrowed by local governments.

We believe that the central government still has enough capacity to manage the current level of public debt, including both central and local government debt. According to our estimate, China's local government debt stands at 50%-62.5% of GDP. Together with existing central government debt, the general public debt in China could reach 67.0%-76.8% of GDP. Such a level is higher than those of many developing economies but lower than those of advanced countries. (Chart 5) Fortunately, the public debt in China is mainly financed by domestic funds and accordingly denominated in the Chinese currency. As long as China maintains a high saving rate and fulfil its potential growth (5-6% as we estimated), it should not be a problem for the central government to service public debt of the current level.

However, the largest challenge to China's debt sustainability is whether the authorities can find an effective way to prevent further rise in local government debt. In the past several years, the augmented fiscal deficit (including both the central and local governments' deficits) grew at a pace of around 10% annually. If China's authorities cannot effectively curtail further piling-up of local government debt, the country's total public debt could exceed the international warning line of 90% in the next couple of years. By then the indebtedness is likely to have a significantly negative impact on growth and even financial stability. That being said, the Chinese authorities need to take prompt actions to curtail the fast accumulation of local government debt before it climbs to an unmanageable level.

More needs to be done to defuse the risks

We believe that the main focus of addressing local government debt should be to control its further increase. We summarize some measures which have been implemented or likely to be implemented to address this issue below.

(i) Downplay the importance of GDP growth for the local governments. As explained previously, the root cause for debt accumulation at the local government level is their faced persistent pressure of meeting growth target. Therefore, it is essential to change the incentive mechanism of local governments so that they have less appetite for further borrowing. In last year's concluded 19th Party's Congress, the authorities have pledged to downplay the growth target in future. However, in practice it highly depends on to what extent the central government could tolerate growth slowdown.

(ii) Include the local government future borrowings into the fiscal budget through legal process. Starting from 2015, China implemented a new Budget Law, stipulating that all the new borrowings of local governments must be included in their budget, regulated by local People's Congress. Although this is an important progress it isn't powerful enough to prevent further accumulation of local government debt as we analysed. Above all, this move points to the right direction. Looking ahead, the central government is likely to instruct local governments to disclose more financial information, in particular relating to LGFVs or local government controlled state-owned enterprises (SOEs), in their fiscal budget so that local People's Congress can better monitor local governments' borrowing behaviours.

(iii) Enhance the central government's supervision of local government debt. Indeed, the central government has beefed up their efforts in this respect. For example, since November 2017, Ministry of Finance has overhauled the approving system of PPP and rejected more PPP applications of local government debt. Till April 2018, 1,695 PPP projects with the total amount of RMB 1.8 trillion have been cancelled. More importantly, the supervision of the central government should be more comprehensive and forward-looking. It should be able to promptly identify the new forms of local government borrowing and stop them before they propagate to a large scale.

(iv) Clarify local governments' obligation for LGFVs. Not all the LGFV borrowing should be included as local government debt. The central government needs to draw a clear line between the

debt to be repaid by local governments and that to be repaid by projects themselves. On the top of it, the central government should allow individual default of the self-supported LGFVs so as to strengthen local government market discipline and avoid moral hazard problem.

(v) Expand the debt swap program. The purpose of the debt swap program is to make the maturity of LGFV borrowing better match their projects on the asset side. In addition, it helps to reduce the cost of local government borrowing. The existing debt swap program will end by this year. It is necessary to expand this program to include more newly acknowledged local government debt.

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Renminbi's Global Reserve Share Rising*

By GARY SMITH *

Asset class diversification continues to be a key theme for central bank foreign exchange reserves managers. A survey at a recent gathering of regional central bankers in Asia showed that more than half had amended their strategic asset allocation in the last two years, and more than two-thirds had expanded the permitted number of investible asset classes. Many had either invested in, or had considered, 'non-traditional' asset classes, including equities. Almost all expected the Chinese renminbi to become more important as a reserve currency over the next five years.

It is noteworthy that despite a weaker renminbi/dollar rate this year, the Chinese currency has increased its share in global reserves, according to International Monetary Fund data. The latest report, released at the end of September, shows a jump in renminbi holdings of around $50bn in the second quarter of 2018. Less than a decade after the launch of the renminbi internationalisation initiative, we estimate that more than 60 central banks have renminbi in their reserves. But allocations are still relatively small.

The IMF data suggest the global share of renminbi is around 2%, but we should highlight the technical point that nations don't hold their own currency in foreign reserves. As the world's largest holder of foreign reserves, China effectively lowers the global reading for renminbi in global reserves. Feedback from central bankers in Asia supports the view that over the next 5 years a move to a 5% global share was probable. This would take the renminbi past the yen and sterling into third place in the reserve currency league table.

There are three reasons why we at Barings believe allocations to the renminbi will continue to increase. First, most nations have explained their decision to add renminbi to their reserves as a need to reflect growing trade flows with China. However, these initial allocations to the renminbi have reflected the existence, but not the magnitude of trading relationships with China. A recent IMF paper suggests the international monetary system is now tripolar, and although still dominated by the dollar, the renminbi trading bloc has already surpassed that of the euro in terms of importance. The renminbi bloc is centred on Asia, and Asian nations (even when excluding the Chinese total) are amongst the largest holders of foreign reserves in the world. These countries will be the key drivers if reserve currency weights are to change.

Second, in response to rhetoric about the US-China trade war and a rise in geopolitical tensions, Beijing may seek to deepen both trade and political relationships with Asian neighbours. Japanese Prime Minister Shinzo Abe made his first trip to China in late October, and used the occasion to announce that the People's Bank of China and Bank of Japan had signed a $30bn currency swap agreement. This is five years after the previous agreement had expired during a period of frosty relations. One consequence of current US trade and foreign policy action has been to help thaw relations between these East Asian neighbours. It may also help China extend its economic and political influence throughout Asia, encouraging the deepening of financial ties, including the building of renminbi-denominated foreign reserves.

Finally, the onshore Chinese bond market is the third largest in the world, according to Bloomberg data. As index providers continue to include Chinese markets, there will probably be

* This article appeared in OMFIF Commentary on November 16, 2018.

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rising pressure for global bond investors, including foreign reserves managers, to increase their allocations to the renminbi-denominated bond markets. Given these factors, the renminbi is likely to continue climbing the reserve currency league table and eventually contend with the dollar for the top spot.

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Monetary & Fiscal Policy

The Fed's Misleading Money Supply Measures *

By STEVE H. HANKE

The most robust national income determination model is the monetarist model. The course of the economy when measured in nominal terms is determined by the course taken by the money supply. Indeed, the positive relationship between the growth rate of the money supply and both nominal GDP and nominal aggregate demand growth is unambiguous and overwhelming.

So, just what is the measure of money that is most suited for taking the temperature of the economy and forecasting its course? Is a narrow metric, like the monetary base (M0), the best? Or, should we focus on broad money metrics, like M3 and M4? For national income determination, the more inclusive the metric, the better. Indeed, for the most complete and accurate picture, one should include all the important components of money supply, not just a few.

To obtain money supply data is simple enough. Just go to the Fed's monetary data base and pick the broadest money supply measure, and you will be ready to go. Right? No, it's not that simple. First, since the Fed stopped reporting the M3 money supply measure in March of 2006, one is left with M2 as the broadest measure reported by the Fed. And, M2 is not very broad.

The Fed's money supply measures are limited to rather narrow metrics, and that's a problem. To obtain superior, broader measures, one must go to The Center for Financial Stability (CFS) in New York, where I serve as a Special Counselor. The CFS was founded in 2009 by Lawrence "Larry" Goodman to, in part, improve on the measurement and reporting of money supply statistics. The CFS was fortunate in that William A. "Bill" Barnett, the world's leading expert on Divisia monetary aggregates, agreed to develop and lead the CFS's Advances in Monetary and Financial Measurement program. As a result, the CFS, under Bill's watchful eye, produces a detailed monthly report "CFS Divisia Monetary Data for the United States." That report contains a broad money measure M4. It includes five more components than M2: institutional money-market funds, long-term deposits, repurchase agreements, commercial paper, and T-bills. These components are important because they all serve, in varying degrees, as money. To exclude them from a measure of money would be to exclude a great deal.

So, the CFS money supply metrics contain important components that are excluded in the Fed's M2. In this sense, the CFS data are superior. But, narrowness is only the start of the Fed's data problems.

What really separates the CFS measures from the Fed's is that the CFS's measures of money are not just a simple sum of the various components that make up the different measures of money (read the various M's). It has long been recognized that simple-sum aggregation can result in big measurement problems. Indeed, Irving Fisher in his classic 1922 book, The Making of Index Numbers, concluded that simple-sum aggregation can lead to the very worst type of index numbers. When it comes to measuring monetary aggregates, Milton Friedman acknowledged that there were cases in which simple-sum aggregation might result in poor measures of the money supply.

* This article appeared on Forbes.com on October 29, 2018.

Why was Friedman's conjecture correct? Money takes the form of various types of financial assets that are used for transaction purposes and as a store of value. Money created by the Fed (notes, coins, and banks' deposits at the Fed) represent the monetary base (M0). This state money, or high-powered money, is imbued with the most moneyness of the various types of financial assets that are called money. Components of the monetary base are ready to use in transactions in which goods and services are exchanged for "money."

But, in addition to the assets that make up monetary base, there are many others that possess varying degrees of moneyness—a characteristic which can be measured by the ease of, and the opportunity cost associated with, exchanging them for base money. These other assets are, in varying degrees, substitutes for money, and are included in broader measures of money. But, these other assets should not receive the same weights when they are summed to obtain a broad money supply measure. Instead, those assets should receive less weight per unit than the other components of high-powered monetary base, with the ones that are easiest to substitute for base money receiving higher weights than those that possess a lower degree of moneyness.

How can we dump simple-sum aggregates and determine the weights that should be attached to the components of broad money supply metrics? Enter Bill Barnett. Using a theory of aggregation developed in 1925 by the French engineer Francois Divisia (1889-1964), Bill pioneered the application of the Divisia index to money supply measurement. So, the broad measures of money produced in the CFS's monthly report are not just simple-sum M3 and M4 numbers. They are superior Divisia M3 and Divisia M4 measures, in which their components are weighted according to the moneyness of each component.

We all know that good science is not possible without good data. After all, bad measurements and faulty data can result in disastrous missile launches. What pilot would want to be "flying blind," with an altimeter that was malfunctioning? What about the money supply? Do the Fed's faulty metrics really make any difference for policy makers and investors? In a word, the answer is "yes." Let's take a look at one dramatic example of how the Fed's data caused economic "crash landings."

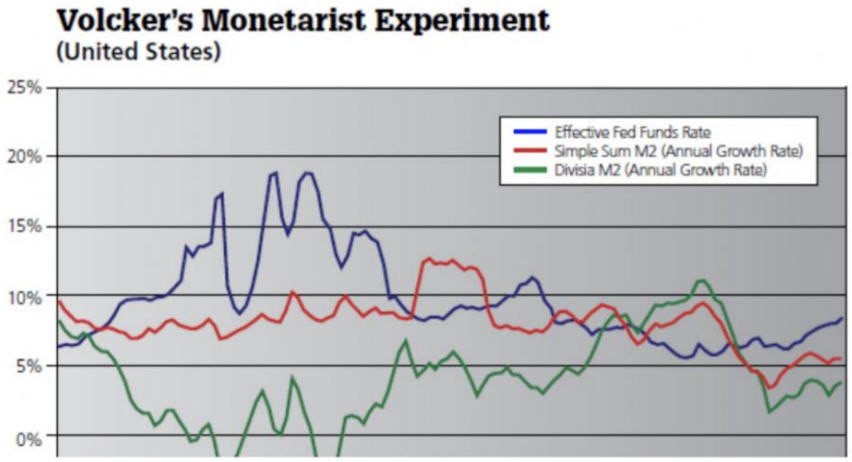
When Paul Volcker took the reins at the Fed, the state of the U.S. economy's health was "bad." Indeed, 1979 ended with a double-digit inflation rate of 13.3%. Remember stagflation?

Chairman Volcker realized that money matters, and it didn't take him long to make his move. On Saturday, October 6, 1979, he stunned the world with an unanticipated announcement. He proclaimed that he was going to put measures of the money supply on the Fed's dashboard. For him, it was obvious that, to restore the U.S. economy to good health, inflation would have to be wrung out. And, to kill inflation, the money supply would have to be controlled.

Volcker achieved his goal. By 1982, the annual inflation rate dropped to 3.8%—a great accomplishment. But, the problem was that the Volcker inflation squeeze brought with it a relatively short recession (less than a year) that started in January 1980, and another, more severe slump that began shortly thereafter and ended in November 1982.

Paul Volcker's problem was that the monetary altimeter installed on his dashboard was defective. When my friend Volcker looked at his M2 gauge, he was viewing M2 data that were calculated by a simple summation of their components—the normal Fed procedure. As shown in the chart below, the Fed thought that double-digit fed funds rates that it was engineering allowed it to tap on the money-supply brakes with just the right amount of pressure. In fact, if the money supply had been measured correctly by a Divisia metric, Volcker would have realized that the Fed was not just tapping on the breaks, but unnecessarily slamming on them from 1978 until early

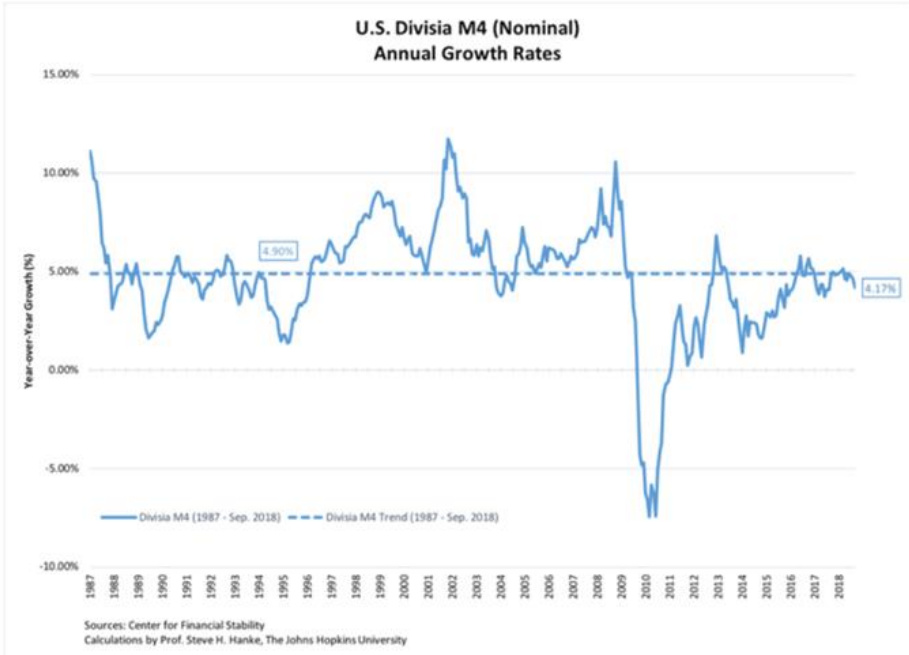
1982. The Fed was imposing a monetary policy that was much tighter than it thought—an excessive tightness that resulted in two recessions.



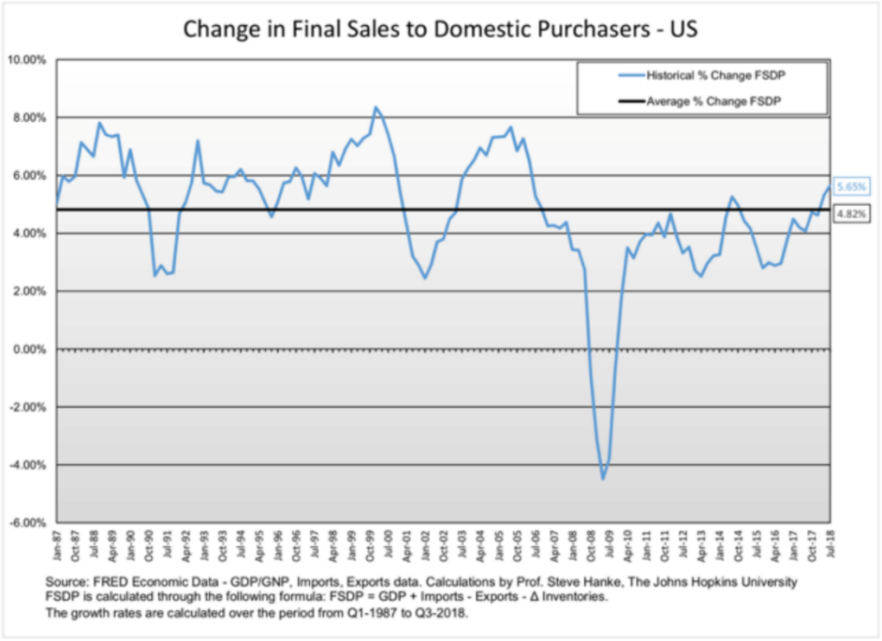
Why the huge divergences between the standard simple-sum measures of M2 that Volcker was observing and the true Divisia M2 measure? As the Fed pushed the fed funds rate up, the opportunity cost of holding cash increased. In consequence, retail money market funds and time deposits, for example, became relatively more attractive and received a lower weight when measured by a Divisia metric. Faced with a higher interest rate, people had a much stronger incentive to avoid "large" cash and checking account balances, opting to keep their funds in relatively high-yielding assets. As the fed funds rate went up, the divergence between the simple-sum and Divisia M2 measures increased.

Alas, the data problems associated with Volcker's monetary experiment have been ignored by the Fed. Indeed, as Bill Barnett concluded in his book Getting It Wrong: How Faulty Monetary Statistics Undermine the Fed, the Financial System, and the Economy: "When more and better data were needed by the private sector, as the complexity of financial products grew, the quantity and quality of Fed data declined." Fortunately, we have a reliable alternative for the provision of high-quality money supply data: The Center for Financial Stability.

Where are we today? As shown in the chart below, the Divisia M4 growth rate is 4.2% yr/yr. That rate is a bit weak. Indeed, it is lower than it has been during the past year, and it is also below its trend rate for the past 30 years of 4.9%. This suggests that the Fed's balance sheet unwind has resulted in a somewhat "tight" monetary stance.



If we turn to aggregate demand measured in nominal terms, it is holding up rather well (see the chart below). At a 5.65% yr/yr rate, nominal aggregate demand, as measured by final sales to domestic purchases, is above its 30-year trend rate of 4.82%. So for now, things look pretty good. But, a monetary storm cloud would develop if the Fed were to misstep and slip into a quantitative tightening mode. Without Divisa M4 on the Fed's dashboard, the Fed might not realize the storm forming on the horizon.



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ER Policy for RMB

By HERBERT POENISCH*

Since China's entry into the SDR, the performance of RMB as an international currency has been rather modest, compared with its weight of nearly 11% in the SDR basket[i]. Even political declarations, such as the one by BRICS countries to use their currencies in their bilateral trade, have not had any serious impact.

Although the exchange rate regime has been more market determined since mid-2015, it is a far cry from one required for a truly international RMB. The reasons are twofold. First, RMB's use for international payments and settlement for goods and services is still well below China's share in international trade in goods and services (section1). Secondly, the RMB's use for capital account transactions, such as international lending and borrowing has only been a shadow of dollar denominated transactions (section2).

If China were to pursue its internationalization of RMB in line with its economic and political clout, the exchange rate policy needs to be reconsidered radically. At present the exchange rate policy is that of passive partner, limiting its policy rate fluctuation to a basket of currencies, in fact to the nominal USD rate on a daily basis and worrying about pressures in one direction or the other. Among other countries with such a 'Stabilised arrangement' are Lebanon, Croatia, Singapore, Czech Republic, Kenya[ii].

Other member currencies of the SDR basket do not display such behavior. They are classified as free floating by the IMF, with Japan voicing occasional concerns about the movement of its exchange rate, also expressed in USD rather than a basket.

This article will provide an updated picture of the cross border use of RMB, in the current account as well as financial account. It will focus on obstacles which have to be removed for a greater use of RMB in the trade of goods and services. It will also be argued that greater use should be made of RMB in international lending and borrowing activities, the hallmark of an international currency.

Great efforts continue to be made by Chinese authorities, banks and enterprises to increase the use of RMB within the OBOR strategy. As will be argued in section 3 most of these measures launched are implemented on a bilateral base, which is probably not reflected in the official RMB internationalization indices, thus potentially understating the actual use of RMB in international transactions.

Once RMB use in both these components has been strengthened, the exchange rate policy can move away from passive adjustment, to RMB playing a leading role, due to international demand and supply of the currency, creating deeper and liquid markets for RMB. This will be possible while keeping CNY and CNH separate as part of limited financial account opening. More exchange rate flexibility will allow more monetary policy freedom to follow domestic priorities rather than those of the US (section 4).

Bearing in mind the economic clout of China, with an increasing number of countries having China as a main trading partner, these countries might consider pegging to the RMB, building an emerging RMB block.

