International Monetary Review

July 2023, Vol. 10, No. 3

INTRODUCTION TO THE INTERNATIONAL MONETARY INSTITUTE (IMI)

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

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

WeChat

We only share the most valuable financial insights

CONTENTS

Special Column on Reform of International Monetary System

Prospect of the International Monetary System*

By ZHANG ZHIXIANG *

The three year long pandemic and over one year of the Russian-Ukraine military conflict have indeed created tremendous difficulties and uncertainties for the global economic development and the international monetary system. Global supply chain has split, production chain has also divided and international payment system has fragmented. Once again, the prospect of the international monetary system has become one of the important focuses in the economic and financial circles.

The current international monetary system, known as the Bretton Woods System is a global public good with the main purpose as outlined in the IMF's Articles of Agreement for promoting the expansion and balanced growth of international economic development by promoting exchange stability to maintain orderly exchange arrangement among members. However, the dollar gold par value system expressed by US$35 for one ounce of gold collapsed in 1971. As early as in 1960, Robert Triffin published his famous paper known as Triffin Dilemma in which he tried to explain US dollar being the only reserve currency, it is impossible to maintain dollar par system. However, the real picture is that according to the statistics published by the UN trade and development committee, total volume of global commodities export reached US $50 billion in 1948, but it jumped to US$353.6 billion, registering an increase of more than 7 times, while the international gold reserve increased only from 30,183 tons to 36,575 tons with an increase of only 21% in the same period of time.

During the floating exchange rate in the post Bretton Woods System of more than 50 years, more than 100 financial crisis took place in the world. There have been four major types of crisis, namely the US dollar crisis and the Latin American financial crises, which are called the fundamental crises, as the economic targets and policies were mismatched and in conflict causing financial problems. The second type of crisis is named as "self-fulfilling", which explains that as monetary policy has self-fulfilling character and in the process of transmission of monetary policy, the herding and contagion effect resulting in dissymmetrical phenomenon in the market. The North European banking crisis, the Japanese banking turbulence, the Mexican financial crisis, the Russian financial crisis and the Brazilian financial crisis all belong to this group. The third type of crisis is called "moral hazard" induced crisis. Enterprises borrow with banking sector's guarantee. However international creditors evaluate risks according to the overall debt service ability of the economy. When the international creditors believe that the enterprises borrow too much, capital flow to the economy reduces sharply and very quickly. In Asia, domestic banks lend to enterprises based on sufficient collateral provided. When foreign banks found the Asian enterprises borrowed too much foreign currency debt, they began to reduce and even drastically cut down their financial presence within a very short time. The forth type of crisis is related to "asset bubble". 2008 global financial crisis is a good example.

Here it should be pointed out that all the international financial crises are related to and even triggered by disequilibrium movement of liquidity. The Asian financial crisis can serve as a good example. The international multilateral banks lent to Indonesia, Korea, Malaysia and Thailand in 1971 US$ 18.4 billion totally, but in the second half of 1997 fell to negative US$ 20.3 billion and in the first half of 1998, fell further to negative US$46.9billion. The private capital net flow of capital to the same group of countries

---

was US$65.2 billion in 1996, but it fell to negative US$20.4 billion in 1997 and to negative US$25.6 billion in 1998. Foreign direct investment to these countries was US$10.3billion, but fell to US$8.6 billion in 1998. Foreign investment in security markets to the same countries was US$12.9 billion, but fell to negative US$6 billion. Therefore, it has become a most important and urgent issue for the international community that capital flow under strict supervision and control.

How to supervise and deal with irregular flow of capital is not a new issue in the IMF. Back in 1972, when the Articles of Agreement of the Fund was amended, this issue was discussed and debated. However, this problem still exists. It has been suggested that international liquidity should be made a global public good. The international community is able to supervise and effectively cope with the disequilibrium flow of capital. He continued to propose that SDR should well be in the position to play the role of curbing the spill-over effect caused by the irrational flow of liquidity. Since financial crisis can involve 10 to 20 percent of world GDP. The IMF must have at least US$10 trillion reserve in SDRs. It is very difficult to envisage that SDR allocation can increase to that amount from current size of only about US$ one trillion. In IMF, allocation of SDR is an important issue which needs 85% of vote for approval. What is more, the distribution of SDR in the IMF is undertaken according to the percentage of member's quota. It is very difficult if not impossible to implement it, though it can be a good proposal. Therefore, it has further been suggested that a sequenced approach be adopted and formulated. For instance, some basis reform of SDR should be made, such as SDR can be used for trade settlement and SDR holders can transfer their SDRs to other members in the fund. It is believed that these reforms can well play an important role for paving the way for SDR playing the key role to facilitate making international liquidity a global public good in the international monetary system.

Serving as a 2nd best, regional monetary cooperation can well help protect the safety of the economies in the region. This is also recognized as a part of the sequenced agenda in making international liquidity a global public good. The Chiang Mai Initiative can continue to play a great role for promoting formation of greater monetary cooperation in the region. Sharing what we Asian countries have already learned from 1997 financial crisis, ASEAN plus three can play an active role promoting necessary reform of SDR as mentioned earlier. On March 28, when ASEAN financial ministers and central bank governors met, they called for trade settlement in local currencies. This ideal proposal can well be undertaken in the whole Asian region at large. It was reported that Malaysia had proposed for building up an Asian monetary fund, which can well help build a safety net for our region especially at time when we face unprecedentedly a great amount of uncertainties and challenges worldwide.

The IMF and the World Bank held their Spring meeting on April 10, 2023. The World Economic Outlook Report and the Global Financial Stability Report issued by the Fund have both emphasized that recent events in the United States have been a reminder that funding can disappear rapidly and even events at smaller banks can have systemic implications by triggering widespread loss of confidence and rapidly spreading across the financial system, amplified by technology and social media. Once again, it is of vital and imperative significance to keep liquidity under effective control and make international liquidity a global public good.

The Asian Development Bank has made great contribution to the economic and social development in our region. We are happy to meet and discuss the prospect of international monetary system during the 56th ADB annual meeting in the beautiful city of of Incheon, Korea. Let us wish the current ADB annual meeting every success.

A Short Review of the International Monetary System and Future Prospects

By IL HOUNG LEE [*]

There was growing expectation in the early 2010s that with the shift in economic balance toward Asia, notably China, the share of the RMB in international payments would rise, culminating in a tripolar currency system consisting of the US dollar, the Euro and the RMB. [1] Even then, the US Dollar was expected to remain as the main reserve currency and a store of value in the foreseeable future. Since then, the use of the RMB as a settlement currency has steadily expanded and the centrality of the US dollar in the International Monetary System (IMS) has further cemented with the expansion of the global financial market. Going forward, the structure of the IMS will be shaped, plausibly, by the evolution of geopolitical tension (an issue outside the scope of this note), China's capital account openness, and the introduction of Central Bank Digital Currency (CBDC). This note asks a couple of questions on the current IMS to assess what else might be involved in the future path of the IMS.[2]

1. Has the centrality of the US dollar in the IMS cemented?

The dominance of the US dollar in the IMS reflects its strong demand as a medium of exchange, store of value and unit of account. Inertia in demand rests in the natural advantage of the incumbent, e.g., the network externalities,[3] or equivalently market liquidity, i.e., conversion into goods and services at minimum cost at short notice. In particular, the store of value motive is guided by the expected future value of the currency as well as "future prospects" of market liquidity, i.e., global demand for a currency is determined by the market's expectation of the issuing country's long-term growth prospects which presumes stability of the governance structure and full access to the capital market.

The International Investment Position (IIP) of a country can be regarded as a measure of demand for the currency it issues. IIP data indicate strong preference for the US as an investment destination and equivalently for the US dollar. The US accounts for 26% of global IIP Liabilities and 18% of assets in 2021. Its assets and liabilities combined amounts to 3.5 times of its GDP, which compares with 1.8 times its GDP about two decades ago, notwithstanding valuation changes. This huge increase took place at a time when the size of the global IIP itself rose from US$63 trillion to US$403 trillion, cementing the centrality of the US dollar in the global financial market even though its relative GDP share has declined.

Countries with convertible currency tend to have a high share of their IIP liabilities denominated in their own currency, e.g., around 93% of US' IIP liabilities are held in US dollar. Relating to debt claims, domestic currency share in the US stands at 80% which is comparable to Germany's 77% in Euro.

Table 1. Currency composion of IIP in Selective countries, 2021

	IIP Liab.	Debt Claims				
	US	US	GER	JPN	RUS	IDN
In USD bn						
Total	23,316	10,523	7,235	4,554	579	193
In % of US Liabilities						
Total	100.0	45.1	31.0	19.5	2.5	0.8
Domestic currency	92.5	36.1	23.8	4.5	0.4	0.0
Foreign currency	7.5	9.0	7.2	15.0	2.1	0.8
U.S. dollar			4.3	9.5	1.4	0.5
Euro	4.2	3.8		3.1	0.6	0.0
Yen	0.5	1.1	0.1		0.0	0.0
Other currencies	2.8	4.1	2.8	2.4	0.1	0.3

Sources: IMF IIP and author's estimates

Fed's provision of dollar liquidity swap lines to several OECD countries, including additional temporary ones during heightened global financial risks provided further assurance on the resilience of dollar liquidity. Countries with non-convertible currencies tend to hold understandably a larger portion of their debt claims in US dollar, a mirror image of the composition of international reserves.
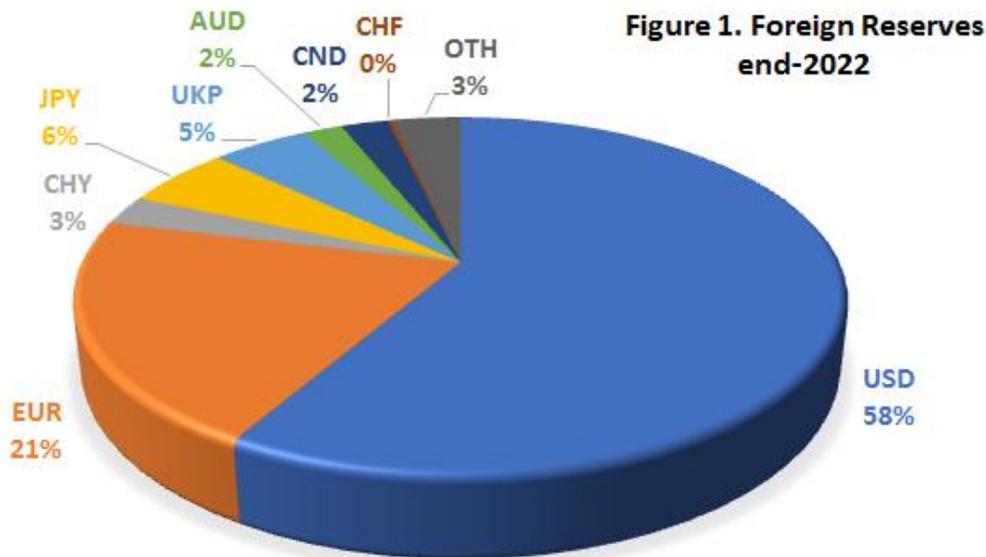
Sources: IMF data

The strong influence of monetary condition in the US financial market over other countries, at least through the first half of 2010s is supported by quantitative assessments. One such study[4] covering 12 OECD countries over 1995-2014 (annual data) indicates a strong US liquidity (credit instruments plus financial equity) spillover on other advanced economies. A one percent increase in US liquidity/GDP ratio is associated with a 0.7 percent increase in other countries' respective liquidity/GDP ratio.[5] In fact, during this period, the (simple) average of these 12 countries' liquidity grew from 3.1 times to 4.7 times their respective GDP.

---

[4] "Redefining Liquidity for Monetary Policy" K. Kim, I.H. Lee, W Shim, East Asian Economic Review, Vol 22 No.3, September 2018

[5] Three-stage least squares (3SLS) and two-step GMM; robust standard errors indicate significance at the 1-percent level.

Figure 2. Liquidity (Financial assets) of 12 OECD countries (As share of GDP)
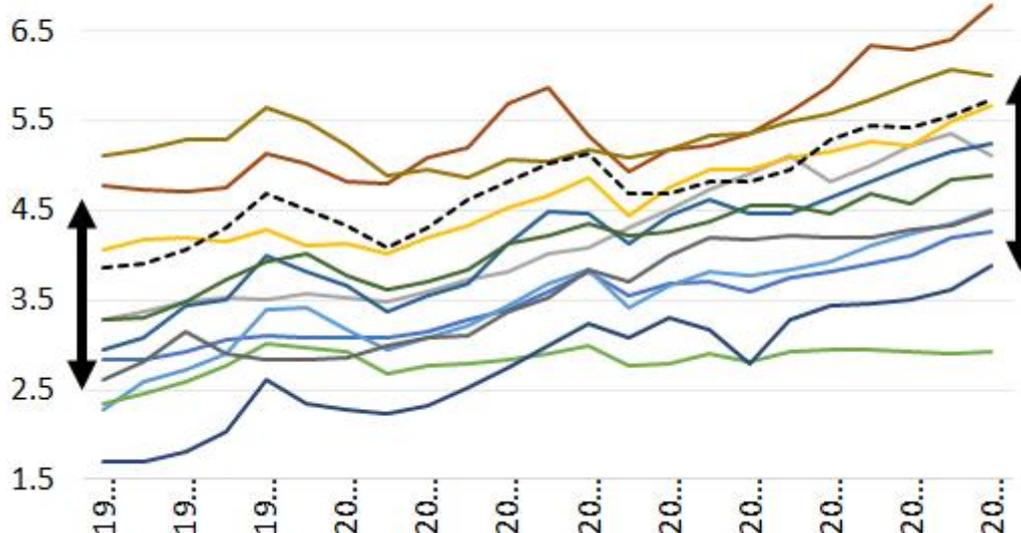
Sources: OECD, and Author's calculation.

2. Does the FED set the agenda for global monetary policy?

The main contributors of global imbalance, i.e., the US, China, the EA, the UK, and Japan, together account for 46% of current account payments and 64.3% of capital flows. Global monetary policy coordination thus centers around these few countries, with most other countries acting as price takers. China's participation in the monetary policy discussion is more focused on its responses to global monetary shocks via the exchange rate reflecting its expanding but still relatively limited capital account convertibility (hence relatively smaller portfolio or cross border banking flows) but a much stronger linkage via trade and direct investment, e.g., the latter account for close to 50% of its IIP liabilities.

The strong influence of the FED's policy decision was most clearly illustrated in the 2022 global inflation shock. Most advanced economies under inflation targeting framework focused their monetary policy on containing respective inflation expectations. Even then, their policy actions "relative to the FFR" mattered since any divergence from what the market saw as an appropriate policy response was reflected instantly in their respective exchange rates (i.e., guided by the UIP and PPP and FED's announced inflation and policy rate path). In fact, both the FED's policy rate and the balance sheet changes[6] are important in the monetary policy transmission. China is more on the recipient side of global monetary policy outcome, but certainly not in the overall aggregate demand management discussions.

---

[6] Philip Lane (speech on The International Transmission of Monetary Policy, November 14, 2019), for example, noted that over half of the variation in the EUR/USD exchange rate reflected US macro conditions, and on average reacts twice as strongly to policy rate expectations than the term premium (i.e., EU's APP).

Figure 3a. Difference in Real Policy Rate vs. the US (Inflation based; In percent)
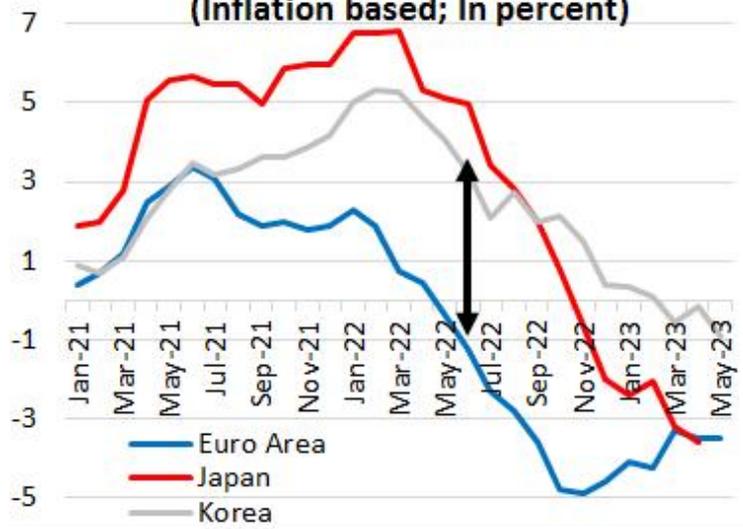
Sources: IMF, FED and author's estimates

Figure 3b. NC per USD (Dec 2020=100)
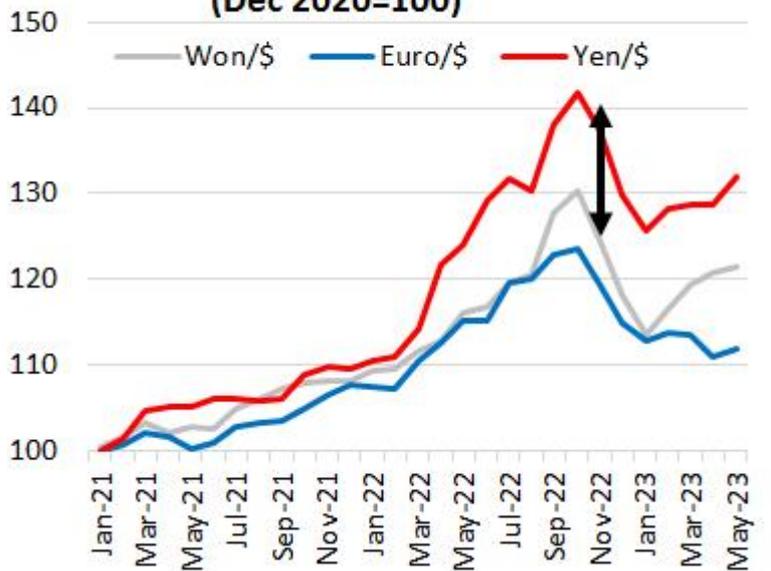
Sources: IMF, FED and author's estimates

Monetary policy reaction to inflation shock led to an overshooting (depreciation of most AD countries' currencies relative to the US dollar) towards the end of 2022. However, they rebounded in the early 2023 and the overall path seems to be consistent with fundamentals, e.g., growth outlook. The heavily leverage-supported growth of the last decade in Japan and Korea, for example, do not arguing well for future growth prospects which are now brought to the fore with higher interest rate. Hence their GDP in USD terms (i.e., the dotted lines) widened in 2022 relative to the US GDP, contrasting the path of real GDP growth in national currencies. This suggests that under the current IMS despite all its weaknesses, exchange rate and consumer prices flexibility seem to ensure that the real effective exchange rate broadly track the path that is consistent with fundamentals.

Figure 4. Changes in stock of Debt (% of GDP)

Legend:
- 2008 stock
- 2008-14
- 2014-19
- 2019-20
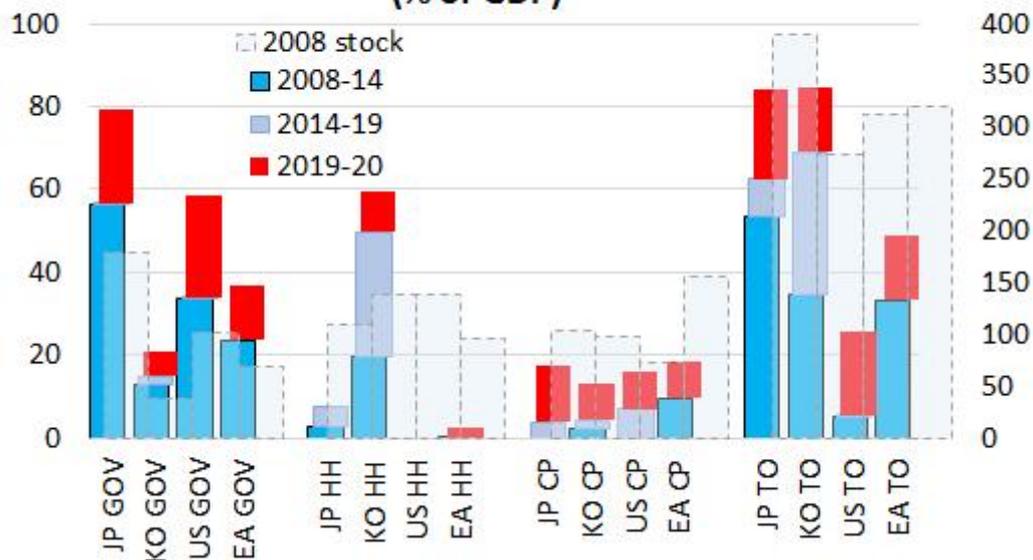
Sources: OECD, IMF and author's estimates

Figure 5a.Diff. in GDP vs. US GDP real and in USD (2016=100)

Legend:
- EA
- JPN
- KOR
- EA $
- JPN $
- KOR $
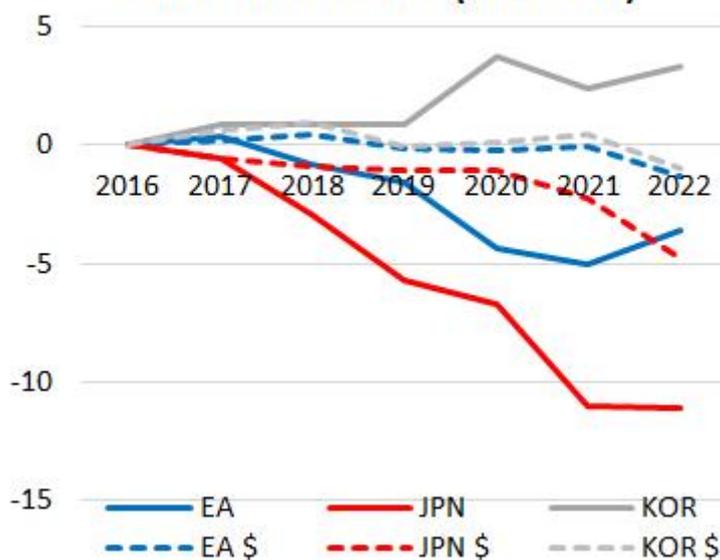
Source: IMF WEO

Figure 5b. Diff of REER vs the US (Rebased 2020=100)

Legend: EUR, JPN, KOR, US
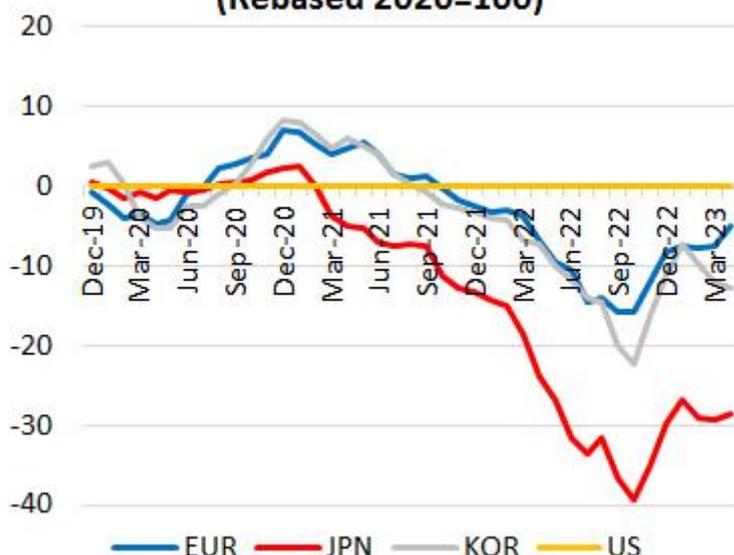
Sources: IMF, FED and author's estimates

3. Is global imbalance due to the weaknesses of the current IMS?

The widening of the US current account deficit during the first half of the 2000s associated with China's large current account surplus, i.e., the Global savings glut, is often attributed to the US dollar centric IMS system. China's low consumption growth, or high savings, could have been moderated, inter alia, through faster appreciation of the RMB, i.e., non-intervention in the foreign exchange market. This claim, however, seems contrary in a market-based system where a country would naturally hedge against expected shocks, i.e., accumulation of reserves, especially just after the experience of the 1997 Asian foreign exchange crisis. The other argument was to encourage more consumption as investment growth was deemed excessive at 13.8% p.a. in real terms. However, consumption was also growing at 11% p.a. in real terms (15% for urban households) and expecting even a faster growth was unrealistic. The scope for raising the import share of consumption via trade measures was limited as most of the population, at $1,141 per capita (2002), was still heavily dependent on locally produced cheaper products. Lastly and perhaps most importantly, the high current account surplus was broadly consistent with the population profile.[7]

Other arguments included China's non-market-based interventions, e.g., subsidies, especially involving the state-owned enterprises and, on the other side, the US' large fiscal deficit. These are, however, not directly related to the IMS per se.

The latest resurgence of the US current account deficit reflects, inter alia, the pandemic related fiscal spending and domestic production and global supply chain disruptions. Reflecting the greater importance of capital account flows on exchange rate determination relative to trade settlements, the US dollar strengthened further vis-a-vis the Euro, the Yen and the Won during 2022-23, a point noted earlier. While the US dollar centrality of the IMS may have played a part, it seems to be more of a confidence issue (i.e., the US being "a safe heaven"). Again, these are not IMS originating issues.

---

[7] See "China's Demography and Its Implications" I. H. Lee, M. Syed. IMF Working Paper 13/82. Mar 2013

Figure 6a. Current account balances (In US$ bn)
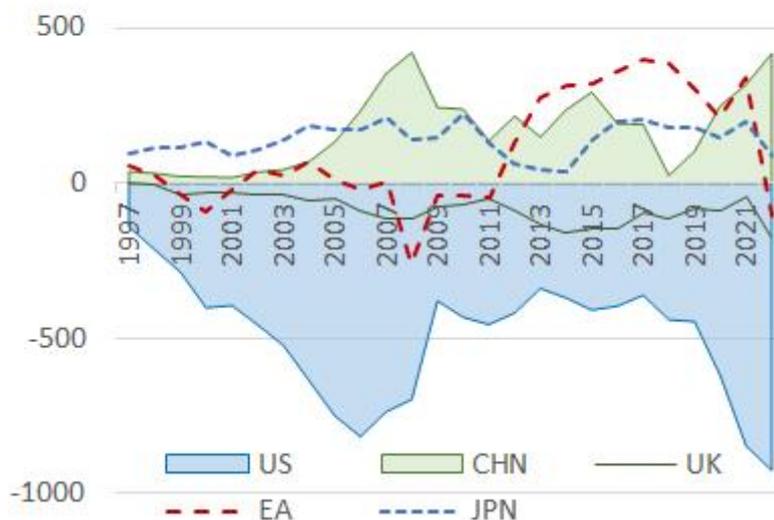
Sources: IMF WEO

Figure 6b. US BoP (In USD bn)
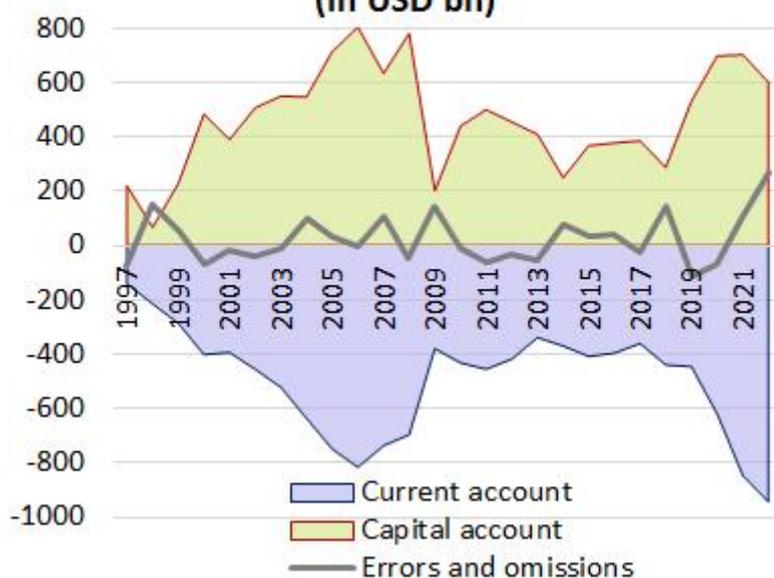
Sources: IMF IFS

4. Is high global leverage due to the IMS?

Global liquidity expanded excessively under the current IMS when measured against savings rates. While gross national savings as percent of GDP in advanced economies have on average remained broadly unchanged, total financial assets, which are the main instruments for storing wealth (e.g., savings), have increased by about 180% between the mid-1990s and the late-2010s. For example, Japan's national savings declined from 33% to 29% of GDP while its financial assets/GDP rose by 186%.[8] Similarly but to a lesser extent, US savings rate remained broadly unchanged at 19-20% but its financial assets/GDP rose by 50%. This implies that the actual purchasing power of the current value of financial assets is only about

---

[8] To the extent that GDP can be regarded as a proxy for a country's productive capacity, a lower savings rate should imply a lower stock of financial assets as a share of GDP.

70% of its face value (relative to 95-97 purchasing power). It could be even as low as 60% considering the US and Japan' value of financial assets to GDP ratios were already high in the mid-1990s.

Figure 7. Gross Savings and Financial Assets
(As share of GDP)

NS: National Saving/GDP — NS 95-97, NS 16-18
FA: Financial Assets/GDP — FA 95-99 (RHS), FA 15-18 (RHS)
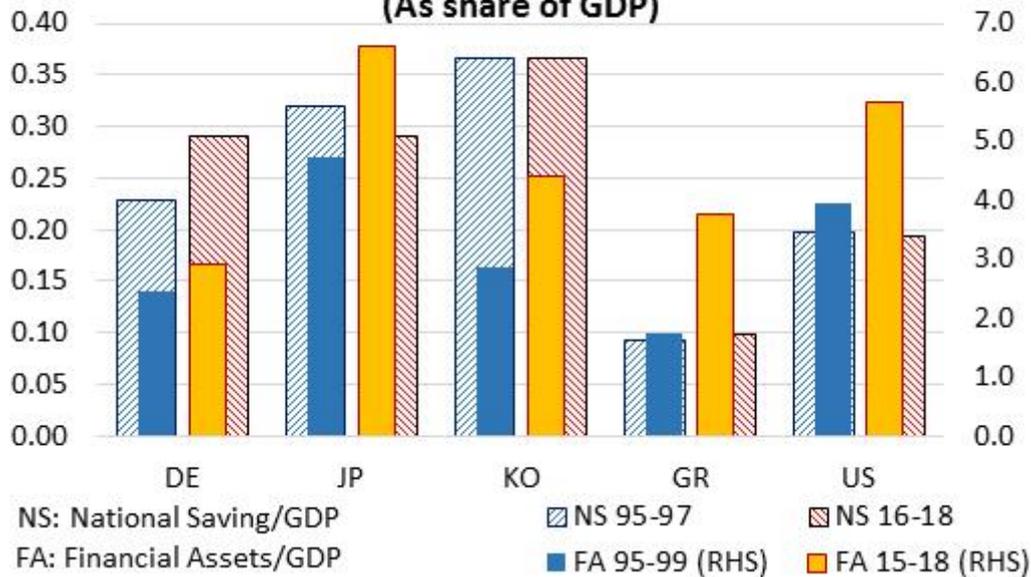
Sources: IMF WEO, OECD data, and author's estimates.

The excessive global liquidity expansion during the decades leading to the early 2010s was facilitated by the rapid growth of cross-border holdings, e.g., non-resident holdings of financial assets. However, while the latter in most OECD countries has moderated since then, global liquidity has continued to expand, i.e., the liquidity/GDP ratio is rising. This implies that liquidity growth has been increasingly induced by respective country's accommodative monetary policy consistent with low global inflation (i.e., low interest rate) for most of the period.[9] Liquidity growth in turn was accompanied by leverage that fed into valuation gains rather than investment in productive capacity, and hence the rise in liquidity over GDP ratio. The US is a rare exception where non-resident's share of total US financial assets has continued to increase, i.e., from 17% in the early-2010s to 27% in the early-2020s, which suggests the unabating preference for US financial assets.

---

[9] For most EMD countries with non-convertible currency, expansionary macroeconomic policy without destabilizing their foreign exchange market was possible due to the amply supply of the US dollar.

Figure 8a. US Total Financial Assets held by non-financial sector (In US$ tr)

Sources: Flow of Fund (z1 tables), FED

Figure 8b. US Financial Assets held by non-residents (in US$ tr)
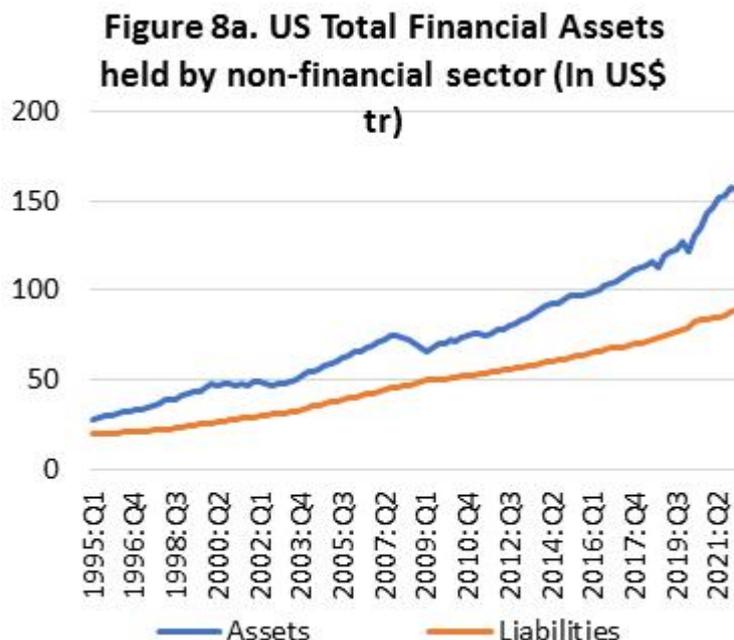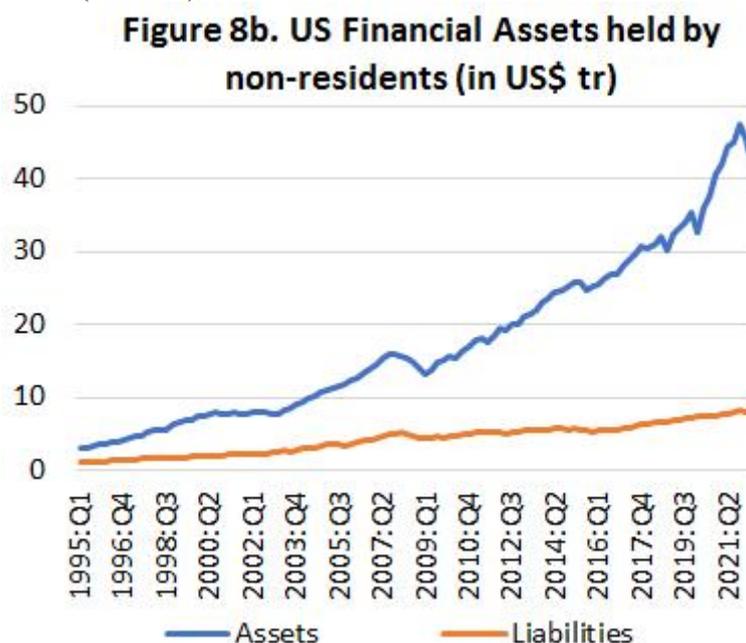
Sources: Flow of Fund (z1 tables), FED

Speculating on how the global financial market may have evolved under a different IMS is a non-trivial issue. A multi-polar currency IMS would still be preferable but would not be able to address excess global liquidity as long as countries maintain policies that nurture excessive leverage. Moreover, continued effort to address the mismatch between financial innovation and the regulatory environment (both at national and international levels to avoid, for example, another "European banking glut"), the search for yield that led to mispricing of risks combined with cross-border policy arbitrage activities would need to accompany any improvement in the IMS.

5. The role of the RMB in the current IMS
As attested by the inclusion in the SDR basket, the RMB meets key criteria to be a part of the main currencies constituting the IMS. China's global share of GDP rose from 1.7 percent in 1990 (4.7% in PPP

terms) to 17.5% (29.2% in PPP) in 2022, only second to the US (1st in PPP terms) and ahead of the Euro area at 13.5% percent. In terms of current account transactions and cross border capital flows (receipts and payments), it accounts for 9.7% and 10.0% of global flows, respectively, well ahead of Japan.

Figure 9. Global Payments, 2017-20
(Share of total)
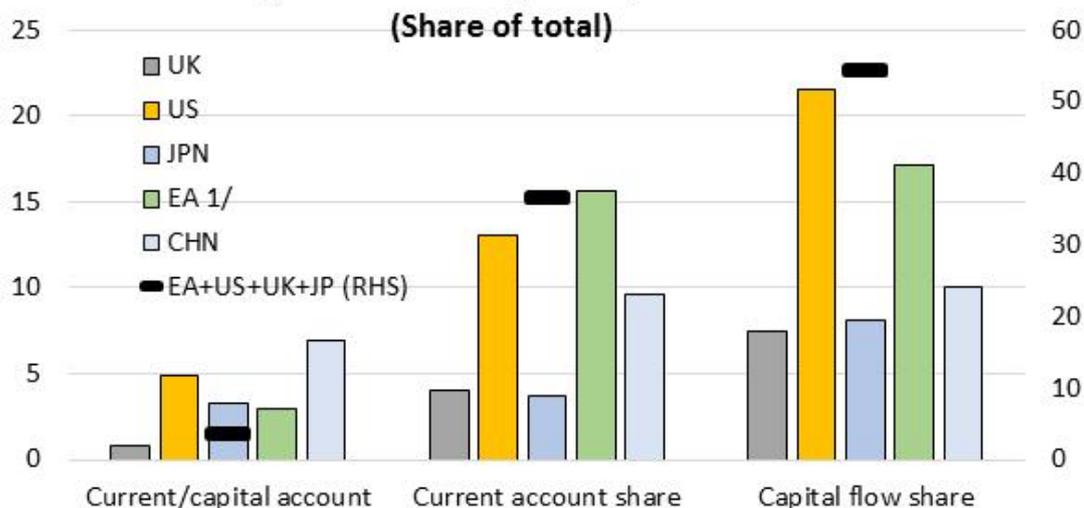
1/ Cu/ca account adusted for intra-EA trade.
Sources: IFS, IMF and author's estimates

The use of the RMB has steadily increased accounting for 7 percent of total turnover (net basis, April 2023).[10] This reflects not only the growing share of China's cross border transactions but also steady progress in putting in place the necessary framework for the RMB to become an international currency.[11] China has established cross-border trade settlement agreements in RMB with Russia, Venezuela, the UAE, Oman, Bahrain, Qatar, Kuwait, and Saudi Arabia and most recently with Brazil (March 2023). Chinese authorities have also set up the Yuan Cross-border Interbank Payment System (CIPS) in 2015 which by February 2023 had 1366 participants from 109 countries and regions. As of 2020, 27 offshore clearing banks have been set up in 25 economies, greatly simplifying the settlement of the RMB at local clearing bank, rather than via China's local correspondent banks. Furthermore, the demand for RMB as a reserve currency was supported by PBoC's swap lines with 38 countries and regions close to 4 trillion RMB.

Figure 10. USD paired 2022, except as noted
(% of total)

---
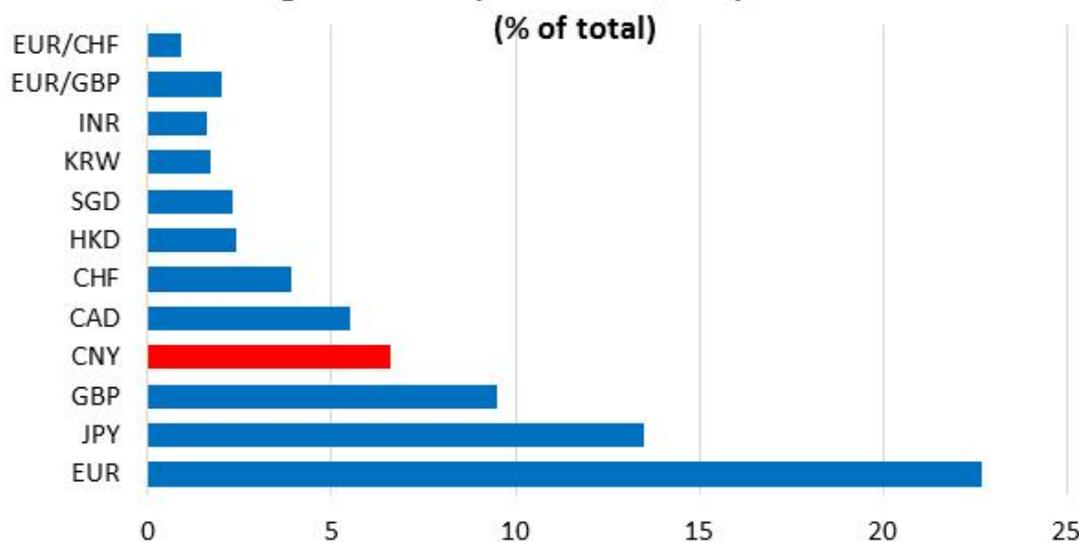
[10] BIS Triennial Central Bank Survey. Since each transaction involves two currencies, the sum of shares is 200%.
[11] For a more detailed exposition of the RMB use, see: "Renminbi Usage in Cross-Border Payments: Regional Patterns and the Role of Swaps lines and Offshore Clearing Banks, H. Perez-Saiz, L Zhang, Mar 31, 2023, IMF eISBN: 9798400235559

Source: BIS Triennial Central Bank Survey

The PBoC is at the forefront of developing e-CNY, i.e., a Central Bank Digital Currency (CBDC) focusing on setting global standards. It has already several pilot projects in place, covering 260 million wallets in 25 cities,[12] including in Shenzhen and Chengdu. The Digital Currency Institute of the PBoC, along with the BIS, HKMA, the Bank of Thailand, and the Central Bank of UAE tested Project mBridge[13] (named after a new blockchain, the mBridge Ledger to serve as a platform for multi-currency payments in CBDCs), placing the PBoC in position of strength relative to most other central banks on issues relating to CBDC. Thus, from an institutional point of view, the RMB is well positioned to play a greater role in the IMS.

6. Prospects for the IMS

The three critical missions of the IMF, i.e., "furthering international monetary cooperation, encouraging the expansion of trade and economic growth, and discouraging policies that would harm prosperity" are still very relevant and should form the basis of any revision to the international monetary system. Against this objective, we noted that the current IMS has become more US dollar centric. The spillover effect of the Fed on other advanced economies, initially through the growth of the US financial market, and later through monetary policy transmission, remains strong. That said, the greater role of the US dollar is associated with, inter alia, greater attractiveness of the US as an investment destination. Challenges remain, however, in addressing inadequate financial regulatory framework, individual countries' expansionary macroeconomic policies that promote leverage, and structural deficiencies associated with financial globalization.

Concerns are also voiced that the US-dollar based system would be difficult to maintain as supply of global safe assets by the US through its fiscal space is limited. Others note that such a situation, coupled with the decline in the global share of the US economy could be addressed by diversifying reserve currencies, such as the RMB.

Given the size of the global financial market (about US$ 475 trillion and almost 5 times global GDP)[14] of which about 30% is cross-border holdings, it seems inevitable that the IMS be structured around the currencies with largest share in cross country capital flows and stocks, i.e., the US dollar, followed by the euro. One could expect the role of China to increase in tandem with the gradual move towards full capital account convertibility. Meanwhile, the role of the RMB would likely increase as a settlement currency given China's share in global trade and investment, and its effort to develop the CBDC. It is difficult to construct an IMS where the basic principles of monetary framework would change under a CBDC, e.g., central banks would remain as the gate keeper for ensuring the value of the currency they issue are maintained. Even then, China's first mover advantage will have a positive impact on the RMB once a multicurrency payment platform using CBDCs is introduced. Ultimately, the role of the RMB will be determined by the market, which will be influenced also by non-IMS related issues.

---

[12] "Practice makes perfect: What China wants from its digital currency in 2023" A. Kumar, Econographics, April 24, 2023, Atlantic Council

[13] "Project mBridge: Connecting economies through CBDC" October 26, 2022, BIS https://www.bis.org/publ/othp59.html

[14] Bond market (US$127 trillion), equity market (US$124 trillion) and bank lending (US$224 trillion—but with potential for double counting); BIS and Statistia.2021 or 2022.

Multilateral Currency Systems for Reform of the International Monetary System

By Herbert Poenisch *

Presently the global world is increasingly fragmented because of geopolitical developments. The leading role of the dollar is being challenged on a number of grounds, such as the privilege of the issuer of dollars, the dependency of the rest of the world on the whims of the US government and on their unilateral monetary policy decisions, such as raising interest rates. In addition, the war in Ukraine has added geopolitical concerns, such as the sanctions on Russia. Political urgency has been added in the recent meeting of BRICS foreign ministers in South Africa. They designated the New Development Bank to look into the possibility of a common currency.

A surge in projects to provide alternatives to the global dominance of the dollar confuses a number of issues. The first one is: will the alternative eventually replace the dollar or just be an additive. Secondly, digital central bank currencies are seen as panacea to solve these problems. They are only a technical instrument which cannot solve the underlying economic fundamentals, such as giving up monetary autonomy or fiscal sovereignty. Finally, it seems that the world is ready to accept any economic costs of an alternative because of political polarization. Even a relapse into bilateral clearing has become acceptable. Present bilateral arrangements and their subsequent problems will not be discussed here.

This article will first describe the present system with a number of global convertible and fungible currencies fulfilling the basic needs of a global currency, a common denominator, a universal means of payment and a store of value in deep and liquid markets. Secondly, it will address the experiments of regional currencies, first and foremost, the Euro. Thirdly it will present projects for alternatives to the dollar which are on the table now, such as the BRICS common currency project. Finally, a gradual move from bilateral payments arrangements to a multilateral clearing system based on European experience will be suggested.

1. Present multicurrency global system

The present global monetary system is the outcome of two world wars, when the then world monetary leader, Britain was financially ruined by these catastrophes and had to be saved by the new superpower, the United States. The Bretton Woods conference in 1944 established a new world monetary system with the dollar as lynchpin. This gave extraordinary privileges to the dollar, which the USA subsequently misused. It changed the rules in 1971 and keeps expanding the global money supply in order to serve its own needs. Regardless of the misuse, its share of foreign exchange trading for payments and private savings remains dominant at 88% (out of 200 % currency pairs) in the 2022 BIS foreign exchange survey. According to IMF official reserves in dollar still amounted to 60% at the end of 2022.

The first challenge to the system was the emergence of Japan in the 1980s as the second biggest economy. However, the Japanese government was too timid to allow the yen to become a global currency. It earned substantial current account surpluses but resisted to allow borrowing its currency to finance global borrowing needs. However, it retained a share of 17% (out of 200% currency pairs) of global foreign exchange trading, used for payments and private savings until now. According to IMF official reserves in yen still amounted to 5.5% at the end of 2022.

The next challenger, the EU was slightly more successful. It created a common currency, the Euro which was adopted by 20 of the 27 EU member countries. It was also accepted a means of payment and store of value by close trading partners of the EU. However, it ran into a deep crisis in 2011 because of uncoordinated fiscal policy among Euro member countries. However, it retained a substantial share of global payments and private savings, amounting to 31% (out of 200% currency pairs) of foreign exchange trading in the 2022 BIS survey. According to IMF official reserves in Euro still amounted to 20%.

---

* Herbert Poenisch, Member of IMI International Committee, former senior economist, BIS

The following section will outline the challenges in setting up regional common currencies.

2. Past projects for regional currency areas (RCA)

First, and logically prior, is whether abandonment of an independent monetary policy is desirable. Do the benefits of enhanced credibility, predictability and stability of the macroeconomic framework exceed the costs associated with the inability to tailor monetary policy to the circumstances facing a particular country? This question has stimulated active debate since the early 1960s, with the optimum currency area literature suggesting the following criteria for successfully forgoing a national currency: labour mobility, existence of fiscal transfers, symmetry of shocks and a diversified industrial structure. Unfortunately, these criteria are not very good predictors of actual currency regimes, suggesting that political and institutional factors are also important in explaining currency use. This is especially the case for regional currency areas (RCAs), which are often accompanied by, or the culmination of, other regional integration initiatives.

On the other side of the debate, it needs to be recognised that the theoretical advantages of monetary policy flexibility are often not attained, as monetary policy has in a number of countries been misused. In this context, RCAs, currency boards, and use of foreign currencies can be viewed as beneficial precisely because they remove the possibility of exercising monetary flexibility in a harmful fashion. However, such monetary arrangements were not a panacea that would guarantee credibility and stability. They could in fact break down if fiscal policy were not disciplined or if the economy did not exhibit sufficient flexibility. This explained the attention given to the limits on fiscal deficits in the euro zone, both as preconditions to entry and as an integral part of the ongoing surveillance embodied in the Stability and Growth Pact. The experience of Argentina shows that even the straitjacket of the currency board does not necessarily discipline fiscal policy, ensure wage/price flexibility or guarantee credibility. Some participants pointed to official use of a foreign currency as a regime preferable to a currency board, at least with regard to credibility. But there are costs, in particular a loss of seigniorage and the impossibility of making a steep change in the value of the currency to re-establish competitiveness.

A second important question, assuming that the first has been answered in the affirmative, is which of the regimes would be most suitable for a given country. As already noted, an RCA is most likely to emerge when there is already a strong sense of regional solidarity and other institutional manifestations of it. In the EU's case, monetary union was the culmination of these other economic initiatives. There was much debate about whether this model is the only one, with a rough consensus emerging that it need not be. If it was to be successful and permanent, those other elements (customs union, macroeconomic coordination, harmonisation of taxes, removal of barriers to factor mobility, etc) needed at least to be constructed in parallel. While it was difficult to make a precise list of minimum requirements, in the absence of some of the other elements it was very possible that a negative shock would imperil the union by making it no longer attractive for one or several countries to remain in it. A currency board or unilateral use of a foreign currency was more likely to be the response to a severe problem of lack of monetary policy credibility, effective monetary institutions, or both. These two regimes also have the advantage that they can be put in place quickly. Several of the economies with such regimes had adopted them during crises. Though the conditions that had made such regimes necessary might disappear, exit strategies were typically not contemplated for fear of harming the credibility of the union.

A third important question concerns the necessity to put constraints on other policies, in particular fiscal policy. It is generally accepted that in RCAs uncoordinated fiscal policies may have adverse spillover effects. For example, over expansionary deficits that lead to unsustainable debt accumulation in one country can lead to higher interest rates or exchange rate overvaluation in other members of the union. In RCAs, this issue has generally been addressed through procedures for regional surveillance, with the EU's Stability and Growth Pact being a prime example. While the advisability of such mechanisms is clear, there is ample scope for discussion concerning their modalities. Issues include whether to correct fiscal deficits for cyclical conditions, whether to exclude certain categories of spending or revenue, and how to ensure the achievement of convergence, eg through the threat of sanctions. As in other policy design, there exist trade-offs between the credibility and transparency of simple and uniformly applied rules and the flexibility that accompanies discretion to allow for each country's unique circumstances.

3. Present proposals for multilateral currency arrangements

At present there are a number of proposals aimed at replacing the dollar in its dominant role in the world economy for trade as well as for store of value. However, this is a long shot, as none of the other currencies

have the necessary qualities to replace the dollar. Any bilateral solutions are not sustainable as the perennial problem of what to do with trade imbalances. Russian Foreign Minister Lavrov complained recently about what to do with large surpluses of rupees, as nobody else will accept them. An institution like the Bank for International Settlements has to be set up, thus repeating the experience of the European Payments Union. At present the world cannot afford the inefficiencies of such a cumbersome system.

In addition, some of the candidate currencies such as renminbi and rupee do not allow free financial transactions to offset trade imbalances. Allowing such financial transactions would lead to the true internationalisation of currencies with a myriad of consequences for the domestic monetary policy. As the experience of Japan of the 1980s shows, such concerns put paid to the internationalisation of yen, which has never taken off.

The best which can be achieved at present is to establish an alternative multilateral payment system, which will be additional rather than replacing the dollar. The creation of the Euro for closely related countries in a geographical region, Europe is the most relevant experience. If like-minded countries, such as the BRICS countries envisage such a multilateral currency it will be additional at best, rather than replacing the dollar. If it aims to become a global payments and savings instrument it will have to include the other SDR currencies, dollar, euro, pound and yen or have some clearing arrangement with them. The prospects will be elaborated below.

The first idea for an alternative was propagated by PBoC Governor Zhou Xiaochuan in his speech in 2009, that the SDR would become a global currency, for payments and savings. The SDR has progressed by including the renminbi in the basket of 5 currencies. It has served well as a denominator, but the other functions, payments and savings are highly engineered and remain on an official level with lots of conditions attached to the usage of SDR. A country wishing to use its SDR as payment for trade has to contact other countries and ask for their agreement. Holding SDRs is limited to official holders. Making the SDR more fungible has been discussed but not yielded any operational results. The main obstacle is that the creation of SDR is a political process, by voting in the IMF.

At the same time four members of the Gulf Cooperation Council (Bahrain, Kuwait, Saudi Arabia, UAE, Oman, Yemen) took the political decision to peg their currencies jointly to the dollar, thus creating a common currency area. UAE and Oman did not join. As there was a lack of clear objective, the project was abandoned. It lacked any economic rational as trade fundamentals, such as trade with the EU were left out of the considerations. The present political push among BRICS countries repeats this approach.

Since then, creating central bank digital currencies (CBDC) has moved into the focus of research. One such project, mbridge would link digital currencies created by four different central banks, the Peoples' Bank of China, the Hong Kong Monetary Authority, the Bank of Thailand and the Central Bank of the United Arab Emirates.

Project mBridge experiments with cross-border payments using a common platform based on distributed ledger technology (DLT) upon which multiple central banks can issue and exchange their respective central bank digital currencies (multi-CBDCs). The proposition of mBridge is that an efficient, low-cost and common multi-CBDC platform can provide a network of direct central bank and commercial participant connectivity, greatly increasing the potential for international trade flows and cross-border business at large. To test this proposition, a new native blockchain – the mBridge ledger – was custom-designed and developed by central banks for central banks, to serve as a specialised and flexible platform implementation for multi-currency cross-border payments. Particular attention was paid to modular functionality, scalability, and compliance with jurisdiction-specific policy and legal requirements, regulations and governance needs. The platform design ensures that mBridge adheres to the five overarching CBDC principles emphasised by the CPMI/BIS Innovation Hub/IMF/World Bank report to the G20: do no harm, enhancing efficiency, improving resilience, assuring coexistence and interoperability with non-CBDC systems and enhancing financial inclusion.

Over the course of six weeks, the mBridge platform was put to the test through a pilot involving real-value transactions centred around the chosen use case of international trade. Significant groundwork was laid prior to the pilot, including extensive coordination within and among central banks and commercial banks, and tailored legal agreements and dress rehearsals, which ultimately led to its success. Between 15 August and 23 September 2022, 20 commercial banks from Hong Kong SAR, Mainland China, the UAE and Thailand conducted payment and foreign exchange (FX) payment versus payment (PvP) transactions on behalf of their corporate clients using the CBDCs issued on the mBridge platform by their respective central banks. The pilot advances multi-CBDC experimentation by settling real value directly on

the platform and on behalf of corporate customers. Over US$12 million was issued on the platform, facilitating over 160 payment and FX PvP transactions totalling more than US$22 million in value. The pilot's real-world setting also brought to light a range of policy, legal and regulatory considerations of a multi-CBDC, cross-border payments platform such as mBridge. Extending access to central bank money directly to foreign participants and conducting transactions on a shared ledger requires further exploration of policy, data privacy and governance considerations. A new, digital form of currency and a multi-CBDC platform also raise challenging legal questions that depend on each participating jurisdiction's standing rules and regulations and may require regulatory changes to achieve full legal certainty and clarity. While some of these considerations can be addressed by the platform's current design, others (such as BRICS) require further development and exploration.

With the range of technologies and models available, Central Banks require guidance to identify appropriate models that advance international trade, interoperability, financial inclusion and security. mCBDC platforms have great potential to address international trade settlement weaknesses. However, Central Banks have a deep interest in maintaining total control over the CBDC system and are hesitant to implement an mCBDC arrangement, with ownership distributed across the Central Bank network. Central Banks are also concerned about losing domestic control of monetary policy. Allowing a foreign digital currency within a country's borders may result in consumers changing their preference for the foreign currency. The domestic currency then becomes underutilised. The Central Bank thereafter has less control over domestic prices.

All these considerations are included in a recent handbook for launching CBDCs by the IMF. The reasons for exploring CBDC differ somewhat between advanced economies (AEs) and EMDEs, however. Overall, CBDC work in AEs is driven primarily by the desire to maintain and strengthen the institutional underpinnings of modern monetary systems in the digital age, to promote competition in the payment systems, and to facilitate tokenization of finance. In addition to these considerations, CBDC work in EMDEs is also driven by financial inclusion-related motivations. Over the past two years, cross-border payment efficiency has become a more important motivation for CBDC work in EMDEs such as the BRICS countries.

Given the current economic climate, BRICS countries need to adopt radical measures to transform society to break out of the current economic hardships characterised by experiences of poverty, inequality, unemployment, weak trading networks and limited foreign investment brought on by the Global Financial Crisis, and the Pandemic. mCBDC arrangements offer a radical option to reimagine the global financial landscape. However, Central Banks will need to balance the need to drive economic growth with their concerns about sovereignty and ownership. Financial integration in the BRICS using integrated CBDC settlement platforms could become central in international finance and benefit economic growth through risk sharing, improvements in efficiency allocation, and reductions in macroeconomic volatility and transaction costs. With the emergence of national CBDCs, and trade and investment ecosystems developing within BRICS developing and emerging economies, the BRICS should seek to promote interoperability and common standards to ensure seamless international exchanges. Such standards can create more open systems, which allow for a level playing field for all stakeholders in the new system.

A more ambitious projects seeks to create a single currency for BRICS countries, called BRICScoin. It would play a role similar to the Euro, a regional currency rather than a replacement of the dollar. This proposal is driven by politics, such as in case of the GCC. There are possibly two versions: 1) A monetary union between the BRICS countries, creating a bloc similar to the eurozone. 2) A reserve asset based on the BRICS' currency modelled on the IMF's special drawing rights. One way this could work would be for each country's central bank to be issued "BRICS currency" assets constituting a claim on the other central banks. For each central bank, the value of their new asset would be matched by the value of the liability formed by the other central banks' claims. However, there a number of reasons why this might not work: the BRICS countries are not as closely integrated as the Eurozone countries were, factor mobility, such as labour and capital flows are severely limited, and structural imbalances exist, such as perennial deficit countries such as India and South Africa. Therefore, a gradual path from integrating bilateral payment arrangements into a multilateral payments system based on European experience is suggested.

4. The way forward

Presently, the world is proliferating bilateral payment agreements without any serious challenger to the dollar. Common currencies such as BRICScoin are a distant objective without any idea how to move from

bilateral to multilateral clearing. In the absence of this, the European Payments Union (EPU) offers the only cooperative real world example on how to bridge this gap. From 1950 to 1958 the EPU promoted multilateral settlements, encouraged the removal of trade barriers and cemented the stability of exchange rates. Participating countries agreed to accept the currency of any other member in payments for exports, instantly unsnarling the suffocating tangle of bilateral arrangements upon which the region's trade had been based. Deficit countries were provided credits to finance temporary trade imbalances, obviating the need to restrict imports and, potentially, employment and growth.

There were five technical innovations: (i) bilateral balances were automatically offset so that each country had one single balance, debtor or creditor, towards the EPU rather than towards its individual members; (ii) balances were partly settled in gold or dollars by debtors to the EPU and by the latter to the creditors; (iii) the EPU extended credits to debtor countries, created from a fund created by surplus balances; (iv) a single unit of account, the dollar existed for all payments and credits; (v) the US treasury allocated USD 350 million as a start-up fund to cover temporary gold and dollar shortages in the multilateral settlement. The EPU was run by a managing board; the BIS acted as agent.

If indeed the BRICS countries have the political will to set up a regional multilateral payments system which would be an addition to the present global payment system, the following steps should be followed.

An organisation with the same mandate as the EPU has to be set up under the auspices of the BRICS. Balances will have to be settled in a denominator currency, such as the renminbi or gold. In this case, the GCC experiment becomes relevant as countries will be pegging to a common currency, probably the renminbi. This will imply aligning the monetary policy of BRICS countries with that of the PBoC. The strongest member of the group, China needs to provide a start-up fund to cover renminbi shortages in the multilateral settlements. An agent like the BIS would operate the system. At present it looks unlikely that China is prepared to take on such a far reaching global role with major implications for the domestic economy.

Literature used

Bank for International Settlements (2023): Blueprint for the future monetary system: improving the old, enabling the new. In: 2023 Annual Report Chapter III, www.bis.org

Bank for International Settlements Innovation Hub (2022): Project mBridge: Connecting economies through CBDC. www.bis.org/publications

Bank for International Settlements (2003): Regional currency areas and the use of foreign currencies. In: BIS Papers No 17 www.bis.org/publications

Financial Times (2023): The BRICcoin does not stand up, 10. May www.ft.com

IMF (2023): IMF APPROACH TO CENTRAL BANK DIGITAL CURRENCY CAPACITY DEVELOPMENT. www.imf.org/publications

Jadresic, Esteban (2002): On a common currency for the GCC countries. In: IMF Policy Discussion Papers PDP 02/12 www.imf.org/publications

Nelson Mandela University and Zhejiang International Business School (2022): Developing BRICS multilateral economic integration & Promoting trade and investment in BRICS with future cross-border Central Bank Digital Currencies (CBDC). Policy Report.

Ocampo, Antonio J (2019): The SDR's time has come. Rethinking the Special Drawing Right could bolster the IMF's role in the global financial safety net. In: IMF Finance and Development, December www.imf.org/publications

Poenisch, Herbert (2023): BRICS common currency would be no threat to the dollar., June, www.omfif.org

Tonioli, Gianni and Clement, Piet (2005): Central Bank Cooperation at the Bank for International Settlements 1930-1973. Cambridge University Press, pp327ff

Observing De-dollarization from the Perspective of Money Functions

By XIA LE [*]

The US dollar has been the dominant currency in the current international monetary system (IMS) for a long time. It is widely used to settle cross-border transactions, both in trade and finance. It is the primary invoicing currency for major global commodities, including crude oil, copper, iron ore etc. USD-denominated assets make up the majority of foreign reserves held by governments and monetary authorities around the world. Furthermore, the private sectors outside the USA also consider the greenback to be an essential form of storing their wealth.

There has been a recent surge in interest among the international community regarding de-dollarization, which is being evidenced by a number of emerging signs. For instance, in May, Brazilian President Lula and Argentine President Fernández vowed to devise a mechanism that would allow their local currencies to be used in bilateral trade instead of the USD. Additionally, a few Gulf countries, including Saudi Arabia and the United Arab Emirates, are currently exploring the possibility of settling their crude oil exports in currencies other than the USD. Furthermore, official statistics from China indicate that in the first quarter of 2023, the RMB accounted for a greater share of global payments than the USD.

