International Monetary Review

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Special Column on BRICS Summit and Currency Diversification

The BRICS 2023 Summit and Internationalisation of RMB

By HERBERT POENISCH [*]

The decision by the recent BRICS 15th summit to promote intra BRICS trade and use of local currencies to settle this trade will undoubtedly boost the internationalisation of renminbi. However, increased global use of renminbi will be a mixed blessing for China. As other countries, who supply their currencies for global use have experienced, issuing a global currency offers privileges as well as responsibilities, which have to be balanced to assess the net gain for a country. The dollar is the obvious example, where the USA has adopted a benign policy towards the role of global reserve currency. The European Central Bank has been far more prudent towards international use of the euro and the Bank of Japan has stifled the internationalisation of the yen in the late 1980s.

This article will analyse advantages as well as disadvantages of further internationalisation of renminbi. China's commitment so far has been vague without clear analysis of the outcome might be. Using renminbi for trade will need an expansion of money supply of China and holding more renminbi forex reserves will increase the volatility of renminbi exchange rate as more holders of forex reserves in renminbi have different liquidity preferences.

The first part will cover the BRICS summit declaration regarding enhanced use of currencies in the absence of creating a common BRICS currency. In order to gauge the demand for renminbi the patterns of intra BRICS trade will be subject to part two. Part three will be a theoretical analysis of the implications of surplus currencies and deficit currencies in the absence of an institutionalised clearing and conversion mechanism. The fourth part will outline the possibilities of conversion of various currencies into a universally accepted currency, most likely the renminbi. This will be followed by the implications for the monetary policy of China by providing this universal stable currency. The final part will provide the outlook for internationalisation of renminbi under this scenario. Conclusions will sum up the findings of this analysis.

1. The Johannesburg II declaration

The declaration does not mention a common currency but 'we stress the importance of encouraging the use of local currencies in international trade and financial transactions between BRICS as well as their trading partners'. At present Finance Ministers and Central Bank Governors have been asked to consider the issue of local currencies and report back to the next summit in Russia in 2024.

They are being asked to consider a relapse into a cumbersome bilateral clearing, when multilateral clearing has proven superior over many years of refinement. Not only does it avoid the conversion problem but also looking for risk free investment vehicles for foreign exchange reserves.

The first concern is whether it is feasible to propose trade in local currencies to trading with partners outside the BRICS. They are not likely to accept weak currencies if they can continue using strong currencies, such as the dollar or other global currencies. These are readily available in deep and liquid markets.

Secondly, the exchange rate is a concern as most of these local currencies lack a direct currency exchange rate. The solution will be a double currency conversion through the bilateral dollar exchange

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rates. The drawback is that double conversion not only exposes countries to exchange rate risks but makes transactions expensive due to additional handling costs.

Finally, BRICS banks handling rouble transactions are at peril to doing business with Russia due to the sanctions. They will prefer to handle transactions through the traditional SWIFT channels from which only Russia is excluded.

Even if countries trade in the universally accepted renminbi they might like to avoid exposing its volatile currency market to a highly regulated Chinese currency.

2. Recent developments of intra BRICS trade

BRICS countries have been planning to beef up their statistical cooperation. There is an annual statistical compendium of various statistical indicators called Joint Statistical Publication, including trade. However, detailed data about bilateral trade are still missing. Therefore, silkroadbriefing.com is the best source of bilateral trade. According to their data, total intra-BRICS trade amounted to only USD 718bn in 2022. Although the share or BRICS countries' trade with the rest of the world, first and foremost with advanced economies, is 18%, the share of intra-BRICS trade was only 2.2%.

The bilateral trade between China and Russia was USD 190bn, with China's deficit amounting to USD 38bn. China also had a deficit in its trade with Brazil of USD 22bn, out of total trade of USD 166bn. In trade with the other 2 BRICS countries China had a surplus of USD 100bn with India, out of total USD 136bn and South Africa of USD 12bn out of a total if USD 57bn. The total deficit of China was USD 60bn, whereas its surplus was USD 112bn, resulting in a net surplus of China of USD 52bn. Deficits and surpluses are volatile depending on the state of the economy in China, the locomotive of intra-BRICS trade. At present China's economy is anaemic and the outlook for other BRICS countries' exports to China rather dim.

Out of other BRICS countries trade, India's with Russia of USD 45bn and with South Africa of USD 100bn. The other trade is USD 10bn or below, between Russia, Brazil and South Africa.

3. Currency theory

BRICS countries will not be able to ignore the basic economic theories on currencies. The relative value of a currency will be determined by its supply and demand. The supply is determined by the monetary policy of a country, its inflationary track record and the trust by markets. Running a current account deficit creates excess supply of the currency.

The demand for a currency is determined by the transaction demand and for storage of value. The transaction demand is made up of domestic demand as well as foreign demand, such as current account surpluses as well as demand in the financial account for inward FDI, portfolio investment as well as inward credit. The demand for storage of value is made up of domestic confidence in the local currency as well as the willingness of foreigners to hold one's currency. Bad inflationary record as well as lack of trust in a currency will encourage resident's currency flight as well as deter non residents from investing in the country. This is the basis for weak currencies.

Within BRICS, all currencies were subject to lack of domestic confidence as well as foreign trust. Although the renminbi is also subject to these sentiments, China's strong domestic and foreign economic performance has turned it into an economic, export based powerhouse. This has boosted confidence in renminbi for transactions as well as for capital inflows. The renminbi's long term appreciation is evidence of this. This makes renminbi the unequal partner in BRICS with other currencies on the opposite side. The RMB has already become an anchor currency for EME currencies (see IMI working paper in this issue). Renminbi will be subject to excess demand from trade as well as finance in the foreseeable future. Thus buoyant bilateral exchange rates of renminbi against other BRICS currencies are evidence of this and unlikely to change in the near future.

4. Conversion of currencies

The Johannesburg declaration just mentions enhanced use of local currency without any solution to the surplus/deficit currency problem. Will banks or central banks of BRICS countries willingly hold their partner currencies irrespectable if this is a strong or weak currency. The terms strong or weak have be decided according to the net position versus all partners and nobody has been designated to calculate this position. The example of the European Union offers itself where independent currencies, the constituents of the present euro were aligned by the European Payments Union (EPU) which was established in 1950.

'The EPU was created precisely as a tool for multilateral compensation of bilateral balances. There were five main 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 credit to debtor countries, drawing from a fund created by surplus balances; (iv) a single unit of account, the dollar, existed for all payments and credits; and (v) the US Treasury allocated USD 350 mn as a start-up fund to cover temporary gold or dollar shortages in the multilateral settlement'.

If BRICS is serious about moving from bilateral settlement, which is not sustainable to a multilateral settlement, an institution similar to the EPU needs to be set up. In oder to keep the system going, either settlement in gold or the currency of the paymaster, most likely China has to be supplied on demand. China will have to take on the role played by the USA in the European case.

5. Effect on monetary policy of China

Taking on such a role is far more than the simple internationalisation of renminbi as was envisaged at the outset. If China were to play such a role, the implications for the domestic economy and its monetary policy add a dimension which has to be quantified at some stage.

Starting with monetary policy, the Peoples Bank of China will receive its net position as net foreign assets, as it happens now with the dollar and other currencies. They will just add Brazilian, Russian, Indian, South African currencies to this determinant of the money supply. In a way this has already happened with swap transactions and bank loans in renminbi, where China provided renminbi (M0) against some 40 currencies. Through swaps and bank loans China has provided some USD 240bn to major countries, such as Russia, Argentina and Pakistan. The purpose of these swap agreements was to facilitate China's trade, rather than to bail out countries in default. The bank loans are also supported trade but also supported liquidity needs of partners, such as the recent surge in renminbi loans of some USD 10bn by major Chinese banks to Russian banks.

The internationalisation aspect is that the newly created renminbi are owned by foreigners, not Chinese. Unless China succeeds in tying up these balances in onshore investments, such as bonds, these renminbi will be placed in the offshore renminbi market, adding volume and depth to this market. In a way this happened to the dollar after WWII, and particularly with the emergence of the Eurodollar market. There, dollar deposits were placed with banks outside the US and onlent by these banks. At the outset US authorities were concerned about the domestic inflationary impact of these offshore balances. Over time, they realised that domestic demand was unaffected by these transactions. Subsequently they took a benign attitude to this market and never intervened.

However, China's attitude to the offshore renminbi market is quite different. It cares to a point where regular interventions take place to align onshore and offshore interest and exchange rates. This will gain in importance as the volume of offshore renminbi market grows and foreign holders of these renminbi might be tempted to exchange their renminbi into dollars, particularly as the dollar will continue to play a global role. The recent sale of renminbi by Russia in the offshore market is a case in point.

It remains to be seen how much the denomination of BRICS trade in local currencies, and in renminbi after conversion will increase the already elevated money supply of renminbi. At present M2 amounts to some 240% of China's GDP, compared to 80% of US GDP, even after rounds of quantitative easing. The money supply growth exceeding economic growth over the past decade is mostly determined by domestic needs, such as shoring up the slagging economy, the local governments and property sector in particular. Thus the domestic component of money creation far exceeds the NFA, regardless of which currencies make up the NFA.

Finally, China's continued foreign exchange controls will prevent an automatic arbitration between onshore and offshore renminbi markets. Will China ever agree to letting financial markets perform this arbitration? Within a BRICS context this will not happen because of a highly engineered solution, by which BRICS members holding renminbi balances will be required to keep them and stop them from uncontrolled trading.

6. Effect on internationalisation of RMB

The internationalisation of renminbi has certainly picked up in the recent past compared with the intermediary phase between 2015 and 2020. This is reflected in various available indicators.

The most comprehensive one is the BIS statistics on foreign exchange turnover which is collected every three years, latest April 2022 by survey of major foreign exchange market participants. Between 2019 and 2022 the use of renminbi increased in foreign exchange turnover from 4 out of 200 to 7 out of 200 (because of currency pairs). BIS online data now show the renminbi components, such as spot, swaps etc. The second indicator is the use of renminbi in foreign exchange data captured by SWIFT. The share of renminbi in global payments increased from 2.2% in July 2021 to 3% in July 2023. Excluding payments within the eurozone, the renminbi share increased from 1.40% to 2.23% during this period. Another index is the renminbi internationalisation index (RII) compiled by the International Monetary Institute in Beijing. This index increased from 5.4 in 2021 to 6.4 in 2022. Their index includes bilateral renminbi payments outside the SWIFT system and could thus be considered as most inclusive.

Conclusion

The BRICS Johannesburg declaration calling for greater use of local currencies will put China's commitment to internationalisation of renminbi to the test of reality. The reality being China becoming the supplier of a global reserve currency to complement the dollar in this role.

While China's vague concept of internationalisation of renminbi has not covered all the implications of an extended role in international use of renminbi, as it will have to face the backlash for the domestic economy. The extent depends on a number of variables which are uncertain at present. Will ever increasing money supply be required in order to sustain economic momentum or will the domestic debt reduction and return of domestic vibrancy allow monetary authorities to slow down the domestic component of the money supply?

If other BRICS countries will trade and hold renminbi, this will pose the same problems for China as the USA faced during the surge in global use of dollars after WWII. It would be wise for Chinese authorities to study the US experience and adopt a more benign stance. At the same time China should avoid weaponising its currency as the USA has done with the dollar for a long time.

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BRICS Emerging Economies & Currency Diversification in Cross Border Payments

By JAYA JOSIE [*]

Abstract

At the August 2023 15th BRICS Summit in South Africa leaders called for diversification in cross border currency payments in the BRICS and emerging economies for financial transactions and trade through the use of national local currencies. For BRICS and economies in the Belt and Road Initiative (BRI) with concentric links, this would be a significant advantage in their commitment to facilitate strong investment and trade financial transactions. Currently, only China has the use of an internationally recognised reserve currency and only some the BRICS and emerging economies have limited convertibility and/or are dependent on the use of the US dollar or some other reserve currency. Such dependence places enormous macroeconomic burdens on BRICS and BRI foreign exchange and balance of payment. In January 2024 the original five BRICS countries will be joined by six new emerging market economies from Africa, the Middle East and, Latin America. The 15th BRICS summit in Johannesburg took a decision to seek currency diversification and an inclusive multilateral global currency regime so that it could better reflect today's world economy. This article will explore the relevance and importance of this move in the light of the current geopolitical tensions.

Currency; cross border payments; trade; investment finance; diversification, multilateralism

The 15th BRICS Summit in South Africa under the theme, "BRICS and Africa: Partnership for Mutually Accelerated Growth, Sustainable Development and Inclusive Multilateralism" ended with the release of a declaration by the heads of state of the Brazil, Russia, India, China and, South Africa (BRICS) reaffirming their support for an open, transparent, fair, predictable, inclusive, equitable, non-discriminatory multilateral trading system based upon the World Trade Organization (WTO) founding principles. The declaration included 94 items ranging from support for issues relating to the African continental Free Trade Area (AfCFTA), international trade and cross border payments, finance, peace and security, climate change, sustainable development and investment. The focus of this is article will explore the BRICS declaration for diversification in cross border currency payments in the BRICS and emerging economies in the Belt and Road Initiative (BRI) for financial transactions, and trade through the use of national local currencies. Many emerging economies in Africa, Asia, Eurasia, the Middle East and Latin America have close concentric links with both the BRICS and the BRI. For this reason for BRICS and emerging market economies in the BRI diversification of cross-border financial transactions would be a significant advantage in their commitment to facilitate strong investment and cross-border trade flows.

Currently, only China has the use of an internationally recognised reserve currency while some BRICS and BRI members have convertible currencies and, many of the emerging economies are highly dependent on the use of the US dollar or some other reserve currency such as the Euro, Yen, or Pound Sterling. Such dependence places enormous macroeconomic burdens, foreign exchange and balance of payments problems. In anticipation of the report by the BRICS Payment Task Force (BPTF) on the mapping of the various elements of the G20 Roadmap on Cross- border Payments in BRICS countries, Item 44 of the BRICS declaration recognises the advantages and benefits of an efficient cross border payment system. In the meantime, however, the BRICS leaders stressed the importance of encouraging the use of local currencies in international trade and financial transactions between BRICS and their trading and investment partners. Of course such a switch from the exclusive use of the United States Dollar (US$) and other foreign exchange currencies for international cross border payments for trade and other transactions will mean restructuring and strengthening the corresponding banking networks in BRICS and the BRI countries to facilitate settlements in local currencies. To ensure that the BRICS countries move at a faster pace, in Item 45, the leaders further tasked the BRICS Finance Ministers and Governors of their respective

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central banks to consider the use of local currencies, payment instruments and platforms for cross border payments and financial transactions and report back by the next Summit.

Ten years ago, in 2013 President Xi announced the launch of the One Belt and One Road Initiative (OBOR) in Kazakhstan and then, subsequently in Indonesia, at an ASEAN Summit he announced the launch of the New Maritime Silk Route. Together these initiatives became known as the Belt and Road Initiative (BRI). To date the BRI links148 countries across Asia, Africa, Eurasia, the Middle East, and Latin America, and it accounts for two thirds of the world's population, and approximately 40% of the worlds GDP. The BRI opens up investment opportunities for corporations in China and other partners across the BRI linked countries. Initial data published in the first half of 2023 on the 148 countries indicate 102 projects worth US$ 43.3 billion. The latest data on developments in the BRI was published in the China Belt and Road Initiative (BRI)Investment Report 2023 H1 – the first ten years, by Fudan University's Green Finance & Development Center, Shanghai (Nedopil, 2023).

From the Report, preliminary data on Chinese engagement through financial investments and contractual cooperation for the first half of 2023 in the 148 countries of the Belt and Road Initiative (BRI) suggest that globally, China's BRI Investment shows a marked increase of 130% in Sub-Saharan countries in Africa and, with a 69% increase in construction contracts. With this level of BRI investment Sub-Saharan Africa has become, after South East Asia, the second most significant destination for BRI construction investment.   A breakdown of the regional distribution of BRI total investment globally for 2023   reveals the following data trends: Sub-Saharan Africa 69%; Arab Middle East, and North Africa 56%; East Asia 43.9%; South America   22.88% and, Europe 3.7%. China investments in construction projects are financed through loans from financial institutions or contractors   and are backed by guarantees from host government institutions. This is in contrast to construction contracts that are typically financed through loans provided by Chinese financial institutions and/or contractors with the project often receiving guarantees through the host country's government institutions.

The   Report   provides a breakdown of the US Dollar value invested in the 45 BRI countries in 2023. Of the 45 countries 24 received direct investment and 29 engaged in construction contracts. Saudi Arabia received the highest construction contractual engagements in the first half of 2023 valued at about US$3.8 billion, with Tanzania receiving US$2.8 billion and, the United Arab Emirates US$1.2 billion. With respect to investment Indonesia received the largest allocation worth about US$5.6 billion, with Peru receiving US$2.9 billion and, Saudi Arabia US$1.6 billion. The Report suggests that the BRI includes more than 900 ten year infrastructure projects valued at US$1.3trillion across Eurasia, South East Asia and, the Middle East. The funding for the projects will be backed by China's Silk Road Infrastructure Fund and the Asian Infrastructure Investment Bank (AIIB) and, the BRICS New Development Bank (NDB). It is important to note at this stage that the AIIB includes 70 countries from across the world. Among the countries include members from Europe and, the BRICS group of countries. The AIIB also includes members of the G20 and the Shanghai Cooperation Organization (SCO)

The BRICS group of countries started off originally with just Brazil, Russia, India, China and South Africa (BRICS). At the Fifteenth BRICS Summit held in August 2023 the BRICS heads of State invited six more countries with emerging economies to join the group in January 2024. The new members of the group include Argentina, Egypt, Ethiopia, Iran, Saudi Arabia and, the United Arab Emirates (UAE), and from 2024 the group will become known as the BRICS+. The invitation to the new members was based on the BRICS commitment to inclusive multilateralism and, a set of principles, criteria, standards and procedures agreed to by all members of the original five members. The new members of the BRICS group come from Africa, Latin America, the Middle East and, many of them are beneficiaries of the BRI investments.

While many of the BRICS + and the BRI member countries are emerging economies and represent a sizeable proportion of the world's population and GDP,   currently many are also going through difficult economic problems of underdevelopment, unemployment, inequality and poverty. These difficulties are exacerbated by socio-economic and political economy contradictions characterised by corruption, poor governance, capital flight and, undue international pressures from geopolitical tensions. In fact there is a chorus of international media voices that paint China's BRI program as promoting China's international economic agenda   to control the flow of its resource inputs by focusing on transport access across countries and oceans. On the other hand China is promoting the BRI as part of its own policy of inclusive multilateralism. As witnessed in the membership of the AIIB many western and Asian countries are members of the AIIB. As the BRICS+ group becomes concentrically linked with many BRI member

countries and, as many are themselves members of the BRICS New Development Bank they will, like the other members of the NDB benefit from the BRICS Contingent Reserve Arrangement (CRA). The CRA will continue to be an important mitigating mechanism to address situations of financial crises. In this sense it will contribute towards reinforcing the global financial safety net. Also at the Johannesburg 15th BRICS summit the leaders resolved that the BRICS + group will promote the use of own currencies in financial transactions across the member states. As recent as the end of September 2023, CGTN reported that according to the Bank of China, Brazil and China completed a transaction using local currencies through the signing of credit letters.

In the BRI and the BRICS there are concerted efforts to use own currencies for financial transactions in response to the possible threat of restrictions for using the SWIFT messaging system for cross border payments. As China has become an important trading partner for Russia, and in the wake of the sanctions against Russia, the country has introduced its own System for Transfer of Financial Messages (SPFS). China has also introduced its own alternative to the SWIFT called the Cross Border Interbank Payment System (CIPS). Such a move will facilitate the use of own currencies between the two countries. In Africa the African continental Free Trade Area (AfCFTA) has recently also introduced a pan-African payments and settlement messaging system to facilitate intra-African trade in local currency. The AfCFTA payment system is called the Pan African Payment and Settlement System (PAPSS). It was a project of the AfCFTA secretariat and the Cairo-based Afreximbank that specialises in trade and infrastructure finance in Africa. Many of the AfCFTA countries are also members of the BRI and the BRICS networks.

The use of the SWIFT system by Russia is currently prohibited because of USA and European sanctions, and China's messaging system will also safeguard the emergence of the Chinese Renminbi as an international reserve currency. As Russia and China are now strong trading partners cross border transactions will be enhanced by the two payment systems. The PAPSS, the CIPS and the SPFS could become important platforms for the use of own currencies for cross border payments within the BRI and the BRICS. The BRI and BRICS + group will be an important factor in the development of trade and infrastructure investment in supporting the AfCFTA. To kickstart the process the BRICS New Development Bank (NDB) committed to issue bonds and finance Infrastructure projects by raising funds in BRICS + local currencies. There could also be a similar approach within the AIIB and the SCO. Should this approach become a reality the BRI and the BRICS+ programs will show the way towards global win-win inclusive multilateralism.

Currency diversification for cross border transactions in BRICS, the BRI and other groupings have become an important policy discussion in the literature. Canuto (2023), from the Policy Center for the New South presents a perspective on the three functions of currencies as units of account; a measure of value for trade invoices and financial asset pricing , and as a medium of exchange for cross border commercial and financial transactions, and finally, as a store of value for public and private foreign reserve assets or wealth. The author goes on to discuss the role of currencies in cross border payments. For cross border transactions the author presents reasons governments may choose to use local currencies instead of convertible and other reserve currencies. One particular reason is that a country may be subject to geopolitically motivated sanctions by countries issuing dominant international reserve currencies. Recent examples of such countries include Russia, Iran and, Venezuela.

An alternative for a diversified approach for cross border payments is to use own currencies for trade amongst BRICS and emerging economies. To do this BRICS countries will have a pre-determine fixed exchange rate or a Swap agreement for trading in goods and services. In 2013 China and Brazil signed an agreement to use their own currencies for trade. In 2015 China and South Africa entered into a Swap agreement to facilitate trade between the two countries. Since the Ukraine-Russia conflict and the imposition of sanctions against Russia the Russian, Chinese and Indian governments have all agreed to trade using their own currencies. Both Russia and China have set up alternatives to the SWIFT messaging system for international payments. For facilitating infrastructure investment in BRICS and Asian countries the New Development Bank (NDB) and the Asian Infrastructure Investment Bank (AIIB) are taking decisions to use national currencies for investment in their member states.

In the case of the BRICS a Currency Swap agreement is a contract between two countries to exchange a specific amount of one currency for an equivalent amount of another currency. The purpose of the swaps is to reduce currency risk and achieve lower financing costs or gain access to a foreign currency. In the currency swap, the two countries will agree to exchange national amounts of currencies at an agreed upon exchange rate and then, at a specified future date reverse the transaction at a prearranged rate. The swap

rate is the difference between the two exchange rates, and it represents the cost of borrowing one currency compared to the other. Many multinational companies in different countries enter into Swap agreements to mitigate against risks and currency and currency volatility. To ensure against volatility they can sometimes issue bonds in the national currencies of partners using a fixed interest rate. Similarly, the BRICS countries have all maintained stable monetary policies and are in a good position to issue treasury bonds to support their comparative trading advantages in any Swap agreement.

The International Monetary Fund (IMF) presents a different perspective of the fragmentation of the international economy. For the IMF the emergence of the BRICS+ group and, possibly the BRI and the Shanghai Cooperation Organization (SCO) are symptomatic of what is characterised in an IMF staff discussion notes paper by Aiyer et al (2023) as geoeconomic fragmentation (GEF). The authors of this paper argue that the international economy is moving away from the integration of the 20th century. This process was aggravated by the COVID -19 pandemic and global geopolitical tensions that have questioned international relations and global integration. It is this process of policy-driven reversal of integration that the authors refer to as global fragmentation(GEF). The paper offers many reasons for this process but key among them are national strategic objectives, security considerations, enhancing autonomy through less reliance on other countries or regions. The fragmentation could also arise because of strategic economic rivalry; domestic policy objectives, or as a result of perceived unequal trade relations.

Many of these discussions have emerged subsequent on the conflict between Russia and the Ukraine. Since the conflict in February 2022 sanctions against Russia and Iran and, recently, even against companies and individuals in China have grown substantially (Timofeev, 2023).

However, it should be noted that since the emergence of the BRICS group the debates on the diversification of currencies have been on the agenda in academia. The emergence of the BRICS and BRICS+, the BRI and the SCO and other groupings can be viewed as part of the global fragmentation and, as a precursor to the transformation of the global economy. The on-going large-scale transformation of the international economy is a result of economic recovery in the emerging and developing economies where the BRICS+ and BRI member countries have come to reflect a new multipolar global reconfiguration. It is in this sense that the new multipolar dispensation may usher in Kalecki's (1946) vision of multilateralism following the end of the WWII, in response to the need for reconstruction in Europe. In this article Kalecki argued that multilateralism could ensure a better utilization of global resources than bilateralism or regional blocks. A Multilateral approach avoids political disputes that are typical in the formation of regional blocks and is therefore a better system if it can operate under conditions where there are no problems with balancing imports with exports. Ideally, for multilateralism to succeed "there must be maintenance throughout the world of a volume of domestic expenditure which, in combination with foreign net expenditure financed by long-term loans, (and) is adequate for securing full employment" (Kalecki, 1946: 409-416). The full employment of human, natural and technological resources was Kalecki's primary focus.

The transformation of the global economy and the rise of BRICS+ economies is an indicator that domestic and international expenditures will eventually be made easier with the use of national currencies for financial transactions across borders. The BRICS+ and BRI members have begun increasing their industrial and financial capabilities and are among the main economies in international markets for goods, services, and capital and, have a significant impact on the functioning of international markets (Kondratov, (2021). In 2020 (Kondratov (2021) thought it would be premature to expect the BRICS+ and BRI groups to achieve a balance of power in monetary and credit relations with the dominance of the USA, the UK and, the EU in the financial markets. However, following the 15th BRICS summit and the 10th anniversary of the BRI in 2023 the eventuality of multilateralism is becoming more of a reality as members of these groups seek to achieve the full employment of their human, natural and technological resources.

At the 15th BRICS Summit in Johannesburg the countries resolved to use their own currencies for cross border transactions. The central banks of the BRICS will also consider developing a Special Drawing Rights (SDR) basket of their own currencies. All the BRICS countries have swap agreements with China and already use their own currencies for trade. Brazil, Russia, and South Africa already have regulatory protocols and their currencies are fully convertible. The currencies of all three countries are used for international settlements in their respective regions of the MECUSOR (Latin America), Eurasia and SADC (Africa). In the BRICS India and China are hoping to transition to full convertibility as the BRICS+ group and the BRI develop further. In 2012 at BRICS Summit in New Delhi the original five BRICS members signed a General Agreement on the General Procedure for Opening Credit Lines in the National Currencies

of the BRICS and the Multilateral Agreement on the Confirmation of Letters of Credit were signed. Following this agreement and the resolutions taken at the 15th BRICS Summit the move towards a more balanced multilateral global finance system will develop in a consistently and gradually as their production and international trade expands with six more members joining the original five BRICS members to form the BRICS+. Such an expansion and, the concentric relationships within the BRI and the African AfCFTA will stimulate the further development of the NDB, the AIIB and the BRICS+.

The BRICS, BRICS+, BRI and the AfCFTA and the banking systems in these groups will also be strengthened to form their own large international financial centers. This development will provide the basis for cross border financial transactions, intra-group trade and the development of effective regulatory mechanisms. More importantly it will stimulate greater domestic expenditure in combination with foreign net expenditure financed by long-term loans that will be adequate for securing the full employment of human, natural, and technological resources (Kalecki, 1946). The BRICS +, the BRI and the AfCFTA will create a foundation for a multilateralism using national currencies for investments through development banks, loans, guarantees and, finance for priority international projects. The BRICS New Development Bank (NDB) in 2023 committed to issue bonds and finance BRICS Infrastructure projects by raising funds in BRICS local currencies.

With respect to trade data, trends for cross border intra-BRICS trade and investment are an important point for assessing the evolution of cross border payment mechanisms in BRICS. The 2023 United Nations Conference on Trade and Development (UNCTAD) Report indicates that trade in BRICS economies represent 18 per cent of global exports. The global share has increased, and, apparently intra-BRICS exports now surpasses the global average and, could mean that such increases in intra-BRICS cooperation will be beneficial for the original BRICS group. With the expansion of the group to the BRICS + and six more members this could, from 2024 stimulate intra-group investment and trade (UNCTAD, BRICS Investment Report, 2023). The UNCTAD Report shows that the foreign direct investment (FDI) inflow trends for the five original members of the BRICS increased annually by 13.5% in the first ten years of the 21stcentury, and was close to double the global average of 7,6% . However, there was a significant FDI slowdown in BRICS to 1.7% from 2011 to 2021 during which period FDI turned negative globally, and of course was exacerbated by the Covid-19 pandemic from 2020 to 2022. Now that the Africa Union (AU) has established the AfCFTA to encourage intra African trade, negotiating agreements with BRICS, the BRICS + and, the BRI will be easier and, more opportunities will be presented. If the use of own currencies becomes a reality in the groups, transactions to boost opportunities for massive continental industrialization and infrastructure investment will be promoted. Using own currencies offers less dependency on foreign currency reserves and, multilateralism in trade reduces the risk trade becoming a political weapon.

Within the BRICS, the BRICS+, the BRI, Asia and, the AfCFTA the use of own currencies is presently limited. However, the use of China's international Renminbi (RMB) is gaining ground as the preferred currency for cross border transactions especially within the BRI. However, assessing the preference for use of the RMB, and the factors affecting cross border settlements in RMB across the BRI was tested in an empirical study by Yang-Chao Wang, Jui-Jung Tsai and Wenyu Chen (2020). The study using panel data across nineteen BRI countries and regions found that national economic levels, bilateral trade volume, financial development, currency swap agreements, and RMB clearing centers promote the use of RMB as a settlement currency in cross border trade. However, exchange rate fluctuations, and higher Consumer Price Indices (CPI) with the risk of higher inflation expectations are likely to make the use of the RMB as a reserve currency less favourable as a currency for cross border settlement. The further economic factor differences in BRI and non-BRI economies make the continued use of the RMB a difficult prospect. For these reasons gradually moving towards the use of own currencies is an attractive prospect for the BRICS and the BRI economies in the medium to long-term.

Notwithstanding the constraints for deeper intra-BRICS trade and economic integration in a wider BRICS+ market, currency diversification in the BRICS, BRICS+ and emerging economies in the BRI and other groupings maybe difficult to achieve because of the unequal levels of industrial and economic development within each of these groups. Instead of following the traditional linear approach to market integration the BRICS, BRICS+, AfCFTA, BRI and other emerging economies should advance economic cooperation using own currencies and industry trade specialization based on comparative advantages. Concomitantly disaggregated levels of trade and investment flows for ensuring global value chains, services, investment and procurement could also be pursued. Promoting South-South development

integration through such policies will create the instruments for trade and industrial policies for inclusive multilateralism.   In this context, the differences in endowments amongst BRICS, BRICS+ and other emerging economies, and for multilateral cooperation in trade and cross border payments to succeed, cooperation must extend beyond trade in goods alone and include services and operate under conditions where there are no problems with balancing imports with exports. The current multilateral agreements in the BRICS, BRICS+, the Shanghai Cooperation Organization (SCO), the Eurasian Economic Union (EEU) and, related cross-cutting associations with APEC, ASEAN, MERCOSUR PTA, and the Asia Pacific Trade Agreement (APTA), and the African Free Trade Area (AfCFTA) will create an ideal platform for currency diversification and the use of own currencies.   However, the emerging economies must pursue greater coherence in their ability and willingness to rationalize, prioritize and allocate resources to meet the multilateral policy objectives for greater trade and investment integration. As a group BRICS and their emerging market counterparts are ideally placed to help define the roles and responsibilities of the many international institutions, processes, actors in pursuit of reforming the General Trade Architecture (GTA). In particular BRICS, BRICS+   and AfCFTA and other emerging market economy groups can promote a multilateral approach towards reforms in how resources and expertise of development agencies should be better harnessed to support a GTA that serves sustainable development and inclusive multilateralism. In combination with their regional partners BRICS member states could create platforms to foster greater coherence for effective trade and investment negotiations, and promote policy agendas and commitments to address multilateralism and sustainable development challenges.

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China

The Current Macro-Financial Environment and Challenges[*]

By EDDIE YUE [*]

Current Macro Environment

As you know, 2022 was one of the most challenging years for investors. Inflation surged to its highest level in decades.   Central banks around the world raised interest rates aggressively to try to bring inflation under control.   In the end, 2022 turned out to be the only year in almost half a century when equities, bonds and major currencies measured against the US dollar all recorded a negative return.   As a result, 80% of reserve managers, including the HKMA, suffered a loss last year.

Fortunately, we have seen some improvements in the macro environment since the second quarter of this year. Supply chain disruptions have eased and inflation pressure has moderated.   Developed market central banks are hopefully near the peak of their rate hike cycles.   At the same time, despite higher interest rates, global economies have proved to be more resilient than expected.   A 'soft landing' is now the more likely scenario rather than a 'recession'.   Most equity markets have rebounded as a result, with the MSCI World Index recouping most of last year's losses.

Challenges

Despite the resilience of the global economy, we can still see strong headwinds on the horizon.

First, although headline inflation has been trending down, core inflation remains high. It is still highly uncertain how long it will take for core inflation to come down to central banks' target.   More and more investors are expecting core inflation to stay higher for longer for a number of reasons:

Demographic changes. In many developed economies, the fall in the number of workers due to retirement and lower labour participation does not seem to be just a transitory phenomenon.   Continued tightness in the labour market is expected to keep wage growth and inflation elevated in the coming years.

Re-wiring of global trade. Heightened geo-economic fragmentation has led to a re-organisation of global supply chains.   This will add costs to finished goods and could push inflation higher.

Transition to clean and renewable energy. The transition process will be capital intensive and costly in the early stages.   This could drive up energy prices and therefore inflation in coming years.

Second, because of sustained inflationary pressures, central bank monetary policy could remain tighter for longer. The Fed has reaffirmed its 2% inflation target, and that it is prepared to hold interest rates at high levels to allow the effects of tightening to work through the system.   This means that interest rates could also stay higher for longer.

Third, weak economic growth. Although a global recession is now less likely in the near term, economic growth in many parts of the world is still below trend.   The global economy may not be able to sustain a prolonged period of high interest rates.   We have already seen weaknesses in some sectors of the global economy, and a contraction in global manufacturing and trade.   Also, since the US banking turmoil in March, banks have tightened lending standards and credit supply, which will weigh on economic growth. So the risk of a recession is still there.

The "low inflation, low interest rate and steady growth" environment that prevailed pre-COVID may be behind us. More and more investors believe that we are going into a new macro environment of "higher inflation, higher interest rates and more volatile growth", one that will present different challenges for

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[*] Keynote speech at the CIC Forum 2023 & Cross-Border Investment and International Industrial Cooperation Conference, Hong Kong, 20 September 2023.
[*] Eddie Yue, Chief Executive of the Hong Kong Monetary Authority

investors in the years ahead, including us at the HKMA. Therefore, let me briefly talk about some of the areas that we will be focusing on in the current macro environment.

Asset Allocation Strategy

With more macro uncertainties, we need to ensure that there is sufficient liquidity in our portfolio to support our mandates. Events such as COVID-19 remind us that liquidity needs often coincide with fast-changing market conditions in which liquidity is scarce.   For example, during the start of COVID in March 2020, and the UK Liability-Driven Investment (LDI) crisis in October 2022, we saw very wide bid/ask spreads even for the most liquid products like US Treasuries.   Therefore, we need to have a liquidity buffer that is 'just-in-time', in addition to being 'just-enough'.   To help enhance liquidity, we will be looking at measures such as keeping more cash and shorter dated money market products.

At the same time, diversification is now ever more important to help stabilise our investment returns. We have been actively pursuing measures to make our portfolio more resilient.   We learned from the Global Financial Crisis experience that we need to go beyond conventional asset classes to make the best use of diversification. This was the reason why we started investing in private equity and real estate back in 2009; and RMB assets back in 2011.

Private market investment gives us access to return streams that have a low correlation with public assets. Our Long-Term Growth Portfolio of private market assets is now over US$60 billion.   It has achieved an internal rate of return of around 13% since inception, and provided the diversification benefits that we seek when markets are stressed, while enhancing the risk-adjusted return of the Exchange Fund as a whole.

Likewise, we started to invest in RMB assets over 10 years ago, recognising the growing trend for the internationalisation of the RMB, and that China has a different macro cycle to other economies. Over the past decade, which is the sort of time horizon that is relevant to long-term investors, RMB bonds have delivered very attractive risk-adjusted returns, and effectively a zero correlation with other fixed income markets.   RMB bonds have been the best diversifier in our fixed income portfolios in recent years. Diversification remains an effective first-line defence against market uncertainties, and we will continue to spread our investments across asset class types, geographies and currencies.