The best current indicators of RMB usage for trade are the CEIC data based on monthly PBOC data. The composite monthly transaction ones are published by SWIFT (RMB tracker) as well as

* Herbert Poenisch, International Committee of IMI

by Standard Chartered Bank RMB Globalisation Index (RGI). The International Monetary Institute (IMI) Index RII is available only once a year. The quarterly BIS data on cross border banking transactions discloses a certain currency breakdown in its locational (LBS) on a resident as well as nationality basis. In the BIS statistics on debt securities, the issue currency of Chinese residents discloses RMB issues. The issues by Chinese national borrowers in international securities markets do not explicitly show RMB borrowings, but the persistence of USD borrowings tells the story.

1. Use of RMB in current account transactions

The international use of a currency is the same as the 3 basic functions of money. It has to be suitable for denomination (ie invoicing), secondly for transactions (ie cross border payments) and finally as store of value (ie as investment vehicle).

The current opaque Chinese trade practices with foreign countries, first and foremost the Belt and Road (OBOR) countries does not allow a clear assessment of the fulfillment of the first function, ie invoicing in RMB.

To boost RMB internationalization the PBOC encouraged both Chinese enterprises and banks to stimulate RMB use[iii]. The China Development Bank (CDB) and Export-Import Bank of China (EXIM), but also the other state owned banks have extended RMB loans. However, it seems that the use of RMB has not followed political instructions but has 'been driven by Chinese firms' willingness to adjust their use of the RMB to settle trade in line with their expectations for the value of the RMB'[iv].

Anecdotal evidence from the RBA on the invoicing of Australia's China trade has shown only 2.5% of imports from China and 0.5% of exports to China are invoiced in RMB.

China as leading trading power has plenty of leverage to denominate and settle its exports and imports of goods and services in RMB. In 2017 China's share of world merchandise exports was 12.77% and its share of merchandise imports 10.22%. Its share of exports of commercial services was 4.29%, and of imports of commercial services was 9.15%[v]. Yet payments in RMB as recorded by the PBOC accounted for only 13% of current account transactions compared with twice that in 2015[vi].

By 2017 China became the major trading partner of some 40 countries and regions globally. They are mostly in Asia and form part of the OBOR strategy. As China never published an authentic list, the 65 OBOR countries are defined as per Fung Business Intelligence[vii]. The concept of '65 and beyond' could extend to African and Latin American countries to become members of the OBOR strategy (section 3).

Some of these countries have also concluded swap agreements with the PBOC, such as the Asian ones, but also a few Middle Eastern, European, African and Latin American countries. [viii]. A notable recent case study is Nigeria which has activated such a swap line, making RMB available to buy imports or direct investment from China [ix]. The swap agreement was signed on 27 April 2018 and already activated on 6 June 2018 . Use of RMB will alleviate Nigeria's acute shortage of foreign exchange.

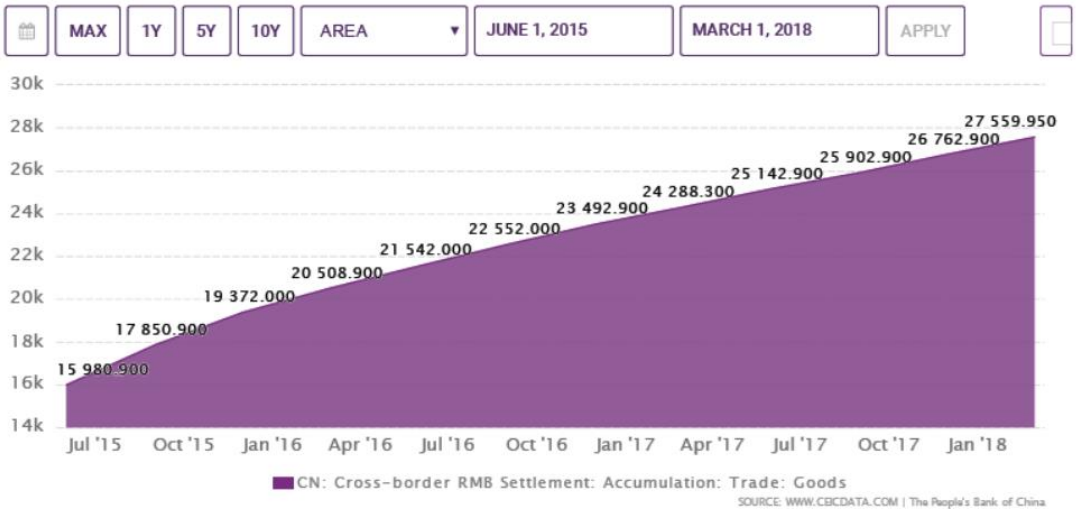
Table 1: Share of China as first trading partner of OBOR countries and regions 2017

	Exports to China	Imports from China
All 65 countries	14%	26%
East Asian 12 countries	33%	75%
South Asian 8 countries	0	63%
Central Asian 5 countries	20%	40%

Source: own calculations from IMF directions of trade statistics

Although RMB cross border settlements increased gradually every year since 2009, they do not match the overall increase in China's trade in goods.

View China's Cross-border RMB Settlement: Accumulation: Trade: Goods from Dec 2009 to Mar 2018 in the chart:



Source: CEIC and PBOC

Compared with the importance of China in the world trade and particular of trade with OBOR Asian countries, it is therefore surprising that the SWIFT recorded share of RMB international payments of 1.2% falls rather short of the full potential of RMB internationalization in current account activities. The Standard Chartered RMB globalization index (RGI) similar to the IMI RMB internationalization index (RII) has been declining slightly since 2015.

2. Use of RMB in financial accounts transactions

The IMF BOP Handbook 6 distinguishes the following four categories of financial transactions: foreign direct investment, portfolio investment, derivatives and other investments, including cross border deposits and lending.

The following kinds of financial transactions (annual values) were recorded by SAFE[x], some of which were denominated and settled in RMB but not explicitly disclosed.

Regarding direct investment, outward investment has increased over the past few years from zero in 2003 to USD 216 bn in 2016 before falling to half in 2017. The major share was taken up by acquiring participation in foreign companies mainly in advanced countries and offshore zones reflecting the 'going out' strategy of Chinese enterprises. Inward direct investment has been on a steady decline, again with the major share taken by shares. If the direct investment outflows are linked to the OBOR strategy, these participations could be denominated and paid in RMB.

Net outward portfolio investment has increased until 2016 but was reversed in 2017. The marked increase in foreign purchases of Chinese domestic debt securities to USD 83bn could be the increased purchases by QFII and monetary authorities. However, the share of domestic debt securities owned by foreigners amounted to only 1.4% in 2017.

Foreigners issuing domestic debt securities, purchased by domestic Chinese entities (so called Panda Bonds) would be recorded in the BOP only when funds are transferred abroad. Multilateral institutions, such as the BRICS New Development Bank (NDB) has issued USD 440million RMB-denominated green bonds[xi]. Other Chinese banks have issued multi-currency bonds, including the RMB.

The cross border purchase of derivatives was zero until 2014 and has since shown modest purchases by Chinese entities.

Regarding other flows, including loans, the outflows increased massively to USD 350bn in 2016 before declining to only USD 77bn in 2017. Other inflows increased markedly from USD 33nb to USD 151bn in 2017, in both categories, loans and deposits. Some of these were made up by increased RMB deposits mainly from Hong Kong with Chinese banks.

The BIS Local Banking Statistics (LBS)[xii] on cross border claims and liabilities of all banks resident in China (latest quarterly data 2Q2018) and Chinese owned banks worldwide capture the share of Chinese cross-border bank lending. Chinese banks, including the policy banks, notably the CDB and EXIM Bank are the main lenders to EME countries, in the context of the OBOR initiative. Their lending is reported as USD 919 billion, some 64% of the total EME-to-EME activity and about half of overall Chinese bank lending abroad. Most of this lending is not from China directly but from affiliates in other EMEs, first and foremost in Hong Kong[xiii].

Only the China table A5, ie cross border lending by resident banks in China show the proportion of RMB in cross border activities as local currency. It can be assumed that Chinese owned banks are the drivers of these developments as foreign banks in China focus on the domestic market.

Table 2: LBS China by residence

Banks located in China

Positions reported by banking offices located in the specified country regardless of the nationality of the controlling parent, in millions of US dollars — Table A5

	Claims			Liabilities		
	Adjusted changes		Outstanding	Adjusted changes		Outstanding
	Q1 18	Q2 18	Q2 18	Q1 18	Q2 18	Q2 18
Total	**81,803**	**2,835**	**1,076,397**	**67,982**	**–23,703**	**1,309,953**
Cross-border positions	81,803	2,835	1,076,397	67,982	–23,703	1,309,953
Of which: local currency	6,922	4,956	127,371	–3,532	15,760	407,654
Local positions	...	...	...	...	...	...
Of which: local currency	...	...	...	...	...	...
Unallocated	...	...	...	...	...	...
Of which: local currency	...	...	...	...	...	...
Cross-border positions	**81,803**	**2,835**	**1,076,397**	**67,982**	**–23,703**	**1,309,953**
By sector of counterparty						
Banks	62,426	–5,420	510,005	24,816	–9,737	552,679
Of which: intragroup	\	\	\	\	\	\
Non-banks	19,377	8,256	566,392	43,165	–13,965	757,274
Of which: non-bank financial	\	\	\	\	\	\
Of which: non-financial	\	\	\	\	\	\
Unallocated	\	0	0	\	0	0
By currency						
Local currency	6,922	4,956	127,371	–3,532	15,760	407,654
Foreign currencies	74,882	–2,120	949,026	71,514	–39,463	902,299
Of which: US dollar	70,709	–6,607	738,622	44,914	–17,833	497,970
Of which: euro	-265	152	53,355	1,735	-2,992	55,267
Of which: yen	90	–576	6,461	644	27	13,873
Of which: pound sterling	–197	153	7,224	1,168	–606	2,251
Of which: Swiss franc	–112	243	756	574	–371	434
Of which: other currencies	4,657	4,514	142,607	22,479	–17,688	332,504
By instrument						
Of which: loans and deposits	66,356	–8,120	801,965	32,893	–13,353	705,506
Of which: debt securities	7,399	9,433	133,303	13,149	7,407	201,917

Source: BIS LBS update December 2018

Of total assets only 12% were denominated in RMB. The higher share of RMB liabilities of 31% can be explained by RMB deposits with banks in China. All changes are reflected as capital in and outflows compatible with the balance of payments.

The statistics on cross border lending by Chinese banks worldwide in table A7 below (within the LBS reporting area comprising 47 countries and regions) do not show a breakdown into RMB. The share of assets denominated in other SDR currencies (except GBP) amount close to 70% and their share in total liabilities amounts to just above 50%. This is explained by the fact that branches of Chinese banks accept deposits in local currencies wherever they are hosted, and in RMB in Hong Kong.

Table 3: LBS Chinese banks by nationality

Banks' nationality: China

Positions reported by banking offices located in LBS-reporting countries and controlled by parents of the specified nationality, in millions of US dollars

Table A7

	Claims			Liabilities		
	Adjusted changes		Outstanding	Adjusted changes		Outstanding
	Q1 18	Q2 18	Q2 18	Q1 18	Q2 18	Q2 18
Cross-border positions	**124,113**	**7,837**	**2,100,623**	**134,857**	–16,848	**1,986,548**
By sector of counterparty						
Banks	81,753	–1,891	1,098,107	88,797	–17,798	1,035,164
Of which: intragroup	52,329	25,645	641,547	38,139	–527	535,898
Non-banks	42,447	9,969	991,713	43,316	–1,095	925,906
Of which: non-bank financial	3,831	10,055	166,074	–28	4,858	122,750
Of which: non-financial	35,484	–1,349	780,433	43,748	–7,333	800,141
Unallocated	–86	–242	10,803	2,744	2,044	25,479
By currency						
Of which: US dollar	90,763	–3,980	1,280,388	92,130	–7,299	896,896
Of which: euro	–7,454	–2,028	120,081	3,343	–6,502	103,614
Of which: yen	8,271	1,697	29,351	2,325	–80	20,546
By instrument						
Of which: debt securities	.	.	.	16,987	12,860	259,302

Source: BIS LBS update December 2018

The share of RMB in global forex turnover doubled every three years when the BIS survey was conducted, ie 1% in 2010, 2% in 2013 and 4% in 2016[xiv]. It reached 4 out of 200 (or 2%) because all transactions are recorded in currency pairs. The next survey will be conducted in April 2019 and results will be published by end 2019.

Turning to the international borrowing through issue of debt securities (mid 2018) the predominance of USD features prominently according to the BIS securities statistics[xv].

Table 4: Debt Securities China by resident and national issuers

China

Debt securities issues and amounts outstanding, in billions of US dollars

Table C3

	Amount outstanding	Net flows	Amount outstanding	Gross issuance	Net flows	Amount outstanding	
						Total	Of which: Up to and including one year
	Q1 18	Q2 18	Q2 18	Q3 18	Q3 18	Q3 18	Q3 18
Resident issuers							
Total debt securities	**12,490.8**	...	**12,333.1**	...	...	...	...
Financial corporations	4,767.2	...	4,683.7	...	...	...	...
Non-financial corporations	3,076.8	...	2,981.4	...	...	...	...
General government	4,646.8	...	4,668.1	...	...	...	...
Domestic debt securities	**12,108.0**	**413.4**	**11,921.8**	...	...	...	...
Financial corporations	4,566.7	139.7	4,480.2	...	...	...	...
Short-term	...	...	...	...	...	...	...
Long-term	...	...	...	...	...	...	...
Non-financial corporations	3,034.9	54.1	2,938.7	...	...	...	...
Short-term	...	...	...	...	...	...	...
Long-term	...	...	...	...	...	...	...
General government	4,506.5	219.7	4,503.0	...	...	...	...
Short-term	...	...	...	...	...	...	...
Long-term	...	...	...	...	...	...	...
International debt securities	**203.7**	**1.2**	**202.5**	**7.2**	**1.2**	**202.6**	**31.8**
National issuers							
International debt securities	**943.7**	**25.7**	**961.8**	**133.4**	**45.6**	**1,004.7**	**266.1**

Source: BIS Securities statistics update December 2018

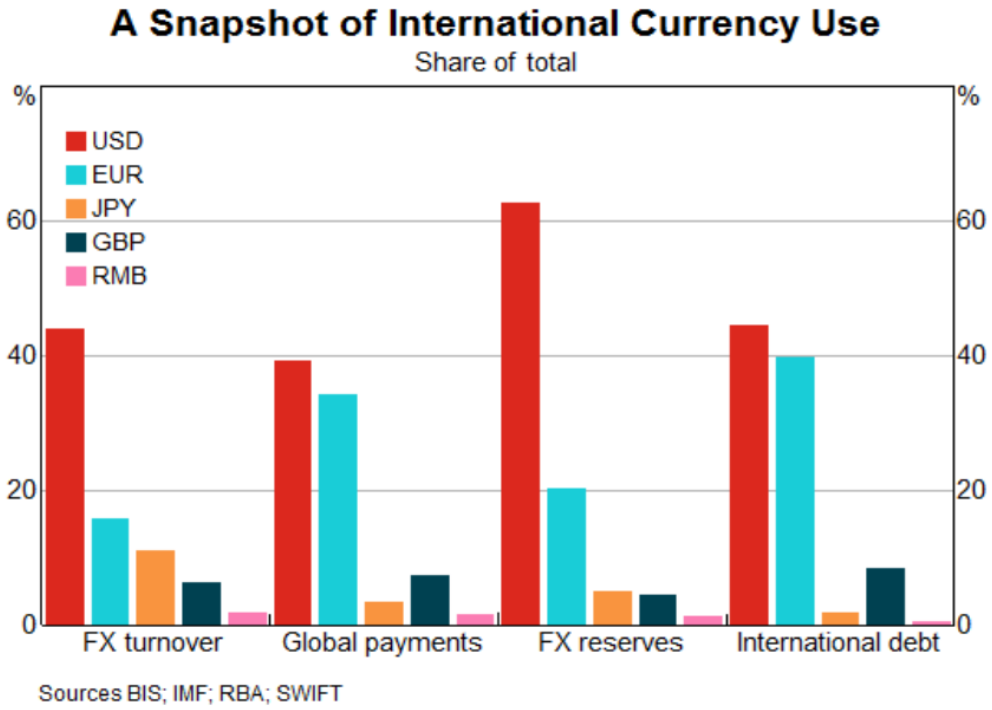
The resident domestic issues are all in RMB, but there is no breakdown into Panda Bonds, ie onshore issues by foreign entities. Even if an estimate of USD 40bn for Panda Bonds at the end of 2017 is accepted, it would amount only to less than 1% of the total. The foreign ownership of domestic RMB securities under QFII is estimated at 1.4%

The International issues by domestic residents at USD 202.5 bn are rather small compared with the international issues by Chinese nationals of USD 961.8bn. Out of these only 12% are denominated in RMB.

As no RMB breakdown is available for international issues by Chinese nationals, the dominant role of the USD component has been steady at just over 80%. These issuers, both banks and nonbanks have benefitted from the low USD interest rates to borrow in international markets.

Finally, the reserve position of other countries holding forex reserves in RMB has increased markedly to 1.84% in mid-2018[xvi]. There is lot of scope to increase this share, particularly for the OBOR countries and China's main trading partners.

Altogether the following picture of all components of RMB use emerges.



3. Steps towards a greater use of RMB

The combined efforts by Chinese authorities to mandate greater use of RMB cannot be divorced from the market behavior of Chinese banks and companies, their expectation of the RMB exchange rate. This vicious circle can only be broken by a greater volatility of the currency in both directions, calling for the greater use of hedging instruments.

The following sequencing has to be observed to achieve this goal:

First step: Invoicing in RMB by Chinese enterprises and banks; ensure ample supply of RMB outside China, either through Chinese banks or PBOC swap agreements.

Second step: Settlement of trade in goods and services in RMB through Chinese banks, settled at the CIPS, needs to speed up the clearing procedure.

Third step: Chinese nationals issue international debt securities in RMB, either CNY or CNH; Foreigners increase issue of Panda Bonds.

Forth step: Spend available RMB on import of Chinese goods and services and projects.

Fifth step: Save remaining amounts in RMB denominated securities, either CNY or CNH or RMB denominated forex reserves.

This strategy has been implemented first and foremost for OBOR countries. These infrastructure projects need cross-border financial services, with financial integration as one of the key components aiding the network build-up[xvii].

The possible sources for financing OBOR projects are public sector financing (such as development financing) and private financing (such as commercial loans and capital market financing as well as public and private equity).

Financing is expected to come from Chinese institutions, in particular the policy banks such as CDB and EXIM Bank which can tap the RMB domestic bond market. Further financing is expected from the Silk Road Fund and the Overseas Fund Business in RMB for promotion of RMB usage, multilateral agencies such as the Asia Infrastructure Investment Bank (AIIB), the

Asian Development Bank (ADB) and the World Bank. These could be largely denominated and settled in RMB.

To procure other financial support, China signed business and trade cooperation agreements with over 30 countries during the Belt and Road Forum in 2017. In the meantime a number of China-led regional development investment funds (debt and equity) have been set up. It should be noted that only the China-Russia Fund is denominated in RMB whereas the other regional funds are denominated in USD.

China's relationship with EME was bolstered following the creation of the China-CEEC Interbank Association established in November 2017 [xviii] and the China-Africa Inter Bank Association in September 2018[xix], when the CDB signed agreements with 14 central and Eastern European banks and 16 African banks across the continent.

Long-term bond financing will be the major instrument of OBOR projects. Silk Road Bonds , issued by the major Chinese banks (either in RMB or multicurrency bonds) are already becoming an international recognized asset class[xx].

China has thus set up a broad framework for the increased use of RMB, ranging from coaxing enterprises and banks to use RMB, activating RMB swap agreements, to enhancing the China International Payment System (phases 1 and 2) for settling RMB transactions, to refinements of the QFII in addition to the special financing vehicles for the OBOR strategy.

It remains to be seen if these will be utilized in order to bring the use of RMB closer to the weight in the SDR and thus boosting the internationalization of RMB. At present the perception in the market is the artificial engineering of RMB financial use and the OBOR segmentation, with special uses and earmarked funding according to countries and projects, which require administrative procedures to check the appropriate use. These financing vehicles are opaque, more like a RMB bazaar than a market, which puts global investors off. In the long run it would be better to create multilateral solutions, transparent and open to anyone willing to participate.

The only remaining administrative wedge between international and domestic finance should be the capital controls which needs verifying the legitimate case of any cross-border transaction .

4. Steps to a new exchange rate regime

Once the goal of internationalization of RMB moves forward, international markets will pay more attention to RMB financing possibilities, thus improve the branding of RMB. Investors will lap up the availability and accessibility of RMB denominated assets. Another step forward will be the inclusion of RMB bonds in global indices, such as Bloomberg's benchmark Global Aggregate and EM Local Currency Government Indices and others.