Despite the enthusiasm of some national leaders on the topic, scholars generally maintain a cautious approach. For instance, Eichengreen (2023) argues that "reports of the dollar's demise have been greatly exaggerated." Arslanalp et al. (2022) did not find any evidence that US financial sanctions have a negative impact on other countries' decision to accumulate USD assets as part of their foreign reserves. However, while the analysis above focuses primarily on the role of the USD as an international reserve currency, de-dollarization may also occur in the areas related to other functions of the USD.

What are the drivers behind the de-dollarization? Will the de-dollarization become an irreversible trend? Or it is just a fad? If the former is the case, in what way will it will proceed? What it means for the IMS? This section will explore these questions through the lens of international currency's functions.

The USD dominance as an international currency

According to canonical theories, money has three primary functions: serving as a unit of account, a medium of exchange, and a store of value. An international currency like the USD also fulfills these three functions, with particular emphasis on their role in facilitating cross-border economic activities. To gain a better understanding of the USD's dominant role in the current IMS, it is helpful to examine it through the lens of its functions.

Unit of Account:

The USD is the primary invoicing currency for major global commodities, including crude oil, copper, iron ore etc. Its widespread international acceptance also makes it the most important currency for invoicing and settling transactions in global trade. In fact, studies have shown that from 1999 to 2019, the USD was used for 96% of trade invoicing in the Americas, 74% in the Asia-Pacific region, 20% in Europe, and 79% in the rest of the world. In total, the USD is used for invoicing over half of global trade.

Medium of exchange

In global trade, the same currency is generally used for both invoicing and settlement, with settlement directly corresponding to the function of medium of exchange. In addition, The USD fulfills this function of international currency, as cash of the USD can be used by overseas residents as a means of payment outside of the USA.

The USD continues to dominate in this respect. Its banknotes (cash) has the largest amount of overseas circulation, estimated to be around USD 950 billion as of Q1 2021. In comparison, the Euro has the second

[*] Xia Le is Chief Economist for Asia at BBVA..

largest amount of banknotes circulated outside the ECB's jurisdiction, which only totaled around USD 350 billion at the same time.

Store of Value

One way to measure a currency's function as a store of value is by looking at its usage in official foreign exchange reserves. As of Q4 2022, the USD still accounted for 58% of globally disclosed official foreign reserves, although this has declined significantly from its position of 71% of global foreign reserves in 2000. The shares of other major international currencies, such as the Euro (20%), Japanese yen (6%), British pound (5%), and Chinese RMB (3%), remain far behind.

For private sectors outside of America, USD-denominated assets are widely held as a global safe asset. For instance, more than 60% of foreign debt instruments are issued in USD, well ahead of the Euro (23%).

The drivers behind the de-dollarization

It is not a coincidence that the issue of de-dollarization has gained momentum under the current circumstance. Many of the drivers of this trend have historical origins, but the unpredictable advent of the pandemic has shifted people's attention to global economic concerns. Additionally, US policy reactions to the pandemic, such as ultra-loose monetary and fiscal policies, have further highlighted the problems of existing USD hegemony. As a result, more people have started to question the existing International Monetary System (IMS) in the aftermath of the Covid-19 pandemic.

A confluence of factors contribute to the growing interest in de-dollarization:

1. Spillover effects of USD dominance: The current IMS, dominated by the USD, has led to significant spillover effects of US monetary policy on the rest of the world. When the US Federal Reserve implements policy changes, strong spillover effects force other countries to deal with consequences they may not want to accept.

This issue has been widely recognized and discussed. As the classical impossible trilemma theory in international finance taught policymakers, they need to sacrifice the fixed exchange rate so as to maintain their monetary policy independent and, at the same time, allow for free capital movement.

However, foreign policymakers have found their options further limited in the new millennium due to increasingly radical US monetary policy adjustments. For example, during the two episodes of the US subprime crisis (2008) and the Covid-19 pandemic (2020-2021), the US Fed deployed ultra-loosening monetary policy (in the name of quantitative easing) to stimulate the economy. And now the US Fed is hiking the policy rate at an unprecedented pace.

All in all, violent adjustments of US monetary policy caused massive capital movement internationally, which forces other countries to synchronize their policy with the Fed regardless of their economic situation. They also led to the external imbalance of many emerging markets and sow the seeds of financial instability.

2. US financial sanctions: Even before the pandemic, the USA has a penchant to leverage its USD hegemony to impose financial sanctions on other countries. In particular, the US government can effectively block a country's access to the USD clearing system to impair its capability of maintaining normal trade and financial transactions with the rest of the world.

Since the outbreak of the Russia-Ukraine war in 2022, the US has escalated financial sanctions against Russia to a new height, including freezing the Russian central bank assets and excluding a number of major Russian banks from the SWIFT system.

The escalation of US-led financial sanctions, along with its frequent usage, have substantially raised many other countries' concerns about "currency weaponisation" and prompted them to diversify their portfolios away from USD-denominated assets.

3. elevated fragmentation risk: The growing risk of fragmentation in the world's economy and financial system also contributes to de-dollarization. Since the US launched a trade war against China, concerns about global economic and financial fragmentation have intensified. The geopolitical tension could lead to the breakdown of global supply chains, potentially resulting in multiple independent supply chains centered around different economic superpowers.

It is envisaged that these superpowers, out of the security consideration, will urge other participants along the chain to shun their competing currencies in the settlement of cross-border transactions. A few

countries that are devising or have already established the international clearing system of their local currencies. They are preparing for the worst scenario of global economic fragmentation.

Will this time be different?

It is not the first time for the USD hegemony to meet with grave challenges. Over the past seven decades after the World War II, the dominant role of the USD in the IMS has been tested during some episodes, including the breakdown of Bretton Wood system, the fast rise of Japanese Yen in the IMS during 1980s, the creation of the Eurozone etc. Nevertheless, the USD can always adapt to the violent changes of the international environment and secure a grip of dominance in the IMS. Will this time be different?

A couple of factors suggest that this time might be different from previous challenges to USD hegemony. First, past challengers were US allies, and their currency competition took place amid deepening economic and trade ties. However, the US now appears determined to push for some degree of economic fragmentation with major competitors, particularly China and Russia. This rising risk of economic fragmentation could lead to a bifurcation of the global financial system and increased use of alternative currencies as discussed in the previous section.

Second, technological progress has made it possible to replace the USD in many scenarios. The rapid growth of electronic payment technology has reduced the demand for cash, and international travelers can now use mobile payment options instead of USD banknotes. Additionally, the development of cryptocurrencies has given rise to new digital assets that could potentially become global safe assets in the future. Central banks worldwide are also exploring Central Bank Digital Currencies (CBDCs) to prepare for upcoming currency competition.

In conclusion, the ongoing de-dollarization appears more sustainable than in the past. However, even the most optimistic advocates of de-dollarization don't expect the USD hegemony to collapse around the corner. Instead, it could take several decades for the USD to relinquish its dominance and integrate into a new multi-polar IMS.

How it will proceed?

The de-dollarization is taking place on several fronts. People can again perceive and predict the trend through the lens of money functions.

Unit of Account:

Other currencies are going to erode the share of the USD in invoicing global commodity trade. In this respect, not only China is trying to denominate their imports of crude oil and iron ore in the RMB but also BRICS countries set out to push for the commodity trade invoicing in local currencies.

Moreover, there are more options available for invoicing or settling the international trade between non-USA countries. The Bank of International Settlement is piloting an umbrella program to facilitate the local-currency clearing between countries. Several countries proactively invite foreign institutions to participate in their self-devised clearing system for cross-border settlement.

Medium of exchange

The popularization and development of electronic payment reduces the demand for cash. Although many foreigners will continue to hold the USD banknotes as an asset, their role as a payment means is set to be weakened among the international travelers.

This trend will become even more pronounced if more central banks unveiled their CBDCs. The size of greenback's overseas circulation will diminish.

Store of Value

Other countries used to favor USD denominated assets as their foreign reserves because they were the most liquid assets during bad times. Nowadays, more and more countries feel the need to guard against financial sanction risks associated with their foreign reserves. Therefore, it become a natural choice for many countries to diversify their portfolios towards gold and towards nontraditional reserve currencies, such as the RMB.

Moreover, central banks of emerging markets can consider to sign bilateral currency swap lines with their peers of big economies, China's PBOC or ECB etc. These bilateral currency swap lines can perform as a liquidity backstop if the country falls into a liquidity crunch.

For overseas private sector, diversification away the USD is also important. In addition to gold and assets denominated in alternative currencies, the mushroomed digital assets could provide more investment options for private sector.

Conclusion

The de-dollarization shows signs of acceleration in the aftermath of the Covid-19 pandemic. The main drivers behind it include strong spillover effects of USD dominance, frequent use of US financial sanctions as well as the increasing fragmentation risk of global economy. Our analysis further shows that it appears more sustainable than in the past and is expected to proceed on several fronts associated with money functions.

The caveat is the de-dollarization process is doomed to be fraught with risks even though its destination, a new multi-polar IMS, sounds reasonable and promising. We highly recommend that global public and private sector to pay due attention to this lengthy and chubby process so as to better identify and manage the associated risks.

China

Precise Policies to Promote Steady Economic Growth in China

By TU YONGHONG *

China is committed to improving the effectiveness and precision of macroeconomic policies. In 2022, China's economic growth was only 3%, the lowest since the statistics of GDP were recorded, affected by factors such as geopolitics, rising commodity prices, the COVID-19 pandemic, and external containment and suppression. The Government Work Report for 2023 proposes an economic growth target of around 5%, increasing 12 million new jobs and keeping inflation below 3%. Despite the challenges of shrinking demand, supply shocks, and weakening expectations amid the Federal Reserve's interest rate hikes, global high inflation, and weakening trade, China needs to strengthen macroeconomic management, stimulate investment and consumption, guard against major risks, enhance international economic cooperation, and promote healthy economic development.

China will implement an active fiscal policy by arranging a deficit rate of 3%, expanding government spending, issuing more local government bonds, increasing social security and transfer payments to local governments, and exploring multiple channels to increase residents' income and consumption potential. Optimize and improve tax preferential policies, continue tax and fee reduction policies, focus on supporting small and medium-sized enterprises, increase market vitality, and consolidate the foundation of stable employment.

China will implement a prudent monetary policy. China's economic cycle is different from that of Europe and the United States. In recent years, when the United States implemented quantitative easing, China maintained normal interest rates and monetary policies. As the United States raised interest rates last year, China implemented a more relaxed monetary policy. In March of this year, the People's Bank of China lowered the reserve requirement ratio for deposits, kept the growth rate of the monetary supply roughly in line with nominal GDP, pushed down loan interest rates, and continued to use differential re-lending and rediscount rates to guide financial institutions to support small and medium-sized enterprises and green finance. The balance of inclusive small and micro loans in 2022 was close to 24 trillion yuan, and the number of small and micro enterprise credit clients exceeded 56 million. For the past five and even ten years, China's average inflation rate has been maintained at 2%, ensuring currency stability. Furthermore, under a flexible market-oriented exchange rate system, the Renminbi's exchange rate against foreign currencies has also been stable. In the past five years, the Renminbi's exchange rate against the US dollar has fluctuated above and below the threshold of "7" for three times, showing bidirectional fluctuations and increasing flexibility, which has played a good role as an automatic stabilizer for macroeconomic and international balance of payments. Among the major currencies in the Special Drawing Rights (SDR) basket, the Renminbi has the least currency volatility and is very stable compared with other global currencies.

China will strengthen the coordination and cooperation among fiscal, monetary, industrial, and technological policies to help stabilize the industrial and supply chain in manufacturing, assist the severely affected service industry to recover as soon as possible, support the research and development of key core technologies, and solve "neck choking" problems.

China adheres to high-level openness, strengthens international economic cooperation, and creates a community with a shared future for mankind. In the past decade, China's doors to the outside world have been opening wider and wider, with the establishment of 21 free trade zones, the construction of the Hainan Free Trade Port, and the organization of the China International Import Expo, the China

* Deputy Director of International Monetary Institute, Renmin University of China.

International Trade in Services Fair, and the China International Consumer Products Expo. China has vigorously developed cross-border e-commerce and digital trade, continuously expanded imports and exports, and has become the largest trading partner of more than 140 countries and the world's largest trading nation.

As an Asian country, China attaches great importance to economic cooperation with Asian countries. ASEAN has surpassed the United States and the European Union as China's largest trading partner. After the RCEP agreement came into effect, trade between China and several member countries grew by double digits. Judging by the excellent performance in the first quarter of this year, the international community has made more optimistic growth forecasts.

At the China Development Forum 2023, Kristalina Georgieva, Managing Director of the International Monetary Fund (IMF), stated that China's economic recovery is stable, and its development momentum is strong, which will improve China and the world's economic growth prospects. It is expected that the contribution rate of China's economy to the world economy will reach or even exceed one-third in 2023. High-level opening-up is the only way for China to build a modern country.

Currently, China is committed to building a market-oriented, law-based, and internationalized business environment. It has implemented a negative list system for foreign investment, with the national negative list reduced from over 170 to 37, and the negative list for free trade zones reduced to 27. China is actively applying to enter into the higher-level CPTPP agreement, constructing a system and regulatory model that is in line with international high-standard economic and trade rules. Through larger-scale and high-level opening up, expanding trade and direct investment, deepening economic and trade cooperation with countries around the world, China aims to achieving common development and living a better life.

We need to strengthen international policy coordination and jointly address development challenges. Currently, we face major challenges such as the Ukrainian crisis, monetary policy tightening, weak global economic growth and banking crises, which require enhanced international cooperation to seek development opportunities in crises. Firstly, we need to strengthen the regulation of capital flows to prevent large-scale irrational capital flows that could impact foreign exchange and credit markets, closely monitor financial events such as the Silicon Valley Bank crisis, and work to avoid potential spill-over effects. Secondly, we need to strengthen cooperation in industrial policies and leverage each country's resource endowments to maintain the stability of international industrial and supply chains. Thirdly, we need to promote digital trade and the digital economy, expand the use of central bank digital currencies in cross-border trade and investment, reform and innovate the international payment system, promote the implementation of the BIS-led mBridge plan, build international financial infrastructure that is suitable for the digital economy era, provide fairer and more reasonable cross-border payment channels for developing countries, significantly reduce trade settlement costs, and enhance the inclusiveness of international finance.

From now to 2035, China will develop its economy and establish a modern Chinese path for modernization. This is a summary of China's development experience over the past 70 years. It has five characteristics: Firstly, with a big population of 1.4 billion, China faces significant resource and environmental constraints, which makes it impossible to follow other countries' modernization models. Secondly, China strives for common prosperity, which has been proved by the successful lifting of over 100 million people out of poverty in the past decade. Thirdly, China seeks to balance material and spiritual civilization, promoting the full development of human beings. Fourthly, China advocates for harmonious coexistence between humans and nature, prioritizing the protection of ecological environments and sustainable development. Finally, China pursues peaceful development, as Chinese culture emphasizes the importance of harmony and rejects the outdated methods of modernization achieved through war, colonization, and plunder.

How to Restructure Chinese Supply Chains*

By Andrew Sheng and Xiao Geng *

China must reconfigure its industries and supply chains to meet the challenges posed by rising geopolitical tensions and rapid population aging. Private markets – including private-equity and venture-capital funds – can and must play a crucial role in this effort.

"The old is dying and the new cannot be born," the Italian Marxist theorist Antonio Gramsci wrote in the early twentieth century. We seem to be living in a similar interregnum today, likewise marked by "a great variety of morbid symptoms," including, not least, the breakdown of global supply chains and the return of inflation. The only way forward is to support the development of new markets, industries, and institutions. But who will finance this effort?

In good times, characterized by rapid growth and fat margins, commercial banks and private markets could help emerging and efficient firms raise enough capital to acquire and restructure their inefficient and failing counterparts and create new supply chains. But tighter financial regulation after the 2008 global financial crisis, together with a prolonged period of low interest rates, has made mainstream financial institutions more cautious. They now prefer lower risks and shorter time horizons.

As a result, debt levels are at historic highs, and market concentration has increased substantially, with a handful of listed companies enjoying huge market share, particularly in the tech sector. At the same time, with public markets tightly regulated, those in search of higher yields are turning to less liquid, opaquer, and less regulated private markets. According to McKinsey's Global Private Markets Review 2023, total private-market assets under management (AUM) reached $11.7 trillion in June 2022, having grown at an annual rate of nearly 20% since 2017.

This growth was driven by the embrace of limited partnership private-equity (PE) funds, which mostly invest in companies that are not publicly listed or traded, and venture-capital (VC) funds, which invest in riskier startups or young businesses with long-term potential. Long-term pension and insurance funds, as well as holders of patient private wealth, are willing to wait for bigger returns, and trust PE and VC funds – especially the larger and more experienced of them – to deliver.

But whether private markets will be able to serve the goal of deep financial restructuring remains to be seen. Though private-market AUM have grown faster than total global financial assets – which increased by 7.7% in 2021 – they account for just 2.4% of the total ($486.6 trillion). Likewise, the non-bank financial intermediation (NBFI) sector, which includes pension funds, insurers, and investment funds, grew by 8.9% in 2021 – faster than its five-year average growth of 6.6%, but still much slower than private-sector AUM. Private AUM amount to only 4.9% of NBFI assets totaling $239.3 trillion.

Furthermore, enthusiasm for PE/VC funds seems to have cooled since last summer. After peaking in 2021, private-equity deal volume fell by 26% to $2.4 trillion, and deal count declined by 15%, to just under 60,000.

The Chinese PE/VC market has followed a similar trend. In 2022, Chinese private-equity deal volume shrank by 48.7%, to $154.8 billion, and deal count fell 16%, to 9,695. In the first half of 2022, Chinese private-market AUM increased, but the total – $539 billion – amounted to just 0.7% of China's total financial assets and 2.7% of its NBFI assets.

But this gap may offer a valuable opportunity for China. The Chinese PE/VC market is clearly underdeveloped. With China accounting for 18% of global GDP, there is considerable potential for Chinese PE/VC funds to expand – and to support domestic economic restructuring.

Already, Chinese PE/VC funds are handling a growing share of mergers and acquisitions (M&A) – more than 56% in 2022, compared to 49% in 2018. M&A transactions have proliferated in the wake of COVID-19 lockdowns, and the number involving VC funds increased by 61% year on year in the first half of 2022.

China's PE/VC funds have two distinctive characteristics. First, foreign funds play a significant role in the sector, offering international expertise and market reach. The problem now is that, amid rising geopolitical tensions, foreign PE/VC investment in China has declined considerably.

In 2022, only 114 new foreign-currency funds were created in China, down more than 40% from the previous year. And in the first quarter of 2023, there were only 87 instances of foreign-currency funds investing in the Chinese equity market – an 87.5% decline by number and a 57.5% decline by value from the previous year.

The second distinctive characteristic of China's PE/VC funds is that a substantial share of their funding comes from various levels of government. As of the end of 2022, Chinese government entities had established 1,531 investment funds, worth a total of about $380 million.

The central government accounts for a very small share of these funds: just 1.5% by number and 7.5% by value. Central-government funds tend to focus on investments that advance national priorities, such as in high-end manufacturing, energy, and environmental protection.

Provincial- and municipal-level investment funds, for their part, aim primarily to develop regional economies. Provincial governments accounted for 24.3% of investment funds by number, and 38.4% by value, in 2022, while municipal governments accounted for 53.4% and 42.7%, respectively.

District and county governments – which account for 20.8% of investment funds by number and 11.4% by value – support companies that can stimulate the local economy. This used to mean investing in infrastructure, especially real estate, but the priority has shifted to creating local jobs and restructuring local industries. The value of these investment funds increased by nearly 54% last year.

China must reconfigure its industries and supply chains to meet the challenges posed by rising geopolitical tensions and rapid population aging. Though foreign investment in the PE/VC sector is declining, China's government has shown that it can support the "birth" and development of private funds, equipping them to provide market-based solutions to the economy's woes.

Allying More Digitally*

By CHEN YINMO AND ZHANG MING AND WANG ZHE *

China can deepen cooperation with countries involved in the Belt and Road Initiative and the RCEP to build an international platform for the digital economy

The participation of a country in the global digital economy is often closely related to its digital economic growth. This conclusion is based on the TIMG index, which aims to measure the development of the global digital economy in four dimensions — technology, infrastructure, market and governance.

According to the index, there are five important trends in international digital economy cooperation.

First, regional organizations have become platforms for signing international cooperation policies in the digital economy. For example, members of the European Union have multiple platforms for participating in international cooperation in the sector. Many of them can rely on global or regional platforms such as the EU and the OECD to actively promote multilateral or bilateral cooperation in global digital economy.

Second, major powers lead the formulation of international cooperation rules for the digital economy. Apart from the EU, the United States and the United Kingdom are leaders in international digital economy cooperation.

Third, leading countries in digital economic growth are actively participating in and attempting to lead international cooperation. As of 2022, Japan, Canada, Australia and Singapore had all joined in around 35 to 40 international digital collaborations.

In stark contrast, by 2021, although China's TIMG index ranked eighth globally, there were only 17 international cooperation policies that China had joined in and led.

Fourth, emerging markets and developing countries such as China, India and Indonesia are actively participating in international digital economy cooperation. As of 2022, China, Indonesia and India had participated in 17, 18 and 19 international cooperation projects, respectively.

Fifth, medium-developed countries in global digital economy are striving to enhance their own strength through international cooperation. For example, countries ranked 20th to 60th in the TIMG index in 2021, such as Italy, Spain, Poland, Croatia and others, are striving to improve their digital economy development level through international cooperation, which demonstrates those latecomers' endeavors and catch-up efforts in the digital economy.

In general, based on the TIMG index score and international cooperation in the digital economy, there is a positive correlation between participation in international digital economy cooperation and the overall performance of the digital economy. However, there is still a mismatch. At the same time, the modes, targets and fields of international cooperation in the digital economy vary significantly. The cooperators of the US, the United Kingdom and Canada are mainly developed regions and countries such as Western Europe and Japan.

As an East Asian country, Japan mainly chooses to cooperate with developed countries represented by the UK and the US, and selectively conducts international digital economy cooperation with Asian countries with geopolitical interests such as the Republic of Korea and India. Geopolitical interests are Singapore's main consideration for choosing cooperators, with its main partners including the ROK, Japan, India, China, Indonesia and others.

Currently, countries that have cooperated with China in the digital economy show three important characteristics.

First, the country with the most international cooperation is the US.Although China and the US both have a large number of international cooperation policies in the digital economy, the main form of their cooperation is multilateral. At present, they have not signed bilateral cooperation policies or agreements on the digital economy. Meanwhile, China is actively carrying out international cooperation with emerging markets and developing countries such as Saudi Arabia, India, Turkiye, Indonesia and South Africa.

---

*This article first appeared in China Daily Global on June 12, 2023. The authors contributed this article to China Watch, a think tank powered by China Daily. The views do not necessarily reflect those of China Daily.

* Chen Yinmo is a researcher with the National Institution for Finance and Development. Zhang Ming is deputy director of the Institute of Finance &Banking at the Chinese Academy of Social Sciences and deputy director of the National Institution for Finance and Develop ment. Wang Zhe is a post-doctorate at the Institute of Finance &Banking at the Chinese Academy of Social Sciences.

Second, China is accelerating the establishment of digital economic cooperation with countries and regions involved in the Belt and Road Initiative. Since 2017, when it officially proposed to build the Digital Silk Road, China has continued to strengthen cooperation with countries and regions involved in the Belt and Road Initiative in cutting-edge fields such as the digital economy, artificial intelligence, nanotechnology and quantum computing to advance the development of big data, cloud computing, smart cities and other fields, and constantly innovate the construction of the Belt and Road.

Third, China is conducting deeper cooperation with countries having close and long-term economic and trade exchanges in the field of the digital economy. For example, the leaders of BRICS countries reached the Digital Economy Partnership Framework at their 14th summit in 2022, forming an important consensus on deepening cooperation among the BRICS countries and initiating a new process of cooperation in the field.

Based on the digital economy development of countries and regions involved in the Belt and Road Initiative measured by the TIMG index, on the one hand, since 2017, these countries and regions' digital economic growth has accelerated, but their development gap is relatively obvious. In 2021, the countries and regions with highest ranking in TIMG index are, respectively, Singapore, China, the United Arab Emirates and Israel; while countries such as Yemen, Laos, Kyrgyzstan and Lebanon have relatively weak digital economies.

On the other hand, from the characteristics of countries that have established international digital economy cooperation with China, in 2021, except for Singapore, which has a relatively high ranking in the TIMG index, other countries and regions have ranked in the middle or lower position globally; from the perspective of segmented indicators, countries that have established digital economic cooperation with China still have room for technology, infrastructure, market, and governance improvements.

Based on the analysis of international cooperation in the global digital economy using the TIMG index, China's international cooperation in this field has broad prospects.

In the future, China can strengthen international cooperation from the following three aspects: First, a new round of digital economy cooperation will start under the existing international economic cooperation pattern. Relying on international organizations such as the United Nations and G20 to carry out multilateral cooperation, fully leveraging China's active role in international cooperation such as the Digital Economy Partnership Agreement; second, give full play to China's leading advantages in digital economic development, carry out in-depth international cooperation with countries involved in the Belt and Road Initiative, members of the Regional Comprehensive Economic Partnership and other regions, build an international cooperation platform for digital economy based on common interests, combine China's comparative digital infrastructure and technological advantages with the digital market of the host country, and seek more opportunities for international cooperation; the third is to actively engage in international cooperation and exchanges with developed countries in the digital economy, with a focus on enhancing cooperation in digital technology, strengthening policy coordination in digital governance, jointly building a new framework for international digital economy cooperation, and actively participating in the formulation of global rules for the digital economy.

Global Economy

Trade Liberalisation is the Solution to Fiscal Uncertainty[*]

By TALAL RAFI[*]

A fractured global trading system will only worsen debt distress. The UN estimates that there are 54 nations globally suffering from debt distress. In the face of multiple crises, including the Russia-Ukraine war and a global economic downturn, this is leading some countries to engage in trade protectionism.

But protectionism would lead to a world that is less resilient and more conflict prone. It is not the solution to debt distress and may further exacerbate the problems.

The International Monetary Fund projects that a deep fracture of the global trading system could reduce global output by 7%. The cumulative stock of import restrictions up to late 2022 impacted over 9% of the total merchandise imports amounting to more than $2tn, according to WTO economists.

Figure 1. Turbulent era: signs of trade fragmentation are increasing
Trade uncertainty contribution to World Uncertainty Index, %
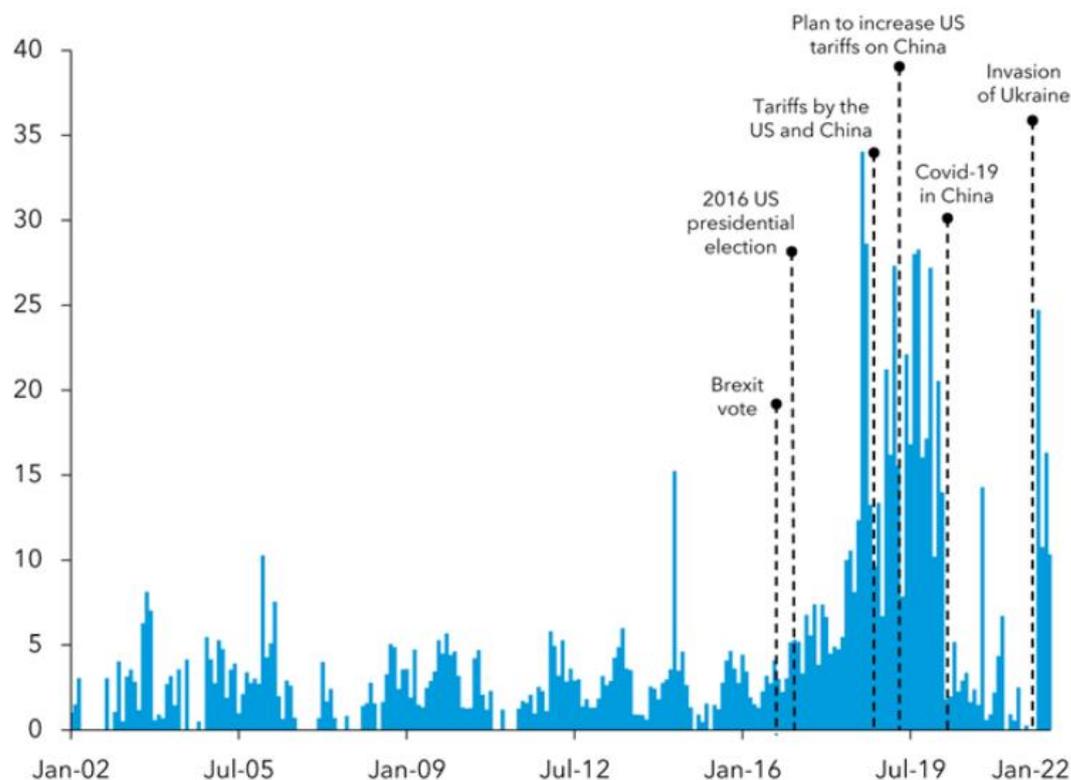
Source: IMF

Increased inflation

As trade barriers on imports are increased, this results in higher prices due to a shortfall on the supply side. To tame inflation, central banks increase policy rates, which leads to higher borrowing costs and lower profits for businesses.

Domestic producers can sell products at a higher price with lower quality due to the reduction in foreign competitors in the market. Fiscal expenditure of the government increases as the need for social security grows. As mortgage rates rise, the disposable income of consumers decreases, resulting in less consumption and leading to lower corporate taxes, which affects fiscal revenue.

Higher trade barriers result in higher costs for the importation of capital and intermediate goods needed by the export-focused manufacturing industries. This makes locally produced exports less competitive, resulting in reduced output. This causes a reduction in fiscal revenue from export-based manufacturing and also decreases foreign exchange, especially for developing markets that need hard currency to import. This has been one of the key reasons for many developing countries to borrow foreign exchange, which puts further strains on fiscal policy.

Less innovation

As domestic companies are protected from imports through trade barriers and subsidies, local companies tend to have fewer incentives to innovate. This results in lower spending on research and development. Consumers receive inferior products as many businesses become comfortable within a protected economy. Local firms tend to focus inwards and, even if the economy is opened a few years later, they cannot build products that can be exported in a competitive global market. Eventually, exports are affected and fiscal revenue from exports decreases.

There is a correlation between innovation and economic growth. As economic growth slows, it also results in fiscal imbalance. Geopolitical tensions over the last few years have resulted in limited technology transfer and restrictions in investments between nations, which reduces the ability to innovate in a fragmented world with less collaboration. This will make it more difficult to develop technology and find solutions for key issues such as climate change. Without this, climate change will cause economic damage and result in drastically higher fiscal expenditure and rising public debt levels.

Depressed economic growth

Trade protectionist policies usually result in a backlash from other countries, resulting in fragmented markets. This means reduced economies of scale for many companies and lower profits as efficiency falters. Fiscal revenue is affected with lower profits from the private sector. As profits drop, many companies may lay-off employees, resulting in a further dip in consumption.

As trade barriers increase, local industries are expected to match the needs of the population. Subsidies, tax breaks and, in certain cases, government financing are provided, which increases fiscal expenditure. This means governments will have to cut down expenditure in other important areas or increase taxes, which further dampens the economy.

The global economy is in a weak position with high inflation, high policy rates, geopolitical tensions, rising public debt and the looming threat of climate change. Trade protectionism leads to higher prices, less innovation, slower economic growth and larger fiscal deficits. But there is an alternative solution.

Trade liberalisation will lead to greater efficiency in production as each country produces goods that have a comparative advantage over others. Free flow of goods and services with increased competition also results in increased innovation, which is essential to driving global economic growth.

Asia Needs to Focus on Productivity to Lead Global Growth[*]

By ANOOP SINGH *

China's recent economic indicators confirm it's too early to say if its reopening and growth rebound can re-establish its global leadership. The pick-up in its consumption in the first quarter has not led to a broader manufacturing and construction boom, and investment has fallen short of expectations. Is this indicative that Asia cannot drive the global economy, whose growth is seen slowing to 2% with recession risks rising for the US and EU?

After the global financial crisis (GFC), emerging markets in Asia led the global recovery. But, over the past decade, Asia's growth prospects were successively lowered. China became the largest country by purchasing power parity and India took over periodically the status ofthe fastest-growing major economy. Both also became the subject of growth uncertainties. The revisions to growth reflected falling productivity fundamentals amid rapid technological change. Weaker capital accumulation is accounting for much of the slowdown, followed by falling total factor productivity (TFP) and labour supply growth. Capital accumulation has slowed in China and private investment has been trending lower in India. More generally, this reflects the rise of financial vulnerabilities, with debt levels having risen in many Asian economies since the GFC.

Excess credit deepened distortions in the pricing of labour and capital that have driven credit largely to unproductive corporate and state-owned enterprises. In many countries, this also diminished their research and development (R&D) spending. Hence, emerging markets in Asia have experienced a productivity slowdown since the GFC.

A well-targeted reform agenda is imperative to reignite productivity growth. Technological factors have accounted for a large portion of productivity variation. TFP measures the efficiency with which all factors are employed, and it has become symbolic of the technology behind the production process—that has now been uplifted by the transformative rise in artificial intelligence.

Sustained productivity growth would be better driven by technological capital-deepening, with related organizational changes and increased competition that can result in more efficient methods of production.

This requires building globally competitive innovation capabilities by long-term R&D spending, with complementary investments in related skills and infrastructure.

There is large variation in Asia in these areas, as a result of high country variation and concentration in R&D spending. Despite the contradictions from its financial leverage, China has made innovation the "first driving force to lead development," and has quickly moved up in the World Intellectual Property Organization's Global Innovation Index (GII) to rank 11, slightly ahead of Japan, and behind Korea and Singapore. But there are few other Asian countries in the top 50. China has now caught up with the OECD in R&D spending of about 2.5% of GDP—close to the US and Europe in purchasing power parity terms. R&D growth in software, computer, and electronic technology lead.

A closer look at the sources of R&D spending shows the bulk of it is accounted for by the private sector. However, in China, its state-run industrial policy also provides significant state spending—this may be aided by the establishment of the centrally-run Central Science and Technology Commission. Although India is in the top 40 countries in the GII, India's spending on R&D is relatively very low, as assessed by the Niti Aayog. Only a fraction of it is done by Indian industry. However, the focus on innovation is building, with rising competition between the states, as demonstrated by India's own innovation index.

India's potential growth could benefit from accelerated implementation of an already-ambitious reform agenda, and leadership in digital infrastructure. Reforms are planned to further rationalize the role of public banks, ensure a more level playing field in the banking sector, and fast-track the development of capital markets.

Looking ahead, technology will continue to be the major driver for building and sustaining productivity, opening a new pandora's box domestically and internationally.

Keynes told us that employment tends to fall after technology-driven productivity improvements, at least initially, and would be "followed by golden eras of human liberation." The first part of his prediction is now a global reality, making it imperative to develop policy options to achieve his second prediction. For more equitable sharing of technology-driven growth, this must include better diversification of skills and training in areas that complement the new technologies. It will require bringing the private sector, startups, research institutes and universities together to better leverage the public infrastructure.

Globally, the overdue need for a multilateral governance and regulatory response to the new frontiers of digital trade and AI is reaching a crisis point. In its absence, global competition to de-risk in these areas is leading to protectionist and discriminatory steps that are fragmenting the new areas of global trade with serious knock-on effects on innovation and related growth drivers.

The G-20 should make this a critical part of its assessment and advice. It should set out a sequenced agenda to establish a new multilateral and rule-based regulatory system in the technology frontiers of trade and growth, and consistent with broadening the role of the World Trade Organization.

Middle East, North Africa Vulnerable to Rising Fiscal Risks[*]

By ANTOINETTE M. SAYEH, MAHMOUD HARB AND JACQUES CHARAOUI[*]

Stronger risk management can reduce budgetary surprises and allow the region to plan better for development.

In an uncertain world, budget revenue and spending often end up far away from government plans. Volatile growth, high universal subsidies, and loss-making state-owned enterprises expose many low- and middle-income economies in the Middle East, North Africa, and Pakistan to such fiscal risks. These factors combine with adverse external developments such as recent interest-rate rises and food and fuel price surges to put public finances under pressure in many countries.

As we explain in a new paper, the "MENAPEG" region—a group that includes economies in the Middle East, North Africa and Pakistan but excludes high-income Gulf countries—is especially vulnerable to fiscal risks. In fact, small fiscal risks occur in countries every year. Importantly, larger shocks that cause debt to increase by an average of 12 percent of gross domestic product occur, on average, once every eight years.

Despite the frequency of these events, policymakers are often caught off guard. Such shocks force them to make ad hoc cuts to development and other priority spending. This also limits many countries' ability to use fiscal policy to smooth economic slowdowns, precisely when it is needed most.

Sources of risks

There are multiple factors behind the region's relatively high exposure to fiscal risks. First is that economic growth is more volatile than in other parts of the world. High reliance on resource revenue among hydrocarbon exporters such as Algeria, Iraq, and Libya, and pervasive universal energy and food subsidies across the region have also exposed budgets to fluctuations in commodity prices.

Onerous subsidies

Universal subsidies, pervasive in the MENAPEG region, expose budgets to fluctuations in commodity prices.
(energy subsidies, percent of regional GDP)
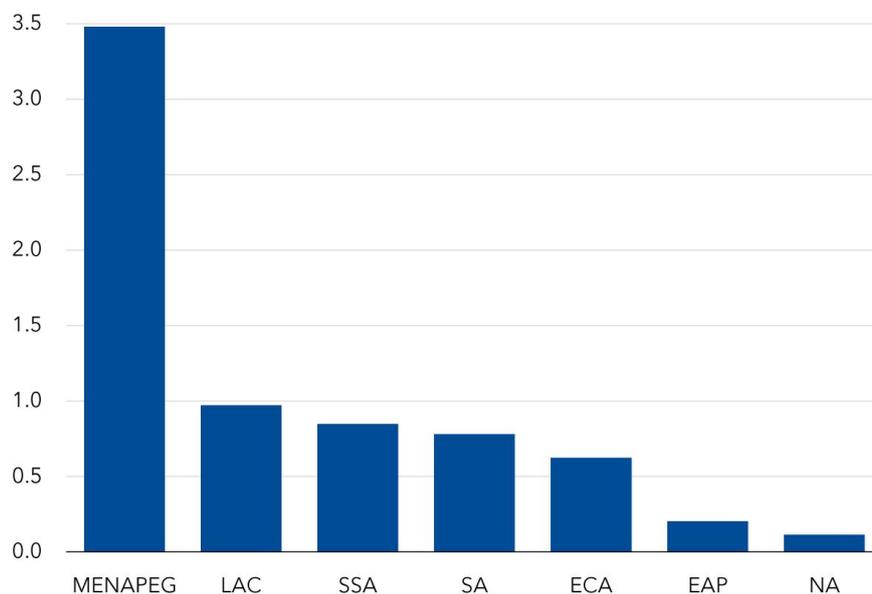
Sources: IMF Country-Level Subsidy Estimates Database, 2020; and IMF staff calculations.
Note: MENAPEG = Middle East, North Africa, and Pakistan region excluding Gulf countries. LAC = Latin America and Caribbean region. SSA = Sub-Saharan Africa.
SA = South Asia. ECA = Europe and Central Asia. EAP = East Asia and Pacific.
NA = North America.

IMF

Second, state ownership of non-financial corporations and banks in these countries can generate sizable government obligations that can come due when negative events occur, known as contingent liabilities. For example, a public electric or water utility company that faces large operational losses might require government financial assistance to continue providing services.

Many state-owned enterprises (SOE) in the region are financially weak and require regular government cash injections. This often reflects their role in fulfilling quasi-fiscal activities such as selling goods and services at below market rates or creating jobs, rather than being run on a commercially sound basis. Contingent liabilities may also be arise frompublic-private partnerships (PPPs). For example, certain PPP contracts might require government to compensate a private partner if collections, as in toll road projects, fall short of projections.

Costly cash injections
Fulfilling contingent liabilities has a sizable impact on the
budgets of countries in the MENAPEG region.
(cumulative budgetary impact 1990-2018, percent of 2018 GDP)
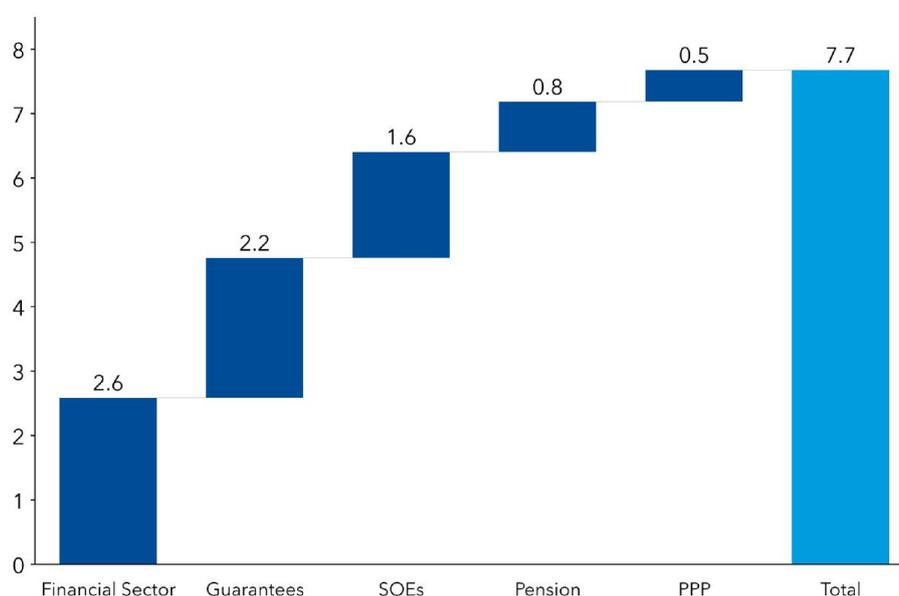
Sources: October 2020 IMF, World Economic Outlook; and authors' calculations.
Note: Contingent liability realizations pertaining to SOEs include on-budget support and
exclude off-budget subsidies. The impact of contingent liability realizations refers to the
associated gross payout, which captures immediate budgetary pressures and excludes
any asset recoveries. MENAPEG = Middle East, North Africa, and Pakistan region
excluding Gulf countries.

IMF

Third, the region's public finances are exposed to rare extreme events that can have large fiscal consequences. For instance, natural and climate disasters such as the catastrophic floods in Pakistan in 2022, extreme droughts in North Africa or social conflict and instability can disrupt economic activities, destroy infrastructure, create additional spending needs, weaken institutional capacity, and displace populations. Damage from natural disasters alone is around $2 billion annually.

Policies
Against this background, governments across the region are strengthening their capacity to analyze and manage fiscal risks. For example, some governments have set up dedicated macro-financial units and developed fiscal risk statements (Egypt) or achieved progress on mapping fiscal risks (Jordan), monitoring SOEs (Tunisia) and implementing risk mitigating measures (Iraq).

However, governments still need to take steps to enhance fiscal risk data collection, identification, analysis, and management capacity.

First, it is particularly urgent to address data gaps through systematic collection of financial information on SOEs, guarantees, PPPs and other sources of contingent liabilities to inform a transparent assessment of fiscal risks. Once sufficient data has been gathered, modeling techniques such as fiscal stress tests can be deployed to deepen understanding of fiscal risks, the probability of their materialization and their potential impact.

Second, governments should consider mitigation measures. These involve a combination of direct controls, for example, well-calibrated ceilings on the issuance of government guarantees, and indirect measures to discourage risky activities, such as charging fees to beneficiaries of guarantees.

Third, Governments can further enhance resilience to shocks by building buffers for unexpected expenditures and medium-term fiscal frameworks using well-defined debt and deficit anchors. The IMF

offers a range of tools and capacity development projects to support national authorities to strengthen their ability to analyze and manage fiscal risks.

Economic reforms can help address fiscal risks at the source. For instance, stronger macroeconomic frameworks can lessen growth volatility. Governance reforms and asset divestment can moderate contingent liabilities or lower the odds of their materialization. And improved budget processes reduce the likelihood of surprises.

Given various uncertainties, fiscal risks in the Middle Eastern and North African countries cannot be fully avoided. However, better risk awareness and stronger fiscal risk management will reduce budgetary surprises and provide firm ground for long-term development policies.

Monetary Policy

Monetary and Fiscal Policy: Safeguarding Stability and Trust*

By CLAUDIO BORIO *

Some things never change. One of them is monetary and fiscal policy's perennial search for coherence and stability. The two policies are simply too closely intertwined. And their influence on the economy too powerful.

Over the past year, we have seen the latest example of tensions. Monetary policy has been restraining aggregate demand to quench inflation; fiscal policy has been boosting it to shield activity from higher commodity prices. And higher interest rates have widened fiscal deficits.

But the challenges go way beyond the short-term policy mix. They have to do with long-term trajectories and their cumulative impact. This is the focus of this year's Annual Economic Report.

To shed light on those challenges, we put forward the notion of the region of stability. The region maps constellations of the two policies that foster sustainable macroeconomic and financial stability, and that keep tensions between the policies manageable.

We reach three conclusions.

First, even before the Covid crisis struck, the two policies had been approaching the boundaries of the region. Hence the recent unique combination of high inflation and widespread financial vulnerabilities.

Second, looking ahead, longer-term government debt trajectories pose the biggest threat. They have been relentlessly narrowing the region of stability and will continue to do so.

Finally, operating firmly within the region calls for adjustments to strategies, institutions and, above all, mindsets. The objective is to dispel a kind of "growth illusion" – a de facto excessive reliance on monetary and fiscal policy to drive growth.

Let me say a few words about the nexus between monetary and fiscal policy as well as the region of stability, the journey to the boundaries, the risks ahead and the policy implications.

The policy nexus and the region of stability

Monetary and fiscal policy are inevitably tied closely together. They give the state privileged access to resources, through the issuance of money and the power to tax, respectively. They back each other up: monetary policy can avoid the government's technical default; the power to tax ultimately backs the value of money. They operate through intertwined balance sheets – those of the central bank and the government. Their transmission mechanisms overlap, notably through financial conditions. And they have a major impact on the economy.

With this great power comes great responsibility. The region of stability, illustrated in Graph 1, delineates the range of policy settings that are consistent with the proper exercise of that power. Drifting outside the region generates large economic costs, in the form of slumps, high inflation and financial instability.

---

*Published on the occasion of the Bank's Annual General Meeting in Basel on 25 June 2023
* Head of the Monetary and Economic Department, Bank for International Settlements

Region of stability
Graph 1

Features   **Determinants**
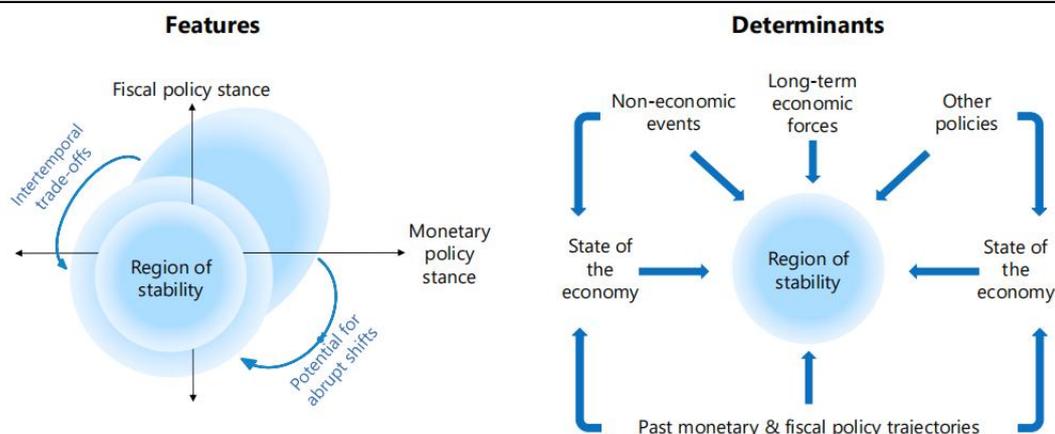
Source: BIS.

The region's location, size and shape depend on the state of the economy, not least that of the financial sector. In turn, the state of the economy depends on two sets of factors. One includes factors other than monetary and fiscal policy. Think, for instance, of non-economic events, eg a pandemic or a war, of powerful long-term economic tectonic forces, eg globalisation and financial liberalisation, or of other policies, notably, prudential policy. The other set comprises monetary and fiscal policies themselves – in particular, their past trajectory and their cumulative impact on the current state of the economy. Think, for instance, of the impact of past deficits on government debt or of long periods of very low interest rates on financial vulnerabilities.

Two important features stand out.

First, the two-way feedback between the state of the economy, on the one hand, and monetary and fiscal policy, on the other, opens the door to intertemporal trade-offs. Policy settings that may appear reasonable, indeed compelling, in the near term may cause problems down the road.

Second, the contours of the region are fluid and can be hard to discern in real time. They may become clearly visible only ex post. And instability may emerge abruptly, as confidence evaporates.

The journey so far

These two features figure prominently in the journey that has taken the two policies to the boundaries most recently.

Even before the Covid crisis, the two policies were approaching the boundaries (Graph 2). Globally, after a long string of deficits, government debt in relation to GDP had climbed to historical peaks (left-hand panel). Interest rates in nominal terms had fallen to historical troughs, while, in inflation-adjusted (real) terms, they had been negative in the wake of the Great Financial Crisis (GFC). And central bank balance sheets had reached wartime peaks. Ostensibly, policy buffers and safety margins had become uncomfortably small, leaving the economy highly exposed and vulnerable.

Policies did manage to ease aggressively once again as the Covid crisis struck, but at the cost of further flirting with the boundaries and laying the ground for the recent economic dislocations.

Monetary and fiscal policy in historical perspective[1]

Graph 2

Fiscal deficits and government debt[2]

Median: — Fiscal balance (lhs) — Government debt (rhs)

Policy rates and central bank balance sheets[3]

— Total central bank assets (median, lhs)
Policy rates (median, rhs): — Nominal --- Real
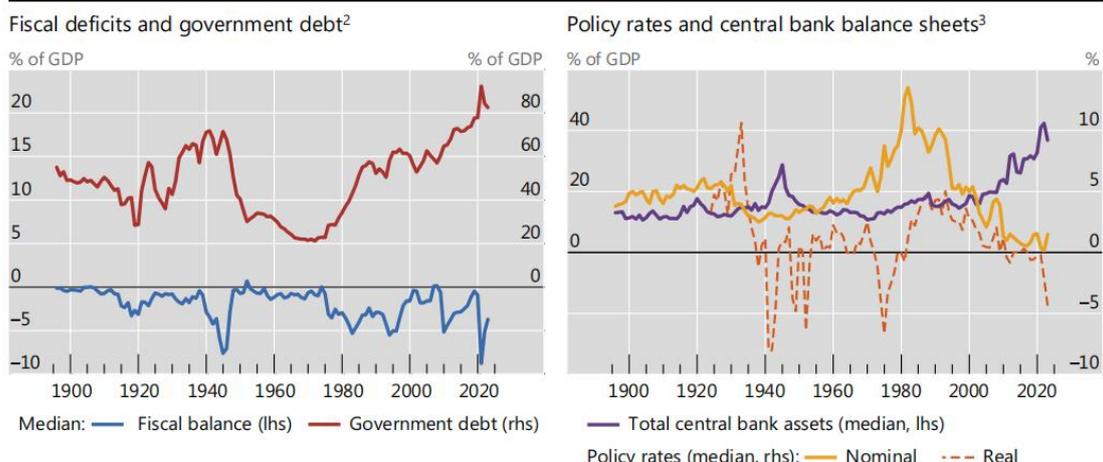
[1] Statistics are computed using a smaller set of countries when data are not available. [2] General (if not available, central) government core (if not available, total) debt at nominal (if not available, market) value. The sample covers AR, AT, AU, BE, BR, CA, CH, CL, DE, DK, ES, FR, GB, GR, IN, IT, JP, NL, NO, NZ, PT, RU, SE and US. [3] The sample covers AR, AU, BE, BR, CA, CH, CL, CN, DE, ES, FI, FR, GB, HK, ID, IE, IN, IT, JP, KR, MX, MY, NL, NO, PE, PH, SE, SG, TH and US.

Sources: S Abbas, N Belhocine, A El-Ganainy and M Horton, "A historical public debt database", *IMF Working Papers*, no 245, 2010; Ò Jordà, M Schularick and A Taylor, "Macrofinancial history and the new business cycle facts", in M Eichenbaum and J Parker (eds), *NBER Macroeconomics Annual*, vol 31, University of Chicago Press, 2016; European Commission; IMF; OECD; Datastream; Global Financial Data; Oxford Economics; national data; BIS.

Looking at the longer journey, back to the 1970s, this was not the first time that the boundaries were tested or breached. All such episodes shared one feature: policies underestimated the   constraints on economic expansions.

That said, the symptoms evolved over time, along with the changing nature of the business cycle and the signals of impending recessions (Graph 3). Until the mid- 1980s (red lines), at least in   advanced economies (AEs), the signal was rising inflation (first panel). Think of the Great Inflation of the 1970s. Thereafter, until the Covid crisis, it was the build-up of financial imbalances (second panel, blue line), here denoted by the deviation of the credit-to-GDP ratio from a slow-moving trend. Think of the GFC as the most spectacular example.

Symptoms of testing/breaching the boundaries[1]

Graph 3

| Inflation | Credit-to-GDP gap | Short-term nominal interest rate | Cumulative change in government debt |

Quarters around recessions | Quarters around recessions | Quarters around recessions | Years around recessions

— 1970–84 — 1985–2019
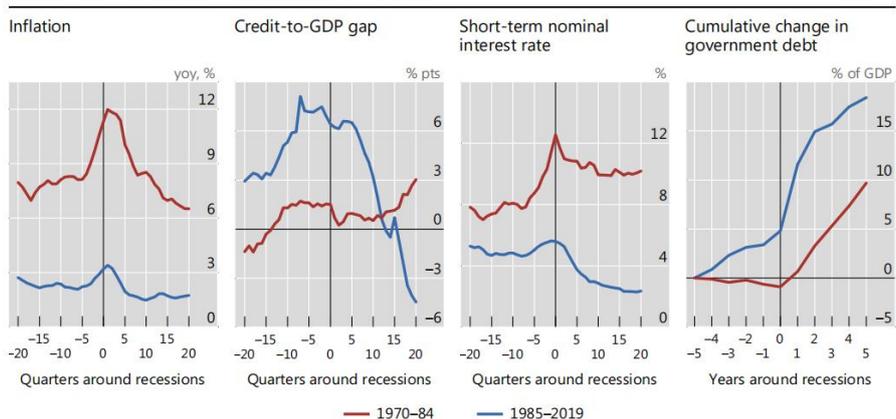
[1] The horizontal axis denotes quarters/years around recessions in the business cycles, with the peak date set at zero (vertical lines). Lines show the mean evolution of the time series across 16 AEs and events from 1970 to 2019, upon data availability. Business cycle dates are from National Bureau of Economic Research for US; Economic Cycle Research Institute for AU, CA, CH, DE, ES, FR, GB, IT, JP and SE. For BE, FI, IE, NL and NO business cycles are dated with a business cycle-dating algorithm. Episodes for which data for the previous and next 20 quarters are available are used in computing the medians.

Sources: IMF; OECD; Datastream; Economic Cycle Research Institute; National Bureau of Economic Research; national data; BIS.

This helps explain the gradual loss in policy buffers following the mid- 1980s: policies became less systematically countercyclical. Monetary policy (third panel, blue line) had little reason to tighten during

expansions, as inflation remained subdued, thereby accommodating the build-up of financial imbalances; but it eased strongly and persistently to fight the recessions, now at times exacerbated by banking crises. These financial recessions, in turn, drove large holes in the fiscal accounts (fourth panel, blue line), that were not replenished during subsequent upswings.

In the background, powerful long-term tectonic forces were also shaping the journey. Financial liberalisation amplified financial cycles. And the globalisation of the real economy helped central banks hardwire low inflation.

In a nutshell, after the mid- 1980s, low and stable inflation masked the constraints on economic expansions, encouraging policymakers to test them. Partly as a result, growth became increasingly reliant on debt accumulation, both public and private (Graph 4).

Greater reliance on debt-fuelled growth[1]   Graph 4

Decadal change in debt-to-GDP ratio: ▮ Public ▮ Private
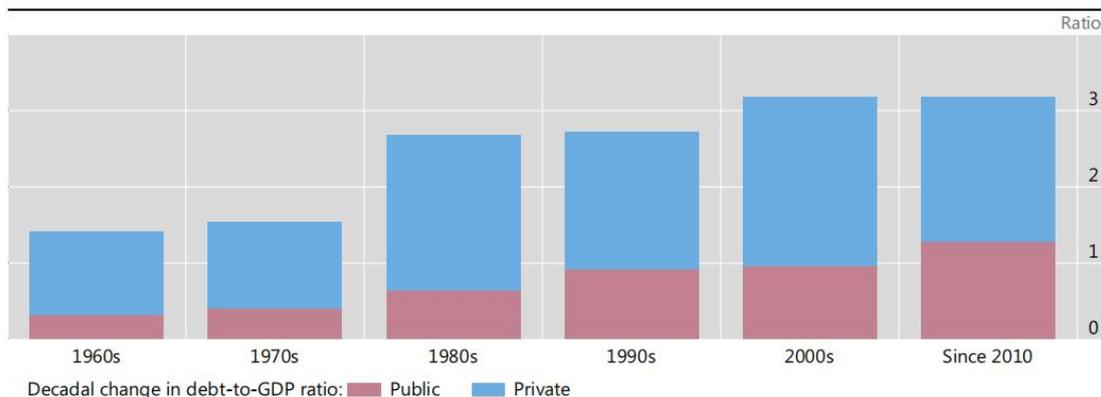
[1] Decadal change of total nominal values across economies. The sample covers AR, AU, BE, BR, CA, CH, CL, CN, CO, DE, DK, ES, FR, GB, HK, ID, IN, IT, JP, KR, MX, MY, NL, NO, NZ, SE, SG, TH and US upon data availability.

Sources: IMF; national data; BIS.

The journey in emerging market economies (EMEs) was similar in significant respects. After all, the same long-term forces were at play. Hence, the similar evolution of key indicators (Graph 5) – inflation, the policy rate, the fiscal balance and public debt.

Monetary and fiscal policy in advanced and emerging market economies[1]   Graph 5

Inflation   Policy rate   Fiscal balance   Public debt

— AEs — EMEs
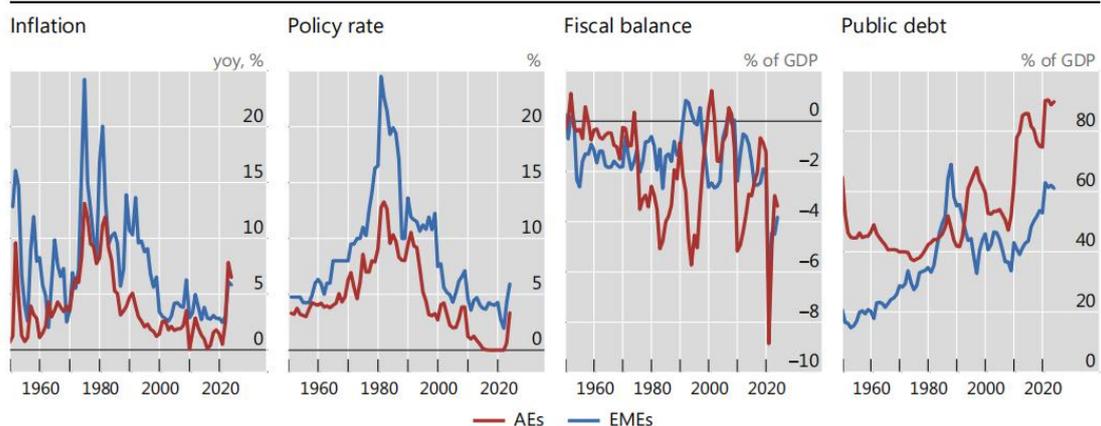
[1] Median across AEs = AU, BE, CA, CH, DE, ES, FI, FR, GB, IE, IT, JP, NL, NO, SE and US. EMEs = AR, BR, CL, CN, CO, HK, ID, IN, KR, MX, MY, PE, PH, SG, TH and VN. For fiscal balance and public debt, IMF forecasts for 2023.

Sources: IMF; Global Financial Data; national data; BIS.

However, regional and timing differences aside, the journey differed in one critical respect: these countries have been much more sensitive to global financial conditions, notably to monetary conditions in AEs, especially those in US dollars – the dominant international currency. Thus, the exchange rate has also played a more salient role.

The long journey explains why, today, we are seeing a unique combination of previous symptoms. In part because of the policy response to Covid, inflation has surged. In part because of the long phase of very low interest rates, vulnerabilities have built up and financial stress has broken out. This makes the current situation particularly challenging.

The journey ahead

What about the risks along the journey ahead?

As monetary policy normalises, the biggest risk is the unsustainability of government debt trajectories – a factor which has already started weighing on credit ratings for both AEs and EMEs (Graph 6).

Sovereign ratings deteriorate[1] Graph 6
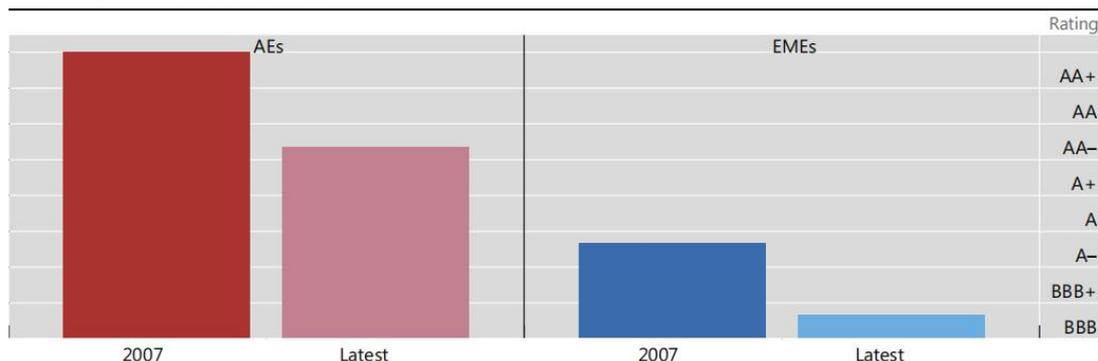
[1] Average sovereign debt ratings from Fitch, Moody's and S&P. The series plotted represent cross-country medians, for a smaller sample when data are not available. AEs = AT, AU, BE, CA, CH, CY, DE, DK, EE, ES, FI, FR, GB, GR, HR, IE, IT, JP, LT, LU, LV, MT, NL, NO, NZ, PT, SE, SI, SK and US. EMEs = BR, CL, CN, CO, CZ, HK, HU, ID, IL, IN, KR, MA, MX, MY, PE, PH, PL, RO, SG, TH, TR, VN and ZA.