Lastly, I want to give an update on HKMA's green and sustainable investments initiatives. As a long-term investor, we have to recognise the risks and opportunities that climate change can bring.   The HKMA has set a net-zero emissions target for our Investment Portfolio by 2050.   On implementation, we have laid down the principle that, when considering potential investments, an ESG investment will be preferred if the risk-adjusted returns are comparable.

ESG investments have been implemented within our allocations to fixed income, public equities and private markets. We have funded ESG-focused mandates in public equity.   On the fixed income side, we started investing in green bonds in 2015 and recently, we have been partnering with BIS to invest in green bond issues in the Asia-Pacific region.   For private assets, we have invested in projects with sustainability features; buildings and warehouses with green accreditations; and projects that focus primarily on energy transition and decarbonisation.

Going forward, we will continue to integrate ESG factors into our investment framework, and seek to further expand our sustainable investments to ensure that we are on track to meet our net-zero commitment. Also, we will continue to contribute to the international efforts in support of the global climate agenda.

Thank you for this opportunity to share with you our take on the current macro environment, the challenges we see and HKMA's areas of focus on the investment front.

Lower Transaction Costs for Greater Innovation *

By Andrew Sheng and Xiao Geng *

China's special economic and cooperation zones bring together diverse economic actors to reduce transaction costs, attract talent, and foster entrepreneurship and innovation. But if they are to reach their full potential, access to global markets – and a stable world economy – are essential.

HONG KONG – A century ago, prevailing microeconomic theories defined economies as a continuous flow of spot transactions between individual buyers and sellers. But in practice, Nobel laureate economist Ronald H. Coase observed in the 1930s, market economies are organized into firms, which consist of individuals coming together to conduct economic activities according to plans and priorities set by management. The reason, he concluded, is that market transactions are not costless, and firms are better equipped than individuals to minimize those costs.

As any multinational well knows, the reduction of transaction costs not only leads to higher profits; it also facilitates greater investment back into the firm. Many companies – especially technology giants, such as Apple and Huawei – direct a significant share of such investments toward research and development in order to produce more profitable innovations.

In 2022, Apple's R&D spending amounted to $26.25 billion – 7% of its total revenue, 57% of which came from overseas markets. Similarly, Huawei spent $21.95 billion – 25% of its total revenue, of which 37% came from overseas – on R&D. The benefits are enormous: according to Boston Consulting Group, the return on equity (ROE) for the world's 50 most innovative companies surpasses that of the broader market by 3.3% per year.

At the country level, the United States accounts for the highest share of global R&D spending (according to 2020 data) – 31% of the total. But this figure, which stood at 69% in 1960, has declined significantly in recent decades. The decline can be at least partly attributed to the surge in R&D investment by other countries, especially China, which is now the world's second-largest investor in this area.

In 2022, total Chinese R&D spending surpassed RMB3 trillion ($410 billion), an increase of more than 10% from the previous year. This surge can be largely attributed to private firms, which accounted for over 76% of such spending over the last decade.

But Chinese firms are encountering limitations in investment. While China's investment as a share of GDP stands at 42%, roughly twice the global average of 21%, it has remained stagnant since 2008. Moreover, the median return on invested capital for urban investment platforms has dropped from 3.1% in 2011 to 1.3% in 2020.

This decline in returns, together with China's high savings rate, explains why Chinese firms have been looking to overseas markets for investment opportunities. The Belt and Road Initiative serves as a prime example. Unfortunately, there are also constraints on the global front, beginning with weak global growth.

According to the World Bank, the global economy's "speed limit" – the highest long-term rate at which it can grow without triggering inflation – is projected to fall to a 30-year low by 2030. By hampering corporate profits, this trend threatens to undermine R&D investment, with implications for everything from ROE to productivity growth. In Western markets, the challenge is compounded by American and European sanctions targeting Chinese industry giants such as Huawei, BYD, and Midea.

Small and medium-size enterprises (SMEs), which account for more than 90% of China's 48 million firms, might be able to circumvent some of these barriers. Not only are SMEs less likely to be sanctioned, but as the German Mittelstand model showed, they are also well suited to compete in niche markets. With this in mind, China's government has sought to cultivate its own "hidden champions" – "specialized, fine, unique, and innovative" medium-size enterprises with the potential to expand into overseas markets.

Meeting that potential is no easy feat. According to an e-works Research Institute report, the biggest challenges lie in localization, risk management and compliance, team building and staff training, strategic

planning, and organizational and institutional integration. But Chinese SMEs also have an important strategic advantage: they can use Hong Kong, an international financial and logistics hub, as a springboard for their overseas expansion.

Hong Kong's common law-based regulatory framework is aligned with global standards. Its internationally connected banking system provides trade credit and commercial insurance. Moreover, its internationally recognized accounting and legal services can act as important resources for Chinese SMEs seeking to enter overseas markets, as well as foreign SMEs moving into China.

Moreover, the Greater Bay Area – which encompasses Hong Kong, Macao, and nine cities in the Guangdong province, including Shenzhen – is rapidly evolving into a major global innovation and supply-chain hub, providing a platform for SMEs seeking to leverage China's manufacturing advantages on global markets. With the Hetao Cooperation Zone for Science and Technology Innovation – recently approved by the State Council – China's government is working to enhance the Greater Bay Area's dynamism even further.

The small but important Hetao Cooperation Zone is set to integrate two industrial parks – a 300-hectare park in Shenzhen and an 87-hectare park in Hong Kong – located on either side of the Shenzhen River. This will facilitate cross-border flows of talent, capital, logistics, and data, while making the most of each side's strengths: manufacturing and technological skill on Shenzhen's side; an internationally connected, low-tax business environment, and world-class universities on Hong Kong's side.

Such cooperation zones take Coase's theory of the firm to the next level, bringing together a wider and more diverse array of economic actors to reduce transaction costs, attract talent, and foster entrepreneurship and innovation. But if they are to reach their full potential and facilitate innovation that benefits all, access to global markets – and a stable world economy – are essential.

Foreign Investment Crucial for Economic Growth*

By CHEN YIHAO AND PAN YUANYUAN *

In his video address at the Global Trade in Services Summit on Saturday, President Xi Jinping emphasized the importance of expanding the services sector and fostering global cooperation to drive global economic recovery. He also encouraged the development of new technologies and innovative business models.

On Aug 13, the State Council, China's Cabinet, issued a document titled the "Opinions on Further Optimizing the Business Environment for Foreign Investment and Increasing the Attraction of Foreign Investment", which outlined 24 policy measures across six areas.

Although these measures reflect China's commitment and determination to promote high-level openness, they should be implemented in a way that they can achieve effective results.

Since the further improvement in the business environment will increase China's appeal to foreign companies, the government should focus on facilitating the cross-border flow of capital, labor, technologies and data to integrate domestic production factors, and advanced technology and management with those of the rest of the world. For that, the government has to expand channels to attract foreign investment, implement some favorable policies to attract foreign executives, high-tech talents and their families to enter and exit China more conveniently, support foreign-funded research and development centers, and ensure the orderly and secure flow of data.

Efforts should also be made to strengthen relations between China and foreign investors, including normalizing exchanges at different levels between Chinese and foreign governments and enterprises. There is a need to advance institutional openness, too, by promoting fair competition, providing better protection to intellectual property rights, and according national treatment to foreign-invested enterprises, and aligning and integrating the domestic business laws and regulations with international business laws and regulations.

To achieve that, the government needs to coordinate with regional and global trade organizations such as the Comprehensive and Progressive Agreement for Trans-Pacific Partnership and the Digital Economy Partnership Agreement. It should also make efforts to play a bigger role in formulating global governance rules on cross-border trade.

These efforts will facilitate the integration of foreign-invested enterprises into the Chinese market. The measures outlined in the "Opinions on Further Optimizing the Business Environment for Foreign Investment and Increasing the Attraction of Foreign Investment" are aimed at attracting more foreign investment to China. Policy stability and predictability impact both existing and new foreign investments. To maintain and expand foreign investment, China needs to focus more on "policy formulation, implementation and adjustment", using diverse measures to help the world better understand China's economic system and how it can benefit them.

In terms of formulating key policies, China should improve certain systems and establish effective market mechanisms to ensure foreign investors that their investments will yield healthy returns. But the emphasis should always be on maintaining fair market competition, which can be done by better regulating foreign trade and economic policies, and drafting laws and regulations related to support policies and competition neutrality.

It is also important to expand the pool of experts by including international and domestic professionals to ensure policies that are formulated succeed in attracting more foreign investments and businesses.

When it comes to implementing key policies, it is crucial to optimize the process of implementation, by reducing the additional institutional costs some foreign enterprises would have to unnecessarily bear, and improve the rules and regulations on the responsibilities of foreign-funded enterprises. For instance, the government should make clearer the rules on the pilot program for further opening up the service sector, further improving the "Qualified Foreign Limited Partner" foreign exchange management facilitation system, and specifying the criteria for "production within China's borders".

This will help foreign-invested enterprises to conduct their business more smoothly.

While policy adjustments and transparency should always be maintained, a system that allows foreign-invested enterprises' opinions to be heard and take corrective measures, if necessary, should be established. Also, policies should be implemented to grant foreign-invested enterprises a transition period to adjust their production and operations.

China's fast-paced economic growth, vast market and complete industry chain are critical factors that make China an attractive investment destination. Yet China needs to further improve its business environment to attract more foreign investment. To do so, the government has to take measures to ensure foreign investments yield healthy returns; and for that the government has to ensure healthy economic growth in the future.

As for the industrial sector, the government should intensify efforts to attract foreign investment in key areas and encourage foreign enterprises to more deeply engage in the high-tech and commodity markets, especially because foreign enterprises' involvement will enrich sectors such as biomedicine and modern services.

The State Council document encourages foreign enterprises to collaborate with vocational colleges and training institutions, too, to promote advanced manufacturing, modern services and the digital economy, and build a pool of new types of skilled workers.

China's robust supply and industry chains have benefited from economic globalization and have been contributing to global economic growth. And foreign enterprises' participation in the Chinese market can play an important role in a new development pattern characterized by the "dual circulation" development paradigm, in which the domestic and overseas markets reinforce each other, with the domestic market being the mainstay.

In other words, China should not only implement policies to attract more foreign investment to boost growth, but also take measures to ensure foreign investment helps support development in the country's less-developed areas. This will sharpen the competitiveness of foreign enterprises and contribute to the coordinated development of different regions and industries in China.

Global Economy

Global Economy on Track but Not Yet Out of the Woods*

By PIERRE-OLIVIER GOURINCHAS *

Economic growth shows near-term resilience amid persistent challenges.

The global economy continues to gradually recover from the pandemic and Russia's invasion of Ukraine. In the near term, the signs of progress are undeniable.

The COVID-19 health crisis is officially over, and supply-chain disruptions have returned to pre-pandemic levels. Economic activity in the first quarter of the year proved resilient, despite the challenging environment, amid surprisingly strong labor markets. Energy and food prices have come down sharply from their war-induced peaks, allowing global inflation pressures to ease faster than expected. And financial instability following the March banking turmoil remains contained thanks to forceful action by the US and Swiss authorities.

Yet many challenges still cloud the horizon, and it is too early to celebrate.

Under our baseline forecast growth will slow from last year's 3.5 percent to 3 percent this year and next, a 0.2 percentage points upgrade for 2023 from our April projections. Global inflation is projected to decline from 8.7 percent last year to 6.8 percent this year, a 0.2 percentage point downward revision, and 5.2 percent in 2024.

The slowdown is concentrated in advanced economies, where growth will fall from 2.7 percent in 2022 to 1.5 percent this year and remain subdued at 1.4 percent next year. The euro area, still reeling from last year's sharp spike in gas prices caused by the war, is set to decelerate sharply.

By contrast, growth in emerging markets and developing economies is still expected to pick-up with year-on-year growth accelerating from 3.1 percent in 2022 to 4.1 percent this year and next. (The corresponding annual growth, shown on the chart below, is 4 percent for 2022 and 2023 and 4.1% for 2024.)
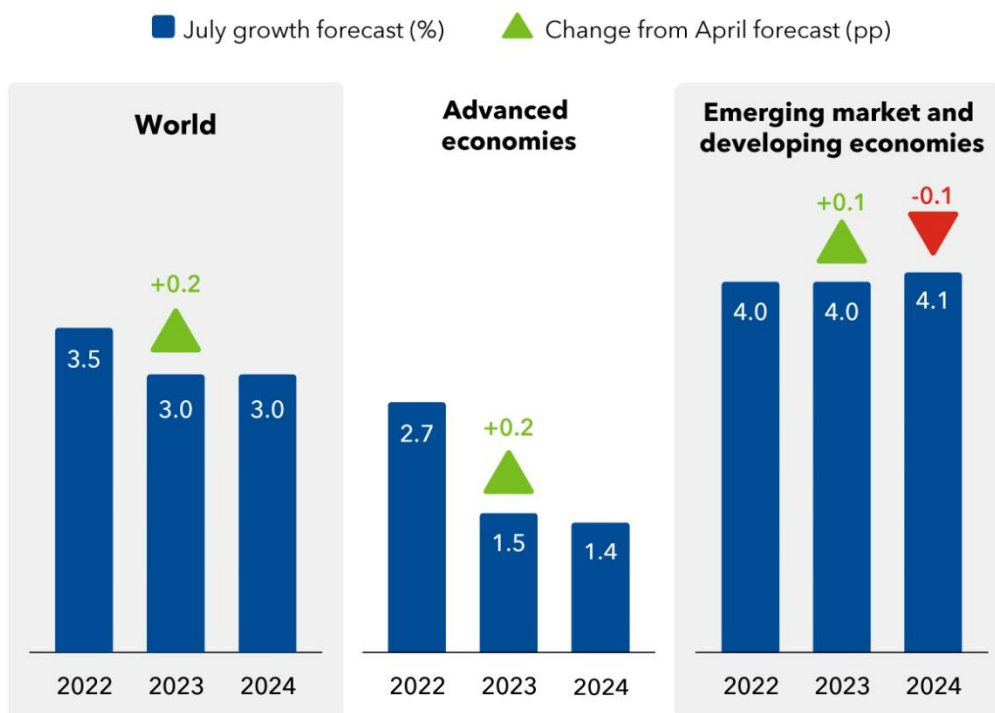
Growth projections

The global economic outlook for this year is slightly brighter,
but growth remains weak.

(GDP, percent; year-on-year)

■ July growth forecast (%)　▲ Change from April forecast (pp)

World

3.5 +0.2 ▲
3.0
3.0

2022　2023　2024

Advanced economies

2.7 +0.2 ▲
1.5
1.4

2022　2023　2024

Emerging market and developing economies

+0.1 ▲　-0.1 ▼
4.0　4.0　4.1

2022　2023　2024

Sources: IMF, World Economic Outlook; and IMF staff calculatuons.
Note: The 3% global growth estimate for 2023 reflects upgrade from
2.8% in the April World Economic Outlook.

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This average, however, masks significant differences between countries, with emerging and developing Asia growing strongly at 5.3 percent this year, while many commodity producers will suffer from a decline in export revenues.

Risks

Stronger growth and lower inflation than expected are welcome news, suggesting the global economy is headed in the right direction. Yet, while some adverse risks have moderated, the balance remains tilted to the downside.

First, signs are growing that global activity is losing momentum. The global tightening of monetary policy has brought policy rates into contractionary territory. This has started to weigh on activity, slowing the growth of credit to the non-financial sector, increasing households' and firms' interest payments, and putting pressure on real estate markets. In the United States, excess savings from the pandemic-related transfers, which helped households weather the cost-of-living crisis and tighter credit conditions, are all but depleted. In China, the recovery following the re-opening of its economy shows signs of losing steam amid continued concerns about the property sector, with implications for the global economy.

Second, core inflation, which excludes energy and food prices, remains well above central banks' targets, and is expected to decline gradually from 6 percent this year to 4.7 percent in 2024, a 0.4 percentage points upward revision. More worrisome, core inflation in advanced economies is expected to remain unchanged at a 5.1 percent annual average rate this year, before declining to 3.1 percent in 2024. Clearly, the battle against inflation is not yet won.

Headline inflation

Inflation is coming down, but the pace of disinflation is slowing.

(world; percent; year-on-year)

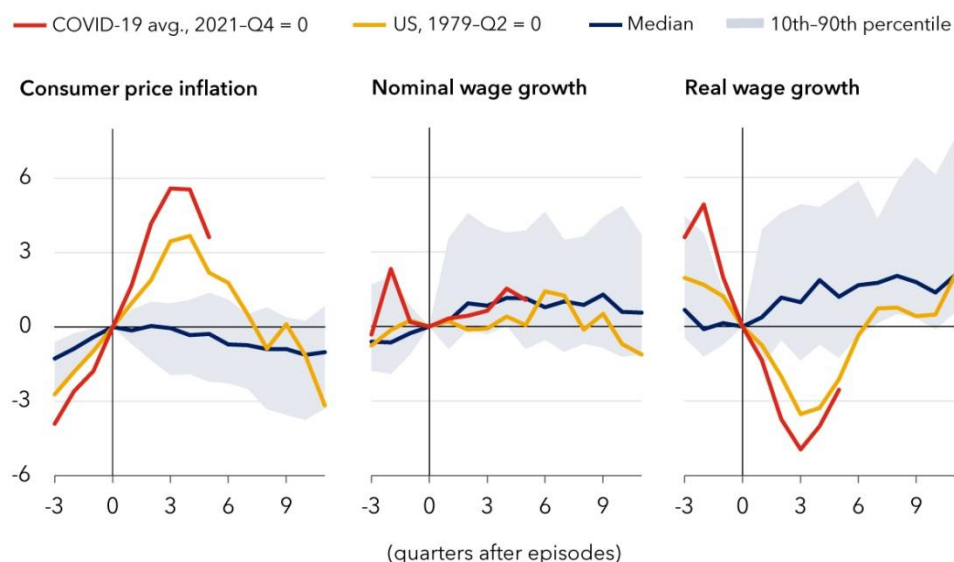Sources: IMF, World Economic Outlook; and IMF staff calculations.

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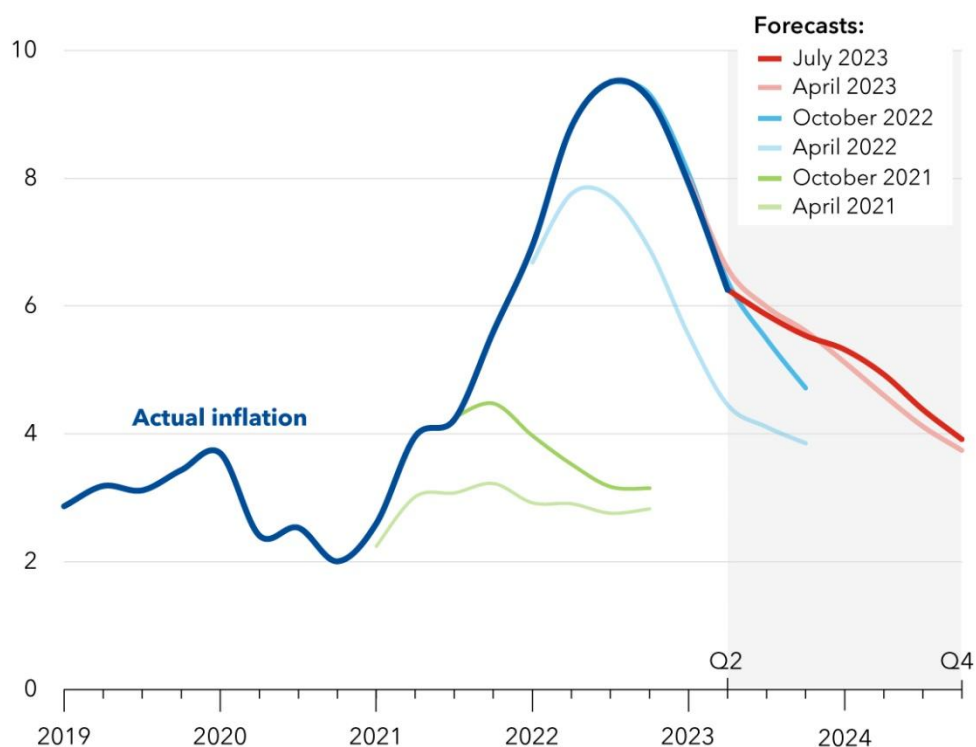
Key to inflation's persistence will be labor market developments and wage-profit dynamics. Labor markets remain a particularly bright spot, with unemployment rates below, and employment levels above, their pre-COVID levels in many economies. Overall wage inflation has increased but remains behind price inflation in most countries. The reason is simple and has little to do with so-called "greedflation": prices adjust upward faster than wages when nominal demand far exceeds what the economy can produce. As a result, real wages have declined, by about 3.8 percent between the first quarter of 2022 and 2023 for advanced and large emerging market economies.

Wage-price spiral risks?

Real wage growth recovery mostly due to declining inflation.

(deviation from t=0, percentage point)

— COVID-19 avg., 2021-Q4 = 0   — US, 1979-Q2 = 0   — Median   ▨ 10th-90th percentile

Consumer price inflation   **Nominal wage growth**   **Real wage growth**

(quarters after episodes)

Sources: ILO, OECD, US BEA, and IMF staff calculations.
Note: Inflation is the year-on-year percent change in the CPI. Growth is calculated year-on-year. Nominal and real wages are defined on a per worker basis. The real wage is the nominal wage divided by the CPI. The figure shows developments following episodes in which at least three of the preceding four quarters have (1) accelerating prices/rising price inflation, (2) positive nominal wage growth, (3) falling or constant real wages, and (4) a declining or flat unemployment rate. 23 such episodes are identified within a sample of 33 advanced economies. The Covid-19 episode is the average of countries in the sample starting in 2021:Q4. See October 2022 WEO Chapter 2 for details.

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Lower real wages translate to reduced labor costs. This may explain part of the strength of the labor market despite slowing growth. But in many countries, the observed increase in employment goes beyond what the decline in labor costs would suggest. It is fair to say that the reasons are not fully understood.

If labor markets remain strong, we should expect—and welcome—real wages recovering lost ground. This means nominal wage growth will remain strong for a while even as price inflation declines. Indeed, the gap between the two has started to close. Because average firms' profit margins have grown robustly in the last two years, I remain confident that there is room to accommodate the rebound in real wages without triggering a wage-price spiral. With inflation expectations well-anchored in major economies, and the economy slowing, market pressures should help contain the pass-through from labor costs to prices.

These labor market developments matter enormously. In the near term, should economic conditions deteriorate, the risk is that firms might reverse course and sharply scale down employment. Separately, the strong recovery in employment, coupled with only modest increases in output, indicates that labor productivity—the amount of output per hour worked—has declined. Should this trend persist, this would not bode well for medium-term growth.

Despite monetary policy tightening and the slowdown in bank lending, financial conditions have eased since the banking stress in March. Equity market valuations surged, especially in the artificial intelligence segment of the tech sector. The dollar depreciated further, driven by market expectations of a more benign path for US interest rates and stronger risk appetite, providing some relief to emerging and developing countries. Going forward, there is a danger of a sharp repricing—should inflation surprise to the upside or global risk appetite deteriorate—causing a flight toward dollar safe assets, higher borrowing costs and increased debt distress.

Policies

Hopefully, with inflation starting to recede, we have entered the final stage of the inflationary cycle that started in 2021. But hope is not a policy, and the touchdown may prove quite tricky to execute. Risks to inflation are now more balanced and most major economies are less likely to need additional outsized increases in policy rates. Rates have already peaked in some Latin American economies. Yet, it is critical to avoid easing rates prematurely, that is, until underlying inflation shows clear and sustained signs of cooling. We are not there yet. All the while, central banks should continue to monitor the financial system and stand ready to use their other tools to maintain financial stability.

After years of heavy fiscal support in many countries, it is now time to gradually restore fiscal buffers, and put debt dynamics on a more sustainable footing. This will help to safeguard financial stability and to reinforce the overall credibility of the disinflation strategy. This is not a call for generalized austerity: the pace and composition of this fiscal consolidation should be mindful of the strength of private demand, while protecting the most vulnerable. Yet, some consolidation measures seem entirely appropriate. For instance, with energy prices back to their pre-pandemic levels, many fiscal measures, such as energy subsidies, should be phased out.

Fiscal space is also key to implement many needed structural reforms, especially in emerging and developing economies. This is especially important since prospects for medium-term growth in income per capita have dimmed over the past decade. The slowdown is sharper for low- and middle-income economies relative to high-income ones. In other words, prospects for catching up to higher living standards have diminished markedly. At the same time, elevated debt levels are preventing many low income and frontier economies from making the investments they need to grow faster, with high risks of debt distress in many places. Recent progress toward debt resolution for Zambia is encouraging, but faster progress for other highly indebted countries is urgently needed.
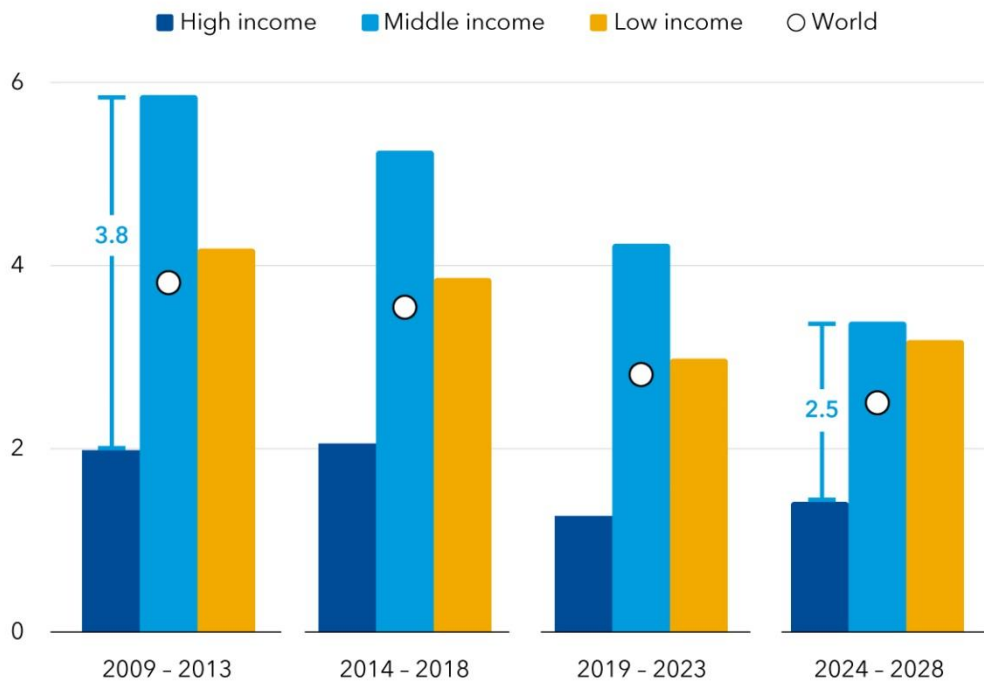
Slowing convergence

The outlook for income per capita growth has dimmed most for middle- and low-income economies in recent years.

Five-year ahead per capita GDP growth
(PPP-GDP weighted averages; percentage points)

Legend: ■ High income ■ Middle income ■ Low income ○ World

3.8

2.5

2009 – 2013   2014 – 2018   2019 – 2023   2024 – 2028

Sources: IMF, World Economic Outlook; and IMF staff calculations.

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    Some of the slowdown in growth reflects the spillover of harmful policies. The rise of geoeconomic fragmentation with the global economy splitting into rival blocs, will most harm emerging and developing economies that are more reliant on an integrated global economy, direct investment, and technology transfers. Insufficient progress on the climate transition will leave poorer countries more exposed to increasingly severe climate shocks and rising temperatures, even as they account for a small fraction of global emissions. On all these issues, multilateral cooperation remains the best way to ensure a safe and prosperous economy for all.

World Economic Outlook Growth Projections

(Real GDP, annual percent change)	2022	PROJECTIONS 2023	PROJECTIONS 2024
World Output	**3.5**	**3.0**	**3.0**
Advanced Economies	**2.7**	**1.5**	**1.4**
United States	**2.1**	**1.8**	**1.0**
Euro Area	3.5	0.9	1.5
Germany	1.8	–0.3	1.3
France	2.5	0.8	1.3
Italy	3.7	1.1	0.9
Spain	5.5	2.5	2.0
Japan	**1.0**	**1.4**	**1.0**
United Kingdom	**4.1**	**0.4**	**1.0**
Canada	**3.4**	**1.7**	**1.4**
Other Advanced Economies	**2.7**	**2.0**	**2.3**
Emerging Market and Developing Economies	**4.0**	**4.0**	**4.1**
Emerging and Developing Asia	**4.5**	**5.3**	**5.0**
China	3.0	5.2	4.5
India	7.2	6.1	6.3
Emerging and Developing Europe	**0.8**	**1.8**	**2.2**
Russia	–2.1	1.5	1.3
Latin America and the Caribbean	**3.9**	**1.9**	**2.2**
Brazil	2.9	2.1	1.2
Mexico	3.0	2.6	1.5
Middle East and Central Asia	**5.4**	**2.5**	**3.2**
Saudi Arabia	8.7	1.9	2.8
Sub-Saharan Africa	**3.9**	**3.5**	**4.1**
Nigeria	3.3	3.2	3.0
South Africa	1.9	0.3	1.7
Memorandum			
Emerging Market and Middle-Income Economies	**3.9**	**3.9**	**3.9**
Low-Income Developing Countries	**5.0**	**4.5**	**5.2**

Source: IMF, *World Economic Outlook Update*, July 2023

Note: For India, data and forecasts are presented on a fiscal year basis, with FY 2022/2023 (starting in April 2022) shown in the 2022 column. India's growth projections are 6.6 percent in 2023 and 5.8 percent in 2024 based on calendar year.

How Managing Inflation Expectations Can Help Economies

Achieve a Softer Landing*

By Silvia Albrizio and John Bluedorn *

Inflation around the world reached multi-decade highs last year. While headline inflation is coming down steadily, core measures—which exclude food and energy—are proving stickier in many economies and wage growth has picked up.

Expectations about future inflation play a key role in driving inflation, as those views influence decisions about consumption and investment which can affect price and wages today. How best to inform people's views on inflation became an even more crucial consideration as the surge in prices fueled concern that inflation could become entrenched.

In an analytical chapter of the latest World Economic Outlook, we examine how expectations affect inflation and the scope for monetary policy to influence these expectations to achieve a 'soft landing,' that is, a scenario where a central bank guides inflation back to its target without causing a deep downturn in growth and employment.

Larger role for inflation expectations

Surveys of professional forecasters have shown that expectations for inflation over the next 12 months—near-term expectations—started a steady rise in 2021 in advanced and emerging market economies alike, then accelerated last year as actual price increases gained momentum. Expectations for inflation five years into the future, however, remained stable, with average levels broadly anchored around central bank targets.
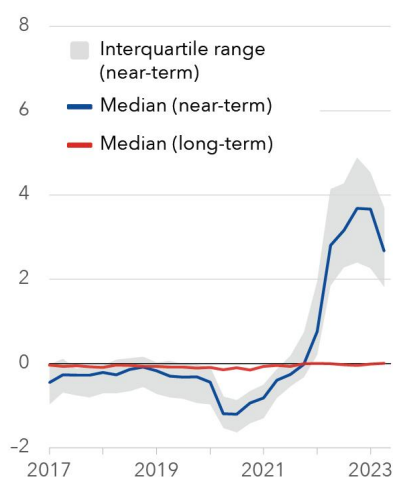
Higher but contained

Near-term inflation expectations shot up rapidly in 2022 but are now reverting; long-term expectations have remained stable.
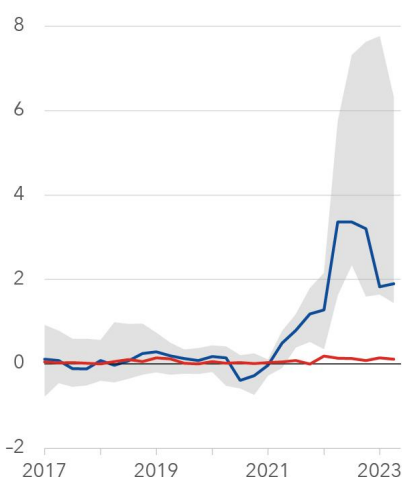
Advanced economies
(deviation of inflation expectations from central bank's target, percentage points)

Emerging market economies
(deviation of inflation expectations from central bank's target, percentage points)

Source: Central banks, Consensus Economics, Haver Analytics, and IMF staff calculations.
Note: Mean inflation expectations by economy come from professional forecasters.

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More recently, near-term inflation expectations appear to have turned the corner and begun to shift onto a gradual downward path. Beyond the world of professional forecasters, we see similar patterns of inflation expectations by companies, individuals, and financial-market investors, on average.

Movements in near-term expectations are economically important for inflation dynamics. According to our new statistical analysis, after the inflationary shocks in 2021 and early 2022 started unwinding late last year, inflation has been increasingly explained by near-term expectations.

For the average advanced economy, they now represent the primary driver of inflation dynamics. For the average emerging market economy, expectations have grown in importance, but past inflation remains more relevant, suggesting that people may be more backward-looking in these economies. This could reflect in part the historically higher and more volatile inflationary experience in many of these economies.

Drivers of inflation

Decomposing recent dynamics of headline inflation reveals the
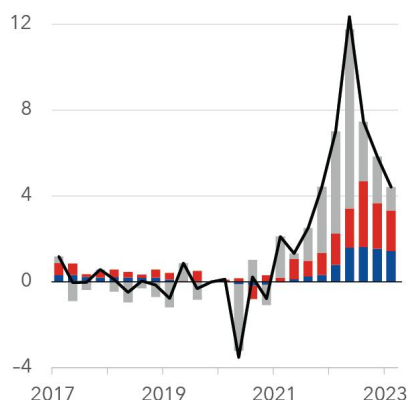growing importance of near-term inflation expectations.

Advanced economies
(headline inflation, deviation from
Q4, 2019; percentage points)
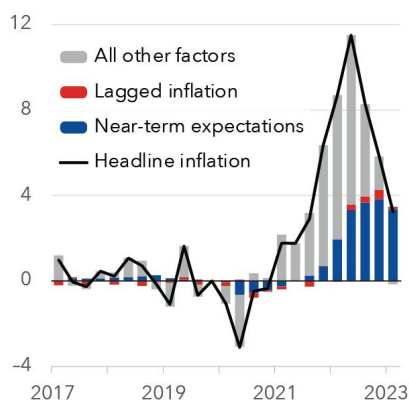
Emerging market economies
(headline inflation, deviation from
Q4, 2019; percentage points)

Source: IMF staff calculations
Note: Average seasonally adjusted annualized quarter-on-quarter headline consumer
price index inflation. Bars show contributions by components to average headline
inflation relative to their 2019:Q4 contributions, as estimated by a linear regression
model for inflation. "All other factors" category includes contributions from time fixed
effects (common global factors), all other explanatory variables, and a residual.

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In fact, we find that inflation in advanced economies typically rises by about 0.8 percentage points for
each 1 percentage point rise in near-term expectations while the pass-though is only 0.4 percentage points
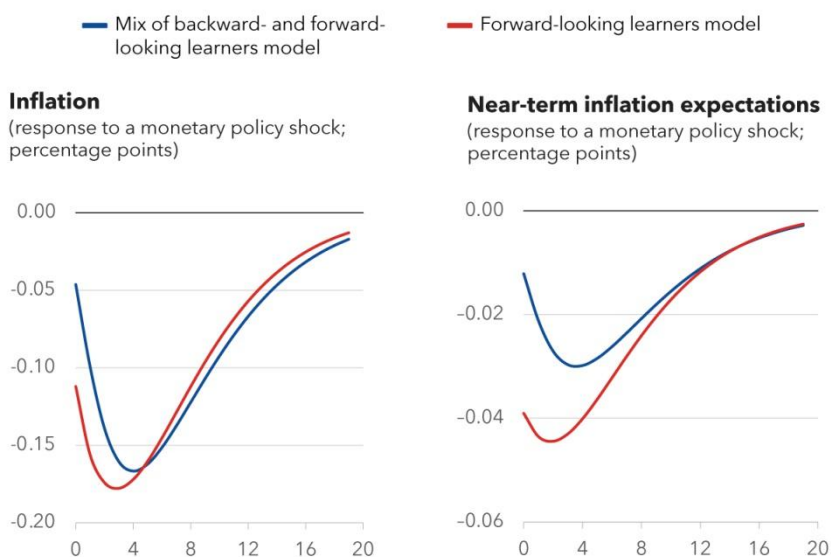in emerging market economies.