Once the separate RMB financial market segments are merged they can reach greater depth and liquidity, the trading band of RMB can be widened. Financial market participants, domestic as well as international, borrowers as well as lenders will have to accept greater exchange rate volatility and risks. They in turn will create the onshore hedging instruments which are only available offshore now, such as the NDFs in RMB.

Following China's gradual approach these changes will not be implemented over night but over years, allowing market participants to manage their own risks.

Once RMB market participants do not rely on a certain exchange rate path, the PBOC will enjoy the greater freedom to detach itself from the dominance of US monetary policy decisions. As the PBOC has not followed the December 2018 hike of the US Federal Funds rate, it can continue the stimulus necessary for the domestic economy. This is exactly the behavior of a global currency, such as the other SDR currencies. They pursue their domestic goals, economic growth, wages and prices but do not act completely detached from the prime mover. Their signals will be transmitted to other countries through various channels, such as a RMB currency block.

Conclusion

There seems to be a general agreement that the present exchange rate regime is not suitable for an economy which claims international status among the big powers. The way has been mapped out for an increased use of RMB, first and foremost in OBOR countries in order to speed up the internationalization of RMB. Once this has been brought more in line with its weight in the SDR basket, monetary authorities will be able to gradually increase the flexibility of the exchange rate. Thus China gains freedom to decide what is good for its economy and those countries closely linked through trade and projects, detaching itself from the US dominance.

China has already become a systemically important economy. Staying away from a 'free floating' exchange rate regime is getting more difficult and more costly for the management of monetary policy. Internationalization of the Chinese economy is already complete whereas internationalization of RMB is under construction. It is better to complete this process sooner which will channel surplus Chinese savings to areas where funds are needed. The role of China in global financial transmission will be enhanced by allowing RMB a more global role with more flexibility of banking and finance. The RMB should be allowed to support the OBOR initiative in a much bigger capacity with more flexibility of all fronts. The final target should be a fully floating exchange rate regime and the RMB playing a full role among all SDR currencies.

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International Capital Markets Association and DaGong Global Credit Rating have set up a Silk Road Working Group in Hong Kong. See Chan, Sarah, ibid, p 63.

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ECB Must Address QE Misallocation Risk

By FRANK WESTERMANN*

By the end of this year, the European Central Bank is expected to end its monthly net asset purchases. This raises several questions about the ECB's reinvestment strategy and the implications for individual countries. So far, it is only clear that the ECB intends to replace maturing bonds and aims for the overall size of the balance sheet to stay constant.

In a series of OMFIF Commentaries from October, David Marsh and Ben Robinson wrote that an adjustment in the capital key – under which bonds are bought in proportion to the share of the ECB capital provided by each country – may adversely affect some member countries in this context. They explored alternative reinvestment strategies, including a five-year adjustment period, freezing the 2018 bond-purchase quota and country specific maturities structures (longer on Italy, shorter on Germany) to offset potential disadvantages.

The idea that a change in quota could disadvantage a country is surprising, as bond-purchases were designed to minimize, if not eliminate, fiscal implications. The ECB is not buying bonds directly from states. Furthermore, it respects a two-year (later reduced to one-year) minimum trading period, to avoid suspicion of monetary financing. This issue was fiercely debated in the German constitutional court in 2015. It eventually accepted (though did not endorse or totally agree with) the European courts' ruling on classifying these purchases as part of monetary policy.

Other commentators went further still. They not only claimed quantitative easing was neutral from a fiscal perspective, but argued that countries whose bonds were purchased were losing out. This is because the interest payments are shared with the ECB's capital key. It is surprising that those worried about the capital key reduction did not express the same concerns about fiscal implications, in response to this line of reasoning, when QE began.

A reduction of bond purchases would not only be a fiscal issue, but also a liquidity issue. It may cut the liquidity provided to banks and thus worsen the situation in countries (like Italy) where banks are in critical conditions. If this is the key concern, however, it is puzzling why it is being expressed now. Most of the liquidity created by the ECB's QE Programme has not stayed within the borders of the country that purchased the bonds right from the beginning. This is visible in the ever-increasing Target-2 balances, which are approaching claims worth €1tn for Germany and €500bn of liabilities for Italy. The Deutsche Bundesbank was obligated to credit the money for bond purchases on recipients' reserve accounts whenever the seller of the bonds wanted to receive its payment in Germany.

This has implications for the wealth of individual countries. Whereas prior to QE Italy owed money to private investors in Rome, Frankfurt or London that had a due date and interest rate, it now owes the same amount to the rest of the Eurosystem, with an open-ended maturity for as long as reinvestments take place.

This illustrates that QE was not as successful as believed. The real issue for the ECB governing council to address when discussing fiscal implications of reinvestment is the risk arising from the misallocation of liquidity and corresponding claims and liabilities of national central banks. If Italy exited the euro area and kept the purchased assets while not honouring the liabilities, this could lead to catastrophic losses for remaining member states.

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A settlement of these liabilities – broadly similar to the US Federal Reserve System's interdistrict settlement accounts accounts – should be part of the ECB's new reinvestment and rebalancing strategy.

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Decision Time for US Deficit

By SEEMA SHAH [*]

As issuer of the world's dominant reserve currency, the US can run up its debt without breaking a sweat – to a point. An ill-timed tax reform package and fiscal stimulus will trigger the type of negative bond market response that typically accompanies a fiscal expansion.

According to the Congressional Budget Office, the deficit in 2019 will be almost 60% higher than forecasts made before the presidential election. Federal debt is set to rise from 78% of GDP at the end of 2018 to roughly 100% by 2030. Some forecasts see it reaching that threshold years earlier.

Usually, a key concern for most countries adding fiscal stimulus of such magnitude is that markets very swiftly begin to doubt the government's ability to attract the required increased funding. This puts upward pressure on interest rates. But in the case of the US, that doubt has not arisen.

The main reason is the dollar's unchallenged role as the world's primary reserve currency: about 60% of international reserves are held in dollar-denominated assets. In addition, thanks to rising life expectancy, strong demand for retirement savings means safe haven assets, such as Treasury securities, will remain strongly bid.

The US can display economic imbalances more characteristic of an emerging market economy, or be at the heart of a global crisis, and continue to attract demand for dollar-denominated assets. However, this dynamic cannot protect the country's economy forever.

Typically, governments introduce expansionary fiscal policy during times of slowdown to kickstart the economy. Providing stimulus when growth is already strong and unemployment is at historic lows tends to be ill-timed, because it increases the chances of overheating. In the wake of stronger than expected employment data and non-manufacturing sector activity, 10-year Treasury yields have surged. This suggests those concerns could be materialising.

In the short term, a further sharp run-up in bond yields is possible, especially if economic data shows rising wage growth. However, the associated risk with a sharp sell-off in bonds is that equity markets may struggle to digest the rise in yields. Therefore, investors should be cautious. In fairness, at some point next year, I suspect concerns about overheating will fade as the strong dollar, tightening monetary policy and the trade war start to weigh on economic growth. Unfortunately, against a weaker economic backdrop, even a renewed drop in bond yields may not be enough to soothe the growing undercurrents of unease among equity market investors.

At that point, President Donald Trump could just unleash another round of fiscal spending to re-stimulate the economy. But something that may stop him in his fiscal tracks, other than the results of the mid-term elections, is the fact that increasing the budget deficit is incongruous with his primary aim of reducing the size of the US trade deficit. A bigger budget deficit will drive down national savings, and in an economy already hitting the limits of production capacity, it will flow through to greater import demand, widening the US trade deficit. The two policies are entirely incompatible. Trump must choose: a larger budget deficit or a smaller trade deficit.

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IMI International Monetary Review

ECB Faces QE Dilemma

By MARCHEL ALEXANDROVICH *

While Italy continues to dominate the headlines, the European Central Bank is more interested in the big picture: the continuing economic recovery, building inflationary pressure, the end of quantitative easing and guiding expectations for what will happen to interest rates next year and beyond.

As its bond-buying programme starts to be wound down, the ECB is increasingly relying on the flow from QE reinvestments to make its presence felt in the markets. The ECB is set to purchase around as many bonds in October as it did in September (around €39bn), before that almost halves to €22bn in November. The uneven nature of its monthly reinvestments is one issue for the ECB to consider when adjusting its policies for next year.

The governing council must also decide whether to reshape its reinvestment policy to deal with the deviations from the ECB capital key (under which bonds are bought in proportion to the share of the ECB capital provided by each country) that have built up since March 2015. In several euro area countries, the national central banks have not purchased as much government debt as their capital key weight prescribed. To compensate for the shortfall, other national central banks have overbought bonds.

The ECB must choose between two scenarios: either, as of 31 December 2018, each national central bank locks in the size of its QE portfolio and runs this fixed balanced sheet for as long as the ECB chooses to carry on its reinvestment policy; or, the size of each national central bank balance sheet will be allowed to decrease or increase such that, over time, the capital key deviations are corrected. In the second scenario, the size of the Eurosystem QE portfolio stays constant, but when a government bond held in the public sector purchase programme portfolio matures in France, Italy or in Spain, the domestic central bank does not necessarily reinvest the full amount into that country. Instead the central bank of Portugal, Slovenia or Cyprus would be allowed to continue to add to their PSPP holdings until Eurosystem imbalances are corrected. This seems like a reasonable approach to follow. Moreover, as hinted by ECB Executive Board Member Benoît Cœuré in September, it could open the possibility for Greece to eventually be included in the reinvestment programme.

However, if the ECB decides PSPP reinvestments need not necessarily be made in the same jurisdiction as they were originally made, this policy shift could affect what happens to reinvestment flows as the ECB amends its capital key from the start of next year. Calculations by Jefferies International compare the projected country PSPP holdings at the end of this year with the amounts that are likely to be consistent with the new ECB capital key. For example, to balance the PSPP portfolio accurately (setting aside the ECB's own purchases), the Deutsche Bundesbank would probably need to add €18bn to its holdings (adding an extra 3.5% to its portfolio); the Banque de France would need to reduce its holdings by around €12bn (2.8% of its existing portfolio); the Banca d'Italia's holdings would need to fall by around €28bn (7.6% of its existing portfolio); and the Banco de España's would need to fall by around €19bn (7.4% of its existing portfolio).

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This means that in 2019, under the normal circumstances when the Banca d'Italia is expected to reinvest around €35bn and the Banco de España around €25bn from maturing bonds, the actual reinvestment flows from these two central banks may end up being only around half that size.

This is a badly-timed dilemma for the ECB – does it focus on the underbuying of bonds in the smaller (and fiscally responsible) countries such as Portugal and Ireland, or the overbuying in larger economies such as France, Italy and Spain (where the commitment to fiscal discipline is not always obvious)? This will not be an easy question to answer, but could have tremendously important implications.

IMI International Monetary Review

Green Economy

Incorporating Climate Risk in QE

By DANAE KYRIAKOPOULOU [*]

In the decade since the 2008 financial crisis, central banks' spheres of influence have grown in substantial and occasionally controversial ways. Over the last few years, that influence has begun to expand to addressing climate change-related disruption.

Ensuring climate-related risk does not translate to financial instability is a key concern for central banks, but not an exclusive one. Central banks are tasked with safeguarding prosperity, which in turn requires that prosperity be generated sustainably. Monetary authorities should lead by example by supporting the transition to lower-carbon economies and combatting climate change in their roles as investors.

This could involve strategies for greening central banks' non-monetary policy portfolios, including their own funds, as well as the management of reserves. Frank Elderson, executive board member at De Nederlandsche Bank and chair of the Network for Greening the Financial System, announced at the panel discussion co-hosted by OMFIF and the United Nations Conference on Trade and Development at the World Investment Forum in Geneva on Friday 26 October that DNB would be the first central bank to sign up to the UN's Principles for Responsible Investment.

The green bond market is a prime example of channelling funds towards green initiatives. While still small (green bonds outstanding total around $400bn), the market is growing fast and expanding into other areas. On 29 October the Seychelles became the first sovereign to issue a 'blue bond', a 10-year $15m issuance earmarked for the protection of marine life.

A more controversial approach would be for central banks to take climate risks into account in the purchases that form part of their quantitative easing programmes. In its first progress report published in October, the NGFS admitted that 'climate- or environmental-related criteria are not yet sufficiently accounted for in internal credit assessments or in the models of credit agencies'… which many central banks rely on for their operations.' This reveals an uncomfortable contradiction for central banks like the European Central Bank, which, as a member of the NGFS, is seen as admitting that risk is improperly accounted for in the current ratings system while at the same time using that system for deciding which assets to buy for its asset purchase programme. Reacting to this contradiction could range from supporting rating agencies in developing a system of accounting for climate-related risks, to a more active approach of central banks developing their own such system.

Climate could be only the start. The framework developed by the NGFS to understand and address the link between climate change and financial stability could be extended to other risks to sustainable growth forming part of the UN's sustainable development goals. This could prove a source of further controversy as central banks tread the fine line between adhering to their mandates and expanding their remits.

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Central Banks Greening Financial System

By DANAE KYRIAKOPOULOU

Central banks' remits have changed profoundly since the 2008 financial crisis, notably – and sometimes controversially – in relation to their monetary policy practices and quantitative easing policies. Their remits are beginning to expand into another, unexpected field: climate change.

The recognition of climate-related disruption as a source of financial risk is propelling this expansion, and ensures that addressing these issues does not require further (potentially controversial) expansion of central bank mandates. Instead, it translates climate-related risks into categories of financial risk that central banks already monitor. This was a key message at a panel co-hosted by OMFIF and the United Nations Conference on Trade and Development at the World Investment Forum in Geneva on Friday 26 October.

There are at least two channels through which climate- and environment-related changes can become relevant to the financial sector. The first relates to the physical risk to the value of financial assets from natural disasters and changes in weather patterns. These can affect the macroeconomy on both the demand side, through influencing the wealth, consumption and investment patterns of households and businesses, and on the supply side, through resource shortages, damages to the capital stock and infrastructure, and associated reductions in productivity. The second channel, that of 'transition risk', relates to the legal and adjustment cost that the financial sector will incur in transitioning towards a lower-carbon economy. While such risks may only be realised over an extended time horizon, immediate action is needed to mitigate the long-term impacts.

Central banks can leverage their influence through their capacity as both regulators and as reserves managers. As supervisors tasked with safeguarding financial stability, they can stress-test firms' ability to deal with climate shocks. Central banks can also encourage, incentivise or even require climate-related disclosures from the institutions they supervise. This would enable investors to price climate risks correctly. A monetary authority may even set capital requirements for institutions to account for climate-related risks.

The insurance industry is one part of the financial sector in which climate risk analysis is already in the mainstream. It was at the insurance firm Lloyd's of London that Mark Carney, governor of the Bank of England, first spoke in September 2015 about the tragedy of the horizon linking climate change and financial stability.

Financial institutions have made considerable progress since then. The Financial Stability Board established the Task Force on Climate-related Financial Disclosures in December 2015. In 2016, the G20 Sustainable Finance Study Group was created. Last year OMFIF, together with the Bank for International Settlements, German finance ministry, Amundi, DZ BANK, HSBC and other institutions, launched the 'Focus on green finance' initiative. Its first symposium was held at the Deutsche Bundesbank in July 2017.

In December of that year, the Banque de France established the Central Banks and Supervisors Network for Greening the Financial System. Starting with eight founding members, the network now includes 18 central banks, in addition to observer members including the Organisation for Economic Co-operation and Development, BIS, World Bank and International Finance Corporation. In October, the Prudential Regulation Authority, the Bank of England's banking and insurance supervisory arm, became the first major financial regulator to specify how it expects banks and insurers to take climate change into account when managing risk.

Such decisions illustrate how central banks are moving on from understanding the analytical framework linking climate change to their mandates and taking action.

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Working Paper

Nonlinear Monetary Policy and Macroeconomic Stabilization in Emerging Market Economies: Evidence from China

By **MA YONG** *

This paper provides a new approach to investigate monetary policy nonlinearities within a micro-founded DSGE model by incorporating a transition function into the traditional Taylor rule. The model is estimated using the Bayesian method for the Chinese economy over the period 1998–2013. The empirical results show that the central bank of China actually adopts a nonlinear Taylor rule and pursues an inflation target zone of [1%, 5%] rather than sticking to a rigid target. Further results from impulse responses and welfare comparisons suggest that economic stabilization is an important motive in the conduct of monetary policy in China and the adoption of a nonlinear rule seems to serve this goal better than the traditional linear rule.

Keywords: Monetary policy; Macroeconomic stabilization; Nonlinear Taylor rule

JEL Classification: E61, E63, F41

1. Introduction

The relationship between monetary policy and macroeconomic stabilization has long been a subject of study. While most traditional studies have assumed a linear rule in the specification of monetary policy, the introduction of nonlinear policy rules has only been a recent focus. Furthermore, although there are a growing number of studies that try to investigate monetary policy nonlinearities, most of these are purely empirical and very few have employed a dynamic stochastic general equilibrium (DSGE) model to discuss the relevant issues. In this context, this paper attempts to model monetary policy nonlinearity within the DSGE framework and to discuss its role in the stabilization of the Chinese economy.

When studying monetary policy and its macroeconomic effects, the DSGE framework provides a workhorse for quantitative analysis because of its solid microfoundations. In recent years, there has been an emerging literature modeling the Chinese economy by using DSGE models. For example, Zhang (2009) calibrates a DSGE model to examine the welfare implications of the money supply rule versus the interest rate rule in China. Xu and Chen (2009),Xi and He (2010) and Yuan et al. (2011) investigate whether there is a financial accelerator mechanism in the Chinese economy by using small open economy DSGE models. Wan and Xu (2010) estimate a DSGE model based on Fernández-Villaverde and Rubio-Ramirez (2004) and find that technology shocks

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are the main driver of China's business cycles. Chen et al. (2012) develop a New Keynesian DSGE model with a banking sector to capture China's unconventional monetary policy toolkit and find that the choice of a particular monetary policy instrument depends on the sources of the shocks. Mehrotra et al. (2013) construct a small-scale DSGE model based on Christiano et al. (2005) to evaluate the rebalance of the Chinese economy from investment-led to consumption-led growth. In a New Keynesian DSGE model based on Iacoviello (2005), Peng (2012) studies the sources of business cycles in China and finds that while technology shocks dominate the variations of output, credit shocks are also an important driver of economic fluctuations. In contrast, Sun and Sen (2012) employ a Bayesian estimated DSGE model to examine business cycles in China and find that the dominant drivers of output are investment and preference shocks, while technology shocks only play a subsidiary role. In a recent paper, Le et al. (2014) develop a DSGE model with a banking sector and find that the main shocks that hit China in the 2008 financial crisis were international, while the domestic banking shocks seemed to be unimportant. Other studies that have employed the DSGE framework to study the Chinese economy include Huang (2008), Zheng et al. (2011), Liu and Yuan (2012), Dollar and Jones (2013), and Jia et al. (2015), among others.

It should be noted that although there is relatively ample literature on the DSGE modeling of the Chinese economy, most of these studies have followed the conventional literature by assuming a linear monetary policy rule. However, this may not be the case, as central banks may respond differently to deviations of aggregates from their targets. In this case, a nonlinear rule would be more appropriate to capture actual central bank behavior (Nobay and Peel, 2003; Surico, 2007). Recent findings by Castro (2008) also reveal that there has been an increase in the adoption of nonlinear policy rules because central banks tend to have asymmetric preferences in their loss functions. Theoretically, as long as the tradeoffs between inflation and output gaps show signs of nonlinearities, applying a linear model will give misleading results and impart systematic biases in monetary policy modeling. Moreover, as noted by Taylor and Davradakis (2006), although nonlinearities in the Taylor rule can result from either asymmetry in the central bank's preferences or nonlinearity in the macroeconomic structure of an economy, it is highly likely that both the presence and the interaction of these in the economy will amplify the degree of nonlinearity in the policy rule. Cukierman (2004) further argues that asymmetric central bank objectives would lead to nonlinear policy rules even if the economic structure is linear. For these reasons, the adoption of a traditional Taylor rule may lead to serious distortions in parameter uncertainties.

In order to address the nonlinear features of monetary policy, a number of studies have employed regime-switching regression models following the seminal paper of Mankiw et al. (1987), such as Owyang and Ramey (2004), Sims and Zha (2006), Assenmacher-Wesche (2006), Perruchoud (2009), Alcidi et al. (2011), and Davig and Doh (2014), among others. Most of these studies have identified nonlinearities in the conduct of monetary policy for different countries and in different time periods. Recently, another emerging strand of literature has applied the smooth transition regression (STR) model to evaluate monetary policy nonlinearities. The STR model requires the identification of a transition variable that indicates a threshold value where a change from a low regime to a high regime takes place. Teräsvirta and Anderson (1992) argue that the STR model could be regarded as a regime-switching model, whereby the transition from one regime to another occurs smoothly. Along this line of research, Petersen (2007) argues that the STR model is capable of justifying why and when the central bank adjusts its policy rule. Castro (2008) investigates whether the Federal Reserve (Fed), the Bank of England (BOE) and the European Central Bank (ECB) follow a linear or nonlinear Taylor rule. The results show that the BOE and the ECB follow a nonlinear Taylor rule, while the Fed appears to follow a linear Taylor rule. In a similar vein, Gerlach and Lewis (2010) estimate gradual regime-switching Taylor rules for the ECB based on a logistic smooth transition regression (LSTR) model and report a change

in the central bank's behavior at the tipping point of the 2008 financial crisis.