Sources: Fitch; Moody's; S&P Global; BIS.

Let me stress that the recent inflation flare-up has cut debt-to-GDP ratios only temporarily. Historical evidence indicates that, in both AEs and EMEs, higher inflation has, if anything, ushered in higher, not lower, debt-to-GDP ratios in the following years (Graph 7). The impact is hardly different from zero even at high inflation rates (left-hand dot and whisker).

Higher inflation does not improve government finances[1] Graph 7

● Association between a 1% increase in inflation and the five-year-ahead change in debt-to-GDP ratio
— 90% confidence interval
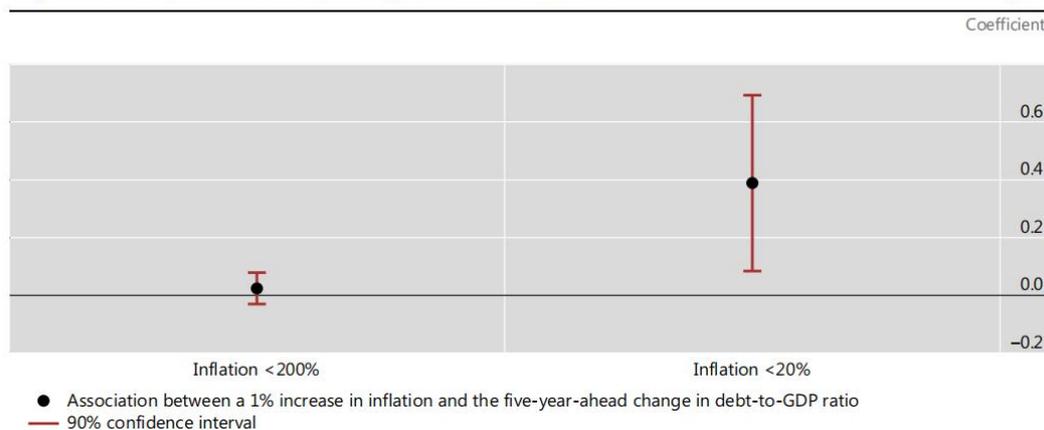
[1] The sample includes annual data between 1970 and 2022 for AE, AR, AT, AU, BE, BR, CA, CH, CL, CN, CO, CZ, DE, DK, DZ, ES, FI, FR, GB, GR, HK, HU, ID, IE, IL, IN, IT, JP, KR, MA, MX, MY, NL, NO, NZ, PE, PH, PL, PT, RO, RU, SA, SE, SG, TH, TR, US and ZA. The estimated effects are obtained from regressing the change in general government debt as a percentage of GDP between year t and t+5 over inflation in year t and country fixed effects. The regression sample excludes periods when a debt restructuring took place.

Sources: IMF; national data; BIS.

Stylised projections underline the longer-term risk to government finances (Graph 8). Even if interest rates stay below growth rates, absent consolidation, debt-to-GDP ratios are set to climb in the long term from their current historical peaks. The increase would be substantially larger if one factored in the impact of ageing populations as well as those of the green transition and higher defence spending linked to possible geopolitical tensions.

Worrying public debt projections[1]

As a percentage of GDP

Graph 8

Advanced economies | Emerging market economies

- – Baseline (constant primary deficits)
- – Adding age-related spending increases
- – Additional spending increase (2% of GDP)
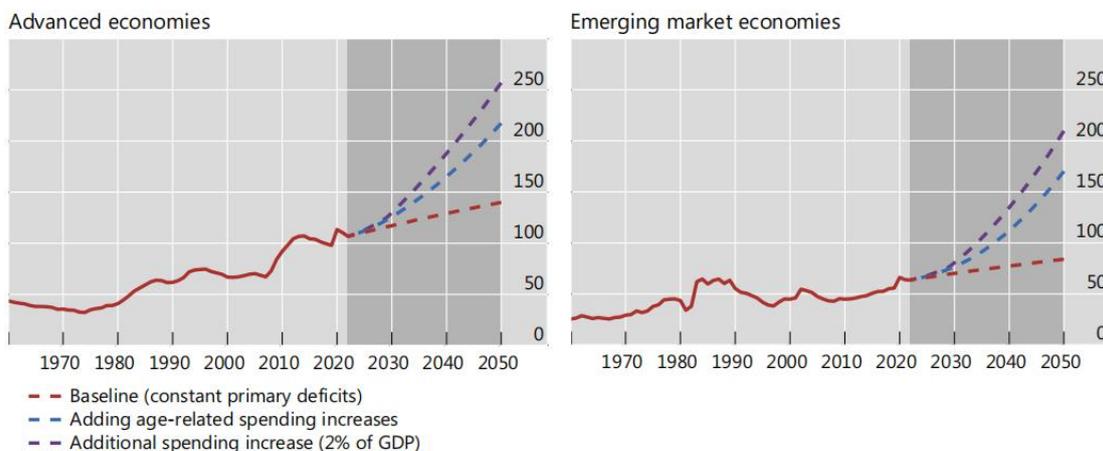
[1] Baseline projections assume an interest rate-growth differential equal to –1% and constant primary deficits in percent of GDP as of 2022. Age-related spending are based on IMF projections for pension and healthcare spending for 2030 and 2050. For the additional spending increase scenario it is assumed that the primary deficit will increase by 2% of GDP by 2030 and stay at that level afterwards. Historical debt is computed using a smaller set of countries when data are not available. Simple average across AEs = AT, BE, DE, ES, FI, FR, GB, IE, IT, JP, NL, PT and US. EMEs = AR, BR, CL, CN, CO, CZ, HU, ID, IL, IN, KR, MX, PL and ZA.

Sources: IMF; OECD; BIS.

Should interest rates exceed growth rates again, the self-reinforcing dynamics would be much stronger. Moreover, it is not uncommon for the differential to switch sign (Graph 9, left-hand panel). To get a sense of the possible impact of high debt, if today's interest rates were as high as those in the mid-1990s – a typical level – all else equal, debt service burdens would over time   exceed their historical peak.

This grim outlook for government debt is quite worrying since it raises serious risks for price and financial stability. Let's consider each in turn.

The interest rate-growth differential and the debt service burden

Graph 9

Interest-growth differential[1] | Debt service cost[2]

% pts | % of GDP

— AEs (mean) | — Median   ● Counterfactual
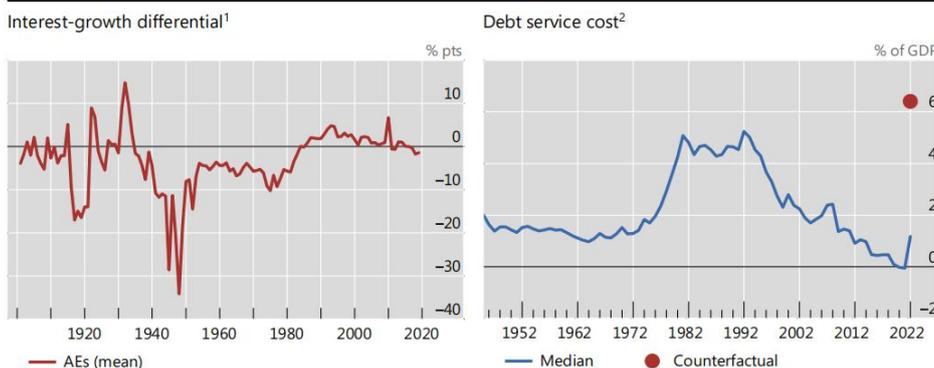
[1] Computed as the effective interest rate (ratio of the interest expense to debt) less inflation less real GDP growth. AEs = AU, BE, CA, DE, DK, ES, FR, GB, IT, JP, NL, NO, NZ, PT, SE and US.   [2] The sample covers AR, AT, AU, BE, BR, CA, CH, CL, DE, DK, ES, FR, GB, GR, IN, IT, JP, NL, NO, NZ, PT, RU, SE and US. Statistics are computed using a smaller set of countries when data are not available. Government debt-to-GDP multiplied by the simple average of short-term and long-term interest rates, where government debt is general (if not available, central) government core (if not available, total) debt at nominal (if not available, market) value. The counterfactual median debt service cost is constructed using the interest rate levels prevailing in 1995.

Sources: S Abbas, N Belhocine, A El-Ganainy and M Horton, "A historical public debt database", *IMF Working Papers*, no 245, 2010; Ò Jordà, M Schularick and A Taylor, "Macrofinancial history and the new business cycle facts", in M Eichenbaum and J Parker (eds), *NBER Macroeconomics Annual*, vol 31, University of Chicago Press, 2016; European Commission; IMF; OECD; Bloomberg; Datastream; Global Financial Data; Oxford Economics; national data; BIS.

Price stability
Fiscal policy can greatly constrain monetary policy in its fight against inflation.

Within a certain range, the constraints are manageable: expansionary fiscal policy increases the required degree of monetary policy tightening only to a limited extent and central bank independence provides sufficient safeguards. But when the credibility of fiscal policy or the creditworthiness of the sovereign are lost, monetary policy can be hamstrung: a tightening would only heighten those concerns and fuel inflation, typically through an uncontrolled exchange rate depreciation – a form of fiscal dominance.

Stylised empirical evidence is consistent with these considerations (Graph 10). The inflationary impact of a fiscal expansion is greater when the fiscal policy regime is less concerned with fiscal sustainability – "spendthrift" rather than "prudent" . Moreover, extreme situations aside, central bank independence is key: inflation is lower regardless of the fiscal policy regime.

Inflationary effects of fiscal stimulus across fiscal and monetary regimes Graph 10
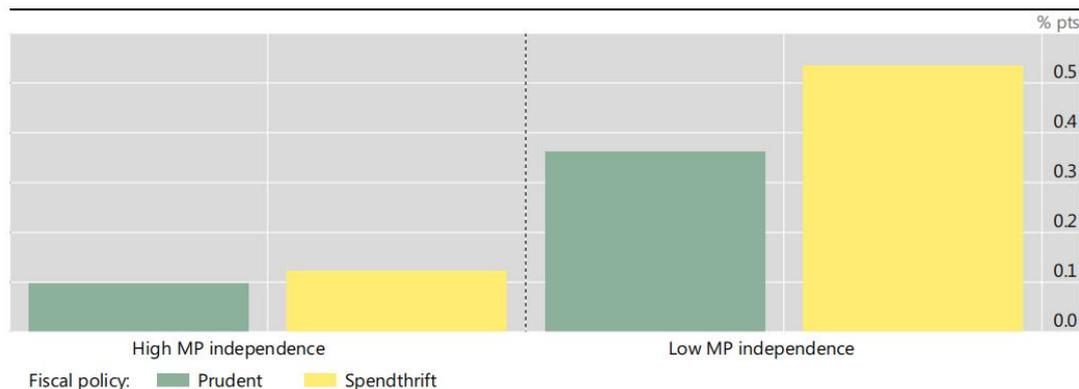
[1] The sample covers AT, AU, BE, CA, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, JP, NL, NO, NZ, PT, SE and US. Fiscal regimes are classified as prudent or spendthrift based on P Mauro, R Romeu, A Binder and A Zaman, "A modern history of fiscal prudence and profligacy", *Journal of Monetary Economics*, vol 76, 2015, pp 55–70. Monetary policy (MP) independence is defined as being high or low based on legal limitations on central bank lending to the public sector in D Romelli, "The political economy of reforms in central bank design: evidence from a new dataset", *Economic Policy*, vol 37, no 112, 2022, pp 641–88. Estimation sample from 1972– 2011 upon data availability.

Source: R Banerjee, V Boctor, A Mehrotra and F Zampolli, "Fiscal deficits and inflation risks: the role of fiscal and monetary regimes", *BIS Working Papers*, no 1028, July 2022.

Financial stability

Fiscal policy can also constrain monetary policy by triggering or amplifying financial instability.

Two-way causality between fiscal policy and financial instability Graph 11
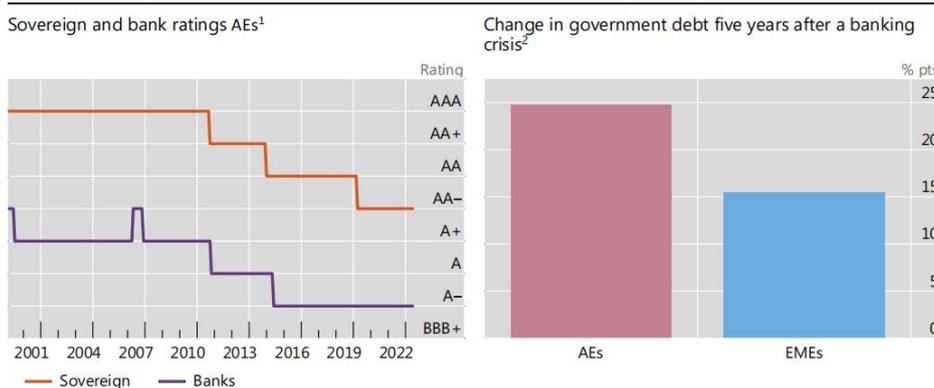
[1] Median ratings across AU, BE, CA, DE, ES, FI, FR, GB, GR, HR, IE, IT, JP, MT, NL, NO, NZ, PT, SE, SI, SK and US. [2] See C Borio, M Farag and F Zampolli, "Tackling the fiscal policy-financial stability nexus", *BIS Working Papers*, no 1090, April 2023.

Sources: Fitch; BIS.

The direction of causality between fiscal policy and financial instability goes both ways. On the one hand, high sovereign indebtedness can cause financial system stress by generating losses for financial institutions, either because of their exposures to sovereign debt or simply by destabilising the economy. This is a key reason why government and bank credit ratings tend to co-move

(Graph 11, left-hand panel). On the other hand, financial system stress, regardless of its origin, can cripple fiscal soundness. It can do so directly, as the sovereign may need to backstop the financial system, and, most importantly, indirectly, as the economy tanks. The surge in public sector debt following banking crises is typically well above 10 percentage points of GDP (right-   hand panel). This two-way causality can give rise to the infamous sovereign-bank doom loop.

Post-GFC in particular, as sovereign debt has soared, financial institutions have absorbed growing amounts. The corresponding increase in relation to bank capital in both AEs and EMEs has been sizeable (Graph 12, left-hand panel). Given the lengthening of maturities, exposures to interest rate (or duration) risk have also grown substantially (right-hand panel), even where central banks have engaged in large-scale asset purchases. The corresponding potential losses can be quite large.

The fiscal policy-financial instability nexus — Graph 12

Banks' sovereign debt exposure as ratio to capital[1]

Average remaining maturity of government securities[2]
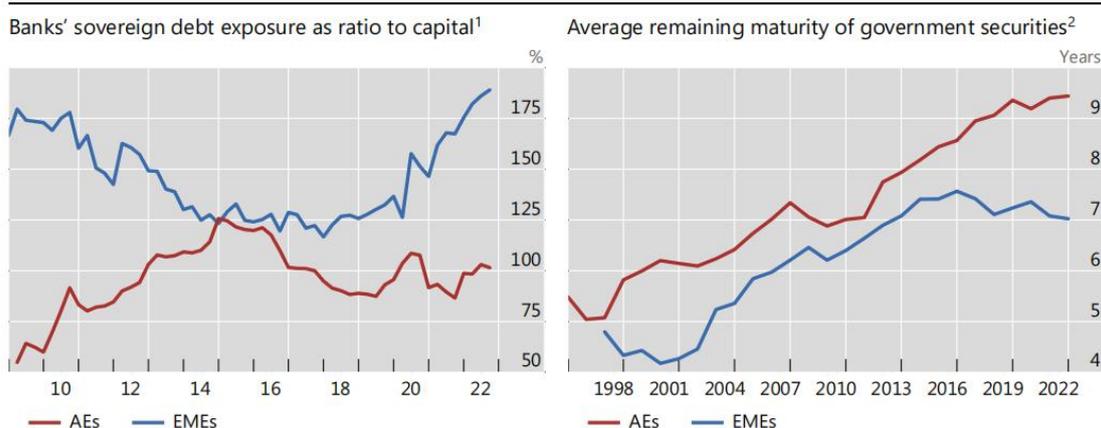
[1] The sample consists of AEs = AT, DK, ES, FR, IT, JP, LU, NL, PT and US. EMEs = AR, BR, CL, CO, CZ, HU, ID, IN, KR, MX, MY, PE, PH, PL, SG, TH, TR and ZA, where data are available. Other depository corporations net claims on central government and their claims on state and local government by residence, as percentage of banks' Tier 1 capital. The reporting depository corporations comprise all solo entities resident in the country, including those which are foreign-owned subsidiaries or branches of foreign entities. Branches and subsidiaries abroad of domestically owned entities are not included. Latest corresponds to latest available quarterly figure in 2022. For AT, data up to Q3 2021; for CL, data up to Q4 2021; for SG, data up to Q4 2019.   [2] Simple average maturity of central government debt securities issued across countries in the region upon data availability. AEs = AT, AU, BE, CA, DE, ES, FR, GB, GR, IT, JP, NL and US. EMEs = AR, BR, CL, CO, CZ, HK, HU, ID, IN, KR, MX, MY, PE, PH, PL, SA, SG, TH, TR and ZA.

Sources: IMF; Bloomberg; Datastream; BIS.

Indeed, in the year under review, we have already seen how interest rate risk alone can cause stress in the system. Think of the turmoil in UK gilts markets, or of the failure of a number of US   banks. The stress would be much more severe should the creditworthiness of some sovereigns be questioned at some point.

Policy

What are the implications of this analysis for policy?

The overriding priority is for monetary and fiscal policy to operate firmly within the region of stability. This requires adjustments to strategies, institutions and mindsets, well beyond monetary and fiscal policies themselves.

For fiscal policy, it is essential to ensure that debt evolves along an unambiguously sustainable path. This is the cornerstone of a well functioning economy and a prerequisite for monetary policy to retain headroom. With regard to strategies, it would be important to pay greater attention to the impact of financial factors on fiscal space, notably to the flattering effect of financial imbalances and to the potential fiscal costs of banking crises. With regard to institutions, it is crucial to give fiscal councils and fiscal rules more bite, possibly through constitutional safeguards.

For monetary policy, the priority is to ensure price stability while paying due attention to financial stability. As regards strategies, once price stability is re-established, it would be desirable to exploit the self-stabilising properties of low-inflation regimes, documented in detail in last year's Annual Economic Report. This means greater tolerance for moderate, even if persistent, shortfalls of inflation from narrowly defined targets. Greater tolerance would also reduce the incidence of long periods of unusually low interest

rates, thereby limiting their side effects, such as the build-up of financial vulnerabilities, the misallocation of resources and the incentive for governments to accumulate debt. As regards institutions, safeguarding central bank independence will be even more important if fiscal positions continue to deteriorate.

Two additional policy areas can substantially enlarge the region of stability.

One is prudential policy, both micro- and macroprudential – the first line of defence against financial instability. An effective prudential framework involves a whole range of elements.   Concerning sovereign exposures, more specifically, there is a need to revisit the favourable treatment of sovereign debt in market and credit risk.

Another, badly neglected, area is structural policy. Higher sustainable growth can be achieved only through decisive measures to improve the supply side of the economy. Structural policies have been flagging for too long. They need to be revived with urgency.

Ultimately, however – and let me conclude with this – a change in mindsets is called for. A keener recognition of the limitations of demand management policies is key to overcoming the "growth illusion" described earlier. The concept of the region of stability, hard as it may be to apply in real time, can promote the necessary shift in perspective. The concept is first and foremost a lens through which to look at the world and guide policy. It can help preserve the vital trust that society must have in the state and its decision-making.

Bold, but Realistic - Monetary Policy and Financial Stability *

By KLAAS KNOT *

Today is June 6th. A date of tremendous historical importance. The day that, exactly 79 years ago, marked the beginning of the end of the Second World War. A day that you could see as the beginning of what we now know as the European Union.

One of the founders of our Union was Robert Schuman. He was born just a stone's throw from where we are today – right here, in Luxembourg City.

What a bold man. A bold, but realistic man.

"Europe," he said, "will not be made all at once, or according to a single plan. It will be built through concrete achievements which first create a de facto solidarity."

And indeed, looking back, there was no single plan. But what we do see, when we look back, are concrete achievements. Like our hosts today: the European Commission, the European Investment Bank, and the European Stability Mechanism. And what we also see, when we look back, is de facto solidarity. Between people, between countries, and in concrete achievements like Next Generation EU.

The ESM is one of the youngest achievements in this very incomplete list.

A mere 14 years ago, at the height of the euro crisis, we did not have the ESM. We did not have a European mechanism in place to deal with economic and financial stability issues. But many of you here today realised that we needed one.

And it is testament to you, and all those involved, that the ESM has become, in a very short time, a cornerstone institution of the European Monetary Union. During the sovereign debt crisis, it was directly involved in successfully restoring market access to multiple euro area member states. One quick look at today's relative borrowing costs tells a very convincing story here.

Today, the sovereign debt crisis seems like something from the distant past. It was followed by a pandemic and, soon thereafter, Russia's brutal and unjustified war on European soil. This triggered an energy crisis that many European households and businesses still suffer from, along with the revival of persistently high inflation.

As central bankers, we did not foresee all of this. It was not part of the plan. But we are dealing with it. Because like Schuman's Europe, monetary policy and a stable financial system will not be made according to a single plan either. They will be made step by step. One concrete achievement after the other.

Until not so long ago, euro area inflation was persistently below our target of two percent over the medium term. And although short-term interest rates were near the effective lower bound, inflation was not budging.

This led the ECB, and many other central banks, to deploy a range of "unconventional" tools such as (Targeted) Long Term Refinancing Operations and large scale asset purchases. And when the pandemic hit us, the pace and volume of purchases picked up substantially.

Of course, unconventional monetary policy instruments are not without risk. When central banks increase their footprint in financial markets, the allocation of resources in the economy will be distorted. And, by substantially lowering both short-term and longer-term interest rates, vulnerabilities in the financial sector and real economy will increase.

To be frank, policymakers were facing a trade-off then, between medium-term inflation considerations and longer-term financial stability concerns. You can see how monetary policy advanced step by step on the next slide.
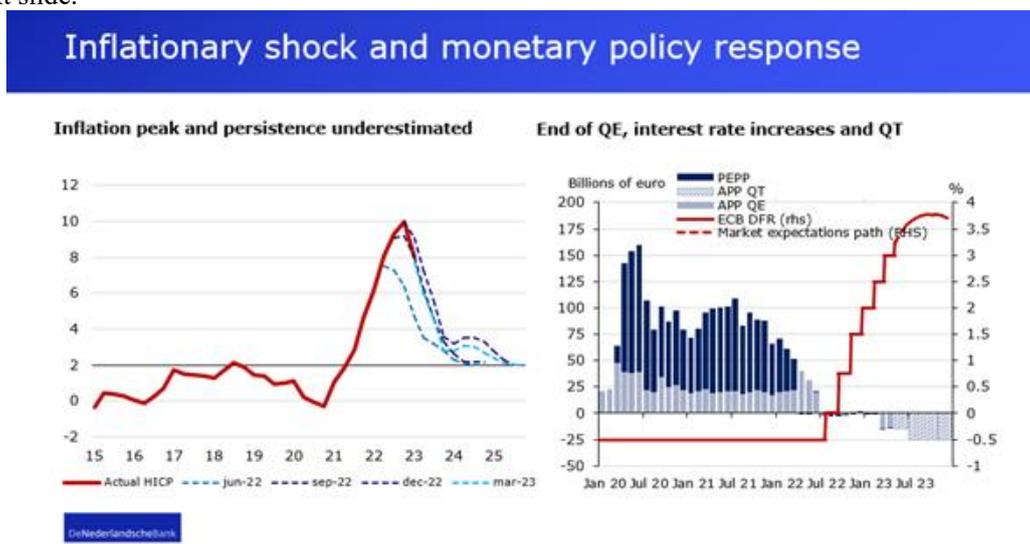
Once the pandemic-related measures gradually eased, demand recovered faster than many, including myself, had anticipated. Combined with some lagging distortions in international supply chains, this led to rising inflation.

And then Russia invaded Ukraine. On February 24th, 2022. An act that will go down in history like June 6th, 1944, but for very different - in fact entirely opposite - reasons. More like September 1st, 1939. An act as unjustified as unforgiving.

Russia's attack had an immediate effect on Europe's energy supply. And it caused record high and surprisingly persistent inflation in the euro area.

As a consequence, monetary policy needed to be tightened – quickly and decisively. So that is what we did. We phased out our asset purchases and raised interest rates in an unprecedented fashion. And this paid off. At its peak, headline inflation was 10.6 percent. Now, it has come down to just above 6 percent. Clearly this is still way too high. But I do believe that, in the absence of further supply shocks, the worst is behind us in terms of the immediate assault on our citizens' purchasing power.

Peak in headline likely behind us, but underlying inflation elevated

HICP inflation seems to have peaked

Measures of underlying inflation remain high
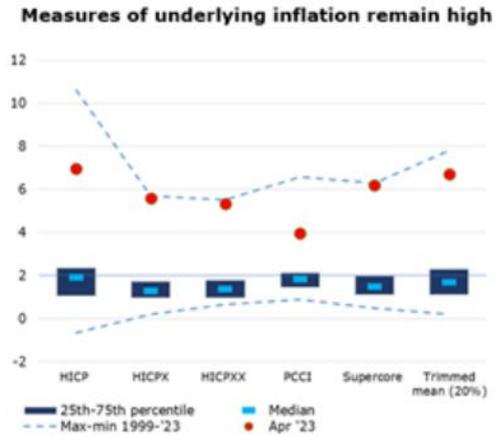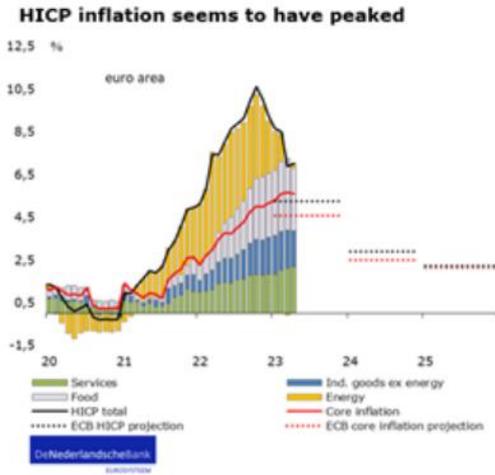
However, a strong word of caution is still in order. Because inflation was high for a long period, underlying inflationary pressures have built up. As a consequence, we now observe second-round effects – energy prices have found their way into other items in the consumer basket, and wages and services in particular have taken over the inflation torch. It is likely that price pressures in these areas will prove more difficult to bring down.

It has clearly been a decade of extremes for monetary policy. But despite all of this, inflation expectations are still decently anchored, and let us hope that the next decade will not be so eventful.

What we do in the realm of monetary policy, is, of course, aimed at having an effect on the real economy and then onto inflation.

We know that this transmission always comes with a lag, whether monetary policy is easing or tightening. But in the spirit of Robert Schuman, we do aim for concrete results. So it is reassuring to see the first signs of recent monetary policy actually being transmitted to the real economy.

Impact on credit provision becomes clear

Credit demand cooling because of tighter credit conditions

Credit growth seemed resilient but is now displaying significant weakening
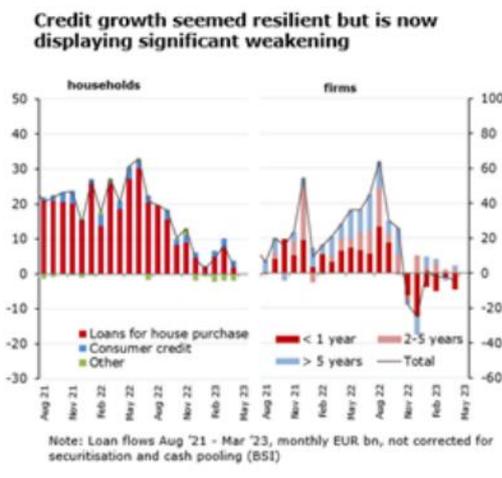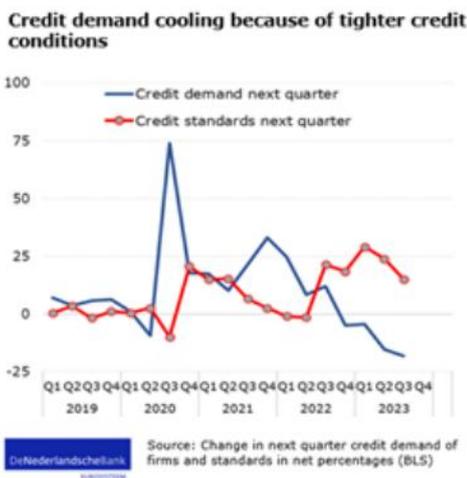
On European capital markets, financial conditions have tightened. And euro area banks are reporting tighter lending standards.

If you look at this graph, with the composite borrowing costs of both non-financial corporations and households on the left, and credit growth on the right, you can also see that interest rates for households

and firms have increased faster than in previous episodes with rising interest rates. This development is in line with the steeper policy rate path compared to previous tightening cycles. We also see these higher rates reflected in lower credit growth in the euro area.

The effect of monetary tightening can also be observed through macro-financial indicators. For example, over the past decade, euro area housing prices skyrocketed. In the Netherlands they almost doubled. Now with the shift in monetary policy, we are observing the first persistent decline in a long time - the number of transactions is going down and the number of houses being sold above the asking price is sharply decreasing.

These are only the first, concrete steps in the transmission of our monetary policy tightening. And we have yet to see their full effect.

So the current situation is one in which our monetary policy is killing two birds with one stone: it is addressing medium-term risks to price stability, while the direction of monetary policy - in principle - aids in addressing longer-term financial stability concerns.

You would think this is a comfortable position for policy makers.

Nonetheless – a word of caution is in order here too. While medium-term inflation and longer-term financial stability policies are now more aligned, a short-term financial stability risk looms around the corner. An abrupt change in monetary policy requires a massive adjustment in the financial system, which could also trigger some of the vulnerabilities that have accumulated in the past.

As we know from theory, higher interest rates can be beneficial for financial institutions. They underpin their profitability and solvability.
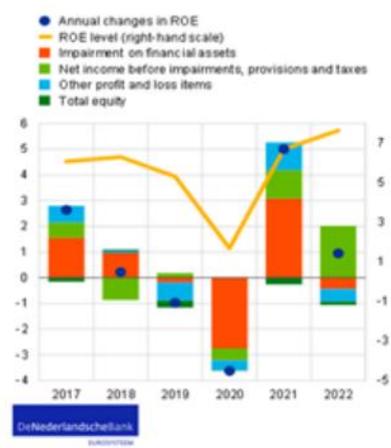
But do we also see this practice?
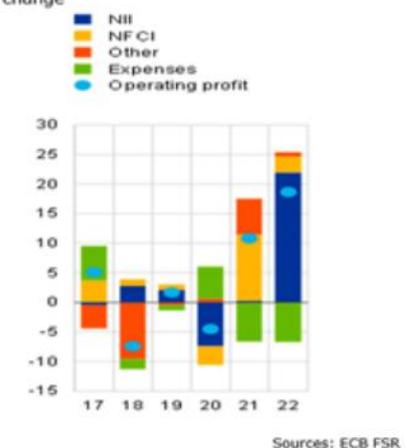
I have borrowed this graph from the ECB's most recent Financial Stability Review.

The panel on the right depicts the annual changes in operating profits and their drivers. The dark blue part shows that in 2022 the operating profit of European banks ballooned due to net interest income. This can be attributed to the relatively sluggish interest rates on saving deposits. It is expected that such passthrough will increase further this year.

But moving from theory to practice, things have a tendency to become a bit more unruly. Testimony to this is the recent banking turmoil in the United States, where sharp increases in interest rates were inadequately accounted for. And this ultimately led to a series of bank failures. Against the backdrop of much tighter management and supervision of this so-called interest rate risk in the banking book on this side of the Atlantic, similar banking failures have not manifested itself in the euro area.

At the same time, I regard debt sustainability, in the broad sense, as one of the major financial stability risks on either side of the Atlantic. And rising interest rates have brought this vulnerability to the surface.

There is no linear correlation between the two – here at the ESM I do not have to belabour the point made by Dornbusch and others that markets can regard debts as sustainable for quite some period of time, before they no longer do. Such potential non-linearities call for additional caution.

Households are experiencing a real income squeeze, which compromises their debt servicing capacity. Though some can benefit from having fixed their borrowing costs at extended maturities during the low-for-long era, this only partially and temporarily cushions the blow.

And non-financial corporates face a similar situation. In the Netherlands, for example, 38 percent of total debt of non-financial corporates will mature within the year or will have to be refinanced at a likely higher interest rate. Higher interest expenditures might eventually also trigger some corporate liquidity issues.

And alongside households and non-financial corporates, the debt sustainability of euro area sovereigns is also affected by the recent rise in bond yields. Here too, the low-for-long era has partially been locked-in with fixed borrowing rates spanning a relatively long horizon. But this can only buy time rather than obviate the inevitable adjustment in the primary fiscal balance.

So I urge caution.

Even though our financial system has proven its resilience, largely due to the buffers we have built since previous crises, and even though we have weathered the shocks of recent years, we mustn't be complacent. Building resilience does not prevent shocks from happening. It just helps us to deal with them.

So it is encouraging that we as central bankers, in deciding on our course of action, have started to pay more attention to the interplay between monetary policy and financial stability. Monetary policy affects the stability of the financial system. But in turn, we need a stable financial system to effectively transmit monetary policy. Financial stability is a pre-requisite for medium-term price stability.

And as Chair of the Financial Stability Board, I must underscore that a stable financial system is also a goal to be pursued in its own right.

So where does that leave us?

Central bankers will have to continue tightening monetary policy for as long as necessary, until we see inflation return to our two percent target over the medium term.

But we will do this step by step. Because the tighter monetary policy gets, the more forceful its transmission to output and prices that is still largely in the pipeline. And with each step, the financial system will have to continue adjusting to the higher interest rate environment. The recent financial turmoil on the other side of the Atlantic illustrates that this cannot be taken for granted.

And with each step, we continuously learn from our experiences.

Allow me to share with you two valuable lessons we have learned in recent years. Lessons that will help us walk this tight rope – step by step. Lessons that will help us tackle future challenges – and go from one concrete achievement to the next.

A first lesson from the recent episode is that the so-called separation principle can be maintained for longer than some might have expected. According to this principle, a central bank should clearly separate its function as lender of last resort from its function as monetary policy maker.

Since the Global Financial Crisis, policy makers worldwide have become more experienced and more innovative with various forms of lending operations. With this experience came a more coherent and powerful toolkit. A toolkit that can, and in my view should, be used to adhere to the separation principle for as long as possible.

Against the backdrop of a better regulated and better capitalised financial system, we can now deal with a broad range of financial stability related risks without compromising on medium-term price stability.

The second lesson we have learned, is that moderate and contained levels of financial turbulence do not necessarily have to be at odds with medium-term price stability. Repricing of risk in financial markets can contribute to tighter financial conditions for a given policy rate. Monetary policy normalisation also entails a reduction of the central bank footprint in financial markets, a decompression of term premia, and some repricing of risks. As long as such repricing is not excessive, it can in fact be combined with a somewhat lower terminal policy rate that would still be compatible with medium-term price stability.

"Europe will not be made all at once, or according to a single plan. It will be built through concrete achievements which first create a de facto solidarity."

Bold, but realistic.

Bold because it set out an ideal. An idea. A vision for Europe.

Realistic because achieving this would not happen overnight.

It would happen every time a step forward was taken. It would happen every time a concrete result was achieved. It would happen through setbacks, shocks and surprises that were overcome and learned from.

Over the past years, monetary and macroprudential policy makers have achieved very concrete results. Often to be confronted with new challenges soon after, not least because monetary and macroprudential policy are intertwined. And these challenges once again called for policy innovation.

And maybe that is the essence of Schuman's vision: that the idea, the ideal of Europe was not set as a goal-to-achieve, but as a guide, to help us along the way. Step by step. One concrete achievement after another. Improvising as we go along, but always in the same direction – towards an integrated, solidary and peaceful Europe. The kind of Europe we will need in order to tackle our future challenges.

Three Uncomfortable Truths for Monetary Policy*

By GITA GOPINATH *

Introduction

The battle against inflation is very much ongoing, both in the euro area and around much of the world. Headline inflation has declined, but the stickier components remain persistently high. Central banks must continue to fight high inflation now, while also determining if—and how—monetary policy strategy may need to change in the future.

This is, of course, no easy task. This evening, I will focus on how to contend with high inflation by confronting what I will call three uncomfortable truths for monetary policy.

• The first uncomfortable truth is that **inflation is taking too long to get back to target**. This means that central banks, including the ECB, must remain committed to fighting inflation despite risks of weaker economic growth.

• The second uncomfortable truth is that **financial stresses could generate tensions between central banks' price and financial stability objectives**. Achieving "separation" through additional tools is possible, but not a fait accompli.

• The third uncomfortable truth is that going forward, **central banks are likely to experience more upside inflation risks than before the pandemic**. Monetary policy strategies and the use of tools like forward guidance and quantitative easing must accordingly be refined.

Let's begin by exploring the first uncomfortable truth: inflation is taking too long to get back to target.

Uncomfortable Truth #1: Inflation is taking too long to get back to target.

Inflation forecasters have been optimistic that inflation will revert quickly to target ever since it spiked two years ago. As you can see, this includes the ECB and the IMF, whose forecasts are nearly indistinguishable. What we see in these charts is that inflation sits well above previous forecasts. This reminds me of Samuel Beckett's famous play, Waiting for Godot. In the play, both the cast and audience await a mysterious character named Godot who never appears. Similarly, we are still waiting for low inflation to reappear. We hope, of course, that real life will have a different ending than the play. But as of now, the audience is still waiting.

Despite repeated forecast errors, markets remain particularly optimistic that inflation in the euro area and most advanced economies will recede to near-target levels relatively quickly (slide 5, left panel). These disinflation hopes—likely fueled by the sharp drop in energy prices—underpin expectations that policy rates will decline soon, despite central bank guidance to the contrary (right panel). Surveys of market analysts paint a similar picture and suggest that inflation is likely to come down without much of a hit to growth. It is useful to bear in mind that there is not much historical precedent for such an outcome.

Setting aside forecasts, the fact is that inflation is too high and remains broad-based in the euro area, as in many other countries. While headline inflation has eased significantly, inflation in services has stayed high, and the date by when it is expected to return to target could slip further.

II.A   Why inflation has proved persistent

While ongoing research will shed light on why inflation has proved so sticky, several factors are probably at play, and continue to pose upside inflation risks.

First, while the ECB has raised interest rates during the past year by 400 basis points—the most in its history—activity has only slowed modestly. The unemployment rate is at historic lows. Wage growth has been solid and is picking up, though not by enough to begin reversing sharp declines in real wages over the past two years.

The combination of tight labor markets with a still solid stock of household savings and residual pent-up demand may be behind the resilience in activity we have seen so far.

Second, despite the large increase in the nominal policy rate, financial conditions may not be tight enough which impedes monetary policy transmission. As seen in the right chart, real rates using market-based measures of inflation expectations are still quite low, and near-term real rates using household measures are likely negative.

Lastly, the pandemic has likely lowered potential output and productivity, which would also help explain some of the upward pressure on inflation.

What is worrisome is that sustained high inflation could change inflation dynamics and make the task of bringing inflation down more difficult. Given the massive decline in real wages since the pandemic, some wage catchup is to be expected. All else equal, if inflation is to fall quickly, firms must allow their profit margins—which have shot up during the past two years—to decline and absorb some of the expected rise in labor costs. But firms may resist this, especially if the economy remains resilient, while workers may demand payback for their real wage losses. Such dynamics would slow inflation reduction and likely feed into expectations and increase susceptibility to further upside cost or resource pressures.

II.B. Fiscal policy can help, but…

Some side effects of fighting inflation with monetary policy could be reduced by giving fiscal policy a bigger role. Indeed, economic conditions call for fiscal tightening. It could help cool demand and reduce the need for rising interest rates, especially if done in concert by a broad group of countries.

At a minimum, it is critical for euro area governments to resist any temptation to dilute the deficit reduction projected under current policies. Where support is needed, they must shift from providing broad-based to well-targeted support, and revenue windfalls from high inflation should be saved.

II.C. Appropriate policy strategy

Ultimately, it is up to central banks to deliver price stability irrespective of fiscal stance. With underlying inflation high and upside inflation risks substantial, risk management considerations in the euro area suggest that monetary policy should continue to tighten and then remain in restrictive territory until core inflation is on a clear downward path. The ECB—and other central banks in a similar situation—should be prepared to react forcefully to further upside inflation pressures, or to evidence that inflation is more persistent, even if it means much more labor market cooling. The costs of fighting inflation will be significantly larger if a protracted period of high inflation boosts inflation expectations and changes inflation dynamics.

There are also some downside risks to inflation that could arise, for instance, from the recent unwinding of supply chain disruptions and fall in energy prices. The effect of the recent tightening in monetary policy is still working through the system. While central banks must be vigilant about not easing prematurely, they should be prepared to adjust course if a chorus of indicators suggest that these downside inflation risks are materializing.

Uncomfortable Truth #2: Financial stresses could generate tensions between central banks' price and financial stability objectives.

If inflation persists and central banks need to tighten much more than markets expect, today's modestly tight financial conditions could give way to a rapid repricing of assets and a sharp rise in credit spreads. We've seen during the past year how, under some circumstances, policy tightening can come with significant financial stresses, including in Korea, the UK, and more recently in the US.

For the euro area, tighter monetary policy may also have diverse regional effects, with spreads rising more in some high-debt economies. Higher rates can also amplify other vulnerabilities arising from household indebtedness and a large share of variable rate mortgages in some countries.

This brings me to the second uncomfortable truth: Financial stresses could generate tensions between central banks' price and financial stability objectives. This is because, while central banks can extend broad-based liquidity support to solvent banks, they are not equipped to deal with the problems of insolvent borrowers. Let me explain.

III.A. Policy response to modest financial stress

If financial stresses remain modest, central banks shouldn't face too much of a challenge in achieving both price and financial stability objectives. If households and firms face a rise in borrowing costs, central banks can lower policy rates to keep output and inflation on roughly the same path. Other relatively standard central bank tools—such as discount window lending and other forms of liquidity support—can also help.

Of course, lowering policy rates—even if to keep broad financial conditions unchanged—may be misinterpreted as waning resolve to fight inflation, so effective communication is important.

III.B.   When stress threatens to morph into systemic crisis

The situation becomes much more difficult if financial stresses threaten to morph into a systemic crisis. Critically, forestalling a crisis may go beyond what central banks can do alone. While they can extend broad-based liquidity support to solvent banks, they cannot support insolvent banks, firms, or households. These must be addressed by governments and may require sizeable fiscal resources.   And central banks may be considerably limited in alleviating nonbank stresses given difficulties in assessing solvency and the political economy risks of picking winners and losers.

Forceful and timely interventions that are backed with the requisite fiscal support could allow monetary policy to focus on price stability, as was the case during the recent stress episodes.   This separation is clearly the most desirable outcome.   But when governments lack fiscal space or political support to respond to the problem, central banks may need to adjust their monetary policy reaction function to account for financial stress. While central banks must never lose sight of their commitment to price stability, they could tolerate a somewhat slower return to the inflation target to avert systemic stress. Even so, the bar should be high to doing so.   Such a shift in the reaction function could leave the central bank behind the curve in fighting inflation – as, for instance, happened when the Federal Reserve decided to ease policy in the mid-1960s on fears of a credit crunch, even as inflation pressures were sizable.

Put simply, while separation is achievable in principle, it is challenging in practice, and must not be taken for granted.

III.C.   Steps to strengthen the EU framework

The ECB has taken forceful steps to help achieve both price and financial stability goals. This includes the Transmission Protection Instrument, which helps guard against the risk of a sharp divergence in borrowing costs across countries and should reduce the risk of an adverse feedback loop developing between sovereigns and banks.

So, what other steps can the ECB and European Union (EU) take?   These would build upon several measures these institutions have already taken to deepen financial resilience.   The EU, for example, applies Basel III capital and liquidity requirements to all banks, not just the largest ones, and the capital and liquidity ratios of the banking system as a whole are solid.

In the near-term, continuing enhanced risk assessments and bank stress-testing (as envisaged in the ongoing EBA-ECB bank stress tests) will help ensure EU banks remain resilient to rate hikes and rapid deposit outflows.

In addition, ensuring prudent public debt paths to safeguard fiscal sustainability—including by finalizing the reform of the EU economic and fiscal governance framework—is essential and critically needed. So is strengthening pan-European institutions such as the European Stability Mechanism that can provide rapid financial support to sovereigns and to the Single Resolution Fund. As part of its journey toward completing a Banking Union, the EU should make meaningful progress toward a European deposit insurance scheme to increase risk sharing across borders.   Making the EU crisis management and bank resolution framework more flexible, possibly by including a systemic risk exception, would also help raise resilience. Moreover, further progress with capital markets union will help deepen capital markets and reduce fragmentation risk within the EU.

On the macroprudential policy side, it would be helpful to strengthen capital buffers even further. Banks should save some of their current high profits as capital.   The macroprudential toolkit should be expanded for nonbank financial intermediaries.

Uncomfortable Truth #3: Central banks are likely to experience more upside inflation risks than before the pandemic.

This brings me to the third uncomfortable truth: central banks are likely to experience more upside inflation risks than before the pandemic.   Monetary policy strategies and the use of tools like forward guidance and quantitative easing must accordingly be refined.

The monetary policy strategies implemented in the post-GFC period by the ECB and other major central banks focused heavily on supporting activity and boosting too-low inflation when the effective lower bound (ELB) seemed a pervasive constraint. There was little sense that inflation could rise persistently above target given the perceived flatness of the Phillips Curve, or that central banks would face significant

tradeoffs in addressing supply shocks. Risk management considerations tilted heavily toward downside risks to activity and inflation.

IV.A.   More upside inflation risk

Looking forward, central banks are likely to experience more upside inflation risks than before the pandemic for two sets of reasons. Some of the upside risk reflects structural changes affecting aggregate supply—heightened by the pandemic and the war in Ukraine—and that may result in larger and more persistent shocks. In addition, we have also learned the lesson that the Phillips Curve is not reliably flat.

Turning first to structural changes, there is a substantial risk that the more volatile supply shocks of the pandemic era will persist. Despite a considerable easing of pandemic-related supply pressures, the restructuring of global supply chains that was intensified by the pandemic and war, coupled with geo-economic fragmentation, may cause ongoing disruptions to global supply. Many countries are turning to inward-looking policies, which raise production costs, and, ironically, make countries less resilient and more susceptible to supply-side shocks. As seen in the left chart, the number of new restrictions on trade and foreign direct investment (FDI) imposed on EU countries ratcheted up markedly during the pandemic. EU countries have also increased their own restrictions on in-bound trade and FDI.

The increasing physical and transition risks from climate change are also likely to amplify short-term fluctuations in inflation and output. Delays in achieving Paris Agreement goals increase the risk of a disorderly transition and serious disruptions to energy supply, which could boost inflation sharply and create more difficult tradeoffs for central banks.

The pandemic has also taught us more about the Phillips Curve. Evidence increasingly shows that nonlinearities may become pronounced at high levels of resource utilization, so that inflation is more sensitive to resource pressures. Difficulties in measuring economic slack may also make it harder for policymakers to gauge the point at which inflationary pressures will escalate.

IV.B.   Implications for policy strategy

These takeaways suggest that when it comes to policy strategy, it will be important to be more cautious about "looking through" supply shocks. Central banks may need to react more aggressively if the supply shocks are broad-based and affect key sectors of the economy, or if inflation has already been running above target, so that expectations are more likely to be dislodged. They may also need to react more aggressively in a strong economy in which producers can pass on cost hikes more easily and workers are less willing to accept real wage declines. And they should be confident that the shocks are mainly supply-driven, rather than fueled by strong demand.

While the focus now is on high inflation, what we've learned about the Phillips Curve also has important implications for the monetary policy response to future periods of below-target inflation. Some refinement may be needed to the "lower-for-longer" strategies—used widely after the Global Financial crisis—that typically involved maintaining policy rates at the effective lower bound until inflation reaches or overshoots its target. Lower-for-longer strategies may still be desirable under some conditions, particularly for an economy in deep recession and facing chronically low inflation.

But the pandemic experience suggests that policymakers should be more cautious about calibrating policy to generate a persistent fall of unemployment below the natural rate U* when inflation is running only modestly below target—say between 1.5 percent and 2 percent. And there could well be a case for preemptive tightening under these conditions if resource pressures appear tight and there is a material risk that new shocks—such as fiscal expansion—could push the economy to overheat. By allowing for a more gradual pace of tightening, a preemptive approach would also reduce the financial stability risks likely to accompany a rapid exit from low rates (the second uncomfortable truth).

IV.C.   Refining the use of tools

Refining monetary policy strategies also calls for adjusting the use of tools. Forward guidance is a helpful tool, and conditional promises can enhance its impact. But such promises should be tempered by escape clauses if developments unfold much differently than expected. The forward guidance provided by central banks during the pandemic may have been too much of a straitjacket and prevented a faster reaction to inflation surprises.

The costs and benefits of quantitative easing (QE) should also be reconsidered. QE will likely remain a critical tool should central banks face circumstances like the post-GFC period in which unemployment runs high and inflation low even though policy rates have hit their floor. But there should be more wariness of using QE—and accompanying it with forward guidance promising low policy rates—when employment has largely recovered, and inflation remains only modestly below target. Maintaining QE in

such circumstances increases the risk that the economy will overheat and that policy will be forced into a sharp U-turn.

So, when we consider the monetary policy of tomorrow, it is important to recall today's lessons: First, take a closer look at supply shocks before deciding to simply "look through" them. Second, be careful about running the economy hot, and be ready to act preemptively if it does—even if inflation isn't yet burning brightly. Third, make sure that forward guidance is coupled with escape clauses; and fourth, be more cautious about deploying QE outside of a recession.

Conclusion

To conclude, now is the time to face the three uncomfortable truths that I've outlined. Inflation remains sticky; financial stresses could make price and financial stability a difficult balancing act; and more upside inflation risks will likely come our way. I am heartened by the actions that the ECB—and many other central banks—have taken to tackle inflation. But the battle won't be easy—financial stresses may intensify, and growth may have to slow more. Even so, we know that we can't have sustained economic growth without a return to price stability. The good news is that while low inflation may seem elusive, it is certainly no stranger, and central bank actions can deliver it. Unlike the characters in Godot, we are not waiting for a potential stranger to arrive; we are inviting an old friend to return.

Central Banks can Fend Off Financial Turmoil and Still Fight Inflation*

By TOBIAS ADRIAN, GITA GOPINATH AND PIERRE-OLIVIER GOURINCHAS*

But there are trade-offs between price and financial stability during times of stress, especially when inflation is high.

Recent events have shown central banks and policymakers can deal with sizable financial stress without compromising their inflation-fighting stance.

Regulators and central banks were able to contain contagion from the collapse of Silicon Valley Bank and other US regional banks, as well as Credit Suisse in Switzerland, without retreating on the inflation front. The same is true of the Bank of England's actions to halt the selloff in bond markets that followed the UK government's tax-cut proposal last September.

In times of acute financial stress and high inflation, though, policy trade-offs are more challenging.

During the 2008 global financial crisis, policies in pursuit of price and financial stability were aligned. As economic activity faltered, the primary question for price stability was how to support aggregate demand to avoid deflation and recession. On the financial stability side, the main concern was to avoid deeper financial distress. Aggressive easing of monetary policy allowed the simultaneous pursuit of both objectives.

With inflation now stubbornly high, the two objectives may clash. Central banks have had to raise policy interest rates aggressively to cool activity and bring inflation back to target. After a long period of low and stable inflation and interest rates, many financial institutions had grown complacent about maturity and liquidity mismatches. Rapidly rising interest rates have stressed the balance sheets of exposed bank and nonbank financial institutions through declining values of their fixed-income assets and increased funding costs. Left unmitigated, these could threaten overall financial stability.

How should central banks navigate this difficult trade-off? Conceptually, we propose to distinguish between times when financial stress remains modest, and times of heightened financial stress or acute financial crises.

Handling modest financial stress

Past episodes of monetary policy tightening have often generated financial stress. Provided these stresses remain modest, they shouldn't pose much of a challenge to achieving both price and financial stability objectives. Increases in the policy rate transmit to the real economy in part by raising borrowing costs for households and firms. If such modest financial stress leads to an unexpected weakening of aggregate demand, the policy rate path can be adjusted, keeping output and inflation broadly on the same trajectory. Central banks have taken this approach in the past. For example, the US Federal Reserve put a hold on raising rates in the early 1990s when it faced a looming credit crunch, even though inflation was running well above desired levels.

In addition, tools other than the policy rate can be used to contain financial stress. For example, emergency lending at the discount window or via emergency liquidity facilities can provide support while macroprudential tools, where available, could be loosened. In principle, the use of relatively standard financial stability tools—without the need for additional fiscal support—should be sufficient in the case of a modest rise in financial stress, allowing monetary policy to focus on inflation.

The challenges of heightened financial stress

Even when financial stresses may seem contained for some time, a number of developments can create adverse nonlinear feedback loops and quickly develop into a full-blown systemic financial crisis, a process that was hastened in the recent bank collapses by technology and social media.

Such an environment presents very difficult challenges for central banks. Forceful and timely action by policymakers is required through aggressive financial policies. These include various forms of liquidity support, asset purchases, or possibly direct capital injections. Sufficiently forceful, these interventions could leave monetary policy free to maintain its focus on inflation.

Critically, the actions needed to forestall a crisis may extend beyond what central banks can do alone. While central banks can extend broad-based liquidity support to solvent banks, they are not equipped to deal with the problems of insolvent firms or borrowers, which must be addressed by governments. The need for aggressive financial interventions becomes more acute as financial stresses intensify and insolvency risks grow, and often requires committing sizeable fiscal resources.

This is illustrated in a recent episode in Korea. When the default of a real estate developer last September triggered sharp disruptions in short-term funding markets, the Korean government responded with market support measures, including a corporate bond-buying program, while the Bank of Korea provided substantial liquidity support. These actions allowed the central bank to raise its policy rate in pursuit of its inflation objectives.

When governments lack fiscal space or political support to provide resources, risk management concerns may induce central banks to adjust their monetary policy reaction function to account for financial stress. Specifically, more prudence in raising rates is needed to reduce the risks of an adverse and potentially nonlinear reaction of the financial system. Under these conditions, while central banks should remain committed to price stability, they could tolerate a somewhat slower return of inflation to target. Uncertainties about balance sheet exposures, intermediaries' connectedness, and self-fulfilling market reactions to policy moves push in the same direction.

Of course, the reduced focus on inflation may be difficult to communicate, possibly heightening the sense of crisis. Moreover, it may leave central banks well behind the curve in fighting inflation or at the mercy of `financial dominance'. Hence the bar should be high in communicating such a shift in the reaction function, especially when inflation is still raging. The preferred course of action should be to rely on financial policies or to restore fiscal support.

In countries with limited monetary policy credibility and weak fiscal positions, policy options are far more limited. These countries are more vulnerable to broad-based depositor flight that triggers a sharp exchange rate depreciation and high inflation. If available, authorities can deploy measures requiring real resources (foreign exchange interventions, equity injections) but if a crisis is imminent, they may have to turn to capital management tools, notwithstanding potentially adverse reputational effects. Policy options can be further narrowed by investor concerns about the vulnerability of the financial sector.

When the financial crisis is acute

Should financial conditions deteriorate into a systemic crisis—with a sharp downturn in economic activity expected to ensue—central banks would clearly want to prioritize restoring financial stability. Central banks with high credibility could ease monetary policy, and if inflation was still running high, indicate that they would be more flexible about the time frame for returning inflation to target. In practice, the materialization of a crisis would likely put substantial downward pressure on inflation, thus realigning monetary and financial policy objectives.

But emerging markets with weaker macro policy frameworks would likely have to confront the very difficult challenges posed by capital flight and currency depreciation-inflation spirals. Their central banks would have to remain vigilant about the need to maintain a nominal anchor, limiting any scope to ease. While these countries could take some steps on their own (for example, with capital flow management measures), a strong international safety net is vital to mitigate the risk of a prolonged and severe crisis.

Supporting nonbanks

The rising importance and criticality of nonbank financial institutions, such as insurance firms, pension funds and investment funds, present important challenges. Typically, central banks provide liquidity through the banking system, but this liquidity may not reach nonbanks. They are often less well capitalized and subject to weaker prudential regulation and supervision, so that central banks have less scope to reduce moral hazard risks in the first place. Yet, in periods of heightened or acute financial stress, central banks

may need to provide liquidity to nonbanks, as they did during the global financial crisis and the COVID-19 pandemic. However, the bar on lending to nonbanks should be higher than for banks because of the greater risks to central banks' balance sheets and the risk of creating incentives that could increase future financial instability.

In sum

In practice, the boundaries between the different scenarios are fuzzy. Uncertainty about the health of the financial system and its resilience to monetary tightening will inevitably complicate central banks' decision processes. However, through the lens of our proposed taxonomy, the recent events in Switzerland, the United Kingdom and the United States suggest that the forceful responses by authorities to heightened financial stress helped reduce financial instability and allowed central banks to maintain their inflation fighting stance.

Cross-Border Payment

Exploring Cross-border and Domestic Payment and Contracting Platforms[*]

By TOBIAS ADRIAN [*]

Morocco welcomes us with its warm hospitality and stunning landscapes. This is a land of sea and mountains—of open horizons and rock-solid stability. Throughout its history, Morocco has also been at the crossroads of cultures and commerce.

It is thus fitting to speak of cross-border payments here in Morocco, of innovation, change and exchange, but also of steadfast commitment to macro-financial stability.

My remarks begin with money, which lies at the foundation of the financial system. Contracts are denominated in money. Exchange is conducted in money. And policymakers play a major role in the management of money.

In today's digital age, technology presents an opportunity for money to evolve. Cryptography, tokenization, and programmability are explored around the world as a basis to improve money. From banks to central banks, the aim is to offer money that can sit alongside our messaging apps, work efficiently, and be even safer.

Today, I would like to explore some of the infrastructure behind money and present a blueprint for improvements—a new class of cross-border and domestic payments and contracting platforms.

My aim is to paint a picture, and inspire many of you to pick up your own brushes, like the remarkable artisans in Rabat's Medina, and continue to refine the painting. I will argue that today's new technologies allow the public sector to renew the infrastructure supporting cross-border payments and possibly domestic ones as well. This will bring people together through faster and cheaper payments, and countries together through a more stable and cohesive international monetary system. It's about technology, but it's also about governance, which establishes the "rules of the game." These are tricky to establish, but an organization such as the IMF with its wide membership, focus on macro-financial interactions, and well-oiled internal governance can help countries build consensus.

My remarks draw on an IMF Fintech Note we will publish today entitled "The Rise of Payment and Contracting Platforms." The work is rooted in a working paper published last November with Federico Grinberg and Tommaso Mancini-Griffoli at the IMF, and Robert Townsend and Nicholas Zhang at MIT.

The future of cross-border payments

Cross-border payments are more complicated than payments made within a single country. They involve the exchange of value between parties located in different jurisdictions and subject to different laws.

When a Moroccan ceramics business exports dinnerware to nearby Spain, it receives money in its account through a complex web of interlinkages between banks, possibly going through Paris and New York. The payment is routed through banks that know and trust each other. Money does not really change hands; instead, each bank offers credit to the next one in line. As a result, the small Moroccan business may face delays in receiving money and will pay high fees, hurting its bottom line.

Things are worse for those sending remittances who often pay even higher fees—about 6.5 percent on average. Costs fall disproportionately on the poor. While cross-border payments work relatively well in the club of most advanced economies, they fall short for many emerging-market and lower-income countries.

The cost, sluggishness, and opacity of cross-border payments comes from limited infrastructure. Settlement is risky. Governance is sporadic, giving rise to substantial legal and operational costs. Recourse is expensive.

To get global finance right, we must come together to get global payments right. Some of the 45 billion dollars paid to remittance providers every year may then go back in the pockets of the poor.

Steps are being taken. In a strong show of multilateral cooperation, the international community is enhancing cross-border payments following the G20's 2020 Roadmap. More than ever, the IMF, World Bank, BIS, and FSB have been tightly collaborating, each bringing its comparative advantage to the table.

Framework of the XC platform

Our work on platforms aligns well with this thrust, and indeed has benefitted from discussions with others and the exploration of many central banks around the world.

Platforms are like digital town squares where people and businesses meet to transact under the watchful eye of the local authorities. Much like town squares must have been in bustling Fez back in the 8th century or in Marrakesh's beautiful Medina.

Expressed in today's language, the vision is for a trusted ledger, which is essentially an electronic document representing property rights on which digital versions of central bank reserves in any currency can be traded among participants.

But payments are not just the transfer of value from A to B. They require complementary services like obtaining foreign currency and managing risks. And they involve the transfer of information on the identity of transacting parties and their trading intentions.

So our trusted ledger cannot exist in a vacuum. It must exist in an environment allowing for basic financial contracts to be customized and exchanged in a safe and efficient manner. And it must allow information to be carefully managed—so only those who need it can see it.

Let me dive a little deeper and speak first about settlement, then about programming financial contracts, and finally about managing information. We call these the three layers of XC platforms.

Settlement layer

The platform would settle money denominated in many different currencies. Which forms of money? The safest possible to reduce counterparty risks. We propose central bank reserves. But each one sits on the books of central banks, in different accounting systems. To make these interchangeable, we propose creating unique and standardized digital representations of them on the platform.

To make a payment, participating banks would deposit their domestic central bank reserves in an escrow account controlled by the platform operator, and in return obtain a digital version to trade on the platform.

In the case of the Moroccan ceramics exporter, its bank would receive tokenized reserves from the Spanish customer's bank. The exporter's bank would credit the exporter's account, but may not be terribly happy holding euro reserves. So it could sell them to another participant on the platform in exchange for domestic reserves.

Settlement would be quick, final, and safe. The ledger would be controlled by the platform operator, and only this operator would settle transactions. The single ledger would ensure there is a unique description of who owns what, so no double spending can occur.

Importantly, XC platforms would allow a multicurrency system, without imposing a single or new settlement asset. The choice of currencies used on the platform would remain at the discretion of participants. And central banks would remain in full control of which institution receives reserves to start with. No changes in legacy systems, arrangements, or institutions are needed.

Programming layer

Moving to the programming layer, when making payments participants may want to obtain foreign currency, synchronize or delay payments, and manage risks. And countries may wish to implement capital flow management measures. All these services could be programmed by customizing and bundling basic functions available on the platform.

Think of your smartphone apps. Developers created them by accessing and customizing pre-set functions allowing the app to respond to a tap on the screen, or to retrieve data from the GPS chip. But developers cannot interfere with the phone's operating system and cause it to crash. So there is innovation,

but it's separate and safe. The same would occur on XC platforms. Basic functions would be available to customize and bundle to complement payments.