One factor that could account for this difference is the share of backward-looking versus
forward-looking learners across economy groups. When information on inflation prospects is scarce and
central bank communications are unclear or lack credibility, people tend to form their views about future
price changes based on their current or past inflation experiences—they are more backward-looking
learners. By contrast, those who are more forward-looking form their expectations from a broader array of
information that could be relevant to future economic conditions, including central bank actions and
communications—they are more forward-looking learners.

Policy implications of differences in learning

These differences have important consequences for central banks. As shown in simulations from a new
model that allows for differences in learning and expectations formation, policy tightening has less of a
dampening effect on near-term inflation expectations and inflation when a greater share of people in the
economy are backward-looking learners.

Weaker transmission

Monetary policy is less effective when there is a higher share of backward-looking learners, as they do not take account of the effects of interest rate rises on future demand and prices.

—— Mix of backward- and forward-looking learners model   —— Forward-looking learners model

Inflation
(response to a monetary policy shock; percentage points)

0.00					
-0.05					
-0.10					
-0.15					
-0.20					
0	4	8	12	16	20

Near-term inflation expectations
(response to a monetary policy shock; percentage points)

0.00					
-0.02					
-0.04					
-0.06					
0	4	8	12	16	20

Source: IMF staff calculations.
Note: Charts show the dynamic responses of the indicated variable to a temporary monetary policy shock that increases the policy rate by 100 basis points. Numbers on the horizontal axes show quarters after the monetary policy tightening shock.

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That's because people more focused on the past do not internalize the fact that interest rate increases today will slow inflation as they weigh on demand in the economy. Therefore, a higher share of backward-looking learners means that the central bank must tighten more to get the same decrease in inflation. In other words, reductions in inflation expectations and inflation come at a higher cost to output when there is a higher share of backward-looking learners.

Enhancing policy effectiveness

Central banks can encourage expectations to be more forward-looking through improvements in the independence, transparency, and credibility of monetary policy and by communicating more clearly and effectively. Such changes help people understand the central bank's policy actions and their economic effects, boosting the share of forward-looking learners in the economy.

Simulations from the new model show how improvements in monetary policy frameworks and communications can help lower the output costs needed to reduce inflation and inflation expectations, making it more likely the central bank can achieve a soft landing.

One way central banks can improve their communications is by simple and repeated messaging about their objectives and actions that is tailored to the relevant audiences.

However, improving monetary policy frameworks and crafting new tailored communication strategies to help improve inflation dynamics can take time or be difficult to implement. Such interventions are complementary to more traditional monetary policy tightening actions, which will remain key to bringing inflation back to target in a timely manner.

—— This blog is based on Chapter 2 of the October 2023 World Economic Outlook, "Managing Expectations: Inflation and Monetary Policy." The authors of the report are Silvia Albrizio (co-lead), John Bluedorn (co-lead), Allan Dizioli, Christoffer Koch, and Philippe Wingender, with support from Yaniv Cohen, Pedro Simon, and Isaac Warren.

Charting a Course Through Rough Seas: How Emerging Markets Can

Navigate Tougher External Conditions*

By GITA GOPINATH *

I. Introduction

Thank you, Deputy Governor Tshazibana, for the warm welcome. It's an honor to join you all today. It was also an honor to recently host Governor Kganyago at the IMF to deliver an excellent Camdessus Lecture, in which he spoke in depth about the role of capital flows in emerging market growth and shared several important lessons for policymakers and for international institutions. I greatly enjoyed the lecture and am very glad to now be here in South Africa.

We are near the Cape of Good Hope, where the Indian and Atlantic oceans meet. For centuries, sailors in these parts have known that success in charting a course through one ocean doesn't guarantee success when the turn is made toward the other. The clash of seas and turning of the winds can bring fierce new challenges to even the most experienced and resilient of seafarers.

This reminds me of the past three turbulent years of the COVID-19 pandemic, Russia's war in Ukraine, and a series of extreme weather events. Emerging markets have demonstrated that they are skilled sailors in choppy waters, but we see more waves ahead. It is only appropriate that this conference is focused on drawing out post-crisis lessons and examining new policy challenges.

Today, I will focus on emerging markets (EMs) like South Africa and discuss three important ways in which the external conditions they face have changed since before the pandemic. First, global financial conditions are tougher. Second, geoeconomic fragmentation is rising. Third, climate change is inflicting growing costs. Together, these changes are transforming the economic landscape and making the world more volatile and uncertain.

To respond to it, I will also discuss three broad actions that policymakers in emerging markets can take. These actions come on top of the significant steps already taken over the last two decades to strengthen EM policy frameworks. It is important to underline that these steps helped many of them prove resilient over the past three years, despite facing unprecedented shocks.

II. A daunting external landscape for EMs.
II.1. Global financial conditions are tougher.

Let's begin with tougher global financial conditions. As the fight to bring inflation back to target continues, we expect global interest rates to remain high for quite some time. Furthermore, there are reasons to think that rates may never return to the era of 'low for long'. This possibility is reflected in U.S. 10-year treasury bond yields, which have surged to over four percent in nominal terms, the highest level since the global financial crisis (slide 4).

In this environment, financing conditions for EMs can be expected to remain challenging. In the 18 months since the U.S. started its aggressive tightening cycle, average long-term yields for EM dollar bonds have increased by about 200 basis points (slide 4), sovereign and corporate bond issuance (in foreign currency) has dropped by half and two-thirds, respectively, and portfolio flows to major EMs have decreased sharply (slide 5).

Down the road, the long-term natural real interest rate—or r*—could return to lower levels. As our research shows, this is because people are living longer, wealth remains highly concentrated, and productivity growth is weak. However, a return to a low global r* is far from certain. Already-high global debt levels—combined with the significant public spending needed to support aging societies, climate change mitigation, and possibly AI-driven productivity growth—could put upward pressure on global r*.

But even if global r* is lower, we may not revert to the "old times" of "low for long" policy rates that prevailed after the Global Financial Crisis (GFC). Why? We learned from the last two years that the

Phillips curve may not be reliably flat, and adverse supply shocks may occur more frequently. Both lessons point to a more difficult inflation-output tradeoff for central banks. Compared to before the pandemic, central banks could react more aggressively to broad-based supply shocks and shy away from over-easy policies when inflation is only modestly below target and labor markets are close to full employment.

II.2. Geoeconomic fragmentation is rising.

A second important development in the external landscape is the rise of geoeconomic fragmentation, or GEF. The pandemic and Russia's war in Ukraine have raised legitimate concerns about supply chain security and broader national security. And indeed, policymakers should act to improve their economic and financial resilience. However, it must be acknowledged that increased resilience comes with a cost. More disturbingly, we are seeing an increase in policy actions around the world that, if continued, pose a serious threat to global prosperity.

Here I am talking about trade restrictions, which have picked up sharply since the pandemic and the war. Almost 3,000 restrictions were imposed just last year—nearly 3 times the number imposed in 2019 (slide 8). Foreign direct investment is now increasingly driven by geopolitical preference rather than geographic distance (slide 9). All of this points to an increasingly fragmented world.

The effects of fragmentation will vary across countries. Our simulations of the impact of trade fragmentation find that while a few EMs could benefit, most will lose—including South Africa, with a hit of 5 percent of GDP. Other EMs could face output losses of over 10 percent of GDP. FDI fragmentation would add to these costs, and because FDI from advanced economies offers access to better technologies and know-how, EMs would be hit hardest.

Fragmentation also makes the world more vulnerable to shocks, as it leaves countries with fewer trading partners. For example, our simulations find that in a fragmented world, a negative supply shock in the U.S. production of wheat would raise its price by about twice as much as it would in an integrated world (slide 10). Such a price increase could seriously hurt millions of people who already face high food insecurity.

In this fragmenting world, countries are also turning inwards and engaging in large-scale industrial policies. In 2023 alone, the number of such measures that also restrict trade has increased nearly sixfold. Most of that increase is in AEs (slide 11). EMs have also increased the use of protectionist industrial policies though with less reliance on subsidies. Recent examples of large-scale industrial policies include the US CHIPS and Science Act and the Inflation Reduction Act, the EU Green Deal Industrial Plan, and China's longstanding industrial policies in strategic sectors. Such policies can heavily influence the direction and volatility of global trade and capital flows.

II.3. Climate change is also inflicting growing costs.

The third change in external conditions is climate change. Extreme weather events like hurricanes, droughts, floods, and fires are becoming more frequent, and more costly (slide 13). To build resilience, EMs are investing in climate adaptation and mitigation. The cost of this will be enormous. The International Energy Agency estimates that mitigation-related investment needs in emerging markets and developing economies will reach about $2 trillion annually by 2030—or 40 percent of global needs. For South Africa, the World Bank estimates climate financing needs of 4.4 percent of GDP per year between 2022 and 2050 (slide 14). This scale of costs—when many emerging markets have limited fiscal space, global financial conditions are tougher, and the world is fragmenting—poses an exceptional challenge.

III. How can EMs succeed in this difficult new environment?

The three challenges I've outlined—tougher global financial conditions, rising geoeconomic fragmentation, and costly climate change—are interconnected. And, as I mentioned, they are making the world more volatile and uncertain. So how can EMs succeed in this difficult new environment?

Before I speak to this, I would like to recognize the resilience many emerging markets have demonstrated to the turbulent shocks of Covid and the war. In major EMs, despite sharply rising rates, spreads have stayed stable and there have been no systemic financial crises. And though inflation rose quite dramatically in several EMs, long-term inflation expectations remain mostly anchored.

These outcomes owe much to the improvements many EMs made to their policy frameworks and financial sectors over the last two decades. Advances in central bank independence, inflation targeting frameworks, exchange rate flexibility, and macroprudential regulation of their financial sectors have all played critical roles.

While many EM central banks were ahead of the curve in raising rates to help bring down inflation, they can seek to avoid premature easing of policy, given the lingering uncertainty about inflation. This will

buttress their hard-earned credibility. We may yet see greater tumult in EMs given the risks ahead, including from the structural rebalancing taking place in China. It is therefore essential to further strengthen monetary policy frameworks and enhance the prudential framework of the financial sector, including by incorporating climate-related financial risks.   Central banks should also stand ready to act if global financial conditions deteriorate markedly. Traditional measures include relying on exchange rate flexibility and selective liquidity provision. In some exceptional cases, foreign exchange intervention could also be useful—for example, to address frictions in shallow FX markets, help counter financial stability risks from FX mismatches, or help preserve price stability when large exchange rate changes risk de-anchoring inflation expectations.

However, FXI should not be used to target a particular level of the exchange rate, or as a substitute for warranted macroeconomic adjustment. In this regard, SARB's approach of maintaining exchange rate flexibility—even in episodes of stress—has acted as an important buffer.

But the three challenges I've laid out today require action beyond traditional monetary policy and financial sector enhancements. Let me now focus on three broad actions emerging markets can take to address these challenges.

III.1. Accelerate domestic resource mobilization and rebuild fiscal buffers.

The first is to accelerate domestic resource mobilization and rebuild fiscal buffers. This will help pay for development priorities and strengthen resilience to shocks in an environment of tougher global financial conditions.

Interest payments on public debt owed by EMs are set to rise significantly from around 11% of revenue in 2019 to around 14% by 2028 (slide 17). This will reduce fiscal space for critical spending needs and put pressure on debt sustainability. In South Africa, for example, the interest bill is forecast to increase from about 19 percent of revenue this fiscal year to 27 percent of revenue by FY28/29—about twice this year's budget allocation for health.

Every EM can do more to mobilize domestic revenue and increase spending efficiency. Even countries with the highest collection rates have room to improve. We estimate that, absent any change to institutions and economic structures, EMs can, on average, still raise their tax-to-GDP ratio by nearly 5 percentage points (an increase of 30%).

Revenues can be boosted by streamlining tax expenditures, such as VAT exemptions. Empirical evidence suggests that such measures that broaden the tax base have a smaller effect on output and unemployment than tax rate increases of the same magnitude during fiscal consolidations.

Personal income taxes in EMs yield only 3% of GDP on average, suggesting that many EMs can take advantage of more progressive personal income tax rates and increased compliance. Real property taxes also remain largely untapped in most EMs. These are efficient taxes that can be designed to be progressive—with appropriate relief for low-income households. Finally, better tax administration—including by advancing digitalization—can improve revenue mobilization in EMs.

But mobilizing that revenue is only part of the story: EMs can also increase spending efficiency. They can eliminate inefficient programs—like broad-based fuel subsidies that are expensive, regressive, and undermine efforts to mitigate climate change—and replace them with better designed programs, such as cash transfers targeted to the most vulnerable. There is also scope to strengthen social protection systems—for example, in half of all Latin American countries, less than 40 percent of social safety-net transfers accrue to the poorest 20 percent of the population. In addition, improving performance of state-owned enterprises in critical sectors and allowing for private sector participation can help both save substantial fiscal resources and enhance the provision of the public services. In South Africa, for example, the budgetary cost of the state-owned energy company, Eskom, has exceeded nine percent of GDP (in total) over the last fifteen years. Fixing the power sector is essential for supporting faster economic growth: the SARB estimates that growth this year could have been 2 percentage points higher with more energy availability.

III.2. Enhance resilience to fragmentation through diversification and reforms.

The second action is to enhance resilience to geo-economic fragmentation through diversification and reforms. While firm-level decisions should predominantly shape the future resilience of supply chains, government policies can help. Upgrading and modernizing critical infrastructure can help firms grow their trade with multiple partners. Stress testing supply chains of critical inputs and outputs can also help prepare for future shocks.

Countries can take advantage of the re-direction of FDI by accelerating reforms that make them an attractive investment destination. This includes improving infrastructure, reducing red tape, and reforming labor and product markets. These same measures will help boost domestic private investment that will play a critical role in raising growth and building resilience.

As for industrial policies to support domestic industry, our advice is to tread carefully. History is replete with examples of IPs that were not only costly, but also hindered the emergence of more dynamic and efficient companies.

But if industrial policies are pursued, what are some important features to consider? Because rent-seeking and misallocation of resources is a major risk, a pre-requisite for IP is strong governance and administrative capacity. Another pre-requisite is that the externality or market failure these policies address should be easy to identify and target, such as carbon emissions. IPs are also more successful when complemented by economy-wide structural reforms. If IPs must be used, governments should ensure they are time-bound and cost-effective to limit fiscal burdens. Moreover, to prevent a protectionist race where all countries lose, these policies must be consistent with countries' international obligations, including WTO rules.

While EMs must adapt to fragmentation, they can also help prevent it from getting worse. By championing global integration, from which they have substantially benefitted, EMs can help reverse a troubling trend.

III.3. Implement a fiscally and socially sustainable climate strategy.

The third action is to address the challenge of climate change by implementing a strategy that is both fiscally and socially sustainable. To ensure fiscal sustainability it will be critical not to rely mostly on spending measures such as green public investment and subsidies to reach net-zero targets. Forthcoming research in the IMF's Fiscal Monitor shows that such an approach would lead to a sharp rise in the debt-to-GDP ratio—over 50 percentage points by 2050 relative to current paths. Clearly, this is not feasible.

Carbon pricing should therefore be an integral part of the policy package as it can raise revenues and catalyze much needed private investment. Given the frequency of climate shocks and their impact on public finances, countries could consider incorporating climate actions in debt sustainability analysis.

Climate policies will also need to be nested in a broader just transition strategythat explains how climate action will be compatible with promoting jobs and sustaining growth. While green transition policies can create jobs and boost growth in some areas, other sectors and regions that are particularly exposed to high-carbon activities may lose out. Ensuring an inclusive transition will therefore require compensating measures, including education and re-skilling to help workers match to green jobs. By addressing distribution concerns, climate strategies can be socially sustainable.

Promising country examples include Chile and South Africa. Chile introduced green taxes in 2014 as part of a broader tax reform package that also included increasing education and healthcare spending. And South Africa has put in place carbon taxes that are easy to administer and are scalable over time. Such reforms are supported by the country's Just Transition Framework, which clearly outlines the measures needed to minimize the social and economic impacts of the climate transition and improve the livelihoods of those most vulnerable to climate change.

IV. The Role of the IMF

I've laid out three major challenges facing EMs. These come on top of a sobering global outlook, with the lowest medium-term growth forecast since 1990—only 3.1 percent.

But EMs do not have to tackle these challenges alone. At the IMF, we are supporting all our members—including EMs—as they navigate this difficult new environment.

IV.1. Making tough global financial conditions easier

While shocks like the pandemic have made global financing conditions tougher, the IMF has stepped up to help countries deal with them. Since the pandemic, the Fund has extended substantial financial assistance through precautionary arrangements, including $148.3 billion to eight EMs. And an additional $97 billion has been provided to 22 other EMs through disbursing arrangements. Moreover, we help our members reduce their debt vulnerability amid difficult funding conditions by assisting them in strengthening their public finances and public financial and debt management.

IV.2. Analyzing fragmentation

The IMF is also closely watching the disturbing fragmentation trend I have described. Through our surveillance mandate, we have conducted analytical work that clearly highlights the costs of worsening fragmentation.

IV.3. Confronting climate change

Finally, we are helping our members confront climate change. The IMF's Climate-Public Investment Management Assessment, or C-PIMA, helps governments identify improvements in public investment institutions and processes to build low-carbon and climate-resilient infrastructure. India, Senegal, and the UK are amongst the 40 countries that have already benefitted from a C-PIMA.

In addition, our new Resilience and Sustainability Trust provides financing for adaptation and mitigation reforms that will help boost private investment in climate projects. This is complemented by technical assistance to support countries as they enhance their framework for managing climate change and attracting private investment. So far, programs have been approved for ten countries, including Kenya, Rwanda, and Seychelles.

V. Conclusion

Let me conclude. The shocks of the past few years have left behind a world that is harsher and hotter. Tighter global financial conditions, increasing geoeconomic fragmentation, and the ongoing effects of climate change will create new challenges for EMs.

It goes without saying that strengthening macro-fundamentals is critical to address any challenge, old or new. Re-invigorating structural reforms can help strengthen governance, labor markets, and product markets, and develop human capital, all of which are crucial. But contending with these new challenges requires going a step further. Mobilizing domestic resources, enhancing resilience to fragmentation, and implementing a fiscally and socially sustainable climate strategy can help.

The challenges may be daunting. But the opportunities are vast. EMs have shown considerable resilience over these past few years, and their potential to accelerate growth and raise living standards remains promising. South Africa embodies this potential. With its abundant natural endowments and strong institutions, this country is poised for a growth take-off—if reforms that resolutely and courageously tackle structural obstacles are implemented. As in other EMs, success in South Africa will require difficult reforms now that may not pay off until later. But it is an investment well worth making—and one that the IMF stands ready to support.

Resurgence of Inflation and the New Geopolitical Realities

Redesigning Macroeconomic Policy*

By ALFRED KAMMER *

This conference could not be more timely as Europe simultaneously grapples with firmly bending the inflation curve in the near-term and attempts to revive its growth engine in the medium term against the background of rising geopolitical risks.

Europe has weathered well an unprecedented series of shocks, the pandemic and the energy crisis triggered by Russia's war in Ukraine. Severe downside scenarios were avoided. This is a big accomplishment!

As the immediate economic effects of these shocks fade, a key policy priority for Europe is to focus on restoring price stability and securing strong and green growth.

But achieving these goals is complicated by emerging headwinds: Geoeconomic fragmentation and the impact of climate change pose new challenges that compound Europe's long-standing growth problems.

Moreover, for countries in the Western Balkans the convergence of income levels to those of advanced European economies has stalled for some time now. And the region is at risk of falling behind. But the future also offers opportunities—think of the many transformations taking place, the advance of electrical vehicles, artificial intelligence and near-shoring. But to succeed countries will need to position themselves well by implementing sound macroeconomic policies and undertaking reforms to strengthen productivity and improve the business environment.

Let me first outline the current economic setting and the near term outlook.

We are projecting a "soft landing". But both the domestic and external risks are tilted to the downside and the medium-term growth prospects are weak.

Southern European countries this year generally fared better than average, in part reflecting the revival in the tourism sector during the summer. In contrast, economies that are more dependent on manufacturing and other energy intensive sectors, such as Germany and some Central, Eastern and Southeastern European countries, have been hit hard.

There are indications that activity in the third quarter has slowed further and that the downward momentum is spreading to services.

The lagged effects of real income losses from high inflation and tighter macroeconomic policies will be shaping the outlook. There is little support expected from the global level. The effects of stronger growth in the US will largely be offset by the growth slowdown in China, although the magnitude of the impact could vary across countries.

In short, the recovery from the double shock remains sluggish and the medium-term outlook remains clouded.

The good news is that headline inflation has fallen in most of Europe and the Western Balkans. This largely reflects two factors: falling energy prices and the unwinding of supply chain bottlenecks. However, the recent spike in oil prices underscores the risks to the inflation trajectory.

In addition, underlying core inflation rates have only begun to moderate but remain stubbornly high—often still 2-3 percentage points above policy targets.

Labor markets remain tight overall with some softening. Employment now stands above its pre-pandemic level in both advanced and emerging European economies.

The tight labor market and high inflation have led to an acceleration in nominal wage growth across Europe, especially in Central, Eastern and Southeastern European countries.

In the Western Balkans, rising nominal wage growth is contributing to already-high inflation. Worryingly, growth of nominal wages in excess of productivity and inflation has started to drive up unit

labor costs. This can lead to sustained wage-price passthrough and risks decreasing the overall competitiveness of Western Balkan economies.

Now let me move to the medium-term growth outlook.

In the Western Balkans, the speed of convergence with advanced economies in output-per-capita has slowed over the last decade. In North Macedonia, for example, output-per-capita grew from around 27 percent of the EU average in 2000 to 37 percent in 2010 but then increased by only 1 percentage point to 38 percent in 2019.

So, what is driving this slowdown in convergence?

In general, reforms have stalled, and growth engines appear exhausted.

A key factor is a still-large investment gap in infrastructure and human capital. In North Macedonia the capital-output ratio has been declining despite steady productivity growth and increasing labor force participation. Other Western Balkan economies displayed a similar slowing of output-per-capita convergence, driven, though, more by a slowdown in productivity growth.

Public infrastructure is substantially underdeveloped in the Western Balkans, on average less than 20 percent of older EU member states. As an example, North Macedonia has half the railway and motorway density of the EU average, half the installed power generation capacity, 30-40 percent lower phone line, cellular, and broadband subscriptions, and underinvestment in human capital and innovation.

Another increasingly important factor is an insufficient labor supply. Young and educated workers continue to leave the Western Balkans for opportunities elsewhere. The latest census figures of 2021 indicate that at least 10 percent of the North Macedonian population has left the country over the last two decades.

This type of migration has a disproportionally negative effect on GDP per capita as migrants tend to be more educated and younger. A recent IMF study showed that that in the short run a 1 percentage point increase in emigration leads to a 3 percent decrease in the number of firms—with a similar effect on GDP.

These domestic challenges are compounded by rising external risks.

Global fragmentation continues to be a disruptive force and a driver of downside risks.

The pandemic and Russia's war in Ukraine, have disrupted commodity markets and global supply chains, raising concerns about national security and supply-chain resilience.

In response, many countries, even those that once championed free trade are turning to inward-looking policies to isolate from rivals and secure strategic supplies of goods, from computer chips and semi-conductors to rare earth minerals vital for clean technologies for the green transition.

Trade restrictions have increased sharply, by 3-fold last year compared to the pre-pandemic period. FDI is also increasingly concentrated among geopolitically aligned countries.

We have also observed a surge of protectionist and discriminatory measures, such as local content requirements in industrial support programs and export restrictions targeting countries that are not regional trade partners. And policymakers are increasingly enacting measures to move production back home or to politically aligned countries.

The global economic costs of fragmentation are not trivial. Estimates of the long-term output losses from restricting the international flow of goods and services, finance, and technology range from 0.2 to 12 percent of global GDP depending on the assumptions and scenarios.

Over the long run, trade fragmentation alone—that is, the splintering of countries into blocks that trade exclusively with each other—could reduce annual global GDP by up to 7 percent, or 7 trillion euros, the equivalent of the combined GDPs of France and Germany.

Costs will vary by country. While some countries could benefit—reorientation of trade and supply chains may create localized growth opportunities—most countries will lose.

And these costs are just of trade fragmentation, before we add the costs of climate change and weather events, which we have seen this summer from Canada, Hawaii, and Hong Kong to Greece and Libya.

So what can the countries in the region do to succeed in this new environment, both in terms of near-term and medium-term policy priorities?

The overarching near-term priority is to restore price stability. Decisively tackling inflation now will also help set the basis for stronger medium-term growth.

Monetary policy needs to be kept in unambiguously tight territory until underlying inflationary pressures abate. Experience from past inflation episodes cautions against easing too early. Predictions of speedy disinflation can prove optimistic as a new IMF paper shows. Easing too soon would be costly.

Fighting inflation also needs the support of fiscal policy. Fiscal authorities should help fight inflation by containing current spending—not by cutting capital spending.

For the medium-term there is a need to reinvigorate engines of growth that are at risk of being exhausted. Strengthening governance and improving the business environment will be key to boost investment, attract FDI and keep high-skilled labor.

Strengthening both institutions and macro-fundamentals is critical, including for successfully implementing reforms. Weaker institutions make it easier for vested interests to block reform efforts; while sound economic policies complement and make reforms more palatable.

Several central banks in the region have been under strain from political interference. Central banks need to be able to fulfill their mandates on inflation and for this independence is essential.

A stronger business climate is needed for domestic investors. To capitalize on FDI, policymakers should help create conditions that create an ecosystem of local suppliers, small and medium-size enterprises to manufacture inputs for larger foreign companies. Here, strengthening governance via better anti-corruption frameworks, and aligning regulation with international best practices would help.

Investment is needed to facilitate the transition to renewable energy and green technology and to modernize transport and telecom infrastructure. Better infrastructure would help raise productivity and improve attractiveness for foreign investment. This would support capital accumulation and help close the gap with Western European economies.

Finally, governments should decarbonize their energy sectors. Energy-intensive economic sectors will be increasingly uncompetitive with the EU's Carbon Border Adjustment Mechanism in place as soon as 2026. Policymakers should introduce carbon pricing and allow electricity prices to rise, using the resulting revenues to finance a transition to renewables.

To conclude.

If there is one key message to leave with you, it is that policies will matter.

With the right policy mix, Western Balkans economies can secure low inflation and increase the long-term growth trajectory.

At the macroeconomic level this means keep a tight monetary stance and do not ease prematurely, and fiscal policy should help with disinflation.

Structural policies also play an important role:

Get the investment climate right: By strengthening governance via better anti-corruption frameworks countries can durably attract investment domestically and from abroad.

Success in the Western Balkans will require difficult reforms now that will pay off later. At the same time the commitment to sound institutional frameworks needs to be maintained. This is an investment worth making—and one that the IMF stands ready to support.

Monetary and Fiscal Policy

Euro Area Central Bank Losses Increase Complications for Monetary Policy[*]

By NOUT WELLINK AND DAVID MARSH[*]

Heterogeneous EMU and German court actions worsen balance sheet problems

European monetary policy is becoming increasingly complicated by the thorny issue of losses accumulated by the European Central Bank and national central banks as a result of eight years of quantitative easing.

Amid signs of economic slowdown or even recession, debate about these losses is coming to a head at a time when the ECB is considering ending its series of rapid interest rate rises since July 2022. The source of the losses – interest rate mismatches on the Eurosystem balance sheet – reflect similar reasons to those elsewhere, above all at the Federal Reserve and Bank of England, which have also acquired massive quantities of government bonds under QE.

From a purely economic point of view, central banks can withstand losses without serious difficulties. They cannot technically become bankrupt, and they can resort to many different devices to plug gaps in their balance sheets. However, the problems faced by the euro area could become troublesome because of the heterogeneous nature of Europe's economic and monetary union. All this could have a serious effect on the ECB's credibility in its main policy goal: maintaining price stability.

Governments relied on central banks to enact important emergency action to counter the effects of the 2007-08 financial crisis, the 2010-15 euro area upsets and the Covid-19 pandemic that started in March 2020. The convoluted questions facing the euro area show that governments cannot sidestep responsibilities for action taken by central banks which – though operationally independent – are ultimately held responsible by governments and taxpayers.

Imbalances in receipts and outgoings stem from two sets of policies

Euro area central bank losses are caused by imbalances in receipts and outgoings. They stem from two sets of policies. First, under heavy and possibly excessive QE over the past 10-15 years (accelerated since the Covid-19 pandemic), the Eurosystem has significantly increased its holdings of expensive, low- (in some cases negative-) yielding government bonds.

Second, the belated but (once it started) accelerated rise in interest rates in the past 14 months has greatly increased the cost of central banks' liabilities, while reducing the value of their assets. After a year of rapidly raising interest rates, the ECB and its shareholder central banks are paying significantly greater sums in interest on deposits from commercial banks than they are receiving on their large portfolios of mainly domestic government bonds.

The overall Eurosystem balance sheet roughly doubled during the pandemic – from €4.7tn at end-2019 to €8.6tn at end-2021 (Figure 1). But it fell to €8tn at end-2022 and has since declined further to €7.2tn in mid-August. This reflects the slowdown of QE and planned repayment by banks of loans extended under the ECB's targeted longer-term financing operations.

Figure 1. Eurosystem balance sheet doubled during the pandemic
Balance sheet by component, 2018-22, €bn
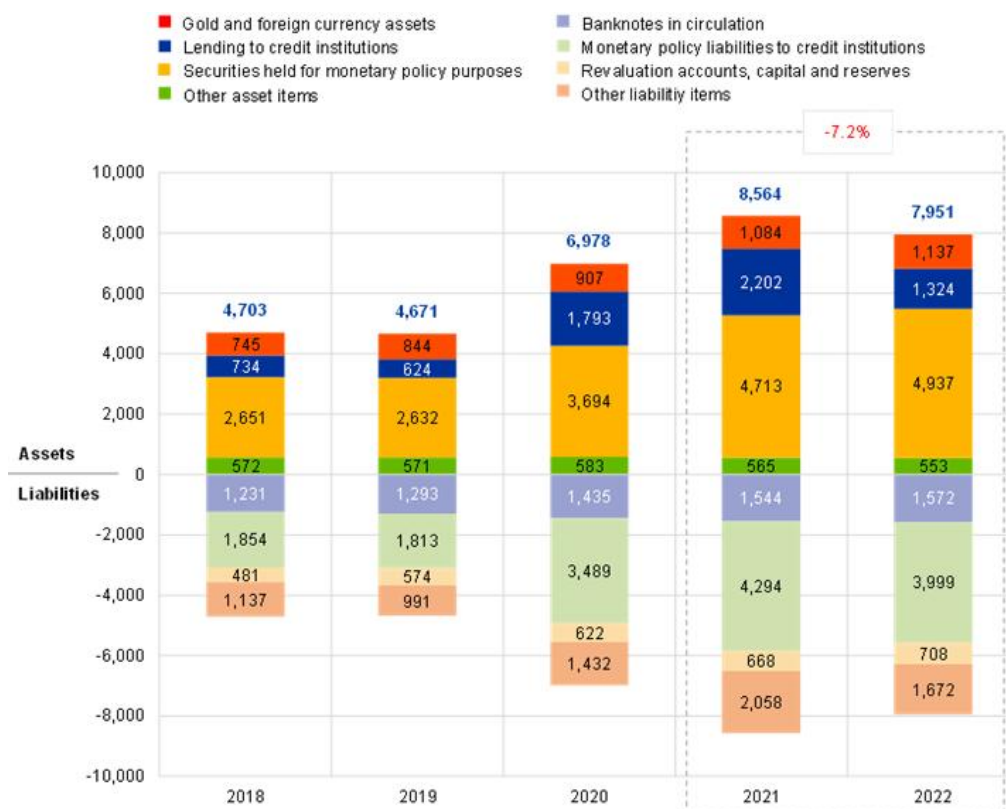
Source: Eurosystem

As Ashok Bhatia, one of the co-authors of a ground-breaking July 2023 International Monetary Fund paper on euro area central bank balance sheets put it, 'The ECB executed a fixed-for-floating rate swap for public debt. This leaves the ECB and its shareholder national central banks with a large interest rate exposure in the current tightening cycle.'

The IMF paper termed the euro area losses 'temporary and recoupable', saying there would be no need for state intervention (including recapitalisation) to strengthen central banks' capital base. There are some question marks – both economic and legal – over the IMF paper's arguments and assumptions. The losses could be larger, as shown by the authors' alternative scenarios, and their distribution among the Eurosystem members could be more problematic.

The net weakening of balance sheets is significantly greater than anything modelled by the ECB when it started large-scale QE in 2015 and higher than expected until recently. Admittedly, the estimates of the losses are surrounded by many uncertainties. Cumulative losses could also be lower, depending on factors such as interest rate paths, reinvestments and reserve requirements.

In contrast to some other central banks such as the Swiss National Bank, with its especially large share of foreign assets, including equities, the Eurosystem does not value its full balance sheet to market prices. As the IMF paper points out, 'amortised cost accounting at the Eurosystem dictates that valuation effects on the QE book are realised only if securities are sold outright.' The IMF calculates that, assuming the QE book remains static in its size and composition as of end-2021, valuation losses would be €758bn at end-2022, equivalent to 5.7% of euro area gross domestic product, exceeding the sum of general provisions, capital and reserves and revaluation accounts as of end-2021.

Bundesbank expected to register losses until 2026

Different Eurosystem central banks face different scales of losses and are accounting for them in disparate ways. The central banks of the northern countries in the euro area, with the highest credit ratings, are suffering the largest nominal losses because their bonds offer the lowest yields.

Germany, the biggest economy in EMU, the largest creditor and the country where the entry of the euro in 1998 was most sensitive, is in an exposed position. The Bundesbank faces larger and more persistent losses than at other euro area central banks. According to the IMF paper, the Bundesbank is expected to register losses until 2026. Under certain conditions, this sequence of losses could extend further.

The dilemmas are likely to come to public attention in the run-up to the next German general election in autumn 2025. The far-right anti-euro Alternative for Germany party (AfD), currently performing well in opinion polls, is front-runner in three important East German state elections next year. These will be seen as a bellwether for the nationwide 2025 poll.

Critics of the Bundesbank point out that it should have accepted in 2014-15 to buy lower-rated government debt (such as Italian bonds) as well as German bonds during fundamental discussions on starting QE. Furthermore, the Bundesbank could have decided under pandemic emergency purchase programme procedures not to buy its full allotment of German government securities in 2020-22 – which would have both narrowed euro area spreads and curtailed its own eventual losses.

Debate about the losses will be exacerbated by analysis from many different sources across Europe. Many commentators – including several who are supportive of the ECB's overall policies – point out the strategic miscalculations of the past few years. A paper from Daniel Gros and Farzaneh Shamsfakhr of the Brussels-based Centre for European Policy Studies states, 'The large bond holdings accumulated by the Eurosystem over the last eight years have represented a massive fiscal bet that interest rates would stay low forever. This bet has now gone spectacularly wrong. Euro area taxpayers are likely to lose around €700bn over the coming decade.' (Figure 2)

Figure 2. Bundesbank faces larger losses than other euro area central banks

Expected cumulative losses on PEPP and PSPP holdings, €bn
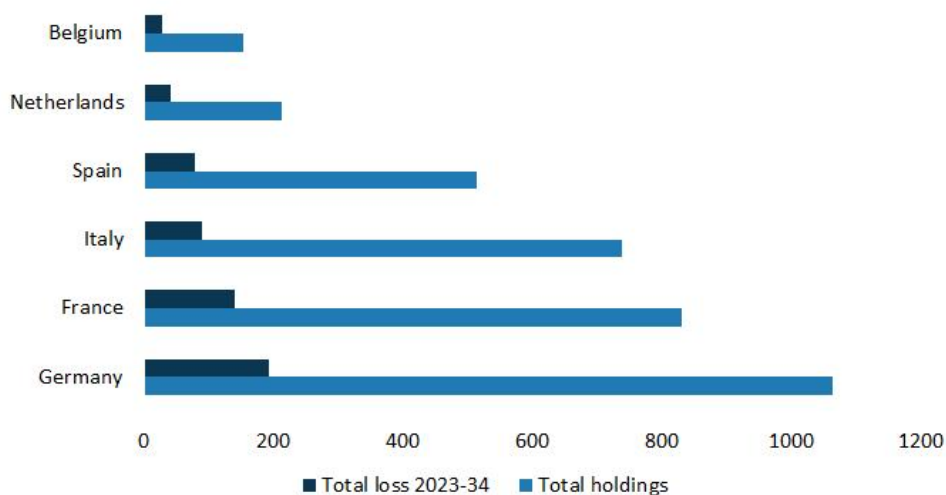
Source: Centre for European Policy Studies

In addition to the purely economic debate, the Bundesbank is affected by a nexus of lawsuits, past and present, at the German constitutional court in Karlsruhe, which could constrain its monetary policy action, with potentially serious repercussions for the rest of the Eurosystem.