Compared with the extensive literature on monetary policy nonlinearities in advanced economies, there is less literature on the study of monetary policy nonlinearities in emerging market economies.[1] However, a nonlinear monetary policy rule may be a more realistic description of central banks' behavior in emerging market economies as it helps to capture asymmetric, discontinuous and time-varying features of monetary policy. Moreover, although empirical studies tend to show that on average nonlinear models outperform simple linear specifications in terms of their ability to track the actual interest rate, only a few studies have analyzed monetary policy nonlinearities within the DSGE framework (e.g., Aksoy et al., 2006; Liu et al., 2009, 2011).2 Thus, the absence of microeconomic foundations may be a potential drawback of the existing studies. Motivated by these considerations, we develop a New Keynesian DSGE model that features an explicitly specified block of nonlinear monetary policy in this paper. Since there is almost no study available that has evaluated and analyzed monetary policy nonlinearities on the lines of micro-founded DSGE models, this paper comes forward to meet this challenge by estimating a nonlinear Taylor rule within a New Keynesian DSGE model for the Chinese economy.

Our paper contributes to the existing literature in both general and country-specific aspects. In the first aspect, we incorporate an augmented nonlinear Taylor rule into the New Keynesian DGSE framework to construct a micro-founded model, which allows us to investigate theory-based monetary policy nonlinearity as well as its impact on the economy. In the second aspect, the model is estimated using the Bayesian method for the Chinese economy, which not only adds to the literature on nonlinear monetary policy rules in emerging market economies, but also provides important insights into China's monetary policy in practice. In particular, although a large number of studies have investigated China's monetary policy (e.g., Wang and Handa, 2007; Zhang, 2009; Chen et al., 2011; He et al., 2013)[2], none of these have evaluated the potential nonlinearities in China's monetary policy within an estimated DSGE model.

The rest of the paper is organized as follows: Section 2 sets up the model and characterizes the equilibrium; Section 3 discusses the estimation methodology and analyzes the empirical results; Section 4 presents some further discussions; Section 5 concludes.

2. Model

Following McQueen and Thorley (1994), we assume that the price of an asset is equal to its intrinsic value plus a bubble, i.e.:

The economy is characterized as a monopolistic competitive economy with a continuum of firms, one representative consumer and one monetary authority. The model is built upon an open economy New Keynesian model similar to Gali and Monacelli (2005) but modified with a nonlinear monetary policy rule by introducing a quadratic logistic transition function into an

[1] Aksoy et al. (2006) estimate a general equilibrium model with a nonlinear policy rule that allows for the opportunistic approach to disinflation for the US. Liu et al. (2009) construct a DSGE model where monetary policy follows a Markov switching process and find that the expectation effect of regime switches in monetary policy is asymmetric across regimes. In another study by Liu et al. (2011), monetary policy is described by a feedback interest rate rule that allows the possibility of regime-switching in the inflation target within a DSGE model.

[2] It is worth noting that, in contrast to previous studies that focus only on a single policy measure, He et al. (2013) study the effects of various policy measures adopted by the central bank of China (People's Bank of China, PBC), including both market-based policy measures such as repo and benchmark lending rates and non-market-based measures such as loan growth and money supply. The authors find that the market-based policy measures are generally less effective than the non-market-based measures in the transmission mechanism of monetary policy in China.

augmented Taylor rule.

2.1. Households

The domestic economy consists of a continuum of identical infinitely-lived households. The representative agent maximizes his lifetime welfare represented by a utility function:

$$\max_{C,N} E_0 \sum_{t=0}^{\infty} \beta^t \left[\frac{(C_t - hC_{t-1})^{1-\sigma}}{1-\sigma} - \frac{N_t^{1+\varphi}}{1+\varphi} \right] \tag{1}$$

Where β is the intertemporal preferences discount factor, N_t denotes hours worked, σ is the inverse intertemporal elasticity of substitution between the present and future consumption, φ is the inverse Frisch elasticity of labor supply, and h captures exogenous habit in consumption. C_t is a composite consumption index of foreign and domestically produced goods defined as:

$$C_t = \left[(1-\omega)^{\frac{1}{\eta}} C_{H,t}^{\frac{\eta-1}{\eta}} + \omega^{\frac{1}{\eta}} C_{F,t}^{\frac{\eta-1}{\eta}} \right]^{\frac{\eta}{\eta-1}} \tag{2}$$

where ω and η measure trade openness (weight of imports in the production of final consumption goods) and trade price elasticity, respectively. The aggregate consumption indices of foreign ($C_{F,t}$) and domestically ($C_{H,t}$) produced goods are given by

$$C_{F,t} = \left(\int_0^1 C_{F,t}(i)^{\frac{\varepsilon-1}{\varepsilon}} di \right)^{\frac{\varepsilon}{\varepsilon-1}} \text{and} C_{H,t} = \left(\int_0^1 C_{H,t}(i)^{\frac{\varepsilon-1}{\varepsilon}} di \right)^{\frac{\varepsilon}{\varepsilon-1}} \tag{3}$$

The household's maximization problem is completed given the following budget constraint:

$$\int_0^1 \{P_{H,t}(i)C_{H,t}(i) + P_{F,t}(i)C_{F,t}(i)\} di + E_t\{Q_{t,t+1}D_{t+1}\} = W_t N_t + D_t - T_t \tag{4}$$

for t = 1, 2, . . .∞, where $P_{H,t}(i)$ and $P_{F,t}(i)$ denote the prices of domestic and foreign good i respectively, D_{t+1} is the nominal pay-off in period $t+1$ of the portfolio held at the end of period t, W_t is the nominal wage, and T_t denotes lump-sum taxes. $Q_{t,t+1}$ is the stochastic discount factor for one-period ahead nominal pay-offs relevant to the domestic household. Following Gali and Monacelli (2005), it is assumed that households have access to a complete set of contingent claims, traded internationally.

Given the constant elasticity of substitution aggregator for $C_{F,t}$ and $C_{H,t}$ in Eq. (3), the optimal allocation for good i is given by the following demand functions:

$C_{F,t}(i) = \left(\frac{P_{F,t}(i)}{P_{F,t}}\right)^{-\varepsilon} C_{F,t}$ and $C_{H,t}(i) = \left(\frac{P_{H,t}(i)}{P_{H,t}}\right)^{-\varepsilon} C_{H,t}$ (5) where $P_{F,t}$ is the import price index and $P_{H,t}$ is the price index of home produced goods. Assuming symmetry across all goods, the optimal allocation of expenditure between domestic and imported goods is given by:

$$C_{F,t}(\mathrm{i}) = \omega\left(\frac{P_{F,t}}{P_t}\right)^{-\eta} C_t \text{ and } C_{H,t}(\mathrm{i}) = (1-\omega)\left(\frac{P_{H,t}}{P_t}\right)^{-\eta} C_t \tag{6}$$

where $P_t = [(1-\omega)P_{H,t}^{1-\eta} + \omega P_{H,t}^{1-\eta}]^{\frac{1}{1-\eta}}$ is the overall consumer price index (CPI). Accordingly, total consumption expenditure for the domestic household is given by $P_t\, C_t = P_{H,t}\, C_{H,t} + P_{F,t}\, C_{F,t}$. Using this relationship, the budget constraint in Eq. (4) can be rewritten as:

$$P_t C_t + E_t\{Q_{t,t+1}D_{t+1}\} = W_t N_t + D_t - T_t \tag{7}$$

Then the first order conditions of the household's maximization problem are summarized by

the labor supply

$$\frac{W_t}{P_t} = (C_t - hC_{t-1})^{\sigma} N_t^{\varphi} \tag{8}$$

and the Euler equation

$$\frac{1}{R_t} = \beta\left(\frac{C_{t+1} - hC_t}{C_t - hC_{t-1}}\right)^{-\sigma}\left(\frac{P_t}{P_{t+1}}\right) \tag{9}$$

where $R_t = 1/E_t\{Q_{t,t+1}D_{t+1}\}$is the gross return on a riskless one-period discount bond paying off one unit of domestic currency in $t+1$.

Log-linearizing Eqs. (8) and (9), we have:

$$\hat{w}_t - \hat{p}_t = \frac{\sigma}{1-h}(\hat{c}_t - h\hat{c}_{t-1}) + \varphi\hat{n}_t \tag{10}$$

$$\hat{c}_t - h\hat{c}_{t-1} = E_t(\hat{c}_{t+1} - h\hat{c}_t) - \frac{1-h}{\sigma}(\hat{r}_t - E_t\hat{\pi}_{t+1}) \tag{11}$$

where the lower case letters with a "hat" denote the log deviations of a variable from its steady state value, e.g.,$\hat{x}_t \equiv \log X_t - \log X$, and $\hat{\pi}_t = \hat{p}_t - \hat{p}_{t-1}$ is CPI inflation.

2.2. Some identities and international risk sharing

Before proceeding with our analysis, this section sets out some of the key relationships between inflation, the real exchange rate and the terms of trade. We start by defining the real exchange rate $Q_t$and the terms of trade S_t as:

$$Q_t = P_t^* \varepsilon_t / P_t \tag{12}$$

$$S_t = P_{F,t}/P_{H,t} \tag{13}$$

where ε_t denotes the nominal exchange rate. For the international market, the law of one price (LOP) is assumed to hold such that:

$$P_{F,t} = \varepsilon_t P_t^* \tag{14}$$

where P_t^* is the price index of imports measured in foreign currency. Recall that the overall consumer price index (CPI) is given by:

$$P_t = \left[(1-\omega)P_{H,t}^{1-\eta} + \omega P_{F,t}^{1-\eta}\right]^{\frac{1}{1-\eta}} \tag{15}$$

By log-linearizing Eqs. (13)–(15), we have:

$$\hat{p}_t = (1-\omega)\hat{p}_{H,t} + \omega\hat{p}_{F,t} = \hat{p}_{H,t} + \omega\hat{s}_t \tag{16}$$

$$\hat{p}_{F,t} = \hat{p}_t^* + \hat{e}_t \tag{17}$$

$$\hat{s}_t = \hat{p}_{F,t} - \hat{p}_{H,t} \tag{18}$$

The combination of (16) and (18) leads to the following relationship:

$$\hat{p}_t = \hat{p}_{H,t} + \omega\hat{s}_t \tag{19}$$

For simplicity, we consider a perfect international financial market with a complete set of assets following Gali and Monacelli (2005). In this case, consumption is tightly linked to the real exchange rate and the following risk sharing condition is obtained:

$$\frac{\sigma}{1-h}(\hat{c}_t - h\hat{c}_{t-1}) = \hat{q}_t = (1-\omega)\hat{s}_t \tag{20}$$

2.3. Firms

2.3.1. Final good firms

As is standard in the literature (e.g., Clarida et al., 2002; Chang et al., 2014), it is assumed that each final good firm in the home country uses a continuum of intermediate goods to produce output, according to the following CES technology:

$$Y_t = \left[\int_0^1 Y_t(j)^{\frac{\varepsilon-1}{\varepsilon}} dj\right]^{\frac{\varepsilon}{\varepsilon-1}} \tag{21}$$

where Y_t is aggregate output and $Y_t(j)$ is the input produced by intermediate good firm j. Given the price of the final good $P_{H,t}$, profit maximization leads to the following set of demand equations

$$Y_t(j) = \left(\frac{P_{H,t}(j)}{P_{H,t}}\right)^{-\varepsilon} Y_t \tag{22}$$

and the domestic price index

$$P_{H,t} = \left(\int_0^1 P_{H,t}(j)^{1-\varepsilon} dj\right)^{\frac{1}{1-\varepsilon}} \tag{23}$$

2.3.1. Final good firms

Intermediate good firms operate under imperfect competition and intermediate goods are produced with the following production function: $Y_t(j) = A_t N_t(j)$, where $N_t(j)$ is the labor employed by firm j, $a_t \equiv logA_t$ is an exogenous technological shock that follows an AR(1) process: $\hat{a}_t = \rho_a \hat{a}_{t-1} + \varepsilon_t^a, \varepsilon_t^a \sim i.i.d.N(0, \sigma_a^2)$. Assuming a symmetric equilibrium across all j firms, the first order log-linear approximation of the aggregate production function can be written as:

$$\hat{y}_t = \hat{a}_t + \hat{n}_t \tag{24}$$

Given the firm's technology, the real total cost of production is $TC_t = \frac{W_t Y_t}{P_{H,t} A_t}$. Hence, the log of real marginal cost will be common across all domestic firms and is given by:

$$\hat{mc}_t = \varphi \hat{y}_t + \sigma\left(\frac{\hat{c}_t - h\hat{c}_{t-1})}{1-h}\right) - (1+\varphi)\hat{a}_t \tag{25}$$

For our model, Calvo (1983) type staggered price setting is assumed. In any period t, only $1 - \theta_P$, where $\theta_P \in [0,1]$, fraction of firms is able to reset its prices optimally, while the other fraction θ_P cannot.[3] All other firms can only index their prices by past inflation, namely $P_{it} = (\pi_{t-1})^{\chi} P_{it-1}$. Indexation is controlled by the parameter $\chi \in [0,1]$, where $\chi = 0$ implies no indexation and $\chi = 1$ implies total indexation. It is assumed that all rms that can re-optimize their prices choose the same price $\tilde{p}_t$. Therefore, the maximization of firm i is given by:

$$\underset{\tilde{P}_t}{Max}\ E_t \sum_{s=0}^{\infty} (\beta\theta_P)^s \lambda_{t+s} \left[Y_{it+s} \prod_{h=1}^{s} \pi_{t+h-1}^{\chi} \frac{\tilde{P}_t}{P_{t+s}} - MC_{t+s} \right)\Bigg]$$

[3] As a result, the average duration of a price is given by $\frac{1}{1-\theta_P}$

$$s.t.\ Y_{it+s} = \left(\prod_{h=1}^{s} \pi_{t+h-1}^{\chi} \frac{\tilde{P}_t}{P_{t+s}} \right)^{-\eta} Y_{t+s}$$

and the first order condition to the above problem is:

$$\tilde{P}_t = \left(\frac{\eta}{\eta - 1}\right) \frac{E_t \sum_{s=0}^{\infty} (\beta\theta_P)^s \lambda_{t+s} P_{t+s} MC_{t+s} Y_{it+s}}{E_t \sum_{s=0}^{\infty} (\beta\theta_P)^s \lambda_{t+s} \prod_{h=1}^{s} \pi_{t+h-1}^{\chi} Y_{it+s}} \tag{26}$$

Furthermore, given equation $P_t = (\int_0^1 P_t(j)^{1-\eta}\, dj)^{\frac{1}{1-\eta}}$ and indexation, the law of motion of price level can be defined as:

$$(P_t)^{1-\eta} = \theta_P \left((\pi_{t-1})^{\chi} P_{t-1} \right)^{1-\eta} + (1^{0} - \theta_P)(\tilde{P}_t)^{1-\eta} \tag{27}$$

Log-linearizing Eqs. (26) and (27), we obtain the following New Keynesian Phillips Curve à la Smets and Wouters:

$$\hat{\pi}_t = \frac{\beta}{1 + \beta\chi} E_t\{\hat{\pi}_{t+1}\} + \frac{\chi}{1 + \beta\chi} \hat{\pi}_{t-1} + \frac{(1 - \theta_P)(1 - \beta\theta_P)}{\theta_P (1 + \beta\chi)} \hat{mc}_t + \varepsilon_t^{\pi} \tag{28}$$

Where $\varepsilon_t^{\pi} \sim i.i.d.N(0, \sigma_c^2)$ represents a cost push (mark-up) shock.

2.4. Nonlinear monetary policy rule

Any attempt to model Chinese monetary policy must take into account the specific monetary policy strategy that the central bank of China (People's Bank of China, PBC) pursues, which can be best described as a combination of inflation control, output smoothing and real exchange rate targeting. Therefore, following Liu and Zhang (2010), Piao and Joo (2011) and Fan et al. (2011), it is assumed that monetary policy is described by a three-factor augmented Taylor-type rule:

$$\hat{r}_t = \rho_r \hat{r}_{t-1} + (1 - \rho_r)[\phi_y(\hat{y}_t - \hat{y}_t^*) + \phi_\pi(\hat{\pi}_t - \hat{\pi}_t^*) + \phi_q \hat{q}_t] + \varepsilon_t^r \tag{29}$$

where ρ_r is the interest rate smoothing coefficient, y_t^* denotes the natural level of output, and π_t^* denotes the time-varying inflation target. ϕ_t, ϕ_p and ϕ_q denote the reaction coefficients of the monetary authority to the gaps of output, inflation and real exchange rate, respectively. ε_t^r is a monetary policy shock, which is assumed to follow $i.i.d.N(0, \sigma_r^2)$. Other variables in Eq. (30) are the same as defined before.

The main difference between Eq. (29) and the standard Taylor rule is that we also add the real exchange rate gap in the policy rule, since moderating exchange rate fluctuations is usually taken as one of the policy goals in many emerging market economies like China. This addition is also justified by the empirical finding that changes in the policy interest rate appear to react to those in the real exchange rate because of the openness of the economy (Scheibe and Vines, 2005) and that China conducts a floating exchange rate regime rather than a flexible one (Liu and Zhang, 2010). In fact, feedback on the exchange rate has been commonly used in open economy models, and the performance of the exchange rate augmented Taylor rule seems to be better than that of the standard one (Piao and Joo, 2011). Yoshimi (2014) also argues that there are significant preferences for exchange rate stabilization in Asian emerging economies. Another advantage of including the exchange rate term in the reaction function is that we can let the data show whether moderating exchange rate fluctuations is a policy goal in China, rather than arbitrarily assuming that China's monetary policy does not react to exchange rate fluctuations.[4]

[4] Since the parameters in the model are estimated with the Bayesian method using China's actual data, we can

It is worth noting that, although Eq. (29) is widely used in the open economy literature, it is still linear. As the main focus of the paper is to investigate potential nonlinearities in monetary policy, our next step is to extend Eq. (29) to include nonlinear features. As mentioned in the introduction, there are two main approaches to studying monetary policy nonlinearities: the Markov switching (MS) model and the smooth transition regression (STR) model. Since there is already an extensive literature that has adopted Markov switching (MS) models to investigate monetary policy nonlinearities for both advanced economies (e.g., Davig and Leeper, 2005; Sims and Zha, 2006; Liu et al., 2009, 2011; Chen and MacDonald, 2012; Foerster, 2014; Davig and Doh, 2014) and China (e.g., Chen, 2009; Zheng et al., 2012), we will use the second approach (i.e., the STR model) in our paper. The STR model has the benefit of capturing and identifying transition variables that indicate threshold values where a change from a low regime to a high regime takes place. Another advantage of the STR model is that it could be regarded as a regime-switching model whereby the transition from one regime to another occurs smoothly (Teräsvirta and Anderson, 1992; Gerlach and Lewis, 2010). In addition, an emerging body of literature has applied the STR model to investigate monetary policy nonlinearities and found a good performance in tracking the actual monetary policy stance (e.g., Petersen, 2007; Castro, 2008; Ncube and Tshuma, 2010; Jawadi et al., 2011).[5]

To investigate monetary policy nonlinearities through the STR model, we first incorporate a transition function $G(\eta, i, \tilde{\pi}_t)$ into Eq. (29):

$$\begin{aligned}\hat{r}_t &= \rho_r \hat{r}_{t-1} + (1-\rho_r)[\phi_y(\hat{y}_t - \hat{y}_t^*) + \phi_\pi(\hat{\pi}_t - \hat{\pi}_t^*) + \phi_q \hat{q}_t] \\ &+(1-\rho_r)[\omega_y(\hat{y}_t - \hat{y}_t^*) + \omega_\pi(\hat{\pi}_t - \hat{\pi}_t^*) + \omega_q \hat{q}_t]G(\eta, c, \tilde{\pi}_t) + \varepsilon_t^r\end{aligned} \tag{30}$$

where $\tilde{\pi}_t = \hat{\pi}_t - \hat{\pi}_t^*$ denotes the inflation gap, the parameters $\Phi = (\phi_t, \phi_p, \phi_q)'$ and $\omega = (\omega_x, \omega_\pi, \omega_q)'$ denote parameter vectors in the linear and nonlinear parts of the model, and the subscripts y, p and q represent the central bank's preferences about output, inflation and real exchange rate gaps, respectively.