Programming also allows contracts to be automated. For instance, the concurrent swap of one currency for another can be programmed to occur when a certain price is met. Today, parties provide a market maker with their orders—which means giving up precious information. And even after agreeing to a trade, the other party can walk away. Settlement fails regularly.

Instead, automating contracts can bring improvements. First, agents may trust technology more than a market marker with their private information. And second, counterparties cannot walk away from an automated trade based on escrowed money. Finally, when programs run on the same ledger, they can be consistent with one another. So a contract to receive money tomorrow can be pledged as collateral today, saving precious liquidity.

Let me briefly clarify that I am speaking here of programming one's own transactions with money, not the money itself. Once transacted, money would go right back to being perfectly fungible. Let us not confuse a programmed transaction with a voucher—which is money that can only be spent on a given good.

Information management layer

The third layer of XC platforms is the information management layer. XC platforms allow the unbundling of settlement and non-settlement services including compliance checks. This leads to a cleaner separation of responsibilities. And countries retain jurisdictional control over how much their citizens and firms can hold or transact in foreign currency, as well as over compliance checks. XC platforms may even be able to contribute to upholding the highest standards of know-your-customer (KYC), anti-money laundering, and anti-terrorist financing.

Because compliance checks can occur outside the platform, transactions on the platform can preserve users' privacy, but not their anonymity. This can bring significant advantages. For instance, participants would have the incentive to bid truthfully in a foreign exchange auction without being concerned with revealing private information, without having an incentive to mislead others, and without fearing that a market maker or private auctioneer would front-load their orders.

And while individual identities can be hidden, aggregate information can nevertheless be shared transparently, in real time. While bidding, for instance, seeing others' anonymized bids is extremely valuable.

Governance

Finally, any platform needs solid, transparent, and effective governance that is accepted by participants as being fair and representative. A strong legal framework backing the platform, as well as active oversight and clear rules governing access, participation, and financing are essential.

Governance is also a way to adopt rules and designs to support the stability of the international monetary system. Platforms should allow countries to:
• Implement capital flow management measures and continue to intervene in their foreign exchange markets when needed.
• Extract aggregate information on capital flows to assist policymaking and detect fragilities.
• Effectively resolve disputes to underpin trust and facilitate market integration.
• Rapidly dispatch funds to support the global safety net.

And the list goes on. Payments, we must remember, are the foundation of the financial and trade links between countries. One of the important roles of the IMF is to oversee and strengthen these foundations for a stable and effective international monetary system.

Let me summarize briefly. XC platforms offer key advantages. They ensure safety by settling with central bank reserves. They offer interoperability among national currencies—and with legacy systems. They bring innovation, efficiency, and safety in contracting. They help manage information flows to overcome economic frictions. And, importantly, they rest on transparent, rule-based governance consistent with the stability of the international monetary system.

Platforms for CBDCs

While XC platforms are designed with cross-border payments in mind, their basic design is sufficiently general to also help domestic financial systems.

There too, we see potential transformations. Take, for instance, newly developed ledgers on which banks, brokerage firms, and fintechs are tokenizing assets (equities, bonds, and commodities) and money. While stablecoins have drawn much attention and some may develop into convenient forms of money if well regulated, less well known are the efforts of banks to explore tokenized deposits. After all, these are institutions that have innovated and adapted for hundreds of years. New technologies, and new legal and regulatory environments will be a hurdle to some but a springboard to others.

Innovation is good for end users and societies, but only if we can preserve interoperability, safety, and efficiency—just like in the cross-border space. So, do the same challenges mean the same solution? Yes, in the form of CBDC platforms—the domestic equivalent to XC platforms. Naturally, such platforms would be backed by strong legal and regulatory frameworks.

As money, CBDCs provide safety. As infrastructure, CBDCs bring interoperability and efficiency among private networks for digital money and assets.

A CBDC platform would be designed much in the same way as an XC platform. Its single ledger would be compatible with those of private firms. Assets could be escrowed for long enough to be paid with safe and liquid central bank money. In fact, the exchange could be programmed and automated to lower counterparty risks as discussed earlier. And assets or tokenized deposits themselves could be escrowed and exchanged directly. Privacy preserving technology and strong governance, which is easier to define domestically than internationally, would complete the picture.

Clearly, the examples above suggest a wholesale CBDC, but we can well imagine countries leveraging this infrastructure, namely CBDC platforms, to also make retail CBDC available to households and firms. In the end, countries will decide based on preferences, needs, and policy objectives.

The point is that many of the same benefits I discussed earlier for the XC platform could be realized domestically. The aim is to allow for innovation, but in an environment that strengthens public policy objectives.

CBDC platforms are a direction well worth investigating. In fact, several central banks have begun experiments along these lines, such as those of Brazil, the European Central Bank, England, France, Italy, and Singapore. We are following their impressive work with great interest.

Conclusion

As innovation tugs ahead, and payments evolve, the public sector too must consider renewing its infrastructure. New technologies, new entrants, and new needs have opened a window of opportunity to think ambitiously and improve domestic and cross-border payment systems, while continuing to pursue public policy objectives such as financial and monetary stability.

Our blueprint for a new class of platforms would enhance and ensure greater interoperability, efficiency, and safety in cross-border payments, as well as in domestic financial markets. More work will be needed in testing architectures and technology, and especially on legal underpinnings and governance arrangements.

This last point looks hard to implement. It will be. Multilateralism is hard. But it can work. Think of the Arab League, the Union for the Mediterranean, and the African Union, of which Morocco is a member. Or think of the IMF with its history of strong governance. We will be a strong partner on the road to improve cross-border payments. The IMF can help bolster trust in governance and oversight. It can leverage its convening power to build momentum around new ideas and evolve them in a direction consistent with the interests of member countries. And it can build on its policy expertise to suggest platform designs that support the continued stability of the international monetary system.

I am inspired by the Moroccan soccer team, which dreamt of big things. Like them, let us dream a little.

Multi-CBDC Cross-border Payments Systems Inch Closer to Reality*

By ARUNIMA SHARAN AND TAYLOR PEARCE*

Foreign exchange liquidity and governance will be key considerations

Improving cross-border payments is a key priority for the G20. At the 2023 Digital Monetary Institute symposium in London, Tommaso Mancini-Griffol, deputy division chief of monetary and capital markets at the International Monetary Fund, said that Libra, Facebook's attempt at a global currency, delivered a 'collective shock' to the public sector. He highlighted the inadequacies of cross-border payments: high costs, low speed and inadequate transparency.

One of the most promising solutions to these problems is the interconnection of central bank digital currency systems. This is an attractive concept because of the global surge in CBDC development. It is hoped that, as these state digital payments systems emerge, the work of creating a seamless cross-border payments system to bridge the gaps will already have been done.

Project Icebreaker versus Project mBridge

Even within this approach, however, there are different strategies. Two projects with distinct philosophies were showcased at the DMI symposium. Project Icebreaker is a collaboration between the Bank of Israel, Norges Bank and Sveriges Riksbank, in coordination with the Bank for International Settlements Innovation Hub Nordic Centre, that aims to connect retail CBDC systems. Project mBridge is a multi-CBDC platform developed by the BIS Innovation Hub Hong Kong Centre, Hong Kong Monetary Authority, Bank of Thailand, People's Bank of China and the Central Bank of the United Arab Emirates. It is the largest multi-CBDC project involving cross-border transactions.

Both Project Icebreaker and Project mBridge are multi-CBDC platforms for cross-border payments. Both aim to reduce the costs and increase the speed of cross-border transactions. However, there are key differences in the design and architecture of the models that have implications for interoperability and scalability of the platforms (Figure 1).

Figure 1. A comparison of the two projects

	Project Icebreaker	**Project mBridge**
Type	Retail	Wholesale
Architecture	Hub and spoke	Common platform
Technology/governance	Various; TBD	Distributed ledger technology (mBridge ledger)
Foreign exchange liquidity provision	Integrated third-party foreign exchange providers	Determined off bridge; TBD
Bridge currencies	Participating currencies, if needed	None
Settlement method	Coordinated settlement in payment versus payment style	Payment versus payment instant settlement

Source: BIS, OMFIF analysis

The first and perhaps most important distinction is that Icebreaker aims to interlink domestic retail CBDCs while mBridge is a platform for wholesale CBDCs – in other words, inter-bank settlement. However, although individuals will not interact directly with mBridge, the improvements to the speed and

---

the reductions to the cost of their cross-border transactions should still improve their experience of transacting with counterparties in participating countries.

The primary difference for retail users of Icebreaker versus mBridge relates to the integration of foreign exchange liquidity provision. Project Icebreaker is a hub-and-spoke system that connects different rCBDC systems of countries (spokes) to a hub, which serves as a marketplace for foreign exchange providers who are willing to provide settlement in more than one currency.

There are minimal technical preconditions for the rCBDC systems that connect to the hub: they must be a real-time or near-real-time payments system, be able to implement and support the use of hashed time locked contracts and have entities that can act as foreign exchange providers within the rCBDC system. Because foreign exchange providers are within the hub in Icebreaker, this ensures both competition and transparency of on-platform foreign exchange transactions.

In contrast, Project mBridge has foreign exchange off platform, which means that end users do not have access to the same degree of choice or market transparency. Making provisions to facilitate foreign exchange dealing on bridge was one of the post-pilot recommendations to improve the project. In 2023 and 2024, the roadmap for mBridge will focus on integrating foreign exchange price discovery and matching into the platform.

Flexibility and scalability

In terms of scalability, the hub-and-spoke model of Icebreaker minimises the number of connections between domestic rCBDC systems, so it can scale up to support many participating systems without increasing the complexity of the design. The hub routes payment messages and does not act on them – its only action is selecting best foreign exchange rates for the payer. Requirements to be part of the system are low, which allows central banks to have autonomy when designing rCBDC systems, but still participate in an interlinked system enabling cross-border payments.

Project mBridge, however, does not support the use of bridge currencies, which might limit the flexibility of the platform. Since it will only be able to facilitate transactions between currency pairs with liquid trading, this could limit the future scalability of the system. Integrating foreign exchange price discovery might change this. With foreign exchange liquidity provision integrated in the platform, exchanging one currency for another via a bridge currency might be accomplished as a two-part transaction relatively smoothly.

Despite being further ahead in foreign exchange liquidity provision and scalability, Project Icebreaker has so far only focused on core features with limited use cases. Before becoming a minimum viable product, Icebreaker still needs to determine a governance arrangement, anti-money laundering and counter-terrorism financing compliance and monitoring, and legal considerations regarding conflict of regulations between connected rCBDC systems.

Here, the mBridge model has clear advantages. Because of its uniquely designed distributed ledger, it uses a decentralised model to address governance considerations. As explained by Mu Changchun, director-general of the Digital Currency Research Institute at PBoC, for cross-border payments, a trustless, decentralised approach via DLT is appropriate to ensure all participating countries trust the integrity of the network.

So far, Icebreaker and mBridge have varied in architecture, technology and use of bridge currencies in the development of the two multi-CBDC cross-border payments systems Whether the two will converge or take different approaches to governance, foreign exchange liquidity provision and other factors remains to be seen.

The Digital Monetary Institute 2023 symposium sessions are available to watch on demand.

Yuan Meets All Criteria to Be a Cross-border Trade Currency*

By LI KUN AND WEI HAO *

In his report to the 20th National Congress of the Communist Party of China last year, CPC Central Committee General Secretary Xi Jinping said China will promote the internationalization of the yuan in an orderly way, especially by increasingly using it to settle cross-border trade payments.

Cross-border trade settlement in the yuan has been increasing at a rapid pace since 2015 thanks to the emergence of new trade models and acceleration of the yuan's internationalization process.

China has signed agreements with a number of countries for settling trade payments in the yuan. For example, China and Brazil agreed in March to use their own currencies, instead of the US dollar, for trade settlement, with the People's Bank of China, the country's central bank, signing a memorandum of cooperation with the Central Bank of Brazil to this effect.

Cross-border trade settlement in the yuan has seen rapid growth over the past years, with China inking agreements with Russia, Venezuela, the United Arab Emirates, Oman, Bahrain, Qatar, Kuwait and Saudi Arabia on the subject from 2016 to 2022. While the PBOC has signed bilateral currency swap agreements with more than 40 countries and regions, with a total value of more than 4 trillion yuan ($582.3 billion), the government has authorized 31 yuan-clearing banks in 29 countries and regions to conduct trade in the Chinese currency.

Cross-border trade settlement in the yuan enjoys institutional guarantee, and infrastructure and technological support from the Chinese government, with the central bank issuing a circular last year to promote the yuan's use to settle foreign trade payments in a bid to ensure it better serves the real economy and increases trade and investment.

China also launched the Yuan Cross-border Interbank Payment System, or CIPS, in 2015 in order to build a stable financial infrastructure and a service platform for cross-border yuan settlement. With the aim of reducing transaction costs and processing time, the CIPS has made the yuan's use more efficient and promoted its internationalization. As of February 2023, the CIPS had 1,366 participants — 79 direct participants and 1,287 indirect participants — from 109 countries and regions.

There is a need to promote cross-border yuan settlement to make bilateral trade more efficient and boost the yuan's internationalization process. For example, China was the biggest trading partner of Brazil from 2009 to 2022, and since 2018, bilateral trade has exceeded $100 billion for five consecutive years, reaching $171.49 billion in 2022, an increase of 4.9 percent over 2021. Given that China is the biggest investor in Brazil's energy, minerals, agriculture, infrastructure and manufacturing sectors, the CIPS offers the two sides an alternative to the US dollar to settle trade payments to boost their trade.

The development of the CIPS can hasten the internationalization of the yuan, because if a country mostly conducts foreign trade in its own currency, its currency can become a fully convertible international currency more expeditiously.

According to the General Administration of Customs, China's foreign trade in goods was 42.07 trillion yuan in 2022. Reportedly the yuan's share in global trade financing has risen from less than 2 percent in 2017 to 4.5 percent in 2023. The fact implies that the CIPS will deepen the financial cooperation between China and the rest of the world, and expand the global influence of the Chinese currency.

To be sure, cross-border trade settlement in the yuan will reduce many countries' dependence on the US dollar. Brazilian President Luiz Inacio Lula da Silva said on April 13, during his visit to China, that BRICS member states (Brazil, Russia, India, China and South Africa) should conduct trade in their own currencies.

As a matter of fact, India and Malaysia agreed on April 1 to settle bilateral trade in Indian rupees. And in the ASEAN Financial Ministers and Central Bank Governors meeting in March, member states of the Association of Southeast Asian Nations agreed to promote the use of their currencies in intra-ASEAN trade in a bid to reduce their reliance on the dollar.

The rising "de-dollarization" trend in many parts of the world is a response to the decreasing global influence of the US and its currency — the United States' share of global GDP, based on purchasing power parity, declined from 22.13 percent in 1986 to 15.57 percent in 2022.

Besides, the US Federal Reserve's years-long loose monetary policy has led to record inflation in the US, lowered investors' expectations from US assets, and prompted many countries to look for other currencies to settle foreign trade payments. According to the International Monetary Fund, the dollar's share of international reserve dropped from 71 percent in 1999 to about 58.4 percent in the fourth quarter of 2022. Hence, China should continue to expand the CIPS to help reduce its trading partners' dependence on the greenback.

Also, the US has been using the dollar as a financial weapon to impose sanctions on other countries and regions, dealing a blow to the international financial system. For example, sanctions imposed on Moscow after the Russia-Ukraine conflict broke out have negatively affected emerging economies, even some of the US allies. Therefore, it makes sense for countries to trade in the yuan or other currencies to shield against the "weaponized dollar".

Moreover, the CIPS will also help boost small and medium-sized enterprises, which are the backbone of cross-border e-commerce and need more support from the government to hedge exchange rate risks. And the improvement in cross-border transactions will help improve the financial environment for the SMEs, traditional trade and new trade models, boost the development of foreign trading companies and develop new growth points.

Financial Regulation

Investing in Banking Supervision[*]

By AGUSTÍN CARSTENS[*]

Introduction

Recent months have seen several episodes of banking stress, in both Europe and the United States.

Once again, central banks have stepped in to provide liquidity, restore confidence and prevent contagion. At the same time, they have been raising interest rates to bring inflation back to target.

In principle, central banks can separate their monetary policy actions from their financial stability function. But perceptions matter. And raising interest rates on the one hand, while easing financing conditions for banks on the other might create the impression that policy arms are pulling in different directions.

This wasn't meant to happen. The Basel III reforms aimed to ensure that banks kept ample liquidity on hand and remained well capitalised at all times. And, if systemically important institutions did fail, well planned resolution procedures were meant to prevent spillovers to other institutions.

What went wrong? Many have pointed fingers at rapid interest rate hikes, falling bond prices and flighty depositors. In some cases, these provided the trigger. But in my view, the main cause of recent bank crises was the failure of directors and senior managers to fulfil their responsibilities. Business models were poor, risk management procedures woefully inadequate and governance lacking.

These issues existed well before depositors ran and investors lost confidence. Many of the shortcomings could, and in my view should, have been identified and remedied ahead of time. This speaks to the crucial role of banking supervision. This will be the focus of my talk.

Banking supervision needs to up its game. It needs to identify weaknesses at an early stage and act forcefully to ensure that banks address them. To do this, supervisors will need to have operational independence, strengthen their forward-looking culture and adopt a more intrusive stance. They will also need to continuously seek to improve their capabilities. First, by accessing greater resources. And second, by enhancing their productivity with the aid of technology.

The crucial role of banking supervision

Rising interest rates have challenged some banks, central banks and banking supervisors. Some banks' business models have been exposed, particularly after a decade of exceptionally low interest rates led them to take on greater risks in search of yield.

The banks that have come under strain were similar in several respects. One was that they had poor governance and inadequate risk management. As the Chair of the Basel Committee recently noted, bank boards and senior managers are the first line of defence in managing and overseeing the risks posed by rising rates.

But there were also some important differences. Some of the banks that failed had a long track-record of financial underperformance. The weaknesses of their business models had been clear for some time. For others, financial difficulties emerged suddenly. I am referring here to banks who had significant exposures to long-term, fixed rate assets funded with less stable short-term funding. Of course, such liquidity transformation is inherent in the banking system – but the liquidity risks need to be managed.

The regulatory framework provides authorities with tools to address the risks posed by rapidly rising interest rates. In particular, well defined minimum capital and liquidity requirements – such as those in the

Basel III standards – equip banks with a buffer to withstand adverse interest-rate movements and buy time to address more structural weaknesses. At the same time, we need to acknowledge that the current regulatory framework may not fully capture risks such as those posed by rising interest rates to exposures in the banking book, which were at the heart of some of the recent failures. As a result, recent developments may offer lessons that could justify adjustments to prudential rules – in specific jurisdictions or at the global level – to help them become even more effective.

However, regulation alone cannot address all channels through which higher interest rates affect a bank's viability. Minimum regulatory requirements are, by design, narrow in scope and are not tailored to each bank's risk profile. And there is simply no reasonable level of minimum capital and liquidity that can make a bank viable if it has an unsustainable business model or poor governance.

This is why supervision is so important. In most jurisdictions, legal frameworks give supervisors a broad and flexible toolkit to identify, assess and, if warranted, address banks' exposure to heightened risks. Through the combined outputs of its various components, including onsite inspections, stress tests and business model analysis, supervisors can develop an informed, comprehensive assessment about the ability of banks to manage their main risk exposures and the sustainability of their business models.

These comprehensive assessments form the basis for supervisory actions to address problems pre-emptively, before risks crystallise. In the first instance, regular supervisory dialogue and moral suasion may be enough to resolve issues. Beyond that, supervisors often have the power to escalate matters and deploy formally binding requirements commensurate with the nature and severity of the identified deficiency. Available measures can include capital and liquidity add-ons, as well as qualitative measures aimed at correcting structural deficiencies in governance, risk management and even business models. With such a holistic and forward-looking approach, supervisors can prevent an identified vulnerability from evolving into a threat to the bank's safety and soundness.

Early identification of vulnerabilities is even more relevant in the light of recent events. The combination of social media and technology seems to have amplified the speed at which bank runs can occur. Social media can spread concerns about a specific bank among its depositors even more quickly. And technology such as a mobile banking app lets customers open and close accounts and transfer their deposits in a matter of minutes. Therefore, an intrusive and forward-looking supervision, which takes forceful action at an early stage when necessary, is more important than ever.

The ability and will of supervisors to take early and forceful action when needed are predicated on supervisors having operational independence, appropriate powers and legal protection. An organisational culture that empowers supervisors to take such actions even when faced with uncertainty is also essential. These are some of the pre-conditions that allow supervisors to properly discharge their responsibilities with autonomy while remaining accountable for their actions and decisions. However, while necessary, these elements may not be sufficient if supervisors do not have the resources or the ability to use them efficiently.

Stepping up supervision part 1: resources

After the Great Financial Crisis, most supervisors increased the intensity of their supervision of systemically important banks following a risk-based approach. This meant prioritising resources where they were most needed. In some cases, however, it also meant greater reliance on automated processes and fewer resources devoted to dealing with less systemic financial institutions.

Allocating resources following a risk-based approach makes sense. It helps supervisors to pursue their mandate and safeguard financial stability. But recent episodes remind us that banks that may not be considered systemic ex ante can create systemic distress, via contagion, when they fail. This indicates that resources should be sufficient to apply an adequate oversight to all institutions.

This is not just about numbers. It is also about having the right skills to keep up with relevant developments. Traditional financial disciplines such as accounting and risk management remain essential. But other, less traditional, skills are now needed as well. In particular, the large and far-reaching impact on banks of ongoing technological disruption means that supervisors must find and develop sufficient expertise in areas like cyber security, data analytics and artificial intelligence. That, of course, obliges authorities to face the challenges posed by the strong demand in all sectors for professionals with those qualifications.

Needless to say, supervisory resources cost money. Budgets must rise, in some jurisdictions significantly so. A range of funding arrangements could facilitate these investments, including by creating

or increasing industry-contributed supervisory fees. Some will no doubt complain. But this would be money well spent. Financial crises give rise to massive social and financial costs. By reducing their likelihood, investments in a more effective supervisory framework will certainly pay off and generate substantial returns for society as a whole.

Stepping up supervision part 2: technology

Supervisory output and effectiveness may also be enhanced by means of productivity gains, which in turn could be obtained with the aid of technology. For example, tools may be developed to automate parts of the supervisory process, particularly repetitive tasks that do not require expert judgment, thus creating conditions for a more effective and efficient allocation of supervisory resources.

In addition, authorities may adopt innovative technology such as big data, artificial intelligence and machine learning to further enhance effectiveness and efficiency. Indeed, many authorities have followed this route, with the pandemic accelerating this trend. Travel restrictions and social distancing protocols forced supervisors to shift nearly all their on-site activities to an off-site surveillance mode. In response, several authorities developed new tools with a view to maintaining their capacity to assess the soundness of financial institutions even under such challenging conditions.

One area where significant progress has been made in the past few years is data analytics. These suptech tools, which use a vast amount of data, both qualitative and quantitative, have the potential to enhance different components of the supervisory process. For example, tools for text analysis, text summarisation and information classification allow for faster extraction of useful insights from lengthy documents produced by the supervised entities. Tools for sentiment analysis, network analysis and peer group identification can provide additional insights on the risks faced by banks and may therefore contribute to the difficult task of identifying deficiencies at an early stage.

Concluding remarks

Let me conclude. The ultimate cause of recent bank failures lies with the institutions themselves, not with regulators or higher interest rates. There is no excuse for institutions to mismanage interest rate risk, or to fail to address long-term structural weaknesses in their business models.

But banking supervision needs to step up to ensure the safety and soundness of financial institutions under different macro-financial scenarios in the new technological environment. It is essential, in that regard, that supervisors are sufficiently forward-looking and intrusive. With sufficient resources and the aid of technology, supervisors will be able to identify more vulnerabilities at an early stage and to act on them before problems become too large and complex to handle. While this will not prevent all future bank failures, such investments will certainly reduce the likelihood and impact of failures affecting the stability of the financial system.

The Quest for Deposit Stability*

By FERNANDO RESTOY *

Introduction

Thank you very much for the invitation to participate in this European Forum of Deposit Insurers International Conference. This year the timing of this event is particularly opportune as it takes place soon after episodes of financial distress that have required the intervention of deposit guarantee funds. Moreover, only a couple of weeks ago the European Commission released an important legislative proposal on crisis management and deposit insurance (CMDI).

My remarks today are largely motivated by those two developments. More concretely, I plan to focus on the implications of uninsured deposits for financial stability.

Without expanding much on what we all know well, the recent turmoil has affected banks with different risk profiles on both sides of the Atlantic. On the American side of the ocean, a few mid-sized banks – with significant interest rate risk exposure – have failed. On this side, a major bank – actually a globally systemically important bank (G-SIB) – with a weak business model also failed.

While those banks were quite different, their failure followed a broadly common pattern. Although all failing banks satisfied minimum solvency requirements, market concerns about their viability provoked sharp corrections in equity prices which triggered unprecedented runs on deposits, particularly those not covered by the deposit guarantee scheme.

Those bank failures shined a spotlight on the significant increase in non-covered deposits and the structural risks posed by banks' reliance on them. A larger demand for banks' deposits can well result from a specific juncture characterised by ample liquidity and low opportunity costs in a context of low market rates. However, the speed at which the runs took place – fuelled by social media and the new technological means to move funds rapidly from banks' accounts – could call into question prevailing assumptions about the stickiness of non-covered deposits.

The prospect of a structural loss of stability in banks' deposit base could have severe implications for the sustainability of commercial banks' business models and the robustness of the current regulatory framework, including features of current deposit guarantee schemes. That has triggered a debate on what policy actions, if any, should be explored to preserve banking system stability in the light of recent developments. Let me share with you some preliminary ideas in that regard.

How to contain bank runs: the US experience

Arguably, both prudential regulation and deposit insurance share the same origin. In the first half of the 19th century there was a wave of bank failures affecting in particular the redeemability of bank notes issued by entities chartered in some US states, starting in New York in 1829. These triggered the creation of the first insurance programmes.

Those programmes included not only the insurance of a series of banks' obligations but also the introduction of some regulatory restrictions, such as a specific list of eligible investments for bank capital and the creation of an authority with examination powers. Prudential regulation and oversight were introduced mainly to mitigate the risk exposure of the insurance programmes. Yet authorities also recognised at that time the supplementary objective of providing assurance about banks' safety to their clients.

The establishment of a prudential regime for banks has accompanied all deposit insurance programmes implemented since then in the United States, including the one leading to the creation of the Federal Deposit Insurance Corporation (FDIC) in 1933. Indeed, the first federal deposit insurance scheme had a limited coverage ($2,500). However, it also contained a detailed set of rules – including the compulsory separation of investment and commercial banking – established rigorous admission requirements and gave the FDIC substantial supervisory powers.

Over the years, this scheme combining insurance coverage up to a specified limit and prudential controls has served the US financial system well and restrained the number of bank runs. This outcome has been supported by the progressive increase of the maximum coverage amount (currently $250,000) and the strengthening of prudential regulation in parallel with the development of international standards. In their latest version, Basel III, those standards include, for the first time, liquidity requirements (a Liquidity Coverage Ratio (LCR) and a Net Stable Funding Ratio (NSFR)) that differentiate between covered and non-covered deposits as a function of their estimated stability. In the US, however, only a few large banks are directly subject to the Basel standards.

In addition, the development, starting in the 1950s, of a broadly successful bank failure management regime has further contributed to the overall stability of banks' deposit base. At present, that regime gives non-covered deposits the same privileged ranking as covered deposits in the hierarchy of liabilities in insolvency. Moreover, the FDIC can support transfer transactions involving all (and not only covered) deposits if this satisfies a least cost test, ie if it is less expensive for the deposit insurance fund than paying out covered deposits in liquidation. As seen recently, that requirement to adopt the least cost method of managing a bank failure can be waived in case of a risk to financial stability. Under this regime, there have been a relatively limited number of bank failures in which non-covered deposits have suffered losses. That has logically generated the stabilising perception – but in no way the certainty – that non-covered deposits have, in practice, a fair amount of protection.

The US experience illustrates that, at least until now, limited coverage deposit insurance can deliver sufficient stability, but only if it is properly accompanied by an effective prudential framework and a bank failure management regime which moderates expected losses for uncovered deposits.

The European situation

What is the situation in Europe in terms of those elements that help maintain the stability of banks' deposit base?

The summary could be that, compared with the US, deposit coverage is smaller, the prudential regime is somewhat more stringent (at least for small and medium-sized institutions) and the bank failure management framework is relatively weaker.

As you all know better than anyone else, deposit insurance is currently only provided at the national level, but following rules established in European legislation. The coverage is harmonised and kept at a maximum of €100,000. Prudential regulation, which closely follows the Basel standard, is also developed in European legislation and applies with little adjustment to all credit institutions in the EU. The rule book includes Basel's LCR and NSFR, which have been applicable in Europe since 2015 and 2021, respectively.

As for bank failure management, the current framework is a combination of a centralised regime (a common resolution framework) for banks whose failure passes a public interest test and domestic (mostly non-bank-specific) insolvency regimes for the rest. The former largely relies on the application of creditors' bail-in rules that can affect non-covered deposits for banks under resolution. The latter contains a partially harmonised creditor hierarchy that gives covered depositors preference over holders of all other non-preferred liabilities, including non-covered depositors.

As has been discussed already for a few years, including in a forum with European deposit insurers like this one back in 2018, this framework fails to offer a robust toolbox to deal effectively with the failure of mid-sized banks which are too large and sophisticated to be subject to liquidation but also too small and too unsophisticated to be able to issue large amounts of bail-in-able liabilities. In particular, as those banks typically have little market funding, their failure would often imply losses for non-covered deposits, through the application of bail-in in resolution and, in liquidation, through their subordination to covered deposits. In order to avoid the destabilising implications of that outcome, European authorities have often relied on substantial bailouts. In particular, given the existing restrictions on public support in resolution, in recent crisis episodes they have opted for stretching the potential under national insolvency regimes to support the sale of failing banks with the provision of liquidation aid by the state.

The most reasonable approach to addressing these deficiencies is to learn from the US experience and facilitate sale of business strategies – involving the transfer of deposits to an acquirer – by establishing effective funding arrangements, with the key participation of deposit insurance funds. Some proposals in that direction have been put forward over the last few years.

Building on those proposals, the European Commission has recently launched a legislative initiative aimed at improving the crisis management framework by facilitating transfer strategies under the common

resolution framework. Without being exhaustive, the proposal establishes a general depositor preference rule to replace the current super-preference of covered deposits and makes deposit insurance funds more readily available to support sale of business operations under resolution. The amount of funds available remains capped through a US-type least cost restriction but without the flexibility created by the systemic exception. In parallel, the proposal aims to expand the range of cases that are dealt with through resolution by effectively banning the application of domestic insolvency regimes when public liquidation aid is foreseen. Bringing more failures within the resolution framework not only gives resolution tools effective transfer powers, but also brings an additional source of funding from the Single Resolution Fund in appropriate cases.

The proposal is a major step towards improving the European crisis management framework. Yet, as the European Commission openly recognises, a significant drawback is that the new framework for funding transfer strategies relies heavily on national arrangements rather than on a European deposit insurance scheme. This not only deprives the new framework of the diversification benefits of a pan-European fund, but also makes it unable to contribute to the core banking union objective of denationalising banks' risk.

Those shortcomings are also relevant from the point of view of providing stability to uncovered deposits. In that regard, the expected availability of public funds to support the liquidation of failing banks under domestic insolvency regimes, while sub-optimal from the point of view of limiting taxpayer' costs of a bank crisis, could have a stabilising effect on non-covered deposits. By excluding (formally unlimited) liquidation aid under insolvency regimes and replacing it with funding provided by national deposit insurers in resolution, which is subject to quantitative limits, the proposal might not contribute much by itself to strengthening the expected protection of non-covered deposits in a crisis episode. Importantly, the lack of a European deposit insurance scheme with a greater capacity to support transfer strategies of individual banks than national funds could increase the perceived uncertainty about the protection of uncovered deposits in a bank's failure.

On recent reform proposals

Arguably, the current framework that combines limited deposit insurance coverage, a prudential regime and bank failure arrangements, while helpful for containing bank runs, it is not meant to eliminate the risk that a bank's crisis will entail costs for non-covered depositors. In fact, as discussed before, recent developments might suggest that the probability and speed of bank runs could become more acute in the future.

Against that background, it is reasonable to consider reforms aimed at further protecting the stability of the financial system in these new circumstances. Some reforms of this kind are already being put forward and can be broadly classified around the three key elements described above: coverage of the deposit insurance scheme, prudential rules and bank failure management.

A first set of measures would entail increasing the current limits of insurance coverage for all or specific types of deposits, and eventually the coverage of all deposits without pre-specified quantitative limits.

A second set of measures would seek to strengthen prudential regulation. In particular, some observers are now proposing more stringent controls on those risk factors that have had a bearing on recent bank failures. Those would include a review of Basel III's LCR to further restrict the instruments that would qualify as high quality liquid assets or to modify the underlying assumptions (eg non-covered deposit stickiness) that determine the required volume of those assets. A far-reaching regulatory reform, but with a similar objective, could consider the introduction of collateralisation obligations for non-covered deposits to explicitly enhance the protection of those instruments.

A last set of proposals focuses on the management of banks' liquidity distress. Rather than trying to prevent bank runs, some initiatives aim to make them less disruptive by ensuring that central banks can cover any liquidity gap created by a bank run with collateralised lending. In its purest form, such a proposal would imply requiring banks to pledge ex ante sufficient qualifying collateral to central banks to cover all their runnable liabilities such as deposits or short-term market funding.

All those proposals merit a careful analysis, particularly if further evidence emerges that current developments are the result of a structural reduction in the effective stability of the deposit base of financial institutions. Yet that analysis should include a rigorous assessment of the potential costs and side effects of each proposal.

A fundamental consideration is that reform options should not aim to fully transfer all banks' risks away from bank creditors to the state or the industry. Otherwise, this might well lead to disproportionate costs

for taxpayers or the banking sector and may denigrate banks' risk management. In particular, a scenario in which some depositors would withdraw funds to avoid losses when the bank is perceived as weak constitutes a powerful disciplining device for banks' managers which can hardly be fully replaced by stricter regulation.

In addition, while it is worth considering whether some technical adjustments could be warranted, excessively stringent liquidity requirements (through higher minimum liquidity ratios or the collateralisation of non-covered deposits) could ultimately impair commercial banks' business models and make them constrain their credit supply and/or rely more on expensive and less stable short-term market funding.

Those potentially adverse effects are present, possibly to a larger scale, in the more radical proposals aimed at constraining the acceptable volume of runnable liabilities as a function of the assets that could be pledged to the central bank. As the central bank would need to cover the risk of lending in critical situations, acceptable collateral could only consist of either relatively safe assets (such as government securities) or risky assets (such as loans) only if they are subject to conservative haircuts. Since deposits would be constrained by available collateral, the proposal could possibly create funding gaps for the loan portfolio that might have to be covered either by reducing banks' lending in favour of less risky exposures or increasing the reliance on costlier longer-term (non-runnable) market liabilities.

Therefore, when considering this type of proposal, authorities should bear in mind the potential negative impact of those initiatives on banks' profitability, safety and soundness, and ability to intermediate. Otherwise, these initiatives could lead either to the reduction of credit availability to the real economy or to an excessively prominent role of non-banking intermediaries.

The role of supervision

What about supervision? Arguably, the far-reaching regulatory proposals are motivated by a lack of trust in the ability of the existing regime to preserve a well- functioning banking system in a context of a more unstable deposit base. That could well be the justified, although much more evidence and analysis would still be required to establish the need to substantially modify the current regulatory framework.

That said, while the case for radical regulatory reforms still remains quite uncertain, I believe there are already clear arguments for reviewing supervisory practices and seeking ways to strengthen them. For example, the materialisation of interest rate risks triggered several bank failures. But banks' vulnerabilities unveiled by those failures went beyond specific exposures or funding sources. This included excessively risky balance sheet structure, deficient risk management and unsound growth strategies. In other words, the root cause of the weaknesses of failing banks was a flawed business model and poor governance. Of course, the large amount of non-covered deposits – while not the predominant funding source in all cases – accelerated the failure, but this was not the main vulnerability of the failing banks. Put differently, the assumption that non-covered deposits are now less stable than in the past should primarily lead to the conclusion that more and earlier policy action is needed to promote sustainable business models and sound governance practices.

Importantly, the ability of standard prudential rules to address this type of weakness is limited. There is simply no feasible amount of capital and liquidity requirements than can compensate for banks with poor governance or business models. To the contrary, an attempt by authorities to compensate for a bank's structural deficiencies with more capital and liquidity could well exacerbate problems and further undermine the viability of the institution.

Actually, the prompt identification and correction of those deficiencies is the core business of supervision. Indeed, under the current Basel III pillar 2, supervisors have a broad range of powers and tools – including both quantitative and, more importantly, qualitative measures – that could help correct banks' structural weaknesses. Unfortunately, Pillar 2 is not sufficiently well developed in all jurisdictions.

The European banking union is a good example of a jurisdiction which has developed a well structured supervisory review and evaluation process (the SREP) which supports the application of Basel's pillar 2. In particular, unlike other jurisdictions, together with capital and liquidity adequacy, the ECB's SREP evaluates the governance and business model sustainability of all banks under its remit. On the basis of that evaluation, it regularly conveys recommendations or requirements to banks in order for them to address their weak points. In a recent report commissioned by the ECB, a group of experts have praised this structure, although we have also recommended that the approaches followed when deploying qualitative measures be further improved by refining their formulation, prioritisation and monitoring.

More broadly, I believe that supervision can become more effective with a more forward-looking and intrusive approach. Authorities should have the means, powers and culture to challenge more forcefully banks' business plans, internal organisations and decision-making processes without, obviously, alleviating any management responsibility.

Concluding remarks

Let me conclude. I believe it would be a mistake to downplay the relevance of the recent bank failures. At a minimum, they indicate that a scenario in which banks and their regulation would need to adapt to a less stable deposit base cannot be ruled out. Against that background, given the potential disruption that this scenario could generate, we cannot now exclude the need to eventually consider bold policy reforms. In any event, those reforms should be grounded on compelling evidence and, crucially, on a rigorous cost-benefit analysis.

For the time being, though, those episodes already constitute a good case for speeding up a full implementation of the Basel standards in all jurisdictions. Moreover, they support the need to put in place or further develop pragmatic bank failure management regimes that sufficiently acknowledge the need to provide non-covered deposits with a sensible degree of protection when banks fail.

More importantly, I believe that supervision already has the potential to address the root causes of many bank failures, and that this potential is often not fully exploited. Frankly, before we even think of introducing far-reaching changes in prudential rules or in the scope for deposit guarantees, I would first give supervision another chance.

The Evolving Nature of Banking, Bank Culture, and Bank Runs*

By MICHELLE W. BOWMAN *

This symposium, focused on building the financial system of the twenty-first century, is very timely. Given the recent banking system stress many are welcoming a fresh look at whether the Dodd-Frank era changes to the financial system and the approach to supervision and regulation have kept pace with the evolving nature of banking, the evolving culture of banking, and how the risks of bank runs today have evolved to be meaningfully different from what we've seen in the past. While my remarks will largely focus on the United States, the lens through which regulators and policymakers should view these issues has some broader applicability and is worthy of an ongoing discussion.

I will begin by offering a few thoughts on U.S. monetary policy. At our most recent meeting last week, in light of the ongoing unacceptably high inflation, the Federal Open Market Committee (FOMC) increased the target range for the federal funds rate by 25 basis points. With this increase, the FOMC has raised the federal funds rate by 5 percentage points since March of last year. These increases, combined with the runoff of our balance sheet, are having the desired effect of tightening financial conditions. In my view, our policy stance is now restrictive, but whether it is sufficiently restrictive to bring inflation down remains uncertain. Some signs of slowing in aggregate demand, lower numbers of job openings and more modest gross domestic product (GDP) growth indicate that we have moved into restrictive territory. But inflation remains much too high, and measures of core inflation have remained persistently elevated, with declining unemployment and ongoing wage growth. And, as senior loan officers signaled beginning last summer, credit has continued to tighten. I expect this trend will continue given increased bank funding costs and reduced levels of liquidity.

While the U.S. banking and financial system remains sound and resilient, the recent failures of three U.S. banks with unique risk profiles have added to the uncertainty surrounding the economic outlook. This uncertainty is further complicated by stock price movements among regional banks.

Should inflation remain high and the labor market remain tight, additional monetary policy tightening will likely be appropriate to attain a sufficiently restrictive stance of monetary policy to lower inflation over time. I also expect that our policy rate will need to remain sufficiently restrictive for some time to bring inflation down and create conditions that will support a sustainably strong labor market. Of course, the economic outlook is uncertain and our policy actions are not on a preset course. I will consider the incoming economic and financial data during the intermeeting period and its implications for the economic outlook in determining my view of the appropriate stance of monetary policy. I will look for signs of consistent evidence that inflation is on a downward path when considering future rate increases and at what point we will have achieved a sufficiently restrictive stance for the policy rate. In my view, the most recent CPI and employment reports have not provided consistent evidence that inflation is on a downward path, and I will continue to closely monitor the incoming data as I consider the appropriate stance of monetary policy going into our June meeting.

My remarks today will address the recent bank failures in the United States and how the evolution of the banking industry has influenced and amplified bank deposit run risk. I will then discuss supervision, regulation, bank management culture, and technology, and how each of these changes the dynamics of our approach to building a stronger and more resilient financial system. Finally, I will close with my views on the importance of approaching the future in a deliberate, evidence focused, and thoughtful manner.

The Evolving Context of Banking and Bank Failures

Those who are involved in the business of banking will not find this shocking, but it is a fundamental fact that banking involves risk. It is inherent in, and foundational to, the business of banking: banks take demand deposits—a short-term liability—and make term loans—creating a long-term asset. Absent this intentional risk-taking, banks could not play their indispensable role of credit provision in the economy.

There are many other risks, with the specific risks that banks face today as varied as the wide range of bank business models. The most fundamental banking risks include credit, concentration, interest rate, liquidity, cybersecurity, more recently operational risk and, of course, the risk of contagion.

Banking simply cannot work in its current and historical form without risk, so unless the goal is to change the nature of banking, the task of policymakers and regulators is not to eliminate risk from the banking system, but rather to ensure that risk is appropriately and effectively managed. Fundamentally, this is the basis for the bank regulatory frameworks that exist around the world. In countries with well-functioning and appropriately regulated banking systems, banks serve an indispensable role in credit provision and economic stability. The goal is to create and maintain a system that supports prudent banking practices, and results in the implementation of appropriate risk management. No efficient banking system can eliminate all bank failures. But well-designed and well-maintained systems can limit bank failures and mitigate the harm caused by any that occur.

In practice, the "maintenance" of the bank regulatory and supervisory framework has often been challenging, in part because maintenance requires vigilance in responding to evolving circumstances and risks. Lapses in this effort are revealed when something breaks, which could include fragilities resulting from the emergence of unidentified risks and financial stability threats; banking practices that expose shortcomings in the supervisory framework; or policymakers, regulators, and/or examiners who have lost sight of the fundamental goal of encouraging prudent banking practices and appropriate risk management.

The need for maintenance of the U.S. bank regulatory and supervisory framework has come into stark relief with the failures of two large banks in March, followed by a third at the beginning of May. The future and current policy choices made in responding to these failures will have important consequences for the U.S. banking system. Including the extent to which bank regulation will continue to drive banking activities from regulated banks and into shadow banks. While shoring up the resiliency of the banking sector is important, it is also important that we consider the consequences of any regulatory change.

Before discussing the direction of policy, I think it's imperative that we pause and consider where we are and what has changed.

The Failure of Silicon Valley Bank

As financial services have evolved to meet the demands and expectations of sophisticated and wealthy businesses and individuals, risks inherent in the very nature of these services—instant accessibility and transferability of funds—created the potential for instability at an extensive and accelerated scale. For Silicon Valley Bank in particular, while the run was ignited by traditional concerns, it was much faster than previous bank runs, was fueled by the most modern communication methods and social media, and was enabled through new technology that allows customers to move money on a scale and at a velocity not previously accessible directly to customers.

On Thursday, March 9, SVB experienced a deposit outflow of more than $40 billion, and more than $100 billion was anticipated in queue for outflow on Friday, March 10. Let's consider this in comparison to past bank failures and the pace and size of deposit outflows. Prior to SVB, the largest bank failure in U.S. history was the failure of Washington Mutual, which experienced two periods of large deposit outflows, the first lasted 23 days with outflows of $9.1 billion, and the second $18.7 billion over 16 days.3 In other bank failures resulting from deposit runs, deposits flowed out of the bank in significantly smaller volumes and over much longer time horizons than SVB experienced on March 9 and 10.

The recent bank runs have many familiar elements. SVB relied on funding from extremely large deposits of technology and health care sector firms, which were mostly uninsured (more than 95 percent) and held in transaction accounts. In traditional banking, uninsured depositors have historically been exposed to credit risk on their bank deposits, which provides some incentive for them to impose market discipline on the bank, such as by discouraging excessive risk-taking. As we were very recently reminded, a disproportionate percentage of uninsured depositors can also present risk, since they may have strong incentives to withdraw their funds at the slightest sign of actual or perceived bank stress. These dynamics and incentives are certainly not new but have featured prominently in past bank runs.

The most significant shift has been one of speed. This is where modern technology has played a significant role, both in facilitating the transfer of funds and in the access to, and expedited flow of, information among depositors.

Evolving Technology and Customer Expectations

Back-end money transfer systems have been gradually shifting to real-time payments, which are immediately available to customers upon transfer, rather than being subject to a waiting period while it is processed between financial institutions. Many bank websites provide capabilities that appear to allow customers to initiate funds transfers in real time. Sophisticated customers that hold uninsured deposits also have tools at their disposal—like the ability to initiate wire transfers between financial institutions—that allow faster transfers of funds.

The capacity to initiate transfers, and even the changed perceptions of customers that they can move their funds at any time of day or night, have caused important structural shifts. Large depositors may have less incentive to act as a force for market discipline, even for banks where they hold large uninsured deposits in their operational accounts. These depositors have a cheaper and more efficient mechanism at their disposal to protect against credit risk—they can pull their money out in banking's new normal. These changes have exacerbated the potential flight risks of uninsured deposits, while changing some of the incentives for depositors imposing market discipline.

Bank Runs and the Rumor Mill

The speed and size of deposit withdrawals were a feature, not a cause, of the recent U.S. bank failures. We live in a world where a wide array of communication tools—text messaging, group chats, and social media postings—have enabled expedited, if not always more accurate, dissemination of information.

The spread of information has always played an important role in bank confidence and bank runs. When information is more readily and quickly accessible and shared among shareholders, creditors, customers, and depositors, bank management needs to be attuned to how it communicates, especially when remediating identified weaknesses.

The failure of SVB illustrates this dynamic. Uninsured depositors were connected by a closely linked network of business relationships and contacts, and strong ties with venture capital fund investors. The flow of information among these depositors—and the mechanisms that pushed them to act collectively—seem apparent in retrospect, but the closely linked relationships among this group exacerbated the risks involved in SVB's public communication of its remediation strategy.

But while the risk of uninsured depositors acting collectively was a significant vulnerability, communications from management caused this group to begin to withdraw their deposits on a massive scale and in a coordinated fashion. We know that there were many supervisory issues at SVB over several years. At the time the bank failed, it had been selling securities to improve liquidity and raising capital to address some of these fundamental weaknesses in its funding and liquidity. Simply the act of announcing that the bank's management was taking steps to remediate these issues created panic—highlighting the risks they were confronting—and the panic spread quickly.

Social media has also played a role in fueling stock price volatility, which can lead to other risks to a bank. In October of last year, rumors circulated about Credit Suisse's stock price conflating stock price with capital and liquidity strength. Despite Credit Suisse management's efforts to intervene and calm markets, its stock experienced significant volatility, resulting in an increase in the spreads on the firm's credit default swaps and a decrease in the value of its bonds. Credit Suisse had been dealing with significant issues for an extended period of time, but this incident highlighted how quickly investor sentiment can change in the age of social media.

Bank Culture and Mindset

A more subtle way we are seeing banking evolve is most evident in the "culture" of banking for those banks whose business models directly involve funders of startups, transformative new technologies, or novel activities like digital and crypto assets. For many banks, innovation has been a long-term priority because it enables them to offer customers new products and services and remain competitive in the current financial services environment. But regardless of the business model, the culture of a bank must also prioritize the values and rules that make banks successful over time. This includes not only being responsive to the needs of their customers and communities, but also maintaining a strong risk-management culture.

The expansion from traditional bank business models brings an influx of non-bankers into bank management. Over the past several years, there have been a number of charter-strip acquisitions, where a new management group transforms a traditional bank's business model. And we have seen consistent growth in banking-as-a-service partnerships—where the bank partners with a nonbank company, often a

fintech, to offer new products and services. Even without these external influences, bankers who leverage innovation as a significant aspect of their business model often have a mindset that is compatible with continued innovation and are less sensitive to regulatory and supervisory communications. I view these trends as part of a cultural shift within these banks.

Some innovators espouse an "ask for forgiveness, not permission" mentality when it comes to regulation and compliance. This is a particularly dangerous mindset when it comes to banking. Bank supervisors often rely on their interactions with bankers to communicate supervisory concerns. This enables supervisors to provide feedback to bank management before these issues escalate and are cited in examination reports and as Matters Requiring Attention (MRAs), Matters Requiring Immediate Attention (MRIAs), or enforcement actions. But bank management must be receptive to these supervisory messages and should take proactive measures to address the issues identified. This kind of proactive approach may not be the most natural reaction for those who have been successful in a less-regulated tech or start-up environment.

The Policy Response

Given the recent banking sector stress, it is clear that we need to review the bank regulatory and supervisory framework to determine whether updates are needed. As we consider potential changes to improve supervision and regulation, we should start from a baseline understanding of the available tools and determine whether those tools have been utilized and implemented effectively. Before regulators seek new tools, it is necessary to understand the need—how would the use of those new tools address deficiencies in the existing regulatory toolkit? Imposing additional requirements on regulated institutions without understanding this need results in additional costs and can have unintended consequences like encouraging bank consolidation and constraining credit availability to critical business activities or geographies. In addition to these unintended consequences, we also need to carefully consider the broader implications of regulatory change for financial stability.

The policy response to a crisis should be multifaceted, as changes to different elements of supervision and regulation in combination may be the most efficient and effective response. We should have no illusions that "getting it right"—finding the right combination of regulatory and supervisory changes—is a simple task. This fine tuning is a core element of maintaining an effective system, constantly re-evaluating whether our tools are effective and used appropriately.

There are a few specific areas where I see a need to revisit our approach, specifically in supervision, regulation, and technology.

Supervision

Starting with supervision, effective bank supervision requires both transparency in expectations, and an assertive supervisory approach when firms fail to meet these expectations.

In the past, I have spoken about the virtue of transparency in supervision. Transparency in supervisory expectations builds legitimacy, promotes a compliance culture, and is critical to ensuring that we preserve due process. Transparency between a bank and its examiners can be a profoundly effective tool by allowing bankers to air issues early with their examiners. This type of communication promotes understanding—of the bank and its operation by examination staff, and of regulatory expectations by the bank's management and board of directors. Amorphous standards or standards that change without prior notice frustrate this goal.

If regulators are clear in our expectations with banks, and banks fail to meet those expectations, regulators are well-positioned to take strong action and demand remediation of supervisory issues. When a bank fails to promptly address identified issues, the bank and the banking system run the risk that those issues can become far more damaging over time. There is a significant cost to delay.

While the specific timelines for remediation of supervisory issues vary significantly across firms, the Board has published statistics on the number of and general nature of supervisory findings, and how those have evolved over time. Remediation of technology infrastructure, data, and operational resilience issues often take longer to address than those in other business areas or related to risk management.9 Some variability is reasonable as these issues vary in complexity. And, to the extent that a bank is reliant on third parties, core providers, or others to help remediate issues, providing sufficient remediation time can be necessary and appropriate.

Providing time to remediate issues should not be a pretext for inaction or inattention to important supervisory issues. Ultimately, one of the primary goals of supervision is to hold the bank accountable for safety and soundness and consumer compliance. Accountability is critical for both the bank and for supervisors. Where regulators have failed in supervision, we must hold ourselves accountable.

Part of the solution to inaction may simply be to take a stronger approach when examiners have identified deficiencies in need of remediation. But for some banks, management's responsiveness to supervision—traditionally an area that rewarded conservative and prudent management—has changed, with a greater emphasis on innovation, especially those that promise to transform the business of banking.

These shifts impact supervision, in that we need to reevaluate the effectiveness of formal and informal enforcement mechanisms. If moral suasion as an informal tool is less effective, and bank management and boards are less attuned to hear and respond to supervisory messages, we need to reconsider our supervisory toolkit. This may mean taking more formal remediation measures, with definitive timelines, and imposing meaningful consequences for firms that fail to remediate issues in a timely way.

In addition to being transparent, supervision must be nimble and responsive because the financial services landscape and bank risks evolve over time. The low interest rate environment following the 2008 financial crisis shifted the supervisory focus away from interest rate risk to other risks, just as the current rising rate environment required supervisors to return to interest rate and emerging credit risk.

Supervision must also complement regulation. While regulation is a critical tool, it operates with a significant lag for most developed banking systems. This is where supervision can complement regulation to address emerging threats and risks by allowing supervisors to pivot to those fundamental risks that may be most salient based on that bank's business model and evolving economic conditions.

Regulation

In response to the recent bank failures, it is tempting to engage in a wholesale revision of the bank regulatory framework. Before changing rules, we need to take a critical look at actual weaknesses, and acknowledge the strengths that should be preserved.

As a threshold matter, today's regulatory system is fundamentally strong. But as the Federal Reserve continues to carefully monitor developments and changes to the banking system, we must recognize that the regulatory framework has been transformed through a broad range of changes in response to the 2008 financial crisis. These changes have led to a strong and resilient banking system. Overall, our regulatory framework is also strong. This framework has materially increased bank capital and liquidity and added a number of other requirements to improve resiliency, including new stress testing and resolution planning requirements.

Following the 2008 crisis, the U.S. regulators implemented changes designed to improve the quality and quantity of bank capital. This included the introduction of common equity tier 1 (CET1) as a measure of the highest quality form of regulatory capital, and the capital conservation buffer. Today, large U.S. banks are also subject to additional capital requirements, based on the tiering framework. For all banks with over $100 billion in assets, the requirements include the stress capital buffer and a number of additional GSIB and large firm-specific requirements. The U.S. capital requirements are described as "gold plating" the standards set in the Basel III reforms.

This is today's starting point, and it is strong. With the commitment of U.S. regulators to implement Basel III capital reforms, there will soon be additional changes to the capital framework. I would like to better understand the U.S. approach to these reforms before passing judgement, but if changes are implemented in a way that takes costs and benefits into consideration and preserves capital neutrality, in my view, these reforms could improve the capital framework.

Prior to 2008, there were also no standardized, quantitative liquidity requirements for U.S. banks and their holding companies. Today, there are two: the Liquidity Coverage Ratio, which supports short-term resilience by requiring banks to have liquidity to cover net cash outflows in a 30-day stress period; and the Net Stable Funding Ratio, which requires firms to maintain stable funding over a one-year time horizon. There are also internal liquidity stress testing and liquidity buffer requirements.

With this in mind, we should be careful and intentional about any significant changes to the regulatory framework, including imposing new requirements that will materially increase funding costs, like higher capital requirements or the requirement of firms to issue long-term debt. Many of the issues related to the recent bank failures have been identified in bank management and supervision. Therefore, a broad-based imposition of new capital requirements on all banks with more than $50 billion in assets would be a far

more costly solution than taking the time to specifically identify and address known management and supervisory process issues. Relying on the timeless adage to guide us: if it ain't broke, don't fix it.

I do not mean to suggest that regulation has worked perfectly and needs no improvement or maintenance. I think where we find improvements are necessary, we should make them. But we should also be working toward a defined goal and verifiable end state that incorporates the principle of efficiency. And of course, regulation should be durable throughout the economic cycle. Our regulatory framework is extremely complex with many overlapping and sometimes contradictory requirements. Engaging in a piece by piece, regulation by regulation approach will likely have a similar outcome.

Technology

We should also review and update the Fed services available to support banking system resiliency. In payments, the Federal Reserve offers payments-related services including Fedwire® to facilitate wire transfers. In the U.S., the Federal Reserve serves as the "lender of last resort" to the banking system, providing loans at the discount window since the early part of the twentieth century.

These tools are important but are not effective mechanisms to rescue troubled institutions. Discount window lending is available only to institutions that meet certain minimum eligibility standards, and that have collateral available to pledge. Its function is to provide a solvent institution with a vital backup source of liquidity to meet unexpected customer outflows. Similarly, the ability to process fast, efficient payments can also facilitate effective market functioning, but its utility is limited.

In light of the extensive recent use of these tools and the lessons that can be learned, I think it is time to review these tools—which operate during limited, fixed hours and rely to some extent on dated technology—to determine whether they have kept up with the pace of change for the future payments landscape and expectations of liquidity planning. These tools must be nimble and flexible to support the banking system during times of stress. I think it is important that we understand how well these tools functioned in early March as two U.S. banks experienced stress and ultimately failed, and what can be improved regarding timeliness or effectiveness of fulfilling the lender of last resort function.

The Path Forward

My views on the path forward are informed by serving as the bank commissioner for the state of Kansas as its lead regulator and supervisor, my experience as a banker, and especially by my service on the Board of Governors since 2018, during a time when the banking system has experienced many unique stresses including those associated with the COVID pandemic. There have already been some preliminary and expedited internal reports published on the failures of SVB and Signature Bank, and I fully expect to see additional reports and analysis of these failures, and the failure of First Republic, in the coming months. These preliminary reviews are an important first step for the U.S. bank regulators working to identify root causes of these bank failures and holding themselves accountable for supervisory mistakes. There are additional steps that we can take.

First, I believe that the Federal Reserve should engage an independent third party to prepare a report to supplement the limited internal review to fully understand the failure of SVB. This would be a logical next step in holding ourselves accountable and would help to eliminate the doubts that may naturally accompany any self-assessment prepared and reviewed by a single member of the Board of Governors. This external independent report should also cover a broader time period, including the events of the weekend following the failure of SVB, and a broader range of topics beyond just the regulatory and supervisory framework that applied to SVB, including operational issues, if any, with discount window lending, Fedwire services, and with the transfer of collateral from the Federal Home Loan Banks.

Second, I believe we need to do a better job identifying the most salient issues and moving quickly to remediate them. It is clearly evident that both supervisors and bank management neglected key, long-standing risk factors that should be an area of focus in any examination. These include concentration risk, liquidity risk, and interest rate risk. We have the tools to address these issues, but we need to ensure that examiners focus on these core risks and are not distracted by novel activity or concepts.

Finally, we should consider whether there are necessary—and targeted—adjustments we should make to banking regulation. This will likely include a broad range of topics, including taking a close look at deposit insurance reform, the treatment of uninsured deposits, and a reconsideration of current deposit insurance limits. We should avoid using these bank failures as a pretext to push for other, unrelated changes to

banking regulation. Our focus should be on remediating known, identified issues with bank supervision and issues that emerge from the public autopsy of these events.

A debate about regulatory changes must also consider where we are today as compared to prior to the 2008 financial crisis. The banking system is strong and resilient despite recent banking stress. The Fed has refined regulatory standards over time at the direction of Congress, most recently pursuant to the bipartisan Economic Growth, Regulatory Relief, and Consumer Protection Act, and through so-called "tailoring" regulations designed to better align regulation with risk. Even with the implementation of these changes, banks today are better capitalized, with more liquidity, and are subject to a new range of supervisory tools that did not exist prior to 2008. This paints a picture of a banking system that is not only strong today but is well prepared to continue supporting the provision of credit and the broader economy.

Calls for radical reform of the bank regulatory framework—as opposed to targeted changes to address identified root causes of banking system stress—are incompatible with the fundamental strength of the banking system. I am extremely concerned about calls for casting aside tiering expectations for less complex institutions, given the clear statutory direction to provide for appropriately calibrated requirements for these banks.

I have heard the drumbeat calling for broad, fundamental reforms for the past several years, shifting away from tailoring and risk-based supervision. I believe this is the wrong direction for any conversation about banking reform. The unique nature and business models of the banks that recently failed, in my view, do not justify imposing new, overly complex regulatory and supervisory expectations on a broad range of banks. If we allow this to occur, we will end up with a system of significantly fewer banks serving significantly fewer customers. Those who will likely bear the burden of this new banking system are those at the lower end of the economic spectrum, both individuals and businesses.

The American economy relies on a broad and diverse range of businesses supported by a broad and diverse range of banks. The elimination of regional banks from the US banking system would be devastating to businesses and communities across America. Especially for those regions whose communities are not sufficiently served by larger institutions.

I appreciate your time and engagement, and I look forward to discussing how the participants view these issues, and what it might mean for the future of banking in your financial systems.

Central Bank Digital Currency

Developing BRICS Multilateral Regional Economic Integration & Promoting Trade and Investment in BRICS with Future Cross-Border Central Bank Digital Currencies (CBDCs)[*]

By JAYA JOSIE[*]

This current research explores an option for economic development integration that the BRICS group of countries may consider to promote industrial policy instruments to enhance levels of market integration, especially in trade, investment and finance. However, the Nach et al. (2020) study raised limitations that may handicap the use of a single payment platform for promoting cross-border trade within the BRICS and other emerging economies. Such limits as domestic and external monetary shocks limit the possibility of the BRICS becoming an optimum currency area (OCA) and a currency union. Within BRICS, there are strong coordination mechanisms, and recent global events have shown that there is political commitment and willingness towards multilateralism in international relations among BRICS countries and other emerging economies. In this context, Section Three of our study and Nach et al. (2020) propose that the BRICS countries could consider a free trade zone among members and associated states. The introduction of a CBDC platform will require necessary preconditions for currency coordination. As with the European Union or any monetary union, all the countries will have to coordinate macroeconomic parameters, financial, and banking rules and regulations. In addition, transparency in capital and current account transactions will be required.

In the current conflictual geopolitical environment, BRICS countries and associated economies are experiencing extreme vulnerability with the threat of sanctions from some developed economies. Within the BRICS economies, there has been a move to promote the use of national currencies for trade and other financial transactions as the currencies in BRICS and other emerging economies become internationalized. The current study and the Nach et al. (2022) study agree that BRICS and other emerging economies can challenge the existing international monetary system through coordination. As mentioned earlier in this report, the NDB and, in particular, its Contingency Reserve Arrangement (CRA), together with BRICS and emerging market central banks, could coordinate a monetary framework to facilitate cross-border transactions more effectively. Without such coordination and political consensus, introducing a multiple CBDC platform for the BRICS will not be feasible.