In judgements on outright monetary transactions in 2016, and on the public sector purchase programme in 2020, Karlsruhe set down a requirement for the Bundestag to give prior approval for any purchase programmes that could lead to 'incalculable liabilities affecting the German budget'. And it obliged the government to recapitalise the Bundesbank with 'an adequate amount' in the event that financial losses affect its functioning.

Central banks could draw on other sources of equity on their balance sheets to help cover losses

Central banks could draw on other sources of equity on their balance sheets to help cover losses. One possible buffer alluded to in the IMF paper would be the 'valuation reserves' many European central banks have built up over the years, mainly stemming from the sharp increase in the price of gold in their reserves.

However, many central banks would rather not draw attention to such additional capital backing for fear that governments might wish to draw upon such funding sources to plug their own budgetary gaps. Highlighting the 'valuation reserves' – as both the IMF and the Bundesbank has done in its 2022 financial statement – may raise more attention on the role of gold in the financial system. This could increase the attractiveness of gold to many central banks and governments around the world which see gold as a source of stability in a world affected by overarching geopolitical risks.

All these issues will be on the mind of Christian Lindner, German finance minister, as his ministry draws up a legal response to a challenge during the summer from the German court of public auditors. The court claimed that the ministry did not independently check risks on the Bundesbank's balance sheet when it signed off the central bank's 2022 accounts. The court of auditors' report, dated March 2023, came to light in July. It has been sent to the constitutional court as part of a legal complaint lodged in March 2021 against PEPP.

Central bank policy dilemmas

According to central banks' long-established doctrine, monetary policy always takes priority over balance sheet issues. However, the Bundesbank case shows the difficulty of resolving conflicts between these two sets of considerations. The actions that the Bundesbank might favour for monetary policy purposes – raising the ECB deposit rate further and accelerating the phase-out of securities purchases by ending PEPP reinvestment earlier than planned, or even starting outright sales – would exacerbate losses.

Net purchases of bonds under PEPP were stopped in March 2022. But the Eurosystem is continuing to operate PEPP because maturing bonds are being reinvested, under a process which the ECB at present says it intends to continue least until end-2024.

It is legitimate to question why PEPP reinvestment is continuing when the pandemic is over. A tacit reason could be that, under the flexible PEPP reinvestment policy, the Eurosystem can intervene discreetly to prevent spreads from widening between German and Italian government bonds. Moreover, as of a certain point during the monetary tightening process, reinvestments become profitable, reducing previous losses.

Pressure for recapitalisation in Germany may grow, both because of publicity for the losses and also on account of the legal action at the German constitutional court. Recapitalisation can be carried out relatively simply. A government transfers bonds to its central bank and takes equity into consideration. Yet such action would carry a stigma that, in a febrile pre-election period, Chancellor Olaf Scholz, from the Social Democratic Party, and Lindner, Free Democratic Party leader and his successor as finance minister, would rather avoid.

This is a much more severe situation than that faced by the Bundesbank in the 1970s, when it ran losses as a result of falls in the value of the dollar against the D-mark, which affected its sizeable foreign exchange reserves.

Questions raised by IMF paper

The IMF paper throws up many questions. Many might ask why the IMF – and not the ECB itself – has mounted the first serious inquiry into the euro area balance sheet. The paper highlights differences in accounting procedures and methodology as well as policies on profit distribution and provisioning among euro area central banks. In the interest of public transparency, these central banks should be trying to harmonise their approaches. This is also important in the light of efforts to align European accounting rules to help pave the way for capital markets union in Europe, which is vitally necessary to secure the European Union's macroeconomic and climate mitigation goals.

The issues raised in the IMF paper are likely to influence a wider debate about the volume and composition of high bank reserves in the euro area, now around €3.5tn. The ECB and its shareholder national central banks have decided in recent weeks some relatively minor loss-mitigation steps on remuneration of reserves deposited by commercial banks and government entities. In a step which took some by surprise, the Bundesbank decided on 4 August to reduce to zero, effective 1 October, the interest rate on German government and public agency deposits. In a more general action, the ECB council decided on 27 July to reduce to zero, effective 20 September, the interest rate on minimum reserves, which apply to a relatively low 1% of deposits. With the goal of draining excess liquidity, maintaining relatively tight monetary policy and improving the profit position, some governing council members favour sharply increasing non-interest bearing minimum reserves in coming months.

A proposed Italian bank tax led to sharp falls of Italian bank share prices in August and to a partial retraction by the government – even though Giorgia Meloni, the prime minister, says she is standing by the idea. This is a sign of tensions over the profits generated by commercial banks across Europe as a result of the liquidity created by the Eurosystem's QE.

The ECB will however be very cautious about the possible impact, both on financial markets and on bank lending behaviour, of over-hasty shifts in reserves requirements and remuneration and on the interlinked issues of QE reinvestment policies. Much more debate can be expected before the ECB takes necessary decisions.

Central Banks at the Crossroads *

By Luiz Pereira da Silva *

Let me thank you for the kind invitation to share my thoughts on central banking to the graduating students at the prestigious Asia Business School's Master in Central Banking Class of 2023. It is a privilege and honour to speak to you. As you have just finished your studies, you are familiar with the facts and the history of central banking. In my address I would like to build on this knowledge and think together about some challenges and how the future path of central banking might address them. Naturally, thinking about the future comes with many caveats: trends can change quickly. I am sure you are familiar with the famous Yogi Berra quotation, "It's tough to make predictions, especially about the future." But you have an advantage: you are the future.

Central banks, and central bankers, stand at a crossroads. They face not one, but five major forks in the road. In line with their mandate and in addition to their known achievements, central banks, in the 21st century need to reflect carefully on how the new challenges could affect their role. I will list five of these forks: (1) the re-emergence of inflation; (2) climate change; (3) inequality; (4) digital financial innovation; and (5) artificial intelligence. As you know, modern central banks have been successful because they have been capable of strengthening their analytical thinking when facing challenges in the past, balancing risks properly and choosing the best path, even if that path looked challenging. Now, the many consequential issues that we face imply that central banks will have to carefully identify and analyse the paths they mean to tread.

Fork 1: Inflation

The first fork relates to the re-emergence of inflation, its interpretation and its future pattern. After the Great Moderation and the Global Financial Crisis, which was followed by a long period of monetary and fiscal stimulus, inflation has returned. Not surprisingly, inflation rates started to rise after the faster-than-expected post-pandemic recovery, as supply chains were stretched. Price increases accelerated further after Russia invaded Ukraine, with food and energy prices driving inflation higher. Many advanced economies have experienced headline inflation rates not seen in decades. Now, headline inflation is moderating slowly. However, core inflation has proved to be more resilient than expected.

For monetary policy, the first debate was about how transitory this inflation might be, and therefore the timing and intensity for policy reaction. With hindsight, and when core inflation is so resilient, it is easier now to be more assertive. Indeed, fighting inflation requires monetary policy rates to be set at a level that ensures convergence to target, while inflicting minimal damage on activity, employment and financial stability. Thus, fighting inflation during this "last mile" becomes a challenging balancing act, as laid out in the recent BIS Annual Economic Report. Fortunately, some challenges during monetary tightening episodes are well known.

For example, one relates to financial stability. Financial intermediaries are vulnerable to interest rate increases. Banks, for instance, tend to have longer-maturity assets (say loans) than liabilities (say deposits). As interest rates increase, shorter-maturity deposits tend to move faster than longer maturity loans: the result is lower profitability, perhaps losses – and in extreme cases, such as Silicon Valley Bank, potential default. It is well known that periods of rising interest rates are marked by a higher incidence of bank failures and economic crises – which is why supervisors and regulators are attentive to developments and any sign of stress in financial markets and institutions.

A second challenge is slowing economic growth. Of course, moderating economic activity is an intended consequence of fighting inflation: aggregate demand needs to match supply in the economy to help contain upward pressure on prices. Yet, calibrating slowdowns is always delicate as they reduce corporate profits, increase budget deficits (as social transfers grow) and lift unemployment.

So, the art for monetary policymakers is to find the policy mix that will best avoid running the risk of stagflation, ie lower growth accompanied by sticky inflation. And therefore, monetary policy, while

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contributing to macro-financial stabilisation in the short term, should be accompanied by growth-enhancing structural reforms to strengthen long-term economic prospects.

Facing these challenges, emerging market economies (EMEs) have weathered the recent crisis much better than before. Traditionally, EMEs have experienced greater vulnerability to monetary tightening in advanced economies. Risk aversion associated with weaker institutions and macro-financial imbalances made them more vulnerable to shocks, including spillovers from advanced economies. Therefore, in the past, tightening in advanced economies has triggered sudden stops in capital inflows and large capital outflows, resulting in higher FX volatility.

This time, it was different. EME central banks started to raise interest rates ahead of their peers in advanced economies, confirming that they have indeed strengthened their policy frameworks. Stronger macroeconomic fundamentals and more robust corporate and government balance sheets, along with a more stable banking sector, have underpinned the robust central bank response. Thanks to these stronger fundamentals, the FX impact of advanced economy tightening was more muted than in the past. In particular, many EME central banks have learned their lessons from past crises and have strengthened their monetary-financial stability policy frameworks to preserve price and financial stability by using a broader toolkit combining more policy instruments.

Now what about the future of inflation? This is what you will have to understand and address. These will be new challenges as it is likely that you will have to reflect on structural changes that are in the making and could result in cost-push factors, whether one-offs or perhaps extended over a longer period of time. In labour markets, for example, these are reflected in post-Covid reservation wages that are up with unfilled vacancies for some low-skill services; in the higher costs of operating global value supply chains, with the reshoring of some activities for security reasons; in the reshaping of global trade due to the lingering of geopolitical tensions including the war in Europe; in the fading of the disinflationary effect of China's role in reducing global manufacturing production costs;4 and, last but not least, in the additional costs for greening our economies, in terms of both technological investments and rises in production costs due to potential regulation and taxes on activities with a high carbon footprint. This brings me to the second fork.

Fork 2: Climate change

The second fork is presented by climate change. Climate change impacts central banks' core mandates because it affects both price and financial stability. Indeed, climate change represents a new type of systemic risk, which we have characterised as a Green Swan.5 Unlike rare tail events, such as the Black Swans of the Global Financial Crisis, Green Swans are doomed to happen with certainty if not addressed by appropriate policies.

Climate change presents two main kinds of risk. Physical risks stem directly from the effects of more frequent extreme weather such as more frequent floods, heatwaves, rising sea levels or lower crop yields. Transition risks stem from the transition to net zero economy, which can produce changes in asset valuation due to exposure to climate-related risks.

As there is no "silver bullet" to address these risks, central banks need to coordinate their actions with other stakeholders such as governments, other public agencies, the private sector and other actors in society, locally and globally.

Coordination is all the more relevant because climate change is a global negative externality that forces our societies as a whole to confront complex challenges. On the one hand, climate risks threaten macroeconomic stabilisation. On the other hand, the financing requirements of investing in the innovations needed to foster a net carbon zero economy call for the mobilisation of very large public and private financial resources.

Moving towards a net zero carbon economy is a typically Schumpeterian creative-destruction process that has large macroeconomic implications. Our best scientific experts estimate that huge investments in green technologies must be made quickly, with corresponding financing needs. The financing mix is likely to involve several sources: taxes (including on carbon), and government and private debt. While the economic impact will depend on the transition speed and the precise financing mix, it is likely that climate-related investments will affect macro-financial conditions in a substantial way. These large investments may increase the neutral rate in the economy, and they might also require novel forms of private-public burden-sharing. Last but not least, climate risk-related financial regulation and supervision might be necessary to enable the financial system to adequately map its climate risk exposures as well as

channel these large investments effectively – along with more stringent regulation in the real economy to ensure the path to net zero in our production and consumption processes.

In responding to climate change, central banks are displaying a careful balance in their actions and have already joined forces in the Network for Greening the Financial System (NGFS). Their analysis is reflected in a number of important published reports: the construction of climate scenarios to help financial sectors to work from a common set of hypotheses; guidelines for identifying climate risks; discussions on the implications of climate change for monetary policy; solutions for financing the transition with blended finance etc.

Climate-related action poses obvious challenges for central banks, some strictly related to their traditional price and financial stability mandates and some when the radical uncertainty that Green Swans bring is considered, such as the cost-push factors related to the effects of global warming on agriculture, migration and labour, and the financing of the transition to net zero. Finally, climate change has distributional consequences: it affects primarily poor countries and poor people in rich countries. It is likely that you will have to deal with the severe distributional consequences of global warming, especially if we do not manage to address it in time. That sense of urgency and the impact on the poor need always to be remembered in order to strengthen and calibrate our policy responses. That brings us to the next fork.

Fork 3: Inequality

Inequality within countries represents the third fork. Inequality has declined between countries as more effective social policies have been deployed in both advanced economies and EMEs. The distance between poor and rich countries has shrunk tremendously. However, inequality has increased within countries. This rising within-country inequality has compounded many other questions about fairness, equity and socio-political stability. But, perhaps surprisingly, it also matters for monetary policy.

A line of research conducted at the BIS shows that monetary policy is less effective in more unequal societies. In very simple terms, as rich households tend to save more and their consumption is less sensitive to their income, more unequal societies may respond less to monetary policy stimulus. Furthermore, an adverse feedback loop can arise, because recessions tend to increase inequality. More unequal societies respond less to expansionary monetary policy and experience slower recoveries from recessions. This, in turn, keeps them more unequal. We call this "inequality hysteresis".

Central banks need to understand the impact of inequality on monetary policy effectiveness. In particular, this might imply exploring new types of modelling approach in fulfilling their mandates, which some central banks such as the Fed and the ECB have started doing. In addition, they can take into account the way in which fiscal policies are addressing today's income inequalities, through the progressiveness of taxation and the quality of spending on public goods such as education and health, while structural reforms and policies can help to reduce future inequality, including through fostering innovative financial technology for social inclusion. That brings me to the next fork.

Fork 4: Digital financial innovation

Digital financial innovation represents the fourth fork. Technological innovations such as big data, fast payment systems and distributed ledger technology (DLT) are gaining ground – in both the financial sector and the real economy. This is visible in digital payments, in online lending and insurance, and in applications of DLT in crypto and decentralised finance (DeFi). We at the BIS are exploring these issues in our research and also in the hands-on work of the BIS Innovation Hub.

These technologies are helping to increase access to finance and are playing a key role in fostering financial inclusion in many countries. The technological advances in digital finance can dramatically reduce the cost of processing information and expand the set of available contracts – including in (social) insurance, and sometimes in voluntary adherence to new contractual arrangements. This could, in principle, help to smooth consumption and enhance welfare, allowing more people to escape poverty traps.

Digital financial innovation thus offers the potential for a brighter future. If we develop common interoperable platforms and safeguard data privacy, we can strengthen global links and improve resource allocation. Furthermore, we can offer financial tools for the previously underserviced and poorer segments of our societies. We can also strengthen trust in the financial system through new, more widely available and higher-quality financial products. In this way, digital innovation can contribute to a more efficient and more stable global financial system.

Yet, there is a flipside to this. Technologies can also allow concentration and market power and trigger new types of discrimination. To assess their net impact, one must look at all aspects of the existing

technological transformation and be guided by more data and evidence. What matters is how digital technologies are applied, and in particular what role public policy will play.

Grasping this potential requires the public and private sectors to work together. The development of digital financial products, like all technological advances, is a double-edged sword. Used responsibly, new technologies can offer increased welfare for all, but they can also result in new forms of discrimination. That is because digital innovation can also drive a fragmentation of the financial world. Differing systems can divide different user groups and countries from each other. Globally, in the context of increased geopolitical tensions, digital innovation can foster segmentation and disintegration along geopolitical fault lines. Locally, if abused, digital technologies can give rise to more sophisticated, and thereby less perceived, discrimination against specific minority groups. They can also pose new challenges to global and local financial stability by amplifying asset price volatility, contagion, exuberance and, for example, accelerate deposit runs simply using smartphone apps. At the extreme, these trends could result in a more volatile financial system, eroding people's trust in money.

Thus, central bank actions matter in digital innovation: they can steer digital innovation towards a more efficient and more stable financial system, with new instruments for supervision and more data points. Central banks can innovate and consider implementing faster payments systems with new digital tools, such as central bank digital currencies. At the same time, they can build on their track record as trusted safekeepers of price and financial stability. Conferring the credibility of a central bank on new digital tools offers a new form of public good. However, the exponential development of cryptoassets without a proper regulatory framework is just one among many signals of potential dramatic changes where a multiplicity of hitherto human decision-making processes can be automated. If this occurs on a large scale, too many processes will escape from our human institutional settings, which provide necessary checks and balances that have so far ensured that our ethical values always play a critical role when deciding on how, when and to whom new technologies spread. Yuval Harari has warned us against losing these safeguards,9 and introduces to the next and final fork.

Fork 5: Artificial intelligence

If at some point in the future, algorithms were to determine most if not all of our societies' decisions, this will certainly go beyond mechanically applying some form of a Taylor rule to monetary policy decisions. The recent leapfrogs in artificial intelligence represent the fifth and final fork. Artificial intelligence (AI) promises jumps in productivity, greatly expanding the set of routine tasks that can be automated. Productivity jumps seem particularly relevant for key public goods such as health care and education. Over the past decades, healthcare and education costs have increased relative to the price of physical goods, because increasing demand for these public goods were not matched by a commensurate increase in productivity. AI promises exactly such an increase in health care and education productivity: just imagine AI nurses analysing symptoms more accurately than human doctors can. Or imagine AI teaching assistants promptly answering questions and explaining concepts better than professors can. Thus, AI could radically change the nature of health care and education, thus perhaps lowering costs and further democratising access. But there is a but-

Indeed, progress in AI technology also has potentially challenging aspects. Given big data and the scalability of computer power, there is a realistic chance for non-linear developments, that is, large jumps in AI capabilities. AI with untrammelled capabilities could play an unknown role if not properly supervised. Tireless AI surveillance could monitor human activities, controlling and reducing the critical thinking by humans that is the basis for innovation and epistemological revolutions. Even in a more benevolent scenario, we might lose our control over an expanding set of economic, social and political decision-making. In addition, AI might replace millions of semi-skilled and even skilled jobs, at a pace that is not commensurate with the creation of new activities for humans. Thus, the risk of rising skilled unemployment in many sectors is not negligible, putting our social welfare systems under further strain. This concern for AI's distributional consequences for employment is expressed by Daron Acemoglu and Simon Johnson in their new book Power and Progress.

In addition, AI development might represent a new, non-biological form of intelligence, raising ethical and practical questions about a potential new life form. We understand humans to have human rights but how should we treat AI fairly?

Thus, AI poses unprecedented challenges for all of us. For central banks, one can see increased powers to monitor price and financial stability with the help of AI. At the same time, there is a possibility that AI might take over key decisions on price and financial stability and challenge what has been so far the "art"

of central banking: a reliance on many models to analyse data, project scenarios and make forecasts, but always in the context of a decision-making process where the balancing act of assessing the balance of risks was conducted by humans, in a fairly sophisticated collegial way, with a well-tested institutional setup, and under the scrutiny of society and its representatives. Your generation will have to reflect on these new challenges sooner than later.

Conclusion

Central banks stand at a crossroads. Five major forks are already with us: (1) the "last mile" for convergence of inflation to target; (2) climate change; (3) inequality; (4) digital innovation; and (5) artificial intelligence. The choices that central banks make today about these forks in the road will affect macroeconomic conditions for years to come. And given the important role that central banks play in societies, they will have to consider their implications. And to better answer these challenges, you will have also to help foster in the central banking community a culture of diversity and inclusion.

The combined effects of these challenges are hard to grasp, precisely because the uncertain interaction between decisions taken across different forks. One obvious conclusion is that that our traditional economic and monetary models do not seem to be designed to capture this complexity and we need new innovative models and approaches to guide central bank policies. While we are already, in many cases, including more instruments in our toolkit, ranging from macroprudential tools, asset purchases, market interventions in specific circumstances, and new forms of communication, and while we are able to more effectively calibrate monetary policy and tackle new emerging risks, we also need to keep our models tractable and retain some simplicity in communicating our role and function in society.

When you look at the forks or the challenges that you will most likely have to face, in a nutshell they all affect the current parameters that guide monetary policymaking or the "stars" usually associated with the concept of a neutral level for the interest rate and also unemployment. Structural changes in labour supply, re-shoring, a new geography for trade, geopolitical tensions and greening our economies are apparently all cost-augmenting factors. Obviously, many changes will be productivity-enhancing in due course, such as those associated with using more digital financial innovation and AI. But you will have to go through a period where it will be difficult to assess the combined net effects of all this and especially the timing when each and all of these factors will manifest. Therefore, your art as future policymakers will be to analyse these future trade-offs, their transitory or more permanent nature, and construct a determined and credible strategy for safeguarding price and financial stability. I am confident that you will do so and successfully achieve your objectives with the appropriate intensity and right timing for your policy actions. And you could also reflect on other possible objectives that societies might mandate you to fulfil. Finally, as mentioned before, many of these challenges have distributional consequences: you might also have to analyse how your future treasury department colleagues will design their fiscal policies to respond to these new financing needs, quite possibly adopting innovative tax burden-sharing in a sustainable and balanced format that should improve the one in our existing social welfare states.

While the five forks that I evoked above are challenges to think about, the way forward is perhaps not to despair when confronted with them, and not to try to embrace everything, but to use the traditional wisdom of Tinbergen's separation principle, and seek to construct policy frameworks that, with defined objectives and instruments, have the aim of best serving the common good. And when I look at the smart young students receiving their degrees in central banking today, I am absolutely sure that all of you will help to make progress towards meeting these critical challenges for central banking.

Monetary and Fiscal Policy-Mix Addressing the Disease of Inflation*

By FRANÇOIS VILLEROY DE GALHAU *

It is a great pleasure to be here for this final day of the traditional September Eurofi meeting, and I extend my warmest thanks to Didier Cahen and David Wright for organising this event, this time in the holy city of Santiago de Compostela. Let me start with good news about a favourite Eurofi topic: banking regulation and Basel 3. I say it as BIS Chair and former chair of GHOS: we had in Monday an important GHOS meeting in Basel, and we unanimously welcomed the decisive progress made this year in the implementation of Basel 3. By 2025, all jurisdictions – including Europe and – yes – the US – should have implemented it in a broad compliance with the standards. I know each banking industry, on both sides of the Atlantic, tends to consider that the other side has undue advantages. It's simply not right, and our motto is now straightforward: let us now close this page, and implement the European compromise, no less and no more. No less as some banks would perhaps still dream of, and no more as some theoreticians of regulation would perhaps imagine. And we should now turn to the priority learned from the banking turmoil: "strengthening supervisory effectiveness" rather than focusing on further regulation. Let me now turn to my theme which is the policy mix to fight our main economic disease: inflation.

Well, Santiago has not yet produced a miracle for inflation, but there is indeed some encouraging news: headline inflation has passed its peak since the beginning of 2023, and it seems that core inflation is following suit. Indeed, the latter started to recede, to stand at 5.3% in August (down from 5.5% in July and 5.7% in March) in the euro area. Obviously, these inflation rates remain too high: we must and we will bring inflation back towards our 2% target by 2025. I reiterate this morning this clear commitment which is fully consistent with our latest ECB forecasts. Monetary policy is the first line of defence, and the main remedy for this disease. I won't make comments about yesterday's Governing Council and monetary decision. But our collective fight against inflation calls for a more appropriate policy mix: the revision of the European economic governance framework provides a major window of opportunity to realign fiscal and monetary policy.

Alongside high inflation, public debts have reached historical levels mainly due to unprecedented waves of shocks, but also, for several countries, to legacy debts. Now that these shocks are fading, governments must avoid an overly expansionary stance that would further fuel inflationary pressures. We therefore need a more coordinated and realigned fiscal and monetary stance.

Better alignment of fiscal and monetary policies would unleash greater efficiency of the policy mix: everyone agrees on this point. The question is how to ensure a better coordination between fiscal authorities – overseen by the Commission within the European Semester – and the ECB, which are both independent, and have specific mandates. Well: coordinating two independent and strong-minded personalities is always challenging, even more so with two independent institutions. In my view, they can be seen as travellers that have to take a journey together. They did not necessarily choose each other, but they can follow simple rules of cohabitation. Agree on the destination, i.e. the respective "anchors" of the 2% inflation target over the medium term, and the medium-term debt reduction path ensure a continuous dialogue to foster mutual trust and address divergences.

Moreover, the higher the inflation and interest rates, the harder it is to manage public debt. Attention is increasingly focusing on the sustainability of public finances, and rightly so. In this context, the July Eurogroup statement on the euro area fiscal stance, which highlights the need for fiscal consolidation, is very welcome. This is also true for France, which should avoid drifting towards a gloomy resignation about the constantly increasing government expenditure (58 % of GDP vs 51 % on average in the euro area in 2022) and public debt (112 % vs 94 %). Moreover, my country failed in the past to meet its commitments on budgetary targets. I strongly hope the next pluriannual public finance programming bill and the 2024 budget will demonstrate increased commitment and credibility.

The reform of EU fiscal governance underway is a key opportunity to re-establish a sound framework for public debt management. In April 2023, the Commission published its legislative proposals. iii The

sooner an agreement is reached – hopefully by end-2023 –, the faster we can build on these tools to regain control of debt dynamics. Let me say upfront that the Commission's proposal is a step in the right direction.

That said, the "fiscal rules trilemma" iv provides a useful matrix to analyse its merits relative to current rules. The trilemma states that it is impossible to fulfil simultaneously the following three objectives: i simplicity, which can also be understood as political intelligibility and ownership ii flexibility, i.e. the ability to adapt to specific economic situations or unforeseen developments, and iii enforcement, i.e. the extent to which the rule is binding. In practice, the current Stability and Growth Pact includes too many – and too complex – flexibility provisions and escape clauses to compensate for the "one size fits all principle", while efforts to improve its enforceability proved ineffective. The reform must strike a better balance between these three features – simplicity, flexibility and enforcement – in order to make the fiscal framework more effective and operational.

As regards simplicity, the fact that the new framework is built around a single operational indicator, i.e. a net primary public expenditure aggregate, is a major improvement compared to structural deficits. In principle, this new indicator should be easier for governments to measure and oversee, and would entirely fall within their control. It is also simpler to use as a communication tool in the public debate, which would help to make the new rules politically intelligible and acceptable.

On flexibility, the proposal goes a long way towards better tailoring the efforts required to country-specific circumstances. The expenditure path would be defined in a pragmatic process, based on a debt sustainability analysis and after a thorough discussion between the Commission and Member States. Each country would commit to a national medium-term plan including structural reforms and public investment programmes. This process acknowledges that debt heterogeneity is too high between Member States to dictate a single debt reduction rule – 66 % of GDP in Germany vs 144 % in Italy in 2022 – while enhanced dialogue with national authorities should improve political ownership and hopefully compliance with the framework.

But this brings me to enforcement. We should nevertheless seek to ensure that the national plans do not turn into political negotiations and result in insufficiently ambitious fiscal adjustments. I must admit that I do not 100% believe in the wisdom of institutional processes or in enlightened economic debates for sufficiently steering national cycles. They must be complemented with common rules and anchors to ensure fiscal discipline. In other words, in the famous rules/discretion debate, we need indeed more discretion- but not too much; and we need less mechanical or obscure rules, but we still need rules. The set-up should indeed ensure binding thresholds for the minimal annual adjustment of public finances. Let me add that the more we progress effectively on national fiscal discipline, the easier we could envisage a common fiscal capacity – which we badly need. Mario Draghi eloquently advocated it recently, and I wish it will be part of his new mission on competitiveness in Europe.

To conclude, let me borrow a fundamental principle from physics, stated by Isaac Newton: "when two forces unite, their efficiency double". Well, it is time to combine the two forces of our monetary and fiscal policy, towards a greater efficiency of our euro area economy and to the benefit of our citizens.

Monetary Policy and Financial Stability[*]

By Michael S. Barr[*]

I would like to talk with you today about the intersection of my two roles at the Federal Reserve as the Vice Chair for Supervision at the Federal Reserve Board and as a member of the Federal Open Market Committee (FOMC).In particular, I'll focus on the interaction of monetary policy and financial stability policy.

Views on Monetary Policy and Current Conditions

First, my views on current monetary policy.

I am squarely focused on our dual mandate to promote maximum employment and stable prices for the American people. I strongly agree with the point that Chair Powell has made often, which is that without price stability, the economy does not work for anyone. Price stability is crucial to achieving a sustained period of strong labor market conditions that benefit all.

I joined the FOMC last year at a time when the headline CPI inflation was peaking at about 9 percent, and we had begun our policy response. There has been a lot of progress since tightening the stance of policy began last year. In August, the 12-month change in CPI inflation was about 3-3/4 percent. The Committee has raised the federal funds rate 5-1/4 percentage points while also reducing the Fed's securities holdings by about $1 trillion. Our strong measures have ensured that inflation expectations remain well anchored.

While inflation has been moderating, incoming data on economic activity have shown considerably more resilience than I had expected. We are being helped by improvements in supply. I now see a higher probability than I did previously of the U.S. economy achieving a return to price stability without the degree of job losses that have typically accompanied significant monetary policy tightening cycles. However, the historical record cautions that this outcome could be quite difficult to achieve.

Of course, the labor market is tight and the data show that employment continued to expand through August, but incoming data also suggest we are making progress on bringing labor demand and supply back into better balance. Job growth has moderated while labor force participation has continued to improve. Immigration has increased, and job vacancies have moved down toward a more normal level.

My baseline projection is for real GDP growth to moderate to somewhat below its potential rate over the next year as restrictive monetary policy and tighter financial conditions restrain economic activity, and I expect this below-trend growth will be associated with some further softening in the labor market. As we watch how conditions evolve, I remain highly attuned to risks to achieving both components of our mandate.

There is a robust debate about the lags of monetary policy transmission; how long it takes for past tightening to come into full effect. While these lags are difficult to estimate, I expect that the full effects of past tightening are yet to come in the months ahead. I strongly agree with what Chair Powell has said about where we are in the tightening cycle. Given how far we have come, we are now at a point where we can proceed carefully as we determine the extent of monetary policy restriction that is needed. In my view, the most important question at this point is not whether an additional rate increase is needed this year or not, but rather how long we will need to hold rates at a sufficiently restrictive level to achieve our goals. I expect it will take some time. I will continue to evaluate a range of incoming data as I make my assessments at upcoming meetings. As a part of this, I continue to track the cost and availability of credit to the economy, as I will discuss later in these remarks.

Monetary Policy and Financial Stability

Now let me turn to my focus today, which is the interaction of monetary policy and financial stability. Monetary policy affects the cost and quantity of credit in the economy, usually in a broad-based and gradual fashion. Financial instability, however, can affect the cost and quantity of credit in an acute and abrupt fashion. Both forces have an effect on economic activity, as the flow of credit to businesses and households is crucial for spending, hiring, and production, underpinning economic growth.

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[*] This article first appeared on June 5, 2023.
[*] Vice Chair for Supervision At the Forecasters Club of New York

Financial stability was a key motivation for the creation of the Federal Reserve System in 1913.2 Although the term "financial stability" wasn't in the vernacular at the time, the Fed was established in part to provide "an elastic currency"—a major concern in an era when periodic strains in the banking sector resulted in currency hoarding and widespread bank runs and failures, causing severe harm to our economy. For much of our subsequent history, however, the Federal Reserve tended to consider financial stability and monetary policy separately. That perspective changed considerably in the years after the Global Financial Crisis, which had many implications for how we think about financial stability and the role of the Federal Reserve. The Dodd-Frank Act was pivotal in reducing financial-sector vulnerabilities that contributed to the crisis, as were attendant reforms to capital and liquidity rules that strengthened the resiliency of the banking system.

Financial Stability Considerations in a Low-Rate Environment

After the Global Financial Crisis, the Federal Reserve kept interest rates low for years to revive a badly damaged economy. Researchers, market participants, and policymakers took note of the potential for very low interest rates to encourage investors to "reach for yield"—that is, to take increased risk in pursuing higher returns on their investments. This behavior can include taking on increased interest rate, credit, and liquidity risk. In some ways, investor reach for yield is an indication that monetary policy is helping stimulate economic activity. Lowering borrowing costs increases the expected return on any investment that is financed. This means that lower rates result in more investments or projects getting the green light. As a result, more people get jobs as economic activity increases.

But in that environment of record low interest rates, and with the ravages of the financial crisis a fresh memory, people rightly wondered whether the incentive to reach for yield would drive excessive risk-taking, leading to a buildup in vulnerabilities that could ultimately threaten the stability of the financial system and the economy. Were those risks so considerable that financial stability concerns should be taken into consideration in making monetary policy decisions? At the same time, some risks were moving outside the banking system, leading some to worry that measures to build resilience at banks would miss these risks. Indeed, as then-Governor Jeremy Stein famously pointed out, monetary policy "gets in all the cracks" and therefore could push back against excessive risk-taking, not only in banks, but across the financial system.5 Despite these concerns, financial stability risks were contained until the pandemic.

Financial Stability Consideration of Moving from Low Rates to Rising Rates

The pandemic resulted in an unprecedented mismatch between demand and supply, both here and abroad, and these forces were the initial impetus for high inflation. The shift from an environment of generally low and slowly adjusting rates to the rapid and near-simultaneous tightening of monetary policy around the world that began last year set the stage for additional stresses in the financial system. For example, in the United Kingdom, an initial jump in the yields on longer-maturity government bonds was amplified by distress at liability-driven investment funds. These funds had become popular with many pension funds during the low-rate period and faced a liquidity squeeze, as they had to rapidly post collateral to cover derivatives losses. This led to widespread disruptions in the gilt market last fall, requiring the Bank of England to undertake a temporary and targeted program of purchases of long-dated government bonds.

Here in the United States, starting in 2022, the FOMC began a period of rapid and substantial increases in the federal funds target range to combat inflation that was much too high. While most banks were well positioned to handle rate increases, higher interest rates had a severe effect on the balance sheets of banks that had not managed their interest rate risk appropriately. This mismanagement came into acute focus when Silicon Valley Bank (SVB) announced it had realized a large loss from the sale of securities that had declined in value and that it intended to raise capital to fill that hole. Uninsured depositors abruptly ran on the bank—with actual and planned flight totaling roughly 85 percent of its deposits within 24 hours—and it failed instantly. SVB's failure caused widespread contagion that led quickly to the failure of Signature Bank and eventually to the failure of First Republic Bank, and it posed acute stress on other banks. The stress only abated after invocation of the systemic risk exception that permitted the Federal Deposit Insurance Corporation to protect all depositors (including uninsured depositors) of the failed banks and the creation of the Bank Term Funding Program (BTFP) using the Fed's emergency lending authorities. The BTFP allowed banks to get access to Fed liquidity based on the par value of their high-quality securities at fixed rates for up to a year.

This response helped calm conditions in the banking sector. Deposit flows returned to normal, and the prospect of a widespread and acute bank credit contraction receded. Such a contraction could well have

harmed the economy and even triggered a recession. Indeed, one recent study looked at data for 46 countries over 150 years and found that episodes of bank stress are frequently followed by significant drops in bank lending and economic activity that persist for many years. Despite the effectiveness of our response to the March stress events, the question again arose whether monetary policy goals were in conflict with financial stability.

Given these historical experiences, I think it is particularly important that we watch closely how both monetary policy and the effects of the March banking stress are affecting bank behavior and the provision of credit to the economy. Recent data are consistent with pressures on banks easing relative to March. Nevertheless, although deposit volatility has abated, some banks have had to turn to higher-cost funding sources to make up for lost deposits. And core loan growth appears to be relatively stagnant in banks of all sizes. While low loan growth can be explained in part by weaker demand for loans in response to higher costs of credit, it is also driven in part by banks tightening their standards, as they reported they were doing in the past several releases of the Senior Loan Officer Opinion Survey on Bank Lending Practices.

As we continue to track developments, we are also continuing to learn from this episode. As I have discussed in other remarks, as well as in congressional testimony, we are using lessons learned from the March episode to consider how we can both enhance our supervision and adjust our regulations as appropriate to address risks at the institutions over which we have supervisory and regulatory authority.