To conduct an empirical analysis, the transition function $G(\eta, i, \tilde{\pi}_t)$ must first be specified. Following the standard literature (e.g., Granger and Teräsvirta, 1993; Teräsvirta et al., 2010), the transition function is given by the following quadratic logistic STR model (LSTR2 model):

$$G(\eta, c, \tilde{\pi}_t) = \{1 + \exp[-\eta(\tilde{\pi}_t - c_1)(\tilde{\pi}_t - c_2)]\}^{-1} \tag{31}$$

where $c = \{c_1 + c_2\}$ and $c_1 \leq c_2$. The parameter η ($\eta > 0$) denotes the transition speed, with higher values representing a faster transition speed. The threshold parameters $c = \{c_1, c_2\}$ denote policy turning points, which means that the central bank actually considers a target zone ($[c_1 + c_2]$) instead of a rigid target for inflation. Note that the transition function is symmetric about $(c_1 + c_2)/2$ and asymmetric otherwise, and the model becomes linear when $\eta \to 0$. Note also that for large deviations of inflation from the target zone, the transition function tends to unity (i.e., $G(\eta, c, \tilde{\pi}_t) \to 1$) and thus the central bank's policy parameter vector is given by $(\Phi + \omega)' = (\varphi_\pi + \omega_\pi, \varphi_y + \omega_y, \omega_q)'$. However, if there are only small deviations of inflation from the target zone, the transition function tends to zero (i.e., $G(\eta, c, \tilde{\pi}_t) \to 0$) and the policy rule collapses to

judge whether China's monetary policy reacts to exchange rate fluctuations by looking at the posterior estimate of the reaction coefficient on the real exchange rate. Specifically, if the posterior estimate of the reaction coefficient on the real exchange rate turns out to be statistically significant/insignificant, it can be concluded that China's monetary policy does/does not react to exchange rate fluctuations.

[5] However, as mentioned in the introductory section, these studies are mainly empirical and none of them have analyzed monetary policy nonlinearities in the DSGE framework. Therefore, the lack of microeconomic foundations may be a potential drawback of these studies.

the linear one, as specified in Eq. (29). In this case, the central bank's policy parameter vector is given by $\Phi = (\phi_y, \phi_p, \phi_q)'$

Finally, following the recent DSGE literature (e.g., Cogley and Sbordone, 2008; Cogley et al., 2010), the inflation target is assumed to evolve exogenously as:

$$\hat{\pi}_t^* = \rho_\pi \hat{\pi}_{t-1}^* + \varepsilon_t^{\pi^*} \tag{32}$$

where $\varepsilon_t^{\pi^*} \sim i.i.d.N(0, \sigma_{\pi^*}^2)$. As emphasized by Lubik and Schorfheide (2004), the introduction of a time-varying inflation target in the DSGE model is helpful in generating fairly rich dynamics and thus avoiding bias in estimation.

2.5. Equilibrium

Equilibrium requires that supply must equal the total demand stemming from final good firms, foreign countries, and the government:

$$Y_t(j) = \left(\frac{P_{H,t}(j)}{P_{H,t}}\right)^{-\varepsilon} \left[(1-\omega)\left(\frac{P_{H,t}}{P_t}\right)^{-\eta} C_t + \omega\left(\frac{P_{H,t}^*}{P_t^*}\right)^{\eta} C_t^* + G_t\right] \tag{33}$$

where C_t^* denotes foreign consumption and $P_{H,t}^*$ is the price index of domestic goods expressed in foreign currency. Define the index for aggregate domestic output as $Y_t = (\int_0^1 Y_t^{\frac{\varepsilon-1}{\varepsilon}}(j)dj)^{\frac{\varepsilon}{\varepsilon-1}}$, then the aggregate relationship can be derived by substituting for $Y_t(j)$ using (33):

$$Y_t = (1-\omega)\left(\frac{P_{H,t}}{P_t}\right)^{-\eta} C_t + \omega\left(\frac{P_{H,t}^*}{P_t^*}\right)^{-\eta} C_t^* + G_t \tag{34}$$

Following Corsetti et al. (2013), under the assumption that foreign variables are constant and using the condition $\hat{P}_t = \hat{P}_{H,t} + \omega\hat{s}_t$, the log-linearization of Eq. (34) can be written as:

$$\hat{y}_t = (1-\omega)(\omega\eta\hat{s}_t + \hat{c}_t) + \omega\eta\hat{s}_t + \frac{\chi_g}{1-\chi_g}\hat{g}_t \tag{35}$$

where $\hat{g}_t$ denotes the log deviation of government spending to output and $\chi_g = \frac{G}{Y}$ is the steady state value of the government spending to output ratio. In addition, as is standard in the literature, government expenditure is assumed to follow an AR(1) process: $\hat{g}_t = \rho_g \hat{g}_{t-1} + \varepsilon_t^g$, where $\varepsilon_t^g \sim i.i.d.N(0, \sigma_g^2)$.

3. Estimation methodology

3.1. Econometric methodology

In the empirical literature, numerous methods are used to estimate and evaluate New Keynesian DSGE models, including pure calibration, over generalized method of moments (GMM), full-information based maximum likelihood estimation, minimum distance estimation based on the distance between impulse response functions received from VAR and DSGE model, and Bayesian estimation.

Following An and Schorfheide (2007) and Mancini-Griffoli (2007), we apply the Bayesian technique to estimate the model, since this gives us several advantages over the competing techniques. As stressed by Lubik and Schorfheide (2005), it overcomes the potential

misspecification problem in the comparison of DSGE models. In addition, as pointed out by Fernández-Villaverde and Rubio-Ramirez (2004), it outperforms GMM and maximum likelihood estimation for small data samples.

To understand the procedure of Bayesian estimation, one may refer to An and Schorfheide (2007), Mancini-Griffoli(2007), and Fernández-Villaverde (2010), among others. We do not provide details here in order to avoid redundancy.

3.2. Data and prior distributions

China's quarterly time series data are collected from 1996:Q1 to 2013:Q3, with the starting point decided by data availability. In order to avoid the beginning-of-sample filtration problem, we estimate the model using observations from 1998:Q1. Thus, the sample used in the estimation ranges from 1998:Q1 to 2013:Q3. As the stochastic behavior of the dynamic system is driven by five exogenous disturbances (productivity shock, cost push shock, interest rate shock, government spending shock and inflation target shock), five key macroeconomic time series are used as observable variables in the estimation: output (real GDP), inflation (CPI), nominal interest rate, real exchange rate, and government spending to GDP ratio.[6] In order to guarantee the stationarity of the variables, all the data (log form) are detrended (HP Filter) and seasonally adjusted.[7]

In Bayesian estimation, some parameters cannot be identified if all structural parameters are estimated using the Bayesian method. Therefore, some parameters are kept fixed in the estimation procedure (Canova and Sala, 2006; Fukac et al., 2007; Ozdemir, 2013). As is standard in the literature, the discount factor β is assumed to be 0.99 to produce an annual steady state interest rate of 4 percent. The degree of openness (import share) ω is set to 0.231 by taking into account the average value of the import to GDP ratio over the sample period of 1998–2013. Similarly, the steady state value of the government spending to GDP ratio χ_g is set to 0.172, which is equivalent to the average value over the sample period. The elasticity of substitution between foreign and domestic goods η is calibrated to 1 following Lubik and Schorfheide (2007).

According to Schorfheide (2000), priors can be gleaned from personal introspection to reflect strongly held beliefs about the validity of economic theories. Priors also reflect researcher confidence about the likely location of the structural parameter of a model. The specification of prior distributions for each parameter is reported in Table 1. As is usual in the literature, the inverse elasticity of intertemporal substitution in consumption σ and the inverse elasticity of labor supply φ are assumed to follow gamma distributions with prior means of 1 and standard deviations equal to 0.2. The habit formation parameter h, the Clavo price stickiness θ_p parameter up and the

[6] All data are obtained from the National Bureau of Statistics of China.

[7] Except for the nominal interest rates and the real exchange rate, all time series are seasonally adjusted using the X12 method.

indexation parameter χ are all assumed to follow beta distribution with prior means of 0.50 and standard deviations of 0.2. For the parameters of the shock processes, where we have little guidance from the literature, inverted gamma distributions with standard deviations of 1 are used. The persistence of the AR(1) processes is beta distributed with prior means of 0.5 and standard deviations of 0.2.

For monetary policy priors, we choose a beta distribution with a prior mean of 0.5 and a standard error of 0.2 for the interest rate smoothing parameter ρ_r. As is standard in the literature, the interest rate feedback on output gap ϕ_y is assumed to have a gamma distribution with a prior mean of 0.5 and a standard error of 0.2, while the feedback parameter on the inflation gap ϕ_π is assumed to follow a gamma distribution with a prior mean of 1.5 and a standard error of 0.5. As for the feedback parameter on the exchange rate gap ϕ_q, where we have little guidance from the existing literature, a normal distribution with a moderate mean value of 1 and a standard error of 0.5 are used. In the nonlinear part of the monetary policy rule, the feedback parameters on output gap (ω_y), inflation gap (ω_π) and exchange rate gap (ω_q) are assumed to have the same distributions as defined in the linear part for symmetric considerations. For parameters in the transition function, the speed parameter η is assumed to follow normal distribution with a prior mean of 20 and a standard error of 10. By centering the distribution around 20 with a large standard error of 10, we allow the data to tell us whether or not there is a fast transition speed from the linear rule to the nonlinear one. Generally, if the posterior estimate of η turns out to be more than 20, a fast transition speed is identified. On the contrary, if the posterior estimate of h turns out to be lower than 10, a slow transition speed is found. For the two threshold parameters, c_1 is assumed to follow a normal distribution with a prior mean of -2 and a standard error of 1, while c_2 is assumed to follow a normal distribution with a prior mean of 2 and a standard error of 1. Given that the optimal deviation of the actual inflation from the target is zero, which is usually assumed in the literature, the above specifications of the threshold parameters c_1 and c_2 imply that a policy regime change is expected to happen when actual inflation is about two percent above or below the target value. Moreover, since it would be interesting to test possible asymmetries below and above the target range, other representative prior distributions for the two threshold parameters (c_1 and c_2) are also considered in the robustness checks in the next section.

3.3. Parameter estimates

In Table 1, we report the Bayesian estimates of the model parameters with 95% confidence intervals based on 100,000 draws.[8] Since the main aim of the paper is to study China's monetary policy, we will not provide a detailed discussion of all the parameters in Table 1 in order to save

[8] A sample of 100,000 draws is sufficient to ensure convergence of the Metropolis-Hastings sampling algorithm according to multivariate and univariate diagnostics.

space.[9] Instead, we will concentrate on the parameters of the monetary policy rule.

Table 1

Prior and posterior distributions of parameters.

Parameter	Prior distribution*	Prior mean	Posterior mean	95% Confidence interval
σ	Gamma[1,0.2]	1	0.794	[0.581, 0.964]
φ	Gamma[1,0.2]	1	1.062	[0.722, 1.225]
h	Betal[0.5, 0.2]	0.5	0.909	[0.887, 0.927]
χ	Beta[0.5, 0.2]	0.5	0.530	[0.384, 0.670]
θ_p	Beta[0.5, 0.2]	0.5	0.470	[0.246, 0.726]
ρ_r	Beta[0.5, 0.2]	0.5	0.405	[0.245, 0.603]
ϕ_y	Gamma[0.5, 0.2]	0.5	0.344	[0.156, 0.655]
ϕ_π	Gamma[1.5, 0.5]	1.5	1.442	[0.974, 2.222]
ϕ_q	Normal[1,0.5]	1	0.236	[0.058, 0.522]
η	Normal[20,10]	20	31.726	[16.912, 48.131]
c_1	Normal[−2, 1]	−2	−1.696	[−2.831, −0.617]
c_2	Normal[2,1]	2	3.086	[1.006, 4.209]
ω_y	Gamma[0.5, 0.2]	0.5	0.370	[0.189, 0.615]
ω_π	Gamma[1.5, 0.5]	1.5	1.926	[0.925, 2.627]
ω_q	Normal[1,0.5]	1	0.916	[0.203, 1.462]
ρ_a	Beta[0.5, 0.2]	0.5	0.903	[0.867, 0.926]
ρ_{π^*}	Beta[0.5, 0.2]	0.5	0.510	[0.418, 0.655]
ρ_g	Beta[0.5, 0.2]	0.5	0.516	[0.334, 0.742]
σ_a	Inv gamma[1,∞]	1	0.939	[0.816, 1.140]
σ_{π^*}	Inv gamma[1,∞]	1	0.464	[0.282, 0.550]
σ_r	Inv gamma[1,∞]	1	0.580	[0.435, 0.731]
σ_g	Inv gamma[1,∞]	1	2.796	[2.373, 2.974]
σ_c	Inv gamma[1,∞]	1	0.382	[0.296, 0.456]

Note: The table reports the Bayesian estimates of the model parameters with 95% confidence intervals based on 100,000 draws.
* The numbers in the square brackets are prior means and standard deviations.

From the posterior estimates of the monetary policy parameters in Table 1, we can see that all the parameters are estimated to be significantly different from zero except the coefficient of the exchange rate gap in the linear part of the augmented Taylor rule. The posterior mean for the interest rate smoothing coefficient ρ_r is estimated to be 0.405, implying a moderate degree of smoothness in the monetary policy conduct. In the linear part of the augmented Taylor rule, the inflation coefficient ϕ_π, the output coefficient ϕ_y and the exchange rate coefficient ϕ_q are estimated to be 1.442, 0.344 and 0.236 respectively, all lower than their prior means. By comparison, in the nonlinear part of the rule, the posterior means of the inflation coefficient ω_π, the output coefficient ω_y, and the exchange rate coefficient ω_q are significantly higher, estimated to be 1.926, 0.370 and 0.916 respectively. Note that the posterior estimate of the exchange rate coefficient in the linear part of the rule (ϕ_q) is statistically insignificant, implying that in normal times (small deviations of inflation from its target) the central bank typically does not react to exchange rate variations directly.

Now we turn to the parameters in the transition function. The posterior estimate of η is 31.73, which is much larger than its prior mean, indicating a very fast transition speed of the transition function towards unity. The threshold parameters c_1 and c_2 are estimated to be -1.696% and 3.086% respectively, implying an inflation target zone (in terms of deviation from the target value)

[9] A detailed discussion of the parameters is available upon request. For model discussions and parameter comparisons, one may also refer to Smets and Wouters (2003) and Lubik and Schorfheide (2005).

of [-1.696%, 3.086%] adopted by the central bank, which generally corresponds to an inflation target zone of [1%, 5%] in terms of absolute value since the central bank of China announced an average inflation target of 2–3% during the sample period. In this way, when inflation falls within the target zone, the central bank will follow a linear rule and the policy parameter vector $\Phi = (\phi_\pi, \phi_y, \phi_q)'$ is given by $\Phi = (1.442, 0.344, 0)'$. However, for large deviations of inflation (outside the target zone), the transition function comes into effect and the central bank's policy parameter vector turns out to be $(\Phi + \omega)' = (3.368, 0.714, 0.916)'$.[10] Note also that the threshold parameter c_1 is lower than its prior mean while c_2 is much higher than its prior mean, implying that the central bank may have asymmetric preferences for deflation and inflation. In fact, as a central bank in a typical emerging market economy, the PBC generally exhibits more aversion towards deflation than inflation, because deflation is usually associated with unemployment and social instability, which is regarded as a major risk for sustainable economic growth.

Overall, three basic conclusions can be drawn from the above results: (1) nonlinearity is an important feature of China's monetary policy rule; (2) instead of pursuing a rigid target for inflation, the central bank of China actually considers an inflation target zone that lies between 1% and 5%; (3) the central bank follows a linear Taylor rule for moderate inflation, but quickly switches to the nonlinear rule and responds much more strongly when inflation deviations exceed the target zone.

3.4. Sensitivity analysis

Since the main focus of this paper is to investigate nonlinearities in China's monetary policy, two crucial parameters in the transition function, c_1 and c_2, deserve further investigation for robustness. We therefore perform various sensitivity analyses in this section to check the robustness of the estimation for the two parameters.

First, we check whether the estimation results are sensitive to the choice of priors. In particular, we are interested in testing possible asymmetries below and above the target range, as in Boinet and Martin (2008). In order to do so, two basic scenarios for the choice of priors, denoted as I and II, are considered. In scenario I, the priors for the threshold parameters $c = \{c_1, c_2\}$ are given by $c_{s1} = \{c_1 = -3, c_2 = 1\}$, while in scenario II, the priors are given by $c_{s2} = \{c_1 = -1, c_2 = 3\}$. Thus, compared with the benchmark priors in Table 1, scenario I features relatively lower prior values for c_1 but higher prior values for c_2, while scenario II features the opposite. The estimation results under the two scenarios are presented in Table 2. From Table 2 we can see that the posterior estimates under the two scenarios are not only very close but also quite similar to the

[10] Note that for large deviations of inflation from the target zone, the transition function Gðh; c; ~ptÞ ! 1. Then, the central bank's policy parameter vector will be given by $(\Phi + \omega)' = (\phi_\pi + \omega_\pi,\ \phi_y + \omega_y, \omega_q)' = (3.368, 0.714, 0.916)'$.

benchmark estimates in Table 1. This means that the estimation of c_1 and c_2 is generally insensitive to the choice of priors and our estimation of the two parameters is robust.

Table 2

Sensitivity analysis with respect to alternative priors for c_1 and c_2.

Parameter	Prior distribution*	Prior mean	Posterior mean	95% Confidence interval
	Scenario I			
c_1	Normal[-3, 1]	−3	−1.699	[−2.835, −0.619]
c_2	Normal[1,1]	1	3.083	[1.002, 4.204]
	Scenario II			
c_1	Normal[-1, 1]	−1	−1.693	[−2.831, −0.612]
c_2	Normal[3,1]	3	3.089	[1.008, 4.213]

Note: The table reports the estimates of the two threshold parameters (c_1 and c_2) in the transition function under alternative prior specifications. Two different scenarios for the choice of priors, denoted as I and II, are considered. Compared with the benchmark priors in Table 1, scenario I features relatively lower prior values for c_1 but higher prior values for c_2, while scenario II features the opposite.

* The numbers in the square brackets are prior means and standard deviations.

Second, we check whether our estimates are robust to the method adopted in the estimation. In particular, as c_1 and c_2 are parameters that control the endogenous propagation mechanism, it might be desirable to use the quasi-likelihood (QL) method as a check when the priors of these parameters are not widely known (Del Negro and Schorfheide, 2008). Meanwhile, we also explore the maximum-likelihood (ML) method as a check since it is widely regarded as a complement to Bayesian estimation in the DSGE literature (e.g., Smets and Wouters, 2003; Sun, 2010). The results are presented in Table 3. From Table 3 we can see that both the ML and QL estimates are broadly similar to those obtained with Bayesian estimation (see Table 1), which gives additional credibility to the estimation of the parameters.

Table 3

Robustness to alternative estimation methods: Maximum-likelihood and Quasi-likelihood.

Parameter	Maximum-likelihood (ML)		Quasi-likelihood (QL)	
	Posterior estimate	Standard error	Posterior estimate	95% Confidence interval
c_1	−1.695	0.232	−1.698	[−2.786, −0.599]
c_2	3.088	0.516	3.085	[1.258, 4.137]

Note: The table reports the estimates of the two threshold parameters (c_1 and c_2) in the transition function using two alternative estimation methods: Maximum-likelihood (ML) and Quasi-likelihood (QL).

4. Policy analysis

After obtaining the estimated model and checking the robustness of the crucial parameters, this section proceeds to discuss whether the nonlinear Taylor rule provides a reasonable description of the monetary policy practice in China. In order to do so, the relative performance of the nonlinear Taylor rule versus the traditional linear rule in matching the properties of the data is investigated and the associated macroeconomic consequences are explored.

4.1. Comparing the estimation results with stylized facts

According to the estimation results in the previous section, the central bank of China (PBC) adopts a nonlinear Taylor rule and pursues an inflation target zone of [1%, 5%] in its conduct of monetary policy. This means that when the actual inflation rises above 5% or falls below 1%, the central bank will respond much more strongly to gaps of inflation, output and real exchange rate to stabilize the economy.

From the perspective of China's monetary policy practice, the above conclusion seems to be quite convincing as well. As shown by the dashed circles in Fig. 1, wherever inflation exceeds the bounds of the targeted inflation zone (the shaded area), there is a spike in the interest rate gap, implying a sharp reaction of the monetary policy. By comparison, when inflation is located within the targeted zone, the response of the interest rate seems to be smoother as well as much more moderate.

Another interesting result found in the model estimation is that the central bank of China generally does not react to the real exchange rate gap directly during times of moderate inflation, but will do so explicitly when there are large deviations of inflation from the targeted zone. This result is quite reasonable when the central bank tries to control inflation in an overheated economy with the anticipation of a domestic currency appreciation. The reason is that in an overheated economy accompanied by high inflation, an appreciation of the real exchange rate will cause large-scale inflows of foreign currency (hot money), resulting in even higher inflation and a more heated economy. In this case, reacting to the real exchange rate gap directly will make it easier for the central bank to control inflation and stabilise the economy.