A recent Note by the International Monetary Fund (Soderberg et al., 2022) on the use of CBDCs presented some emerging trends, insights and policy lessons in developing CBDCs as a payment mechanism. The note dedicates a whole section (Chapter 4, Section D) to Cross- Border Payments Using CBDC and highlights some of the current challenges facing using CBDCs for cross-border payments. The section underscores the macroeconomic, currency substitution and vulnerability to financial shocks as potential risks. The note further indicates that G20 countries are preparing a roadmap to enhance cross-border payment. The initial findings of the current study were accepted by the G20 Think Tank (T20) for submission to the 2022 G20 Summit in Indonesia. One of the BRICS countries, China, and its central

---

bank, the Peoples Bank of China (PBOC), are involved in a G20 Future of Payments Working Group. The PBOC is currently exploring with the Bank of International Settlements (BIS) the use of its national retail CBDC, the e-CNY, for cross-border payments.   The IMF Note also presents other practices of cross-border payments using CBDCs. In summary, the Note highlights the following challenges raised by the PBOC and the Eastern Caribbean Central Bank (ECCB) in using CBDCs;

•   Avoiding negative spillovers such as significant currency substitution on all national economies using a retail CBDC

•   CBDC cross-border payments system must comply with all rules and regulations, including capital flow management measures of participating countries

•   Information flows across countries should help authorities counter money laundering and tax evasion

•   Cross-border payments should be interoperable across domestic CBDCs or between domestic CBDCs and existing payment systems in different jurisdictions

•   There should be consideration given to a system where domestic CBDCs payments can be converted to other currencies in cross-border transactions

•   Technical interoperability where there is a lack of coordination on technology and messaging standards

•   The need for legal and regulatory harmonisation that goes beyond domestic legal systems and includes data and privacy, tax and payment laws and capital flow management measures.

Notwithstanding the limitations on the immediate use of CBDCs highlighted above the current research study focuses on ways to increase the level of trade limited by exchange rate volatility and instability in foreign currency reserves within BRICS countries. These limitations have effectively prevented the extension of a strategic trade and industrial policy to the BRICS countries and associated economies, thus preventing industrialisation and development. This study should contribute to the debate on using CBDCs for cross-border financial transactions in the BRICS group and associated emerging economies.

1. The Path to Institutionalising an Integrated BRICS CBDC System

In reflecting across the dimensions of this study, it is clear that institutionalising the arrangements for an integrated BRICS CBDC System is crucial for its adoption and success. While CBDC implementation across all BRICS countries has not yet arrived, China is closer to implementing a national CBDC than its other BRICS counterparts. In the near future, national CBDC models may become a reality and defining the path for the BRICS to achieve this institutionalisation is crucial.

Consequently, it is recommended that a BRICS CBDC Working Group is formed with representation from BRICS Central Banks and other relevant stakeholders. The key question for the BRICS Finance Ministers and Central Bank Governors to determine is where to locate the Working Group. Potentially, the BRICS NDB might house the Working Group, given its established networks. Alternatively, the ministers or Central Bank Governors may opt for a new institution to base the Working Group. This Working Group can then define the processes needed to integrate the BRICS CBDC systems.

This Working Group must then establish political convergence in support of the initiative. In addition, the Working Group must define the problem that the integrated BRICS CBDC is meant to solve. With a clear definition of the purpose of the system, the Working Group can then work towards defining the underlying policy and technology architecture.

Thereafter, the Working Group must help define BRICS national policies which enable the creation of shared exchange rules and standards. These policies will define how the integrated BRICS CBDC addresses the challenge of currency internationalisation

Once the overarching policy framework is defined, the Working Group must define the standards for interoperability, currency exchange, integration and general communication. With defined standards, the Working Group can work towards defining the technological architecture appropriate to solving the problem defined by the working group.

2. The impact of exchange rate volatility on BRICS trade transactions

This section of the research aims to examine the impact of exchange rate volatility on BRICS trade transactions within the BRICS group. The ARDL results show that the exchange rate volatility has mixed effects on import volumes in BRICS countries. This suggests that the lack of predictability of the exchange rates in BRICS countries is also transmitted in the import volumes as denoted by mixed signs of the

coefficients. Clearly, exchange rate volatility heightens the level of uncertainty in the economy, particularly in businesses that are in the import sector.

The results align with our a priori expectations in the case of Brazil, Russia and China in the long run but only in the short run in the case of India and South Africa. The results further suggest that the null hypothesis of no relationship between import volumes and exchange rate volatility is rejected in favour of the alternative hypothesis in the cases of Brazil, Russia and India in the long run and South Africa in the short run. We fail to reject the null hypothesis in the case of China in the long and the short run and South Africa in the long run only.

The econometric results found that in most instances, the exchange rate volatility had a negative relationship with export volumes in BRICS. Similarly, there is strong evidence of a negative relationship between exchange rate volatility and import volumes in BRICS countries. It can be safely concluded that the exchange rate uncertainty impacts negatively on BRICS trade. This threatens the consolidation and enhancement of cooperation amongst BRICS countries through trade.

2.1 Recommendation: Introduce alternative and more stableforms of internationalfinance tofacilitate trade

The use of digital currencies will go a long way in addressing the shortcomings posed to BRICS countries by the use of the conventional exchange rate system. The econometric study provided evidence that the existence of volatility shocks is important to ascertain the impact of such shocks on BRICS trade. Clearly exchange rate volatility heightens the level of uncertainty in the economy for businesses. Given the results of the econometric tests on exchange rate volatility, we recommend introducing alternative and more stable forms of international finance to facilitate trade.

3. A Networked Approach to Multilateral Trade Integration in BRICS

Section three found weak evidence for a centre of gravity that identifies a core and periphery structure in the BRICS trade network. The results measured by network density show that trade integration increases much more at lower levels of trade than at higher levels. Overall, the import network is not significantly centralised.

The extent of multilateralism has remained relatively higher across the period of our data, especially for the export network. The results for the BRICS trade network presented in Table 1 show that the clustering coefficient was on an upward trend for the export network at all thresholds from 2010 to 2015 but remained practically constant from 2015 to 2020. For the import network, the clustering coefficient was in the range of 0.5-0.7 between 2010 and 2020. The implication is that the number of complete triangles and triples increased proportionally.

When mapping the topology of the multilateral trade network among the BRICS, the analysis made two observations. Our first observation is that China and India have the highest degree of centrality, followed by Brazil, Russia, and South Africa. So China and India are most connected with other BRICS countries in their export networks. Our second observation is that during 2010, the country pairs of Brazil and India, Russia and South Africa are not directly connected in their export networks. This indicates that over time the export network has become more connected between Brazil and India, but the export network has become less connected between Brazil and South Africa, and the export network has remained not directly connected between Russia and South Africa.

To promote BRICS regional economic integration, there are two possible paths forward: the formation of a regional trade agreement (RTA), and the adoption of central bank digital currency (CBDC).

3.1 Recommendation: Introduce a Regional Trade Agreement

The first option is to have a regional trade agreement (RTA) among the five BRICS states. From the trade data, we find that China is the largest export partner for Brazil, Russia, and South Africa; and the third largest export partner for India. China could increase its exports to and imports from these four countries, and these four countries could increase their pair-wise exports and imports to each other to increase trade integration in the BRICS.

3.2 Recommendation: Adopt Central Bank Digital Currencies

The second option is to introduce central bank digital currencies to deepen the regional integration of the BRICS. Digital currencies will soon drive financial inclusion and increase global trade and economic

integration. CBDCs offer great opportunities to promote financial inclusion while disrupting traditional banking architecture. During the 10th BRICS Summit in Johannesburg in July 2018, the BRICS signed the Memorandum of Understanding (MOU) on the prospects for using distributed ledger and blockchain technology to develop the digital economy. The COVID- 19 pandemic and the consequent economic crisis have altered global trade. One of the profound changes has been the shift towards digital payments. With this shift, CBDCs are rapidly gaining ground, with all BRICS nations in the process of researching or adopting such options.

4. Technological Architecture
4.1 Recommendation: Adopt the SCISA Model to maximise BRICS Trade Integration
Given the recommendations to explore CBDC adoption, our study examined a possible technological architecture that will maximise trade integration in the BRICS. We recommend a solution that is based on two new technologies:
• Central bank digital currency that forms the foundation of a payment layer for all participating countries and,
• A trade-specific closed loop application based on the unit of account and settlement instrument SDR-C (Special Drawing Rights Commodity) or Legal Digital Commodity Trust (LDCT)
The architecture of this platform, as shown in Figure 11, is called the System of CBDC International Settlements and Applications (SCISA). Based on innovative design concepts and advanced technology architecture, section 4 found that SCISA has five main benefits for establishing CBDCs:

4.1.1 Standardisation
SCISA is inherently standardized and compatible with existing CBDC systems.   SCISA abstracts the data, operation, and security standards and develops standards accordingly. It can guide member countries to make incremental upgrades and use them as new CBDC standards and standards for international clearing systems and payment networks are developed

4.1.2 SCISA National Sovereignty and International Group Independence
National sovereignty means that member countries are free to choose technical solutions and suppliers, manage relevant data, systems, and facilities, control their own CBDC systems and decide whether to participate in international clearing and settlement according to their political considerations and actual needs. Hence, member countries have a high degree of national sovereignty. International group independence means that the SCISA system is built with the cooperation of member countries. Its affairs are negotiated and arbitrated by the member countries and are not controlled by any other power group/s, so SCISA is group independent internationally.

4.1.3 Extensibility
SCISA realizes an application platform based on smart contracts to connect the domestic financial infrastructure of member countries with the international financial infrastructure. Entities can construct smart contracts for different businesses in different areas and deploy them on SCISA, which intelligently executes relevant operations according to the business logic and settlements by SCISA domestically or internationally after the business is completed, which has rich scalability.

4.1.4 Security
SCISA is divided into a software system and a hardware platform: the main components of the software system through modern cryptography, blockchain, and other advanced theories and reliable software technology to ensure its security; and other high-security hardware equipment. Therefore, it has high reliability and security.

4.1.5 High-Efficiency
SCISA adopts SCISA's independent intellectual property blockchain system and combines with the existing cloud computing platform… uses efficient hardware such as cryptographic computing acceleration cards or supercomputers to meet the actual application requirements and reach the world's top level. SCISA, a new generation of international settlement systems and payment networks based on CBDC, is innovative, advanced, and practical. It can provide member countries with a modern domestic financial infrastructure based on CBDC to help them realize financial digitization and provide member countries with a modern international financial infrastructure to establish a next-generation global financial network. Moreover, it also provides an application platform for different groups, industries, and businesses to connect to domestic and international markets and traditional settlement systems and payment networks

and proposes a new financial model, like SDR-C. Therefore, SCISA has a greater application significance and far-reaching development prospects.

5. Inclusive Economic Development Principles for BRICS CBDC Integration

Section five recommends that the CBDC model can operate parallel to the current traditional exchange system processes. However, implementing the CBDC model introduces several ecosystems based on broad public-private collaboration. As an extension of the public sector, this implementation requires that the Central Bank carry out certain functions while providing a framework for the private sector to integrate into the new financial architecture.

5.1 Recommendation: Share mCBDC Regulatory and Governance Powers in the Group

The BRICS mCBDC Governance Model must share responsibilities between the Central Bank and the BRICS Common Platform. The model will allow the Central Bank to maintain control and authority over its monetary policy, while the BRICS Common Bridging Platform will act as a clearing centre for cross-border transactions. The Bridging Platform will need to manage exchange rate conversion, define communication protocols and set the minimum standards for exchange.

5.2 Recommendation: Support Inclusive Economic Development Principles for CBDC Integration

Expanding on the public policy principles for CBDCs, the BRICS must act to promote the inclusive economic development of all countries participating in the mCBDC. These principles should include but not be limited to the following:

5.2.1 Foster Financial Inclusion

The CBDC model contributes to financial inclusion and enhance access to payment services, particularly among the financially excluded population (G7, 2021). In addition to limiting intermediaries to decrease costs, the offline wallet transaction capability can allow the CBDC to be used where there is no internet access, broadening potential usage. Creating circumstances that make digital transactions appealing to the financially excluded community and can expand financial inclusion opportunities. The BRICS can drive financial inclusion by promoting knowledge and technology sharing among affiliated Central Banks. By sharing the open-source software for Central Bank-issued wallets that enable offline transactions, all countries will be in a position to offer financially affordable services to their consumers.

5.2.2 Promote Payment Platform Interoperability and data privacy

The CBDC may also form the backbone of future cross-border payment systems that integrate digital identities, data governance, and privacy standards. With the Central Bank holding end-user CBDC accounts, the Central Bank takes responsibility for the know-your-customer (KYC) and anti-money laundering (AML) checks. By centralising this role, trust is integrated into the financial system and is shared among all systems that connect to the CBDC infrastructure, thereby unlocking new opportunities in other ecosystems, including supply chain, healthcare, security, retail and e-commerce.

5.2.3 Promote Carbon Neutrality

Achieving a net-zero carbon neutral financial system requires procuring renewable-energy-based power to support the digital processing of transactions that pass through country CBDCs, the exchange application and the BRICS Common Platform. The BRICS can endorse using renewable energy power generation to power mCBDC and country CBDC services to mitigate against any harmful effects on the climate.

5.2.4 Catalyse Digital Economy Innovations

By redesigning the global financial architecture, the CBDC can be used as a launchpad for future innovations that accelerate global economic growth. The innovation provides novel ways for Central Banks to interact directly with consumers when adjusting monetary policy. Such innovations must be managed to be inclusive and benefit all consumers. The BRICS can again support knowledge, innovation and technology sharing among countries affiliated with its mCBDC platform. Sharing knowledge will allow all consumers an equal opportunity to benefit from new applications of the CBDC.

5.2.5 Minimise banking intermediaries

A complementary Retail CBDC model targeted to the retail sector can support peer-to-peer transactions, minimising banking intermediaries. The Retail CBDC model allows the Central Bank to minimise the financial intermediaries engaged in vetting transactions. The end-user thus can hold an account directly with the Central Bank instead of an intermediate commercial bank. The retail model thus allows end-users to transact directly with their peers in a foreign country. With fewer intermediaries in the transaction chain, the transaction costs will be lower than the current system's fees. Retail CBDCs offer novel opportunities

for consumers to hold multiple currency accounts via the Central Bank-issued wallet. While the Interbank Cooperation Mechanism is a step towards minimizing the use of foreign exchange currencies, the process is not seamless and requires intermediary bodies to secure access to such loans. CBDC arrangements could eliminate intermediaries, allowing cross-border transactions without introducing foreign exchange currencies, during the exchange.

5.2.6 Reduce Transaction Fees

CBDC arrangements can advance international peer-to-peer payments with near-instantaneous transfers. The CBDC processes inherently verify transactions and payment partners, minimising the need for banking intermediaries and making it affordable for the low-income sector to trade internationally. Using CBDC consumer wallets the Retail Sector can transact directly with peers and have transactions routed through the Central Banks transaction interface and central point of coordination. From the consumer's perspective, using the CBDC wallet will be as easy or easier than using cash, while for the merchant, it will be less costly to receive payments using payment services which connect directly to the CBDC system.

5.2.7 Combat Illicit Financial Flows

CBDCs provide Central Banks with a more secure financial network, allowing the sector to more easily trace back payments to its initial source, reducing fraud and money laundering opportunities. In mCBDC structures, there is still a need to ensure that the Central authority employs verification checks that satisfy each member country's regulations (International Monetary Fund, 2020).

5.2.8 Promoting Bank Competition against Monopolies in the Financial Sector

By centralising the role of verification, anti-money-laundering (AML) and know-your- customer (KYC) checks through the Central Bank, the CBDC framework supports the integration of Non-Bank Financial Service Providers who can provide inexpensive financial services without a banking license. In this regard CBDC development can leverage the trust engendered by the Central Banks to build service offerings that compete with established banking financial service.

Central Bank Digital Currency – To Be or Not to Be?[*]

By KAUSHIK JAYARAM AND HERBERT POENISCH [*]

I. Introduction

For many, the advent of digital money was logically inevitable. In the long history of the evolution of money, as a commodity, as coins, and as paper, the form of money has become progressively more symbolic and abstract. The digital form is merely its latest manifestation. From this perspective, the discussion around a digital currency would be essentially technical in nature and would focus on its benefits, costs, and risks, and which particular form of digital money would most suit the needs of an economy.

Central banks around the world are actively engaged with the question of having a central bank digital currency (CBDC). In more than 100 central banks, the question has moved beyond academic enquiry—some are researching its feasibility, others are in the design stage or pilot testing variants of CBDCs, and some have already launched a digital currency.

Emerging markets have taken the lead with the Bahamas being among the first to launch a CBDC in 2020, the Bahamian Sand Dollar. Nigeria launched its eNaira in 2021. China was the first among the major economies to pilot a CBDC, the e-Yuan, and is conducting large-scale trials with some 100 million users.[1] South Korea and Sweden are the other major economies conducting trials on variants of CBDC. Many of the advanced economies are undecided as yet, but they are carrying out detailed studies on the pros and cons of having a digital currency.

The principal raison d'être for a CBDC is that the pace of technological change has created new challenges to the central bank monopoly of issuing currency with several versions of privately issued digital "money". The proponents of a CBDC see many advantages to it, beginning with it being an efficient and technologically advanced replacement for paper currency.

We make the case that a CBDC as a fiat currency represents a fundamental transformation of the nature of money as we know it, and not enough is known on how this will affect the monetary and the financial system or, indeed, society as a whole.

The House of Lords Committee in the UK has called the CBDC a solution in search of a problem (House of Lords Committee 2022). Its scepticism stems mainly from that central banks have not yet made a convincing case for a digital currency. Our reasons for arguing against a CBDC go further. We make the case that a CBDC as a fiat currency represents a fundamental transformation of the nature of money as we know it, and not enough is known on how this will affect the monetary and the financial system or, indeed, society as a whole.

The rest of the paper is organised as follows. Section II describes the design options available for a digital currency and the different types of CBDCs that are being considered by central banks worldwide. The next section sets out the case for a CBDC and briefly discusses the key arguments in favour of it. Section IV contrasts electronic money with digital currency, pointing out that the extent of currency in narrow money provides a clear indication of the use of electronic money in an economy. Looking at how a CBDC could affect the monetary system, section V lays out the potential asymmetrical effects this could have. In section VI, we lay out a case against having a CBDC, listing the other substantive reasons to consider before deciding to switch. The last section concludes by summarising the issues central banks and others need to pause and think about.

II. Design of a Digital Currency

---

[*] The article was originally published in The India Forum (https://www.theindiaforum.in/article/central-bank-digital-currency)

[*] Kaushik Jayaram is a former central banker who worked for many years in an international financial organisation; Herbert Poenisch is Member of the International Committee, International Monetary Institute, Renmin University, Beijing and Senior Fellow, Academy for internet Finance, Zhejiang University, Hangzhou and former Senior Economist, Bank for International Settlements, Basel.

[1] There were earlier versions of digital cash such as the Bank of Finland's Avant, or Tunisia's e-Dinar but these were more in the nature of debit cards.

The design of a digital currency assumes critical importance in enhancing its effectiveness while mitigating potential risks. A universal digital currency, which is often described as a retail CBDC, could be based on a centralised ledger technology (CLT) or a distributed ledger technology (DLT)[2]. The former would enable greater control of the central bank while the latter would be based on a blockchain of decentralised transactions. A CBDC may be account based in the central bank, or mediated through commercial bank accounts, or issued as anonymised tokens (as digital cash), or some combination of these. In the hands of a retail user, a CBDC would be available in a digital wallet similar to the many types of electronic payment instruments now available.

Wholesale digital currency

Some central banks are looking at wholesale digital tokens (wCBDC) for the settlement of transactions between financial institutions. A wCBDC would essentially be a pre-paid digital token that offers definitive finality of payment between financial intermediaries, and under certain conditions improve the liquidity management of the financial institutions participating in the system. However, a wCBDC in a purely domestic setting might not add much value over a real time gross settlement (RTGS) system.

RTGS provides for a number of ways to manage liquidity—by balancing incoming payments against outgoing payments and through effective queue management. Secondary liquidity is also available via access to central bank credit.

Payment transactions in an RTGS system have near instant settlement finality in the books of the central bank. RTGS provides for a number of ways to manage liquidity—by balancing incoming payments against outgoing payments and through effective queue management. Secondary liquidity is also available via access to central bank credit (See Mägerle and Oleschak 2019). However, since RTGS systems everywhere are generally restricted to major participant banks and significant financial entities, settlement in wCBDC could potentially include a wider range of participants, including non-resident institutions and other non-bank entities, as pre-paid wCBDC tokens could be used to settle payments even without having an account or access to central bank credit.

Cross-border payments

The use of CBDCs for cross-border payments could potentially have many benefits. A retail CBDC could be made available to foreign residents either conditionally, for limited purposes, or without restriction. This would be similar to non-residents holding a country's currency in cash or as bank credit for travel, remittance, or payments within the currency area. However, there are concerns and risks for the issuing central bank.

Cross-border settlement systems using wCBDC would have significant advantages. They could potentially simplify intermediation chains of correspondent banks, and operate a peer-to-peer settlement in bilateral or multilateral central bank currencies. Cross-border payments would be faster, cheaper, and considerably reduce credit and liquidity risks as counterparty central banks would provide the implicit guarantee of settlement. For emerging market central banks this would significantly enhance their ability to manage international payments in multiple currencies and reduce their need for maintaining substantial reserves in dominant currencies.

However, this requires a lot of groundwork for developing interoperability and security standards as well as cross-border governance frameworks. Incidentally, the Financial Stability Board (FSB) in its roadmap on behalf of the Group of Twenty (G20) assigns only one out of 19 building blocks to a CBDC in enhancing cross-border payment. Other building blocks focus on enhancing the existing infrastructure and technology (FSB 2020).

A CBDC combining the features of direct cash payments and the efficiency of electronic transfers enables a faster, cheaper, and more reliable system of payments and settlements than is currently available.

III. Case for a CBDC

The motivations for issuing a CBDC vary among central banks. The most commonly cited reasons are cash substitution, competition from private issuers of digital money, enhanced payment services, reducing the cost of financial services, improving financial inclusion, preventing money laundering, tax evasion, or

---

[2] See (Saha and Ray 2021) for a detailed explanation of the use of CLT and DLT technologies as well as other technical design elements of digital currencies .

counterfeiting, and a more effective monetary policy (BIS 2022). The case for a CBDC is based on the following key points.

Increasing efficiency of payments: A CBDC combining the features of direct cash payments and the efficiency of electronic transfers enables a faster, cheaper, and more reliable system of payments and settlements than is currently available.

Enhancing cross-border payments: The use of a CBDC in cross-border payments, as well as in domestic payments, would be faster, cheaper, reliable, and transparent.

Broadening financial inclusion: While it would not directly promote access to a range of financial services for underserved households and businesses, a CBDC would help mitigate some of the constraints by enabling low-cost payment services and direct fiscal transfers of benefits.

More effective monetary policy: By monitoring, controlling, and directing the supply of central bank money, a CBDC could support faster and more effective transmission of a monetary policy. Central banks could lever the tools of monetary policy far more granularly and target specific sectors of the economy than is now possible.

Reforming the international financial system: Some would see the issuing of CBDCs by many countries as a shift from the dominance of the dollar. A multi-currency cross-border settlement system could potentially correct reserve imbalances and suit the needs of an increasingly multipolar global economy.

Risks: Central banks also see potential risks. The dominant concerns are privacy, disintermediation, operational risks, disruption of financial systems, cyber threats, cross-border currency substitution, volatility, currency dominance, and, ironically, the potential loss of currency sovereignty.

IV. Electronic Money versus Digital Currency

The use of cash among the systemically important economies (G20 economies) shows a mixed picture in both advanced and emerging market economies (Figure 1). In countries such as Sweden, the UK, Brazil, or South Africa, cash in circulation is below 5% of the gross domestic product (GDP). In others, notably Hong Kong, India, Switzerland, and Japan, the share of cash is well above 10% of the GDP. A better gauge of the use of cash is comparing the currency in circulation to broader monetary aggregates, as a share of broad money (M3) and narrow money (M1) respectively. [3] The share of currency in M1 provides a clearer view of the use of digital or electronic money—the lower the share of cash, the greater the use of commercial bank liabilities as a means of payments.

Figure 1: Currency in Circulation as a Percentage of Money Supply and GDP, 2021
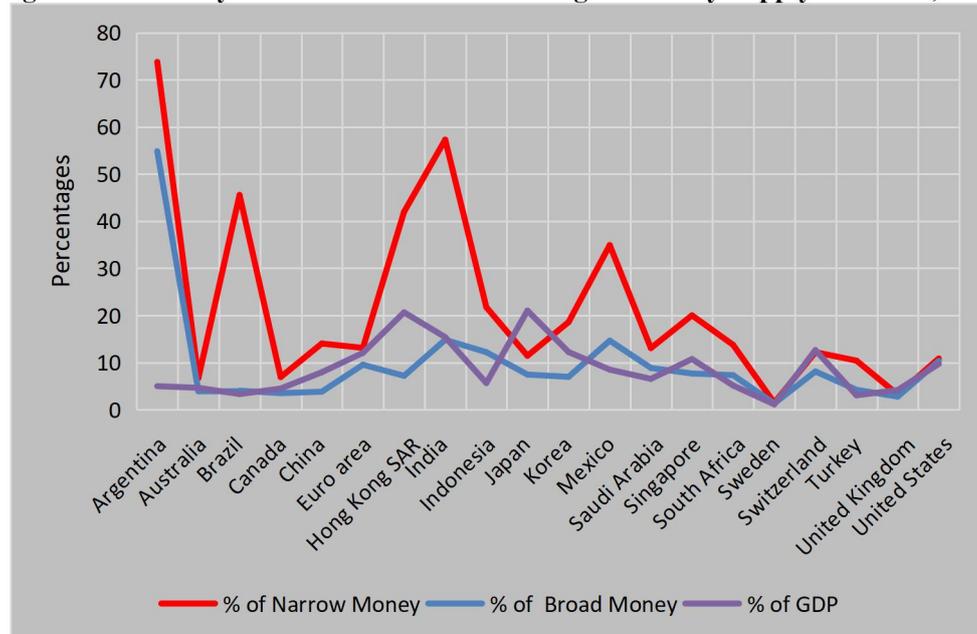
Source: BIS, central banks, FRED, national statistical offices, and OECD.

___

[3] The definitions and components of money supply aggregates such as broad money (M2, M3 or M4) and narrow money (M1) vary among central banks. However, narrow money (M1) in most central banks consists of currency-in-circulation, reserves held with the central bank, and demand and short-term time liabilities of commercial banks.

Recent trends suggest that the Covid-19 pandemic may have accelerated the shift to digital (credit) transfers in both advanced and emerging markets (CPMI 2021a). In more than 60 countries, fast payments systems (FPS) allow instant and final payments on a 24/7 basis for person-to-person and person-to-business transactions. The retail payments landscape, mostly privately intermediated, is rich in a variety of payment instruments from debit and credit cards to payment apps and digital wallets that ensure instant online and offline transfers. Simultaneously, RTGS operations are getting synchronised on a near continuous basis for inter-bank settlements (CPMI 2021 b).

The main takeaway is that electronic money in the form of bank deposits has substantially replaced cash or even card transactions in several countries. Digitalisation and online platforms are becoming faster, cheaper, and more reliable than before.

Improvements in cross-border payments are equally impressive. New data from the Society for Worldwide Interbank Financial Telecommunications (SWIFT) on its global payment improvements suggests that the average time for processing international payments is around eight hours while the median time between high-income countries could be as low as one and half hours. A vast majority of payments among major economies (both advanced and emerging) are settled on the same day. Delays in reaching the beneficiary account are mainly due to the levels of controls required at the beneficiary bank. Capital controls and processing technology could be contributory factors (CPMI 2022).

The main takeaway is that electronic money in the form of bank deposits has substantially replaced cash or even card transactions in several countries. Digitalisation and online platforms are becoming faster, cheaper, and more reliable than before. A CBDC as a means of retail payments may be cheaper than private electronic payments only to the extent that the public payments systems (central bank) absorbs or subsidises costs. There are no compelling technological reasons to suggest that a CBDC would have a greatly superior outcome.

V. CBDC and Monetary System

Any discussion on a CBDC must begin with the essential elements of a monetary system, with central bank money (fiat money) at its centre, as a unit of value, and a means of payment (the settlement medium), and a mechanism to transfer payments and settle transactions. A well-functioning monetary system depends on trust, the absence of uncertainty about the value of money (as a unit of account), and stability of that value (price stability). Moreover, it would also depend on an elastic supply of the means of payment (central bank money) and commercial bank money (credit) to ensure the smooth functioning of the economy, a two-tiered monetary system with central bank credit (and interest rates), interbank markets, and bank credit to settle payments between persons and businesses (Borio 2018). Cash is an essential part of the mix whose holding preference is largely demand determined.

In theory, the substitution of cash by digital money should be neutral in its impact if the digital currency (token) is a mere change of form. However, as will be argued, a CBDC is a new form of money unlike any of its previous manifestations. The ability of individuals and businesses to hold and directly make electronic payments using a CBDC has far reaching consequences for the monetary system, not all of them salutary. It would also profoundly affect the way a central bank would manage its monetary operations.

Countervailing measures to limit the quantity of a CBDC to the public would alter this balance and could impact the liquidity of the system, particularly if the payment systems shift towards settling in a CBDC.

First, some level of disintermediation is inevitable. The shift from deposits to a CBDC would reduce the level of credit in the economy. The larger the shift, the larger the associated reduction in the supply of bank reserves. This would have important consequences for the aggregate demand and supply of money in the economy (Bank of England 2020).

A two-tiered settlement system depends on a fine balance between the supply elasticities of central bank money and bank credit, where the two trade "at par" in all states of the world. Countervailing measures to limit the quantity of a CBDC to the public would alter this balance and could impact the liquidity of the

system, particularly if the payment systems shift towards settling in a CBDC. In times of financial stress, a CBDC would trade at a premium over bank deposits in the absence of an elastic supply of CBDC.

Second, the probability of adverse selection (currency substitution) among competing CBDCs would increase if there are no capital controls or if a CBDC is freely available to non-residents. The effect would likely be exacerbated if the value of the currency is not stable. Once again, the option would be to restrict access to non-residents or impose other forms of control.

In neither of these scenarios are the conditions for a well-functioning monetary system fully met through the ordinary mechanism of demand and supply of central bank and commercial bank money. Instead, the monetary system would have to depend on a variety of controls to ensure the smooth supply of means of payments. While such scenarios are plausible even under current monetary systems, a digital currency could amplify these effects to a degree inconceivable in a cash-based system.

Third, a CBDC differs from the fiat currency, as we understand it, in two important ways. Its programmable nature makes it impossible to maintain the privacy of payment transactions. The entire chain of transactions involving each individual unit of a CBDC is traceable and accessible. Beyond the privacy question, a digital currency can be programmed in ways such that it is no longer a universal exchange of value. A CBDC can be of limited tender, for a specific basket of goods or services, or limited by quantities or even for a specific time period.

The normal response to these critical questions is to suggest legal or governance frameworks that would provide the required workarounds. However, once the genie is out of the bottle, it is anyone's guess how different countries and regimes would use the power of this technology.

VI. Do We Need a CBDC?

At the outset, it should be clarified that a wholesale CBDC is a misnomer. It is not a digital version of money, either as a unit of account or as a medium of exchange or, indeed, as a store of value, although it might have some of its characteristics. It is essentially a means of payment or a settlement medium. Therefore, the discussion on the utility of a wholesale digital currency (token) ought to be separated from the concept of a CBDC.

We argue that attempts to implement a universal CBDC in large economies is, at best, premature, and, at worst, an irreversible transformation of monetary systems as we know them, with far-reaching consequences for the economy and society.

Indeed, there are many advantages and benefits to the use of a wholesale digital asset as a settlement medium among financial intermediaries in the first-tier interbank payments system. Wholesale digital assets could bring substantial progress in cross-border payments both in a bilateral and multi-currency framework. Central bank cooperative initiatives in this area are particularly welcome and desirable.

That said, the so-called retail CBDC is a true replacement of fiat money in any jurisdiction. It is what is described as a "universal CBDC" (Cecchetti and Shoenholtz 2021). We argue that attempts to implement a universal CBDC in large economies is, at best, premature, and, at worst, an irreversible transformation of monetary systems as we know them, with far-reaching consequences for the economy and society. A step not to be taken lightly, but with a full understanding of its consequences.

We have already touched upon the potential asymmetrical effects of a CBDC on the functioning of a monetary system. Even if this turns out to be not insurmountable, there are other substantive reasons to consider. These are set out in the reverse order of importance.

CBDC and payments: The ability to make faster, cheaper, and reliable payments is seen as a major advantage of a CBDC. However, the benefits are not so substantial if one considers the rapid digitalisation of the payments landscape and developments such as retail fast payments systems, 24/7 RTGS systems, and numerous non-bank payment service providers and payment mechanisms. A CBDC does not add much value but could, instead, stifle innovation and competition.

Conflict of interest: Central banks have a core mandate to ensure a well-functioning monetary system as a supplier of the means of payment (fiat money), as a supplier of inter-bank credit (liquidity), and as a lender of last resort. This mandate is best served by overseeing payment and settlement systems instead of administering them. Platforms such as PIX in Brazil or UPI in India are shared by all payments providers, banks and non-banks alike. These and numerous other mobile payment services have also boosted

financial inclusion. Central bank issuance of a CBDC could potentially make it a monopoly operator to the detriment of these already well-functioning platforms.

Privacy and anonymity are the two key attributes of paper currency that would be eroded by a digital currency. Irrespective of the design or form, a CBDC would be fully traceable.

Currency substitution and currency dominance: A CBDC will have to contend with non-residents holding digital currency. While this can be controlled through technology, it would limit its usability. Cross-border currency could potentially dominate domestic currencies, leading to a loss of currency sovereignty.

Privacy and anonymity: Privacy and anonymity are the two key attributes of paper currency that would be eroded by a digital currency. Irrespective of the design or form, a CBDC would be fully traceable. While this is useful in preventing money laundering and criminal activity, there is the greater danger that an individual's economic autonomy will be compromised. Institutional safeguards are not wholly adequate as they can be breached, depending on the political system and the regime.

Smart money (Programmable currency): Perhaps the most powerful aspect of a CBDC or digital currency of any kind is its programmable features. A CBDC is not a digital substitute for paper money—it can be modified, withdrawn, restricted, or limited in its usage. Limits can be imposed on how much of and for what purpose the currency may be used. The consumer behaviour could be controlled and nudged in directions according to state policy.

Digital ID and CBDC: Independent of CBDCs, the push towards expanding the use of digital IDs across the world raises concerns about the erosion of privacy and autonomy of the individual. A digital ID is an important element in the design of payments services in many countries, whether at the central bank level or by private banks and other payment providers. Paired with a CBDC, a digital ID can be a valuable resource in the hands of big tech or the state.

Surveillance and state control: A CBDC would be a powerful tool in an authoritarian state. Even in democratic countries, the ability to control and observe makes it a potent means to control the way money may be spent. Coupled with a digital ID, every individual and her money are fully accessible—to be observed, to be monitored, and, if necessary, to be controlled in the way it is used.

VII. Conclusion

Powerful technological forces and a sense of inevitable progress are largely pushing the movement towards introducing a CBDC. The concerns raised in this paper are not new and are generally recognised. However, multilateral agencies and national authorities assume that international standards and principles that enshrine a good governance framework will suffice to manage concerns (BIS AER 2022, CH III).

Grand projects of the state based on some notion of high modernistic ideology see technology as an infallible means of social progress (Scott 1998). The outcomes are often extreme. States, even democratic ones, quickly adopt technologies that are intended for surveillance to track their citizens. In the hands of an authoritarian state, this becomes lethal.

A CBDC has this power. At its most basic level, the technology behind digital currency could be used to track and trace every transaction along a long chain of transactions. The data obtained from these transactions can be exploited by big tech, private entities, or the state. More advanced levels can nudge, push, and control the use of money in the hands of the public, for benign or malign reasons. Central banks and others need to pause and re-evaluate its use.

References

Auer, R., Boar, C., Cornelli, G., Fraost, J., Holden, H. and Wehrli, A. (2021): "CBDCs Beyond Borders: Results from a Survey of Central Banks", BIS Papers No 116, June.

Bank of England (2020): "Central Bank Digital Currency – Opportunities, Challenges and Design", March.

BIS Annual Economic Report (BIS AER 2022, III): The future monetary system", Bank for International Settlements, 21 June.

Bank for International Settlements (BIS) (2022): "CBDCs in Emerging Market Economies", BIS Papers No. 123, April.

BIS (2021): "Central Bank Digital Currencies for Cross-border Payments", Report to the G20, July, BIS-CPMI-Innovation Hub-IMF-WB.

Borio, Claudio (2018): "On Money, Debt, Trust and Central Banking", Cato Institute 36th Annual Monetary Conference, Washington, DC, 15 November.

Cecchetti. S.G. and Schoenholtz, K.L. (2021): "Now is Not the Time for Central Bank Digital Currencies", Financial Times, 28 July.

CPMI (2021 a): "Covid-19 accelerated the digitalisation of payments", Committee on Payments and Market Infrastructure, BIS, 9 December.
https://www.bis.org/statistics/payment_stats/commentary2112.htm

CPMI (2021 b): "Developments in retail fast payments and implications for RTGS systems",
CPMI Papers No 201, Committee on Payments and Market Infrastructure, BIS, 14 December
https://www.bis.org/cpmi/publ/d201.htm

CPMI (2022): "SWIFT gpi data indicate drivers of fast cross-border payments", Committee on Payments and Market Infrastructure, BIS, 8 Febuary. https://www.bis.org/cpmi/publ/swift_gpi.pdf

CPSS-IOSCO (2012): "Principles for Financial Market Infrastructures", CPMI Papers No. 101, April, BIS.

CPSS (2001): "Core Principles for Systemically Important Payment Systems", CPMI Papers No. 43, January, BIS.

FSB (2020): "Enhancing Cross-border Payments – Stage 3 Roadmap", Financial Stability Board, October. www.fsb.org

House of Lords Committee (2022): "Central Bank Digital Currencies: A Solution in Search of a Problem?" Economic Affairs Committee, 3rd Report of Session 2021-22, 13 January, London.

Jayaram, Kaushik (2021): "Digital ID: A Single Source of Truth", India Forum, 30 September. https://www.theindiaforum.in/article/digital-id-single-source-truth

Mägerle, Jürg and Oleschak, Robert (2019): The Swiss Interbank Clearing (SIC) Payment System, Berne: Swiss National Bank. https://www.snb.ch/en/mmr/reference/sic_system/source/sic_system.en.pdf

Saha, Debashis and Ray, Partha (2021): Digital Currency: Fog beyod the hype", The India Forum, 10 November.
https://www.theindiaforum.in/article/digital-currency-fog-beyond-hype

Scott, James C. (1998): Seeing Like a State: How Certain Schemes to Improve the Human condition have Failed, New Haven: Yale University Press.

Soderberg, Gabriel (2022): "Behind the Scenes of Central Bank Digital Currency, Emerging Trends, Insights and Policy Lessons", Fintech Notes/2022/004, Washington, DC: International Monetary Fund.

Sveriges Riksbank (2020): Second Special Issue on the e-krona, Economic Review, Stockholm. https://www.riksbank.se/globalassets/media/rapporter/pov/engelska/2020/economic-review-2-2020.pdf

CBDCs can Help Protect against Surveillance Capitalism[*]

By LEWIS MCLELLAN[*]

Digital currencies present an opportunity to improve payments privacy, not worsen it.

Among digital privacy advocates, the launch of central bank digital currencies is often greeted with suspicion and alarm. On both sides of the Atlantic, there are concerns that CBDCs represent an opportunity for the state to obtain greater oversight over payments systems. In Europe, protesters demonstrated against a digital euro as an invasion of privacy in February, while in the US, Republican Congressman Tom Emmer has sponsored a bill called the CBDC Anti-Surveillance State Act.

In early 2022, a convoy of truckers in Toronto had their assets frozen after objecting to vaccine mandates and gridlocking US-Canada trade. This led some people to suggest that a CBDC would consolidate state control over payments and provide an easier tool to suppress dissidents or discourage certain behaviours.

It is true that certain ways of designing a CBDC might provide new, more efficient means for the state to implement control. Payments are best provided as a public good, and for the state to use access to them as a tool of social engineering is much closer to authoritarianism than most of us are comfortable with.

But as the example of the Toronto truckers indicates, Canadians are already living in a world where the state has the willingness and capacity to restrict access to payments services, despite not having a CBDC.

A CBDC might – if designed in a certain way – concentrate data, leading to new risks and the capacity to make the exercise of state authority over payments more complete. But this kind of development does not require a CBDC. Aggregating data from multiple services is a technical challenge, but one that law enforcement agencies are already eminently capable of solving.

Threatening our privacy? What privacy?

CBDCs are not a serious threat to the privacy of digital payments because we have so little to begin with. The European Data Protection Supervisor points out that, 'tracking payments of a person can describe the consumers' life in great detail… The amount of personal information that actors involved in transactions' management learn about each individual when a payment system operates is significant. This generates a systemic risk of profiling and surveillance by the parties operating the payment system.'

Whether a CBDC is implemented or not, there should be more robust protection of privacy. At present, the main defence is simply that most people use a variety of services, but the sophistication of the tools used to aggregate and process payments data is growing. Regardless of whether this is driven by private actors seeking profit or state actors seeking greater control, the prospect is not appetising, as the EDPS also mentions that 'payment data is often used for purposes other than those strictly related to the payment execution… payment providers may collaborate with private credit scoring companies that inform landlords, creditors and service providers about the individual trust score of their future clients.'

Can we hope for better?

Central banks have made it clear that they will not launch a fully anonymous CBDC due to the risk that it would facilitate financial crime. There is a notion that privacy and oversight are a trade-off and the best that regulators and privacy advocates can hope for is some kind of mutually unsatisfying compromise.

But innovation in privacy-enhancing technology offers a way to improve privacy without degrading law enforcement agencies' ability to fight crime. In most countries, payments data is generally only available for use by law enforcement agencies under circumstances set out in a comprehensive legal framework. If a CBDC erodes that framework's ability to protect individuals' right to privacy, that is a design choice and not a necessity. If (and this is far from certain) a CBDC is designed with the correct principles, it can form a new benchmark for privacy in digital payments.

A central bank should not become a repository of individuals' data. Whether the core ledger is distributed or centralised, there is no reason for the central bank to have access to the know-your-customer information of those transacting in CBDCs. That should be sufficient to ensure that a CBDC does not worsen the privacy of digital payments systems. Privacy-enhancing technologies can also be used to make improvements. There are a broad range of such techniques, many of which are discussed in the Bank of England's digital pound technology working paper. These include: zero-knowledge proofs, which allow a party to verify a statement without revealing additional data; homomorphic encryption, which allows parties to process encrypted data; and distributed data analysis, which allows multiple entities to jointly process datasets without sharing data.

Central banks and law enforcement agencies will still need the capacity to obtain personal data in their crime-fighting activities, but these data should only be visible to them if rigorous criteria are met. The concept of reciprocal negotiated accountability offers a framework that keeps payment data encrypted and keys held in escrow – released only if certain rules are satisfied. It is a cryptographically secured enforcement of the existing framework.

Winning public trust

Much of the challenge in this area is cultural, not technical. The encryption standards and systems architectures already exist but revelations from Edward Snowden, the National Security Agency whistleblower, and others have shaken the public's trust in the state's willingness to respect individual privacy. Can the state be trusted to implement these privacy-enhancing technologies without leaving additional backdoors? Convincing the general public will be a tremendous challenge.

That is not a reason not to try. We are not starting from a point of sufficient privacy so do not risk losing it. Privacy in digital payments is already poor – the chance is that we improve it.

The digitalisation of the global economy has caused a rapid loss in control over data. The technology exists to regain it but, as the commercial value of such data increases, the likelihood of the private sector willingly deploying that technology shrinks. If, however, the state establishes a benchmark – a free, high-quality payments system that protects privacy without facilitating crime – then the private sector will be forced to raise its standards.

Are CBDCs A Ticking Timebomb for Commercial Banks?[*]

By DAVID CREER AND ALEXANDER FEENIE[*]

Banks need digital currency integration plans

Most central banks have advanced plans to launch central bank digital currencies to run in parallel with traditional money. There have been many pilot schemes, with some now being made live. Several central banks are accelerating the introduction of CBDCs to stem the growth of private digital currencies which are emerging as a viable alternative to fiat money.

The direction of travel is clear: CBDCs are inevitable and have moved from theory to practice. Banks should act now or risk strategic irrelevance or even obsolescence. Fractional reserve banking could even disappear in jurisdictions where the operating model chosen would have people keeping their CBDC on deposit at the central bank.

In these instances where the central bank would assume the role of lender and service provider to consumers and businesses, the traditional banking model is under threat. As the function of end-client management for lending and financial services products is not one that many central banks want to control, they are working with commercial banks to make sure that this revolution is a smooth one and does not completely disrupt the existing financial system.

Virtual money is the next phase of the digital revolution and is potentially the biggest change in the monetary system since the invention of paper money. Digital currencies promise to fulfil all the functions of money for consumers and businesses while at the same time enhancing the central banks' ability to fine tune, monitor and optimise monetary policy within an economy. But central banks will enlist the support of commercial banks – as intermediaries – to drive adoption through the network effect.

Without the universal support of commercial banks, CBDCs may not be integrated, adoption will be hindered and everyone will lose out. Banks are at various stages of preparedness and those that have not started must start soon. But there's a lot to consider.

CBDCs will disrupt many areas of banking while streamlining, refining and simplifying others. Bank operating models must be adapted and a successful CBDC implementation must be aligned with a bank's technology strategy, business goals and strategic ambition.

Money is the lifeblood of any bank so the arrival of a new type of money touches every part of its operation. CBDCs are not simply an additional currency but an entirely new way of operating. While this is a challenge it is also an opportunity to streamline business processes, boost digitalisation and promote innovation.

Although there are many proven CBDC solutions, they cannot operate alone and must be fully integrated within a bank's end-to-end value stream. For many banks, integration will be a significant technical and operational challenge, particularly for smaller outfits or those with legacy technology.

Ideally, CBDCs should be considered as part of a digitalisation strategy, which simplifies integration and testing. But in every case there is a need for a thorough technical and business assessment of the challenges and opportunities. It is also crucial to note that CBDCs will become legal tender so participation will eventually become obligatory.

There are many good reasons to get involved with CBDCs early, particularly around availability of resourcing and expertise. Banks that leave it to the last minute will undoubtedly face higher costs and miss out on the opportunity to influence the future direction of CBDCs.

By starting early, banks can also benefit from a fully integrated end-to-end solution. Those who delay or ignore CBDCs may face disintermediation by central banks who can opt for a direct distribution model or a smaller network of intermediary banks. The good news is that banks can think big and start small. But the crucial thing is to start soon.

Working Paper

The Impact of Financial Development on the Income and Consumption Levels of China's Rural Residents ⃰

By QIAN ZONGXIN, TU YONGHONG AND ZHOU ZINAN ⃰

Abstract

In this paper, we investigate the impact of financial development on rural residents' income and consumption levels in China. We discover that the development of traditional financial services has little impact on the income and consumption levels of rural residents. In contrast, the development of emerging financial services has a significant positive impact on the income and consumption levels of rural residents. Traditional financial services, as is well known, require collateral and high expected future cash flows from customers, making financial inclusion difficult. Emerging financial services in China are special financial services promoted by financial regulators to support technological innovation, cultural development, environmental protection, and rural development. Our findings suggest that these emerging financial services are effective in increasing the income and consumption levels of rural residents. Interestingly, while emerging financial services that directly target rural development have no significant impact on rural residents' income and consumption, financial support for technological advancement and cultural development appears to be more effective in increasing rural residents' income and consumption.

---

1. Introduction

In this paper, we investigate the impact of financial development on the income and consumption levels of rural residents in China. We contribute to the literature by improving the measurement of financial development and delving deeper into the relationship between financial development, income, and consumption level.

Many previous studies in this field define financial development narrowly by the level of development of the banking sector. Financial development was measured using indicators, such as the credit-to-GDP ratio (Levine *et al.* 2000), the ratio of deposits to GDP (Rajan and Zingales, 2003), loans of the financial system to GDP (Lu and Yao, 2009).   The shortcomings of such indicators are twofold. First, it only considers indirect financing channels, neglecting the rapid development of China's capital market. Second, it makes no distinction between various areas of financial development, thereby neglecting fundamental structural changes in China's financial industry.

In recent years, Chinese financial regulators have promoted financial development in a few specific areas, leading to structural changes in the financial industry. More specifically, regulators encourage the financial sector to support technological innovation, environmental protection, cultural development and rural development. These financial services are respectively referred to as 'technological finance', 'green finance', 'cultural finance' and 'rural finance'. In this paper, we will refer to these new financial services areas as 'emerging finance'. One important difference between traditional and emerging finance is that the objective of emerging finance is not only making profits for financial institutions, but also supporting national development targets. For the specific targets it serves, emerging finance businesses could be supported by complementary government policies, which are not available for traditional financial businesses.

The government promotes emerging financial services because traditional financial services are concentrated in sectors with less uncertainty in future cash flows and/or high growth rates. Such financial services are consistent with China's traditional growth model, which promotes and sustains high GDP growth rates through investment in capital-intensive manufacturing. However, China is changing its development strategy to promote a more balanced growth model that considers not only the importance of income growth rate but also environmental protection, cultural development and income distribution. Furthermore, the new development strategy emphasizes technological innovations as the primary source of economic growth rather than capital investment. The recent developments in emerging finance are in line with the new growth model.

Existing studies paid limited attention to the above mentioned transformation of the Chinese growth model and accompanying structural changes in the financial industry. Therefore, it is necessary to investigate the implications of those structural changes on various aspects of economic development. This paper focuses on one particular aspect. More specifically, it studies the effect of those structural changes, which we call emerging finance development, on the income and consumption levels of rural residents. Unfortunately, traditional finance development indicators only capture the overall development level of China's financial sector, particularly the banking sector, and are completely silent on the development of emerging financial businesses. This paper uses a newly developed index of financial development to solve this problem. The index is called the Tianfu financial index (TFFI). The advantage of this index is that besides the development of traditional finance, it also measures the development of the emerging finance.

The TFFI was developed by the Renmin University of China's TFFI Research Group (2017; 2018; 2019; 2020). It includes not only banking-related indicators but also capital market-related indicators, which complements the traditional finance development indicators by considering the development of direct financing. Furthermore, whereas traditional measures of financial development only measure the scale of financial services, the TFFI covers the scale of financial services, the quality and supporting facilities of financial services, human resources, etc. It distinguishes between traditional and emerging finance, allowing us to investigate the potentially heterogeneous impact of financial development in different areas on the income and consumption levels of rural residents. Our empirical findings suggest that such distinction is important. More specifically, we find that traditional finance has no significant impact on rural residents' per capita income and consumption. In contrast, emerging finance has a significant positive impact on rural residents per capita income and consumption. Technological finance and cultural finance, in particular, have a significant positive impact on the rural residents' per capita income and consumption.

The remaining sections of this paper are structured as follows: Section 2 briefly reviews the literature. Section 3 introduces the Tianfu financial index. Section 4 provides the theoretical analysis. Section 5 introduces our methodology and describes the data. Section 6 presents the empirical results. Section 7 concludes.

2. Literature review

This paper is related to the literature on the differences between traditional finance and emerging finance. Compared with traditional finance, emerging finance has specific supporting areas that traditional financial institutions are often reluctant or unable to enter.

Take green finance as an example. While traditional finance focuses mainly on profits, green finance considers financial, social and environmental returns in combination (Schoenmaker, 2017; Okyere-Kwakye and Md Nor, 2021). Generally, financial institutions tend to show more interest in fossil fuel projects as opposed to green projects (Benincasa, 2021). This is primarily due to several risks that are prevalent among green technologies, as well as a relatively lower rate of return (Sachs *et al*., 2019). Green projects also require large borrowings, as they are capital-intensive (Peimani, 2019). At the same time, these projects are usually associated with high risks and low returns at the initial research and development stage (Noh, 2018). Therefore, green projects have difficulties in accessing finance from banks. Generally, traditional finance cannot provide enough funding for green projects. Therefore, it is necessary to establish a green finance system to fill this gap (Taghizadeh-Hesary *et al*., 2021).

Technological entrepreneurs face a similar problem. Innovation and commercialization of new technology are usually accompanied by high uncertainty and risks, thus financial institutions usually invest in technological innovation cautiously to avoid potential losses. In addition, information asymmetries may make raising external capital expensive for entrepreneurs (Myers and Majluf, 1984; Greenwald *et al*., 1984). Giudici and Paleari (2000) conduct an empirical analysis on a survey of 46 small high-tech Italian firms, arguing that traditional financial sources are inadequate to finance innovative projects. To support technological innovation of the firms, governments in many countries have taken on the role of venture capital investors to solve these problems (Jang and Chang, 2008).

Cultural enterprises are also confronted with financing difficulties due to the comparatively large initial investment and the unpredictability of future return. While traditional enterprises rely on tangible collateral for debt financing from banks, cultural enterprises mainly rely on intellectual property rights and human capital which are difficult to assess under the current evaluation system (Liu *et al*., 2021). The implementation of cultural finance policy is beneficial to reduce the financing cost of cultural enterprises by alleviating problems of information asymmetry with more specialized financial products.

The small and complex rural economic structure makes the rural financial market in China small, dispersed and seasonal. Generally, the commercial banks' penetration in rural areas was restrained due to the limited collateral or guarantee capacity and high-transaction costs (Guo and Jia, 2009). Lin (2003) points out that the lack of suitable and effective financial institutions is one of the main reasons hindering the growth of farmers' income. In this background, China has implemented rural financial reforms, including lifting barriers on access to rural financial markets and promoting diversification of rural financial institutions. There are different evaluations in the existing literature on the effect of China's rural financial development or reform. Guo and Jia (2009) argue that the formal financial institutions in rural areas mainly function as a payment window and can hardly provide balanced and full services. From the perspective of industrial integration, Tian *et al*. (2020) point out that rural finance has a significant and positive effect on promoting farmers' participation in new agricultural management organizations.

This paper also contributes to the literature on the effect of financial development on the income and consumption level of rural residents. The existing empirical studies generate mixed results.

Some find that financial development increases the income or consumption level of residents in rural areas. Holden and Prokopenko (2001) suggest that financial development can help the poor to deal with fluctuations of income in the future, and promote the financial system to provide better services and capital support to poor family. Inoue (2018) finds that financial development and remittance inflows help increase income of the poor in developing countries. Ding *et al*. (2011) point out that financial development has a positive effect on the income of rural residents. Cui and Sun (2012) find that financial development can increase poor people's consumption. Uddin *et al*. (2014) show that financial development helps enhance private household consumption per capita in Bangladesh. Rewilak (2017) argues that financial deepening help reduce the proportion of people below the poverty line.

Other studies argue that financial development does not contribute to the increase in rural residents' income and may even have a negative impact on rural residents' income. Haber (2005) indicates that financial development has not increased poor people's income. Wen *et al*. (2005) even find that the financial development in China has negative effects on farmer's income growth. Similarly, Yu *et al*. (2010) and Ye *et al*. (2011) also find a negative relationship between financial development and rural residents' income.

The third body of literature investigates the relationship between financial development and income distribution and poverty. Sun (2012) finds that financial development promotes urbanization and, as a result, narrows the urban–rural income distribution gap. Beck *et al*. (2007) suggest that the Gini index fell sharply after the state relaxed regional commercial banking restrictions. The research of Alshubiri (2021) shows that the financial depth has a positive and significant impact on income inequality in the OECD and ASIAN countries. Some studies find that the effect of financial development on poverty has an inverted U-shape (Aghion and Bolton, 1997; Townsend and Ueda, 2006; Chakraborty and Lahiri, 2007). Greenwood and Jovanovic (1990) propose a theory to explain the inverted U-shape relationship between poverty and financial developments. In particular, in the early stages of financial development, the poor cannot afford the cost of financial services, causing the income gap to widen. When financial development reaches a certain level, the poor gain access to financial services, and financial development begins to aid in poverty alleviation. This result is known as the Kuznets effect (Kuznets, 1955).

The existing literature has a limitation in that it ignores the distinction mentioned in the introduction between traditional and emerging finance. There has been little research on the relationship between emerging finance and rural residents' income and consumption. This paper fills that void.

3. The Tianfu Financial Index

Finance plays a positive role in accelerating capital formation, expanding output scale, optimizing resource allocation, and increasing income and consumption. China has long had a bank-dominated financial system in which the proportion of direct financing is relatively low but rising rapidly. However, traditional finance mainly serves cities, state-owned enterprises and large enterprises, which can neither adequately adapt to the requirements of the economic transformation, nor reflect the requirements of new development concepts and high-quality development.

Since the 18th National Congress of CPC, China has attached greater importance to supply-side reform of the financial sector, and promoted finance to support technological innovation, sustainable development, cultural development, and rural revitalization, forming emerging finance including technological finance, green finance, cultural finance, and rural finance.

One important difference between traditional and emerging finance is that the objective of emerging finance is not only making profits for financial institutions, but also supporting national development targets. Compared with traditional finance, emerging finance has more accurate market position and specific service targets. For example, in the fields of green finance, green bonds are issued to finance specific environmental sustainability and energy transition projects, such as projects related to renewables, public transportation, energy efficient building and waste management. For the specific targets it serves, emerging finance businesses could be supported by complementary government policies (Song, et al., 2021), which are not available for traditional financial businesses. Moreover, as emerging finance often supports fields that traditional financial institutions are reluctant to enter, the operation of emerging finance is more personalized in terms of functions, standards, products features and risk management.

The Tianfu Financial Index (TFFI) takes both the traditional and emerging finance into account, systematically and comprehensively reflecting the financial development of 35 sample cities.[1] In the field of traditional finance, TFFI considers financial market size, the strength of financial institutions, supporting facilities for the financial sector's full functioning, and human resources that are essential for the financial sector development. TFFI measures not only the development of traditional finance but also four emerging financial industries, namely technological finance, green finance, cultural finance and rural finance. As a result, the index system includes one index of average financial development (TFFI), one index of traditional finance development (TFI), one index of emerging finance development (EFI) and eight sub-indices (see Fig. 1 for details).

---

[1] Beijing, Shanghai, Shenzhen, Guangzhou, Hangzhou, Chengdu, Chongqing, Nanjing, Tianjin, Wuhan, Xian, Changsha, Hefei, Zhengzhou, Jinan, Ningbo, Qingdao, Dalian, Xiamen, Fuzhou, Kunming, Taiyuan, Shenyang, Guiyang, Nanchang, Nanning, Urumqi, Shijiazhuang, Harbin, Changchun, Lanzhou, Hohhot, Yinchuan, Haikou, Xining.
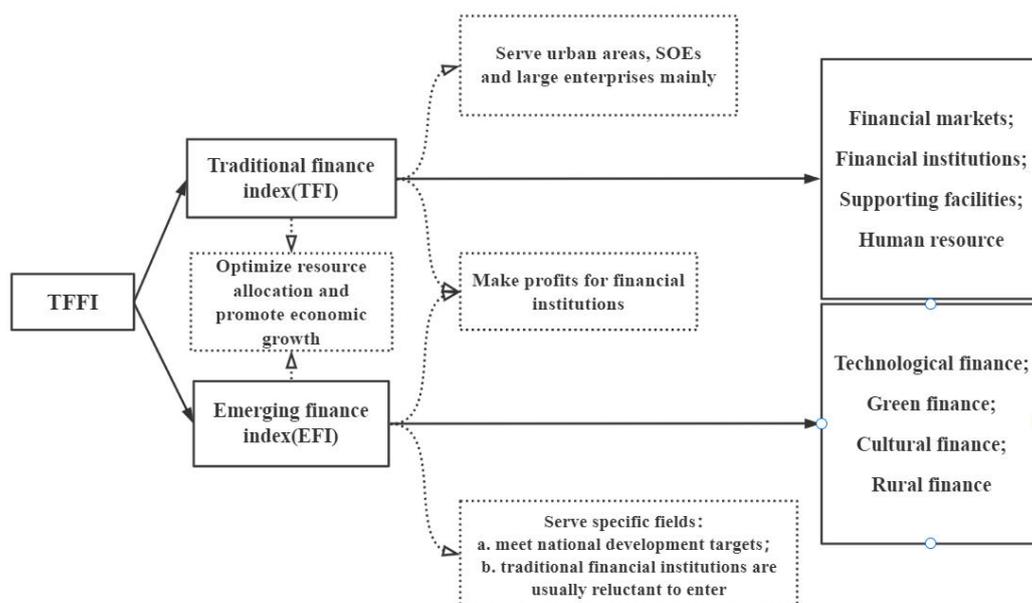
Fig. 1. The index system of TFFI.

There are four sub-indices for traditional finance development: financial market, financial institution, supporting facilities and human resources. There are also four sub-indices for emerging finance development: technological finance, green finance, cultural finance and rural finance. The financial market sub-index measures different financial markets' development level. The financial institution sub-index is designed to reflect the scale, operation quality, risk management and social reputation of financial institutions. The supporting facilities sub-index is evaluated from four aspects: infrastructure, urban environment, institutional environment and economic environment. The human resource sub-index is designed to reflect human resource quantity, quality, foundation and potential. The technological finance sub-index is designed to capture two aspects of financial services that support technological innovation. The first is the environment in which technology is being developed. The second factor is the quality and quantity of financial services available to help technological innovation. The green finance sub-index is mainly evaluated based on two aspects: the current level of environmental protection and the quality and quantity of green finance services. The cultural finance sub-index reflects the current level of cultural development as well as the quality and quantity of financial services available for cultural development. The rural finance sub-index mainly reflects the current rural area development level and quality and quantity of financial services provided for rural area development.

TFFI employs the max–min method on the original data for data normalization, after which the dimensionality is eliminated so that the standardized indicator variables are all within the interval of [0 100]. We sort the indicators to follow the rule that the higher value of an indicator indicates stronger financial competitiveness. TFFI is a weighted average of the sub-index, where the weights are calculated using the principal components analysis. For further technical details, please refer to the Renmin University of China's TFFI Research Group (2017, 2018, 2019, 2020).

4. Theoretical analysis

Given the availability of more detailed indicators of financial development, we can investigate the disparate roles of various types of financial development in increasing rural residents' income and consumption levels. In this paper, we focus on the roles of traditional and emerging finance.

Traditional finance's ability to increase the income and consumption of rural residents may be limited for the following reasons. First, it necessitates collateral and high expected future cash flows from borrowers, making financial inclusion difficult. Rural residents are viewed as high-risk borrowers by creditors and investors owing to a lack of pledgeable assets, low capitalization and vulnerability to market fluctuations (Wang, 2005). Furthermore, the lack of adequate financial statements or business plans makes it difficult for investors to assess their creditworthiness. Second, some researches suggest that the poor primarily rely on informal family connections for capital, so improvements in the formal financial sector benefit the wealthy (Bourguignon and Verdier, 2000; Haber *et al.*, 2003).