A stable financial system is a necessary condition for sustainably achieving the FOMC's monetary policy goals of maximum employment and stable prices. It is critical that banks have enough capital to remain resilient to those stresses. The safety and soundness of the banking sector is paramount in achieving both our monetary policy and financial stability goals. Everyone in America depends on a safe and stable financial system that channels credit to businesses so they can grow and hire workers, and to households so they can deal with the ups and downs in the economy and invest in the future. Of course, major portions of the financial sector are not subject to federal prudential regulation. As I noted in a speech on bank capital earlier this year, we also need to worry about how risk outside the banking sector can threaten financial stability, as stress in broader financial markets is often transmitted to the banking system. So we need to take a broad view of financial stability.

Perspectives from the Literature and the Policy Debate

Recent experience lines up with academic research. I see three basic findings. First, when financial intermediaries, such as banks, play the important role of channeling funds from savers to borrowers, they frequently do so through various forms of maturity and credit transformation. This transformation results in the creation of risk on their balance sheets. Issuing short-term, liquid liabilities (including uninsured deposits) to fund longer-term, less liquid assets is one example of maturity transformation. These assets, such as loans, can have a credit risk component as well. These types of activities are key aspects of how the financial system supports the economy. But they can also lead to a buildup of financial vulnerabilities. And, of course, banks also engage in trading activities with their own set of exposures to market risk, a concern for regulation and supervision.

The second conclusion of researchers is that such financial vulnerabilities can amplify the effects of adverse shocks to the economy, as witnessed during the Global Financial Crisis.

And third, there is some evidence that monetary policy can affect financial vulnerabilities. I described, for example, how a low-rate environment can affect investors' inclination to reach for yield and how a rising rate environment can expose poor asset-liability management.

While there is some agreement among researchers about how monetary policy can affect the accumulation of financial vulnerabilities, there is more debate about whether monetary policy decisionmaking should be affected by concerns about financial stability. One view is that there is often a discernable tradeoff between the objectives of monetary policy and financial stability, and that monetary policy decisions should consider the consequences for the stability of the financial system. Another view is that there should be a strict separation of monetary policy and financial stability policy. According to this perspective, these goals are often complementary, particularly over the longer run, and even in cases when they do clash, the conflicts are short lived and better dealt with through specific and separate sets of tools. For example, Ben Bernanke, Don Kohn, and Lars Svensson, among others, have argued that the likely costs of using monetary policy to address financial stability risks outweigh the benefits.My view is somewhere in the middle of these two perspectives. Let me explain what I mean.

Monetary policy is a blunt tool, affecting every individual, investor, and business. In contrast, financial stability threats can emerge from discrete parts of the financial system. Correctly calibrating monetary

policy to target a financial vulnerability specific to one part of the financial system is likely not possible. Moreover, a monetary policy response, even to a broad-based search for yield, might require an increase in rates so large that it causes broad-based economic harm. In addition, if a segment of the financial system comes under stress but does not affect broader credit conditions, easing funding costs to the entire economy through monetary policy may not be appropriate. Targeted supervisory and regulatory action is often more effective. If financial stress is so large that it causes a macroeconomic downturn, then monetary policy and financial stability policy are well aligned, and the objective function can be clearly defined as restoring economic growth. Therefore, monetary policymakers are generally best served by focusing squarely on their macroeconomic objectives.

That said, policymakers need to be cognizant of what is happening in the financial system and of any accumulation of financial stability risks, as these risks can be a threat to achieving the dual mandate. As the first line of defense, where we have authority, supervision and regulation are best positioned to address vulnerabilities in the financial system as they emerge. If these tools are properly deployed, these actions may be sufficient. But sometimes they won't be. Turning back to the SVB example, the bank failed because of a textbook case of mismanagement, particularly of interest rate and liquidity risk.The result was that the firm's collapse created financial stability risks that required emergency intervention.

Monetary policy cannot be indifferent to financial stability risks. When financial stability events materialize, they can significantly affect both the price and quantity of credit to the economy. At that point, financial stability problems become a monetary policy concern, as they can adversely affect the flow of credit to households and businesses as well as depress economic activity.

As I mentioned earlier, in its deliberations about monetary policy, the FOMC considers how credit conditions are affecting the economy. We receive regular briefings on financial stability risks, briefings that I find hugely valuable. But we also need to be conscious of the inherent limits in our ability to foresee how the financial system will respond to shocks given its complexity and evolving nature. Our ability to address financial stability risks has been greatly improved by the reforms of the Dodd-Frank Act and enhanced bank capital and liquidity requirements. But we can expect that the economy remains vulnerable to unanticipated shocks that affect both financial stability and economic growth. While continuing to bolster the resilience of the financial sector where we have authority to do so, we must also continue to monitor how emerging financial-sector risks may threaten the broader economy.

Concluding Thoughts on Federal Reserve Liquidity Provision

I would like to wrap up my thoughts today by discussing one of the Federal Reserve's oldest tools of both monetary policy and financial stability: the discount window. I will again harken back to our founding and note that providing backstop liquidity to banks is one of the original purposes of the Federal Reserve System.

Today, the discount window plays an important role. Currently, the primary credit rate, which is the rate available to banks in generally sound financial condition, is set at the top of the target range for the federal funds rate. In this way, this tool, as well as the standing repo facility, which also has a rate currently set at the top of the target range, can help keep the federal funds rate within the target range established by the FOMC if pressures arise in short-term funding markets.For the discount window to support rate control, however, banks need to be willing and prepared to use it when other means of supporting their funding and liquidity—such as tapping the federal funds market—are more expensive. I have been working to ensure that eligible institutions know that supervisors expect them to be ready and willing to use the discount window. We recently published a joint-agency message on the importance of readiness to tap contingency funding sources, including the discount window.

Readiness to use the discount window is also crucial when it comes to financial stability. When the system is hit with a shock that results in widespread stress, funding markets are often unable to effectively distribute liquidity. In these cases, the discount window can be particularly important both to the institutions that need liquidity and to the Federal Reserve's efforts to stop dysfunction from spreading and restore stability, but, again, only if banks do the work ahead of time and are ready and able to use it. As we saw in March, many banks found that having more than one option at the ready to monetize assets was important. Other sources of funds to banks, even the Federal Home Loan Banks, are dependent on private-sector financial market functioning to provide liquidity to their customers. When the market isn't working, such sources of funding and liquidity come under strain.

In contrast, even when banks find that other sources of funds are not available, the discount window can provide liquidity to every eligible institution that is prepared to use it. In this way, the discount window is an important means of supporting financial stability.

In conclusion, monetary policy needs to be cognizant of the risks that financial stress can lead to abrupt changes in the price and quantity of credit, and thus can cause significant harm to the real economy. At the same time, focusing monetary policy decisions on macroeconomic objectives and using other tools for financial stability is likely the most prudent path. Even as we address the lessons from past financial stress, the Federal Reserve must be vigilant about potential risks to financial stability that may lie ahead. Financial institutions need to have an array of both public and private contingent funding sources immediately available to weather a variety of conditions.

Countries Can Tap Tax Potential to Finance Development Goals *

By VITOR GASPAR AND MARIO MANSOUR AND CHARLES VELLUTINI *

Emerging markets and developing economies need $3 trillion annually through 2030 to finance their development goals and the climate transition. That amounts to about 7 percent of these countries' combined 2022 gross domestic product and poses a formidable challenge, particularly for low-income countries.

Our new research finds that many countries have the potential to increase their tax-to-GDP ratios—enabling them to provide critical government services—by as much as 9 percentage points through better tax design and stronger public institutions. Making use of this potential would also contribute to financial development and private sector entrepreneurship. Easier financing, in turn, together with efficient and well-targeted spending, including to strengthen social safety nets, would go a long way toward delivering sustainable development.

Stalled progress

The average tax-to-GDP ratio in emerging market and developing economies has increased by about 3.5 percentage points to 5 percentage points since the early 1990s, driven primarily by taxes on consumption such as value-added and excise taxes.

Some countries have been remarkably successful in raising revenue, such as Albania, Argentina, Armenia, Brazil, Colombia, and Georgia—all of which mobilized more than 5 percentage points of GDP. Much of this increase occurred before the 2008 global financial crisis, however, suggesting that progress has been difficult and fragile in the face ofrecent shocks.

In a rut

Tax revenues across all country groupings have stagnated since 2010.
(percentage of GDP)
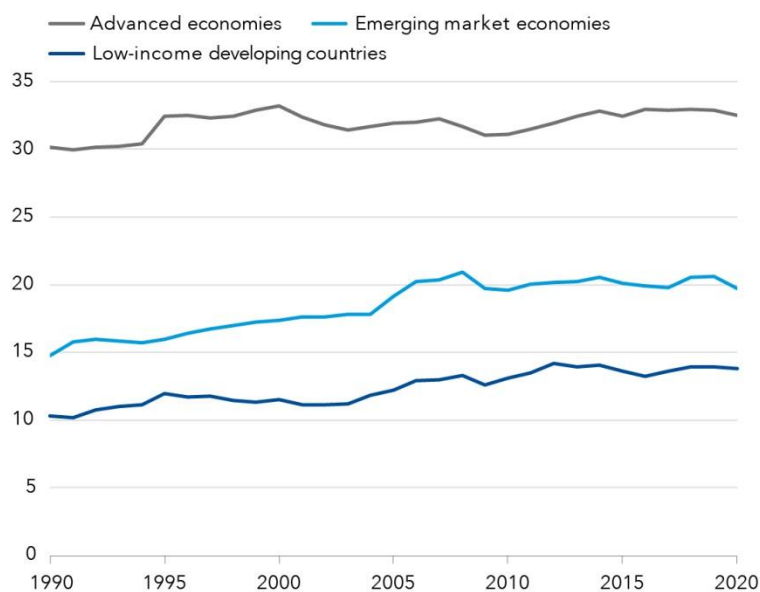
Source: "Building Tax Capacity in Developing Countries," IMF Staff Discussion Note 2023/006.
Note: Tax revenue includes social security contributions.

IMF

Moreover, progress on raising revenue since the early 1990s has varied widely across countries. Half of emerging market economies and two-thirds of low-income countries had a tax-to-GDP ratio in 2020 that was lower than 15 percent— a tipping point above which growth has been found to accelerate. And resource-rich countries have typically generated less tax revenue, as some governments reduced taxes as a result of higher revenue from natural resources.

Countries have considerable room to collect more revenue based on their tax potential—the maximum a country can collect given its economic structure and institutions. We find that low-income countries could raise their tax-to-GDP ratio by as much as 6.7 percentage points on average.

Improving public institutions, including reducing corruption, to the level of those in emerging market economies would result in an additional 2.3-point increase. The total revenue-raising potential, at 9 percentage points of GDP—a staggering two-thirds increase relative to their tax-to-GDP ratio in 2020—would go a long way toward enabling the state to play its crucial role in development.

Untapped tax potential

Countries can raise significant tax revenue with the right policies and institutional reforms.
(percent of GDP)
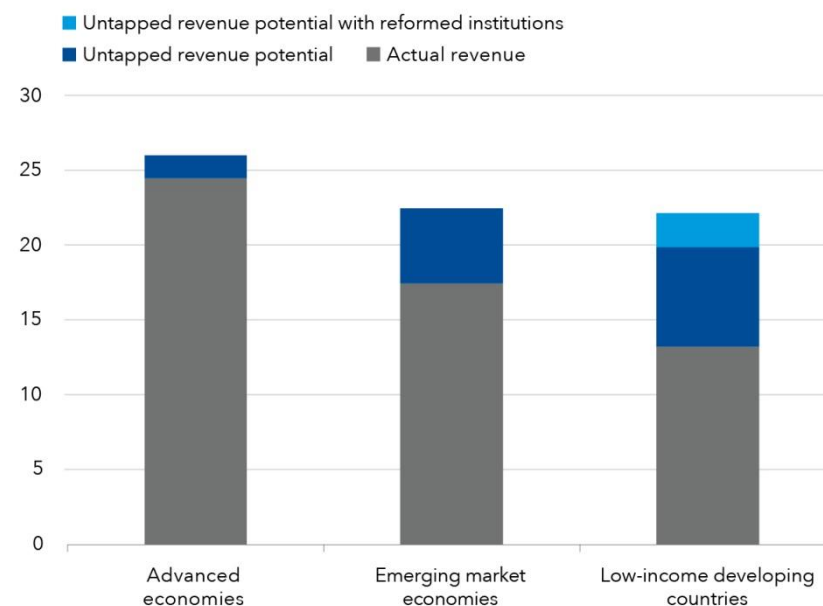
- Untapped revenue potential with reformed institutions
- Untapped revenue potential ■ Actual revenue

Source: "Building Tax Capacity in Developing Countries," IMF Staff Discussion Note 2023/006.
Note: Figures shown exclude social security contributions.

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Similarly, emerging market economies can raise their tax-to-GDP ratio by 5 percentage points on average, while improving their institutions to the average of advanced economies could raise an additional 2 to 3 points.

Some policymakers hope for additional revenue from the ongoing international collaboration on taxing profits of large multinational corporations. But the direct revenue impact of this initiative is likely to represent only a tiny fraction of the overall revenue needs, as shown in a February policy paper.

Essential reforms

To build tax capacity, governments will need to take a holistic and institution-based approach that focuses on leveraging core domestic tax policies. We offer the following concrete advice:

• Improve the design and administration of core domestic taxes—value-added taxes, excises, personal income taxes, and corporate income taxes. VAT revenue in low-income countries, for instance, could be doubled by limiting preferential treatments and improving compliance without increasing standard tax rates. And the widespread adoption of digital technologies would result in higher revenue collection and narrow compliance gaps.

• Implement bold reform plans and focus on tax base broadening through the rationalization of tax expenditures, more neutral taxation of capital income, and better use of property taxes. Headline tax rates are generally not the main concern. Excise taxes—particularly fuel excises and forms of carbon pricing—can mitigate domestic health and climate-related costs. This multi-pronged approach, over the long term, can balance equity and efficiency considerations—the Achilles' heel of managing the political economy of tax reforms.

• Improve the institutions that govern the tax system and manage tax reform. The political economy of tax reform has proven to be hard. Policymakers need evidence to convince the public of the gains and show progress in policy implementation over time. This requires adequate staffing to forecast and analyze the impact of tax policies on the economy, greater professionalization of public officials working on tax design and implementation, better use of digital technologies to strengthen compliance, and transparency and certainty in how policy and administration are translated into legislation.

• Carefully prioritize and coordinate reforms across government agencies, because the broader institutional context matters. This creates a virtuous circle by which enhanced institutions improve state capacity, which in turn increases the quality of tax design and its acceptance by citizens. This is in a nutshell the IMF's approach to supporting countries in tax system reform and raising domestic revenue.

Financial Regulation

Reflections on the 2023 Banking Turmoil*

By PABLO HERNÁNDEZ DE COS *

Introduction

A common expression in Spain is that "el Camino da más de lo que recibe" – the Camino gives more than it receives. While I cannot claim to offer you any more ecclesiastical insights this evening, I will be reflecting on the recent banking turmoil and the implications for the global banking system and the Basel Committee.

For some of you, the turmoil may seem like a distant memory. Since the frenzied months of March to May, many banks have been reporting bumper financial results on the wave of rising interest rates. A cursory look at financial markets since that period would also suggest that the worst may be behind us. So why do I plan to look back at what may be regarded as some as a historical event?

Put simply, the banking turmoil that started in March is the most significant system-wide banking stress since the Great Financial Crisis (GFC) in terms of scale and scope. Over the span of 11 days – from 8 to 19 March 2023 – four banks with total assets of about $900 billion were shut down, put into receivership or rescued. This was followed by the failure of a fifth bank with roughly $230 billion in assets on 1 May 2023. To give you a sense of the order of magnitude, the total value of these banks' assets is roughly equivalent to Spain's annual GDP (leaving aside the stock versus flow nature of these numbers).

The distress of these individual banks, while having largely distinct causes, triggered an assessment of the resilience of the broader banking system. In response, large-scale public support measures were deployed by some jurisdictions to mitigate the impact of the stress, including significant central bank liquidity provision to banks, the activation of FX swap lines, government backstops or guarantees, and, in certain cases, an extension of deposit guarantee schemes. In many respects, today's stabilisation of the banking system is due to a combination of public support measures and the increased resilience provided by post-GFC regulatory reforms, most notably Basel III. We had hoped that we would not need to rely on the former so frequently.

Against that backdrop, the Basel Committee undertook a review of this period and conducted a stocktake of the regulatory and supervisory implications of these developments, with a view to learning lessons. I am pleased to inform you that, as recently announced by the Group of Governors and Heads of Supervision, good progress has been made with this work. I will focus my remarks tonight by offering my personal views on some of the main takeaways and identifying some issues that may warrant further reflection.

Risk management and governance

There is perhaps a near universal agreement that one of the main lessons from the turmoil is the importance of banks' risk management practices and governance arrangements as the first and most important source of financial and operational resilience. The boards and management of banks should be the first port of call in managing and overseeing risks; these functions cannot be outsourced to supervisors. Jumping straight to discussions about the regulatory and supervisory implications of recent events is akin to forgiving banks for not fulfilling their primary responsibilities and likewise shareholders for not exercising due diligence.

Yet the banking turmoil highlighted a series of weaknesses by some banks in this area, including:

• fundamental shortcomings in (basic) risk management of traditional banking risks (such as interest rate risk and liquidity risk, and various forms of concentration risk);

- a failure to appreciate how various risks that were building up were interrelated and could compound one another;
- inadequate and unsustainable business models, including an excessive focus on growth and short-term profitability (fuelled by remuneration policies), at the expense of appropriate risk management;
- a poor risk culture and ineffective senior management and board oversight; and
- a failure to adequately respond to supervisory feedback and recommendations.

Many of these elements may appear obvious and quite basic in nature. So it is of deep concern to see that, in 2023, some banks' boards and senior management failed in their most elementary responsibilities of overseeing and challenging a bank's strategy and risk tolerance. More is clearly needed to shore up such responsibilities.

Consider the following historical anecdote.In 1800, a French chemist by the name of Éleuthère Irénée du Pont set up a gunpowder factory in Delaware. He quickly realised that gunpowder factories have an undesirable property: they tend to explode frequently. In response, du Pont took two initiatives. First, he required that the director (himself) live inside the factory with his family, putting his life on the line – what you could view as "skin in the game". Second, he established a rule that every new piece of machinery had to be operated for the first time by the factory's senior management. If the machine blew up, the manager would suffer the consequences. Needless to say, the safety of the plant increased overnight.

I don't think I need to draw out explicitly the comparisons with today's banking system. But it is clear that the turmoil raises some fundamental questions about the current banking system.

Is it simply inevitable that there will always be "outlier" banks with serious governance and risk management shortcomings? Is this a "feature" of a banking model that combines leverage and maturity transformation with a focus on short-term gains? Have we optimised the alignment of incentives between banks' boards and senior management and broader financial stability objectives? I don't have the answers to all of these questions, but I think they certainly merit further reflection.

Strong and effective supervision

The banking turmoil also highlighted the importance of strong and effective supervision across various dimensions. These include recurrent issues that we've seen in previous banking crises in addition to newer elements. Either way, they raise important takeaways for supervision, which I've grouped into six categories.

First, the turmoil underlined the importance of supervisors developing a thorough understanding of the viability/sustainability of banks' business models as part of their supervisory process, including identifying any areas in which a bank is an outlier, so they can assess and take action to address any weaknesses at an early stage. This may all seem obvious to you, but there are clearly outstanding challenges for supervision, including: (i) how best to assess the viability of business models in a holistic manner (eg relying on a broad set of quantitative and qualitative indicators); (ii) how to proactively engage with outlier banks without "crossing the line" and "co-owning" a bank's business strategy; and (iii) how to monitor medium-term structural changes to better identify their impact on different business models.

Second, a core element of supervisory work is ensuring that banks have effective and robust governance and risk management. This includes, but is not limited to, the composition of the board and the extent to which its members have relevant experience, including banking and financial expertise; the board's ability to effectively challenge the bank's senior management, oversee the bank's risk profile and steer its strategy; the independence and empowerment of the risk management and internal audit functions; the enterprise-wide risk culture, including how embedded it is in corporate and business processes; and the incentives provided by senior management compensation schemes.

Third, the turmoil highlighted clear challenges in overseeing banks' liquidity risk. These challenges relate to: the speed and volume of deposit outflows and changes in banks' funding profile; the importance of banks being operationally prepared for liquidity stress scenarios (eg by having credible and tested contingency funding plans, and operational readiness to access central bank liquidity facilities); and the role of social media and the digitalisation of finance in hastening the speed and impact of a bank's distress. These developments, in turn, prompt considerations for supervisors around, among other issues, whether (i) their monitoring of banks' liquidity risk profile provides the relevant information in a timely manner; (ii) the frequency of monitoring can be increased, both during times of stress and business as usual; (iii) supervisory monitoring can leverage different sources of information and high-frequency data; and (iv) monitoring of concentration risks is warranted.

Fourth, we've been reminded once again that supervisory judgment is a critical element to ensure that the intent, as well as the letter, of regulation is addressed. A rules-based approach on its own is unlikely to appropriately identify, assess and allow the timely mitigation of key risks to a bank's safety and soundness and broader financial stability. This does not diminish the role of a rules-based approach in setting minimum standards. Rather, it prompts considerations for supervisors around how they can effectively complement such standards by exercising judgment – and therefore intervene proactively even when specific rules have not been breached – to make bank supervision dynamic and adapted to a bank's specific business model and operations, and the risks that they present.

Fifth, it is important to reflect on the role and scope of existing supervisory toolkits as complements to minimum global standards and to ensure they are sufficient to drive concrete action at banks, including in the light of any legislative/regulatory constraints on how or when they might be applied. A recent paper by staff at the International Monetary Fund finds that, while the importance of a sound institutional setting for effective bank supervision is widely accepted, many jurisdictions do not equip bank supervisors with the necessary powers and conditions for their work.5 Supervisory authorities could also review whether the guidance and processes given to individual supervisory teams appropriately incentivise a willingness to act early, accompanied by a clarity of process on how to do so.

Sixth, while there were several positive elements of cross-border supervisory cooperation during the turmoil – including at the Committee level – consideration could be given as to whether broader information-sharing protocols at a cross-border level are necessary. Any such protocols would, of course, have to take into account constraints on authorities' ability to share confidential information, existing information-sharing arrangements and resource implications.

Robust regulation

Moving to regulatory reflections, let me be clear upfront: the regulatory imperative for the Basel Committee at this stage is to implement all aspects of the Basel III framework in full, consistently, and as soon as possible. Nevertheless, there are issues directly or indirectly related to the turmoil that I think would merit further analysis and reflection.

My starting point is that prudential regulation – and Basel III more specifically – is not calibrated to produce "zero failures", but seeks to reduce the likelihood and impact of banking stress, while facilitating financial intermediation and economic growth.

Moreover, most of the banks that failed were not subject to the Basel III framework in full.

Let me now offer some personal reflections on four regulatory issues that I think would benefit from further analysis.

First, liquidity. While each of the banks that failed during the turmoil had idiosyncratic features, they all ultimately succumbed as a result of significant liquidity outflows and an inability to maintain sufficient stable funding. To date, most of the commentary has focused on the significant scale and speed of outflows experienced by these banks – up to 85% of deposits over the span of two days for one of them – and whether the Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSFR) are miscalibrated as a result. It is helpful to take a step back and consider a broader set of questions about the Basel III liquidity standards:

• What exactly are the objectives of these standards? The LCR requires banks to hold sufficient liquid assets to meet a 30-day stress outflow period. So, before reviewing the "denominator" of this ratio (ie the assumed outflow rates), a more fundamental question is whether we still expect banks to be able to survive a liquidity stress for 30 days without some sort of public intervention/resolution/private sector solution. Should the LCR be more focused on buying enough time for authorities to address a liquidity stress? What is its role relative to other liquidity metrics, both quantitative and qualitative?

• A second fundamental question is with regard to the design of the LCR and NSFR. Unlike capital standards, there is no concept of a "hard" minimum requirement supplemented by a "buffer" requirement. In principle, banks should be able to dip into their stock of liquid assets in times of stress to meet outflows, while also submitting a satisfactory restoration plan to their supervisor. Yet it would appear that banks continue to be reluctant, or unable, to fully use their liquid assets in the manner envisaged. A number of potential factors behind such behaviour have been suggested, including the calibration of existing liquidity requirements, perceived stigma, market expectations and/or operational constraints.

There is also the more topical question about the role of digitalisation and social media on liquidity outflows. Through the modern history of finance, advances in communication technology have sped up the flow of information, affecting the nature and magnitude of banking crises. In the Panic of 1873, financial

stress that began in Europe spread to North America, facilitated by the transatlantic telegraph cable completed in 1866. In the Black Monday global stock market crash in 1987, contagion spread across financial markets via electronic communications. In the present, rumours can spread through social media.

At the same time, innovation has made it faster and easier to move money, from the creation of the ATM to modern digital banking apps, alongside faster payments and reduced settlement windows. When combined with advances in communications technology, these developments have further reduced frictions and allowed for rapid inflows and outflows. As recently as 2008, depositors at IndyMac and Northern Rock still formed long lines outside bank branches; as we saw in the recent turmoil, withdrawals can now be initiated online in a matter of minutes if not seconds.

And while fingers have pointed at the role of social media, it is important to further unpack what this means. In practice, there is a wide spectrum of "social media" communication channels. This ranges from public platforms that target a broad audience and can amplify bank concerns (eg X/Twitter, Facebook, LinkedIn, Instagram), specialist (public) forums (eg Y-combinator, Reddit, Discord), encrypted messaging applications (eg WhatsApp, WeChat, Signal, Telegram), internal corporate messaging platforms (eg Slack and Circle) and even telephone calls. These platforms increase the global interconnections among clients, which could foment the risk of herd behaviour in times of stress. As a result, these developments may be relevant not only for regulators, but, as I previously mentioned, also raise important questions for supervisors as to how best to monitor and respond to social media, in both "peace" and "crisis" times.

Second, interest rate risk. A recurring theme related to the distress of some banks during the turmoil was the common and concentrated exposure to interest rate risk in the banking book (IRRBB). Again, these banks were not subject to the existing IRRBB standard, but these events have once again attracted attention towards the current regulatory treatment of IRRBB in the Basel Framework. Some areas that have been mentioned for further analysis and evaluation include whether the current Pillar 2/3 approach to addressing IRRBB is still appropriate? Are there ways to further strengthen it, by providing more stringent guidance and requiring further disclosures? Or is there a need to move towards a Pillar 1 capital framework for IRRBB to promote greater international consistency and comparability?

The third category of issues relates to two aspects of the definition of regulatory capital. First, unrealised interest rate losses on fixed income assets held at amortised cost were an important driver in the failure of several banks during the recent turmoil. If banks need to sell such securities before their maturity date to meet liquidity needs, unrealised losses on those securities become realised losses and would reduce both equity and regulatory capital. Moreover, the large-scale and ad hoc fire sales by some troubled banks to meet large-scale and simultaneous deposit withdrawals may also require reflection on how best to reflect the risks from second-round fire sales. This is an area where further analysis and evaluation could also be performed but, equally importantly, is of critical importance for supervision and banks' own risk management practices.

Recent events have also highlighted the role of Additional Tier 1 (AT1) capital instruments in the capital framework. Investors and markets did not fully internalise the various trigger events that could lead to the loss participation of AT1 instruments, even though the Basel Framework contains explicit language on those trigger events and despite contractual documentation clearly highlighting the corresponding risk factors of such instruments. In addition, the fact that a distressed bank continued to make expensive replacement issuances and to pay substantial amounts of discretionary interest on these instruments (alongside dividend payments for common shares), despite reporting losses over several consecutive quarters, raises questions about the ability of such instruments to absorb losses on a going-concern basis. The Committee has previously evaluated the functioning of these instruments, but was unable to draw robust empirical conclusions regarding their loss-absorption capacity.[6] Future analysis and evaluation would need to be considered as part of a more holistic assessment of the role of different regulatory capital instruments and their functioning in crisis times.

The fourth category of regulatory issues to reflect on pertains to the application of the Basel Framework. This includes the determination of what constitutes an "internationally active bank". The Basel Framework intentionally does not define this concept, given structural differences in banking systems across jurisdictions. Yet recent events have shown that the failure of a bank can have systemic implications through multiple channels, including first- and second-round propagation effects. Put differently, factors such as size and cross-border interconnections are important considerations when deciding on the appropriate scope of application of the Basel Framework.

The flip side of this issue is the role of proportionality for non-internationally active banks. As you know, jurisdictions may opt to apply the Basel Framework for non-internationally active banks, including smaller ones. In such cases, they can apply the framework in some proportionate manner, commensurate with the risk profile and systemic importance of banks. Member jurisdictions are wholly responsible for deciding on whether and how to apply and design proportionate frameworks, and the recent turmoil highlighted how the distress of banks subject to domestic proportionality regimes could have cross-border financial stability effects.

The turmoil also highlighted how the design of proportionality frameworks can impede effective supervision by reducing standards, increasing complexity and promoting a less assertive supervisory approach.

There may therefore be merit in members continuing to share their experiences in applying proportionality, monitoring the scope of banks subject to proportionate approaches, and in ensuring that these objectives are adequately met.

Conclusion

I started my remarks this evening with a Spanish expression about the Camino. Let me end with another one: "Nunca es demasiado tarde para encontrar el Camino" – it is never too late to find the Way.

So what is the way forward for the Committee with regard to the implications from the banking turmoil? I am pleased to note that there is broad agreement to prioritise further work to strengthen supervisory effectiveness, including identifying issues that could merit additional guidance at a global level. In addition, the Committee will pursue additional follow-up analytical work based on empirical evidence to assess whether specific features of the Basel Framework performed as intended during the turmoil, such as liquidity risk and interest rate risk in the banking book. And we will continue to coordinate with other global forums and standard-setting bodies on cross-cutting issues.

Importantly, the already-implemented Basel III reforms helped shield the global banking system and real economy from a more severe banking crisis. So there is also an equally broad agreement at the Committee level, reaffirmed by the Group of Governors and Heads and Supervision, on the critical importance of implementing all aspects of the Basel III framework in full, consistently, and as soon as possible. Put simply, none of the follow-up work to the turmoil should interrupt the imperative of implementing the outstanding Basel III standards. In this respect, the Committee will continue to monitor and assess the full and consistent implementation of Basel III.

Stick to the Core Principles*

By NEIL ESHO *

Introduction

When asked how he went bankrupt, Mike Campbell, a Scottish war veteran who features in Hemingway's novel, The Sun Also Rises, responded: "two ways: gradually and then suddenly". This description of financial failure – clearly not new – is also an apt description that sums up many an episode of banking distress. This includes the failure of a number of US regional banks earlier this year, and the merger of two large Swiss G-SIBs. In the US case, there was a build-up of excessive interest rate risk and a concentration of unstable funding sources, before the sharp rise in interest rates triggered a realisation that the banks' tech-focused business models were particularly susceptible and the capital and liquidity resources available to cover such risks were inadequate. In the case of Credit Suisse, the gradual build-up of issues was perhaps even longer and more public. They included large losses linked to Archegos and Greensill Capital, fundamental weaknesses in risk management and governance, various scandals, reporting weaknesses, and repeated changes in management and strategy. The final loss of confidence in the viability of the business model was also sudden.

Strong capital and liquidity buffers can buy bank managers and supervisors time to rectify weaknesses. But, unless weaknesses are addressed with sufficient urgency, that time can suddenly run out. So gradually then suddenly has been a common theme throughout the history of banking crises – the gradual build-up of vulnerabilities, followed by the sudden materialisation of losses. While the specific causes of banking crisis may differ, they drive home the same set of lessons: the need for strong and effective supervision and a comprehensive regulatory framework for banks.

The Chair of the Basel Committee, Pablo Hernández de Cos, will speak on Thursday about the implications of the banking turmoil for the work of the Basel Committee.

Today I will focus my remarks on the Core principles for effective banking supervision, better known as the "Basel Core Principles". For supervisors around the world, the journey to compliance with the Basel Core Principles is something of a pilgrimage. Like the Camino de Santiago, it can be a long journey, but one which is well worth the effort.

The Committee issued a consultative document proposing revisions to the Core Principles in July this year.1 Originally published in 1997, the Core Principles are the de facto minimum standards for the sound prudential regulation and supervision of all banks and banking systems. Their rationale, a recognition that weaknesses in the banking system of a country, whether developing or developed, can threaten financial stability both within that country and internationally, remains highly relevant given the turmoil earlier this year.2 The Core Principles provide a framework for strengthening prudential supervision in all countries, and so are designed to be universally applicable – that is, unlike the Basel Framework, which is intended for internationally active banks, the Core Principles accommodate a broad spectrum of banks and range of different banking systems. To be capable of universal application, the principles aim to be simple, flexible and outcome-oriented rather than prescriptive on process.

In total, there are 29 core principles, which are broadly grouped according to the expectations of supervisory authorities (CPs 1–13) and those of banks (CPs 14–29).

The Core Principles are comprehensive, and so are used as a minimum standard by which banking supervisors can assess the effectiveness of their regulatory and supervisory frameworks. The International Monetary Fund (IMF) and World Bank also use them as part of their Financial Sector Assessment Program (FSAP) to evaluate the effectiveness of countries' banking supervisory systems and practices. Over 100 different jurisdictions have undergone assessment against the Basel Core Principles as part of FSAPs – and so they are a truly global standard.

The proposed amendments to the Core Principles

Why are the Core Principles being reviewed now and what are the proposed changes?

The Core Principles are intended to be a "living" standard that evolves over time in response to global financial developments, emerging risks and trends, and changes to the global regulatory landscape. Since their introduction, the Core Principles have been revised twice: first in 2006 and most recently in 2012.3 Given that over a decade has passed since the last update, the Committee considered that it was time to comprehensively review the standard and started the current review about a year ago.

To ensure that the revised standard reflects the global experience of banking supervision, a Task Force comprising both Committee and non-Committee member jurisdictions, as well as the IMF and World Bank was formed to carry out the review.

The current review has been informed by a range of inputs, including:

- the effect of recent structural changes affecting the banking system;
- supervisory and regulatory developments over the past 10 years;
- lessons learnt in implementing the 2012 update to the Core Principles; and
- experiences gained from the IMF and World Bank's FSAPs since 2012.

A careful examination and consideration of these inputs has resulted in proposed changes to the standard that can be grouped into six thematic topics.

First, financial risks and macroprudential supervision, where the Core Principles have been strengthened to reflect key elements of many of the post-global financial crisis reforms. These include, in particular, the introduction of a leverage ratio to complement the risk-weighted framework; enhancements to credit risk management practices; the introduction of expected credit loss approaches to provisioning; and more stringent requirements for managing large exposures and related party transactions.

The last 10 years have also reaffirmed the importance of applying a system-wide macro perspective to the supervision of banks. As a broad financial system perspective is integral to many of the principles, the existing requirements have been strengthened based on lessons learnt. This includes the importance of cooperation between supervisors and authorities with responsibility for macroprudential policy, having a process to identify domestic systemically important banks, and the value of having flexible buffers that can be used in periods of stress.

Given that the Core Principles are outcomes-focused, the proposed adjustments do not require non-Committee member jurisdictions to implement the Basel III Framework in order to comply with the principles. Rather, the changes are intended to reflect key elements of the Basel III reforms, such as the leverage ratio and capital buffers, but they allow for these to be implemented in a simpler and proportionate manner.

The second thematic topic is operational resilience, where significant supervisory efforts have focused on ensuring that banks are better able to withstand, adapt to and recover from severe operational risk-related events. For example, disruption from pandemics, cyber attacks, technology failures and natural disasters. The proposed revisions aim to incorporate elements from the Committee's Principles for operational resilience and revised Principles for the sound management of operational risk. This includes enhancements to governance, business continuity planning and testing, third-party dependency management and resilient cyber security.

Third are climate-related financial risks, where changes have been proposed to improve supervisory practices and banks' risk management, reflecting elements of the Committee's Principles for the effective management and supervision of climate-related financial risks. We expect banks to understand how climate-related risk drivers may manifest themselves through financial risks, recognise that these risks could materialise over varying time horizons, and implement appropriate measures to mitigate these risks. Supervisors are also expected to consider climate-related financial risks in their supervision of banks and should be able to assess banks' risk management processes.

Fourth is the digitalisation of finance and non-bank financial intermediation (NBFI). Financial intermediation has evolved significantly since the last update to the Core Principles, prompted by rapid advances in financial technology and the proliferation of NBFIs. While the Core Principles are designed to apply to banks, supervisors should also remain alert to the risks arising from NBFI activities and their potential impact on the banking system. The proposed revisions reinforce the group-wide approach to supervision by ensuring that supervisors can access all relevant information (wherever records are located) and review the overall activities of the banking group, including those that may be undertaken by service providers. The proposals also recognise that risks can arise from a range of different NBFIs, and strengthen requirements for supervisory monitoring and for banks to manage their counterparty risks.