The above situation occurred twice during the sample period: once in 2007–2008, and again in 2010–2012, as shown by the two dashed circles in Fig. 2. In fact, several years after China joined the World Trade Organization (WTO), large external surpluses and recurrent anticipation of RMB appreciation prompted the PBC to resort to a variety of monetary policy instruments, including the use of exchange rate interventions to control capital inflows (Li and Tsai, 2013). As a result, when the domestic economy is facing the dual threats of high inflation and RMB appreciation, it is appropriate for the PBC to respond to real exchange rate fluctuations via interest rate policy since this helps to balance capital inflows and is thus conducive to inflation control.

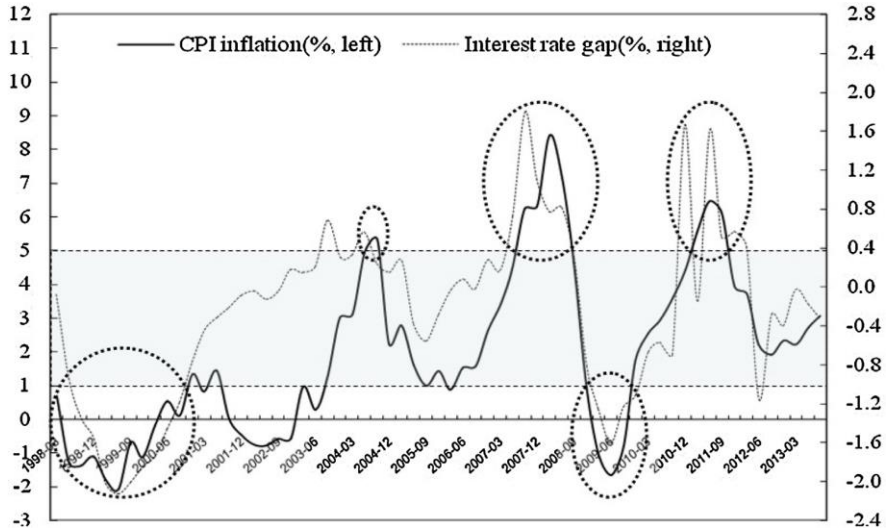

Fig. 1. Inflation target zone and interest rate behavior.
Note: The left y-axis represents the movements of the CPI inflation (%), while the right y-axis represents the values of the interest rate gap (%). The x-axis is the corresponding time period. The shaded area represents the upper and lower bounds of the targeted inflation zone, while the dashed circles indicate the time periods when actual inflation exceeds the bounds of the targeted zone.

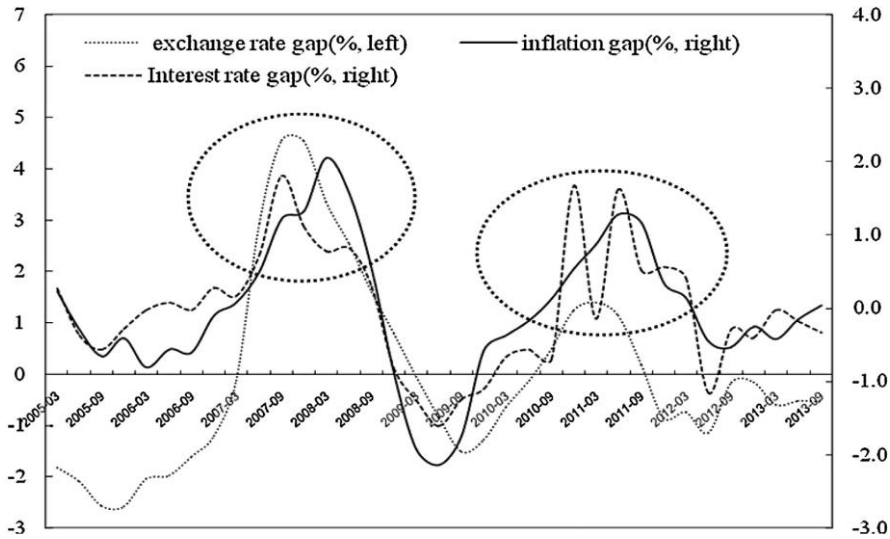

Fig. 2. Exchange rate, inflation and interest rate behavior.
Note: The left y-axis represents the movements of the exchange rate gap (%), while the right y-axis represents the movements of the inflation gap (%) and the interest rate gap (%). The x-axis shows the time period. The dashed circles indicate the two periods of high inflation associated with hot money during the observation period.

4.2. Linear versus nonlinear rule: macroeconomic implications

As mentioned in the introduction, most of the existing literature has implicitly assumed that China's monetary policy rule is linear. However, this is probably not true according to the empirical findings of this paper. Therefore, this section further explores how the two different rules may differ from each other and what would happen if we had taken a linear rule for granted. This is done by first comparing a set of standard statistics computed for the actual data to the same set of statistics computed for data simulated with the model. Second, the relative fit of the model with nonlinear monetary policy is explored, through comparison with the model with a traditional linear rule. Finally, some applications of the estimated model, including impulse responses, variance decompositions and welfare analysis, are explored to assess the associated macroeconomic consequences.

4.2.1. Assessing the fit of the estimated nonlinear model

Before conducting a comparative analysis of the differences between linear and nonlinear rule, it would be useful to assess the fit of the estimated nonlinear model first. This not only provides further insight into the validity of the model but also gives additional credibility to the relevant analysis based on it. After all, the conclusions drawn from the subsequent analysis (e.g., impulse response analysis and variance decomposition) would not be reliable unless the estimated model shows a good fit to the actual data.

Table 4

Data and model implied statistics.

Variable	Standard deviation		Autocorrelation (Order = 1)		Cross-correlation with output	
	Data	Model	Data	Model	Data	Model
Output	1.536	1.538	0.612	0.613	1.000	1.000
Inflation	1.181	1.180	0.720	0.723	0.417	0.416
Interest rate	0.485	0.483	0.801	0.797	−0.164	−0.165
Consumption	2.737	2.732	0.892	0.901	0.926	0.943
Exchange rate	3.746	3.630	0.795	0.804	0.838	0.851

Note: The table reports the second moment statistics (i.e., standard deviations, first order autocorrelations and cross-correlations with output) calculated from the actual data and those implied by the estimated nonlinear model.

As is standard in the literature, to assess the fit of a model to macroeconomic data, we present the second moments implied by the estimated nonlinear model and compare them with those in the actual data. In particular, we compute model-implied statistics for major macroeconomic variables by solving the models at the posterior means obtained from the estimation. Then the results of the model's second moments are compared with the second moments in the actual data to evaluate the model's empirical performance. The results are reported in Table 4.

In the first section of Table 4 (columns 2–3), we present the volatility measure (standard deviation) of the main macroeconomic variables and compare them to the ones implied by the model estimates. The results show that the standard deviations of output, inflation and interest rate implied by the model almost coincide with the data, while those for consumption and exchange rate also fit the data very well.

In terms of first order autocorrelations, which are presented in the middle section of Table 4 (columns 4–5), the estimated model performs successfully in generating results close to those observed in the data: the model-generated first order autocorrelations of output and inflation exhibit values very close to those implied by the data, while those for consumption, interest rate and exchange rate also fit the data reasonably well.

With regard to the cross-correlations with output (see the last two columns of Table 4), despite differences in magnitude, all the cross-correlations simulated from the model have the correct sign as those implied by the actual data. Although the cross-correlations of consumption and exchange rate with output are relatively higher than the values implied by the actual data, inflation and interest rate fit the data very well by giving nearly the same coefficients as those implied by the actual data.

Overall, the information presented in Table 4 indicates that our estimated nonlinear model captures the properties of the Chinese economy very well for the main macroeconomic variables, which gives additional credibility to the model as well as the relevant analysis based on it.

4.2.2. Comparing alternative model specifications: nonlinear versus linear

The analysis in the previous section shows that the estimated nonlinear model has a good fit to the actual data. However, this does not mean that the performance of the nonlinear model in matching the data is necessarily superior to the linear model. Therefore, in this section we further proceed to conduct formal model evaluations by comparing marginal data densities and the Bayes factors associated with the two alternative model specifications.

According to Geweke (1999), Bayesian inference provides a framework to assess the empirical performance of competing models by comparing the different specifications through their Bayes factor (posterior odds ratio). Kass and Raftery (1995) and Koop (2003) also argue that the Bayes factor (posterior odds ratio) represents a summary of the evidence of the data in favor of one model as opposed to another and thus is an ideal method for model evaluation.

We follow the standard literature (e.g., Geweke, 1999; Schorfheide, 2005; DeJong and Dave, 2007) to calculate the marginal data densities and the associated Bayes factors. The model comparison results with respect to the two alternative monetary policy rules (linear versus non-linear) are presented in Table 5, where the "linear rule" (M_1) in this table refers to the model estimated with a traditional linear Taylor rule given by Eq. (29), while the "nonlinear rule" (M_2) refers to the model estimated with a nonlinear Taylor rule given by Eq. (30), other things being equal. The second and third columns of Table 5 present the log marginal data density of each model and the associated Bayes factors, respectively. To facilitate comparison, the model estimated with a linear monetary policy rule (M_1) is used as a benchmark.

Table 5

Model evaluation: Log data densities and Bayes factors.

Model with different monetary policy rules	Log marginal data density $\ln p\left(Y^T \mid M\right)$	Bayes factor (versus M_1)
Linear rule (M_1, benchmark)	−375.12	1.00
Nonlinear rule (M_2)	−368.78	566.80

Note: The table reports log marginal data densities $\ln p\left(Y^T \mid M\right)$ and Bayes factors relative to the benchmark specification (M_1). The Bayes factor of the nonlinear model (M_2) versus the benchmark linear model (M_1) can be obtained from $\exp\left[\ln p\left(Y^T \mid M_2\right) - \ln p\left(Y^T \mid M_1\right)\right]$.

From Table 5 we can see that the marginal data density for the model with a linear monetary policy rule (M_1) is -375.12, while that for the nonlinear model (M_2) is -368.78, suggesting a model improvement by using the nonlinear rule. Furthermore, the Bayes factor of the nonlinear rule model (M_2) versus the linear rule model (M_1) turns out to be 566.80, implying that the nonlinear model (M_2) fits the data much better than the linear model (M_1). In fact, according to the criterion given by Jeffreys (1961), a Bayes factor above 100 provides "decisive evidence" in favor of the nonlinear model against the linear one. Hence, the results in Table 5 strongly suggest that the central bank of China does indeed conduct a nonlinear monetary policy, which is highly consistent with the observed stylized facts in Section 4.1.

4.2.3. Impulse responses

To gain insight into the dynamic properties of the two model specifications, we compare the impulse response functions (IRFs) of output and inflation with respect to the five structural shocks. Following Levin et al. (2005), all impulse responses are computed by simulating the model at the posterior means obtained in Section 3.3.

The impulse response functions are plotted in Figs. 3–7, where the "nonlinear rule" (represented by the solid line) refers to the estimated rule obtained in the previous section using Eq. (30), while the "linear rule" (represented by the dotted line) refers to the traditional Taylor rule specified by Eq. (29), other things being equal. From the impulse response functions in Figs. 3–7, we can see that although the model dynamics are very similar under the two different rules (with the exception of inflation to government spending shock), the variable fluctuations seem to be less volatile under the nonlinear rule in most cases. To be more specific, both of the output and inflation impulse responses show smaller deviations from the equilibrium level under the productivity shock and the inflation target shock. Even though the linear rule seems to have less output and inflation fluctuations in the face of interest rate and government spending shocks, the differences are very small. For the cost push shock, output impulse responses are less volatile under the nonlinear rule while the inflation impulse responses are less volatile under the linear rule.

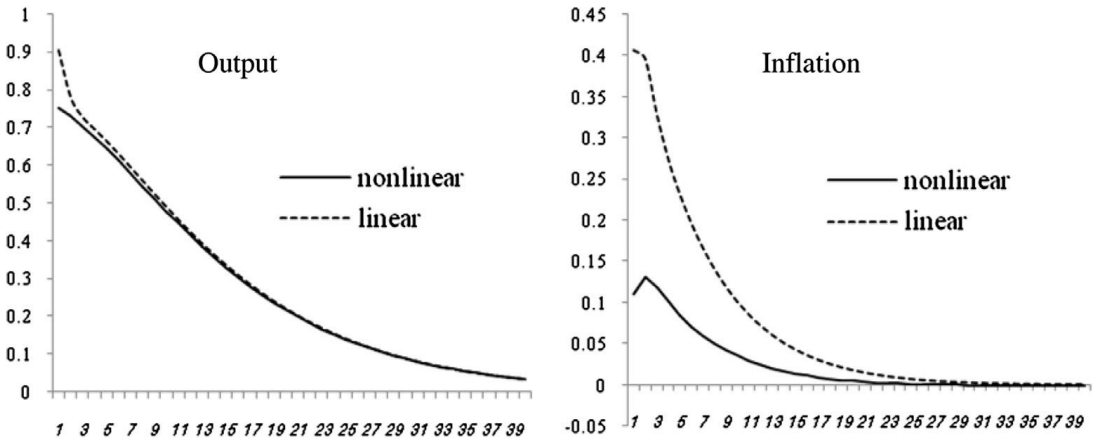

Fig. 3. Impulse responses to a productivity shock.

Note: The x-axis represents the time horizon (quarters), while the y-axis represents the impulse responses of output and inflation to a productivity shock. The solid line shows the impulse responses of the nonlinear policy rule given by Eq. (30), while the dotted line shows the impulse responses of the linear policy rule given by Eq. (29).

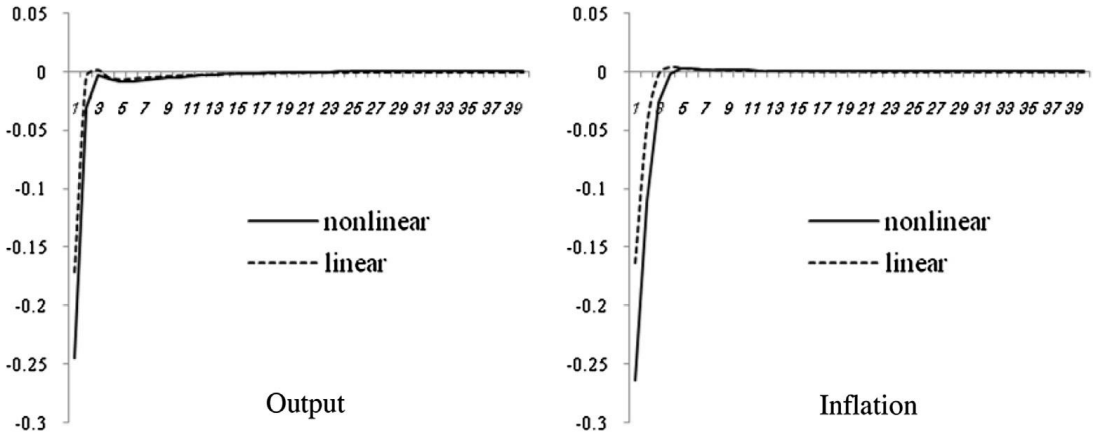

Fig. 4. Impulse responses to an interest rate shock.

Note: The x-axis represents the time horizon (quarters), while the y-axis represents the impulse responses of output and inflation to a productivity shock. The solid line shows the impulse responses of the nonlinear policy rule given by Eq. (30), while the dotted line shows the impulse responses of the linear policy rule given by Eq. (29).

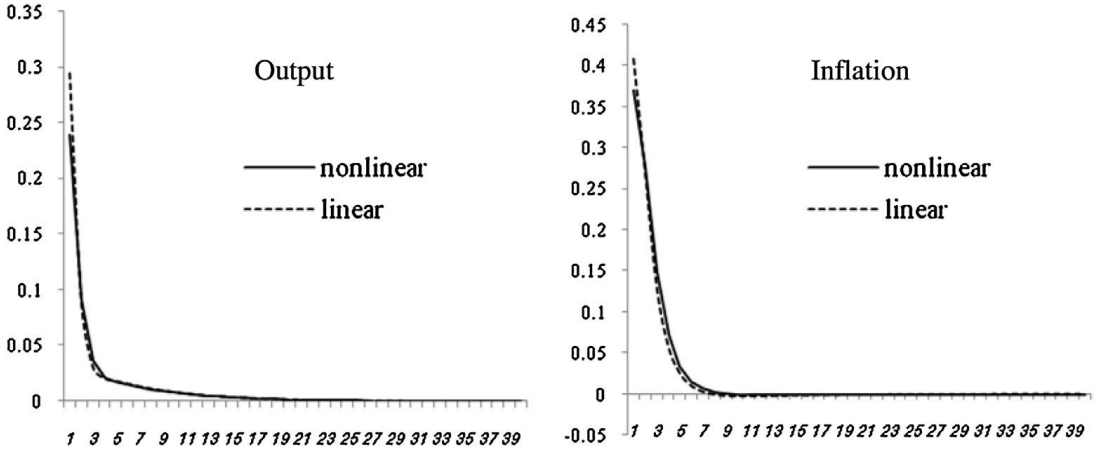

Fig. 5. Impulse responses to an inflation target shock.

Note: The x-axis represents the time horizon (quarters), while the y-axis represents the impulse responses of output and inflation to a productivity shock. The solid line shows the impulse responses of the nonlinear policy rule given by Eq. (30), while the dotted line shows the impulse responses of the linear policy rule given by Eq. (29).

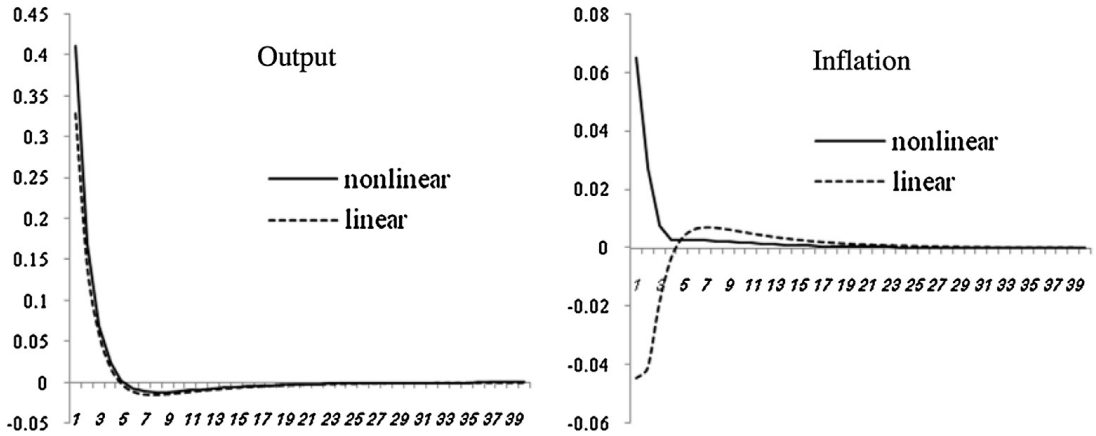

Fig. 6. Impulse responses to a government spending shock.

Note: The x-axis represents the time horizon (quarters), while the y-axis represents the impulse responses of output and inflation to a productivity shock. The solid line shows the impulse responses of the nonlinear policy rule given by Eq. (30), while the dotted line shows the impulse responses of the linear policy rule given by Eq. (29).

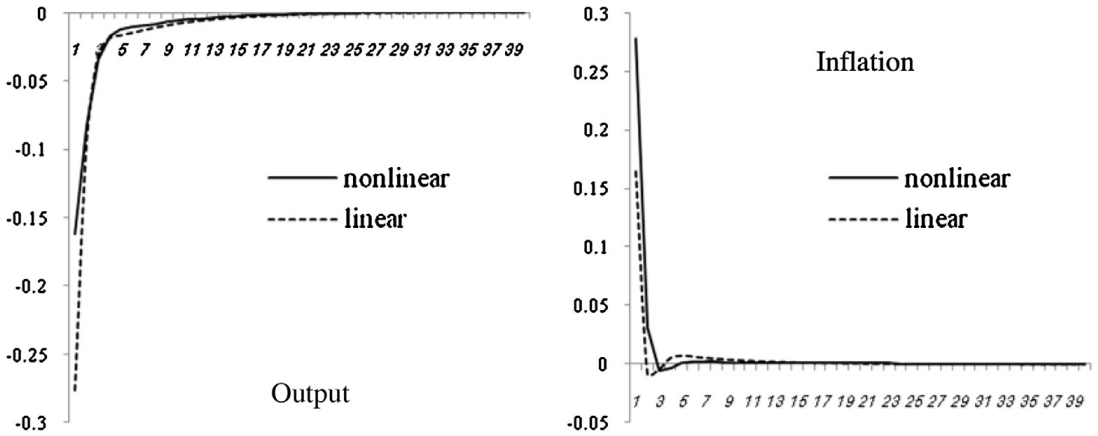

Fig. 7. Impulse responses to a cost push shock.