In China, emerging financial services are special financial services that are promoted by financial regulators to support technological innovation, cultural development, environmental protection and rural development. By design, those emerging financial services not only have clear goals but also alleviate the problems caused by borrowers' weak financial backgrounds. Fig. 2 summarizes the mechanisms by which different types of emerging finance affect rural residents' income and consumption levels. As we can see from this figure, technological finance and cultural finance may have positive effects on the income and consumption levels of rural residents, but the direction of the impact of rural finance is uncertain.

Technological finance primarily refers to financial assistance for the development of technology businesses. By reducing the financing costs of technological enterprises, it promotes technological innovation, which may increase total factor productivity in the rural area and thus increase rural residents' income and consumption level. Furthermore, technological advancements help to improve financial inclusion (Huang and Huang, 2018). Big data, artificial intelligence and blockchain technology enable finance to innovate financial products and services, cultivate market-leading enterprises and then promote the construction and development of agricultural industries, which can increase rural residents' income through more job opportunities and sales revenue.

The development of cultural finance may help increase rural income and consumption in three ways. First, cultural development can help change the poor's inherent concept of poverty from the perspective of poverty culture and then promote the income level. Second, improved cultural infrastructure can promote high-quality education, which improves rural residents' human capital. Third, financial supports can transform cultural resources into cultural assets in rural areas and then develop cultural industries, which is particularly important for poor areas lacking production conditions. The development of cultural industries can provide local residents with new employment opportunities and cultural product sales income.

Rural finance aims to match financial resources for agricultural development, and lower the barrier to financial services for rural residents. Rural financial development has increased the availability of financial resources in rural areas. In recent years, various financial institutions have broadened their business in rural areas. Financial sources such as micro-credit and credit card can effectively alleviate the problem of household liquidity constraints, helping rural households realize the inter-temporal allocation of small amounts of funds in the short term and thereby increasing consumption (Zhao *et al*., 2022). Moreover, rural capital investment has the potential to increase the amount of capital per capita of rural residents, potentially leading to an increase in per capita output and income (Xu and Gao, 2005). Furthermore, rural finance has a significant and positive effect on rural industrial integration by providing channels of financing and managing risks (Tian *et al*., 2020), and thus promoting the income and consumption level of rural residents. As a result, it is natural to believe that the development of rural finance contributes to an increase in rural residents' income and consumption. However, there are still existing difficulties in the practice of rural finance, such as inefficient credit markets due to the lack of qualified collateral and credit records (Li, 2018; Li *et al*., 2013; Yeung *et al*., 2017), insufficient technical monitoring and supervision, as well as inadequate rural financial products and services innovation. With these constraints, it is an empirical question whether the current development of rural finance is adequate to support rural residents' income and consumption growth.
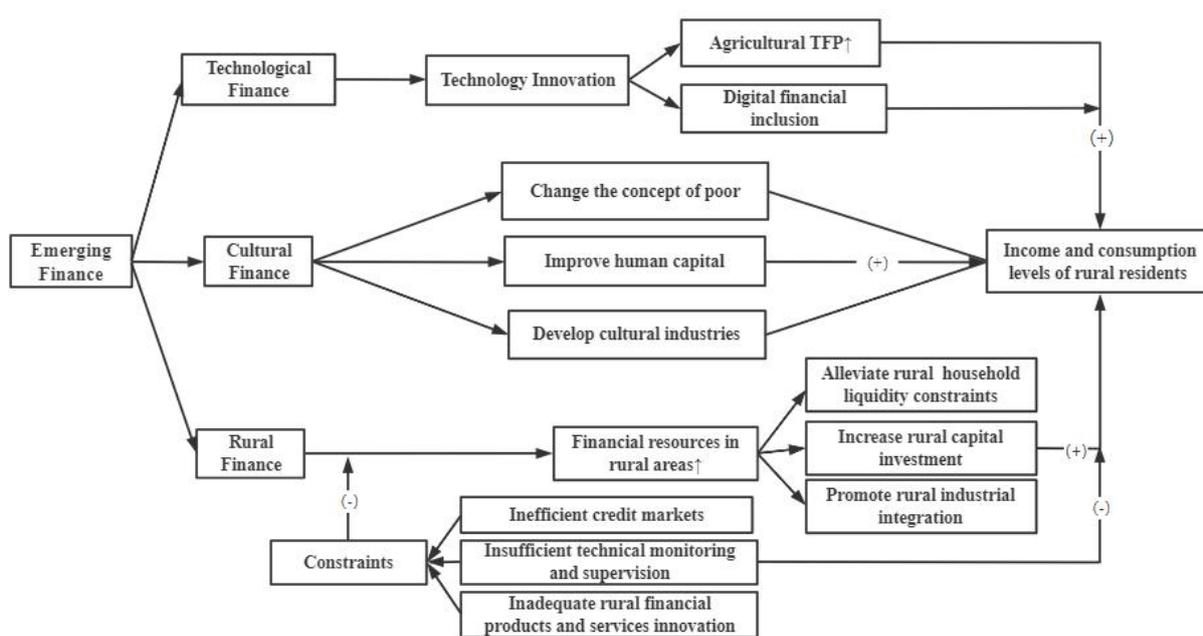
Fig. 2. Mechanisms of emerging finance influencing rural residents' income and consumption levels.

5. Empirical model

5.1 The effect of financial development on the income level of China's rural residents

We first estimate the following panel regression:

$$ICM_{i,t} = \alpha_0 + \alpha_1 TFFI_{i,t} + \gamma X_{i,t} + \mu_i + \varepsilon_{i,t} \tag{1}$$

We use $ICM_{i,t}$, which represents the per capita disposable annual income of rural residents in year t and city i, as the dependent variable. The independent variable $TFFI_{i,t}$ measures financial development for city i in year t. If the regression coefficient α_1 is significantly positive, financial development significantly increases the rural income level. $X_{i,t}$ is the vector of control variables containing economic development, urbanization, inflation, degree of openness, fiscal support and industrial structure. α_0, α_1 and γ are coefficients to be estimated. μ_i represents city-fixed effect, and $\varepsilon_{i,t}$ is the error term. The sample period is from 2016 to 2019.

We also further investigate the impact of traditional and emerging finance development on rural residents' income. The key explanatory variable in Eq. (1) is replaced by the traditional finance development index (TFI) and emerging finance development index (EFI), as shown in model (2) below.

$$ICM_{i,t} = \alpha_0 + \alpha_1 TFI_{i,t} + \alpha_2 EFI_{i,t} + \gamma X_{i,t} + \mu_i + \varepsilon_{i,t} \tag{2}$$

We explain our choice of control variables below:

Economic development. Economic development brings benefits to all people, including the poor. According to the 'trickle-down effect', economic growth can increase total wealth and ultimately benefit the poor through channels of consumption, employment and transfer payment. Our proxy for economic development is the log of real GDP per capita (Barro, 2000; Deininger and Squire,1998).

Urbanization rate. The urbanization rate is calculated as the ratio of urban residents to total residents. First, urbanization can increase rural residents' non-agricultural income (especially wage income) by absorbing rural surplus labor force. Second, the rural land circulation can promote property income of rural residents. Third, urbanization produces positive spillover effects on rural areas by improving human capital, production technology and knowledge accessibility, which enhances the productivity of rural labor. Thus, we expect a positive sign of the coefficient of urbanization rate.

Degree of openness. We use the ratio of overall value of export and import to GDP to measure degree of openness. With a higher degree of openness, imported agricultural products from more advanced countries may squeeze the market share of local agricultural products, causing prices to fall. Furthermore, as foreign trade develops, demand for technology and capital-intensive products rises, potentially decreases the price of traditional labor-intensive products and slowing the income growth of rural migrant workers. As a result, we anticipate a negative sign for the coefficient of trade openness.

Fiscal support. We measure fiscal support by fiscal expenditure on agriculture. In general, the relationship between agricultural fiscal expenditure and rural residents' income can be either substitutive or complementary. Fiscal expenditure on agriculture can reduce the cost of agricultural production and increase the income of rural residents. However, an increase in fiscal expenditure may crowd out productive private investment in the rural areas, reducing rural residents' disposable income. As a result, the sign of regression coefficient on agricultural expenditure is determined by the combined effect.

Industrial structure. We use the primary industry-to-GDP ratio as a proxy for industrial structure. In general, while the primary industry's share of GDP gradually decreases, there is an increasing tendency in rural residents' income from non-agricultural activities, thereby improving rural income levels. However, sometimes the impact is the opposite. Because agriculture is the traditional source of income for rural residents, a decrease in primary industry share would result in a decrease in agricultural income. However, because non-agricultural industries are primarily concentrated in urban areas, migration may have a negative impact on the rural economy and income level. As a result, the sign of the industry structure coefficient is ambiguous.

5.2 The effect of financial development on the consumption level of China's rural residents

Regression models for rural residents' consumption levels are similar to those for income levels, with overall financial development, traditional finance development and emerging finance development included as independent variables:

$$CSPT_{i,t} = \alpha_0 + \alpha_1 TFFI_{i,t} + \gamma X_{i,t} + \mu_i + \varepsilon_{i,t} \qquad (3)$$

$$CSPT_{i,t} = \alpha_0 + \alpha_1 TFI_{i,t} + \alpha_2 EFI_{i,t} + \gamma X_{i,t} + \mu_i + \varepsilon_{i,t} \qquad (4)$$

We use $CSPT_{i,t}$, which represents the log of real per capita consumption of rural residents in year t and city i, as the dependent variable. In addition, we add the urban–rural income gap into $X_{i,t}$, considering income is an important factor for consumption.

5.3 Data description

Table 1 summarizes the variable definitions. For per capita GDP, income and consumption, we calculate the real value (based on 2015 price) and take natural logarithm to reduce heteroscedasticity. Except for the TFFI, all variables are calculated using data from the wind database and statistical bureaus.

Table 1 Variable definitions

Variable	Definition	Source
lrincome_rural	Log of real per capita income of rural residents	Wind database
lrconsmpt_rural	Log of real per capita consumption of rural residents	Wind database
IFFI	Average financial development index	TFFI Research Group
TFI	Traditional finance development index	TFFI Research Group
EFI	Emerging finance development index	TFFI Research Group
tech	Technological finance sub-index	TFFI Research Group
green	Green finance sub-index	TFFI Research Group
culture	Cultural finance sub-index	TFFI Research Group
rural	Rural finance sub-index	TFFI Research Group
lrpgdp	Log of real per capita GDP	Bureau of statistics (city-level)
urban	Ratio of urban residents to total residents	Wind database, Statistical yearbook (provincial-level)
CPI	Inflation rate	Wind database
openness	Ratio of value of import and export to GDP	Wind database
agri_support	Share of fiscal expenditure on agriculture, forestry and water conservancy	Wind database
share_primary	Ratio of primary industry to GDP	Wind database

The descriptive statistics for all variables are shown in Table 2. The sample size for a few variables is less than 140 because of missing data in some cities. It is obvious that the level of financial development has large differences in cross-section. Specifically, the maximum value of TFFI is 79 and the minimum value is close to 13, indicating large differences of the financial development levels of sample cities.

Among the components of TFFI, the traditional financial development index (TFI) of sample cities is between 12 and 81, and the emerging financial development index (EFI) is between 13 and 80, also showing great differences. For the four emerging finance sub-indices, we find that the sample cities are less dispersed in green finance and rural finance than in technological finance and cultural finance.

Table 2 Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
lrincome_rural	136	9.764	.285	9.157	10.419
lrconsmpt_rural	131	9.485	.280	8.958	10.074
TFFI	140	35.23	13.290	13.041	79.147
TFI	140	36.779	13.786	12.452	81.024
EFI	140	33.275	13.355	13.336	80.051
tech	140	27.531	17.852	2.14	84.079
green	140	42.213	9.497	21.863	80.313
culture	140	27.497	16.604	3.416	90.762
rural	140	49.648	12.530	20.291	84.302
lrpgdp	137	11.444	.309	10.858	12.101
urban	134	75.435	10.152	48.565	100.000
CPI	140	2.165	.608	.500	3.400
openness	140	33.715	31.787	1.986	134.959
agri_support	127	6.540	2.299	1.455	13.551
share_primary	140	3.677	2.612	0.000	11.300

6. Econometric analysis and results

6.1 Regressions for the income level of rural residents

Table 3 summarizes the results of model (1). The TFFI coefficient is positively and statistically significant in all specifications, indicating that financial development increases rural residents' income.

For control variables, economic development and the rate of urbanization have significantly positive effects on the income of rural residents, which is consistent with our expectations. In the case of trade openness, we find a negative and significant effect on rural residents' income, which is also consistent with our expectations. The effect of inflation, primary industry share and fiscal support are all statistically indistinguishable from zero.

Table 3 The effect of TFFI on real per capita income of rural residents

	(1) lrincome_rural	(2) lrincome_rural	(3) lrincome_rural	(4) lrincome_rural	(5) lrincome_rural	(6) lrincome_rural	(7) lrincome_rural
TFFI	.026***	.016***	.012***	.012***	.011***	.011***	.011***
	(.002)	(.003)	(.003)	(.003)	(.003)	(.003)	(.002)
lrpgdp		.523***	.406***	.374***	.416***	.423***	.428***
		(.096)	(.102)	(.101)	(.091)	(.087)	(.099)
urban			.016**	.014*	.015**	.013*	.013*
			(.008)	(.007)	(.007)	(.007)	(.007)
CPI				.016	.013	.012	.012
				(.011)	(.011)	(.012)	(.015)
openness					-.003**	-.003**	-.003*
					(.001)	(.001)	(.001)
agri_support						-.006	-.006
						(.004)	(.004)
share_primary							.003
							(.022)
_cons	8.856***	3.25***	3.49***	4.011***	3.573***	3.705***	3.622***
	(.079)	(1.022)	(.861)	(.947)	(.871)	(.881)	(1.18)
Observations	136	133	127	127	127	115	115
R-squared	.459	.721	.746	.756	.776	.763	.763

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1

We further compare the effects of traditional finance and emerging finance development on rural residents' income. The results of model (2) are shown in the first column in Table 4. We obtain a point estimate of the TFI coefficient of 0.003, which is not significantly different from zero. Interestingly, the EFI is significant at 1%. The estimated coefficient is 0.006, implying that increasing the emerging development index by 1 unit increases per capita rural resident income by 0.6%. The cross-sectional difference in the index is large, as shown in Table 2, implying that income differences caused by differences in emerging finance development could also be large.

The finding that traditional finance development has no significant impact on rural residents' income reflects the difficulty for poorer households in the traditional financial service model to access financial resources. Productive activities in rural areas have long cycles and low returns, and agricultural products are vulnerable to natural disasters. Furthermore, rural areas have a low level of economic development, and rural residents usually lack high-quality collateral. In addition, developing a credit system for rural residents is difficult. For these reasons, profit-driven financial resources would flow to more developed areas. Therefore, traditional finance is inefficient in providing financial services to rural areas, making it difficult to increase rural residents' income.

In contrast to traditional finance, emerging finance is born from changes in a country's development strategy. It is intended to help areas that have historically been overlooked by traditional finance. Our findings imply that financial policies which promote the development of emerging finance help increase rural residents' income.

Table 4 Effects of traditional and emerging finances on real per capita income of rural residents

	(1) lrincome_rural	(2) lrincome_rural	(3) lrincome_rural	(4) lrincome_rural	(5) lrincome_rural
TFI	.003				
	(.003)				
EFI	.006***				
	(.001)				
tech		.003***			
		(.001)			
culture			.002**		
			(.001)		
green				.002	
				(.002)	
rural					0
					(.001)
lrpgdp	.41***	.388***	.428***	.473***	.492***
	(.103)	(.116)	(.117)	(.109)	(.116)
urban	.013*	.018**	.017*	.019*	.02**
	(.007)	(.007)	(.009)	(.009)	(.009)
CPI	.015	.015	.013	.011	.009
	(.015)	(.015)	(.015)	(.014)	(.014)
openness	-.003**	-.003*	-.003**	-.003**	-.003**
	(.001)	(.001)	(.001)	(.001)	(.001)
agri_support	-.006	-.009*	-.008*	-.011**	-.009*
	(.004)	(.005)	(.004)	(.005)	(.005)
share_primary	.007	.008	-.005	-.008	-.007
	(.022)	(.022)	(.024)	(.023)	(.024)
_cons	3.9***	3.989***	3.648***	3.085**	2.829**

	(1.234)	(1.343)	(1.318)	(1.178)	(1.242)
Observations	115	115	115	115	115
R-squared	.767	.743	.73	.717	.712

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1

Since the emerging finance index consists of four sub-indices, we consider a more detailed study on the effects of emerging finance on rural residents' income levels. We regress rural residents' income on the four sub-indices of the EFI respectively. Columns (2)-(5) in Table 4 show that the technological finance and cultural finance have positive effects on the income level of rural residents with significance level of 1% and 5% respectively, while the rural finance has a negligible and insignificant impact on rural residents' income, which is consistent with some related literature (Xu and Gao, 2005; Wen *et al*., 2005, Yu *et al*., 2010) . The literature explains the ineffectiveness of rural finance by inefficient credit markets due to the lack of qualified collateral and credit records (Li, 2018; Li *et al*., 2013; Yeung *et al*., 2017), insufficient technical monitoring and supervision, as well as inadequate rural financial products and services innovation. There are two further explanations for the inability of rural finance to increase rural residents' income. First, large-scale rural financial institutions lack an effective competition mechanism and the motivation for business innovation and thus are unable to meet the multi-level and diverse financial demands of rural economies. Small rural financial institutions' ability to support rural credit and control risks is limited owing to disadvantages in terms of capital scale and information acquisition. As a result, rural finance may have a limited impact on rural economic development and income growth among rural residents. Second, most sample cities have relatively high levels of economic development; thus, credit funds from local rural financial institutions may primarily flow to other extra-poor regions rather than the local rural residents.

The technological finance index in TFFI system measures the demand and current conditions of local technological finance business, and the cultural finance has a similar logic. It can be seen that there is few overlaps between the sub-indices of technological finance, cultural finance and rural finance, since the former two don't directly measure the financial supports for rural residents or enterprises. However, technological finance and cultural finance can indirectly promote rural economic development and promote rural residents' income through technological innovation and cultural infrastructure construction respectively.

More specifically, technological finance can contribute to rural residents' income through increasing the productivity of rural residents and improving digital financial inclusions in rural areas. Technological finance encourages risky investment in R&D and promotes technological innovation. Technological innovation has the potential to not only increase the productivity of rural residents but also improve financial inclusion (Huang and Huang, 2018), which is beneficial for rural economic development. For example, advances in big data, artificial intelligence and blockchain technology have opened up new opportunities in rural areas. It promotes the development of market-leading enterprises, new industries and business forms in rural areas, which can increase rural residents' income through more job opportunities and sales revenue. It can also encourage the innovative provision of rural public services and the improvement of rural governance efficiency. Moreover, advanced technology can contributes to financing for rural areas by reducing information asymmetry and transaction costs.

For cultural finance, we give three main explanations for its positive effects on rural residents' income. First, cultural development can help change the poor's inherent concept of poverty from the perspective of poverty culture[1] and then promote the income level. Using institutional construction, conceptual transformation and educational resource supply, we can foster the concept of rural residents' modern development, improve the rural public culture service system, improve population quality and develop the agricultural economy, all of which help to increase rural residents' income.

---

[1] The culture of poverty was first proposed by the anthropologist Lewis (1959). Poverty culture is a social subculture produced by poor groups with common values and behaviours. It reflects the self-adaptation of poor people to economic deprivation and social marginalisation. From the perspective of poverty culture, even if the initial conditions of poverty change, it is difficult for the poor to get out of poverty.

Second, improved cultural infrastructure promotes high-quality education, which improves rural residents' human capital. For example, with the popularization of the Internet in rural areas, rural residents can now access high-quality public resources in cities. The development of online classes, distance education and 'Internet +' medical care, provides new channels for rural residents to accumulate human capital.

Third, financial support for the prosperity of cultural industry can help expand economic resources and thus increase the income of rural residents. We can promote the integrated development of cultural resources with agriculture, eco-tourism and other industries; accelerate the transformation of cultural capital into economic capital; and finally realize cultural enrichment by investing in cultural industries and supporting cultural enterprises to go public. For example, the cultural industry can increase rural residents' income through online media publicity, rural e-commerce, and cultural and tourism integration.

The index of green finance development has no significant impact on the income of rural residents. This is not surprising given that green finance services are not directly related to rural development.

6.2 Regressions for the consumption level of rural residents

Aside from rural residents' income, we investigate whether traditional and emerging finance development are effective in improving rural residents' consumption levels. The main results are shown in Table 5. The main regression results of consumption levels are similar to those of income levels, which is understandable given that income level is a significant factor influencing consumption (Keynes, 1936; Friedman, 1957; Duesenberry, 1949). We obtain a point estimate of the semi-elasticity of rural residents' consumption with respect to the financial development of 0.006, which is significant at the 5% level. Emerging finance has a significantly positive effect on rural residents' consumption, whereas traditional finance has no significant effect on rural residents' consumption. Furthermore, technological finance and cultural finance continue to have a positive and significant impact on consumption levels of rural residents.

Table 5 Effects of financial development on real per capita consumption of rural residents

	(1) lrconsmpt_rural	(2) lrconsmpt_rural	(3) lrconsmpt_rural	(4) lrconsmpt_rural	(5) lrconsmpt_rural	(6) lrconsmpt_rural
TFFI	.006** (.003)					
TFI		-.003 (.003)				
EFI		.004*** (.001)				
tech			.001* (.001)			
culture				.002** (.001)		
green					.002 (.001)	
rural						.001 (.001)
lrpgdp	.427*** (.141)	.391*** (.133)	.412*** (.148)	.405*** (.138)	.443*** (.141)	.453*** (.148)
urban	.013** (.006)	.013** (.006)	.015** (.006)	.014* (.007)	.015** (.007)	.016** (.007)
CPI	.014 (.011)	.021** (.009)	.015 (.01)	.017 (.01)	.013 (.011)	.012 (.011)

openness	-.002*	-.002*	-.002	-.002*	-.003**	-.002*
	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)
rgap	-.111	-.141	-.137	-.156	-.11	-.147
	(.145)	(.143)	(.151)	(.159)	(.165)	(.165)
agri_support	-.012	-.012	-.013	-.013	-.016**	-.014*
	(.008)	(.008)	(.008)	(.007)	(.008)	(.008)
share_primary	-.018	-.011	-.016	-.022	-.024	-.027
	(.019)	(.019)	(.021)	(.019)	(.019)	(.021)
_cons	3.699**	4.267***	3.868**	4.066**	3.546**	3.425**
	(1.54)	(1.414)	(1.587)	(1.522)	(1.57)	(1.631)
Observations	111	111	111	111	111	111
R-squared	.789	.803	.784	.791	.784	.776

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1*

6.3 Discussions about the possibility of endogeneity

We consider the possibility of endogeneity in two aspects. On the one hand, in the regression we've controlled the per capita GDP, which represents the level of regional development and thus deals with the proposed problem of missing variable.

On the other hand, we think that there is little possibility of reverse causality, as the income or consumption level of rural residents can hardly influence the technological finance, green finance and cultural finance of the whole city (particularly after controlling GDP per capita). For rural finance, one may argue that the low level of rural residents' income and consumption would lead to an increase in rural finance supply. In this regard, we've tried to alleviate this potential reverse causality problem by replacing the explanatory variable with the rural finance lagged one-period. The regression results show that the coefficients of rural finance lagged one-period remain insignificant, which provides an additional evidence for our conclusions (see Table 6).

Table 6 Regression results for rural finance lagged one-period

	(1) lrincome_rural	(2) lrconsmpt_rural
l.rural	0.000	0.000
	(.001)	(.001)
lrpgdp	.21***	.237**
	(.063)	(.097)
urban	.03***	.042***
	(.009)	(.009)
CPI	.031***	.011
	(.01)	(.011)
openness	-.003***	-.002*
	(.001)	(.001)
agri_support	-.007*	-.016*
	(.004)	(.008)
share_primary	.022	.008
	(.025)	(.016)
rgap		-.107
		(.12)
_cons	5.138***	3.794***
	(.915)	(1.264)
Observations	84	81
R-squared	.674	.779

Standard errors are in parentheses
*** *p<.01, ** p<.05, * p<.1*

7. Conclusions

This paper studies the effects of financial development on rural residents income and consumption levels. By distinguishing between traditional and emerging financial services, we attempt to extend the analysis of the existing literature. While traditional financial services focus on making profits for financial institutions, emerging financial services are designed to promote technological innovation, cultural development, environmental protection and rural development. We discover that, while traditional finance development has little impact on rural residents' income or consumption levels, the development of emerging financial services has a significant positive impact on rural residents' income and consumption levels. Financial support for technological innovation and cultural development, in particular, helps increase rural residents' income and consumption levels.

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Zongxin Qian reports financial support was provided by National Natural Science Foundation of China.

Biography

Zongxin Qian: Professor in School of Finance, Renmin University of China. Research Fields: Monetary Economics, International Finance, Asset Pricing and Macroeconomics.

Yonghong Tu: Professor in School of Finance, Renmin University of China. Research Fields: International Finance, Commercial Banks and Macroeconomics.

Zinan Zhou: Ph.D. graduate from School of Finance, Renmin University of China. Research Fields: International Finance.

References

Aghion, Philippe, and Patrick Bolton. 1997. "A trickle down theory of growth and development." *The Review of Economic Studies* 64 (2): 151–172.

Alshubiri, Faris. 2021. "Financial deepening indicators and income inequality of OECD and ASIAN countries." The *Journal of Economic Asymmetries*, 24: 1703-4949.

Barro, Robert J. 2000. "Inequality and growth in a panel of countries." *Journal of Economic Growth* 5: 5–32.

Beck, Thorsten, Asli Demirguc-Kunt, and Ross Levine. 2007. "Finance, inequality and the poor." *Journal of Economic Growth* 12: 27–49.

Benincasa Emanuela. 2021. "Climate policy and cross-border lending: evidence from the syndicated loan market." *Economic and Political Studies*, 9(4), pp. 463-476, 10.1080/20954816.2021.1976904.

Bourguignon, Francois and Thierry Verdier. 2000. "Oligarchy, democracy, inequality and growth." *Journal of Development Economics* 62: 285–313.

Chakraborty, Shankha, and Amartya Lahiri. 2007. "Costly intermediation and the poverty of nations." *International Economic Review* 48: 155–183.

Cui, Yanjuan, and Gang Sun. 2012. "Is financial development the cause of reduced poverty? -- Evidence from China." *Journal of Financial Research* 11: 116–127. (in Chinese)

Deininger, Klaus, and Lyn Squire. 1998. "New ways of looking at old Issues: inequality and growth." *Journal of Development Economics* 57: 259–287.

Ding, Zhiguo, Lingli Tan, and Jing Zhao. 2011. "Study on the effect of rural finance on poverty reduction." *Journal of Agricultural Economics* 11: 72–77. (in Chinese)

Duesenberry, James Stemble. 1949. *Income, saving and the theory of consumer behavior.* Cambridge: Harvard University Press.

Friedman, Milton. 1957. *A theory of the consumption function.* Princeton: Princeton University Press.

Giudici G, Paleari S. 2000. "The provision of finance to innovation: a survey conducted among Italian technology-based small firms." *Small Business Economics*, 14(1): 37-53.

Greenwald B, Stiglitz J E, Weiss A. 1984. "Informational imperfections in the capital market and macroeconomic fluctuations." *The American Economic Review*, 74(2): 194-199.

Greenwood, Jeremy, and Boyan Jovanovic. 1990. "Financial development, growth, and the distribution of income." *Journal of Political Economy* 98(5) Part 1.

Guo, Pei., Xiangping, Jia. 2009. "The structure and reform of rural finance in China." *China Agricultural Economic Review.*

Haber, Stephen, Armando Razo and Noel Maurer. 2003. *The politics of property rights: political instability, credible commitments and economic growth in Mexico.* University of Cambridge: Cambridge University Press.

Haber, Stephen. 2005. "Political institutions and financial development: evidence from the economic histories of Mexico and the United States." Stanford Center for International Development Working Paper, 268

Holden, Paul, and Vassili Prokopenko. 2001. "Financial development and poverty alleviation: Issues and policy implications for developing and transition countries." *IMF Working Paper* 01/160.

Huang, Yiping, and Zhuo Huang. 2018. "The development of digital finance in China: Present and future." *China Economic Quarterly* 17(04): 1489–1502. (in Chinese)

Inoue, Takeshi. 2018. "Financial development, remittances, and poverty reduction: Empirical evidence from a macroeconomic viewpoint." *Journal of Economics and Business*, 96: 59-68.

Jang Woo-Seok, Chang Woojin. 2008. "The impact of financial support system on technology innovation: A case of technology guarantee system in Korea." *Journal of Technology Management & Innovation*, 3(1): 10-16.

Keynes, John Maynard. 1936. *The general theory of employment, interest, and money.* Cambridge: Macmillan Cambridge University Press.

Kuznets, Simon. 1955. "Economic growth and income inequality." *The American Economic Review* 45(1): 1–28.

Levine, Ross, Norman Loayza, and Thorsten Beck. 2000. "Financial intermediation and growth: causality and causes." *Journal of Monetary Economics*, 46 (1): 31–77.

Lewis, Oscar. 1959. "Five families-Mexican case studies in the culture of poverty." New York: Basic Books Inc.

Li L. 2018. "Financial inclusion and poverty: The role of relative income." *China Economic Review*, 52: 165-191.

Li, R., Li, Q., Huang, S. and Zhu, X. 2013. "The credit rationing of Chinese rural households and its welfare loss: An investigation based on panel data." *China Economic Review*, *26*, 17-27.

Lin, Yifu. 2003. "Financial reform and rural economic development." *Shanghai Reform.* (in Chinese)

Liu, Yijun, Xuetao, Jin. and Tianchang, Zhang. 2021. "Did cultural finance policies improve financing efficiency of cultural corporates in China? based on the empirical analysis of listed companies in 2006–2018." In *Proceedings of the 4th International Conference on Economic Management and Green Development* (pp. 439-446). Springer, Singapore.

Lu, Susan Feng, and Yang Yao. 2009. "The effectiveness of law, financial development, and economic growth in an economy of financial repression: Evidence from China." *World Development*, 37(4): 763-777. (in Chinese)

Myers S C, Majluf N S. 1984. "Corporate financing and investment decisions when firms have information that investors do not have." *Journal of Financial Economics*, 13(2): 187-221.

Noh H J.2018. "Financial strategy to accelerate green growth". *ADBI Working Paper.*

Okyere-Kwakye, Eugene, and Md Nor, Khalil. 2021. "The intention of banks to adopt green banking in an emerging market: the employees' perspective." *Economic and Political Studies*, 9(4), 497–504. https://doi.org/10.1080/20954816.2021.1899621.

Peimani H. 2019. "Financial barriers for development of renewable and green energy projects in Asia." *Handbook of Green Finance*. Springer, Singapore: 15-34.

Rajan, Raghuram G, and Luigi Zingales. 2003. "The great reversals: the politics of financial development in the twentieth century." *Journal of Financial Economics*, 69 (1): 5–50.

Rewilak, Johan. 2017. "The role of financial development in poverty reduction." *Review of Development Finance*, 7(2): 169-176.

Sachs, J., Woo, W. T., Yoshino, N., & Taghizadeh-Hesary, F. 2019. "Handbook of green finance: energy security and sustainable development." *Singapore: Springer.*

Schoenmaker, Dirk, 2017, "Investing for the common good- a sustainable finance framework, Essays and Lectures." Bruegel, https://EconPapers.repec.org/RePEc:bre:esslec:21249.

Song, Jianbo, Haiqing Zhang, and Zihao Su. 2021. "Environmental subsidies and companies' environmental investments." *Economic and Political Studies*, 9(4), pp. 477-496, 10.1080/20954816.2020.1760764.

Sun, Yongqiang. 2012. "Research on financial development, urbanization and urban-rural income gap." *Journal of Financial Research* 04: 98–109. (in Chinese)

Taghizadeh-Hesary F, Yoshino N, Phoumin H. 2021. "Analyzing the characteristics of green bond markets to facilitate green finance in the post-COVID-19 world." *Sustainability*, 13(10): 5719.

TFFI Research Group of Renmin University of China. 2017. "Tianfu Financial Index Report 2017" (in Chinese) http://www.imi.ruc.edu.cn/cbw/yjbg/0b35d81aded84a9c8e50b695039e610e.htm

TFFI Research Group of Renmin University of China. 2018. "Tianfu Financial Index Report 2018" (in Chinese) http://www.imi.ruc.edu.cn/cbw/yjbg/6f64613d285b42c7a3d1808c640b155f.htm

TFFI Research Group of Renmin University of China. 2019. "Tianfu Financial Index Report 2019" (in Chinese) http://www.imi.ruc.edu.cn/cbw/yjbg/3d8101f5de5c4b96991d4e612a2b10ae.htm

TFFI Research Group of Renmin University of China. 2020. "Tianfu Financial Index Report 2020" (in Chinese) http://www.imi.ruc.edu.cn/cbw/yjbg/cd1e9b15498e4d59b890882b78d07198.htm

Tian, X., Wu, M., Ma, L. and Wang, N. 2020. "Rural finance, scale management and rural industrial integration." *China Agricultural Economic Review*.

Townsend, Robert M., and Kenichi Ueda. 2006. "Financial deepening, inequality, and growth: A model-based quantitative evaluation" *The Review of Economic Studie*s, 73(1): 251–293.

Uddin, Gazi Salah, Muhammad Shahbaz, Mohamed Arouri, and Frédéric Teulon. 2014. "Financial development and poverty reduction nexus: A cointegration and causality analysis in Bangladesh." *Economic Modelling*, 36: 405-412.

Wang, Fang. 2005. "The financial demands and financial system in China: A theoretical analysis." *Journal of Financial Research* 04: 89–98. (in Chinese)

Wen, Tao, Guanghe Ran, and Deping Xiong. 2005. "Financial development and farmers' income growth in China." *Economic Research Journal* 09: 30–43. (in Chinese)

Xu, Chongzheng, and Xiwu Gao. 2005. "An empirical analysis of rural finance supporting farmers' income." *Journal of Financial Research* 09: 173–185. (in Chinese)

Ye, Zhiqiang, Xiding Chem, and Shunming Zhang. 2011. "Can financial development narrow the urban-rural income gap? An evidence from China." *Journal of Financial Research* 02: 42–56. (in Chinese)

Yeung G, He C, Zhang P. 2017. "Rural banking in China: geographically accessible but still financially excluded?" Regional Studies, 51(2): 297-312.

Yu Xinping, Jingbai Xiong, and Deping Ziong. 2010. "Rural finance development and farmers' income growth in China." *Chinese Rural Economy* 06: 77–86. (in Chinese)

Zhao C, Wu Y, Guo J. 2022. "Mobile payment and Chinese rural household consumption." *China Economic Review*, 71: 101719.

Financial Development, Financial Instability, and Fiscal Policy Volatility:

International Evidence *

By MA YONG AND LV LIN *

Abstract

This paper investigates the effects of financial development and financial instability on fiscal policy volatility using system GMM estimator based on panel data of 96 countries from 1990 to 2019. We find that higher levels of financial development are associated with lower fiscal policy volatility, but an increase in financial instability would lead to greater volatility in fiscal policy. We also find that the harmful effect of financial instability on fiscal policy conduct would be alleviated in the normal phase of the financial cycle but would be magnified during expansionary, recessionary and crisis periods. This paper extends the existing literature by highlighting the role of finance in fiscal policy volatility, where a large and stable financial system is conducive to the smooth conduct of fiscal policy.

---

1. Introduction

Despite the emerging literature on the economic, political and institutional determinants of fiscal policy volatility, few, if any, have discussed the potential role of financial factors such as financial development, financial instability and financial cycles in affecting fiscal policy volatility. However, the conduct of fiscal policy is surely related to financial factors and there are various channels through which finance may influence fiscal policy behavior. For example, fiscal deficits need to be financed by financial resources, whose availability largely depends on the level of financial development. Another example is the impact of financial cycle. Typically, during the upward phase of the financial cycle, we can see an expansion of the business cycle, which is usually accompanied by increased government revenue and expenditures. In contrast, during the downward phase of the financial cycle, especially in times of financial instability, the business cycle enters into a phase of uncertainty, which usually leads to an increase in fiscal policy volatility.

Given the lack of studies on the role of finance in fiscal policy volatility, this paper attempts to partially fill in this gap by examining the impact of financial development, financial instability and financial cycle on fiscal policy volatility using a large dataset covering around 96 countries over the period 1990–2019. This paper contributes to the existing literature in the following aspects:

First, in contrast to the majority of the literature that focuses primarily on the economic and institutional determinants of fiscal policy volatility, our paper highlights the important role of finance in determining fiscal policy volatility. In particular, we have identified two main channels that finance may play a role in affecting fiscal policy volatility: (i) financial development channel; and (ii) financial instability channel. While the first channel has a smoothing effect on fiscal policy volatility, the latter channel has the opposite effect. These results imply that a large and stable financial system is conducive to the smooth conduct of fiscal policy. This conclusion is proved to be valid across various robustness checks. Besides the impact of financial development and financial instability, we also find that economic growth, inflation rate, public debt, fiscal crisis, banking crisis, population, trade openness, financial openness, and IMF-supported programs are also important determinants of fiscal policy volatility. These findings add new evidences to the previous literature on the various determinants of fiscal policy volatility (e.g., Agnello and Souza, 2014; Cevik and Teksoz, 2014).

Second, by examining the interaction effects of financial development and financial instability on fiscal policy volatility, we find that the volatility effect of financial instability on fiscal policy decreases at higher levels of financial development. This means that, as a country becomes more financially developed, the magnifying effect of financial instability on fiscal policy volatility would be smaller. Moreover, by comparing the behavior of government revenue with that of government spending, we find that the marginal effect of financial development on reducing the impact of financial instability on government revenue is more pronounced than that on government spending, suggesting that government revenue policy may benefit more from a large and well-developed financial system in that the policy behavior of government revenue would be better stabilized than that of government spending at higher levels of financial development. These results cast interesting new insights into the recent burgeoning literature on the two-way inter-connections between finance and fiscal policies (Bénétrix and Lane, 2010; Lane, 2011; Obstfeld, 2013; Aghion et al., 2014; Yépez, 2018).

Third, our estimation strategy differs from the previous literature in that we do not use non-overlapping multi-year averages of the proxy variables as our main estimation strategy. In the previous studies on financial macroeconomics, data are usually averaged over 3-year non-overlapping periods to smooth out the cyclical effects of the variables before estimation. The main problem with this method is that non-overlapping time-averaged variables are typically not valid instruments when the reverse-causation problem arises due to time-aggregation, as argued by Ahmed (1998). Moreover, there are two additional reasons why we do not use non-overlapping averages as our main estimation strategy. First, the use of non-overlapping multi-year averages will suffer a significant loss of observations that can be used for estimation, and some important information contained in the time variations of the data will have to be disregarded, both of which will impair the identification of parameters in the estimation. Second, to have a deep understanding of the effects of finance on fiscal policy volatility, not only the long-term effects are worth investigating, but also its short-term effects. However, the use of non-overlapping multi-year averages inevitably ignores the latter. Thus, in this paper we use rolling averages as our main estimation strategy. Nevertheless, the results with non-overlapping averages are also reported as a robustness check.

Fourth, we explore the medium- and long- term effects of financial development and financial instability using the method of local projection. We find that the effects of financial development and financial instability on fiscal policy volatility is enhanced in the medium term but weakened in the long term. In particular, the results from the local projection method show that financial development and financial instability exhibit the strongest effects on fiscal policy volatility in the second or third year after a shock is realized. When the amplifying effects become the strongest, the volatility of government revenue, budget balance and government spending would grow by 0.4%, 0.3% and 0.2%, respectively.

Fifth, we find that the effect of financial instability on fiscal policy volatility also depends on financial cycle, where the harmful effect of financial instability on fiscal policy conduct would be alleviated in the normal phase of the financial cycle, but would be further magnified during expansionary, recessionary and crisis periods. These results suggest that, on the one hand, policymakers should be extremely careful about the instability effect of financial bubble, financial bust and financial crisis on fiscal policy conduct; on the other hand, policymakers may enjoy a more discretionary conduct of fiscal policy when the financial cycle is in the normal phase. Overall, these findings provide interesting new insights into recent literature on the role of financial cycle in affecting fiscal and macroeconomic outcomes (e.g., Borio, 2014; Bénétrix and Lane, 2017) and how fiscal policy should be conducted in different economic and financial conditions (e.g., Hutchison et al., 2010; DeLong and Summers, 2012; Fetai, 2013; Ferraresi et al., 2015; Leeper et al., 2017).

Finally, we investigate the transmission channel through which financial development and financial instability affect fiscal policy volatility. We find that on the one hand, a more market-based financial system tends to have higher financial development and lower financial instability (greater financial stability); on the other hand, fiscal policy exhibits lower volatility in a more market-based financial system. These results suggest that financial development and financial stability contribute to a smoother conduct of fiscal policy by promoting financial marketization.

The rest of the paper is organized as follows. Section 2 gives a brief introduction of the data and variables. Section 3 discusses the model and estimation strategy. Section 4 reports the baseline result and conducts robustness checks. Section 5 provides some further discussions. The final section concludes and discusses some policy implications.

2. Data and variables

Our dataset is composed of annual cross-country data from 96 countries for the period 1990 to 2019, including 39 high income and 57 low and middle income. A detailed list of the countries included in our analysis is provided in Table A1 in the Appendix. The choice of our sample is due to data availability. Unless indicated otherwise, all macroeconomic data are sourced from the World Bank's *World Development Indicators* (WDI) and the IMF's *International Financial Statistics* (IFS). For institutional variables, the main sources are the Cross National Time Series Data Archive (CNTS), the Database of Political Institutions (DPI), and the Polity IV dataset. A detailed description of the data sources is presented in Table A2 in the Appendix. In what follows, we briefly discuss the specific variables used as proxies in the regression analysis.

2.1. Fiscal policy volatility

The traditional approach to measuring fiscal policy volatility is calculating the multi-year standard deviation of a fiscal policy variable such as budget balance, government revenue, or government spending. This approach, however, is frequently criticized by economists for that it does not isolate the exogenous components of fiscal policy changes. To distinguish fiscal policy volatility from adaptability to sudden changes of economic conditions, we follow the previous literature (e.g., Woo, 2011; Agnello and Souza, 2014; Cevik and Teksoz, 2014) and extract the discretionary component of fiscal policy by estimating fiscal policy rules for each country. Specifically, to construct measures of discretionary fiscal policy, we estimate the following equation for each country in our sample:

$$F_t = c + \alpha_1 F_{t-1} + \alpha_2 GAP_t + \alpha_3 Z + \xi_t^F \tag{1}$$

where F_t denotes the fiscal policy variable; GAP_t denotes output gap; Z_t is a set of controls including a time trend, inflation and its squared term; c is a constant; and ξ_t^F denotes the discretionary

component of fiscal policy. According to Eq. (1), fiscal policy can be decomposed into three components: persistence, discretion, and volatility. Excluding discretion and persistence, the remaining residual (ξ_t^F) corresponds to the fiscal policy volatility. As for the fiscal policy variable, we employ three frequently used proxies, including government budget balance/GDP, government revenue/GDP, and government spending/GDP.

We estimate Eq. (1) by using ordinary least squares method. After obtaining the discretionary component of fiscal policy (ξ_t^F) implied by Eq. (1), we get rid of the time-varying trend in the residuals using Hodrick-Prescott (HP) filter, and define fiscal policy volatility as the standard deviation of the HP-detrended cyclical value of the residual (ξ_t^F) for consecutive, overlapping, three-year periods, from 1990 to 2019. Then the country-specific volatility of the cyclical component, denoted by $Vol_{i,t}^F$, can be interpreted as a quantitative estimate of the fiscal policy volatility for a given period, as in Fatas and Mihov (2006).

2.2. Financial development and financial instability

There are two frequently used measures of financial development in the literature. The first one is private sector credit to GDP ratio (denoted by *Financial development*), which refers to the ratio to GDP of the credit provided to the private sector by banks and other financial institutions, excluding credit issued to the public sector. Another one is the M2 to GDP ratio (denoted by *M2*), which refers to the ratio of broad money (money and quasi money) to GDP. According to Levine et al. (2000) and Beck et al. (2000), compared with the M2 to GDP ratio, the private sector credit to GDP ratio is a more appropriate measure of financial development, because it measures the most important activity of the financial sector and has a significant impact on the economy. Therefore, we use the private sector credit to GDP ratio as our main measure of financial development in this paper.

To measure financial instability, the traditional approach is to calculate the standard deviation of the financial development variable considered. This approach has the benefit of being easily computable, but it also neglects the persistence and trend inherent in the evolution of the financial development variable. Another approach is the flexible approach suggested by Guillaumont-Jeanneney and Kpodar (2011), where financial instability is defined as the volatility of the residuals obtained by the following regression for each country:

$$FD_t = \theta_1 + \theta_2 FD_{t-1} + \theta_3 T_t + \xi_t^{FD} \tag{2}$$

where FD_t denotes the financial development variable considered (i.e., private sector credit to GDP ratio), T_t is a time trend, and ξ_t^{FD} is the residual. As in Guillaumont-Jeanneney and Kpodar (2011), Eq. (2) is estimated using ordinary least squares method. Then, similar to the calculation of the fiscal policy volatility, financial instability (denoted by *Financial instability*) is defined as the standard deviation of the HP-detrended cyclical component of the residuals (ξ_t^{FD}) for consecutive, overlapping, three-year periods from 1990 to 2019.

As one can see, the second approach would be superior to the traditional one in that it excludes the persistence and trend of the financial development variable from the calculation of financial instability and thereby reduces the "noises" associated with the financial instability indicator. For this reason, throughout the paper we shall use the indicator obtained by the second approach as our main measure of financial instability. As for the indicator obtained by the first approach, it will be used as an alternative proxy for financial instability in the robustness analysis.

2.3. Control variables

Following the previous literature (e.g., Fatas and Mihov, 2003, 2006; Agnello and Souza, 2014; Cevik and Teksoz, 2014; Furceri et al., 2016), we include a variety of control variables that are likely to have an impact on fiscal policy volatility. First, we use two frequently cited variables, i.e., GDP growth rate (*Growth*) and inflation rate (*Inflation*), to control for the general macroeconomic conditions of an economy. Second, we control for public debt ratio (*Public debt*) and fiscal crisis (*Fiscal crisis*), of which the first is calculated as the ratio of government debt to GDP, while the latter is a dummy variable which equals to 1 if a country

experiences a fiscal crisis. Similarly, we also control for banking crisis (*Banking crisis*), which is a dummy variable that takes the value of 1 if a country experiences a banking crisis for a given year. Third, we control for the effect of country size using the logarithm of total population (*Population*). Fourth, we include trade openness (*Trade openness*) and financial openness (*Financial openness*) to control for a country's exposure to external real-sector and financial shocks. As is common in the literature, trade openness is measured by the ratio of exports plus imports to GDP, while financial openness is proxied by the KAOPEN index (also known as "Ito-Chinn index") developed and updated by Chinn and Ito (2006). Finally, as some studies documented that an IMF-supported program tends to reduce fiscal policy volatility (e.g., Cevik and Teksoz, 2014; Papi et al., 2015; Balima and Sy, 2021), we also include a dummy variable (*IMF program*) that takes the value of 1 if a country implements an IMF-supported program for a given year. In addition to these commonly used controls, in the robustness test (see Section 4.2.6), we further control for government institutions, political stability and demographic characteristics by including additional control variables such as polity scale (*Polity scale*), government crisis (*Government crisis*), cabinet changes (*Cabinet changes*), political constraints (*Political constraint*), political system (*Political system*), and old-age dependency ratio (*Age dependency)*. A more detailed explanation of the variables is presented in Table A2 in the Appendix. Table 1 reports the summary statistics of the data.

Table 1 Descriptive statistics

Variable	Mean	Min	Max	Std. Dev.	Obs
Budget balance	2.179	-6.855	11.321	4.009	2841
Government revenue	27.782	2.764	65.537	12.781	2845
Government spending	29.880	7.096	67.128	12.576	2843
Output gap	-0.005	-3.030	2.970	1.296	2871
Budget balance volatility	1.390	0.026	3.877	1.048	2544
Government revenue volatility	1.262	0.010	3.585	1.016	2548
Government spending volatility	1.476	0.010	4.185	1.148	2546
Financial development	3.555	0.574	5.133	0.982	2827
Financial instability	2.319	0.002	6.533	1.866	2539
Financial volatility	2.719	0.000	8.032	2.272	2636
Growth	3.607	-4.534	11.845	3.459	2866
Inflation	5.853	-9.419	19.848	6.459	2862
Squared inflation	56.891	0.000	208.357	74.707	2862
Public debt	3.859	2.250	5.571	0.683	2828
Fiscal crisis	0.295	0	1	0.456	2880
Banking crisis	0.098	0	1	0.298	2688
Population	15.920	11.043	21.065	1.998	2880
Trade openness	4.246	2.886	5.596	0.537	2833
Financial openness	0.311	-1.924	2.322	1.573	2823
IMF program	0.286	0	1	0.452	2880
Policy scale	4.029	-10	10	6.430	2524
Government crisis	0.134	0	5	0.410	2878
Cabinet changes	0.420	0	5	0.566	2866
Political constraints	0.115	0	1	0.262	2791
Political system	0.846	0	2	0.960	2819
Age dependency	2.261	0.212	3.523	0.642	2880
Expansion	0.233	0	1	0.423	2827

Recession	0.224	0	1	0.417	2827
Normal	0.544	0	1	0.498	2827

To minimize the influence of outliers on estimation results, all quantitative variables are winsorized based on the interquartile range (i.e., IQR)[1] since most of their distributions are either left-skewed or right-skewed (Verardi and Vermandele, 2018). Meanwhile, we take the logarithm of the private sector credit to GDP ratio, public debt ratio, population, trade openness and age dependency to further eliminate outliers. In summary statistics, the underlying variables for which the volatility of fiscal policy is computed include the ratios of budget balance to GDP, government revenue to GDP, government spending to GDP, output gap and inflation as well as its squared term. The average of budget balance is 2.179%, signifying that most countries in the sample have fiscal surpluses. The ratios of government revenue to GDP and government spending to GDP average at 27.782% with a standard deviation of 12.781% and 29.880% with a standard deviation of 12.576%, respectively. The mean of the output gap is negative, implying a relatively low economic growth for most countries over the observation period. As for the dependent variables, the descriptive statistics show that the variables denoting fiscal policy volatility exhibit similar distributions, with their means between 1.2 and 1.5 and their standard deviations around 1. Turning to financial variables, the mean of financial development is 3.555, smaller than the average level of financial development in advanced economies (4.534) and emerging economies (3.763), indicating that less developed countries tend to have less developed financial systems.

As for control variables, the distributions of the public debt ratio, population, trade openness and age dependency are more concentrated, with standard deviations less than 1 after excluding extreme values. The minimums of GDP growth and inflation are less than 0, indicating that some countries in the sample had experienced an economic recession. The maximums of GDP growth (11.845%) and inflation (19.848%) also indicate that some countries in the sample might have gone through an economic expansion. Fiscal crisis is more frequent than banking crisis since the mean of fiscal crisis is greater than that of banking crisis. Similarly, we can tell from the mean of IMF program that the IMF-supported programs are conducted infrequently. The averaged polity scale is greater than 0, which is closer to the maximum value, implying that most sample countries are more inclined to democracy. The means of the government crisis, cabinet change and political constraint are nearer to their minimum values, suggesting that governments in most countries are stable over the sample period. The policy system is averaged at 0.846, which means that most countries abide by an assembly-elected presidential system. Finally, the means of financial expansion, recession and normality reflect that the sample countries have experienced financial bust and boom, but for the most of time financial markets have stayed within the normal ranges.

A safe-haven asset tends to hold its value if stock markets experience extreme negative returns (Baur and McDermott, 2010). Safe-haven currencies are those that give hedging benefits in times of financial market volatility or financial distress (Habib and Stracca, 2012). Conventionally, the US dollar (USD), the Swiss franc (CHF), and the Japanese yen (JPY) have been safe-haven currencies.[2] Some market participants have argued that the renminbi (RMB), the Chinese currency, joined the group of safe-haven currencies after it was included in the Special Drawing Rights (SDR) basket as a global reserve currency in 2016, with the other components of the SDR being traditional safe-haven currencies (Aizenman et al., 2020). Although the RMB did indeed hold its value against the US dollar during the 2008 financial crisis, others dispute the RMB's status as a safe haven and assert that the RMB will not become a safe-haven currency until Chinese economic and broader institutional reforms are implemented because the RMB is not sufficiently liquid and not readily convertible. This paper investigates the role of the RMB as a safe-haven currency in the face of financial stress.

The most intuitive approach to evaluating the hedging benefits of currencies is based on the correlation (or covariance) between equity and currency markets (Dumas and Solnik, 1995; De Santis and Gerard, 1998). From this perspective, investors use foreign currencies to minimise the risk of a diversified portfolio and long those currencies that are more negatively correlated with international equity portfolio returns to minimise the

---

[1] Define r_p25 and r_p75 as the 25th and 75th percentiles respectively, and the upper adjacent value is calculated by r_p75+1.5*(r_p75- r_p25), while the lower adjacent value is computed as r_p25-1.5*(r_p75- r_p25).

[2] Conventional wisdom holds that "When foreign exchange investors felt panicky, they head to, or back to, old faithfuls: the Swiss franc, the US dollar and the Japanese yen." See "Dollar Stands Out as Safe Haven Currency", Wall Street Journal, December 9th, 2011.

overall portfolio volatility. Campbell et al. (2010) show that the US dollar, the euro, and the Swiss franc move against the international equity market. Thus, these currencies should be attractive to risk-minimising global equity investors despite their low average returns. However, there are two main limitations associated with the correlation approach. On the one hand, the correlation cannot capture the nonlinear response of a safe-haven currency to an extreme shock (Habib and Stracca, 2012; Fatum and Yamamoto, 2016; Fatum et al., 2017). On the other hand, the hedging benefits of the currency might not be fully captured by the correlation approach, as investors typically go beyond the mean-variance preference when they flee to safety (Chan et al., 2018).

By dealing with the above shortcomings, we attempt to contribute to the safe-haven currency literature as follows. First, we use a regime-switching approach, a nonlinear method, to derive currency coskewness and cokurtosis and measure the nonlinear response of safe-haven currencies to a global stock market shock. In the literature, Baur and McDermott (2010) provide an intuitive method to study whether gold is a safe haven with dummies measuring extreme downturns in the global stock market at different scales using a linear model. Following Baur and McDermott (2010), Ming et al. (2020) study whether gold is a safe haven against extreme downturns in the Chinese stock market, and Baur and Smales (2020) show that precious metals are ideal safe havens against uncertainty measured by geopolitical risk. Similarly, Habib and Stracca (2012) and Habib et al. (2020) investigate the drivers of safe-haven currency behaviour using a linear model and treat the VIX as the measure of market uncertainty.

Unlike the above linear models, Chan et al. (2018) measure a currency's hedging capacity with its coskewness with the global stock market (the covariance between the currency premium and equity volatility) using a multivariate regime-switching approach, which can better capture the joint distribution of asset returns empirically and theoretically (Ang and Bekaert, 2002; Guidolin and Timmermann, 2008; Branch and Evans, 2010) and situate the time-varying beta method within the literature (Christiansen et al., 2011). We extend this approach to derive not only currency conditional coskewness but also cokurtosis, which refers to the stable performance of a currency (as measured by currency return) during times of financial stress (as measured by stock market volatility or skewness). Our time-varying coskewness and cokurtosis may contain more information in integrated global asset markets since they are driven by the joint distribution of currency and equity returns. Additionally, they are more intuitive than other measures based on extreme value theory and copulas as well as other (nonlinear) comovements used in the recent literature. Intuitively, a higher and positive currency coskewness means that when stock volatility increases, the currency risk premium also increases. Similarly, a lower and negative currency cokurtosis means that when the stock market has a higher possibility to crash, the currency risk premium tends to be higher. In contrast, Bekiros et al. (2017) study the nonlinear relationship between an asset and stock market using continuous wavelet approach and copula models, which are pure econometric models and less intuitive. Moreover, regime-switching-based estimates are typically determined with considerably more accuracy than estimates of the higher moments obtained directly from realised returns (Guidolin and Timmermann, 2008).

Second, currency conditional coskewness and cokurtosis have a strong economic foundation in the skewness and kurtosis preference of investors who consider the capacity of a currency to hedge volatility and crashes in the global stock market. The skewness and kurtosis preference are based on "prudence"[3] (e.g., Kimball, 1990) and "temperance" (e.g., Denuit and Eeckhoudt, 2010), respectively, signifying that investors desire higher (positive) skewness and lower (negative) kurtosis (Rubinstein, 1973; Kraus and Litzenberger, 1983). An investor examines an asset's contribution to the skewness and kurtosis of a broadly diversified portfolio, referred to as coskewness and cokurtosis of that asset with the portfolio. The literature has provided supportive empirical evidence that coskewness and cokurtosis on stock, bond, and option markets are significant in determining expected returns (e.g., Harvey and Siddque, 2000; Dittmar, 2002; Vanden, 2006; Guidolin and Timmermann, 2008; Yang et al., 2010). In contrast, crash risk, captured by currency (idiosyncratic) skewness (Brunnermeier et al., 2008; Burnside et al., 2010) and the global foreign exchange volatility factor (Menkhoff et al., 2012), is not informative about the hedging properties of currencies from a broadly diversified portfolio point of view. Although the currency covariance with global equity volatility in Lustig et al. (2011) is conceptually similar to currency coskewness, we propose time-varying currency coskewness and cokurtosis,

---

[3] Prudence suggests a precautionary saving motive, the propensity to prepare and safeguard oneself in the face of uncertainty. It is in contrast to risk aversion, which is how much one dislikes uncertainty and turns away from uncertainty if possible.

which are essentially risk factors. Chan et al. (2018) evaluate the hedging benefits of currency coskewness but not cokurtosis. In a recent paper, Opie and Riddiough (2020) find that currency returns are predictable, accounting for their hedge capacity against global factor returns from a broadly diversified portfolio point of view, but their research is conducted under a mean and variance framework.

Third, we evaluate the hedging capacity of onshore and offshore RMB using currency coskewness and cokurtosis and compare it with this capacity of the Japanese yen. On one hand, Japanese yen is found to be the safest currency (Fatum and Yamamoto, 2016) and possesses desirable hedging benefits in times of financial market volatility (Chan et al., 2018). On the other hand, though offshore RMB (CNH) is much less regulated and is de facto fully convertible because it is freely traded outside of mainland China, Fatum et al. (2017) find no evidence to suggest that offshore RMB is a safe haven. Similarly, we find that onshore RMB (CNY) has positive coskewness with the global equity market in some periods, while offshore RMB (CNH) has positive coskewness with the emerging stock market. The patterns imply that the CNY can only hedge against global stock market volatility to some extent, while the CNH can only hedge against emerging stock market volatility. In contrast, the JPY has positive coskewness in all periods with a larger scale and is a better hedge in a volatile market, as it appreciates when equity volatility increases. Moreover, the cokurtosis of both onshore and offshore RMB with the equity market is positive, and thus neither can hedge against a stock market crash. In contrast, JPY cokurtosis is negative, suggesting even higher hedging effectiveness during a stock market crash.

Furthermore, we investigate whether the features of a currency as a safe haven are priced in its future excess return using predictive regressions. In general, we find that RMB coskewness with stock markets is not priced in the RMB's future excess return. In contrast, the counterpart of the JPY is priced, suggesting that prudent equity investors use the JPY rather than the RMB to hedge against global stock market volatility. Moreover, the conditional cokurtosis of the RMB and JPY with the equity market does not command a statisticallyor economically significant ex ante risk premium with the expected positive sign. By implication, temperate investors use neither the RMB nor the JPY to hedge against global stock market crashes. On the whole, the RMB is not yet a safe-haven currency, while the JPY exhibits the safe-haven property to some degree. These results are robust after controlling for currency beta (Lustig et al., 2014；Verdelhan, 2018), volatility factors (Lustig et al., 2011; Menkhoff et al., 2012), and crash risk (Brunnermeier et al., 2008; Burnside et al., 2010). For a further robustness check, we use the more intuitive method of Baur and McDermott (2010) and find similar results.

The rest of the paper is organised as follows. Section 2 describes the data and gives a preliminary analysis. Section 3 discusses the regime-switching models and derives their conditional moments. Section 4 presents the empirical results, and Section 5 checks the robustness of the main results. Section 6 concludes and offers final remarks.

3. Model and estimation strategy
3.1. Econometric model
To investigate the effects of financial development and financial stability on fiscal policy volatility, we estimate the following dynamic panel data model:

$$Vol_{i,t}^F = c + \beta_1 Vol_{i,t-1}^F + \beta_2 Finance_{i,t} + \beta_3 Instability_{i,t} + \gamma Z_{i,t} + \upsilon_i + \eta_t + \varepsilon_{i,t} \tag{3}$$

where $Vol_{i,t}^F$ denotes fiscal policy volatility; $Finance_{i,t}$ denotes financial development; $Instability_{i,t}$ denotes financial instability; $Z_{i,t}$ denotes a set of control variables; υ_i and η_t are the unobservable country- and time-specific effects, respectively; and $\varepsilon_{i,t}$ is the stochastic error term.

3.2. Estimation strategy
To estimate the model given by Eq. (3), two major issues should be taken into account: the inclusion of the unobserved country-specific effects and the possibility that the model contains endogenous variables. The standard approach to estimating such a dynamic panel model with country-specific effects and endogenous variables is the generalized method of moments (GMM) estimator. There are two types of GMM estimators: the difference GMM estimator and the system GMM estimator. The first-differenced GMM estimator introduced by Arellano and Bond (1991) uses the following moments:

$$E[(\varepsilon_{i,t} - \varepsilon_{i,t-1})\Omega_{i,t-j}] = 0, \quad j \geq 2 \tag{4}$$

where $\Omega_{i,t-j}$ denotes a set of lagged explanatory variables used as instruments for the first-differenced equation. Besides the moment conditions given by Eq. (4), Arellano and Bover (1995) and Blundell and Bond (1998) propose to use additional moments, where the lagged first differences of the variables are used as instruments for the level equation:

$$E[\varepsilon_{i,t}\Delta\Omega_{i,t-j}] = 0, \quad j \geq 1 \tag{5}$$

When both the moment conditions in (4) and (5) are used in estimation, it leads to a system GMM estimator with more efficient estimates, as shown by Arellano and Bover (1995) and Blundell and Bond (1998). Therefore, throughout the paper we will use the system GMM estimator as our main estimation strategy.

A potential problem with the GMM estimator is that, when a large number of instruments are available, numerous instruments can overfit endogenous variables and make the test for instrument validity misleading. To address this problem, we present results with a collapsed instrument matrix and ensure that the number of instruments used always stays substantially below the cross-section size of the panel, a criterion suggested by Roodman (2009) to avoid the problem of overfitting. We also use the finite sample corrected standard errors proposed in Windmeijer (2005).