The fifth thematic topic is risk management practices, where the proposed revisions aim to reinforce the importance of banks instituting a sound risk culture, maintaining strong risk management practices, and adopting and implementing sustainable business models. This includes amendments to enhance corporate governance, including board independence, renewal and diversity, and to give greater emphasis to risk appetite frameworks and risk data aggregation.

And finally, the sixth thematic topic is lessons learnt since the last review, which has informed several of the proposed changes. Here, the proposed amendments seek to enhance supervisory transparency, decision-making and legal protections. We have also proposed a broader strengthening of the standard by upgrading several existing additional criteria to essential criteria, including those relating to corrective and sanctioning powers, consolidated supervision, corporate governance, interest rate risk in the banking book and liquidity risk. This proposal reflects our understanding that these requirements are no longer aspirational, but rather that practices have evolved sufficiently enough for these expectations to be reasonably embedded within the minimum standard.

Underpinning all the principles is the concept of proportionality. Here it is important to clarify – and we have also tried to do so in the standard itself – that proportionality does not mean lower or less conservative standards. Rather, it reflects the idea that rules and supervisory practices are commensurate with banks' systemic importance and risk profiles, and that they are appropriate for the broader characteristics of a particular financial system.4

Conclusion

The public consultation on the Basel Core Principles will close early next month. I encourage you to take advantage of the opportunity to provide feedback to the Committee. Given that the Core Principles are a global standard, the Committee is keen to hear from a broad range of stakeholders. After carefully reviewing all the comments received, we hope to publish the final revised standard around the middle of next year.

As I mentioned at the start, the banking turmoil of March 2023 has reinforced the importance of effective risk management and supervision. Despite the Core Principles now being in effect for over 25 years, some principles consistently receive weak ratings across jurisdictions. This is seen across institutional arrangements and supervision – for example, independence, accountability, resourcing and legal protection for supervisors (CP2) and corrective actions and sanctioning powers (CP11) – and banks' governance and risk management practices, including transactions with related parties (CP20) and problem assets, provisions and reserves (CP18).5

Our objective – and also our challenge throughout this process – is to raise the bar for supervisory and bank practices, while also keeping the principles universally applicable. While full implementation of the Core Principles by all countries is not a guarantee against bank failure, it provides a good basis for developing effective supervisory systems, and it would be a significant step towards improving banking system resilience and financial stability both domestically and internationally.

Climate Issues and sustainable growth

Countries Must Contain Global Warming While Keeping Debt in Check[*]

By ERA DABLA-NORRIS AND RUUD DE MOOIJ AND RAPHAEL LAM AND CHRISTINE RICHMOND[*]

As the window of opportunity to contain global warming is closing rapidly, many countries are pursuing policies to reduce emissions. Several rely heavily on spending measures, such as increasing public investment and subsidies for renewable energy. These decarbonization efforts are welcome. Yet, in some cases these policies entail large fiscal costs.

Climate action presents policymakers with difficult tradeoffs. Relying mostly on spending measures and scaling them up to deliver on climate ambitions will become increasingly costly, possibly raising debt by 45 percent to 50 percent of gross domestic product by midcentury. High debt, rising interest rates, and weaker growth prospects will further make public finances harder to balance. But prolonging "business-as-usual" leaves the world vulnerable to warming. Countries have the option to generate revenue to decrease their debt burden through carbon pricing, but relying on carbon pricing alone may cross a political red line.

Climate policy tradeoffs

Scaling up spending measures will be costly while moderate action will not achieve the climate goals.
(percent of GDP)

Advanced economy:
— Relying mostly on spending-based instruments
(carbon prices capped at $75 per ton) to reach net-zero goal
--- Pursuing moderate spending-based instruments
(carbon prices capped at $75 per ton)
Large emerging market economy:
— Relying mostly on spending-based instruments
(carbon prices capped at $45 per ton) to reach net-zero goal
--- Pursuing moderate spending-based instruments
(carbon prices capped at $45 per ton)

Note: The figure shows cumulative change in debt-to-GDP relative to a 'business as usual' scenario. The solid lines scale up green public investment and subsidies significantly, while the dotted lines represent the same profile on carbon prices and a moderate rise in green investment and subsidies.

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Governments thus face a policy trilemma between achieving climate goals, fiscal sustainability, and political feasibility.In other words, pursuing any two of these objectives comes at the cost of partially sacrificing the third.

Our latest Fiscal Monitor offers new insights on how to manage this trilemma. Governments must take bold, swift, and coordinated action, and find the optimal mix of both revenue- and spending-based mitigation measures.

Smart policies needed

While no single measure can fully deliver the climate goals, carbon pricing is necessary but not always sufficent to reduce emissions, as also noted by William Nordhaus and others. It should be an integral part of any policy package. Successful experiences from countries at various stages of development, such as Chile, Singapore, and Sweden, show that political hurdles associated with carbon pricing can be overcome. Insights from their experience stand to benefit not only the nearly 50 advanced and emerging market economies with carbon pricing schemes already in place but also the more than 20 countries contemplating their introduction.

But carbon pricing alone is not sufficient and should be complemented by other mitigation instruments to address market failures and promote innovation and deployment of low-carbon technologies. A pragmatic and equitable proposal calls for an international carbon price floor, differentiated across countries at different levels of economic development. The associated carbon revenues could be partly shared across countries to facilitate the green transition. A just transition should also include robust fiscal transfers to vulnerable households, workers, and communities.

Fiscal costs vary depending on the mix of revenue and spending policies. Our analysis shows that an appropriate mix and sequencing of revenue- and spending-based climate measures enacted now can limit the fiscal costs of emission reductions, while achieving climate goals. We find that public debt in advanced economies would rise by 10 percent to 15 percent of GDP by 2050 without additional revenue or spending measures, though such estimates are subject to large uncertainty, reflecting country differences in government budgets, size of investment and subsidies, compensation to households, and dependence on

fossil fuels. Postponing carbon pricing would be costly, adding 0.8 percent to 2 percent of GDP to public debt for each year of delay.

Debt implications of climate action

Tackling climate change could entail fiscal costs for emerging market economies, depending on the mix of fiscal measures.

(cumulative change in debt, percent of GDP)

Legend:
- Real interest rate
- Targeted transfers
- Green subsidies
- Carbon revenue
- Real GDP growth
- Green investment
- Other revenue
- Government-debt-to-GDP ratio
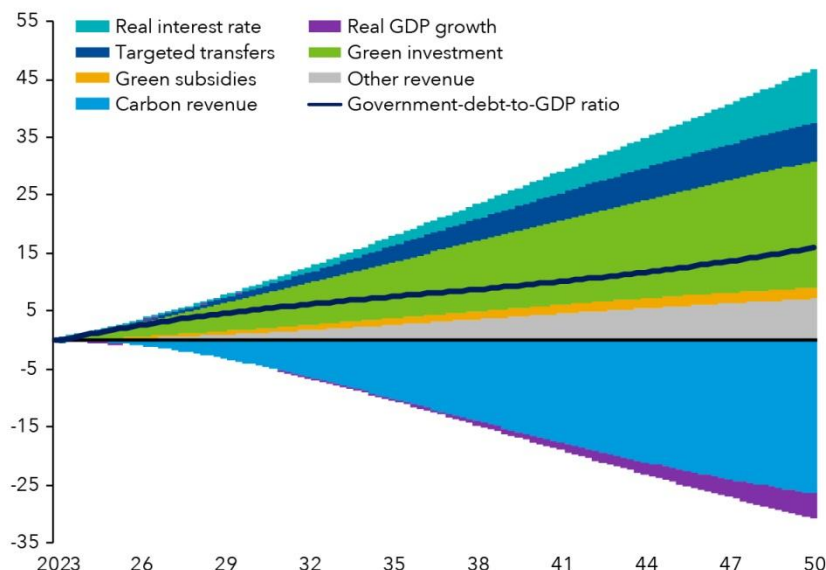
Note: The chart shows the cumulative change in government debt relative to "business as usual" baseline. Indicative simulations are based on a dynamic general equilibrium model for a representative emerging market economy. Please see October 2023 Fiscal Monitor for details.

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While the expected rise in debt for emerging market economies from a climate policy package is estimated to be similar to that in advanced economies, the contribution from different revenue and spending measures is notably different. That's because of larger carbon revenue potential but also higher investment needs and higher borrowing costs that are sensitive to the debt level. Economies with sufficient room in government budgets could accommodate such a policy mix. But such an increase in debt would be particularly challenging for most emerging market and developing countries in light of already high debt and rising interest costs, alongside sizable adaptation needs and aspirations to achieve the sustainable development goals.

To navigate these challenges, governments must enhance spending efficiency and build greater capacity for raising tax revenues by broadening the tax base and improving fiscal institutions.

Shared responsibility

No single country can solve the climate threat alone. Nor can the public sector act by itself. The private sector has to fulfill the bulk of the climate financing needs. The Fiscal Monitor discusses the role of firms in the energy transition. Surveys in both Germany and the United States show that firms were resilient to the 2022 energy price spikes, with limited impact on firms' production and employment, and in many cases, firms adjusted by reducing energy use and investing in energy efficiency.

Policymakers must coordinate their efforts. Emerging market and developing countries face challenges that call for more concessional financing to support the green transition as well as transfers of knowledge and sharing of established low-carbon technologies. For example, the IMF's Resilience and Sustainability Trust provides long-term financing to strengthen economic resilience and support reforms. Governments should harness the momentum of recent announcements such as the Nairobi Declaration and the participation of the African Union in the Group of Twenty to push forward a practical global deal on an international carbon price floor and support developing countries.

Financing Climate Transition in Asia Pacific*

By Roberta Casali *

Multilateral development banks play an important role in helping emerging markets transition to low-carbon economies

Asia Pacific has experienced tremendous economic growth in recent years, but it has come at a cost. The region is now responsible for more than half of global greenhouse gas emissions, meaning transitioning to a low-carbon economy must be executed quickly and on a large scale.

Mobilising finance is key. In developing Asia alone, it is estimated that around $1.7tn is needed every year from 2016-30 to maintain the region's growth momentum, eradicate poverty and respond to climate change. With the size of global private assets under management at approximately $210tn, the key question is how to attract them to climate and sustainable development investments in emerging markets.

Governments need to provide clear policies to incentivise sustainable investments. By establishing coherent transition plans, targets and policies – such as carbon-pricing mechanisms, polluters-pay principles and risk-sharing and transfer mechanisms between public and private sectors – governments can catalyse transition finance.

Regulatory bodies should promote and adopt clear criteria for reporting and disclosure. This is essential for assessing investments that contribute to the United Nations sustainable development goals, while mitigating climate risks. By aligning investment decisions with environmental, social and governance as well as Paris agreement criteria, economies in Asia Pacific can attract private capital flows that support sustainable and resilient growth.

The role of multilateral development banks

Multilateral development banks can steer transition finance into emerging markets at scale. The Asian Development Bank has been supporting developing members to scale up transition and sustainable finance in several ways.

First, ADB was one of the first international financial institutions to launch ESG-themed bonds. Starting with water bonds in 2010 and extending to green, blue, gender, health and education bonds, the principal outstanding amount of our green, blue and themed bonds as of mid-April 2023 reached nearly $19.5bn. In 2022, we issued a record $5.8bn of thematic bonds. With our bonds framework adhering to international standards and receiving a second-party opinion, we set good framework practices to further expand the ESG market in developing Asia.

Second, ADB develops partnerships with standard-setting bodies and regulatory agencies, such as the Association of Southeast Asian Nations Taxonomy Board, to establish taxonomies, guidelines and capacity in the region. As the board provides confidence for ESG-orientated investors, they enable the ESG bond market to thrive and are critical in addressing concerns over greenwashing.

For example, ADB provided support to eight Asean sustainable bond issuers, raising more than $800m in 2022. We also supported three local green bond verifiers, who were accredited by the Climate Bonds Initiative. Having local talent with solid understanding of the local market environment and deep familiarity with international practices is crucial.

Third, beyond its core lending operations, ADB aims to leverage its capital, de-risk projects and improve project bankability, which can eventually attract private capital. Two newly launched initiatives are promising.

The first is the Energy Transition Mechanism, which will use concessional and commercial capital to retire or repurpose coal and other fossil fuel plants on an accelerated schedule, replacing them with clean power capacity. This effort is scalable and designed to foster investments in cost-effective renewable energy solutions and technologies, such as smart grids, hydrogen infrastructure and electric vehicles.

Second is the Innovative Finance Facility for Climate in Asia and the Pacific, which will use guarantees from partners for parts of ADB's sovereign loan portfolio to enable the bank to free up capital to increase lending for climate change investments. Supplementary grants will facilitate project preparation, capacity

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building and knowledge solutions. With a model of '$1 in, $5 out', the initial ambition of $3bn in guarantees could create up to $15bn in new loans for climate projects.

Scaling up transition finance in Asia Pacific requires a combination of policy, knowledge transfer, international co-operation and innovation from governments, financial institutions and stakeholders. Multilateral banks, such as ADB, play an important role in assisting developing countries to transition to a low-carbon economy. By mobilising private and concessional finance to meet financing needs, connecting emerging economies to international markets and investors and developing an ecosystem to promote sustainable and transition finance, banks can lead the charge in providing knowledge, technical support and finance necessary to address climate challenges.

With these actions, the battle against climate change will be placed front and centre in the sustainable development and poverty reduction agenda – where it needs to be.

The Contribution of Capital Flows to Sustainable Growth in

Emerging Markets*

By LESETJA KGANYAGO *

My subject today will be the role of capital flows in emerging market growth.

I want to start with a problem that has often bothered me. As the South African central bank Governor, I regularly meet with global investors to discuss economic conditions and policy settings in my country. The fundamental goal of these engagements is to encourage investment. Then I return from these meetings, and we have policy sessions where staff want to talk about the dangers of capital flows. But the investors I just met are the people who are responsible for the capital flowing. So, I wonder – which part of my time am I wasting? Do we want these capital flows or not?

This is a global discussion, and one that has evolved significantly over my time working in macroeconomic policy.

Twenty or 30 years ago, the mainstream view was that financial globalisation was good. Global markets could provide more financing, at lower rates, than countries could achieve by relying on their own resources. They would allow for better risk sharing, and they would create better incentives to get policy right. The standard policy recommendation was that controls on capital flows should therefore be liberalised, and where they were being applied, this was probably to cover for some other policy error.[1]

Nowadays, the mainstream view has shifted. The IMF encourages policymakers to keep capital flow measures in their toolkits, both for pre-emptive purposes and to address capital flow surges.[2] The guidance is nuanced, and there is still appreciation for the benefits of capital flows – but as Christine Lagarde put it a few years back, "[This] is not your grandmother's IMF" [3], and there has clearly been a big shift in the policy advice.[4]

Outside of the IMF, attitudes to capital flows have been more bluntly critical. One part of this is unhappiness with spillovers from United States monetary policy, sometimes when the stance is loose, as in the 'currency wars' era after the global financial crisis, and sometimes when financial conditions tighten, as they did in the 2013 taper tantrum and as they have been doing during the current period. Another is the geopolitical tensions that have made 'deglobalisation' a buzzword. There have also been shifts in the realm of ideas, with even some mainstream economists condemning most forms of capital flows. For instance, in October 2022, Arvind Subramanian published an op-ed arguing that, "capitalism must be saved from its financial rentiers, and financial deglobalisation is a good place to start".[5]

Altogether, the reputation of capital flows is at a low ebb.

We should, nonetheless, respect the enormous opportunity presented by access to a global financial system. Indeed, taking a blue-sky approach, capital flows look much too small.

There are studies of optimal current account deficits for small economies, and they yield extraordinary estimates, for instance that it would be optimal to run annual current account deficits up to 60% of gross domestic product (GDP).[6]

Relatedly, if you think about it, it is strange that interest rates in developing countries are not orders of magnitude above those in rich countries. Even in middle-income countries, capital stocks are typically less than a third of those in the United States, on a per capita basis.[7] It would make sense to pay radically higher rates to attract more investment, which would then raise the productivity of labour.[8] Yet real rates are not so far removed from advanced country levels: over the past two decades, real policy rates in rich countries have averaged about -1%, compared to just under +1%, on average, for middle-income countries.[9]

Obviously, these observations are not policy recommendations. They do not pass reality checks. But they can help us approach the question of capital flows and financial integration with a more open mind.

Considering the empirical cases, critics of capital flows often point to the successes of Asian countries, most recently China. These fast-growing economies were typically capital exporters, despite starting off poorer and with smaller capital stocks than the economies in which they invested their surplus savings. These countries also suffered crises when they opened to financial flows in the 1990s, disrupting their remarkable development trajectories.

Where are the poster children for proponents of capital flows?

There are countries that have enviable growth records, and which have relied for many years on capital inflows. These include the United States, Canada, New Zealand, and perhaps the clearest case of all, Australia.[10] As one study from the Reserve Bank of Australia pointed out, "Sizeable current account deficits have been recorded in Australia in almost every decade for at least 150 years".[11] These large and sustained capital inflows have allowed for a higher level of investment than could have been achieved with only local savings. And the success of the economic model is hard to dispute. Australia's living standards have ranked among the highest in the world since the middle of the 19th century, and towards the start of the 20th century they were probably the highest of any country.[12] It is highly unlikely that Australia would have performed better in the absence of capital flows.

Of course, we cannot read Australian economic history as one long vindication of free capital movements. Both the depression of the 1890s and the economic crisis of the 1920s had symptoms familiar from modern emerging market crises, including balance of payments pressures and foreign debt stress.

We also cannot say Australia has always been happy with large current account deficits. In the late 1970s and early 1980s, these deficits were a major concern for policymakers, especially because they were being driven by fiscal policy and were draining foreign exchange reserves.

However, significant current account deficits persisted even after the floating of the Australian dollar and fiscal consolidation.[13] This gave rise to the so-called 'consenting adults' thesis, that current account deficits produced by private sector decisions could be optimal and sustainable, and policymakers would not have to worry about them.

Reflecting on other country experiences, the simple fact that deficits were privately contracted seems insufficient. We know private sector flows can be dangerous: clear recent examples are Spain and Ireland's experiences during the euro area crisis. It therefore seems relevant that foreign investors in Australia were willing to accumulate claims denominated in Australian dollars, and that the Australian dollar floated.

Another crucial fact appears to be a bedrock of investor confidence, based on credible macroeconomic policies – including a reasonable degree of price stability – and a resilient financial system.

One also senses some deeper mechanism here, which ensured capital was channelled into productive assets that generated good returns. Of course, this reflects more than the resource endowment, as we could name many countries with ample natural resources which have not absorbed capital flows productively. There has also been something else going on, since at least the 19th century, that has made capital in Australia productive, whereas that same capital deployed elsewhere would have produced boom-bust cycles and default.

Part of this is a story about the quality of institutions as well as the human capital available and empowered to run them.[14] Another theme is the development of local capital and financial markets, and their capacity to turn capital to productive purposes. As I will discuss below, these capacities intersect with policy choices, with capital flows supporting or weakening the productive potential of an economy.

On the whole, the Australian case teaches us that a country can absorb large capital flows over very long periods of time, and use these to support high levels of prosperity. This contrasts starkly with the Asian examples, where a range of countries likewise achieved impressive gains in living standards, but mostly did so without foreign capital.

Most of the world's countries would be happy if they could be Asian tigers, and ecstatic if they could be Australia. But many of us have a long way to go. What attitude to capital flows would help us on our way?

In South Africa, we have long favoured the Australian option.[15]

Given ample investment opportunities and limited domestic savings, growth and capital inflows have typically been correlated. In 1985, when the apartheid government was hit with sanctions, access to capital flows was largely cut off.[16] Of course, this was not a developmental policy for South Africa; it was a punishment. When sanctions were lifted at the end of apartheid, we looked forward to restoring access to global financial markets. We also appreciated that the end of sanctions did not mean the taps were open. Foreign investors all loved South Africa, but they would not invest based on warm feelings. And there was going to be a limit on how much investment we could attract, even with good policies.

With a low domestic savings rate, if the public and private sectors were both borrowing heavily, this meant we were going to hit a balance of payments constraint. Specifically, we anticipated an unsustainable current account deficit, which would weaken the rand and drive up inflation. Interest rates would then have to rise to rebalance savings and investment, slowing growth. This was the core problem statement of the macroeconomic strategy adopted by the Mandela government in 1996. The goal was to attract more foreign savings, apply some fiscal discipline to improve the country's investment profile and reduce government's demands for savings, thereby permitting lower interest rates to allow more private sector investment.

In hindsight, I would say the strategy was mostly successful.

We experienced some of the downsides of openness to capital flows. These included a huge depreciation of the rand in 2001, which only loosely reflected fundamentals, as well as a phase of currency strength during the mid-2000s, which may have affected export competitiveness. The stronger currency and low interest rates also fed dramatic house price appreciation and risky mortgage growth – a dynamic arrested by the 2008 crisis.

Despite those blemishes, it was still a success. Indeed, as time has gone by, it looks more and more like a golden age of South African macroeconomic policy. Living standards were rising and growth was outpacing the global average.[17] Our investment rate rose from around 15% of GDP at the end of apartheid,[18] to around 20% of GDP, even as the domestic savings rate remained low at about 15%. This naturally entailed significant net capital inflows, much of it through portfolio flows rather than foreign direct investment. These we de-risked, in large part, by committing to a free-floating currency and minimising foreign currency borrowing across the economy.

It seems extremely unlikely that we could have had better results by closing ourselves to global capital. What causes me great concern, by contrast, is what happened next.

The 15 years from 2009 onwards are almost a mirror image of the first 14 years of democracy. From 1994 onwards, we achieved steadily high investment and growth, interrupted by temporary setbacks; from 2009 onwards, we have had steadily lower investment and growth, punctuated by incomplete recoveries. The IMF's projections have 2023 investment at 16% of GDP – far below the ratio needed for adequate growth. And yet even this level of investment is posing a serious funding challenge because the domestic savings rate is just 13% of GDP – the lowest level since at least 1980 – and the investment case for external investors has weakened significantly. Growth is projected at a mere 0.1%.

This is where the capital flow story comes in.

For much of the decade after the global financial crisis to date, South Africa had ample access to foreign capital, helped by ultra-low interest rates in major economies. The average current account deficit, until the onset of COVID-19, was over 3% of GDP. The financing for this deficit mainly came from portfolio flows, as it did before the global financial crisis. However, the composition of investment for this period shifted markedly towards government debt, and away from private sector assets such as equities. During the boom of the 2000s, government and public corporations absorbed just 16% of portfolio flows. In the next decade, this rose to 78%.[19]

Recalling the Australian case discussed earlier, what we see is that South Africa moved away from a 'consenting adults' arrangement, where a stable fiscal position and a current account deficit were driven by private sector decisions, to a classic twin-deficit situation.

This had three destabilising implications.

First, the volumes of money available to South Africa after the global financial crisis undermined good policymaking. In the 1990s and 2000s financial markets helped with fiscal discipline; in the 2010s they enabled excess. The underlying problems were homegrown, but the ready availability of foreign savings after the global financial crisis made it harder to win policy battles. Investor scrutiny is good for policy: it obliges everyone to double-check the figures and cut back on things you do not really need. But when you know the money is coming anyway, it becomes much harder to insist on policy rigour.

Second, these flows permitted the build-up of a large sovereign debt position. Debt, famously, is a troublesome form of financing because the lender shares relatively little risk with the borrower – unlike, say equity investments, where unsuccessful projects directly affect share prices and dividends.[20] Sovereign debt is particularly problematic, because declining government creditworthiness also spills over to the credit profiles of firms and households. With time, it leads to higher taxes and lower public sector investment to accommodate higher interest payments. An unsustainable fiscal position can therefore become a drag on the whole economy.

Third, capital flows eroded potential growth. We often talk about the importance of institutions to growth, but debt can be used to weaken institutions by funding systems of patronage and corruption, driving out skilled and diligent public servants. Many private sector firms will also follow the money, redirecting their efforts from productive enterprise. Through these two channels, capital flows helped subvert the market incentives and competent bureaucracies that power modern economies. Our macro framework delivered resilience through a floating exchange rate, low foreign currency debt exposures, and careful regulation of the financial sector. But resilience is not enough; if you are going to absorb capital flows, you also need to get allocation right. Huge non-resident flows into public sector debt can actually make this more difficult.

Today, we face the consequences. With too much borrowing, not much domestic saving and limited non-resident appetite for our assets, interest rates must rise to restore balance. The alternative is an inflationary balance of payments problem, which is plainly against the South African Reserve Bank's mandate. This does not make the Reserve Bank popular, but facts are facts. We have gotten ourselves back in the trap we escaped in the mid-1990s.

Reflecting on this whole experience, it is easy to sympathise with Daron Acemoglu's argument in a recent Project Syndicate piece, that South Africa shows how capital flows, instead of promoting good government and development, can 'facilitate' a "hollowing out [of a] country's economy and institutions…".[21]

Nonetheless, I do not think we should jump from diagnosing bad consequences to urging a prohibitionist approach to capital flows, and giving up on the benefits. I would much prefer a risk management approach. A source of inspiration here is the airline industry, where regulators and companies work together to fly as many planes as possible, as safely as possible, rather than responding to the occasional accident by adopting a zero-tolerance attitude to risk, which would sharply reduce the number of flights and blow up costs.[22] I think this is the right way to approach capital flows.

A great strength of the IMF's 'institutional view' is that it acknowledges the benefits of capital flows upfront and then moves on to risk control,[23] using a toolkit of capital flow and macroprudential measures.[24]

A shortcoming in using these tools, however, is their weakness where the problematic flows spill over into the public sector. And these cases are hardly outliers. Capital flows into sovereign debt have been a major source of crises since at least the 19th century.[25] The ongoing African 'funding squeeze' is fundamentally about government borrowing.[26] Nonetheless, the IMF's 2022 review paper on capital flow measures says relatively little about fiscal policy. The word 'fiscal' appears only nine times in that document, compared to 119 instances of the word 'bank'. The policy advice is simply that if fiscal policy is the problem, it should be adjusted.[27]

Fair enough, but what if that does not happen? Do we have additional policy tools to manage these risks?

One option is to adjust the regulatory treatment for government bond holdings, for instance by obliging banks to hold capital against them instead of treating them as riskless. But this would not directly affect non-resident investment decisions.

A second tool is developing a proper sovereign bankruptcy procedure.[28] This would give lenders stronger incentives to scrutinise borrowers. Where debts become unsustainable, countries would also have a better option than prolonged debt distress which delivers restructuring only after years of misery.[29] Still, I have limited faith in the ability of lenders to exercise adequate caution in the boom phase of the cycle. And where government debt is an asset held throughout society, default is probably a cure worse than the disease.

A more benign tool is foreign exchange reserves. Standard accounts traditionally emphasise the role of reserves in meeting balance of payment needs,[30] especially in the context of inflexible exchange rate arrangements. But foreign exchange reserves are arguably more important for risk management, especially now that floating exchange rates are normal practice. A new wave of research is now also making direct connections between foreign exchange reserves and sovereign debt vulnerability.[31]

With floating exchange rates and reserves financed in local currency, negative shocks to the country generate positive valuation effects on foreign exchange reserves.[32] Central banks can therefore accumulate reserves to hedge the public sector balance sheet against adverse outcomes, driven by factors that include unsustainable fiscal policies. Furthermore, central bank independence provides a technology for protecting these assets from spending demands.[33]

This reserve accumulation approach may well work better than trying to restrain surges with capital flow measures, in a general sense, with reserve growth during inflow phases and the option to release reserves during outflows.[34] And it is a particularly useful option where flows are going to government debt and regular capital flow measures are not viable.

In addition to these tools, we should consider our macro policy narratives. For a start, we need to rediscover the dangers of government borrowing. Responsible policymakers never forget that fiscal debt is risky. But the nature of policy discussions is that while many claims are valid, some points get more emphasis than others. In the past decade, one such point was that fiscal consolidation hurts growth and is therefore self-defeating. Another was that higher government debt levels were safer than previously thought. I have personally observed these claims justify sustained fiscal slippage in South Africa. If we had felt the urgency of debt sustainability more keenly, we would have had a wiser conversation. We need a more responsible set of narratives around fiscal risks.[35]

We also need to think more clearly about allocative efficiency. One of the strongest lessons I have learnt as a policymaker is that poor countries are poor not simply because they do not have money, but because they do not use money effectively. Too often, there is a tendency to look at a problem, cost out a solution and focus on raising the cash. Implementation is just a black box. But good policymaking starts with implementation and the financing need should reflect what can be used efficiently. Indeed, one might cast the volatile and often damaging history of capital flows as a conflict between budget constraints and capacity constraints. Capital flows provide spending power and can radically shift the budget envelope, but implementation capacity is stickier, and budgets can easily overshoot capacity.

This point is relevant, once again, in the global dialogue about climate change justice and the financing that should be directed from rich countries to poor ones. There is a strong focus on costing the climate change impact for poor countries and using those estimates to lobby for massive inflows. But we have seen many times that the sum of money is secondary to the quality of policies, the incentives they create and the capacity of the institutions available to invest funds. The capital flow sceptics and the climate justice activists should exchange notes.

Ladies and gentlemen, to conclude, I remain impressed by the power of global capital flows to support investment, reduce financing costs and accelerate convergence in developing economies – especially where domestic savings are below investment needs. Nonetheless, this is a force that is dangerous as well as useful and powerful. The South African case shows both sides of the coin: intelligent use of capital flows in one period, and abuse in the second.

For countries where investment opportunities exceed local savings rates, doing without capital flows means giving up on significant growth. It is not an attractive strategy. A better one is to welcome capital flows, control risks and nurture institutions that can deliver productive investment choices. That applies to climate finance, too.

We need to remain optimistic about capital flows and vigilant about the risks, rather than pessimistic about the flows and allergic to the risks, or naïve about the flows and blind to the risks. My hope is that when the next boom comes, we will have learnt lessons that make that boom as safe, as long and as large as possible.

[1] An interesting retrospective discussion on this may be found in David Lubin's interview with Larry Summers, titled, 'Thinking aloud on emerging markets: is the international monetary system bad for EM?', 2 August 2022.

[2] 'Review of the institutional view on the liberalization and management of capital flows', IMF Policy Paper No.2022/008, March 2022. Available at: https://www.imf.org/en/Publications/Policy-Papers/Issues/2022/03/29/Review-of-The-Institutional-View-on-The-Liberalization-and-Management-of-Capital-Flows-515883

[3] Christine Lagarde, Opening address to the Conference on 'Challenges for Securing Growth and Shared Prosperity in Latin America', 5 December 2014. Available at: https://www.imf.org/en/News/Articles/2015/09/28/04/53/sp120514

[4] Note the title of an IMF blog post on this advice: Tobias Adrian et al., 'Why the IMF is updating its view on capital flows', 30 March 2022. Available at: https://www.imf.org/en/Blogs/Articles/2022/03/30/blog033122-why-the-imf-is-updating-its-view-on-capital-flows

[5] Arvind Subramanian, 'The case for structural financial deglobalisation', 28 October 2022. Available at:

https://www.project-syndicate.org/commentary/financial-deglobalization-emerging-developing-economies
-federal-reserve-by-arvind-subramanian-2022-10

[6] Sebastian Edwards, 'Does the current account deficit matter?', in Sebastian Edwards and Jeffrey A Frankel (eds), Preventing currency crises in emerging markets, Chicago, IL: University of Chicago Press, January 2002. Available at: https://www.nber.org/system/files/chapters/c10633/c10633.pdf

[7] For 2019, a simple average of the capital stock per capita was 31.7% for a sample of middle-income emerging markets, as compared to the United States. The sample comprises Brazil (28.61%), China (33.64%), Indonesia (30.63%), India (11.76%), Turkey (55.06%), South Africa (23.01%) and Mexico (39.37%). These data are sourced from the Penn World Tables and refer to investment as a GDP concept, not financial wealth.

[8] This specific point was raised recently in a blog post by John Cochrane, 'Bob Lucas and his papers', 17 May 2023. Available at: https://johnhcochrane.blogspot.com/2023/05/bob-lucas-and-his-papers.html

[9] For the period 2003-2023, using policy rates less annual inflation rates from the IMF's World Economic Outlook, the US real policy rate is -1.17%. The UK is -1.0%, while the euro area is at -0.87%. An average of Brazil, China, India, Indonesia, Mexico, South Africa and Turkey is 0.74%, with a high of 5.2% (Brazil) and a low of -3.36% (Turkey). South Africa is at 1.45%.

[10] For an analytical discussion of capital flows out of Britain in the late 19th and early 20th century, see Michael A Clemens and Jeffrey G Williamson, 'Where did foreign capital go? Fundamentals, failures and the Lucas Paradox, 1870-1913', NBER Working PaperNo. 8028, December 2000. Available at: https://www.nber.org/system/files/working_papers/w8028/w8028.pdf

[11] Rochelle Belkar, Lynne Cockerell and Christopher Kent, 'Current account deficits: the Australian debate', Research Discussion Paper No. 2007-02, March 2007. Available at: https://www.rba.gov.au/publications/rdp/2007/pdf/rdp2007-02.pdf

[12] Ian W McLean, Why Australia prospered, Princeton, NJ: Princeton University Press, 2013.

[13] At the end of the 1980s, Australia had a fiscal surplus of 1% of GDP and a current account deficit of 6% of GDP.

[14] The classic comparison is Argentina and Australia; see for instance Alexis Esposto and Fernando Tohmé, Drifting apart: the divergent development paths of Argentina and Australia. Germany: VDM Verlag: Saarbrücken, 2009.

[15] South African balance of payments data are available from 1960. The average current account balance for 1960-2021 is -1.05% of GDP. The broad pattern, however, is for substantial deficits during the boom phases (the 1960s and early 1970s, and the 2000s) and minimal deficits or surpluses during periods of economic stagnation.

[16] In the four years before 1985, the current account recorded an average deficit of 3.02% of GDP. In the four years from 1985, the current account recorded an average surplus of 3.75% of GDP.

[17] For a fuller discussion of macroeconomic performance in this period, see Lesetja Kganyago, Address at the Centre for Education in Economics (CEEF) Africa, 'Reflections of macroeconomics policy since 1995: from NICE to VICE – and back again?', 28 September 2022. Available at: https://www.resbank.co.za/content/dam/sarb/publications/speeches/speeches-by-governors/2022/An%20address%20by%20Lesetja%20Kganyago%20Governor%20of%20the%20SARB%20at%20CEEF%20Africa%20event%2028%20September%202022.pdf

[18] According to IMF World Economic Outlook data, it was 14.16% in 1993 and 16.47% in 1994.

[19] For the period 2002Q1 to 2008Q4, portfolio flows averaged 1.27% of GDP, of which general government comprised 0.197 percentage points (pp), public corporations 0.004pp and all other flows 1.066pp. From 2010Q1 to 2019Q4, total portfolio flows averaged 2.9% of GDP, comprising 2.02pp for government, 0.22pp for public corporations and 0.65pp for all other flows.

[20] For a discussion, see Adair Turner, Between debt and the devil, Princeton, NJ: Princeton University Press, 2016.

[21] Daron Acemoglu, 'The great debt cleanup', 23 June 2020. Available at: https://www.project-syndicate.org/commentary/plan-to-navigate-emerging-market-debts-by-daron-acemoglu-2020-06. The full quote is as follows: "Far from checking autocrats, international finance has been facilitating them. For example, in South Africa between 2009 and 2018, foreign funds continued pouring in even after it was obvious that then-President Jacob Zuma's kleptocratic government was hollowing out the country's economy and institutions. When Zuma was finally kicked out of power, it was because his

own party, the African National Congress, took steps to remove him. The whip of international markets had little to do with it."

[22] Jón Daníelsson, The illusion of control, New Haven and London: Yale University Press, 2022. See for instance p. 252: "What is lacking [in financial regulation] is risk culture. The financial authorities could do well by learning from their counterparts in other fields, like aviation. The airline industry is regulated with a view to simultaneously maximise the benefits to society and keep risk under control, and we see the outcome. The cost of flying is steadily falling while safety gets better every year. The central banks and regulators need such a risk culture."