Note: The x-axis represents the time horizon (quarters), while the y-axis represents the impulse responses of output and inflation to a productivity shock. The solid line shows the impulse responses of the nonlinear policy rule given by Eq. (30), while the dotted line shows the impulse responses of the linear policy rule given by Eq. (29).

4.2.4. Variance decomposition

To measure the contribution of each of the structural shocks to the forecast error variance, this section provides variance decomposition analyses for output and inflation at various horizons, from the short run (1–4 quarters) to the medium (8–16 quarters) and long run (32–40 quarters). This analysis is also related to the welfare comparisons in the next section.

Let us first focus on the variance decomposition under the nonlinear Taylor rule model, as shown in Table 6. From Table 6 we can see that the most crucial shock for output variations is the productivity shock, which accounts for more than 90% of the variations in output in the long run. Even in the short run, over 60% of output variations can be attributed to the productivity shock. Turning to the determinants of inflation, we find that variations in inflation are mainly driven by the inflation target shock. In the short run, about 45% of the variations in inflation are explained by the inflation target shock, while in the long run it is nearly 50%. Note that the productivity shock and the cost push shock also play an important role in explaining inflation variations, with both accounting for about 16% of the variations in inflation. Overall, the results in Table 6 suggest that productivity shocks and inflation target shocks are the two most important sources of macroeconomic fluctuations in China.

Table 6

Variance decomposition: Nonlinear Taylor rule model.

Variable	Time	Structural shocks (%)				
		Productivity	Interest rate	Inflation target	Government spending	Cost push
Y	Q1	64.52	6.79	6.48	19.23	2.98
	Q4	84.90	2.51	2.78	8.39	1.43
	Q8	90.45	1.59	1.77	5.29	0.91
	Q16	92.90	1.18	1.32	3.93	0.68
	Q32	93.48	1.08	1.21	3.61	0.62
	Q40	93.50	1.08	1.21	3.60	0.62
π	Q1	4.09	23.12	45.51	1.42	25.88
	Q4	11.58	17.99	52.18	1.10	17.15
	Q8	14.89	17.25	50.35	1.06	16.45
	Q16	15.88	17.05	49.76	1.05	16.26
	Q32	15.93	17.04	49.73	1.05	16.25
	Q40	15.93	17.04	49.73	1.05	16.25

Note: The table reports variance decomposition (the contribution of each of the structural shocks to the forecast error variance) implied by the nonlinear Taylor rule model. The variance decompositions of output and inflation are calculated at various horizons, from the short run (1–4 quarters) to medium (8–16 quarters) and long run (32–40 quarters). Q1, Q4, Q8, Q16, Q32 and Q40 represent a forecast horizon of 1 quarter, 4 quarters, 8 quarters, 16 quarters and 32 quarters, respectively.

Table 7

Variance decomposition: Linear Taylor rule model.

Variable	Time	Structural shocks (%)				
		Productivity	Interest rate	Inflation target	Government spending	Cost push
Y	Q1	62.64	9.31	6.20	19.17	2.68
	Q4	83.07	5.22	2.26	8.24	1.21
	Q8	88.61	4.59	0.77	5.18	0.85
	Q16	91.05	3.88	0.60	3.81	0.66
	Q32	91.53	3.56	0.87	3.43	0.61
	Q40	91.55	3.56	0.85	3.43	0.61
π	Q1	3.24	26.85	43.79	1.40	24.72
	Q4	9.83	24.95	47.42	1.11	16.69
	Q8	13.24	22.58	47.25	1.06	15.87
	Q16	14.13	21.71	47.93	1.03	15.20
	Q32	14.15	21.03	48.74	1.02	15.06
	Q40	14.15	21.03	48.74	1.02	15.06

Note: The table reports variance decomposition (the contribution of each of the structural shocks to the forecast error variance) implied by the linear Taylor rule model. The variance decompositions of output and inflation are calculated at various horizons, from the short run (1–4 quarters) to medium (8–16 quarters) and long run (32–40 quarters). Q1, Q4, Q8, Q16, Q32 and Q40 represent a forecast horizon of 1 quarter, 4 quarters, 8 quarters, 16 quarters and 32 quarters, respectively.

Similar results are also obtained for the variance decomposition under the linear Taylor rule model, as shown in Table 7. From Table 7 we can see that productivity shocks and inflation target shocks remain the main driving forces of China's macroeconomic fluctuations, together accounting for 92.40% of the variations in output and 64.89% of the variations in inflation. However, in contrast to the results in Table 6, an interesting difference in Table 7 is that the contributions of the interest rate shock to variations in output and inflation are slightly higher, while the contributions of the productivity and inflation target shocks turn out to be slightly lower. Considering that the nonlinear Taylor rule model outperforms the linear Taylor rule model (as already shown in Section 4.2.2), these results suggest that the contributions of interest rate shocks to macroeconomic fluctuations might have been overestimated while those of productivity and inflation target shocks might have been underestimated if we had assumed a linear Taylor rule in

modeling China's monetary policy.

4.2.5. Welfare analysis

As is standard in policy analysis, in order to have a quantitative assessment of the macroeconomic implications associated with the two alternative monetary policy rules, we calculate the output and inflation deviations and employ the following intertemporal loss function to conduct welfare comparisons[11]:

$$\sum_{t=1}^{40}\beta^{t-1}(\hat{\pi}_t^2+\varphi\hat{y}_t^2)$$

where β is the discount rate and ' denotes the weight put on output deviations (Svensson, 1997). For simplicity, three representative scenarios (ϕ =0.5, 1, 2) are assumed in the analysis, with $\varphi =$ 0.5 representing a larger weight on inflation, $\varphi = 2$ representing a larger weight on output, and $\varphi = 1$ representing equal weights on inflation and output.

The results are reported in Table 8, where the last row shows the ratio of welfare loss between the nonlinear rule model and the linear rule model. A higher ratio means a relatively larger loss in the nonlinear rule and vice versa. It can be easily seen from Table 8 that the comparative results are largely in line with the previous findings. In all scenarios, the nonlinear rule outperforms the linear rule in the case of productivity and inflation target shocks, while the reverse is true in the case of interest rate and government spending shocks. For cost push shocks, the accompanying loss ratio depends on the weight structure assigned to the loss function, where the nonlinear rule is preferred for larger values of φ.

It should be noted that although the comparative advantage of the two rules seems to partially depend on the types of shocks, the nonlinear rule will always outperform the linear rule if we take into account the variance decomposition results. In particular, according to the variance decomposition analysis in the previous section, productivity and inflation target shocks are the two most important determinants of macroeconomic fluctuations in China because together they account for over 90% of the variations in output and over 60% of the variations in inflation. Consequently, as long as we take into account the relative importance of the shocks, the nonlinear rule will always be better as it outperforms the linear rule under both productivity and inflation target shocks in all scenarios.

Summing up the above analysis, it might be interpreted to show that the stabilization of the economy is an important motive in the conduct of China's monetary policy and the adoption of a

[11] It should be noted that although we use a quadratic loss function here to analyze welfare, as is the standard in the DSGE literature, with a nonlinear policy rule the loss functions are probably non-quadratic and of higher order (e.g., Woodford, 2003). Note also that, in the derivation of the nonlinear policy rule, one can either assume a nonlinear Phillips curve or non-quadratic preferences for the society. For a further discussion on this topic, one may refer to Nobay and Peel (2003), Boinet and Martin (2008), among others.

nonlinear Taylor rule seems to serve this goal in practice.

Table 8

Welfare comparison between the nonlinear rule and the linear rule.

Nonlinear rule	$\hat{r}_t = \rho_r \hat{r}_{t-1} + (1-\rho_r)[\phi_y(\hat{y}_t - \hat{y}_t^*) + \phi_\pi(\hat{\pi}_t - \hat{\pi}_t^*) + \phi_q \hat{q}_t] + (1-\rho_r)[\omega_y(\hat{y}_t - \hat{y}_t^*) + \omega_\pi(\hat{\pi}_t - \hat{\pi}_t^*) + \omega_q \hat{q}_t]G(\eta, c, \bar{\pi}_t)$				
Shock	Productivity shock	Interest rate shock	Inflation target shock	Government spending shock	Cost push shock
$\sum_{t=1}^{40}\beta^{t-1}\hat{y}_t^2(\%)$	527.93	14.82	15.85	50.30	8.04
$\sum_{t=1}^{40}\beta^{t-1}\hat{\pi}_t^2(\%)$	13.75	20.19	56.34	1.20	19.54
Welfare loss A1 ($\varphi = 0.5$)	277.72	27.60	64.27	26.35	23.56
Welfare loss A2 ($\varphi = 1$)	541.68	35.01	72.19	51.50	27.58
Welfare loss A3 ($\varphi = 2$)	1069.61	49.83	88.04	101.80	35.62
Linear rule	$\hat{r}_t = \rho_r \hat{r}_{t-1} + (1-\rho_r)[\phi_y(\hat{y}_t - \hat{y}_t^*) + \phi_\pi(\hat{\pi}_t - \hat{\pi}_t^*) + \phi_q \hat{q}_t]$				
Shock	Productivity shock	Interest rate shock	Inflation target shock	Government spending shock	Cost push shock
$\sum_{t=1}^{40}\beta^{t-1}\hat{y}_t^2(\%)$	604.74	7.25	22.79	33.32	20.64
$\sum_{t=1}^{40}\beta^{t-1}\hat{\pi}_t^2(\%)$	124.49	7.22	61.93	1.09	6.72
Welfare loss B1 ($\varphi = 0.5$)	426.86	10.85	73.33	17.75	17.04
Welfare loss B2 ($\varphi = 1$)	729.23	14.47	84.72	34.41	27.36
Welfare loss B3 ($\varphi = 2$)	1333.97	21.72	107.51	67.73	48.00
Loss ratio 1 (A1/B1)	0.65	2.54	0.88	1.48	1.38
Loss ratio 2 (A2/B2)	0.74	2.42	0.85	1.50	1.01
Loss ratio 3 (A3/B3)	0.80	2.29	0.82	1.50	0.74

Note: The table reports welfare comparisons between nonlinear and linear rules. The welfare loss is calculated by using a quadratic loss function $\sum_{t=1}^{40}\beta^{t-1}(\hat{\pi}_t^2 + \varphi\hat{y}_t^2)$, as in Woodford (2003) and Svensson (1997). Three representative scenarios are assumed, with $\varphi = 0.5$ representing a larger weight on inflation, $\varphi = 2$ representing a larger weight on output, and $\varphi = 1$ representing equal weights on inflation and output.

4.3. Further discussions and policy implications

To shed more light on our main findings, in this subsection we briefly discuss how our paper is related to previous studies and where the differences are. We also present some theoretical and policy implications that may be drawn from our results.

First, our results contribute to the vast literature discussing the sources of China's business cycle fluctuations. For example, in line with the results of He et al. (2009), we find that productivity shocks are an important source of business cycle fluctuations in the Chinese economy.[12] Another important finding of our paper is that inflation target shocks, which have been largely ignored in

[12] In the framework of a standard neoclassical open economy model with time-varying frictions, He et al. (2009) study the relative contribution of efficiency, labor, investment and foreign debt wedges to business cycles in China. The results show that productivity best explains the behavior of aggregate economic variables in China throughout the period of 1978–2006.

the previous literature on China's business cycles, also play an important role in China's economic fluctuations. In particular, nearly 50% of inflation variations can be attributed to inflation target shocks in the long run. This result is largely consistent with recent theories (e.g. Ireland, 2007; Fève et al., 2010) and indicates that the inflation target is an important factor that should not simply be ignored when modeling China's business cycle fluctuations.

Second, our results also add to the emerging literature on the effectiveness of monetary policy in China. Although significant efforts have been devoted to investigating the effect of monetary policies in China, there seems to be little consensus on the issue. For example, He et al. (2013) employ factor-augmented vector autoregression (FAVAR) to investigate the effectiveness of monetary policy instruments in China and find that market-based monetary policies such as repo and benchmark lending rates have little impact on the Chinese economy. However, there are also studies that suggest the opposite. For example, Xie and Luo (2003) estimate China's monetary policy rule using the standard Taylor rule and find that the reaction coefficients are statistically significant. Zhang (2009) investigates whether money supply or interest rate rules are more effective in managing the Chinese economy and finds that the price rule is more effective. Possible reasons that may explain the different conclusions in previous studies include differences in their theoretical foundations, datasets, and estimation methods. Thus, whether the price rule or the quantity rule is more effective is ultimately an empirical question. In this regard, our results add to the literature by showing that the price (interest rate) rule is effective in capturing China's monetary policy at least within the micro-founded DSGE framework.

Third, while our results show that China's monetary policy can be captured by the price (interest rate) rule, we also show that the nonlinear Taylor rule, which better describes China's monetary policy behavior in practice, outperforms the traditional linear Taylor rule in various aspects. In particular, both macroeconomic fluctuations and welfare losses are significantly lower under the nonlinear Taylor rule. These results not only provide new evidence that monetary authorities in emerging market economies like China may react in a nonlinear manner, but also shed light on the motives behind such a phenomenon: the adoption of a nonlinear Taylor rule can help to stabilize the economy and thus improve social welfare. In addition, given the fact that monetary authorities in many emerging market economies may actually react in a nonlinear manner, the use of a linear rule in modeling monetary policies in these economies may lead to biased conclusions.

5. Conclusion

In this paper, we extend a New Keynesian DSGE model by incorporating a transition function into the three-factor augmented Taylor-type rule to investigate monetary policy nonlinearities in China. Results from the Bayesian estimation suggest that the central bank of China indeed adopts a nonlinear Taylor rule and pursues an inflation target zone of [1%, 5%] rather than sticking to a rigid target.

Further evidence from stylized facts shows that the nonlinear Taylor rule provides a reasonable description of China's monetary policy practice during the sample period. Moreover, the results from impulse responses and welfare comparisons indicate that macroeconomic stabilization is an important motive in the conduct of monetary policy in China and the adoption of a nonlinear monetary rule seems to serve this goal better than the traditional linear rule.

Overall, our paper not only provides a new approach to investigate monetary policy nonlinearities within a micro-founded DSGE model, but also gives further evidence that monetary authorities in emerging market economies may react in a nonlinear manner. In this regard, the results of the paper suggest that central bankers in emerging market economies do not implement monetary policy blindly in practice. On the contrary, they use their discretion in implementing monetary policy according to the specific conditions that prevail.

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A tale of two markets for the redback

By Dong Jinyue and XIA LE

Summary

Chinese financial turmoil has thrown the RMB exchange rate under the spotlight. In particular, the gap between the RMB exchange rates in its onshore (CNY) and offshore (CNH) markets reached the historical high. This has motivated us to introduce this unique phenomenon of "one currency, two markets" of the RMB, and investigate the relationship between these two exchange rates.

The development of RMB offshore markets took off after China embarked on its ambitious plan to increase the usage of the currency in cross-border trade settlements. A "CNH" market is taking shape as the volume of offshore RMB experienced a period of fast growth and became increasingly active since its inception.

The segmentation between the CNY and CNH markets unavoidably led to a price differential, which cannot be fully eliminated as the currency's capital account inconvertibility limits the arbitrage behaviours across the borders. But for a while, two exchange rates tended to converge as China's on-going financial liberalization campaign has made the capital account increasingly porous.

The gap widened significantly again after the PBoC's RMB exchange rate reform on August 11 2015. The pricing power of the RMB shifted to the offshore market as our Granger Causality test shows that CNH's price-guide impact on CNY becomes stronger after the August 11 RMB reform; while CNY's price-guide effect on the CNH offshore market turns insignificant.

The authorities have prioritized the goal of stabilizing people's expectation for the RMB exchange rate and stemming capital outflows. They cut off the linkages between the two markets to impede the transmission of depreciation pressure across the border, which could lead to the stagnation of the offshore market.

The dramatic change of the CNH market largely mirrors the conflict between the exchange rate reform and RMB internationalization under strong depreciation expectation and escalating global uncertainty. In our opinion, the right sequencing should be the exchange rate reform first, then capital account opening and RMB internationalization.

Introduction

Recent financial turmoil has thrown the RMB exchange rate under the spotlight. More interesting is that the "redback" has two prices (CNY and CNH) quoted in its onshore and offshore markets with a significant and time-varying spread. On January 6, the gap between the CNY and CNH exchange rates reached 1,400 basis points. The pair of the RMB exchange rates has added difficulties for investors to understand this fast-rising currency and make their investment decisions. This report seeks to introduce this unique phenomenon of "one currency, two markets" for the RMB, and investigate the relationship between them.

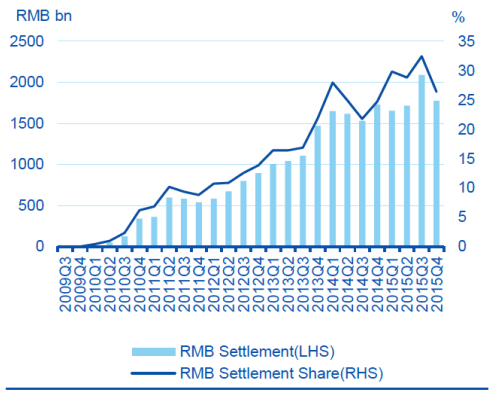
The rise of the RMB offshore (CNH) market

The development of RMB offshore markets took off after China embarked on its ambitious plan to increase the usage of the currency in cross-border trade settlements in the aftermath of 2008-2009 Global Financial Crisis (GFC). The successful progress of the RMB usage in cross-border trade settlements (Figure1) gave rise to a growing pool of RMB funds outside China and fuelled

the development of an offshore RMB market, even though the country hasn't fully opened its capital account.

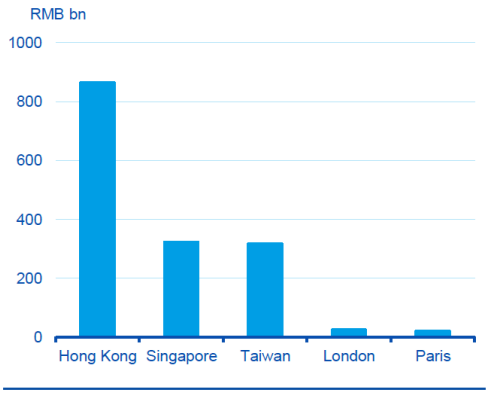
A "CNH" market is taking shape as the volume of offshore RMB experienced a period of fast growth. With its special relationship with China ("One Country, Two Systems") and excellent infrastructure as a well-established international financial centre, Hong Kong became the first offshore RMB business hub alongside the traditional onshore CNY market. In recognition of the RMB's rising power in the international arena, more global financial centres join the competition for offshore RMB business. (Figure 2)

Figure 1
Offshore RMB settlements have been increasing over time



Source: CEIC and BBVA Research

Figure 2
The rank of RMB offshore markets based on RMB offshore deposits (2014)



Source: CEIC and BBVA Research

The CNH market has become increasingly active since its inception. To date, the CNH market offers many types of RMB business and financial products including spot FX, deliverable forwards, swaps, deposits and CDs, Dim Sum bonds (RMB denominated bond issued in offshore market), RMB-denominated loans, etc. In its 2013 Triennial Central Bank Survey, the Bank of International Settlement (BIS) stated "…Renminbi turnover soared from $34 billion to $120 billion. The renminbi has thus become the ninth most actively traded currency in 2013, with a share of 2.2% in global FX volumes, mostly driven by a significant expansion of offshore renminbi trading".

One currency, two markets

In theory, the onshore (CNY) and offshore (CNH) RMB markets are segmented because China hasn't fully opened its capital account yet. There are various forms of restrictions limiting investors from transferring RMB funds between the CNY and CNH markets. The CNY market remains highly regulated by the People's Bank of China (PBoC). For example, access to the wholesale FX market is granted only to domestic banks, finance companies, and domestic subsidiaries of foreign banks. On the other hand, there isn't an official regulator in the CNH market. Local regulators can only apply their rules to financial institutions under their own jurisdictions. Indeed, these regulators have less appetite for imposing additional restrictions on offshore RMB business. Instead, they have been attempting to lobby China's authorities to relax their restrictions for cross-border RMB business because it could gain more business opportunities for their financial markets and institutions.

The segmentation between the CNY and CNH markets unavoidably led to a price differential

(Figure 3). The gap between the CNY and CNH rates was wider at the early stage of the CNH market development (2010 August-2011 January). During that period, the CNH rate appreciated more than the CNY one because the currency was less available in overseas market. Due to the fact that China's still closed capital account limited the arbitrage behaviours between these two markets, the price differential cannot be fully eliminated.

There were also a few episodes when the CNH interbank rates spiked due to the liquidity shortage in the offshore market, for example in October 2011. This type of liquidity shortage can quickly be fixed when the Hong Kong Monetary Authority (HKMA), with the PBoC's support, injected RMB liquidity into the offshore market.