Finally, to ensure the validity of the estimation results, two standard specification tests are employed: (1) Sargan test, which tests the overall validity of the instruments with the null hypothesis that all of the instruments are valid; (2) AR(2) test, which tests the second-order serial correlation of the error term with the null hypothesis that the error term is not serially correlated; (3) Wald Chi2 test or F test, which test the overall validity of the model with the null hypothesis that all coefficients are zero. To ensure adequate model specification, both the null hypotheses of the first two tests should not be rejected and the null hypothesis of the last one test should be rejected.

4. Empirical results
4.1. Baseline results

Our baseline regression results are reported in Table 2, where three fiscal policy volatility variables (i.e., budget balance volatility, government revenue volatility, and government spending volatility) are used as dependent variables and the private sector credit (% of GDP) is used as the proxy for financial development. Financial instability is defined as the standard deviation of the HP-detrended residuals obtained from estimating the model given by Eq. (2). Given the potential correlation between financial development and financial instability, we first incorporate financial development and financial instability separately into Eq. (3) as the major explanatory variable and then include the two variables simultaneously to see if the correlation would affect the results. All models in Table 2 are estimated by the system GMM method. The specification tests indicate that all models in Table 2 are well specified. Specifically, both the null hypotheses of the Sargan test and the AR(2) test cannot be rejected in all models, indicating that our instruments are valid and there is no second-order serial correlation in the estimation. The null hypothesis of the Wald Chi2 test is rejected, meaning that the regression is significant.

Table 2 Financial instability and fiscal policy volatility: baseline results

Independent variables	Dependent variable								
	Budget balance volatility			Government revenue volatility			Government spending volatility		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lagged dep.var.	0.757***	0.568***	0.737***	0.536***	0.689***	0.519***	0.788***	0.682***	0.705***
	(14.081)	(9.706)	(16.247)	(9.659)	(7.904)	(9.602)	(9.722)	(6.887)	(14.117)
Financial development	-1.538***		-1.534***	-1.180***		-1.235***	-0.844**		-0.809***
	(-2.821)		(-3.345)	(-2.840)		(-2.964)	(-2.067)		(-2.695)
Financial instability		0.045**	0.072**		0.055**	0.046***		0.075*	0.065**
		(2.240)	(2.156)		(2.057)	(2.626)		(1.782)	(2.148)
Growth	-0.128	0.014	-0.185**	-0.020	-0.016	-0.016	-0.305	-0.014	-0.082
	(-1.163)	(0.236)	(-2.203)	(-1.573)	(-0.889)	(-1.264)	(-1.562)	(-0.716)	(-1.251)
Inflation	0.005	0.022	-0.008	-0.026	0.069	-0.040	-0.122	-0.098	-0.003
	(0.384)	(0.696)	(-0.931)	(-0.832)	(1.243)	(-1.379)	(-1.360)	(-0.714)	(-0.332)
Public debt	-0.749*	0.760	-0.972***	-0.760**	0.712	-0.770**	-0.219	0.979	0.346
	(-1.870)	(1.605)	(-2.744)	(-2.155)	(1.049)	(-2.231)	(-0.597)	(0.912)	(1.375)
Fiscal crisis	1.303***	0.176	0.860**	1.170*	-1.232	1.090*	-0.487	-0.320	0.801
	(2.695)	(0.849)	(2.284)	(1.801)	(-0.859)	(1.785)	(-0.202)	(-0.658)	(1.188)
Banking crisis	-0.184	0.481**	-0.136	-0.993**	-1.347	-0.618	-1.207	0.366	-0.083
	(-0.339)	(1.969)	(-0.318)	(-2.160)	(-1.085)	(-1.454)	(-1.157)	(0.204)	(-0.139)
Population	-0.086	-1.551***	0.075	-0.481*	-1.552**	-0.561**	-0.529	-3.829*	-0.175
	(-0.261)	(-3.152)	(0.247)	(-1.934)	(-2.266)	(-2.476)	(-1.108)	(-1.762)	(-1.013)
Trade openness	-1.132	-5.774***	1.133	-1.352*	-4.900***	-1.188*	-4.840**	-6.143	-3.735**
	(-0.780)	(-3.647)	(1.126)	(-1.959)	(-2.860)	(-1.767)	(-2.127)	(-0.913)	(-2.436)
Financial openness	0.396*	-0.026	0.401**	0.203	0.550	0.160	0.189	0.344	-0.262
	(1.847)	(-0.274)	(2.127)	(0.720)	(1.038)	(0.790)	(0.352)	(0.379)	(-1.414)
IMF program	-3.968***	-0.280	-2.903***	-0.458	1.378	-0.531*	0.344	1.656	-2.844***
	(-2.927)	(-0.320)	(-2.683)	(-1.379)	(0.970)	(-1.666)	(0.325)	(0.711)	(-3.272)
Constant	15.672*	46.667***	4.629	20.928***	42.291***	21.742***	35.999**	84.031	21.651***
	(1.751)	(3.676)	(0.631)	(2.701)	(2.854)	(2.985)	(2.310)	(1.491)	(2.783)
Time fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR(2)	0.120	0.562	0.350	0.176	0.285	0.227	0.436	0.188	0.634
Sargan	0.743	0.146	0.456	0.197	0.114	0.149	0.797	0.732	0.254
Prob(Wald Chi2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Instruments	41	51	48	47	42	50	39	38	54
Observations	2167	2164	2164	2170	2167	2167	2169	2166	2166
Countries	96	96	96	96	96	96	96	96	96

Notes: (1) *,**,*** indicate statistically significant at the 10%, 5% and 1% level respectively; (2) The statistics given in the parentheses under the coefficients of explanatory variables are Z-values; (3) The statistics in the AR(2), Sagan and Wald tests are *p*-values.

Let us start with the effects of financial development and financial instability on budget balance volatility, as shown by models (1)-(3) in Table 2. From models (1)-(3) we can see that the coefficient of financial development is significantly negative at the 1% significance level, suggesting that higher financial development is associated with lower budget balance volatility. The coefficient of financial development in model (3) indicates that budget balance volatility would decrease by 1.534%, ceteris paribus, as the logarithm of private sector credit to GDP rises 1%. There are many reasons that have been documented in the existing literature to explain the correlation between financial development and fiscal policy volatility. The most intuitive one is that financial development releases financing constraint for the real economy, which fosters economic growth and fiscal policy stability (e.g., Gruss et al., 2020; Osei and Kim, 2020; Jalles, 2021; Mawejje and Odhiambo, 2022; Afonso and Carvalho, 2022). In contrast, the coefficient of financial instability is positive and statistically significant at the 5% significance level, which suggests that greater financial instability would lead to an increase in budget balance volatility. The coefficient of financial instability is estimated to be 0.072, meaning that all else being equal, a 1% increase in financial instability would result in an increase of 0.072% in budget balance volatility.

Models (4)-(9) in Table 2 report results of the repeated analysis for government revenue volatility and government spending volatility, from which we can see that both the two volatility variables are negatively correlated with financial development but positively correlated with financial instability. These results again confirm our previous conclusion that financial development is conducive to reducing fiscal policy volatility whereas financial instability has the opposite effect.

The results of Models (6) and (9) suggest that a 1% growth of (log) private sector credit to GDP would lead to a 1.235% decline in government revenue volatility and a 0.809% reduction in government spending volatility. Moreover, government revenue volatility is more impacted by financial development than government spending volatility. With the development of finance, policy authorities can adopt financial technologies and structural policies to provide new engines for the economy. In this context, financial development steps into digital transformation, and the policies of inclusive finance, industrial structure adjustment and tax refund are introduced. While the development of digitalization helps to reduce costs and improve efficiency, structural policies could facilitate industrial transformation and improve income redistribution. As a result, these policies contribute to boosting industrial optimization and improving private consumption. Although tax refund and reduction may disturb the stability of government revenue, the structural optimization would provide a new impetus for the stabilization of government revenue, which can partially explain why government revenue is more stable than government spending. Another reason is that inclusive policies require periodical cooperations of spending policy, which causes frequent adjustment of government spending policy and makes it more volatile than government revenue. Meanwhile, a 1% increase in financial instability will raise the volatility of government revenue and government spending by 0.046% and 0.065%, respectively. As financial instability brings about economic uncertainty and decreases households' income, the volatility of government revenue is exacerbated.

Turning to the results for control variables, economic growth and inflation rate are found to be negatively associated with fiscal policy volatility. We also find that larger population is negatively associated with fiscal policy volatility, which is consistent with Furceri et al. (2016). This can be attributed to the fact that smaller countries are typically exposed to more economic shocks and thus their fiscal policies need to respond more frequently to these shocks for the purpose of economic stabilization. In addition, public debt ratio has a negative impact on fiscal policy volatility because government bond market broadens external financing channels for the fiscal authority, and the rapid expansion of bond market allows the government to tap into public debt and hence smooth the movements in fiscal accounts. As for the impact of fiscal crisis, it also has a negative impact on fiscal policy volatility. According to Medas et al. (2018), fiscal crisis refers to the following situations: (1) the defaulted amounts of sovereign debts are greater than 0.2% of GDP, or the defaulted amounts grow more than 10% in a year; (2) the country has recourse to large IMF financial support (more than 100% of quota); (3) the country is faced with very high inflation and steep increase in domestic arrears; (4) the country encounters loss of market access and high risk premium of sovereign debts. Based on this definition, one can see that fiscal crisis raises fiscal policy volatility because of the following reasons: (i) the growing defaulted amounts of sovereign debts would trigger a surge in risk aversion, which affects debt

issuance and payment and thus leads to greater fiscal fluctuations; (ii)government's resort to large official financing usually stands for the country's inability to keep its financial obligation and to maintain a stable fiscal policy; (iii) high inflation would force the government to turn to seigniorage or accumulation of domestic arrears to finance the fiscal deficit, which could further induce immoderate fiscal policy. Banking crisis affects fiscal volatility in a similar manner. According to Laeven and Valencia (2020), when a country exhibits signs of financial distress and policy intervention measures to deal with significant losses in the banking system, we treat the country as being trapped in a banking crisis. Given the above definition, we can predict greater fiscal volatility during a banking crisis. This is mainly due to the fact that banking failure cuts off a government's availability of external financing and that intensive policy interventions would inevitably incur the adjustments of fiscal policy for coordination purposes.

Turning to the two openness indicators, financial openness is positively correlated with fiscal policy volatility, while trade openness has the opposite effect. Papi et al. (2015) find that the openness of current and capital account and financial liberalization could reduce the volatility of fiscal policy. As trade openness and financial openness increase, economic growth and household income would benefit from diversification of trade and financial channels, which enables government to maintain the stability of fiscal policy. However, Woo (2011) and Agnello and Sousa (2014) point out that trade and financial openness are explicitly associated with increased risks and shocks, where a higher level of openness may lead to greater fiscal policy volatility. Our results suggest that while trade openness mainly exhibits the growth enhancing effect, financial openness mainly exhibits the risk inducing effect.

Finally, we also find that the IMF-supported program is negatively correlated with all of the three fiscal volatility variables, indicating that IMF support is conductive to reducing fiscal policy volatility. IMF-supported programs typically provide upright phases and long-term loans for countries facing fiscal and financial crisis for the purpose of macroeconomic stabilization. In this way, the role of IMF bailout is reflected as improving credit availability, offsetting the bad signals and moral hazard effects, which helps to mitigate the volatility of fiscal policy (Papi et al., 2015; Balima and Sy, 2021).

To sum up, from the results in Table 2, we arrive at two main conclusions: (1) countries with more developed financial systems tend to have lower fiscal policy volatility; (2) financial instability has an amplifying effect on fiscal policy volatility. Meanwhile, in line with the previous literature, we also find that economic growth, inflation rate, public debt, fiscal crisis, banking crisis, population, trade openness, financial openness, and IMF-supported programs are important determinants of fiscal policy volatility.

Thus, in contrast to the previous studies that focus primarily on the economic and institutional determinants of fiscal policy volatility, our results shed new light on the important role of finance in determining fiscal policy behavior. Specifically, we have identified two main channels that finance may play a role in determining fiscal policy volatility: (i) financial development channel; and (ii) financial instability channel. Interestingly, the first channel has a dampening effect on fiscal policy volatility while the latter has an amplifying effect on fiscal policy volatility. Taken together, it points to the conclusion that a large and stable financial system provides the best financial environment for the smooth conduct of fiscal policy.

4.2. Robustness checks

In this section, we propose four tests to check the robustness of our baseline findings. First, we address endogeneity issues by using instrumental variables, AMG estimator, CCEMG estimator and two-step system GMM. Second, we repeat the analysis using alternative measures of financial instability. Third, we re-estimate the regressions by accounting for long-term effects. Fourth, we allow for a set of additional controls in the regressions.

4.2.1 Reverse causality and instrumental variable (IV) estimation

The estimation methodology in this paper addresses unobserved period- and country-level effects as well as reverse and simultaneous causations to some degree by including the lagged dependent variable and using lagged observations of the independent variables as instruments. However, due to the deep connection between financial activities and fiscal policy, it is likely that financial development, financial instability and the error term are correlated. First, the discretion of fiscal policy affects the policy circumstance for financial development and financial instability. The volatility of fiscal policy stands for unclear policy stance, and further leads to the volatility of financial policy, which incurs insufficient credit expansion and impedes financial development. Meanwhile, fiscal policy also exerts impact on financial indicators. For example,

discretionary fiscal policy might be detrimental to the stability of business conditions and household income, thus reducing overall demand for credit and depressing financial development eventually. Therefore, causality can run in the reverse direction. Second, there might be some other omitted determinants that can affect fiscal policy volatility, financial development and financial instability at the same time. Third, the indicators of interest, i.e. fiscal policy volatility, financial development and financial volatility, are likely to be measured with errors. To address these issues, we use the IV-2SLS approach, which isolates the exogenous element of variation in financial development and financial instability to identify the one-way effect on fiscal policy volatility.

According to the IV-2SLS method, instrumental variables are constructed to eliminate the endogeneity of Eq. (3). For the reverse causality, a country's level origin or legal system strongly influences its legal and regulatory environment governing financial transactions as well as the differences in country-level financial development. Since the legal system is independent of fiscal policy, it can be used as the instrumental variable to control for simultaneity bias (La Porta et al., 1998; Levine et al., 2000). Despite that, legal system, which usually is coded as dummy variable, is limited to identifying the differences between countries and inevitably disregards trends over time. To deal with this problem, we first group countries into "Civil law", "Common law", "Customary law", "Muslim law" and "mixed law", respectively, and assume similarities in financial development within the same group. Then, we average the financial development index of other countries within the group and calculate the standard deviation of HP-detrended residuals in Eq. (2) using the averaged index of financial development as the dependent variable. Finally, we instrument financial development and financial instability using the dummy variable of legal system, the averaged financial development and the modified financial instability as well as their lagged observations.

For omitted variables and measurement errors, we build instrumental variables based on Lewbel (1997). On the one hand, we calculate the product of fiscal indicator's deviation from its average and financial development indicator's deviation from its average as the instrument for financial development. On the other hand, the product of fiscal indicator's deviation from its average and financial instability indicator's deviation from its average are constructed as the instrument for financial instability. Then, we test possible combinations of instruments and perform IV-2SLS estimations for budget balance volatility, government revenue volatility and government spending volatility respectively. The results are reported in Table 3.

Table 3 Robustness test: IV-2SLS estimation

Independent variables	Dependent variable		
	Budget balance volatility	Government revenue volatility	Government spending volatility
	(1)	(2)	(3)
Lagged dep.var.	0.566***	0.529***	0.540***
	(22.593)	(19.083)	(20.731)
Financial development	-0.242*	-0.164*	-0.275**
	(-1.868)	(-1.764)	(-2.090)
Financial instability	0.108***	0.076**	0.112***
	(2.706)	(2.125)	(2.912)
Growth	-0.007	0.003	-0.008
	(-1.030)	(0.500)	(-1.326)
Inflation	-0.011***	-0.003	-0.011**
	(-2.722)	(-0.815)	(-2.546)
Public debt	-0.036	-0.015	0.013
	(-0.651)	(-0.321)	(0.241)
Fiscal crisis	0.133**	0.055	0.078
	(2.539)	(1.219)	(1.530)
Banking crisis	0.141*	-0.006	0.144**
	(1.942)	(-0.087)	(2.073)
Population	0.165	-0.286	0.181
	(0.694)	(-1.217)	(0.752)

Trade openness	0.012 (0.129)	0.145 (1.545)	0.112 (1.124)
Financial openness	-0.037 (-1.215)	-0.037 (-1.292)	-0.029 (-0.944)
IMF program	-0.067 (-1.296)	0.017 (0.356)	-0.077 (-1.502)
Time fixed effect	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes
Kleibergen-Paap rk LM	92.141*** (0.000)	67.798*** (0.000)	77.963*** (0.000)
Anderson-Rubin Wald	16.60* (0.084)	19.17** (0.038)	13.47* (0.061)
Hansen	0.320	0.146	0.372
Prob(F-test)	0.000	0.000	0.000
Instruments	10	10	7
Observations	2164	1987	2166
Countries	96	96	96

Notes: (1) *,**,*** indicate statistically significant at the 10%, 5% and 1% level respectively; (2) The statistics given in the parentheses under the coefficients of explanatory variables are Z-values; (3) The statistics in the Hansen and F tests are *p*-values.

Table 3 shows that fiscal policy volatility is negatively correlated to financial development and positively associated with financial instability. Anderson-Rubin Wald test is rejected, meaning that the instruments are highly correlated with the endogenous variables. Meanwhile, the Kleibergen-Paap rk LM statistics are 92.141, 67.798 and 77.963 for budget balance volatility, government revenue volatility and government spending volatility respectively, indicating that there is no underidentification problem. In summary, these results suggest that our main conclusions remain valid after accounting for potential endogeneity problem.

4.2.2 Cross-section dependence and common shock.

To rule out the effects of cross-section dependence and common shock, we re-estimate Eq. (3) using Augmented Mean Group estimator (AMG) and Common Correlated Effects Mean Group estimator (CCEMG). Then we conduct a Perasan test for residuals to see how cross-section dependence and common shock affects estimation results.

The results are presented in Tables A3-A4, from which we can see that for budget balance volatility, the *p*-value of cross-section dependence statistics is 0.061 for AMG estimator, meaning that the null hypothesis of weak cross-sectional dependence is rejected. Therefore, the AMG estimation is inefficient to control for cross-section dependence effects when the dependent variables is budget balance volatility. For government revenue volatility, the coefficient of financial instability is significantly positive, while the coefficient of financial development becomes insignificant. Meanwhile, the influence of financial development on government spending volatility turns to be significantly positive. These results imply that the AMG estimation cannot adequately solve the endogeneity problem of Eq. (3).

Under the estimation of CCEMG, the *p*-values of cross-section dependence statistics are 0.258 for budget balance, based on which we can infer that the cross-section dependence effect is eliminated using the CCEMG estimator. However, according to the *p*-values of the Wald test (0.877), the independent variables only explain a small fraction of the variations in budget balance volatility under the CCEMG estimation. Also, the problem of weak explanation of CCEMG occurs in the estimates of government revenue and government spending volatility.

Table 4 Robustness test: two-step system GMM estimation

Independent variables	Dependent variable		
	Budget balance volatility	Government revenue volatility	Government spending volatility
	(1)	(2)	(3)

Lagged dep.var.	0.701***	0.580***	0.703***
	(21.227)	(6.604)	(9.500)
Financial development	-0.981***	-0.764*	-0.747*
	(-3.846)	(-1.692)	(-1.901)
Financial instability	0.049**	0.041*	0.116**
	(1.977)	(1.744)	(2.086)
Growth	-0.156***	-0.016	-0.169**
	(-2.802)	(-1.621)	(-2.293)
Inflation	-0.011	-0.004	-0.020*
	(-1.557)	(-0.108)	(-1.909)
Public debt	-0.759***	-0.350	0.060
	(-3.311)	(-0.692)	(0.239)
Fiscal crisis	0.319**	1.882**	1.438**
	(2.156)	(2.051)	(2.065)
Banking crisis	0.363	-1.129*	-0.657
	(1.524)	(-1.906)	(-1.013)
Population	-0.118	-0.637	-0.113
	(-0.494)	(-1.529)	(-0.523)
Trade openness	0.427	-2.799**	-1.215
	(0.459)	(-2.161)	(-0.863)
Financial openness	0.266**	0.827*	-0.132
	(2.153)	(1.810)	(-0.392)
IMF program	-0.888*	-1.047**	-2.304***
	(-1.704)	(-2.005)	(-2.666)
Constant	7.578	25.886**	10.462*
	(1.152)	(2.225)	(1.690)
Time fixed Effect	Yes	Yes	Yes
Country fixed Effect	Yes	Yes	Yes
AR(2)	0.954	0.118	0.361
Sargan	0.392	0.142	0.236
Prob(Wald Chi2)	0.000	0.000	0.000
Cross-section dependence	0.222	0.122	0.227
Observations	2164	2167	2166
Countries	96	96	96

Notes: (1) *,**,*** indicate statistically significant at the 10%, 5% and 1% level respectively; (2) The statistics given in the parentheses under the coefficients of explanatory variables are Z-values; (3) The statistics in the AR(2), Sargan, Wald Chi2 and cross-section dependence tests are *p*-values.

To further address the problem of cross-section dependence and common shock, we experiment with the two-step system GMM estimator and test the cross-section dependence of residuals afterwards. Table 4 summarizes the results, from which we can see that there are significant correlations between financial variables and fiscal policy volatility. In particular, as financial system becomes more developed and less volatile, the volatility of fiscal policy would decrease. In addition, the *p*-values of cross-section dependence test are larger than 0.1, implying that the null hypothesis of weak cross-section dependence cannot be rejected under the two-step system GMM estimation and thus the estimation results in Table 4 are valid.

4.2.3 Alternative measure of financial instability

As a standard practice in the empirical literature, first we test whether our results are robust to alterative measure of financial instability, which is a main focus of the paper. As mentioned in Section 2.2, another widely used measure of financial instability in the literature is the standard deviation of the financial development variable. Thus, we use the standard deviation of the private sector credit to GDP ratio (denoted by *Financial volatility*) as an alternative measure of financial instability and repeat the regression analysis. The

results are reported in Table 5. From Table 5 we can see that both the negative effect of financial development on fiscal policy volatility and the positive effect of financial instability on fiscal policy volatility remain statistically significant, suggesting that our main results remain valid under different measures of financial instability.

Table 5 Robustness test: alternative measure of financial instability

Independent variables	Dependent variable		
	Budget balance volatility	Government revenue volatility	Government spending volatility
	(1)	(2)	(3)
Lagged dep.var.	0.741***	0.597***	0.724***
	(16.989)	(10.717)	(7.293)
Financial development	-1.325***	-0.944***	-0.899***
	(-3.327)	(-2.835)	(-2.669)
Financial volatility	0.049**	0.031*	0.043*
	(1.982)	(1.758)	(1.762)
Growth	-0.225***	-0.017	-0.288***
	(-3.294)	(-1.448)	(-3.362)
Inflation	-0.010	-0.041	-0.084
	(-1.214)	(-1.552)	(-1.598)
Public debt	-1.057***	-0.339	-0.965**
	(-3.194)	(-1.418)	(-2.560)
Fiscal crisis	0.562*	0.334	-0.291
	(1.704)	(0.738)	(-1.389)
Banking crisis	-0.286	-0.657	-0.355
	(-0.765)	(-1.562)	(-1.048)
Population	-0.046	-0.759**	-0.431
	(-0.157)	(-2.501)	(-1.080)
Trade openness	0.802	-2.289***	0.118
	(0.828)	(-2.684)	(0.113)
Financial openness	0.316*	0.431	-0.317
	(1.882)	(1.583)	(-1.369)
IMF program	-1.960**	-0.180	0.358
	(-2.212)	(-0.521)	(0.480)
Constant	7.450	27.782***	14.830
	(1.018)	(3.131)	(1.502)
Time fixed effect	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes
AR(2)	0.674	0.764	0.868
Sargan	0.243	0.202	0.861
Prob(Wald Chi2)	0.000	0.000	0.000
Instruments	48	50	53
Observations	2165	2168	2167
Countries	96	96	96

Notes: (1) *,**,*** indicate statistically significant at the 10%, 5% and 1% level respectively; (2) The statistics given in the parentheses under the coefficients of explanatory variables are Z-values; (3) The statistics in the AR(2), Sagan and Wald tests are *p*-values.

The relationship between fiscal policy volatility and control variables also remains unchanged. The restraining effect on fiscal policy volatility is mainly driven by the high output growth, high public debt ratio, large-scale population, trade openness and IMF's support. Comparatively speaking, the intensifying effect on fiscal policy volatility is brought by fiscal crisis and financial openness.

4.2.4 Accounting for long-term effects

To further account for the long-term effects of financial development and financial instability on fiscal policy volatility, we check the robustness of our results by using non-overlapping averages, as in Beck and Levine (2004). To do so, we split our sample into two data sets including a three-year non-overlapping panel (1990-92, 1993-95, and so on) and a five-year non-overlapping panel (1990-94, 1995-99, and so on) and re-estimate the regressions. The results are presented in Table 6.

Table 6 Robustness test: accounting for long-term effects

Independent variables	Dependent variable					
	Budget balance volatility		Government revenue volatility		Government spending volatility	
	3-year (1)	5-year (2)	3-year (3)	5-year (4)	3-year (5)	5-year (6)
Lagged dep.var.	0.190***	-0.034	0.633*	0.238***	0.183***	0.105
	(2.657)	(-0.410)	(1.859)	(2.831)	(2.739)	(1.380)
Financial development	-1.596**	-0.921***	-1.239**	-0.351**	-0.814**	-0.422***
	(-2.019)	(-3.162)	(-2.421)	(-2.081)	(-2.512)	(-2.726)
Financial instability	0.355**	0.065*	0.324**	0.055*	0.267*	0.062*
	(2.042)	(1.656)	(2.240)	(1.675)	(1.675)	(1.658)
Growth	-0.149	-0.101*	-0.032	0.038	-0.141	-0.114**
	(-1.307)	(-1.875)	(-0.761)	(1.557)	(-1.541)	(-2.381)
Inflation	0.009	-0.012	-0.108	0.004	-0.061	-0.001
	(0.173)	(-0.822)	(-1.287)	(0.322)	(-1.213)	(-0.062)
Public debt	-0.681**	-0.783***	-0.244	-0.340**	-0.195	-0.199
	(-2.065)	(-3.321)	(-0.574)	(-2.217)	(-0.494)	(-1.357)
Fiscal crisis	0.284	-0.046	-0.375	0.476	0.186	0.324
	(0.449)	(-0.098)	(-0.495)	(1.085)	(0.391)	(0.712)
Banking crisis	-0.101	0.821***	-1.070	0.113	0.065	1.000**
	(-0.253)	(2.802)	(-0.825)	(0.283)	(0.182)	(2.194)
Population	-0.620***	-0.249	0.108	-0.246**	-0.431	-0.189
	(-2.632)	(-1.056)	(0.341)	(-2.052)	(-1.582)	(-1.380)
Trade openness	-1.741	1.177**	0.600	0.464	-1.918	0.142
	(-1.614)	(2.302)	(0.583)	(1.317)	(-1.512)	(0.342)
Financial openness	-0.431	0.176	-0.135	0.056	0.029	-0.011
	(-1.508)	(1.202)	(-0.270)	(0.481)	(0.121)	(-0.103)
IMF program	-0.230	0.255	0.350	-0.311	-0.001	-0.020
	(-0.463)	(0.340)	(0.825)	(-0.947)	(-0.001)	(-0.053)
Constant	27.043***	6.625	1.513	4.938*	20.409**	6.105*
	(2.675)	(1.232)	(0.169)	(1.845)	(2.251)	(1.866)
Time fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
AR(2)	0.179	0.672	0.543	0.349	0.687	0.590
Sargan	0.786	0.249	0.896	0.113	0.479	0.149
Prob(Wald Chi2)	0.000	0.000	0.000	0.000	0.000	0.000
Instruments	45	35	34	54	39	49
Observations	711	361	712	362	713	361
Countries	96	96	96	96	96	96

Notes: (1) *,**,*** indicate statistically significant at the 10%, 5% and 1% level respectively; (2) The statistics given in the parentheses under the coefficients of explanatory variables are Z-values; (3) The statistics in the AR(2), Sagan and Wald tests are *p*-values.

From Table 6 we can see that, consistent with the previous results, the coefficient of the financial development variable is estimated to be significantly negative while that of the financial instability variable is estimated to be significantly positive, indicating that our main conclusions remain robust after accounting for the potential long-term effects of finance on fiscal policy volatility.

However, there are also some slight changes in the coefficients of control variables. First, the effect of fiscal crisis on the volatility of fiscal policy becomes insignificant after considering the longer-term effect. It indicates that fiscal crisis primarily leads to short-term disruption in the fiscal policy of many countries. This is probably because the official financing support and austerity measures can quickly offset the disturbing effects of fiscal crisis, which as defined in our paper is largely caused by credit event, domestic public debt default and loss of market confidence, in a relatively short time.

Second, the significance of the coefficient on IMF-supported programs is weakened in the medium and long run. In the existing literature, both the amplifying and depressing effects of IMF-supported programs on fiscal policy volatility are documented. On the one hand, some studies have provided supporting evidences that the IMF-supported stabilization program is a potential driver for fiscal policy volatility (e.g., Jorra, 2012; Cevik and Teksoz, 2014), which is largely attributed to the moral hazard problem and debt dilution when IMF fails to distinguish between liquidity and solvency crisis. On the other hand, the favorable aspect of the IMF-supported stabilization programs is also verified in Papi et al. (2015) and Balima and Sy (2021). They argue that the IMF-supported programs can improve credit availability and offset bad signals as well as moral hazard effects. Taking into account all these possibilities, our results suggest that the IMF-supported programs could help to smooth the conduct of fiscal policy in the short run, but the stabilization effect would probably be neutralized by the adverse effects over longer horizons.

Third, the combined effect of positives and negatives can also give an explanation for the similar changes in the coefficients of trade and financial openness. For one thing, Papi et al. (2015) find that, as the trade openness and financial openness increase, economic growth and household income will benefit from diversification of trade and financial channels, which enables the government to maintain fiscal policy stability. For another thing, Woo (2011) and Agnello and Sousa (2014) point out that trade and financial openness are explicitly associated with increased risks and shocks, where a higher degree of openness may lead to greater fiscal policy volatility. In our study, the positive effects of trade openness benefit the economy in the short run, while the potential risks gradually emerge over the long term. By contrast, the risk factors brought by financial openness take the lead in the short term, while the economy-stimulating effect comes to standing out at longer horizons.

Comparing the long-term results with the baseline results in Table 2, we find that the absolute values of the coefficients for financial development and financial instability display an upward trend when the calculation window changes from overlapping to non-overlapping, and then the absolute values show a downward trend when the calculation window shifts from medium (3-year) to long term (5-year). Therefore, it is reasonable to assume that the effects of financial development and financial instability are strengthened in the medium term and begin to recede over the long term.

4.2.5 Different groups of countries

To test whether our main results vary with respect to different groups of countries, we classify the sample countries into advanced economies (AEs), emerging economies (EMs) and low-income countries (LICs) according to the country classification by World Bank and re-estimate the regressions for each group. The results for the AEs, EMs and LICs are reported in Tables 7-9, respectively. It is obvious that the negative relationship between financial development and fiscal policy volatility remains unaltered in all regressions in Tables 7-9. Meanwhile, the amplifying effect of financial instability on fiscal policy volatility still holds as before, as suggested by the significantly positive coefficient on the financial instability variable. Again, these results suggest that the main conclusions of the paper do not change with respect to different groups of countries.

Table 7 Robustness test: advanced economies

Independent variables	Dependent variable		
	Budget balance volatility	Government revenue volatility	Government spending volatility

	(1)	(2)	(3)
Lagged dep.var.	0.495***	0.510***	0.443***
	(4.928)	(5.354)	(3.701)
Financial development	-3.235***	-0.781***	-2.648***
	(-3.338)	(-3.107)	(-2.795)
Financial instability	0.070*	0.023*	0.067**
	(1.707)	(1.705)	(2.347)
Growth	-0.150**	0.015	-0.079
	(-2.050)	(0.901)	(-0.466)
Inflation	-0.047	0.064*	0.004
	(-0.821)	(1.921)	(0.158)
Public debt	-2.889***	-0.330	-1.531**
	(-3.707)	(-1.563)	(-2.445)
Fiscal crisis	-4.806*	-2.379**	0.433
	(-1.831)	(-2.050)	(0.258)
Banking crisis	0.586*	0.789**	1.326
	(1.955)	(2.147)	(1.247)
Population	1.021**	-0.321***	-0.011
	(2.298)	(-3.289)	(-0.047)
Trade openness	-1.838**	-0.425**	-2.340**
	(-2.104)	(-2.278)	(-2.455)
Financial openness	1.372***	0.613***	1.447**
	(3.690)	(2.756)	(2.254)
IMF program	5.566*	2.573**	4.178*
	(1.942)	(2.055)	(1.783)
Constant	15.760**	10.704***	25.704**
	(2.146)	(3.529)	(2.562)
Time fixed effect	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes
AR(2)	0.866	0.332	0.557
Sargan	0.689	0.848	0.100
Prob(Wald Chi2)	0.000	0.000	0.000
Instruments	54	66	51
Observations	582	582	583
Countries	25	25	25

Notes: (1) *,**,*** indicate statistically significant at the 10%, 5% and 1% level respectively; (2) The statistics given in the parentheses under the coefficients of explanatory variables are Z-values; (3) The statistics in the AR(2), Sagan and Wald tests are *p*-values.

Table 8 Robustness test: emerging economies

Independent variables	Dependent variable		
	Budget balance volatility	Government revenue volatility	Government spending volatility
	(1)	(2)	(3)
Lagged dep.var.	0.353	0.754***	0.434***
	(0.997)	(5.895)	(2.734)
Financial development	-3.445**	-1.003**	-3.186**
	(-2.273)	(-1.965)	(-2.079)
Financial instability	0.380*	0.105*	0.127**
	(1.829)	(1.810)	(2.135)
Growth	-0.125	-0.019	-0.080

	(1)	(2)	(3)
	(-1.070)	(-0.642)	(-0.991)
Inflation	-0.161**	-0.004	-0.116*
	(-2.181)	(-0.120)	(-1.883)
Public debt	-1.104*	0.114	-0.392
	(-1.815)	(0.270)	(-0.853)
Fiscal crisis	-1.810	-2.811**	-0.384
	(-1.099)	(-2.365)	(-0.455)
Banking crisis	-0.028	0.069	-0.434
	(-0.026)	(0.088)	(-0.648)
Population	0.975	1.404**	-0.425
	(1.474)	(2.114)	(-0.940)
Trade openness	1.929	2.295**	1.520
	(1.349)	(1.993)	(1.257)
Financial openness	-0.405	0.432	-0.484
	(-0.909)	(1.413)	(-1.268)
IMF program	0.960	0.877	1.013
	(0.823)	(1.627)	(1.257)
Constant	-6.802	-31.274**	15.702
	(-0.530)	(-2.018)	(1.622)
Time fixed effect	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes
AR(2)	0.883	0.379	0.718
Sargan	0.812	0.884	0.387
Prob(Wald Chi2)	0.000	0.000	0.000
Instruments	43	52	46
Observations	317	320	318
Countries	14	14	14

Notes: (1) *,**,*** indicate statistically significant at the 10%, 5% and 1% level respectively; (2) The statistics given in the parentheses under the coefficients of explanatory variables are Z-values; (3) The statistics in the AR(2), Sagan and Wald tests are *p*-values.

Table 9 Robustness test: low-income countries

Independent variables	Dependent variable		
	Budget balance volatility	Government revenue volatility	Government spending volatility
	(1)	(2)	(3)
Lagged dep.var.	0.399	0.654***	0.498***
	(1.415)	(6.719)	(3.028)
Financial development	-3.633**	-1.516***	-3.283***
	(-2.259)	(-2.702)	(-3.054)
Financial instability	1.048**	0.270***	0.294**
	(2.006)	(2.604)	(2.002)
Growth	-0.206*	-0.020	0.064
	(-1.737)	(-0.912)	(0.909)
Inflation	-0.126*	-0.023	-0.004
	(-1.932)	(-0.985)	(-0.141)
Public debt	-0.082	-0.334	-0.084
	(-0.091)	(-0.930)	(-0.121)
Fiscal crisis	1.310	0.588	1.035*
	(1.498)	(1.173)	(1.710)
Banking crisis	3.802**	1.695**	2.788***

	(2.037)	(2.096)	(2.590)
Population	0.008	0.379	1.021
	(0.006)	(0.652)	(1.561)
Trade openness	-0.940	1.283*	0.149
	(-0.561)	(1.805)	(0.244)
Financial openness	-0.426	0.201	0.597
	(-0.486)	(0.971)	(1.446)
IMF program	-0.945	-0.616*	-0.643
	(-1.269)	(-1.645)	(-1.433)
Constant	13.756	-5.466	-9.392
	(0.640)	(-0.579)	(-0.901)
Time fixed effect	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes
AR(2)	0.380	0.336	0.844
Sargan	0.827	0.814	0.714
Prob(Wald Chi2)	0.000	0.000	0.000
Instruments	46	61	58
Observations	252	252	252
Countries	11	11	11

Notes: (1) *,**,*** indicate statistically significant at the 10%, 5% and 1% level respectively; (2) The statistics given in the parentheses under the coefficients of explanatory variables are Z-values; (3) The statistics in the AR(2), Sagan and Wald tests are *p*-values.

However, we do find some differences between different groups of countries. In particular, we find that the coefficients of financial instability are the largest in Table 9 and the smallest in Table 7, implying that financial instability has the strongest impact on fiscal policy volatility in the LICs, followed by EMs and AEs. Similar results are also obtained for the impact of financial development on fiscal policy volatility: the coefficients of financial development are larger in magnitude in Table 9 than those in Tables 7-8, suggesting that fiscal policy volatility in LICs decreases at a higher speed with the development of the financial system than in EMs and AEs. Obviously, these differences point to a more pronounced relationship between finance (both in terms of financial development and financial instability) and fiscal policy volatility in LICs. A possible explanation for this difference is that less developed countries typically have more volatile business cycles due to less-developed financial systems as well as weaker economic institutions (Fatas and Mihov, 2003), which makes them resort more often to discretionary fiscal policy. In this context, financial development in less developed countries would have a more pronounced effect on smoothing business cycles and thus lowering fiscal policy volatility. At the same time, as business cycles in less developed countries depend more on financial development, an increase in financial instability will naturally have a larger weakening effect on economic stability, which leads to more volatile business cycles and thus more volatile fiscal policy.

4.2.6 Including further controls

To check the robustness of our results to potential omitted variables, we allow for a variety of further controls that may have an impact on fiscal policy volatility, including: (1) polity scale (*Polity scale*), which measures how democratic a country is; (2) government crisis (*Government crisis*), which indicates a country's government instability; (3) cabinet changes (*Cabinet changes*), which measures a country's political instability; (4) political constraints (*Political constraints*), which measures the percentage of veto players dropping from the government for a given year; (5) political system (*Political system*), which characterizes a country's political system; and (6) old-age dependency ratio (*Age dependency*), which accounts for a country's ageing process (potential burden on working-age population). The first five variables control for the quality of government institutions and political instability (Agnello and Souza, 2014), while the last variable further controls for a country's demographic characteristics (Woo, 2009). The regression results with these additional controls are reported in Table 10.

Table 10 Robustness test: adding further controls

Independent variables	Dependent variable		
	Budget balance volatility	Government revenue volatility	Government spending volatility
	(1)	(2)	(3)
Lagged dep. var.	0.771***	0.334***	0.701***
	(12.914)	(4.309)	(11.435)
Financial development	-1.263**	-1.081***	-0.625***
	(-2.259)	(-2.755)	(-2.955)
Financial instability	0.328**	0.034**	0.092**
	(2.173)	(2.076)	(2.101)
Polity scale	-0.046	-0.017	0.005
	(-0.810)	(-0.770)	(0.206)
Government crisis	0.182	0.026	-0.026
	(0.447)	(0.548)	(-0.297)
Cabinet changes	0.619*	0.077**	0.085*
	(1.909)	(2.128)	(1.689)
Political constraint	0.614	0.305*	0.077
	(0.636)	(1.805)	(0.797)
Political system	0.056	0.547	-0.311
	(0.100)	(1.436)	(-1.203)
Age dependency	0.087	0.228	-0.186
	(0.089)	(0.692)	(-0.804)
Constant	9.821	6.282	2.937
	(1.268)	(1.483)	(1.174)
Other controls	Yes	Yes	Yes
Time fixed effect	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes
AR(2)	0.278	0.100	0.551
Sargan	0.726	0.396	0.617
Prob(Wald Chi2)	0.000	0.000	0.000
Instruments	58	71	83
Observations	1978	1981	1980
Countries	88	88	88

Notes: (1) *,**,*** indicate statistically significant at the 10%, 5% and 1% level respectively; (2) The statistics given in the parentheses under the coefficients of explanatory variables are Z-values; (3) The statistics in the AR(2), Sagan and Wald tests are *p*-values.

The results in Table 10 again confirm our main results that financial development is conducive to smoothing fiscal policy volatility while financial instability leads to greater fiscal policy volatility. Thus, the main results of the paper would not change after more country characteristics such as government institutions, political instability and demographic characteristics are controlled. As for the six additional control variables, we find that cabinet changes and political constraint have significantly positive impacts on government revenue volatility. In all other cases, the additional control variables are not statistically significant.

5. Further discussion
5.1. Interaction effects

In the previous analysis, we have treated the impact of financial development and financial instability on fiscal policy volatility independently. However, one might think of potential mechanisms that link financial development and financial instability, reinforcing or weakening each other's effect on fiscal policy volatility. Thus, it is interesting to see whether the effect of financial instability decreases or increases at higher levels of financial development. To see this, we can introduce an interaction term between financial development and financial instability in the regression equation:

$$Vol_{i,t}^{F} = c + \beta_{1}Vol_{i,t-1}^{F} + \beta_{2}Finance_{i,t} + \beta_{3}Instability_{i,t} + \beta_{4}Instability_{i,t}*Finance_{i,t} + \gamma Z_{i,t} + \upsilon_{i} + \eta_{t} + \varepsilon_{i,t} \tag{6}$$

where $Finance_{i,t}*Instability_{i,t}$ is the interaction term of interest, and the coefficient β_{4} captures the interaction effects between financial development and financial instability. All other variables in Eq. (6) are defined the same as before.

Table 11 reports the results. We find that the coefficient on the interaction term is significantly negative in all regressions, suggesting that the positive effect of financial instability on fiscal policy volatility is weakened as financial development increases. In other words, as a country moves to a higher level of financial development, the volatility effect of financial instability on fiscal policy tends to be smaller.

Table 11 Interaction effects between financial development and financial instability

Independent variables	Dependent variable		
	Budget balance volatility	Government revenue volatility	Government spending volatility
	(1)	(2)	(3)
Lagged dep.var.	0.727***	0.709***	0.718***
	(16.263)	(14.169)	(10.051)
Financial development	-1.176**	-0.702**	-0.876**
	(-2.467)	(-2.222)	(-2.003)
Financial instability	0.440**	0.964**	0.775**
	(2.408)	(2.128)	(2.060)
Financial development * Financial instability	-0.093**	-0.231**	-0.185**
	(-2.110)	(-2.053)	(-2.003)
Growth	-0.117	-0.038*	-0.098
	(-1.537)	(-1.757)	(-1.323)
Inflation	0.001	0.011	0.001
	(0.099)	(0.457)	(0.121)
Public debt	-0.559	0.164	0.348
	(-1.339)	(0.578)	(1.150)
Fiscal crisis	0.506	-0.980	0.822
	(0.663)	(-0.824)	(0.966)
Banking crisis	-0.371	-1.435	-0.470
	(-0.445)	(-1.269)	(-0.422)
Population	0.168	-0.610	0.047
	(0.599)	(-1.578)	(0.190)

Trade openness	-0.508 (-0.530)	-2.750** (-2.304)	-5.521** (-2.224)
Financial openness	0.288 (1.328)	0.554 (1.562)	0.084 (0.306)
IMF program	-3.192** (-2.437)	-1.523 (-1.549)	-3.627*** (-2.781)
Constant	7.130 (0.871)	23.746** (2.211)	26.242** (1.971)
Time fixed effect	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes
AR(2)	0.159	0.145	0.201
Sargan	0.663	0.366	0.765
Prob(Wald Chi2)	0.000	0.000	0.000
Instruments	50	46	51
Observations	2164	2167	2166
Countries	96	96	96

Notes: (1) *,**,*** indicate statistically significant at the 10%, 5% and 1% level respectively; (2) The statistics given in the parentheses under the coefficients of explanatory variables are Z-values; (3) The statistics in the AR(2), Sagan and Wald tests are *p*-values.

In order to calculate the marginal effect of financial instability on fiscal policy volatility and its significance for different levels of financial development, we conduct a linear restriction test of the sum of the coefficient β_3 and β_4 in Eq. (6) for different values of financial development. To facilitate interpretation, the marginal effect of financial instability on government budget balance volatility, government revenue volatility and government spending volatility in relation to financial development are plotted in Figs. 1, 2 and 3, respectively.
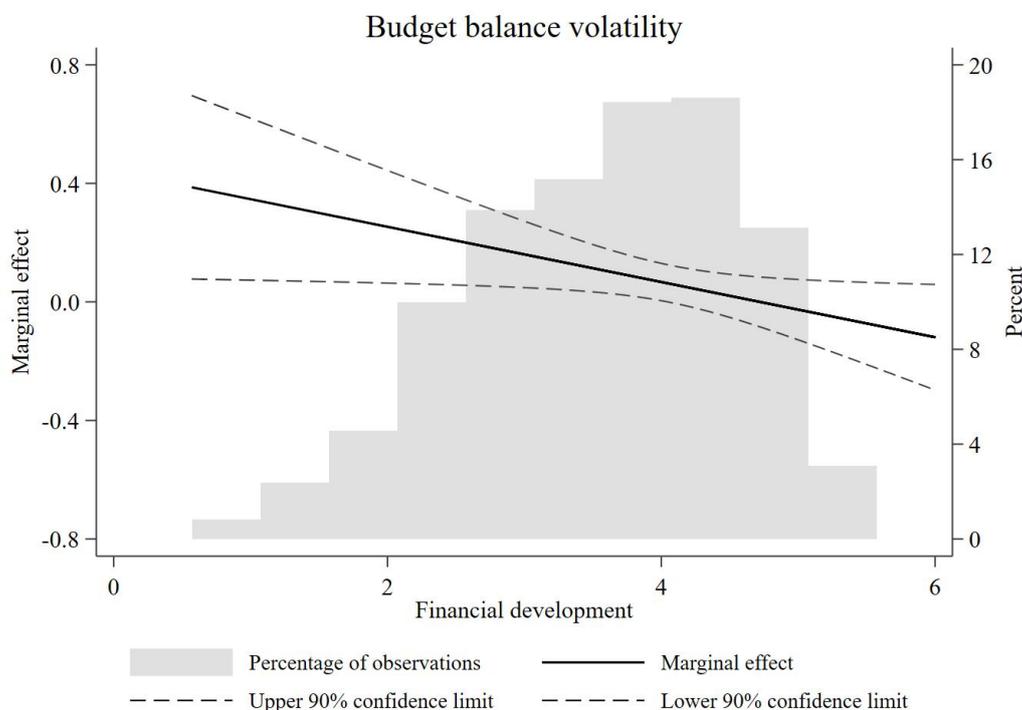
Fig. 1 Marginal effect of financial instability on budget balance volatility in relation to financial development

Notes: (1) This figure illustrates the marginal effect of financial instability on budget balance volatility at different levels of financial development; (2) financial development is measured by the logarithm of private sector credit to GDP ratio (%); (3) budget balance volatility is measured by the standard deviation of the HP-detrended residual for Eq. (1) in Section 2.1, using government budget balance as the dependent (fiscal policy) variable.
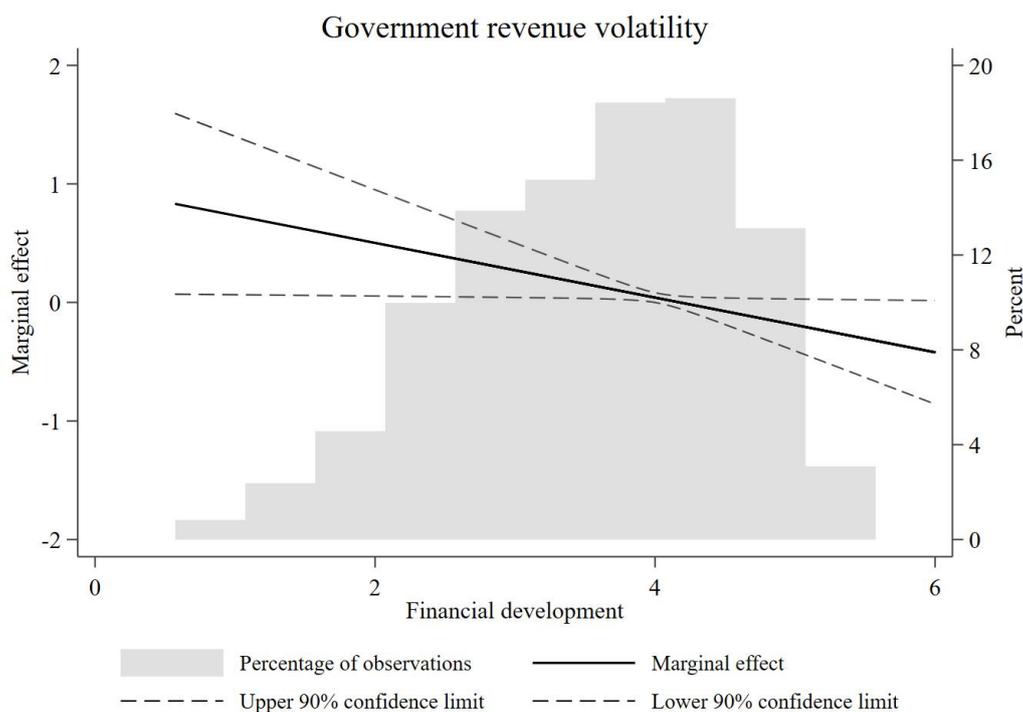
Fig. 2 Marginal effect of financial instability on government revenue volatility in relation to financial development

Notes: (1) This figure illustrates the marginal effect of financial instability on government revenue volatility at different levels of financial development; (2) financial development is measured by the logarithm of private sector credit to GDP ratio (%); (3) government revenue volatility is measured by the standard deviation of the HP-detrended residual for Eq. (1) in Section 2.1, using government revenue as the dependent (fiscal policy) variable.
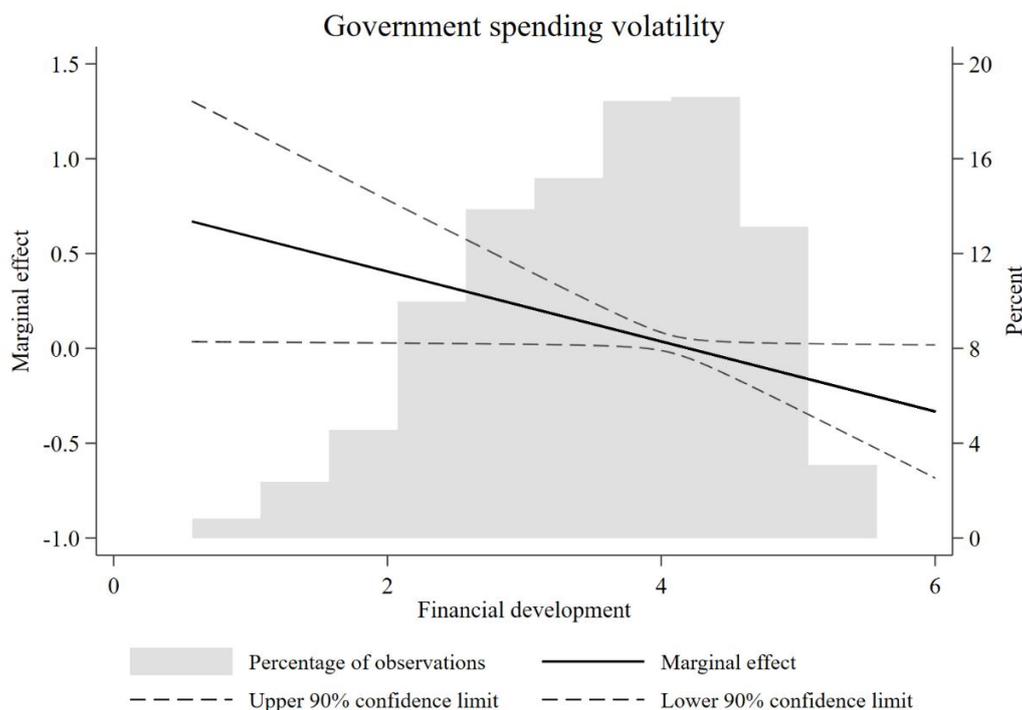
Fig.3 Marginal effect of financial instability on government spending volatility in relation to financial development

Notes: (1) This figure illustrates the marginal effect of financial instability on government spending volatility at different levels of financial development; (2) financial development is measured by the logarithm of private sector credit to GDP ratio (%); (3) government spending volatility is measured by the standard deviation of the HP-detrended residual for Eq. (1) in Section 2.1, using government spending as the dependent (fiscal policy) variable.

From the results in Figs. 1–3, we can see that except for a few exceptions for government revenue volatility at very high levels of financial development, the marginal effect of financial instability on fiscal policy volatility remains positive for all levels of financial development considered, and such positive relation weakens as financial development increases. These results suggest that financial instability is a source of fiscal policy volatility in countries with relatively less developed financial systems, and countries with more developed financial systems are less sensitive to the adverse effect of financial instability.

There are at least two interpretations for this finding. First, a larger financial system may have greater capacity to absorb shocks from financial instability, which weakens the impact of financial instability on fiscal policy volatility. Second, countries with more developed financial systems typically have more financial means to stabilize their fiscal policy behavior, which may partially offset the volatility effect of financial instability on fiscal policy.

5.2. The impact of financial cycle

Despite the growing body of literature on the sources of fiscal policy volatility, few, if any, have discussed how financial cycle may affect the effect of financial instability on fiscal policy volatility. As we have already shown that financial instability has a significant impact on fiscal policy volatility, it would be interesting to further discuss how financial cycle may play a role in this relationship. For this purpose, in this subsection we attempt to investigate how the effect of financial instability on fiscal policy volatility varies across different phases of the financial cycle. To this end, first we follow the "peak-to-trough" approach suggested by Braun

and Larrain (2005) and identify three typical phases of the financial cycle: expansion, recession and normal. Specifically, we identify the phases of financial cycle for each country according to the cyclical component of the private sector credit to GDP ratio. Denoting the level of the private sector credit to GDP ratio in country i and year t by $F_{i,t}$ and its cyclical component by $\tilde{F}_{i,t}$ (calculated by Hodrick-Prescott filter) and its standard deviation by $\sigma(\tilde{F})_{i,t}$, then the three representative phases of the financial cycle can be defined as follows:

(1) Financial expansion (*Expansion*). As in Braun and Larrain (2005), we identify a financial "peak" if $\tilde{F}_{i,t} > \sigma(\tilde{F})_{i,t}$, i.e., the cyclical component of $F_{i,t}$ is more than one standard deviation above the trend. Once a local "peak" is found, we look back until reaching a local "trough", which is defined as a time satisfying both $\tilde{F}_{i,t} < \tilde{F}_{i,t-1}$ and $\tilde{F}_{i,t} < \tilde{F}_{i,t+1}$, i.e., the cyclical component of $F_{i,t}$ is lower than both the previous and posterior years. Then, financial expansion (*Expansion*) is defined as a dummy variable which takes the value of 1 for years falling into the periods between the peak and trough, and 0 otherwise.

(2) Financial Recession (*Recession*). Likewise, a financial "trough" is identified as a year when the cyclical component of $F_{i,t}$ is more than one standard deviation below the trend, i.e., $\tilde{F}_{i,t} < \sigma(\tilde{F})_{i,t}$. Then we look back to find a local "peak", identified as a year when both $\tilde{F}_{i,t} > \tilde{F}_{i,t-1}$ and $\tilde{F}_{i,t} > \tilde{F}_{i,t+1}$ hold. Then, financial Recession (*Recession*) is defined as a dummy variable that takes the value of 1 for years between the peak and trough, and 0 otherwise.

(3) Normal period (*Normal*). Having identified both the expansionary and recessionary periods of the financial cycle, the left years that do not fall into these two phases are identified as "normal" periods, captured by a dummy variable "*Normal*" taking the value of 1 for a year belonging to the "normal" periods, and 0 otherwise.

After the four dummy variables for identifying financial cycle phases are constructed, we can interact them with the financial instability variable in the regressions to examine how the effect of financial instability on fiscal policy volatility may vary across different phases of the financial cycle. The estimation results for the three dependent variables (i.e., budget balance volatility, government revenue volatility, and government spending volatility) are reported in Tables 12, 13 and 14, respectively.

Table 12 Financial instability and budget balance volatility over the financial cycle

Independent variables	Dependent variable: *Budget balance volatility*			
	(1)	(2)	(3)	(4)
Lagged dep. var.	0.277*** (3.534)	0.438*** (5.612)	0.394*** (5.102)	0.642*** (12.331)
Financial development	-1.034*** (-2.881)	-0.524*** (-3.671)	-1.327*** (-5.049)	-2.367*** (-3.131)
Financial instability	0.044** (2.387)	0.056* (1.739)	0.060* (1.685)	0.271*** (2.714)
Financial instability Banking crisis*	0.078* (1.775)			
*Financial instability*Expansion*		0.099* (1.667)		
*Financial instability*Recession*			0.180* (1.663)	
*Financial instability*Normal*				-0.169* (-1.718)
Banking crisis	0.283* (1.707)	0.210** (2.266)	0.367*** (3.436)	0.229 (0.632)
Expansion		0.055 (0.336)		
Recession			-0.468	

	(1)	(2)	(3)	(4)
			(-1.400)	
Normal				0.436
				(1.509)
Constant	6.138**	2.796*	-0.534	35.727**
	(2.520)	(1.680)	(-0.251)	(2.316)
Controls	Yes	Yes	Yes	Yes
Time fixed effect	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes
AR(2)	0.109	0.223	0.162	0.150
Sargan	0.102	0.126	0.210	0.523
Prob(Wald Chi2)	0.000	0.000	0.000	0.000
Instruments	60	114	88	76
Observations	2164	2164	2164	2164
Countries	96	96	96	96

Notes: (1) *,**,*** indicate statistically significant at the 10%, 5% and 1% level respectively; (2) The statistics given in the parentheses under the coefficients of explanatory variables are Z-values; (3) The statistics in the AR(2), Sagan and Wald tests are *p*-values.

Table 13 Financial instability and government revenue volatility over the financial cycle

Independent variables	Dependent variable: *Government revenue volatility*			
	(1)	(2)	(3)	(4)
Lagged dep. var.	0.210***	0.217***	0.485***	0.473***
	(2.600)	(3.405)	(7.531)	(8.632)
Financial development	-1.287***	-0.687***	-0.833***	-0.659**
	(-3.739)	(-3.655)	(-3.428)	(-1.987)
Financial instability	0.051***	0.032*	0.038**	0.077***
	(3.099)	(1.869)	(1.962)	(2.939)
Financial instability* Banking crisis	0.069*			
	(1.668)			
Financial instability*Expansion		0.060*		
		(1.656)		
Financial instability*Recession			0.071*	
			(1.652)	
Financial instability*Normal				-0.072*
				(-1.654)
Banking crisis	0.274*	0.184	0.291**	-0.595
	(1.853)	(1.356)	(2.025)	(-1.267)
Expansion		0.204*		
		(1.707)		
Recession			0.238*	
			(1.698)	
Normal				-0.231*
				(-1.650)
Constant	6.168**	19.566***	10.388**	8.038
	(2.352)	(3.715)	(2.066)	(1.561)
Controls	Yes	Yes	Yes	Yes

Time fixed effect	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes
AR(2)	0.104	0.153	0.123	0.400
Sargan	0.212	0.620	0.875	0.893
Prob(Wald Chi2)	0.000	0.000	0.000	0.000
Instruments	62	79	81	76
Observations	2167	2167	2167	2167
Countries	96	96	96	96

Notes: (1) *,**,*** indicate statistically significant at the 10%, 5% and 1% level respectively; (2) The statistics given in the parentheses under the coefficients of explanatory variables are Z-values; (3) The statistics in the AR(2), Sagan and Wald tests are *p*-values.

Table 14 Financial instability and government spending volatility over the financial cycle

Independent variables	Dependent variable: *Government spending volatility*			
	(1)	(2)	(3)	(4)
Lagged dep. var.	0.362*** (4.272)	0.068 (0.894)	0.704*** (8.387)	0.508*** (8.993)
Financial development	-1.276*** (-4.035)	-0.545*** (-2.903)	-1.055*** (-3.338)	-0.728** (-2.249)
Financial instability	0.041** (2.411)	0.051* (1.954)	0.071* (1.657)	0.068*** (2.683)
Financial instability Banking crisis*	0.082* (1.697)			
*Financial instability*Expansion*		0.089* (1.655)		
*Financial instability*Recession*			0.103* (1.649)	
*Financial instability*Normal*				-0.070* (-1.654)
Banking crisis	0.326* (1.730)	0.369*** (3.971)	0.307 (1.614)	-0.751 (-1.469)
Expansion		0.310* (1.647)		
Recession			0.344* (1.666)	
Normal				-0.168 (-1.208)
Constant	3.239 (1.068)	-12.255*** (-2.656)	-20.970*** (-2.996)	9.504* (1.780)
Controls	Yes	Yes	Yes	Yes
Time fixed effect	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes
AR(2)	0.645	0.190	0.894	0.142
Sargan	0.573	0.529	0.983	0.507
Prob(Wald Chi2)	0.000	0.000	0.000	0.000
Instruments	78	75	80	94
Observations	2166	2166	2166	2166

Countries	96	96	96	96

Notes: (1) *,**,*** indicate statistically significant at the 10%, 5% and 1% level respectively; (2) The statistics given in the parentheses under the coefficients of explanatory variables are Z-values; (3) The statistics in the AR(2), Sagan and Wald tests are *p*-values.

From the results in Tables 12–14, we can see that for all of the three fiscal policy volatility variables, the coefficients of the interaction term between financial instability and expansion (*Financial instability* Expansion*) and that between financial instability and recession (*Financial instability* Recession*) are estimated to be significantly positive, while those on the interaction term between financial instability and normal (*Financial instability* Normal*) are estimated to be significantly negative. This suggests that the positive effect of financial instability on fiscal policy volatility would be magnified during expansionary or recessionary phases of the financial cycle, but would be weakened during normal phases of the financial cycle.