[23] For instance, see the comment: "The key challenge is macro risk management" in Tobias Adrian, 'Policy responses to capital flows', 11 October 2018. Available at: https://www.imf.org/en/News/Articles/2018/11/15/sp101118-policy-responses-to-capital-flows

[24] For an IMF taxonomy of capital flow measures (and other comparable measures), see https://www.imf.org/-/media/Files/Data/2020/update-of-imf-taxonomy-of-capital-flow-management-measures.ashx

[25] Consider, for instance, this summary: "Sovereign debt defaults and renegotiations have been the bread and butter of Latin American countries since the first defaults in the 1820s. During the first period of financial globalization (1820-1931) there are sixty seven defaults across all countries from the richest, like Argentina, to the poorest, like Bolivia." Graciella Laura Kaminsky and Pablo Vega-García, 'Varieties of sovereign crises: Latin America, 1830-1921', April 2014. Available at: https://www.nber.org/system/files/working_papers/w20042/revisions/w20042.rev0.pdf

[26] The title of the IMF's April 2023 Regional Economic Outlook for Sub-Saharan Africa is 'The big funding squeeze'. Available at: https://www.imf.org/en/Publications/REO/SSA/Issues/2023/04/14/regional-economic-outlook-for-sub-saharan-africa-april-2023

[27] The nine references to 'fiscal' contrast with 119 instances of 'bank'; 33 of 'house', 'housing' or 'household'; and 28 for 'corporate' or 'corporations'. Of the fiscal instances, three are versions of advice to 'adjust fiscal policy'. There is one mention of fiscal revenues as a comparator for the size of banks' external assets; one comment on capital flow measures generating fiscal revenue; and one reference to fiscal policy as an incentive, among others, for locals to borrow in foreign exchange. There is one discussion of themes which would count as macro-critical and therefore relevant for IMF surveillance, with fiscal policy included on that list. There is one mention in the context of the different tools in the integrated policy framework. The last use of 'fiscal' is in the reference section. Similarly, work done by the IMF in 2011 on the capital flows toolkit has six references to 'fiscal' and 139 to 'bank' – see Jonathan Ostry et al., 'Managing capital inflows: what tools to use?', IMF Staff Discussion Note. 11/06, 5 April 2011. Available at: https://www.imf.org/external/pubs/ft/sdn/2011/sdn1106.pdf

[28] This point was made strongly by IMF leadership over two decades ago – see Anne Krueger, 'The evolution of emerging market capital flows: why we need to look again at sovereign debt restructuring', 21 January 2002. The design of the mechanism might have been suboptimal, but the issue is still here with us. Available at: https://www.imf.org/en/News/Articles/2015/09/28/04/53/sp012102

[29] David Malpass, 'Remarks by World Bank Group President David Malpass at the Breaking the Impasse on Global Debt Restructurings Conference', 26 April 2023. Available at: https://www.worldbank.org/en/news/speech/2023/04/26/malpass-president-breaking-impasse-global-debt-restructurings-conference

[30] See, for instance, the discussion by the IMF, 'Clarifying the concept of reserve assets and reserve currency', BOPCOM–15/14, 27–29 October 2015. Available at: https://www.imf.org/external/pubs/ft/bop/2015/pdf/15-14.pdf

[31] Laura Alfaro and Fabio Kanczuk, 'Debt redemption and reserve accumulation', IMF Economic Review 67(2), June 2019. Available at: https://www.hbs.edu/ris/Publication%20Files/redempt180504_6.21.18_da35aab6-70e6-4893-b94c-94ea6ac519c1.pdf

[32] César Sosa-Padilla and Federico Sturzenegger, 'Does it matter how central banks accumulate reserves? Evidence from sovereign spreads', NBER Working Paper No. 28973, June 2021. Available at: https://www.nber.org/papers/w28973

[33] Agustin Samano 'International reserves and central bank independence', Policy Research Working PaperNo. 9832, 2021. Available at: https://openknowledge.worldbank.org/handle/10986/36483

[34] Olivier Jeanne and Damiano Sandri, 'Global financial cycle and liquidity management', BIS Working PapersNo. 1069, January 2023. Available at: https://www.bis.org/publ/work1069.pdf

[35] This point is also well made by World Bank Chief Economist Indermit Gill in his foreword to the June 2023 Global Economic Prospects: "… long before the outbreak of the pandemic, governments across the world had developed an appetite for huge budget deficits. They turned a blind eye to the dangers of rising debt-to-GDP ratios. If a lost decade is to be avoided, these failures must be corrected—now, not later." (The reference to "These failures" includes reduced support for free trade as well as large fiscal deficits.)   Available   at: https://openknowledge.worldbank.org/server/api/core/bitstreams/6e892b75-2594-4901-a036-46d0dec1e75 3/content

Global trade and rebalancing

Global Trade and External Rebalancing[*]

By JACK CHEN [*]

Global Current Account Balance[1]
(Percent of world GDP)
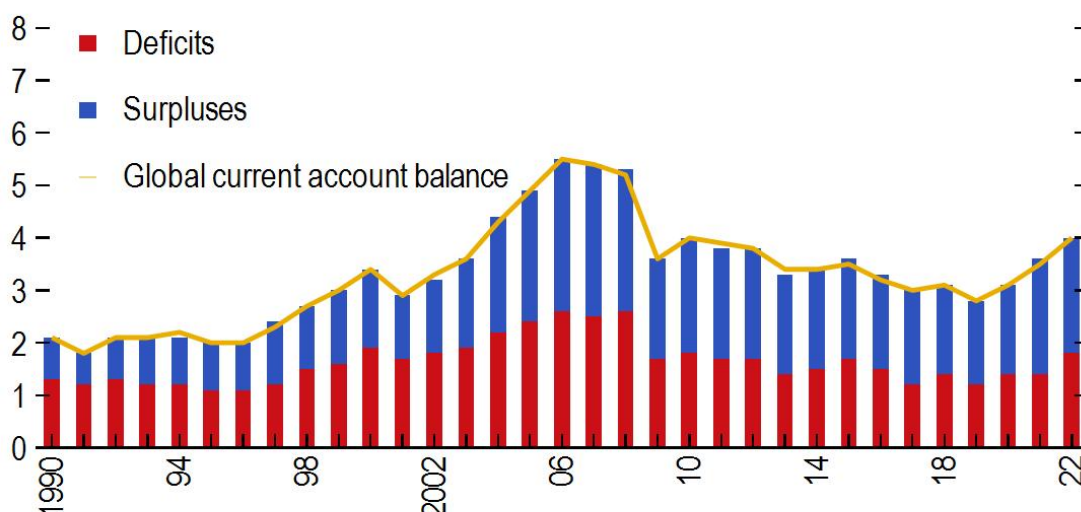
Sources: IMF, Information Notice System; IMF, *April 2023 World Economic Outlook*; and IMF staff calculations.

[1]Global current account balance is defined as the sum of absolute values of current account balances.

Let me just begin by today's talk with this is time series chart essentially that clause what is so called global current account balance which is defined as the sum of absolute values of current account balances for the world economy. The issue is that some of those current account balances or some of the current account surpluses or deficits are what are so called healthy. For instance, imagine a country that has an aging population. They can typically save more, therefore they should run current account surpluses. But on the other hand, like countries with the faster growing economies that emerging market economies, they tend to have high productivity. Instead, they should be typically should invest more attract capital from advanced economies. And they tend to run current account deficits. But unfortunately, not all of the current account balances are what I so called healthy. The unhealthy part of we call it global imbalances actually pose a risk to the global economy as it triggers trade tensions, also causing abrupt capital flows.

Now the main question or the difficulty is that how do we distinguish from this chart which part is healthy and which part is unhealthy? Hopefully not surprisingly, this is where the external sector report in acronym ESI as many acronyms at IMF and then this is just another one of those ESI comes in. And essentially, just to reiterate what it does essentially improvise the so called multilateral consistent assessment of external positions of world largest economy. And a bit more specifically, when we talk about

external positions, we will focus on five aspects of it is include the current account, real exchange rate, capital flow, external balance sheets and international reserves.

And in doing so, the reports trying to identify what is so called excess current account deficits and surpluses, global imbalances and the report also tries to detect external sector vulnerabilities that be the associated with the stock position as well as the currency composition. The reports trying to discuss some policies that try to promote an external rebalancing. And finally, i'll just to say that this report fulfill one of the core IMF mandates, which is to maintain international monetary system's stability. With that brief introduction, let me just give you the outline of today's presentation essentially two parts. The first part based on the first chapter of the report that talks about external sector development in the last year, we briefly talk about the outlook for the global balances as well as the risks associated with it.

And then third section which will briefly introduce how do we go about and then identify the healthy or unhealthy part of the global balances for 2022 and else present the results. Finally, briefly touch on the policies to promote external balancing. Then I will move on to the second chapter of the report, which is typically what we do is that we focus on one analytical topic. And it will take a deeper dive. And in this year's report, we look at the external sector implications of what so called global dollar cycle, which will discuss and define more later. And when we get there. So with that, let me turn to the first chapter of the present take order of the report of first part of the presentation is essentially is the same kind of thing for that again for of the global current balance.

What we've seen is that it's called the so called global balances is on the rise for the third consecutive year. It increased again in 2022. And several factors affected this improvement including increasing commodity prices, which is you can see on the chart on the right and also an even recovery from COVID and the tightening of monetary policy has also contributed to the widening of the global balance.

Oil Inventory Built and Price
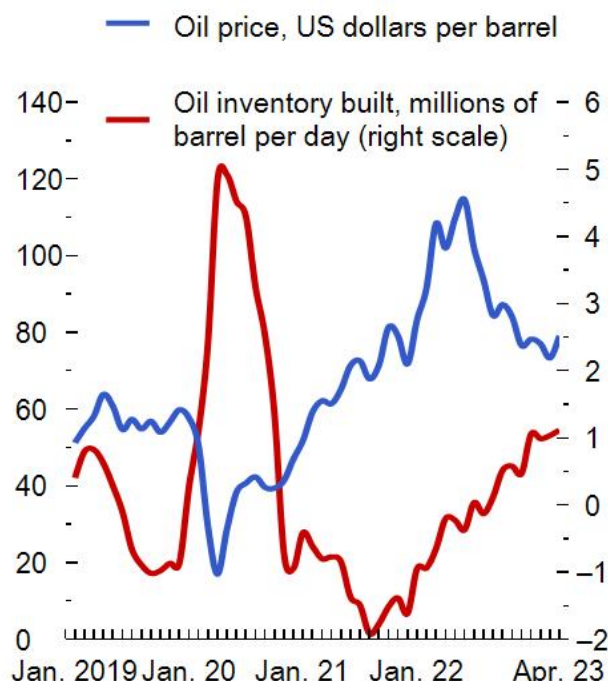
Sources: CEIC Global Economic Data; Haver Analytics; IMF, Primary Commodity Price System; Joint Organisations Data Initiative; and US Energy Information Administration. Note: Oil inventory built is calculated as the six-month moving average of total world petroleum production minus total world petroleum consumption, and oil price refers to crude oil (petroleum), West Texas Intermediate 40 American Petroleum Institute (API), in US dollars per barrel.

Second, there's also a lot of volatility in the currency market of 2022. Starting the chart on your left, you see this a dollar, a real effective exchange rate where the dollar essentially as appreciated by about 40% by

October 2022 compares average in 2021. This essentially reflects a strong fundamentals in the US as well as the tightening of US monetary policy. But what is interesting in this, what I so called dollar appreciation episode compared to the past is that you see that the dollar has strengthened much more relative to other advanced economies compared to the EMs. Whereas in the previous episode, dollar tend to appreciate more with EM currencies compared to advanced economy finances. Part of the reason we think is because of increasing commodity prices that has supported some of the EM(emerging markets)   commodity exporting currencies. So that could be one of the reasons I explained the better performance that of the young currency relative to other advanced economies with dollar, not being said that many EM currencies have experienced very large depreciation pressure in 2022.

As you can see the chart in the middle where we plot the so called exchange remark index, that is a way to better capture the depreciation pressure on the EM(emerging markets) currencies just to describe very simply. Like a positive number means the higher depreciation pressure that a country currency experienced in 2022. The reason that we plotted is a exchange of market pressure index is that just focusing on the headline index or the headline exchange rate is that this index give a broader picture of accurate and depreciation pressure that the currency faced, because for instance, some policy actions, including in increased interest rate or doing FX(foreign exchange) interventions can mitigate the observed impact on exchange rate.

US dollar reached record levels

Many EM currencies have experienced large depreciation pressures …

… especially, in countries with high inflation

US Dollar Real Effective Exchange Rate¹
(Index, Jan. 2019=100)

Exchange Market Pressure Index
(Percent change)

Exchange Market Pressure and Inflation, 2022
(Percent)
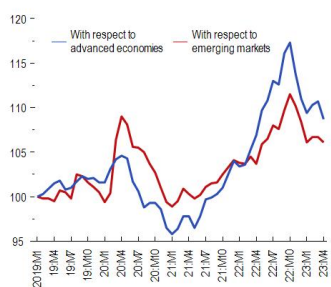
Sources: Federal Reserve Board; and IMF staff calculations. ¹Constructed as a weighted average of the foreign exchange value of the US dollar against the currencies of a group of major US trading partners that are advanced economies and emerging market economies. An increase in the real effective exchange rate index corresponds to an appreciation of the US dollar.

Sources: Adler and others (2021); Goldberg and Krogstrup (2023); IMF, *International Financial Statistics*; and IMF staff calculations. Note: Positive values correspond to exchange market pressure that would depreciate the nominal exchange rate. A country's total exchange market pressure in 2022 is the sum of scaled and weighted observed foreign exchange interventions (FXIs), short-term interest rate changes, and nominal exchange rate movements.

Sources: Goldberg and Krogstrup (2023); and IMF staff calculations. Note: Figure plots the cumulative Exchange Market Pressure Index for 2022 and the change in inflation between 2021 and 2022. Russia is excluded. If policy rate changes are excluded from the Exchange Market Pressure Index, the correlation goes from 0.6 to 0.5.

We looked a little bit deeper. What explains this? What are the characteristics can be associated with a stronger depreciation pressure? We find that economies that has a lot of higher inflation or weaker institutional factors tend to be associated with a greater depreciation pressure. With that, let me move on to the capital flows and the better than I do actually at the standard economic theory would actually predict that capital should flow from faster growing. I'm sorry, capital abandoned, advanced economies to fast growing emerging market economies. That's what so called down-to capital flow. However, the reverse happened in 2022 where we can actually seen that capital flow out from EM developing economies to advance economies. This you can see on the is very large the negative yellow line you see on the chart itself. But this is actually not the first time that we observe. This was so called uphill capital flows like in the mid-2000, it was many years are so associated with uphill capital flows. But what is really unique or different in the current episode or in 2022 was that this outflow was really driven by what so called non reserve outflows. Whereas in the past, the outflows, majority of the output reflects that EMDE(emerging markets and developing economies) are accumulating reserves.

… in contrast to past episodes, the accumulation of official reserves played a limited role

Emerging Market and Developing Economies: Net Financial Inflows
(Percent of world GDP)
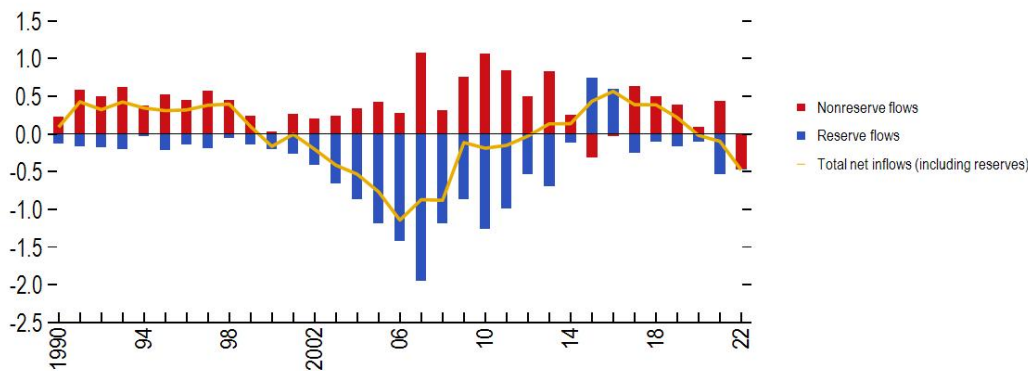
Sources: IMF, Information Notice System; IMF, *April 2023 World Economic Outlook*; and IMF staff calculations.

Now we think that a little bit deeper into the financial accounts just try to see like what can explain its capital outflows in EMDEs or which sector was driven this capital outflows in the EMDEs. In particular, we find that essentially a lot of this net capital outflow is driven by portfolio flows. This you can see on the second panel, on the chart, on yours, the and then this could be associated with the rising interest rate in advanced economies where essentially that the investors are putting the investment out of the EMs essentially searching for higher yields. Other than we also seen that FDI(foreign direct investment) inflow slow quite sharply in2022 that the FDI goes to EMDEs.

A large share of net capital outflows in EMDEs was driven by portfolio flows…

Capital Inflows to EMDE (percent of group GDP)

… nonetheless, short-run portfolio inflows to EMDEs resumed in the first few months of 2023

Cumulative High-Frequency Portfolio Flows to EMDEs
(Billions of US dollars)
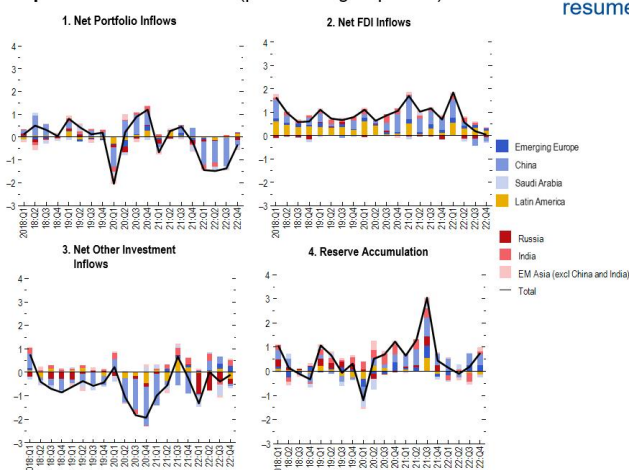
Sources: IMF, *International Financial Statistics*; Institute of International Finance; and IMF staff calculations.
Note: Group GDP is the total GDP of all economies considered in the figure.
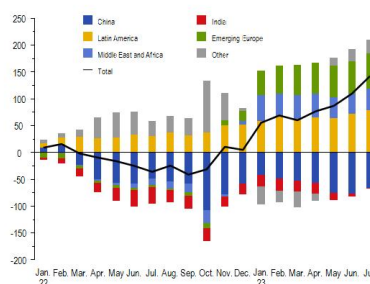
Sources: Institute of International Finance; and IMF staff calculations.

And also we see that consistent actually with the previous chart that reserve accumulation also stored quite significantly 2022, not like what I would say more positively. What happened in early 2023 is that seeing that short run portfolio inflow EMDE has essentially resumed to large part of the EMDEs this is what you can see on the chart on your right? We talked about flow. Let's move to the stock position here. We are focusing on country's net international investment positions. So essentially you can think about this is like the accumulation of the current account happened in the past. What we've seen is that the so called creditor and the debit of stock position remain very elevated in 2022. This essentially reflects to offsetting

forces. On one hand, we have a very high current account that essentially continue to enlarge the net international position in countries. But at the same time, what is so called evaluation effects which actually offset this widening effects coming from the current account. This is illustrated on the track on your right, we bought countries net ip position on the vertical axis without evaluation changes for those countries.

Creditor and debtor stock positions remains elevated …

… reflecting offsetting effects of widening CA and valuation effects …

Net International Investment Positions, 1990–2022
(Percent of world GDP)

… with net debtors tend to experience valuation gains

International Investment Position Valuation Change and Net International Investment Position, 2022
(Percent of GDP)
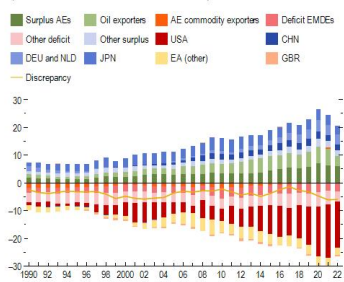
Sources: External Wealth of Nations database; IMF, *April 2023 World Economic Outlook*; and IMF staff calculations..
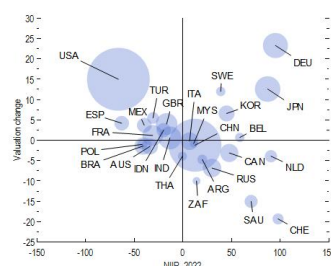
Sources: IMF, *April 2023 World Economic Outlook*; and IMF staff calculations.
Note: Valuation changes are calculated as the difference between changes in net international investment position (NIIP) and current account. For some countries, NIIPs are still projections. Bubble sizes are proportional to 2022 GDP in US dollars. Singapore and Hong Kong SAR are excluded because of the size of their NIIPs.

Research

And then you can see this negative correlation, meaning that in countries with negative NIIP(Net International Investment Positions) , so debit countries, they actually tend to see valuation gains in there for their investments and then for country that has a positive and I means that they have more investment board than what they own to the rest of the world. They tend to experience negative valuation change. Sensation is an aviation changes that interesting is actually playing if I record a civilization role of the international investment position for countries, we discussed the size of the NIIP but not just the size matters. Also the currency composition also is always important because imagine a EM country that were a lot with this from external countries, but in foreign currency, then those countries are typically associated with very significant adverse balance is affected when it's currency increases.

That's why just get getting a better understanding of the currency composition of the NIIP position. So it's important. This is what we do in this year's report. Essentially, we looked at the foreign currency exposure of each country for the assets and liabilities, then starting the chat on the left, what we do is that we essentially profit the cumulative distribution of foreign currency exposure. You can think this is essentially defined as the form currency that I can hold. Is there a foreign asset minus the foreign currency they own to their own trading partner? So a positive number, which means that the country was actually long in foreign currency. So they own more foreign currency assets than what they have in foreign currency liabilities. And each of the dots on this chart represent an economy that in our sample, then the chance has three lines corresponds to three different time periods where the blue dots corresponds to the position in 1990. The red dot represented position for the seven and the yellow dot represent the position in twenty, twenty. You can see that clearly that the dot has essentially shifted towards the right as time goes back.

What it means is that essentially more EMs are basically becoming long in foreign currency in the net, In their foreign exposure, which is a positive news. Basically, it says that the currency risk it's basically become lower over time. So the china middle is actually plot the same picture as what we show on the left. Instead of probably the whole distribution, we essentially just focus on the medium of EMBEs net form times exposure. Again, you can see this increasing trend over time and the fact that the medium net exposure has improved from a negative number, which means that EMs was short in foreign currency to a positive number means that the end become long in foreign currency is again, another way to say that the risk associated with the domestic housing depreciation has reduced. but now all the development has been very positive, unfortunately. And what like so far, we only presented a picture for the aggregate position, but if you just focus on portfolio debt, which is like a component of an idea that tend to be a riskier

because they tend to because investors can move money outbreak from their investment position bonds. The foreign currency exposure has actually deteriorated over time. So bottom line from this is that there seems to be some improvement over time in the first in foreign crimes exposure. Not all the news is that good.

Special focus: EMDEs' portfolio debt net FX position has deteriorated

Aggregate Foreign Currency Exposures: Cumulative Distribution of Foreign Currency Exposures[1]

EMDEs: Aggregate Net Foreign Currency Exposure[2]
(Percent of GDP)
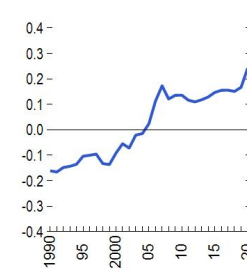
EMDEs: Portfolio Debt Net Foreign Currency Exposure[2]
(Percent of GDP)

Source: Allen, Gautam, and Juvenal (2023).

Note: AEs = advanced economies; EMDEs = emerging market and developing economies.

1 Aggregate foreign currency exposure is defined as total net foreign assets denominated in foreign currency as a share of total assets and liabilities.
2 A 1 percent uniform shift in the value of the domestic currency against all foreign currencies leads to a median valuation change of x percent of GDP.

Now finally moving to quickly move on to the outlook for the global balances. So this is the chart that you've seen for the third time already in the last 15 minutes. But what I did here is a bit different is that we extended discharge to the next 5 years which essentially is based on IMD forecast for the current account balances and you see that we do expect a sharp drop in the current balance in 2023 and is continued to decline go forward. Essentially, this reflects three forces. First of all, is that we would expect effect from the Covid as was the war in ukraine that we talk about the commodity price is going to resuscitate. And also we do expect some policy effort is going to be in place that helped to narrow this global kind of imbalance. And over the medium term, I don't want to put so much emphasis on outlook of itself to say, but instead, I think it's important to recognize the multiple risks associated with it. In the report, we discuss more progress that associated with outlook, but let me just focus on one of those that seems to be particularly relevant in today's environment, which is so called geoeconomic fragmentation.

Global Current Account Balance[1]
(Percent of world GDP)
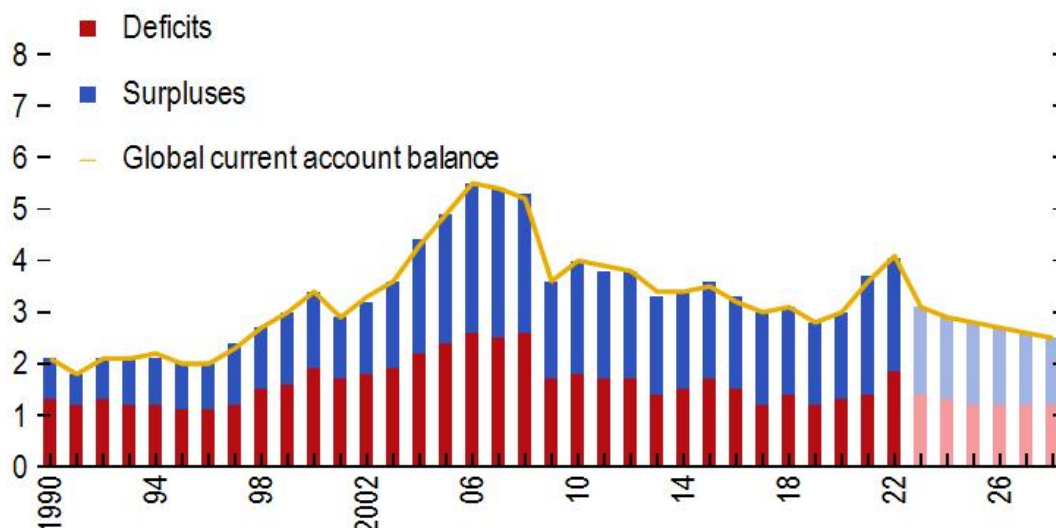
Sources: IMF, Information Notice System; IMF, *April 2023 World Economic Outlook*; and IMF staff calculations.
[1]Global current account balance is defined as the sum of absolute values of current account balances. Note: Shaded bars indicate forecasted values based on the April 2023 IMF *World Economic Outlook*.

In the report, we specifically ask two additional questions around this risk. First is that we ask has increased risk of geoeconomic fragmentation, affected financial recycling of large current consequences. Related on still on the person side, has it also affected the funding of the us current deficit? The second question we ask in the report is how do higher trade costs, which is part of the geoeconomic fragmentation affect kind of current account balances. So in the interest of time, then just first focus on the first question and i'm happy to take to discuss the second topic. It is interesting. Here, let me just briefly present the finding that we related to the first question. So I think there are three key messages. First of all, we find out that in the so called interdependence between large surplus and deficit economies remain large impact. So we don't see all clear signs that it's a risk of finding that the economy's lifetime deficit.

China: Portfolio Investment Assets
(Billions of US dollars)
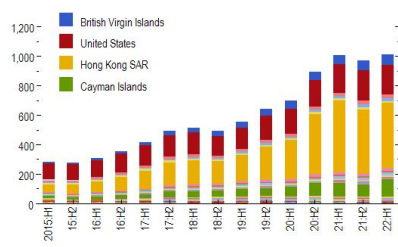
Source: IMF, Coordinated Portfolio Investment Survey.
Note: Legend only displays selected economies for clarity.

Net Foreign Purchases of US Securities
(Billions of US dollars, 12-month sum)
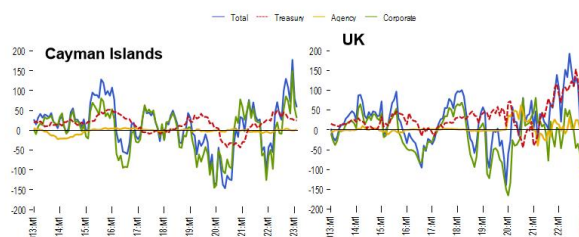
Sources: Federal Reserve, and IMF staff calculations.
Note: The estimated flows are essentially constructed using changes in foreign holdings of US Treasury securities adjusted for valuation effects as discussed in Bertaut and Judson (2014). Tabova and Warnock (2021) assess the different sources available for measuring foreign transactions in US Treasury securities and support the use of holdings-based estimates of flows. Corporate includes bonds and stocks.

The second thing we find was that this currency composition of official effects preserves has remained largely stable in the recent years, in particular with US dollars, still accounting for a majority of total allocating reserves in our survey. But there have been some changes that we observe in the box in this analysis. First of all, what we've seen is that the so called the role of financial center has clearly increased. Let me just ask you to draw your attention to the chart on the left, which essentially crossed the china portfolio investment assets abroad and broken down by geographic locations. Hong kong, and US still

account for a large share of the foreign investment from china. But let me just ask you to look at the very little green by the bottom and the blue by the top. So the green represents china's investment in cayman islands and the blue bar represents an investment in british virgin islands. Admitted it is the bars are still very small compared to the size of above Hong Kong but the us but it's interesting that you see this bar is really growing, has grown over time. So that's one of the supporting evidence that we've seen that this will be so called the role financial center has increased to account for china and foreign investment.

Now, if I can let me ask you to pay attention to the two charts on your right here what we call is the net purchases of US securities again, broken under geographic occasions. Here we do into two economies, cayman islands and UK sorry, for so many lines because they just essentially represent different US securities that invest in those country hold. But if you look at the blue line, not sure if you can see, but clearly I hope you can see this upward trend. That is basically meaning that it has been somewhat a lot more investors come from cayman island and uk holding us security in recent years. Then let me just point out these numbers are very large, and these numbers are significant, especially when you compare to the GDP in those countries. This seems to give some indication that it may not be the actual invested in those countries, but instead of investor abroad using those countries, the heart of holding us securities, then the second thing that we find in the box that has something has changed is that the so called the role of non official sectors has increased. Specifically, what we mean is that if we look at the accumulation of FX reserves by china and saudi arabia, two countries that has a very large current on surfaces has decreased basically right after the global financial crisis.

IMF's external assessments: a holistic approach

EBA Model Gaps
- Current Account (workhorse)
- REER Index
- REER Level
- Semi-elasticities CA-REER

External Sustainability

Other indicators
- Competitiveness (ULC-based REER, world trade shares)
- NIIP position / composition, reserve adequacy
- Capital flows.

Staff Judgment

Selecting relevant indicators

Country-specific adjustors
- Analytically grounded
  - ✓ Tools for measurement
- Evenhanded application

Interpreting residuals
  - ✓ Tools for structural policies

Uncertainty ranges

Final Assessment
- External gaps
- Policies

Publication
- Staff Reports
- External Sector Report

With that, let me just quickly turn to discuss a little bit how do we go about is so called identifying healthy quote unquote and unhealthy part of the current imbalances and surface. This is the so called IMF external sector assessment. And very broadly speaking, at very high level, I would say the assessment consists of two parts. One is the first party state degree boxes, which we have a suite of models that help us to give us like a first numerical benchmark of what the current should be in the medium term and what exchanges should be essentially in very brief arrange. I'm simplifying a lot, but that's what the gist of it, what it does. Then once we have those model results, also recognizing the fact that there's no one model is perfect and capture all the what's going on in the world. Then what we do is that we lay on top of the numerical results with them with so called staff judgment. This is where like our research department is accountable for the models. And once we have the model results will go to the country teams and discussing with them in the sense that what are we really capturing or what we not country that is very unique to each country and to what extent we have to negotiate and call it negotiate or discuss, we can actually combine.

$$\frac{CA}{Y}_{it} = \alpha + C_{it}\beta + F_{it}\lambda + P_{it}\gamma + u_{it}$$

Cyclical and Short-Term Factors (C)	Fundamentals (F)	Actual Policies (P)
Output gap	**Macroeconomic**	Fiscal balance
Commodity terms of trade	Net foreign assets	Health spending
Lagged REER annual change	Output per worker	Credit gap
	Expected growth	FXI/Capital controls
	Structural	
	Demographics	
	Institutional quality	
	Oil and gas resources	
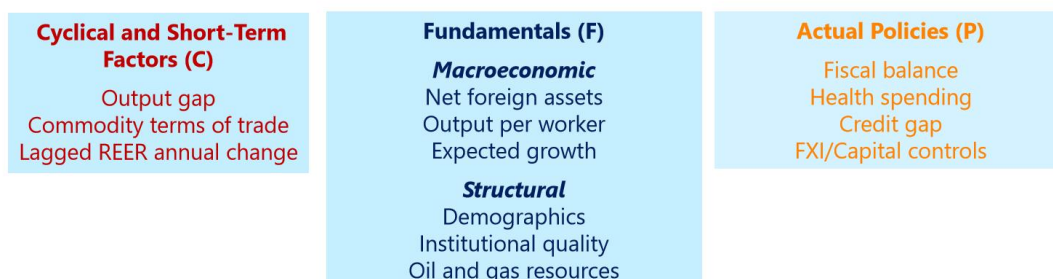
And these two input is the final attitude to reach and what is so called the final assessment of the external position of the country. But that being said is so called current account model is still really the workout of the whole exercise. Really the starting point of the assessment. Let me just quickly describe me what is this current model is. Essentially, it's very simple. A is a panel regression that relates the current account as a share of GDO on a bunch of factors that the literature has a day. In fact, the importance affecting the kind of current account balance. What is speaking? You can break down the factors in three buckets. The first bucket is so called the cyclical and short term factors. This include alpha gas, commodity terms of trade like the idea and changes. So for instance, just give me the one example. When is increasing oil prices that decision automatically drive up the current compounds for export all the exporting countries and vice versa for all people in countries. The second bucket of factors, which is that we so called a macro fundamentals or also as well as some structural factors. One example I want to start from this that is so for demographics is go back to the idea that for an economy with 18 population, they tend to save more current account balance surface and then the last bucket of factors will be called actual policies.

And then these matters, for example, in a country that reads very large current fiscal deficit that automatically drive down public saving and that will be associated with a more negative partners. Once we ask, once we have an estimate of that panel regression, and we can use the estimated coefficient to construct what is so called current income norms. The norm you can think about essentially is a benchmark for the medium term current account should be, it's essentially a combination of the structural features, the structural factor that I just described you before FIT it's based on the desirable policies. So the norm is not constructed on actual policy instead of desirable policies because again, the norm essentially provides adventure for the medium term current account and the desired policies. Essentially, the IMF staff assessment of what policy should be over the immediate term. Then once we have a normal, we have the benchmark for the current account is relatively straightforward to construct a gap. The gap, essentially, the difference between we call it simple adjusted current account, which is that you remove the cyclical factor contribution to the actual current account with a bit of the norm or the benchmark. You can just think almost like a gap between the current account and the benchmark of the norm that we assess.

- **Norms**: Based on medium-term structural features and desirable policies (P*)

$$Norm_{it} = \widehat{\alpha} + \boldsymbol{F}_{it}\widehat{\lambda} + \boldsymbol{P}^*_{it}\widehat{\gamma}$$

- **Gaps**: Difference between cyclically-adjusted CA balance and norm.

$$Gap_{it} = \left(\frac{CA}{Y}_{it} - C_{it}\widehat{\beta}\right) - \left(\widehat{\alpha} + \boldsymbol{F}_{it}\widehat{\lambda} + \boldsymbol{P}^*_{it}\widehat{\gamma}\right)$$
$$= (\boldsymbol{P}_{it} - \boldsymbol{P}^*_{it})\widehat{\gamma} + u_{it}$$

Contribution of Policy Gaps (P-P*):
how much policies contribute to CA gap?

Regression Residual:
Unexplained factors

esearch

That's a in a nutshell, two slides, a brief summary of the current model in the EBA exercise, which is a key component. And in that section, let me just quickly present you the results for 2022, the assessment for political external assessment. Here you see so essentially across the current account gap, the positive number means that the security adjusted current account in 2022 is above one should be open in ten. The negative number means that the current account is below what it should be in the here for each other countries, as you will see, two gaps. One is the red dot, which is so called REER gap, which the gap that comes straight out of the even regression model. Also the blue bar, which is so called IMF staff assess the current come gap is this thing. In most cases, you will see these two gaps are consistent with each other, but there are some exceptions that different. Let me just give example at thailand because that has the largest difference between the current account, the evil current account gap, and then find staff assess the gap. This is purely because the even current account was not able to capture the effect from coal fully. So essentially what we do and because Thailand is an economy that rely heavily on tourism because of the travel restrictions that had a very big hit on their current compounds. Therefore, what we do is that because again, the current conflict, the deep access is more about the millions of the current account.