Over time the CNY and CNH rates tended to converge as the PBoC steadily stepped up their efforts to liberalize the capital account and push forward RMB internationalization. Moreover, to boost the international usage of the RMB, the authorities also increased their tolerance of arbitrage behaviours which exploited interest and exchange rate differentials between the CNY and CNH markets. These efforts have proved to be effective in the sense that they have substantially increased the usage of the RMB in overseas markets and thereby enabled the "redback" to meet the International Monetary Fund's "freely usable" requirement for its inclusion in the currency basket of the Special Drawing Rights (SDRs) last November.

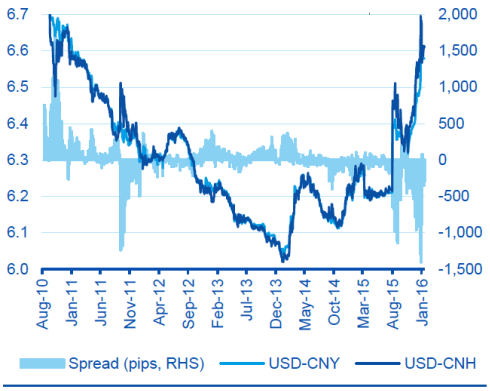
Pricing power shifted to the CNH market after the 2015 August devaluation

The gap between the CNH and CNY exchange rates started to widen again after the PBoC unexpectedly announced the reform of the RMB fixing price mechanism and devalued the currency by 1.9% on August 11 2015. (See our China Flash) In retrospect, the authorities seemingly intended to increase the flexibility of the RMB exchange rate. However, the timing of this move seems questionable as global financial markets were then surrounded by enormous uncertainties over the US Fed's monetary policy. As such, the unexpected RMB devaluation rattled investors and made the exchange rate anchorless. Panicked investors thought that China wanted to join the "currency war" and would depreciate the RMB much deeper to regain its competitiveness in exports. More pessimistic investors even interpreted that the devaluation itself was a signal of the economy implosion and scrambled to transfer their money out of the country. Policymakers' poor communication also hindered investors from learning the true policy intention at the first time.

To avoid too sharp depreciation and associated risk of accelerating capital flight, the authorities intervened into the CNY market again to stabilize investors' expectations. However, an unintended result is that the PBoC gave the pricing power of RMB to the offshore market because the CNH market was less affected by the government's interventions. Our Granger Causality empirical results (Refer to the BOX at the end) demonstrate that in the aftermath of the August devaluation, the CNH price tends to have a guide impact on the CNY price, while the CNY price has no significant guide impact on the CNH price.

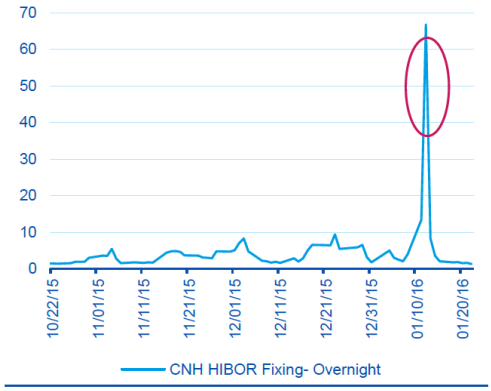
Since then, the CNH market has persistently priced a relatively lower value of the RMB than its onshore counterpart. The authorities thus faced a policy dilemma: the more interventions they did in the CNY market, the larger extent of depreciation was priced in the CNH market. In turn, the large depreciation pressure of the offshore market transmitted to the onshore market via cross-border arbitrage behaviors and consequently nullified the authorities' interventions.

Figure 3
The gap between onshore and offshore RMB became large again at the beginning of 2016



Source: CEIC and BBVA Research

Figure 4
Large discrepancy of CNY and CNH also leads to CNH inter-bank rate soaring in January



Source: CEIC and BBVA Research

The offshore market gave its way to the financial stability for the time being

Now the authorities have prioritized the goal of stabilizing people's expectation for the RMB exchange rate and stemming capital outflows. On top of introducing a basket currency index (CFETS) as the new anchor for the RMB exchange rate (see our recent China Flash), the authorities have also increased their interventions in the onshore market so as to establish their credibility of this new FX policy regime soon.

To solve the policy dilemma mentioned in the previous section, the authorities have adopted new approaches to deal with the offshore market as well. In particular, they cut off the linkages between the two markets to impede the transmission of depreciation pressure across the borders. In the meantime, the authorities deliberately reduced the RMB liquidity in the offshore market to raise the CNH interest rates. High interest rate levels will not only increase the attractiveness of holding RMB but also add financing costs for the RMB short-sellers in the offshore market. It is also believed that China's authorities are attempting to intervene in the CNH market via some Chinese banks' overseas subsidiaries. (Table 1)

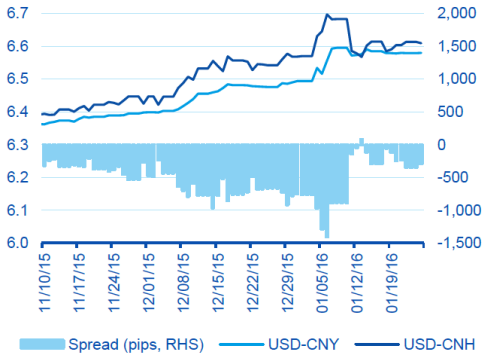
Table 1
The recent PBoC's interventions to the onshore and offshore RMB market

Time	The PBoC's interventions on offshore RMB market
September-15	The PBoC increased the transaction fee of foreign banks' spot RMB purchase and sale from the previous 0.0001%-0.0002% to 0.3%.
September-15	Some big Chinese banks started to buy offshore RMB and exchange them to USD at a high cost, which was deemed to be at instigation of the PBoC.
November-15	To tighten the RMB liquidity in the offshore market, the PBoC stopped to provide cross-border finance to the offshore banks' RMB account; also, the offshore RMB settlement banks' bond repurchase business are stopped as well.
December-15	The PBoC announced that starting from 2016, the interbank market FX trading time will be expanded till 23:30, to promote a more coincident exchange rate of onshore and offshore market.
December-15	The PBoC implemented window guidance to some foreign banks to temporarily stop their FX trading.
January-16	The PBoC announced that it will implement Reserve Required Ratio (RRR) on the RMB deposits by foreign financial institutions' mainland branches

Source: The PBoC website and BBVA Research

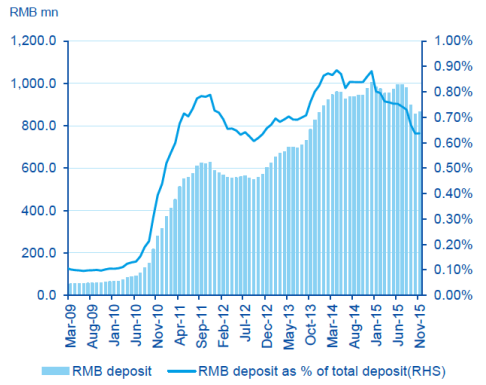
These new measures seem to be effective in the recent weeks as the authorities managed to align the CNH rate with the CNY. (Figure 5) However, these measures bear a high cost. They indeed have dampened foreign investors' interest in the RMB and have largely weakened the price discovery function of the CNH market. The depth of the offshore market is also adversely affected, which means that the CNH interest and exchange rates will inevitably become more fickle. All in all, these measures will sacrifice the development of the offshore market, which is a serious setback for RMB internationalization. (Figure 6)

Figure 5
The authorities managed to align the CNH rate with CNY through intervening offshore market…



Source: CEIC and BBVA Research

Figure 6
…but these measures might sacrifice the development of the offshore market



Source: CEIC and BBVA Research

When will the CNH market thrive again?

The dramatic change of the CNH market largely mirrors the conflict between the exchange rate reform and the RMB internationalization under strong depreciation expectation and escalating global uncertainty. Under such a circumstance, the right sequencing issue becomes more pronounced than before. Although China's authorities have been pushing forward a number of financial liberalization reforms on multiple fronts simultaneously, now it seems to be the right time to fine-tune the agenda and rearrange the order. In our opinion, the right sequencing should be the exchange rate reform first, then capital account opening and the RMB internationalization. We believe that the authorities' priority is to link the RMB value to a basket of currencies in order to stabilize market expectations and avert large-scaled capital exodus. The CNH market could suffer a period of stagnation until China's authorities established its credibility of the new FX policy regime. That being said, the CNH market is likely to regain its prosperity in the next couple of years as capital account liberalization and RMB internationalization are back on the top of the authorities' reform agenda again.

Box 1. CNH's price-guide mechanism becomes stronger after the 2015 August 11 RMB reform based on Granger Causality test

We deploy Granger Causality test to illustrate that CNH's price-guide impact is increasing after the 2015 August 11 RMB exchange rate fixing price reform. Among many of the causality test methods in time series studies, Granger Causality test is the most widely used and intuitively straightforward.

The basic idea of Granger test is that X is said to Granger-cause Y if Y can be forecast better using past Y and past X than just past Y. To implement the idea, we normally do the regression from Y on the past X and past Y in the time t-1, t-2, etc. (lags are determined by some statistically

optimal choice), and to test whether the F-test of all the past X's coefficients are jointly significant. We basically test the mutual Granger causality relationship between CNY and CNH exchange rate in two regions: before and after the 2015 August 11 RMB reform. The first time window is from August 23, 2010 to August 10, 2015 and the second time window is from August 11 2015 to January 15, 2016.

Table 2 is the summary of significance level of the F-statistic of our Granger Test. (Table 2) Our results show that: (1) CNH to USD exchange rate could Granger-cause CNY to USD exchange rate both before and after the August 11 RMB exchange rate reform; (2) CNY to USD exchange rate can Granger-cause CNH to USD before the reform, however, it cannot Granger-cause CNH to USD after the reform.

The empirical results indicate that CNH's price-guide impact on CNY becomes stronger after the August 11 RMB exchange rate reform while CNY's price-guide effect on the CNH offshore market turns weaker after the reform. That said, the price-guide mechanism of CNH/USD was much amplified after the RMB exchange rate fixing price reform.

Table 2

Summary of Granger Causality test result

		Regress CNY on CNH (lag=8)	Regress CNH on CNY (lag=8)
Before the August 11 Reform	F-statistic	3.335	3.798
	significance level	0.0008***	0.0002***
Before the August 11 Reform	F-statistic	6.986	1.322
	significance level	0.0000***	0.2279

Notes: *** means F-test is significant at 1% level; no * means it is not significant at 1%, 5% or 10% level.
Source: BBVA Research

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[xv] BIS (2018): Debt securities statistics www.bis.org/statistics

[xvi] IMF (2018): Currency composition of official foreign exchange reserves (COFER). www.data.imf.org

[xvii] The following section follows closely Chan, Sarah (2017): ibid, p 56.

[xviii] Xinhua New (2018): Chinese Premier announces establishment of China-CEEC Inter-Bank Association 27 Nov www.xinhuanet.com

[xix] Euromoney (2018): Nigeria swap deals show RMB's African rise. By Kanika Saigal, 1 October www.euromoney.com

[xx] International Capital Markets Association and DaGong Global Credit Rating have set up a Silk Road Working Group in Hong Kong. See Chan, Sarah, ibid, p 63.

IMI News

- On October 9, the 100th Great Financial Thought Salon was held. Zhang Jie, Director of International Monetary Institute & Professor of School of Finance, was invited to the salon as the keynote speaker. During the meeting, various questions raised by Professor Zhang also caused the collisions of thoughts and consonance among the guests. Other guests such as Wei Benhua, Wei Gejun, Wang Guogang, Xiao Ruiyan, Wang He also expressed their opinions and conducted in-depth exchanges on the above issues, which were fruitful, vivid, and interesting.
- On October 10, the 101st edition of Macro-Finance Salon was held. Dr. Wang Wei, Contract Research Fellow of IMI, Managing Director of Bank of China International (BOCI) and Deputy Director of the Research Department of BOCI, attended this salon as a keynote speaker and delivered a speech titled "A Quantitative Analysis of Sino-US Trade Relations and Current Problems". During the discussion, the guests exchanged many thoughts with each other and with Dr. Wang Wei. They discussed multiple issues, including the impact of China-US trade conflict on the future of China's economy and the possibility of a shift in the international trade landscape. Dr. Wang Wei gave detail explanations on these issues.
- On October 15, the "Big-financial academic seminar"(103rd session) and the "numismatic society academic seminar"(4th session) were held in classroom 0202 of the Mingde Law Building in Renmin University. These sessions focused on "Gresham's Law in Action in the History of Chinese Currency", chaired by Professor He Ping of the Department of Monetary Finance from Renmin University's School of Finance. The featured guest speaker is Dr. Cheng-Chung Lai, professor emeritus of National Tsinghua University (Taipei).
- On October 18, the International Monetary Fund Published the "Report on World and China Economic Outlook" in Beijing. The International Monetary Fund (IMF) Representative Office in China, the International Monetary Institute of China Renmin University (IMI), and Huachuang Securities Co., Ltd. co-hosted the publishing ceremony of the Report on the World and China Economic Outlook at the Beijing Financial Street International Hotel.
- On October 19, the Great Financial Thought Salon (No. 102) was held. As the keynote speaker, Jin Yu, the Secretary of the Party Committee and Chairman of the Bank of Shanghai, delivered a speech entitled "Observation and Reflection on Structural Deleveraging from the Perspective of Commercial Banks". During the round-table discussion, the guests actively interacted and exchanged ideas on how to deleverage, take supply-side reform, and make regulatory policies. In the questioning session, students and guest teachers discussed the structural deleveraging.
- On October 25, the "2018 Tianfu Financial Index Conference and Money Finance Roundtable • 2018 Autumn" hosted by the International Monetary Institute (IMI) of Renmin University of China was held in Chengdu. The forum invites famous financial experts from home and abroad to discuss the path of monetary and financial reform and development, with a view to providing a credible policy for the formulation and implementation of China's international financial strategy.
- On October 30, 2018, the Great Financial Thought Salon (No. 104) was successfully held in Room 509 of Mingde Main Building, Renmin University of China. Mr. Fu Chuanyong, senior expert of AMRO (ASEAN and Japan-China-Korea Macroeconomic Research Office) and Mr.

Liu Xinyi, an economist at AMRO, gave keynote speeches on the theme of "International Monetary System and Its Impact on East Asia". After the speech, the host Wei Benhua expressed his thanks on behalf of all guests. And as the founder of AMRO, he also put forward his opinions. Zhang Zhixiang also shared his insights about the theme of this Macro-Finance Salon.

- On October 31, the internal seminar of the Macro-Finance Salon (No. 105) was held. On this salon, Xu Jiankang, advisor to the Social Science Department of Social Science in China Press, was invited as the speaker and delivered a speech on the topic of "the rise and fall of great powers and the long period of hegemony". The academic member of IMI and the deputy president of University of International Business and Economics Ding Zhijie, the dean of the School of Economics in Jilin University, the Changjiang Distinguished Professor Li Xiao and the Professor Xie Fusheng of School of Economics of Renmin University attended the salon and gave their remarks. The salon was hosted by Di Dongsheng, the special research fellow of IMI and the deputy dean of the School of International Studies.
- On November 7, the Macro-Finance Salon (No. 106) was successfully held. This salon explored RMB exchange rate and macro-economic status quo. Guests invited included Tu Yonghong, the Deputy Director of IMI and Professor from the School of Finance in RUC, Professor Dai Wensheng from the School of Finance in RUC, Chang Ming, Deputy General Manager of Jin Chengsheng Asset Management Company and Panda Trader, Li Gongfu, Senior Trader of Bank of China, and Zhang Lu, chief macro analyst of Caixin Think Tank Monita Research. The salon was hosted by Zhang Yu, IMI researcher and head of macro research at Huachuang Securities.
- On November 9, the Macro-Finance Salon (No. 107) was successfully held. Special guest invited as the keynote speaker included Zhou Yinggang, the professor at the School of Economics in Xiamen University, and vice president of the Wang Yanan Institute of Economics. He delivered a keynote speech on "Is the influence of the RMB on the Belt and Road Countries Enhanced?" Tu Yonghong, deputy director of IMI, was a guest speaker who commented on the speech. The lecture was hosted by Wang Fang, IMI Special Researcher, assistant to the Dean of the School of Finance and Finance in RUC, and Associate Professor.
- On November 12, Tao Xiang International Financial Lecture (No. 14) was successfully held at Room 2221, Teaching Building 2, Renmin University of China. Li Biao, President of CCB London Branch, delivered a speech on Operation and Management of Overseas Chinese Banks. Mr. Tu Yonghong, Deputy Director of IMI & Professor of School of Finance, hosted the lecture and students of School of Finance and guests from academic and commercial circles participated in the lecture.
- On November 13, Chinese and Foreign Financial Technology Roundtable Conference was held in Hangzhou by Zhejiang University Internet Finance Research Institute (AIF, ZJU). Han Seung-soo, Former Prime Minister of Korea, Co-Chairman of International Finance Forum (IFF), and President of the 56th UN General Assembly, joined IMI International Committee as Chief Advisor. Mr. Ben Shenglin, Co-Director of IMI & Dean of AIF, ZJU granted a letter of appointment.
- On November 21, the McKinnon Lectures（No.13）was held. Mr. Edmond Alphandéry, the President of the Euro50 Group and Former French Minister of Finance, was invited as the keynote speaker. He delivered a keynote speech on "Global Monetary Policy Observation and Financial Risk Prevention". The lecture was chaired by Zhang Zhixiang, IMI Academic Committee member，Former Executive Director for China in IMF and Professor at the School of Finance. Wei Benhua, IMI Academic Committee member，Former Deputy Director of the

State Administration of Foreign Exchange and Former Executive Director for China in IMF，Xiang Songzuo，Deputy Director of IMI，Former Chief Economist of Agricultural Bank of China，and Zhao Xuankai，Researcher of IMI，Lecturer of the China Center for Internet Economy Research，Central University of Finance and Economist，attended the seminar.

- On November 28, Macro-Finance Salon (No.108) on "Financing Issues of Non-state Companies" organized by IMI was successfully held. This salon is called on by Sun Chao, the IMI researcher and vice general manager of the fixed income in Changjiang Securities. Guest keynote speakers include Wu Ge, Xia Le, Yin Ruizhe, Su Li, Liao Zhiming and Chen Xiaoliang. Other guests include Chen Hao, Guo Yumei, Hu Hengsong, Peng Bo. This salon was hosted by Song Ke.
- On November 28, the 15th Tao Xiang International Finance Lecture was successfully held. The guest lecturer Mr. Mu Changchun is the Deputy Director of the Payment and Settlement Department of the People's Bank of China. His lecture is titled Fintech's Current Development and its Supervision in China. Deputy director of the IMI Professor Tu Yonghong of the School of Economics and Finance, presided over the lecture. The lecture is also attended by IMI Special Researcher Wang Fang, IMI researcher Hu Bo, students and teachers from the School of Economics and Finance, as well as guests from academia.
- On December 12, Tao Xiang International Finance Lecture (No. 16) was successfully held. Toyoki Oka, President of Mizuho Bank China Ltd., gave a speech on Finance Supporting Industries and Japan's Economic Outlook in 2050. The lecture was hosted by Prof. Tu Yonghong, deputy director of IMI and professor from the School of Finance in Renmin University of China. He Ping, associate professor from the School of Finance in Renmin University of China, teachers and students of the School, and guests from the academia and industries also participated in the lecture.
- on December 13, the first term of the "Global Leadership" series (No. 109) was successfully co-hosted by IMI and the School of Finance of RUC. Han Seung-soo was IMI international senior consultant , co-chairman of the International Finance Forum, president of the 56th UN General Assembly, and former South Korean Prime Minister. He and his wife joined salons and delivered speeches.
- On December 20, the "China-US Economic and Trade Confrontation and International Order" Symposium and the 110th Macro-Finance Salon jointly sponsored by the Economic and Political Studies (EPS) of the Renmin University of China and the International Monetary Research Institute (IMI) was held at RUC. Professor Donald Lien of the School of Business at the University of Texas at San Antonio, Mr. Zhuang Tailiang, Executive Director of the Institute of Global Economics and Finance of the Chinese University of Hong Kong, Di Dongsheng, Associate Dean of the School of International Relations at RUC, Ding Haoyuan, Associate Professor of the School of Business at Shanghai University of Finance and Economics, Li Wei, professor of the School of Relations at RUC, Lu Liping, Assistant Professor of the University of Amsterdam, Qian Zongxin, Associate Professor at the School of Finance and Economics of RUC, Qu Fengjie, Director of the Institute of Foreign Economic Research of the National Development and Reform Commission, and Zhu Wenyu, IMI Researcher and other scholars attended the meeting and gave speeches.
- On December 23, the first China Finance Ph.D. Student Forum——the Annual Conference of the 15th Anniversary of China Finance was held in Beijing. Experts, scholars and doctoral students from various universities gathered together to witness the first academic seminar of the first China Finance Ph.D. Student Forum and the Annual Conference of the 15th Anniversary of *China Finance*.

Call for Papers

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