These results can be explained from two different perspectives. The first one is that fiscal policy is procyclical in many developing countries due to political distortions and incentives (Talvi and Végh, 2005; Alesina et al., 2008; Erbil, 2011; Bova et al., 2014). Therefore, fiscal policy will increase public spending and decrease tax in boom while reducing public spending and raising tax in bust, both of which would lead to greater volatility in government revenue, government spending and fiscal deficit eventually. The other perspective is that for the purpose of macroeconomic stability, the fiscal authority needs to be more responsive to financial instability during times of financial expansion or recession than it does during normal period. Financial expansion means more financing available for the private sector, which leads to higher economic growth as well as more government revenue and expenditure. Higher financial instability would prompt the fiscal authority to increase government revenue and reduce government spending to smooth economic fluctuations, both of which would lead to greater fiscal policy volatility. Similarly, financial recession stands for less financing supply for the private sector, which results in economic slowdown as well as less government revenue and expenditure. In this case, the fiscal authority would have to cut down government revenue and raise government spending to prevent economic recession, which makes the conduct of fiscal policy more volatile.

Meanwhile, the coefficient of the interaction term between financial instability and crisis (*Financial instability* Banking crisis*) is significantly positive for all of the three fiscal volatility variables, suggesting that the conduct of fiscal policy is more volatile during times of financial crisis. This might be interpreted that during financial crises, on the one hand government revenue tends to be more volatile due to crisis shock; on the other hand, the government needs to adjust its spending policy more aggressively to counteract the crisis shock, both of which lead to an increase in fiscal policy volatility.

To sum up, the results in Tables 12–14 suggest that the effect of financial instability on fiscal policy volatility also depends on the state of the financial cycle, where the positive effect of financial instability on fiscal policy volatility is more pronounced during expansionary, recessionary and banking crisis periods.

5.3 The medium-term effects

In this subsection we employ the local projection method proposed by Jordà (2005) to investigate the dynamic characteristics of the effects of financial development and financial instability on fiscal policy volatility. According to Jordà (2005), the basic model of local projection method for panel data is as follows:

$$\Delta Vol_{j+i}^F = c + \sum_{\omega=1}^{3}\beta_{Vol,\omega}^i \Delta Vol_{j-\omega}^F + \sum_{\omega=1}^{3}\beta_{Fin,\omega}^i \Delta Finance_{j-\omega} + \sum_{\omega=1}^{3}\beta_{Ins,\omega}^i \Delta Instability_{j-\omega} + \gamma \Delta Z_{j+i} + \varepsilon \quad (7)$$

where j represents the benchmark year and i denotes the impulse response period. ΔVol_{j+i}^F is the change of fiscal policy volatility at $j+i$, representing the response of fiscal policy volatility to the financial shock, either financial development shock $\Delta Finance$ or financial instability shock $\Delta Instability$, which happens at $j-1$.

As in Jordà (2005), we explore the response of fiscal policy volatility in five years by setting i to range from 0 to 5 and focusing on the time-varying coefficients $\beta_{Fin,1}^i$ and $\beta_{Ins,1}^i$. The maximum number of lag periods ω is set as three periods, consistent with Jordà (2005). The lags of the dependent variable, independent variables with two and three lags and the difference of other financial and economic indicators are treated as control variables in Eq. (7).
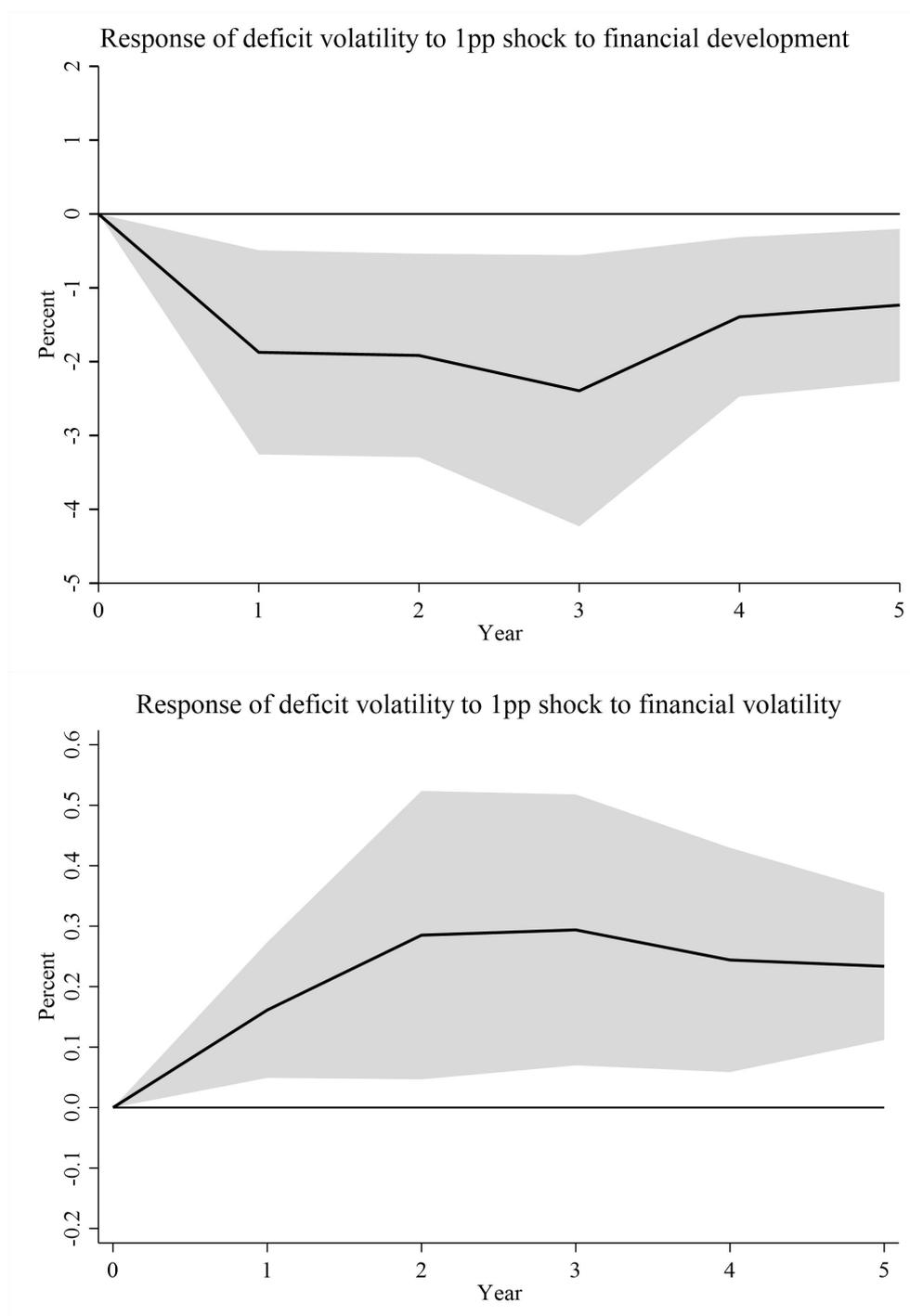
Fig.4 The response of budget balance volatility to 1 percent shock to financial development and financial volatility

Notes: (1) financial development is measured by the logarithm of private sector credit to GDP ratio (%); (2) government spending volatility is measured by the standard deviation of the HP-detrended residual for Eq. (1)

in Section 2.1, using government spending as the dependent (fiscal policy) variable; (3) the grey area denotes the 90% confidence interval.

Response of revenue volatility to 1pp shock to financial development

Response of revenue volatility to 1pp shock to financial volatility
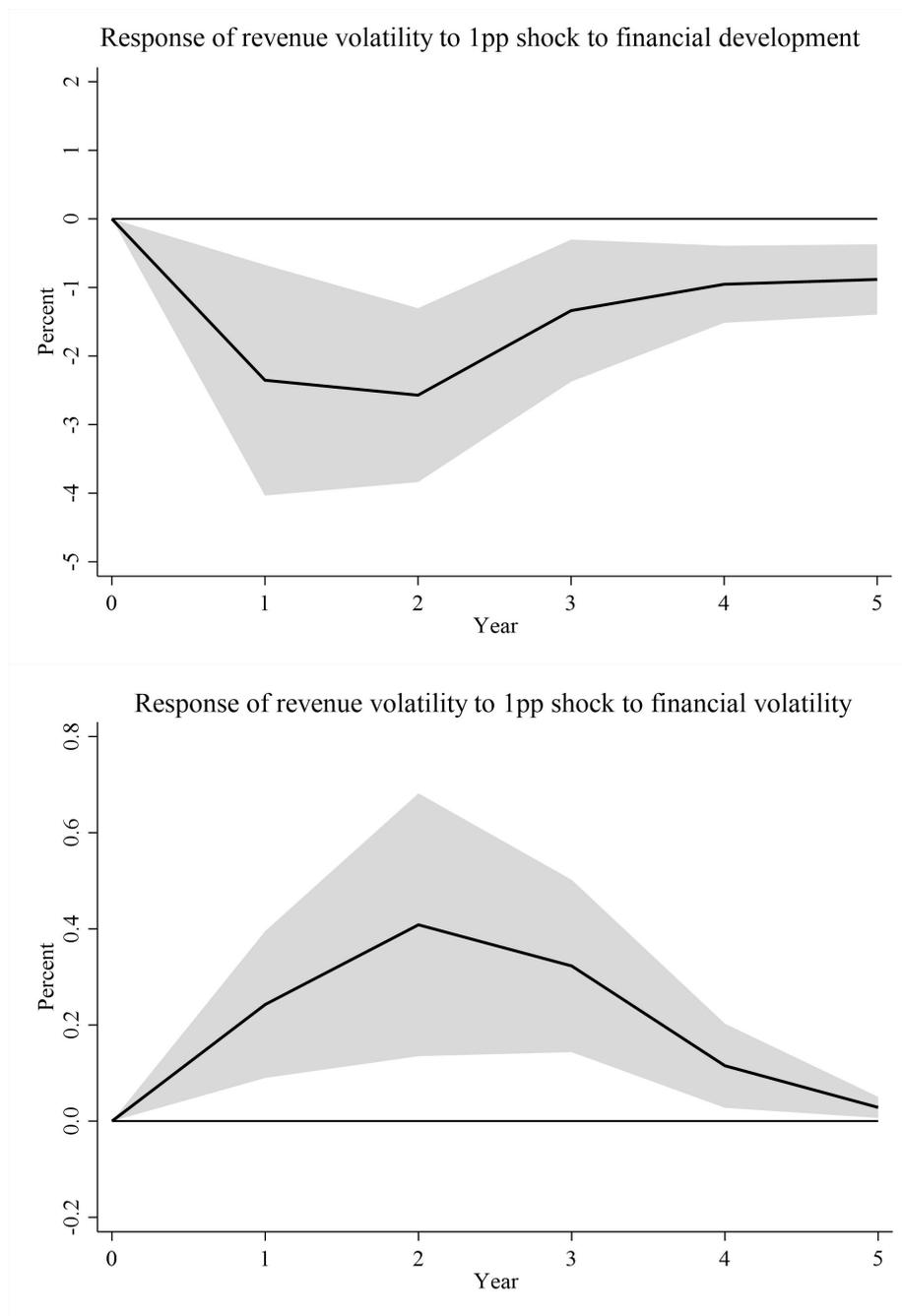
Fig.5 The response of government revenue volatility to 1 percent shock to financial development and financial volatility

Notes: (1) financial development is measured by the logarithm of private sector credit to GDP ratio (%); (2) government spending volatility is measured by the standard deviation of the HP-detrended residual for Eq. (1)

in Section 2.1, using government spending as the dependent (fiscal policy) variable; (3) the grey area denotes the 90% confidence interval.

Response of spending volatility to 1pp shock to financial development

Response of spending volatility to 1pp shock to financial volatility
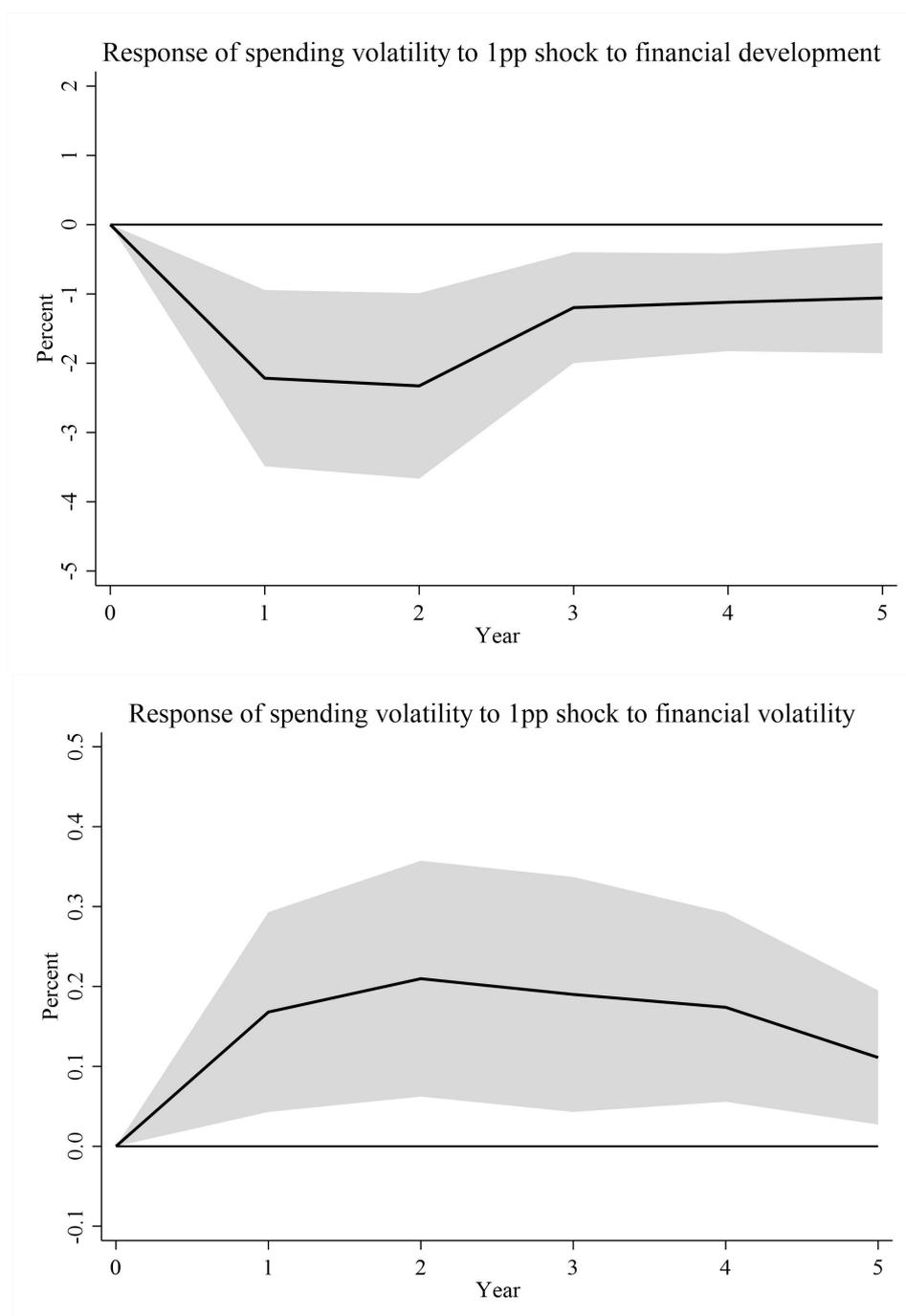
Fig.6 The response of government spending volatility to 1 percent shock to financial development and financial volatility

Notes: (1) financial development is measured by the logarithm of private sector credit to GDP ratio (%); (2) government spending volatility is measured by the standard deviation of the HP-detrended residual for Eq. (1)

in Section 2.1, using government spending as the dependent (fiscal policy) variable; (3) the grey area denotes the 90% confidence interval.

The results are presented in Figures 4-6, from which we can see that the depressing effect of financial development on fiscal policy volatility gradually increase after the 1 % shock of financial development, and exhibits the strongest effect in the second or third year, after which the effect begins to reduce rapidly. The maximum decrease of fiscal policy volatility after a financial development shock is less than 3 percent on average. The effect of a financial instability shock shows similar dynamics, where the positive effect of financial instability on fiscal policy volatility displays an upward trend before the second or third year and then starts to fade away. When the effect become the strongest, the volatility of government revenue, budget balance and government spending grows by 0.4%, 0.3% and 0.2%, respectively.

5.4 The role of financial structure

The previous literature has documented that financial development is closely associated with the marketization of financial system (Toye, 2016; Ma, 2018; Chen et al., 2021; Ma and Yao, 2022). In this subsection, we proceed to explore the mediation role of financial structure in the relationship between financial development, financial instability and fiscal policy volatility using the following mediation model:

$$Vol_{i,t}^F = c + \theta_1 Vol_{i,t-1}^F + \theta_2 Finance + \theta_3 Instability + \theta_4 Structure_{i,t} + \mu Z_{i,t} + \upsilon_i + \eta_t + \varepsilon_{i,t} \tag{8}$$

$$Structure_{i,t} = a + \alpha_1 Vol_{i,t-1}^F + \alpha_2 Finance_{i,t} + \alpha_3 Instability_{i,t} + \varphi Z_{i,t} + \upsilon_i + \eta_t + \varepsilon_{i,t} \tag{9}$$

As is standard in literature (Ma, 2018; Chen et al., 2021), financial structure is measured as the stock market capitalization to GDP relative to private sector credit to GDP (denoted as *Financial structure*). The significance of the mediation effect depends on the significance of the coefficients α_2, α_3 and θ_4. More specifically, only if the null hypothesis is rejected (i.e., the coefficients (α_2, α_3 and θ_4) are significantly different from zero) can we conclude that financial structure plays a mediation role in the relationship between financial development, financial instability and fiscal policy. Furthermore, the significance of θ_2 and θ_3 denotes that financial development and financial instability have remarkable indirect and direct impact on the volatility of fiscal policy, otherwise they only have the indirect effect on fiscal policy volatility.

From the results in Table 15, we can see that higher financial development is associated with more market-based financial market and greater financial instability is associated with less market-based financial market. Meanwhile, more market-based financial system is associated with lower volatility of fiscal policy. To sum up, these results tend to suggest that higher financial development and more stable financial system would contribute to a smoother conduct of fiscal policy by promoting financial marketization.
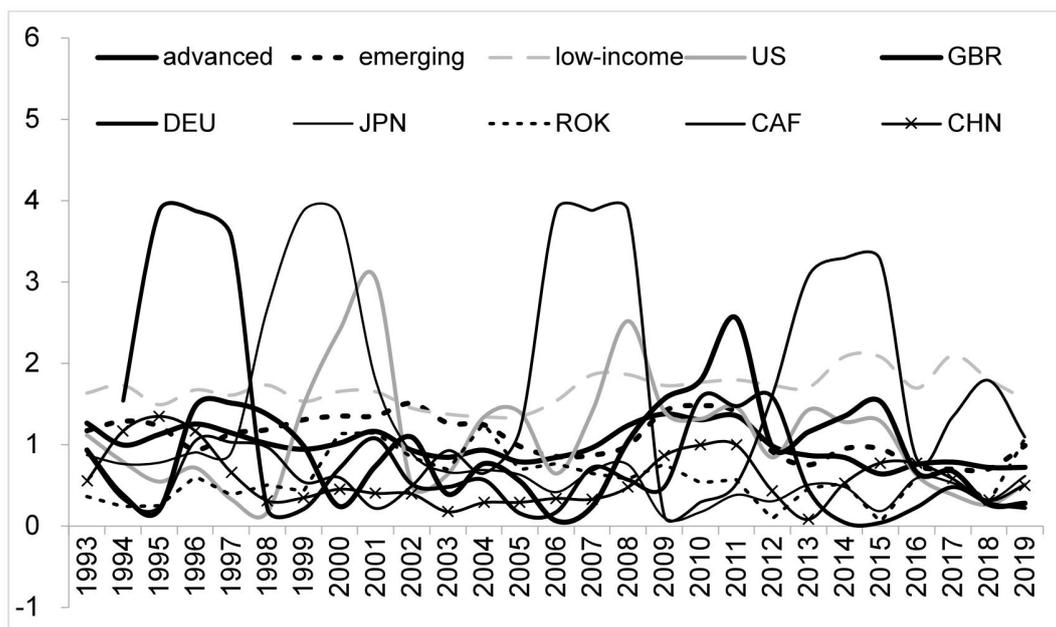
Fig.7 Budget balance volatility in the sample countries

Notes: (1) budget balance volatility is calculated as the standard deviation of the HP-detrended residuals of Eq. (1) when the dependent variable is the ratio of budget balance to GDP; (2) the time span is from 1993 to 2019 since the 1990-1992 samples become invalid for the calculation of residuals and rolling standard deviation; (3) we choose representative economies and countries to illustrate the volatility of budget balance in the sample, including advanced economies, emerging economies, low-income countries, the United States (US), the United Kingdom (GBR), Germany (DEU), Japan (JPN), Republic of Korea (ROK), Central Africa Republic (CAF) and China (CHN).
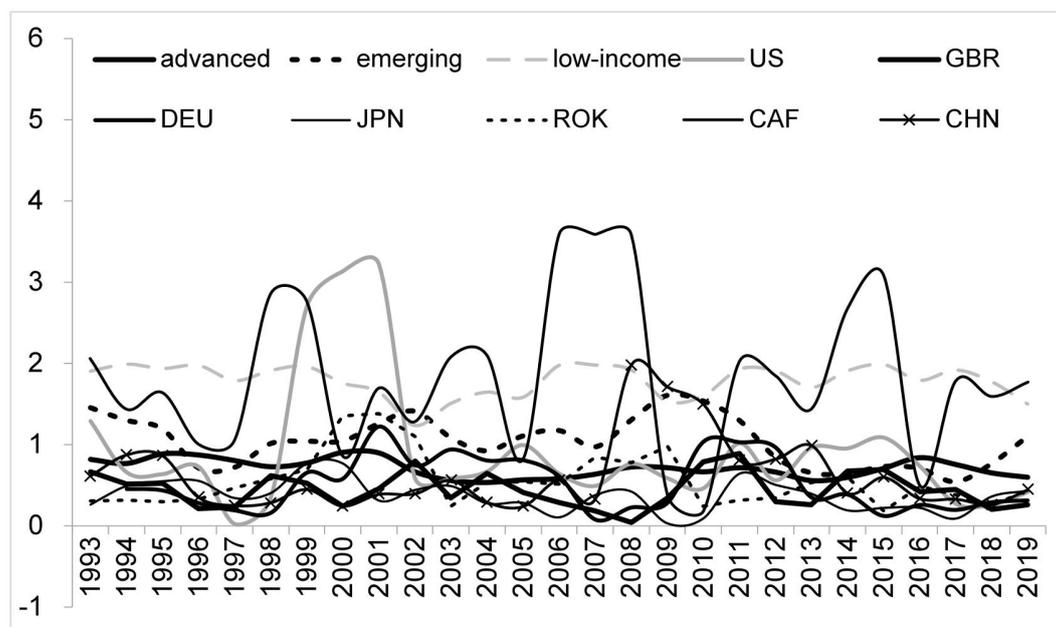
Fig.8 Government revenue volatility in the sample countries

Notes: (1) government revenue volatility is calculated as the standard deviation of the HP-detrended residuals of Eq. (1) when the dependent variable is the ratio of government revenue to GDP; (2) the time span is from 1993 to 2019 since the 1990-1992 samples become invalid for the calculation of residuals and rolling standard deviation; (3) we choose representative economies and countries to illustrate the volatility of budget balance in the sample, including advanced economies, emerging economies, low-income countries, the United States (US), the United Kingdom (GBR), Germany (DEU), Japan (JPN), Republic of Korea (ROK), Central Africa Republic (CAF) and China (CHN).
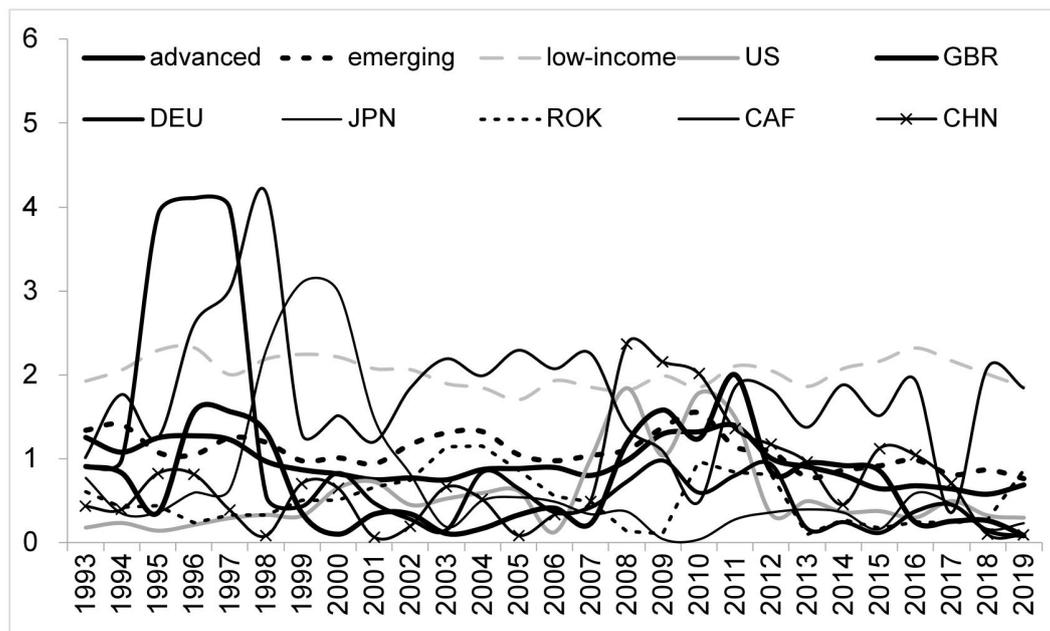
Fig.9 Government spending volatility in the sample countries

Notes: (1) government spending volatility is calculated as the standard deviation of the HP-detrended residuals of Eq. (1) when the dependent variable is the ratio of government spending to GDP; (2) the time span is from 1993 to 2019 since the 1990-1992 samples become invalid for the calculation of residuals and rolling standard deviation; (3) we choose representative economies and countries to illustrate the volatility of budget balance in the sample, including advanced economies, emerging economies, low-income countries, the United States (US), the United Kingdom (GBR), Germany (DEU), Japan (JPN), Republic of Korea (ROK), Central Africa Republic (CAF) and China (CHN).

Table 15 The mediation effect of financial structure

Independent variables	Dependent variable					
	Budget balance volatility		Government revenue volatility		Government spending volatility	
	Financial structure	Fiscal policy volatility	Financial structure	Fiscal policy volatility	Financial structure	Fiscal policy volatility
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged dep.var.	0.024	0.515***	0.070	0.274**	-0.010	0.767***
	(0.390)	(8.286)	(0.590)	(2.104)	(-0.206)	(15.858)
Financial development	1.586**	-0.931***	1.359*	-0.908***	0.467***	-0.501**
	(2.149)	(-2.867)	(1.820)	(-3.168)	(2.732)	(-1.987)
Financial instability	-0.081*	0.043*	-0.079*	0.048***	-0.035*	0.048**
	(-1.681)	(1.766)	(-1.660)	(2.955)	(-1.842)	(2.510)
Financial structure		-0.354*		-0.406*		-0.863***
		(-1.798)		(-1.840)		(-3.130)
Constant	-2.576	30.929***	-3.820	29.975***	-4.314	-3.502
	(-0.334)	(5.044)	(-0.484)	(4.421)	(-1.529)	(-0.564)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
AR(2)	0.477	0.597	0.526	0.154	0.550	0.323
Sargan	0.414	0.138	0.505	0.858	0.143	0.102
Prob(Wald Chi2)	0.000	0.000	0.000	0.000	0.000	0.000
Instruments	43	67	44	61	69	61
Observations	1414	1414	1417	1417	1416	1416
Countries	68	68	68	68	68	68

Notes: (1) *,**,*** indicate statistically significant at the 10%, 5% and 1% level respectively; (2) The statistics given in the parentheses under the coefficients of explanatory variables are Z-values; (3) The statistics in the AR(2), Sagan and Wald tests are *p*-values.

The transmission mechanism can be explained as follows. Since financial development is measured by the financial intermediary credit to private sector, the indicator of financial development stands for the development of indirect financial market (mainly referring to banking market). By contrast, stock market capitalization captures the development of direct financial market. The more development of finance indicates the greater financing demand of the economy. Although banking market could satisfy most of capital demand, banks are subject to many constraints, including capital adequacy requirement, required reserve and credit structure constraints, which prevents credit from rapid growth and results in credit rationing. The development of stock market broadens financing channels for enterprises and governments, which improves the allocation efficiency of financial resources. In this context, as banking market develops, the growing demand for financing further promotes the development of stock market and financial marketization. With the promotion of financial marketization, financial system becomes more efficient, which impels the steady growth of economy and thus enhances the stability of fiscal policy. On the contrary, greater financial instability means that financing demands are more difficult to be satisfied, which is harmful for financial marketization and leads to higher fiscal policy volatility.

7. Concluding remarks

This paper investigates the effects of financial development and financial instability on fiscal policy volatility using system GMM estimator based on panel data of 96 countries from 1990 to 2019. We find that while an increase in financial development is conducive to reducing fiscal policy volatility, an increase in financial instability raises the volatility of fiscal policy. In addition, we also find that the effect of financial instability on fiscal policy volatility depends on the financial cycle, where the harmful effect of financial instability on fiscal policy conduct is alleviated in normal and recessionary phases of the financial cycle but magnified during expansionary and crisis periods.

The findings of the paper have both theoretical and policy implications. On the theoretical side, in contrast to the previous literature that focuses primarily on the economic and institutional determinants of fiscal policy volatility, our paper highlights the important role of finance in determining fiscal policy volatility, where a large and stable financial system is found to be helpful for smoothing fiscal policy volatility. From a policy perspective, this implies that policy reforms aimed at reducing fiscal policy volatility should also take into account the impact of financial factors. In particular, policy makers should be aware that it is essential to promote financial development and maintain financial stability for a smooth conduct of fiscal policy.

Besides promoting financial development and maintaining financial stability, our study also suggests that better developed government bond market and stock market, greater trade openness and smoother financial cycles can contribute to the stability of fiscal policy. In light of these results, we can draw the following policy implications:

First, as for government bond market, a nearly full-scale market making system would be prudently workable for generating or enhancing liquidity in high-end emerging markets and developed markets. In comparison, the governments of emerging, developing and least-developed countries should consider more about building a call market or a dealers' club market according to the phase of bond market before introducing a market making system (Endo, 2013). Also, constantly improving the varieties of government bond traded could facilitate the development of diversified government bond market, which is beneficial for fulfilling the investment needs for government.

Second, the prosperity of stock market can be realized by implementing a relatively loose monetary policy for some well-developed stock markets. The growth of money supply and reduction in financing costs under loose monetary policy will boost the price of financial assets and stabilize the risk appetite of investors, which increases investor's participation in stock market eventually. In terms of underdeveloped stock market in developing countries, establishing the basic system of stock market and optimizing the industrial structure are the cornerstone of consolidating the steady development of the market. To be more specific, government should improve the information disclosure mechanism, expedite the build-up of circuit breaker mechanism and use comprehensive accounting indicators to strictly implement the delisting process to accelerate the reform of registration, trading and delisting system. Furthermore,

encouraging the development of innovative high-tech enterprises is favorable for increasing return on capital and hence the expansion of stock market.

Third, the taxation of financial services under VAT may improve trade openness (Xu and Krever, 2016; López-Laborda and Peña, 2017, 2021). The financial VAT can reduce the price of traded goods relative to the price of non-traded goods, triggering an increase in tradable sector. Besides, the practical experience of European countries shows that the "option-to-tax" method is more efficient in improving trade openness than "separate taxes". Besides, the high economic growth and low domestic saving rate are the main drivers of trade openness in some low-income countries, while the two factors cannot act as the driver for openness in lower-middle income countries (Osei et al., 2019). For both low-income countries and lower-middle income countries, improving the gross capital formation is essential for trade openness, which means that the government should pay more attention to the construction of a multilevel capital market and encouraging the long-term capital to enter financial market.

Finally, in the aftermath of the global financial crisis, the researches of the BIS have pointed out that the implementation of countercyclical macroprudential policy is an effective way to tame the cyclical fluctuations of financial system in the long term. In practice, macroprudential policy is used to avoid credit booms and busts by imposing the requirements of capital adequacy, liquidity coverage, reserves and countercyclical capital buffer on commercial banks. In the short term, to control the leverage of the real economy and optimize the allocation of credit resources is inevitable indispensable to solving the problem of extreme financial volatility.

Appendix
Table A1 Countries included in the sample

High income (39)	Advanced (25)	Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Korea, Netherlands, New Zealand, Norway, Portugal, Singapore, Slovak, Spain, Sweden, Switzerland, United Kingdom, United States
	Emerging (4)	Chile, Poland, Saudi Arabia, United Arab Emirates
	Developing (10)	Antigua and Barbuda, Bahamas, Bahrain, Barbados, Kuwait, Oman, Panama, Romania, Seychelles, Trinidad and Tobago
Middle income (46)	Emerging (10)	Argentina, China, Colombia, India, Indonesia, Iran, Malaysia, Mexico, Philippines, Thailand
	Developing (25)	Algeria, Azerbaijan, Bolivia, Costa Rica, El Salvador, Fiji, Gabon, Ghana, Grenada, Honduras, Jordan, Kenya, Lebanon, Mongolia, Morocco, Namibia, Nigeria, Pakistan, Papua New Guinea, Paraguay, Sri Lanka, Suriname, Tunisia, Swaziland, Venezuela
	Least developed (11)	Bangladesh, Benin, Bhutan, Comoros, Djibouti, Equatorial Guinea, Lesotho, Samoa, Solomon Islands, Tanzania, Vanuatu
Low income (11)	Least developed (11)	Burkina Faso, Burundi, Central African Republic, Guinea, Guinea-Bissau, Madagascar, Mozambique, Niger, Rwanda, Sudan, Togo

Note: The sample countries are classified according to the income level and overall development. The countries are first classified into 39 high-income countries, 46 middle-income countries and 11 low-income countries according to the World Bank's classification of countries[1]. Under each income level, the countries are then split into advanced economies, emerging economies, developing countries and least developed countries based on the standard of IMF and the United Nation[2].

---

[1] High income: https://data.worldbank.org/income-level/high-income?view=chart;
   Middle income: https://data.worldbank.org/income-level/middle-income;
Low income: https://data.worldbank.org/income-level/low-income
[2] IMF:
   https://www.imf.org/external/pubs/ft/fandd/2021/06/the-future-of-emerging-markets-duttagupta-and-pazarbasioglu.htm#:~:text=This%20approach%20identif
   ies%20the%20following%20countries%20in%20the,Africa%2C%20Thailand%2C%20Turkey%2C%20and%20the%20United%20Arab%20Emirates.
   The United Nation: https://www.un.org/development/desa/dpad/least-developed-country-category/ldcs-at-a-glance.html

Table A2 Definitions and sources of variables

Variable	Description	Source
Budget balance volatility	Standard deviation of the HP-detrended discretionary component of the general government budget deficit (% of GDP)	Authors' calculation
Government revenue volatility	Standard deviation of the HP-detrended discretionary component of the general government revenue (% of GDP)	Authors' calculation
Government spending volatility	Standard deviation of the HP-detrended discretionary component of the general government spending (% of GDP)	Authors' calculation
Financial development	Logarithm of domestic credit to private sector (% of GDP)	WDI*
Financial instability	Standard deviation of the HP-detrended discretionary component of the domestic credit to private sector (% of GDP)	Authors' calculation
Financial volatility	Standard deviation of private sector credit (% of GDP)	Authors' calculation
Growth	Annual percentage change of real GDP	WDI
Inflation	Annual percentage change in GDP deflator (%)	WDI
Public debt	Logarithm of government debt (% of GDP)	IMF**
Fiscal crisis	Binary variable (taking the value of 1 if a country experiences fiscal crisis)	Medas et al. (2018)***
Banking crisis	Binary variable (taking the value of 1 if a country experiences banking, currency or debt crisis)	IMF
Population	Logarithm of the population of a country	WDI
Trade openness	Logarithm of the ratio of exports and imports to GDP (%)	WDI
Financial openness	Capital account openness index (the Chinn-Ito Index)	Chinn-Ito website****
IMF program	Binary variable (taking the value of 1 if a country implements an IMF-supported program for a given year)	IMF
Policy scale	Discrete variable (ranging from -10 to +10)	Polity IV Database*****
Government crisis	Discrete variable (ranging from 0 to 5)	CNTS
Cabinet changes	Discrete variable (ranging from 0 to 5)	CNTS******
Political constraints	Percentage of veto players who drop from the government in a given year	DPI*******
Political system	Discrete variable (0 is given for a presidential system, 1 is given for an assembly-elected presidential system, and 2 is given for a parliamentary system)	DPI
Age dependency	Logarithm of the number of people aged 65 or over in percent of working-age population (aged 15-64)	WDI
Expansion	Binary variable (taking the value of 1 if a country is experiencing an expansionary period of financial cycle for a given year)	Authors' calculation
Recession	Binary variable (taking the value of 1 if a country is experiencing a recessionary period of financial cycle for a given year)	Authors' calculation
Normal	Binary variable (taking the value of 1 if a country is experiencing a normal period of financial cycle for a given year)	Authors' calculation

Notes: (1) * WDI denotes the World Bank's *World Development Indicators* database; (2) **Data are accessible at the website (http://www.imf.org/external/pubs/ft/wp/2010/data/wp10245.zip); (3) *** Data are available from the online appendix of Medas et al. (2018); (4) ****Data are available at the Chinn-Ito index website (http://web.pdx.edu/~ito/Chinn-Ito_website.htm); (5) ***** The Polity IV Database is available at http://www.cidcm.umd.edu/inscr/polity/index.htm; (6) ****** CNTS denotes the *Cross National Time Series Data Archive*; (7) ******* DPI denotes the *Database of Political Institutions.*

Table A3 Robustness test (Augmented Mean Group estimator)

Independent variables	Dependent variable		
	Budget balance volatility	Government revenue volatility	Government spending volatility
	(1)	(2)	(3)
Lagged dep.var.	0.182***	0.142***	0.142***
	(5.332)	(4.796)	(3.539)
Financial development	-0.280	0.128	0.647**
	(-0.799)	(0.450)	(2.030)
Financial instability	0.001	0.056**	0.004
	(0.018)	(2.171)	(0.105)
Growth	0.007	-0.005	0.011
	(0.621)	(-0.494)	(1.221)
Inflation	-0.014	-0.011	-0.004
	(-0.916)	(-1.282)	(-0.244)
Public debt	-0.137	-0.099	0.658***
	(-0.639)	(-0.534)	(2.898)
Fiscal crisis	0.133**	-0.020	-0.023
	(2.414)	(-0.372)	(-0.295)
Banking crisis	0.038	-0.062	-0.004
	(0.382)	(-0.772)	(-0.041)
Population	-5.833*	-4.554***	-7.139*
	(-1.749)	(-3.350)	(-1.836)
Trade openness	-0.248	0.114	0.216
	(-0.746)	(0.432)	(0.514)
Financial openness	-0.270	-0.302**	-0.144
	(-1.522)	(-2.326)	(-0.998)
IMF program	0.091*	-0.010	0.054
	(1.677)	(-0.172)	(1.214)
common dynamic process	1.003***	0.996***	0.883***
	(3.983)	(3.466)	(3.155)
Constant	96.013*	70.990***	106.780*
	(1.806)	(3.343)	(1.751)
Prob(Wald Chi2)	0.000	0.000	0.000
cross-section dependence	0.061	0.286	0.228
Observations	2134	2137	2136
Countries	93	93	93

Notes: (1) *,**,*** indicate statistically significant at the 10%, 5% and 1% level respectively; (2) The statistics given in the parentheses under the coefficients of explanatory variables are Z-values; (3) The statistics in the Wald Chi2 and cross-section dependence tests are *p*-values.

Table A4 Robustness test (Common Correlated Effects Mean Group estimator)

Independent variables	Dependent variable		
	Budget balance volatility	Government revenue volatility	Government spending volatility
	(1)	(2)	(3)
Lagged dep.var.	-0.128	0.123	-0.007
	(-0.751)	(0.510)	(-0.047)
Financial development	-1.102	0.241	5.082*
	(-0.767)	(0.198)	(1.919)
Financial instability	0.246	-0.079	-0.242
	(1.176)	(-0.717)	(-1.122)
Growth	0.184*	-0.031	-0.038

	(1.646)	(-0.685)	(-0.979)
Inflation	0.071	-0.030	-0.131
	(1.230)	(-0.528)	(-0.947)
Public debt	-1.640	0.145	2.233
	(-0.685)	(0.170)	(1.095)
Fiscal crisis	0.004	-0.312	-0.646
	(0.018)	(-1.331)	(-1.605)
Banking crisis	0.311	-0.251	0.324
	(0.381)	(-0.850)	(0.465)
Population	38.026	-3.689	-26.414
	(1.366)	(-0.547)	(-0.692)
Trade openness	-6.454	1.311	2.675
	(-1.318)	(0.998)	(1.174)
Financial openness	0.106	-0.199	1.148
	(0.094)	(-0.293)	(1.295)
IMF program	0.167	0.366**	0.031
	(0.985)	(2.109)	(0.133)
Constant	-531.746	83.466	529.277
	(-1.052)	(0.756)	(0.753)
Prob(Wald Chi2)	0.877	0.481	0.230
cross-section dependence	0.258	0.664	0.674
Observations	2134	2137	2136
Countries	93	93	93

Notes: (1) *,**,*** indicate statistically significant at the 10%, 5% and 1% level respectively; (2) The statistics given in the parentheses under the coefficients of explanatory variables are Z-values; (3) The statistics in the Wald Chi2 and cross-section dependence tests are *p*-values; (4) For brevity, the table omits the estimation results for coefficients of cross-section averaged regressors and the results are available upon requests.

Table A5 Tests for coefficient differences (budget balance and government revenue)

Independent variables	Panel A		Panel B		Panel C	
	Budget balance volatility	Government revenue volatility	Budget balance volatility	Government revenue volatility	Budget balance volatility	Government revenue volatility
Lagged dep.var.	0.680***	0.709***	0.682***	0.709***	0.563***	0.538***
	(43.549)	(47.602)	(43.430)	(47.097)	(31.005)	(28.976)
Financial development	-0.072***	-0.104***	-0.076***	-0.115***	0.139**	-0.013
	(-3.118)	(-4.889)	(-3.199)	(-5.289)	(2.420)	(-0.248)
Financial instability	0.015*	0.017**	0.014	0.020**	0.001	0.010
	(1.718)	(2.171)	(1.596)	(2.462)	(0.135)	(1.187)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effect	No	No	Yes	Yes	Yes	Yes
Country fixed effect	No	No	No	No	Yes	Yes
Prob(*F*-test)	0.000	0.000	0.000	0.000	0.000	0.000
Observations	2164	2167	2164	2167	2164	2167
Countries	96	96	96	96	96	96
Difference in coefficient (β_2)	0.032		0.040		0.152**	
Difference in coefficient (β_3)	-0.002		-0.006		-0.009	

Notes: (1) *,**,*** indicate statistically significant at the 10%, 5% and 1% level respectively; (2) The statistics given in the parentheses under the coefficients of explanatory variables are Z-values; (3) The statistics in the F-test are *p*-values.

Table A6 Tests for coefficient differences (government revenue and government spending)

Independent variables	Panel A		Panel B		Panel C	
	Government revenue volatility	Government spending volatility	Government revenue volatility	Government spending volatility	Government revenue volatility	Government spending volatility
Lagged dep.var.	0.709***	0.706***	0.709***	0.706***	0.538***	0.550***
	(47.602)	(46.623)	(47.097)	(46.305)	(28.976)	(29.777)
Financial development	-0.104***	-0.087***	-0.115***	-0.091***	-0.013	0.109*
	(-4.889)	(-3.694)	(-5.289)	(-3.789)	(-0.248)	(1.911)
Financial instability	0.017**	0.009	0.020**	0.007	0.010	-0.009
	(2.171)	(1.051)	(2.462)	(0.804)	(1.187)	(-0.956)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effect	No	No	Yes	Yes	Yes	Yes
Country fixed effect	No	No	No	No	Yes	Yes
Prob(*F*-test)	0.000	0.000	0.000	0.000	0.000	0.000
Observations	2167	2166	2167	2166	2167	2166
Countries	96	96	96	96	96	96
Difference in coefficient (β_2)	-0.018		-0.024		-0.122*	
Difference in coefficient (β_3)	0.008		0.012		0.019*	

Notes: (1) *,**,*** indicate statistically significant at the 10%, 5% and 1% level respectively; (2) The statistics given in the parentheses under the coefficients of explanatory variables are Z-values; (3) The statistics in the F-test are *p*-values.

Table A7 Tests for coefficient differences (budget balance and government spending)

Independent variables	Panel A		Panel B		Panel C	
	Budget balance volatility	Government spending volatility	Budget balance volatility	Government spending volatility	Budget balance volatility	Government spending volatility
Lagged dep.var.	0.680***	0.706***	0.682***	0.706***	0.563***	0.550***
	(43.549)	(46.623)	(43.430)	(46.305)	(31.005)	(29.777)
Financial development	-0.072***	-0.087***	-0.076***	-0.091***	0.139**	0.109*
	(-3.118)	(-3.694)	(-3.199)	(-3.789)	(2.420)	(1.911)
Financial instability	0.015*	0.009	0.014	0.007	0.001	-0.009
	(1.718)	(1.051)	(1.596)	(0.804)	(0.135)	(-0.956)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effect	No	No	Yes	Yes	Yes	Yes
Country fixed effect	No	No	No	No	Yes	Yes
Prob(*F*-test)	0.000	0.000	0.000	0.000	0.000	0.000
Observations	2164	2167	2164	2167	2164	2167
Countries	96	96	96	96	96	96
Difference in coefficient (β_2)	0.014		0.016		0.030	
Difference in	0.006		0.007		0.011	

coefficient (β_3)				

Notes: (1) *,**,*** indicate statistically significant at the 10%, 5% and 1% level respectively; (2) The statistics given in the parentheses under the coefficients of explanatory variables are Z-values; (3) The statistics in the F-test are *p*-values.

Table A8 OLS regression: fixed effect

Independent variables	Dependent variable		
	Budget balance volatility	Government revenue volatility	Government spending volatility
	(1)	(2)	(3)
Lagged dep.var.	0.562***	0.537***	0.552***
	(31.160)	(29.179)	(30.077)
Financial development	0.094*	0.006	0.057
	(1.751)	(0.119)	(1.072)
Financial instability	0.008	0.010	-0.001
	(0.810)	(1.164)	(-0.104)
Growth	-0.005	0.001	-0.003
	(-0.889)	(0.190)	(-0.635)
Inflation	-0.005	-0.000	-0.002
	(-1.483)	(-0.131)	(-0.738)
Public debt	-0.017	-0.041	0.025
	(-0.425)	(-1.166)	(0.619)
Fiscal crisis	0.121**	0.069*	0.070
	(2.573)	(1.662)	(1.505)
Banking crisis	0.185***	0.004	0.194***
	(3.109)	(0.082)	(3.292)
Population	-0.013	-0.216*	-0.055
	(-0.096)	(-1.774)	(-0.399)
Trade openness	-0.030	0.153**	0.061
	(-0.360)	(2.099)	(0.747)
Financial openness	-0.044	-0.066***	-0.030
	(-1.515)	(-2.596)	(-1.037)
IMF program	-0.052	-0.002	-0.061
	(-1.054)	(-0.056)	(-1.251)
Constant	0.669	3.510*	0.981
	(0.307)	(1.824)	(0.454)
Time Effect	Yes	Yes	Yes
Country Effect	Yes	Yes	Yes
F-test	0.000	0.118	0.361
Observations	2164	2167	2166
Countries	96	96	96

Notes: (1) *,**,*** indicate statistically significant at the 10%, 5% and 1% level respectively; (2) The statistics given in the parentheses under the coefficients of explanatory variables are Z-values; (3) The statistics in the F-test are *p*-values.

Definitions and sources of variables

Growth. This variable is the annual percentage growth rate of GDP at market prices. Aggregates are based on constant 2015 U.S. dollars. The data are sourced from the World Bank Database (WDI).

Inflation. This variable is computed as the annual growth rate of the GDP deflator. The data are sourced from the World Bank Database (WDI).

Financial development. This variable is the logarithm of the private sector credit to GDP ratio. The raw data are sourced from the World Bank Database (WDI).

Public debt. This variable is the logarithm of the government debt to GDP ratio. The data are sourced from the working paper of IMF.

Fiscal crisis. This indicator is a dummy variable, which equals to 1 if a country experiences a fiscal crisis for a given year.

Banking crisis. This variable is a dummy variable, which takes the value 1 if a country experiences a banking, currency or debt crisis for a given year. The original information for the crisis episodes for each country is from IMF financial data.

Population. This variable is the logarithm of a country's population. The raw data are available at the World Bank Database (WDI).

Trade openness. This variable is calculated as the logarithm of the ratio of national trade (imports plus exports) to GDP. The raw data are sourced from the World Bank Database (WDI).

Financial openness. This variable is an index (Chinn-Ito Index) which measures a country's degree of capital account openness. The data are available at the Chinn-Ito index website (http://web.pdx.edu/~ito/Chinn-Ito_website.htm).

IMF program. This variable is a dummy variable, which takes the value 1 if a country implements an IMF-supported program for a given year.

Polity scale. This variable is Polity2 from Polity IV, which measures how democratic a country is. It subtracts the country's score on an 'autocracy' index from its score on a 'democracy' index and produces a polity scale ranging from -10 (strongly autocratic) to +10 (strongly democratic). The data are sourced from the Polity IV Database (http://www.cidcm.umd.edu/inscr/polity/index.htm).

Government crisis. This indicates the number of any rapidly developing situations that might cause the downfall of the present regime, excluding the situations of revolt. The data are sourced from the Cross National Time Series Data Archive (CNTS).

Cabinet changes. This annual frequency variable counts the number of times that a new premier is named and/or 50 per cent of cabinet posts are occupied by new ministers. The data are sourced from the Cross National Time Series Data Archive (CNTS).

Political constraints. This variable measures the percentage of veto players dropping from the government for a given year. The data are sourced from the Database of Political Institutions (DPI).

Political system. This variable characterizes the political system, a value of 0 is given for a presidential system, a value of 1 is given for an assembly-elected presidential system, a value of 2 is given for a parliamentary system. The data are sourced from the Database of Political Institutions (DPI).

Age dependency. This variable is calculated as the logarithm of the number of elderly people (aged 65 or above) as a percentage of working age (aged 15-64). The raw data are sourced from the World Bank Database (WDI).

Expansion. This variable is a dummy variable, which takes the value 1 if a country is experiencing an expansionary period of financial cycle for a given year. Methods used for characterizing the phases of the financial cycle can be found in the main text of the paper.

Recession. This variable is a dummy variable, which takes the value 1 if a country is experiencing a recessionary period of financial cycle for a given year. Methods used for characterizing the phases of the financial cycle can be found in the main text of the paper.

Normal. This variable is a dummy variable, which takes the value 1 if a country is experiencing a normal period of financial cycle for a given year. Methods used for characterizing the phases of the financial cycle can be found in the main text of the paper. Methods used for characterizing the phases of the financial cycle can be found in the main text of the paper.

References

Afonso, A., and Carvalho, F.T. (2022). Time-varying Cyclicality of Fiscal Policy: The Case of the Euro Area. *The North American Journal of Economics and Finance*, 62, 101778.

Aghion, P., Hemous, D., and Kharroubi, E. (2014). Cyclical Fiscal Policy, Credit Constraints, and Industry Growth. *Journal of Monetary Economics*, 62, 41–58.

Agnello, L., and Souza, R. (2014). The Determinants of the Volatility of Fiscal Policy Discretion. *Fiscal Studies*, 35(1), 91–115.

Ahmed, S. (1998). Comment on the Legal Environment, Banks, and Long-Run Economic Growth. *Journal of Money, Credit and Banking,* 30(3), 614–620.

Alesina, A., Tabellini, G., and Campante, F.R. (2008). Why Is Fiscal Policy Often Procyclical? *Journal of the European Economic Association*, 6(5), 1006-1036.

Arellano, M. and Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *Review of Economic Studies*, 58, 277-297.

Arellano, M., and Bover, O. (1995). Another Look at the Instrumental Variable Estimation of Error-Components Models. *Journal of Econometrics*, 68(1), 29–51.

Balima, H., and Sy, A. (2021). IMF‐Supported Programs and Sovereign Debt Crises. *IMF Economic Review*, 69, 427–465.

Beck, T., and Levine, R. (2004). Stock Markets, Banks, and Growth: Panel Evidence. *Journal of Banking & Finance*, 28, 423–442.

Beck, T., Levine, R., and Loayza, N. (2000). Finance and the Sources of Growth. *Journal of Financial Economics*, 58(1), 261–300.

Bénétrix, A., and Lane, P. (2010). Fiscal Shocks and the Sectoral Composition of Output. *Open Economies Review*, 21(3), 335–350.

Bénétrix, A., and Lane, P. (2017). Financial Cycles and Fiscal Cycles. In Ľ Ódor (Ed.), Rethinking Fiscal Policy after the Crisis, pp. 356-383. Cambridge: Cambridge University Press.

Blundell, R., and Bond, S. (1998). Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. *Journal of Econometrics*, 87(1), 115–143.

Borio, C. (2014). The Financial Cycle and Macroeconomics: What Have We Learnt? *Journal of Banking & Finance*, 45, 182–198.

Bova, E., Carcenac, N., and Guerguil, M. (2014). Fiscal Rules and the Procyclicality of Fiscal Policy in the Developing World. IMF Working Paper 122.

Braun, M., and Larrain, B. (2005). Finance and the Business Cycle: International, Inter-Industry Evidence. *Journal of Finance*, 60(3), 1097–1128.

Cevik, S., and Teksoz, K. (2014). Deep Roots of Fiscal Behavior. IMF Working Paper 45.

Chen, T., Kim, D., and Lin, S. (2021). Nonlinearity in the Effects of Financial Development and Financial Structure on Unemployment. *Economic Systems*, 45(1), 100766.

Chinn, M., and Ito, H. (2006). What Matters for Financial Development? *Journal of Development Economics*, 81(1), 163–192.

DeLong, J. B., and Summers, L. H. (2012). Fiscal Policy in a Depressed Economy. *Brookings Papers on Economic Activity*, 44(1), 233–297.

Endo, T. (2013). The Development of Government Bond Markets in Emerging Economies: Market Structure Matters. PSN: Other Domestic Development Strategies (Topic).

Erbil, N. (2011). Is Fiscal Policy Procyclical in Developing Oil-Producing Countries? IMF Working Paper 171.

Fatas, A., and Mihov, I. (2003). The Case for Restricting Fiscal Policy Discretion. *Quarterly Journal of Economics*, 118(4), 1419–1447.

Fatas, A., and Mihov, I. (2006). The Macroeconomic Effects of Fiscal Rules in the US States. *Journal of Public Economics*, 90(1–2), 101–117.

Ferraresi, T., Roventini, A., and Fagiolo, G. (2015). Fiscal Policies and Credit Regimes: A TVAR Approach. *Journal of Applied Econometrics*, 30(7), 1047–1072.

Fetai, B. (2013). The Effectiveness of Fiscal and Monetary Policy during the Financial Crisis. *EAST-WEST Journal of Economics and Business*, 16(2), 53–66.

Furceri, D., Çelik, S.K. and Poplawski-Ribeiro, M. (2016). Government Consumption Volatility and the Size of Nations. *Public Finance Analysis*, 72(2), 211-228.

Gruss, B., Nabar, M., and Poplawski-Ribeiro, M. (2020). Growth Accelerations and Reversals in Developing Economies: External Conditions and Domestic Amplifiers. *Open Economies Review*, 31, 753-786.

Guillaumont-Jeanneney, S., and Kpodar, K. (2011). Financial Development and Poverty Reduction: Can There Be a Benefit without a Cost? *Journal of Development Studies*, 47(1), 143–163.

Hutchison, M., Noy, I., and Wang, L. (2010). Fiscal Policy and Monetary Policy and the Cost of Sudden Stops. *Journal of International Money and Finance*, 29(6), 973–987.

Jalles, J.T. (2021). Dynamics of Government Spending Cyclicality. *Economic Modelling*, 97, 411-427.

Jordà, Ò. (2005). Estimation and Inference of Impulse Responses by Local Projections. *American Economic Review*, 95(1), 161-182.

Jorra, M. (2012). The Effect of IMF Lending on the Probability of Sovereign Debt Crises. *Journal of International Money and Finance*, 31, 709-725.

Laeven, L., and Valencia, F. (2020). Systemic Banking Crises Database II. *IMF Economic Review*, 68(2), 307-361.

Lane, P. (2011). Fiscal Policy and Financial Stability. Mimeo, Trinity College Dublin.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., and Vishny, R.W. (1998). Law and Finance. *Journal of Political Economy*, 106, 1113-1155.

Leeper, E., Traum, N., and Walker, T. (2017). Clearing Up the Fiscal Multiplier Morass, *American Economic Review*, 107 (8), 2409–2454.

Levine, R., Loayza, N., and Beck, T. (2000). Financial Intermediation and Growth: Causality and Causes. *Journal of Monetary Economics*, 46(1), 31–77.

Lewbel, A. (1997). Constructing Instruments for Regressions With Measurement Error When no Additional Data are Available, with An Application to Patents and R&D. *Econometrica*, 65(5), 1201-1213.

López-Laborda, J., and Peña, G. (2017). Does Financial VAT Affect the Size of the Financial Sector. *Economics: The Open-Access, Open-Assessment E-Journal*, 11(7), 1-28.

López-Laborda, J., and Peña, G. (2021). Financial VAT May Improve Trade Openness. *Applied Economics*, 54(3),1-13.

Ma, Y. (2018). Financial Development, Financial Structure, and the Growth Effect of Monetary Policy: International Evidence. *Global Economic Review*, 47(4), 395-418.

Ma, Y., and Yao, C. (2022). Openness, Financial Structure, and Bank Risk: International Evidence. *International Review of Financial Analysis*, 81, 102065.

Mawejje, J., and Odhiambo, N.M. (2022). The Determinants and Cyclicality of Fiscal Policy: Empirical Evidence from East Africa. *International Economics*, 169, 55-70.

Medas, P., Poghosyan, T., Xu, Y., Farah-Yacoub, J., and Gerling, K. (2018). Fiscal Crisis. *Journal of International Money and Finance*, 88, 191–207.

Obstfeld, M. (2013). On Keeping Your Powder Dry: Fiscal Foundations of Financial and Price Stability. Mimeo, University of California at Berkeley.

Osei, D.B., Sare, Y.A. and Ibrahim, M. (2019). On the Determinants of Trade Openness in Low- and Lower–Middle-Income Countries in Africa: How Important is Economic Growth? *Future Business Journal*, 5(2), 1-10.

Osei, M.J. and Kim, J. (2020). Foreign Direct Investment and Economic Growth: Is More Financial Development Better? *Economic Modelling*, 93, 154-161.

Papi, L., Presbitero, A.F., and Zazzaro, A. (2015). IMF Lending and Banking Crises. IMF Working Paper 19.

Roodman, D. (2009). A note on the theme of too many instruments. *Oxford Bulletin of Economics and Statistics*, 71(1), 135–158.

Talvi, E., and Végh, C.A. (2005). Tax Base Variability and Procyclical Fiscal Policy in Developing Countries. *Journal of Development Economics*, 78(1), 156-190.

Toye, J. (2016). Financial Structure and Economic Development. *The New Palgrave Dictionary of Economics*, 12, 1-5.

Verardi, V., and Vermandele, C. (2018). Univariate and Multivariate Outlier Identification for Skewed or Heavy-Tailed Distributions. *Stata Journal*, 18, 517–532

Windmeijer, F. (2005). A Finite Sample Correction for the Variance of Linear Efficient Two-Step GMM Estimators. *Journal of Econometrics*, 126(1), 25–51.

Woo, J. (2009). Why Do More Polarized Countries Run More Pro-cyclical Fiscal Policy? *Review of Economics and Statistics*, 91(4), 850–870.

Woo, J. (2011). Growth, Income Distribution and Fiscal Policy Volatility. *Journal of Development Economics*, 96(2), 289–313.

Xu, Y., and Krever, R. (2016). Applying VAT to financial services in China: Opportunities for China and lessons for the world? *Australian Tax Review*, 45(1), 38-49.

Yépez, C. A. (2018). The Impact of Credit and Fiscal Policy under a Liquidity Trap, *North American Journal of Economics and Finance*, 44, 1–11.

Call for Papers

International Monetary Review

International Monetary Review is an internal academic magazine sponsored by International Monetary Institute. Following the principle of including both Chinese and western merits with precise and practical academic spirit, International Monetary Review focuses on the cutting-edge theoretical researches in internationalization of RMB, reform of international monetary system, regional monetary and financial cooperation, China's international financial strategies, and other macro-financial theories and policies.

We welcome submissions by scholars, experts and practitioners in financial industry. Papers and articles should center on key financial issues and follow academic standard and scientific methodology. We welcome quality articles based on data analysis and theoretical model and other insightful articles with standard writing.

Prepare your article

General rule: Submitted manuscripts should be double-spaced texts in 10.5 point font, and formatted for paper of standard size with margins of at least 20mm on all sides. Pages should be numbered, and an abstract (of no more than 200 words), as well as keywords and complete author affiliations, should be included in the paper in the title page. A regular article should not exceed 50 pages.

Mathematics: Equations must be identified by consecutive Arabic numbers in parentheses on the right. Expressions should be aligned and compound subscripts and superscripts clearly marked if there is any potential for confusion.

Figures: Figures must be of professional quality and ready for reproduction. They should be numbered consecutively. Black-and-white versions of figures are required for printing purposes, but color figures can also be supplied for online dissemination.

Tables: Tables should be numbered consecutively throughout the article. Each table must include a descriptive title and headings to columns. Gather general footnotes to tables as "Note:" or "Notes:", and use a, b, c, etc., for specific footnotes. Asterisks * and/or ** indicate significance at the 5 percent and 1 percent levels, respectively, if used.

Reference style

Please follow the EPS Style Guide when preparing your article.
http://eps.ruc.edu.cn/UserFiles/File/EPS%20Style%20Guide.pdf

Further considerations

• Manuscript has been spell-checked and grammar-checked
• References are in the correct format for this journal
• All references mentioned in the reference list are cited in the text, and vice versa
• Permission has been obtained for use of copyrighted material from other sources

Submit your article

Manuscripts can be submitted via e-mail to imi@ruc.edu.cn