So we say that we make an adjustment to the headline current income in Thailand to say what kind of compound should have been if they will know this temporary travel restrictions associated with COVID. And then we compare that adjusted current account with the current account. So that's essentially explains this big gap between the current account gap that calculated directly from the regression. But the overall messaging from this chart is that actually we still do see quite a large global imbalance across the economies. And then this imbalance was actually, in fact, declining over the last 5 years until 2022 that is the current trend has stopped. Once we have this kind of current gap, we can quickly actually translate it into the so called real effective exchange rate gap.

The first starting point is actually just to use the country's specific current account to REER elasticity. And then this is the chart and then because this is the way we started doing it, you will see very high correlation between current account gaps which is used about it on the X axis on the chart on the right. And REER is starting on vertical axis on this chart here. What it means is that for a country that has a stronger kind of composition in this benchmark is a positive current account gap. This is a quick summary of the EBA(External Balance Assessment) as well as the results for 2022. Let me just finally move to the last slide for the first chapter, which is the policy that how do we go about to close this kind of balances?

IMF staff gap includes country-special adjustments (e.g. COVID, measurement)

In most cases, the REER gap is derived using country-specific CA-REER elasticity

IMF Staff and External Balance Assessment Current Account and Real Exchange Rate Gaps, 2022
(Percent of GDP)

IMF Staff Current Account and Real Effective Exchange Rate Gaps
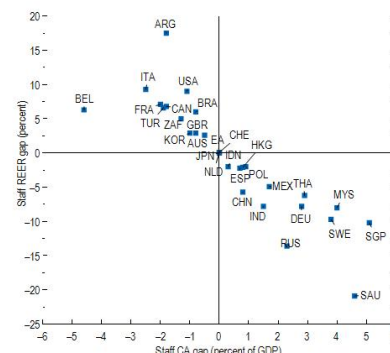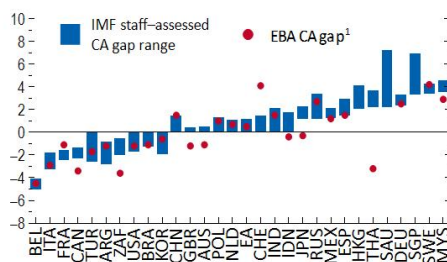
Source: IMF staff assessments.
Note: CA = current account; EBA = External Balance Assessment; REER = real effective exchange rate. REER gap is based on 2021 *External Sector Report*.
[1]There are no EBA estimates for Hong Kong SAR, Saudi Arabia, and Singapore.

I would say the policy recommendation consists of two parts. The first part is that the recommendation for individual comments, this policy will essentially depend on the position of the economy. So specifically, the country that has excess surpluses means if the current account is above the medium term current account used to be, then the general advice is that when the fiscal policy is available, then government should increase public investment. In particular, in the area of digital digitalization and climate change mitigation. And on for the whole country with excess deficit means that the current account is actually below than the medium and benchmark. The general recommendation is that a fiscal consolidation they will improve, public sector saving would help to improve your current account balance and also a country should consider structural reforms to improve productivity and competitiveness of a country. That means that it's also important to complement this country level policies with global policy efforts.

So specifically there's three recommendations coming out from the report. First of all，we call it so strengthening the current rule-based trading system essentially to preserve the benefits that we got from the globalization. Secondly, it's important also to ensure any industrial policy do not introduce distortions, and the body has to be consistent with the international agreement and WTO rules. And last but not least is that we felt that preserving liquidity in the global financial system is also very critical to prevent shock and spills into the economy's origin from the advanced companies.

So with that, let me just take a pause or try to continue first? What will be the best way to do？Maybe I should continue and then we can take the question at the end. Okay, sure. So with that, let me just turn to the second chapter of the report which discussed external sector implications of the global dollar cycle. Why we pick this topic？Because each year like the wheel, we would take one topic and give a much deeper dive on. Why we do this? I guess the first question is that we observe the US dollar displays like a decade long cyclical patterns of the time. Why is this relevant？It is relevant because the literature has shown that when us dollar appreciates, it actually has very large and negative real sectors spillover in the emerging markets and developing countries. This is even after controlling for factors such as US longer policy and US financial conditions.

So a better understanding of this spillover is not just important. It's interesting for economists, but also is important for policy makers because that once we know what are the effects and how these effects affecting country, this is how the policy makers making and formulating the best policy response. And more very recently Obstfeld and Zhou in their book in 2022 paper has pointed this phenomenon as the global dollar cycle. So this is where the name comes from. What do we do specifically this chapter like essentially we focus on three questions? First, are there any external sectors spillovers from this so called the global dollar cycle？We look at the external sector, not just because this is the external sector report itself. It's also because as you will see that real effect exchange rate plays a critical role in final shots or mitigate the shots, as you see. Second question is that we ask do the effective across countries between EMs or the AEs and then how can we explain this heterogeneity that we observe？

Then finally, we're gonna talk about looking at what are the impact on global balances as one of the key it is that we talked about a lot in this presentation or also in the report itself. So this chart illustrates the US dollar index, which essentially the nominal US dollar against a basket of seven advanced major advanced economies, including Australia, Canada, Euro area, Japan, Sweden, Switzerland, and the UK. The reason I will focus on this index is because because we want to study that still was emerging market economies or other smaller advanced economies.

Nominal USD Trade-Weighted Index Against Major Advanced Economies
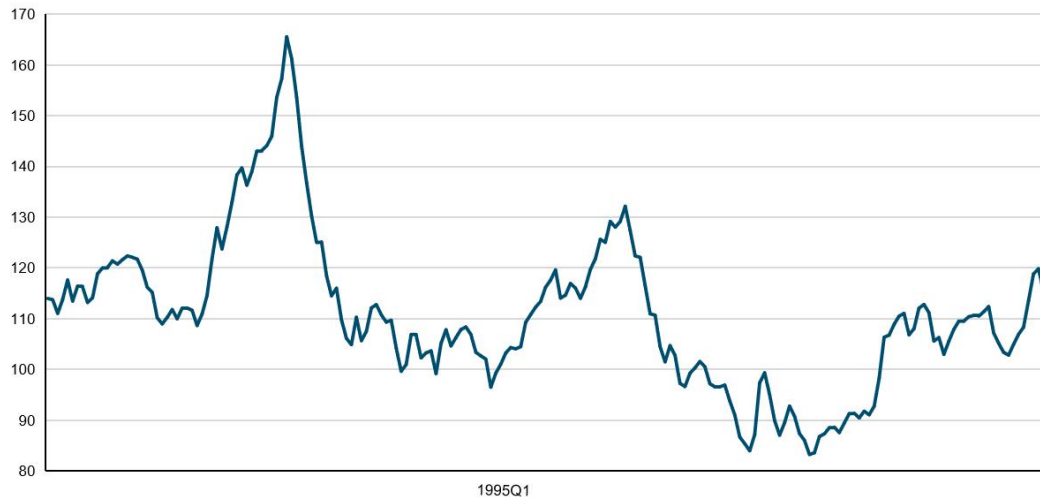
Source: Federal Reserve Bank of St. Louis, Federal Reserve Economic Data (FRED); and Haver Analytics.

Note: Index constructed as the trade-weighted average against the currencies of seven major advanced economies: Australia, Canada, the Euro Area, Japan, Sweden, Switzerland, and the United Kingdom.

Therefore focusing index with the seven major economies is this index become very exogenous to other countries not included in December, but the picture looks the same. So essentially you can see that this very big swings in the US dollar. So the first appreciation episode, I would say, started around late 1970s and then the dollar reached the peak in about mid 1980 and the second dollar appreciation episode essentially start around in early 1990 and then the peak just right after the millennium. And now we are in this new round of a dollar appreciation cycle. After the global financial crisis, you can see this very clear up the trend of US dollars. So then we looked at what are the factors that can account for the us dollar appreciation that has been put forward by the literature？

Specifically look at the monetary policy in the US, rest of the world that we look at the policy differential. We looked at US monetary policy, sorry, US financial conditions. You can think as a factor that measures a long term US interest rate and economic activity. So these are the factors that they have been put together by the literature. I think, Not surprisingly, all of these factors has the correlation with the US dollar index that we thought we just see earlier, meaning that when this increase in the US policy rate, and when it's a tightening of the monetary financial conditions that tend to appreciate the us dollar.

First Stage Regression: Global Dollar Cycle is the unexplained residual

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	ΔUSD Index						
L. ΔUSD Index	0.407***	0.463***					
	(0.134)	(0.107)					
US Financial Conditions (ΔANFCI)	3.624**		3.524***				
	(1.484)		(0.975)				
Monetary Policy							
ΔUS Shadow Rate	0.269			0.656			
	(1.269)			(0.817)			
ΔShadow Rate Differential	1.002				1.302*		
	(1.074)				(0.697)		
Economic Activity Factor	-0.275					-0.636**	
	(0.330)					(0.293)	
L. Δlog real US GDP	0.250						0.174
	(0.733)						(0.233)
Observations	91	92	91	92	92	91	92
Adjusted R2	0.194	0.151	0.121	-0.008	0.047	0.034	0.024
Up to lag 4	yes	yes	yes	yes	yes	yes	yes

Sources: IMF staff calculations.
Standard errors in parentheses, all specifications include lags of each control, L. denotes first lag.
*** p<0.01   ** p<0.05   * p<0.10

But despite we adding all of these factors into this, these factors together can only explain about 20% of the variation of the US dollar index. Let me then from now on, let me just define the residual from the regression as the global dollar cycle. Just repeat that the global dollar cycle actually is a residual that's there's something that we do not know. We cannot explain by the factors in the literature that goes towards the US dollar index. So this chart essentially reiterated message that we concluded from the previous regression. Essentially, you can see that the blue line logs the us dollar index within 7 advanced economies and the red dotted line logs what is so called global dollars？ I hope this remind you the residual from the first regression. And you can see that this two line kind of correlate with each other very strongly, especially in the recent episode. In fact, the correlation between these two lines is almost 85%, which I would say it's not a surprise because in the previous life, we've seen that R2 from this regression is very low.

So how do we think about this residual like at the end of the day, this global dollar cycle is essentially been defined as a residual coming from out from the regression. The literature has tried to relate this global dollar cycle to reflect the global financial market forces. I mean this is essentially because of the very unique role of US dollar not in place a as save haven, currency　itself. So intuitively what happens that in time of high financial sector distress with the risk aversion increase, invest attention for money out of countries and put it towards US was for safety. And that tend to essentially appreciate the US dollar.

The US Dollar Index and the Global Dollar Cycle
(*Index, 0 = 1999:Q4*)

Sources: Federal Reserve Bank of St. Louis, Federal Reserve Economic Data; Haver Analytics; and IMF staff calculations.
Note: Global dollar cycle constructed as cumulated residuals after established factors are controlled for: (1) monetary policy, (2) policy rate differences with major advanced economies, (3) US financial conditions, and (4) an economic activity factor.

So I think that was the story put forward to explain this group without a circle. And what it shows is that and instead of the financial market, acting as a shock amplifier from the macro economy to exchange rate actually the shock itself and the original. But unfortunately, we don't have a direct measure of the shock of underlying shock in the financial market, So that's why what we again, we try to confirm this message, what the global dollar cycle measures with looking at a correlation between the growth of global dollar cycle. Recently, some of the observers that we can see and it can help us to improve our interpretation of the global dollar cycle events. Then you can start from this chart on your right. Essentially what he does is profit is global dollar cycle in red dotted line with the UIP risk premium. And UIP risk premium again is that I think the additional return that investor asks to hold a different currency other than US dollar. You can see that the correlation is actually very strong between these two factors like the correlation is almost 0.7 or 0.69 to be a bit more precise. And this confirmed message is that in times of financial market distress investor would actually want to hold the US dollar.

Therefore the dollar appreciates and also is the flip side is that investor would actually ask for additional premium to hold other kinds of non US dollar. That's why you see the positive increase in the UIP. So that's why that's essentially explain the correlation between these two series here. And we also call it is that residual a global dollar cycle with some other indicators in the literature. First of all, is we see we find a very high negative correlation with the global financial cycle. This is because a negative number in that global financial cycle means the timing of financial conditions and are associated with US improvement in the global dollar index. That's what you see is a negative correlation, but the number is still very high. Somewhat surprisingly, we find very low correlation between the global dollar cycle recently that takes usually is a measure of risk and the global uncertainty index.

The Global Dollar Cycle and the UIP Premium with Major Advanced Economy Currencies
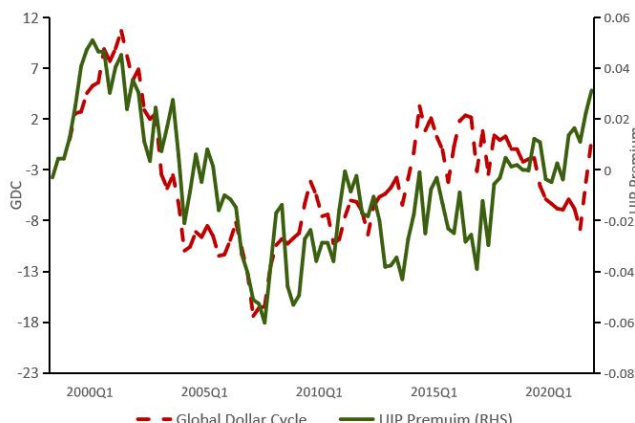
Sources: Haver Analytics; Consensus Forecast; Refinitiv Datastream; and IMF staff calculations.
Note: The UIP Premium is based on a weighted average of UIP premia based on 12-month deposit rates and consensus forecast exchange rate forecasts for the US against the 7 advanced economies in the Fed USD AE Index (Australia, Canada, the Euro Area, Japan, Sweden, Switzerland, and the UK). The correlation is 0.69. Using a 3-month horizon the correlation is 0.58.

For the weeks, I think one of the reasons because we are focusing on quarterly series，that's probably why we can take up the sharp increases in the base itself. But just to summarize the key take away of this slide is that one way to think about the global dollar cycle as a residual is essentially the kind of captures the risk aversion in the financial market. Now let me turn to the framework that we use to look at the spillover effect. Essentially, we employ the same specification as in Obstfeld and Zhou 2022 paper, essentially is the local projection approach that looked at the impact of a US dollar appreciation from on set of macroeconomic aggregate as well as external sector variables for a set of advanced economies and emerging market economies.

Correlates of the Global Dollar Cycle

Indicator	Correlation
Uncovered interest parity deviations from major advanced economy currencies	0.69*
Global financial cycle (Miranda-Aggripino, Nenova and Rey, 2020)	-0.53*
Chicago Board Options Exchange Volatility Index (VIX)	0.04
Global uncertainty index (Davis, 2016)	0.09

Source: Consensus Economics; Davis (2016); Federal Reserve Board; Haver Analytics; Miranda-Agrippino, Nenova, and Rey (2020); Refinitiv Datastream; and IMF staff calculations.
Note: Quarterly correlations over 2000:Q1–2022:Q4 depending on data availability (Global financial cycle variable ends in 2019:Q2).
" * " indicates the correlation is significant at the 1 percent level.

$$y_{i,t+h} - y_{i,t-1} = \mu_{i,h} + \beta_h \Delta s_t + \gamma'_h \Delta z_t + \sum_{l=1}^{p} \delta'_{h,l} \Delta w_{i,t-l} + \varepsilon_{i,h,t}$$

country-horizon fixed-effect

USD index (AE)

- macroeconomic aggregates
- external variables (CA, TB, NIIP, etc....)

global controls
- US financial conditions (ANFCI)
- Rest of the world economic activity (common factor for RoW GDP)
- US effective fed funds rate
- interest rate differential between US and weighted policy rate for countries in the USD index

- lagged **country-specific controls** (real GDP growth, policy interest rate, bilateral ER against the US)
- lagged **global controls**
- lagged **change in the LHS variable**
- lagged **shock**

And in the regression, we also control for global variables that includes US financial conditions and the rest of the world economic activity and also country specific controls, including your GDP policy rate and a bunch of four buses like that will not not discussing here today. So the panel regression essentially estimated on about 34 countries that consist of 15 advanced economies and 19 emerging market economies. And there's a list of the countries. And the data is quarterly that setting from 1999 to 2022.   Let me just show you some of the main results. This chart plus the impulse response from a 10 percent US dollar appreciation on advanced economies. These are illustrated in the blue line and on emerging market economies. These are represented by the red line. And each   line is associated with the 90% confidently on each of the charts, let me start with the panel on your left. And these are basically what is so called the real sector variables. You can see that after the US dollar appreciation, output in emerging economies falls by about 2%.
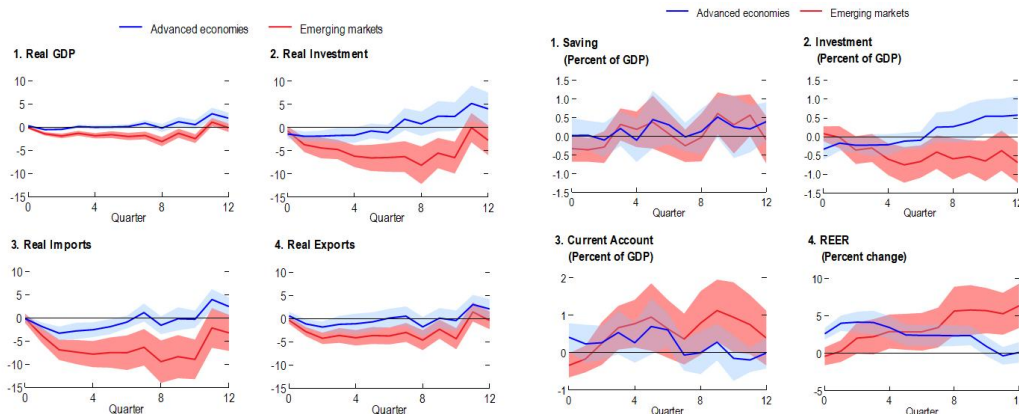
Sources: IMF staff calculations.
Note: 10% appreciation in the nominal US dollar index with 90% confidence intervals. Macro aggregates in national currencies at constant prices. An increase in the REER is a depreciation.

And the fact is very persistent. These two percentage relatively large compared to the impact on the advanced economy where they're out with some $4 \times 0.5\%$. Not only the effect is larger, the impacts are also more persistent. The negative and output job lasts for about 10 quarters before it goes back to zero. Whereas the negative impact on advanced economies lasts for about 3 quarters before university, a majority of this can be accounted by the decline in real investment. This is you've seen in the second panel, Again, we observe is much more deep and persistent impact on real investment in EMs relative to advanced economies. Both imports and exports fall in both advanced and emerging market economies. And in both cases, we see that imports falls much more than exports, which the falling imports could be essentially consistent with its sharper decline in real investment.

Now turning to external sector variables, like we've seen that, the current account actually improves in both advancing economies as well the emerging markets and the improvement in current account essentially accounted by the fall in investment, which you can see on the second panel, saving rate more or less remain unchanged in both country groups. But what is interesting is that let me draw your attention to the last picture here that the response of real effective exchange rate where you see that the exchange reaction depreciate in advanced economies, then just clarify the positive language is charged with depreciation, whereas the currency initially do not move in EMs. And this depreciation is in exchange rate actually held at acting as a shock absorber to cushion the impact in advanced economy. So the reaction of the real effective exchange rate could account for some of the differential effect on output between advanced economies and emerging market economies. Now let's look at the financial variable how financial variables play a role in amplifying the shots on the impact of the shock in many economies.
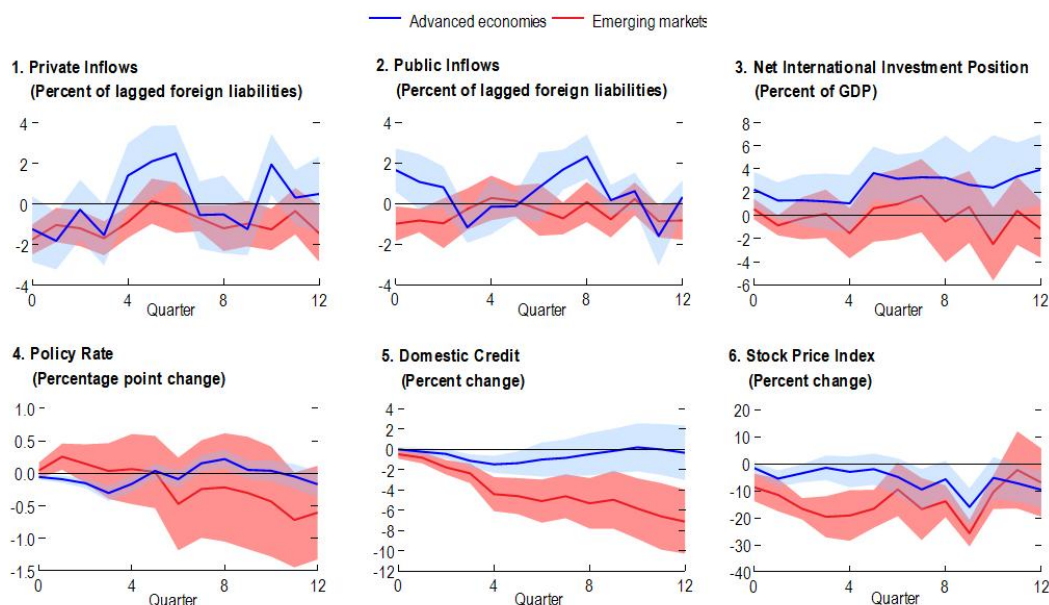
The first panel shows the private sector inflows to both advanced and emerging market economies. You see that inflows to private sector falls for both country groups. But interestingly, if you look at the inflows to the public sector, it actually increased for the advanced economies, but it declines for the EMs. What it means is that even after this appreciation shock, advanced economies do manage to attract capital inflows for the economy. So that could be another way to to cushion the buffer of the shock itself. In the interest of time, let me just tell you attention look at the policy rate. Here, again, you see that in advanced economies, in response to their shock at the central bank in the advanced economy, actually lower the interest rate. That's another way to essentially to provide a support to domestic economy. Whereas in emerging market economy, if anything, the central bank was forced to actually tighten the interest rate in response, which one of the hypotheses behind this is because in kind, if the inflation expectations less anchored in emerging economies and all the possible from currency depreciation was very high to inflation, then in response, the policymaker would actually have to tighten policy to mitigate the depreciation pressure, in view of this efficient effect instead of using policy to lower rate, to support the domestic economy.

We observe the domestic credit decline very sharply in the EMs relatively to AEs as well as the stock prices. Now I present you the overall result. And then the next question is like, what explains is difference in the negative spillover. Why the EMs tend to suffer more compared to advanced economies? Here we in the chapter, we focus on some of the characteristics that potentially could be relevant to account for these differences. For instance, this include the degree of entering inflation expectations, whether country is a common exporters or importers. So we explore these dimensions, but the purpose of this slide actually just trying to tell you it's actually very hard to identify with the source of the shock because for instance, one of the factors that we want to explore is that whether countries with a free floating exchange regime and perform better than countries they do not.

And then actually, what you observe is that let me just ask for your attention. Focus on this chart here is that countries have no free floating or other exchange regime than free floating. They are also associated with very high US dollar invoicing. In a sense, what we're saying is that if we observe the negative spillover effect, it's larger for countries without free floating regime. It's not clear was really the exchange regime that was driven the result. The result is driven by the high US dollar in currency but that means that let me just present the 2 set of results that we feel more or less comfortable and we have a clean identification.

The first set of factors will focus on what the degree the invasion expectations were anchored. Here we only focus on EM sample and this big EM sample by looking one group that has above medium inflation expectation. You can think that a group of countries has a better anchor inflation expectations and the other group has less well and good inflation expectations. Hopefully not very surprisingly like we've seen that the output fall is much more smaller, is a lot smaller in countries with better inflation expectations.

Then again, part of the reason is that it can be really explained by this policy response where you can see the blue line representing the response of countries better and inflation expectation by current policy that

provides a support of domestic economy, whereas the country that has less well anchored inflation expectation was essentially forced to increase interest rate as a response.

Above-median anchoring   Below-median anchoring

1. Real GDP
(Percent change)

2. Investment
(Percent of GDP)

3. Real Effective Exchange Rate
(Percent change)

4. Policy Rate
(Percentage point change)
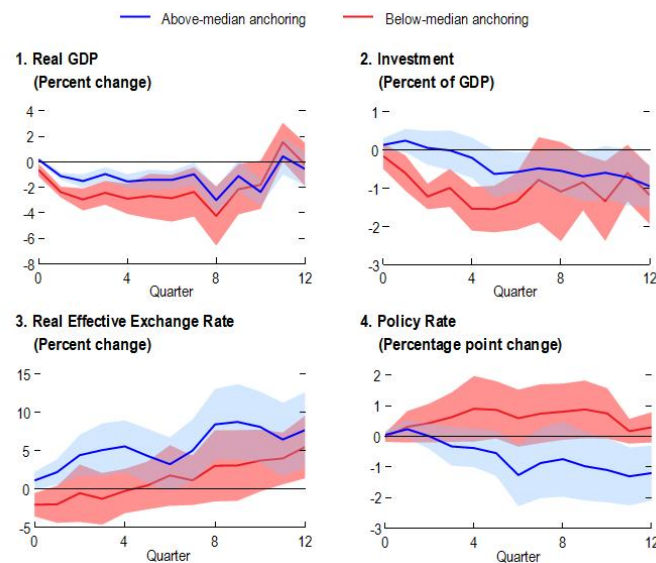
Only on to the second factor that we explore in the chapter is that we look at how does the effect differ between commodity importers and exporters. So here we focus on the whole sample, including bunch of AE, advanced economies and emerging market economies. The blue line represents responses for commodity importers, and the red line represents the input response for commercial exporters. And again, you see that for importers, the GDP fall was much more smaller in magnitude and compared to commodity exporters. And also the commodity exporters suffer a very large negative form of trade shock. In response, this is what you see in the second panel. So what can be accounted for this resource is the fact that historically, whenever we see the dollar depreciation, we also see a sharp decline in commodity prices. One of the reason is that or one intuition between this relationship could be that when the dollar appreciate that heightens the global financial conditions that reduces investment in reducing demand for commodities.

So that's why historically we typically see, whenever the dollar appreciates, we actually see that commodity price decreases. And then the declining commodity prices actually provides a cushion of benefits for commodity importers. So that could explain why the commodity importers have performed better relatively to the commodity exporters. Next we move on to the impact on the global balances because it's just one variable that we have been focusing on a lot in the report itself. We observe that when this increase in the us dollar index, when dollar appreciates, typically tend to narrow the global balances. This is where it shows on the chart on your right. And two potential channels can account for this. One is that when the dollar appreciates that decrease the commodity prices that essentially narrow the gap on surplus for commodity exporters. And now the current deficit for commodity importers. The second channel is that if you look at the dominant currency pricing theory that it suggests that when the dollar appreciates that tend to lower trade flows, so that could be another reason behind the declining global balances following a dollar appreciation.

1. Real GDP (Percent change)
2. Terms of Trade (Percent change)
3. Current Account (Percent of GDP)
4. Trade Balance: Goods (Percent of GDP)
5. Net International Investment Position (Percent of GDP)
6. Real Effective Exchange Rate (Percent change)
7. Policy Rate (Percentage point change)
8. Saving (Percent of GDP)
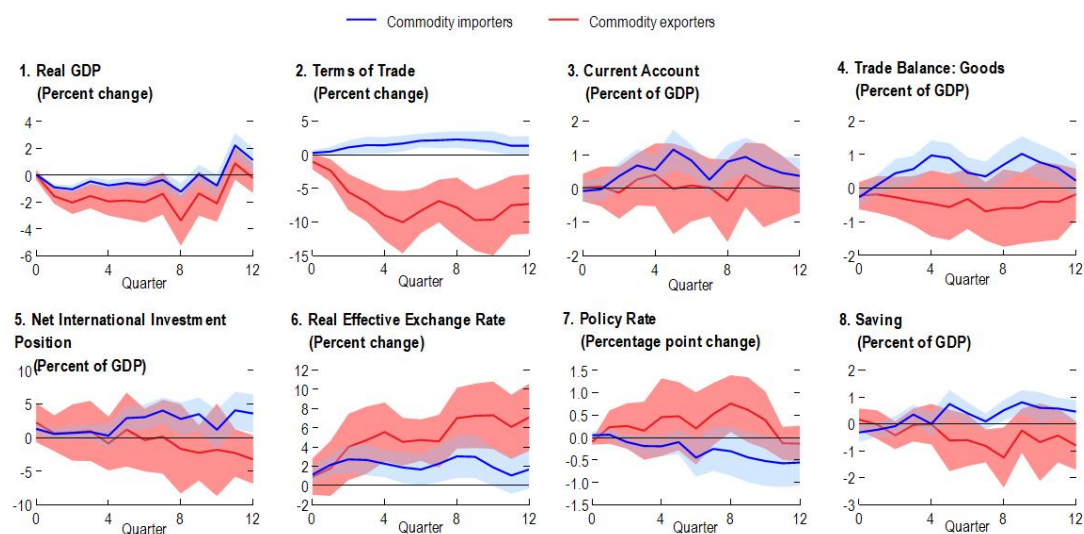
Impact of a US Dollar Appreciation on Global Balances
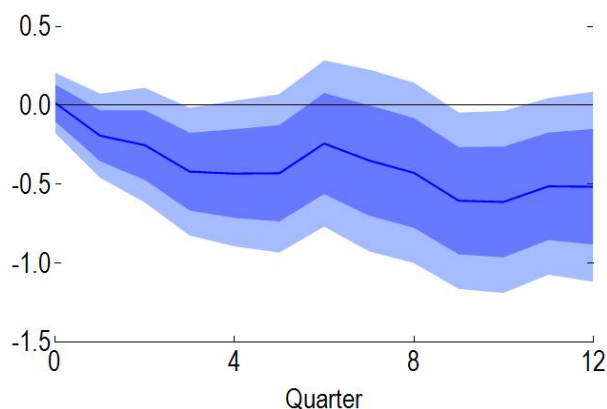
Sources: IMF staff calculations.
Note: 10% appreciation in the nominal US dollar index with 68 and 90% confidence intervals in a time-series local projections exercise. Controls are the US shadow policy rate, policy rate differentials, the adjusted National Financial Conditions Index, the economic activity factor of EMs and small AEs, and lagged US GDP, all in changes and with 4 lags, including lags of the shock and the global balances variable.

Now last slide, it's really a interesting slide is just to remind you actually want to convey the message to you that when you look at the results of commodity prices, you have to read the result with a lot of caveat to interpret what would happen in 2021, 2022. Why? Because something very interesting happened in 2022, let's just look at the chart on your left that shows the change in US dollar index in the blue bar. In 2015 the US dollar appreciated and I was explaining to you earlier typically when dollar appreciates, we see the commodity price falls and this is exactly what happened in 2015. You see this almost like more than 30% fall of the commodity prices. But in 2022, the correlation disease to variable change, we see a bold appreciation of the US dollar as well as the increasing commodity prices. The commodity prices was driven by different forces in 2022, including the economic recovery from COVID that increases the demand of commodities.

US Dollar Index and Commodity Prices
(% change, year-over-year)

■ US dollar index ■ Commodity prices
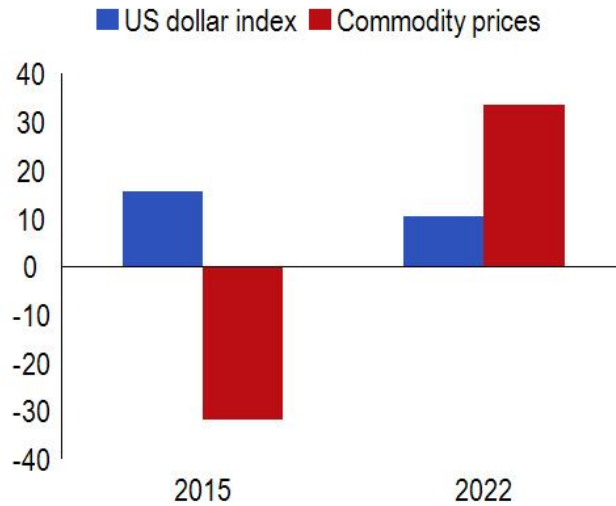
Sources: FRED; Haver Analytics; IMF Global Data Source; IMF staff calculations.
Note: % change is calculated using the year average for monthly data between 2015 (2022) and 2014 (2021).

Also the war in Ukraine, essentially triples supply concerns, but this change in correlation between these two variables, apply some caveat to interpret our results where we typically see that commodity importers, whether the shock better than commodity exporters. So just again, to illustrate this point, we plotted the commodity trade balance in in the middle, on the x axis for several countries. And then we got the new GDP growth forecast revision on x axis. And you see that in 2015, what happened was that the country that tends to have a positive commodity trade balance, they suffered a negative growth revision meaning that this decline in commodity prices actually led to down the division to their GDP to go forth.

Real GDP Growth Revisions for Two Large US Dollar Appreciation Episodes
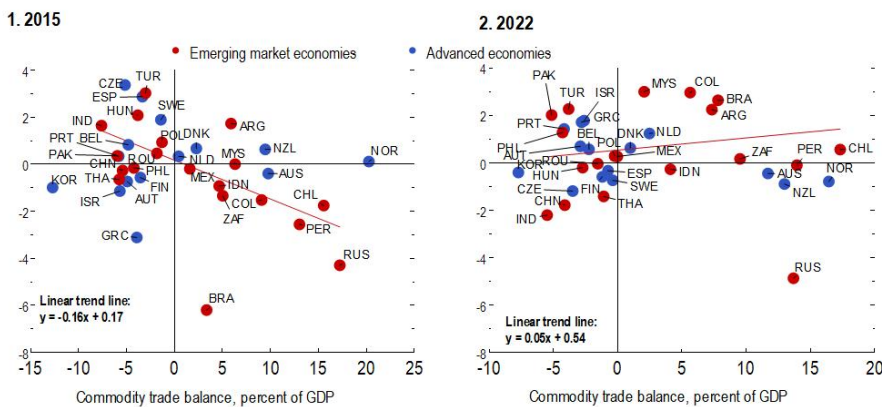
Sources: IMF World Economic Outlook database; IMF staff calculations.
Note: The forecast error for real GDP growth in 2015 (2022) is calculated as actual (April 2023) minus the IMF WEO data for April 2014 (January 2022). Commodity trade is defined as the ratio of commodity exports to GDP minus the ratio of commodity imports to GDP. Trend line includes only EMs. For 2015, the trend line excludes Brazil, the coefficient is statistically significant at the 5% level. For 2022, the trend line excludes Russia.

And then the last chart on your right plots the same picture of 2022 where you don't see this negative correlation anymore. Again, this is just because in a sense that we don't observe a downward GDP revision for commodity export anymore. If anything, their forecast was actually revised up. Again, it's just to show that how commodity price is really played a major role in affecting other spillovers from the dollar appreciation and how to change depending on the commodity prices. So let me just conclude today's top five to wrap up the second part of the chapter, so a few main messages. First of all, that we've seen that the global dollar cycle has a negative real sector spillover that's consistent in the literature. And these spillovers are more pronounced and longer lived in emerging market economies. Second, after a dollar appreciation, current account increases and essentially driven by the weak investment in EM and the real effect exchange rate played a very critical adjustment role in advanced economies, but unfortunately, exchange rate does not adjust on impact in the ends，but that only appreciate the depression gradually. And financial channel also contributes to the adverse effect by reducing capital inflows as well as domestic credit. And commodity exporters magnifies the spillover, given the historically negative relationship between the US dollar and commodity prices. But just to remind you that the correlation changed in 2021 and 2022, and we see that global balances tend to decline when the dollar appreciates. And then last not least two policy implications coming from this chapter, one is that we find countries with more anchored inflation expectations and more flexible exchange regime can actually help to speed up the economic recovery. So with that，let me just end today's presentation with some I would call it useful links, and especially I will throw your attention to the second that we have a very interesting panel discussion with both policy makers in the US and emerging markets coming to discuss on the report. And then the last we can find a lot more detail about how do we go about making the external sector assessment.

Working Paper

How Does the Volatility-Timing Strategy Perform in Mutual Funds Portfolios? *

By YIN ZHIDA, JIANG JILIN AND QIAN ZONGXIN *

March 2023

Abstract

Literature suggests that a volatility-timing strategy improves the performance of factor portfolios in the stock market and currency carry trade. This paper shows that the performance of this strategy is mixed when applied to mutual fund portfolios. More specifically, its performance not only depends on the investment style of the mutual funds but also the time periods when it is applied.

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1. Introduction

Recent studies on stock and currency market find that scaling the investment positions by past volatility from time to time could help reduce the uncertainty and improve performance. For example, Barroso and Santa-Clara (2015) show that by scaling the position of momentum strategy on the stock market, the Sharpe ratios are doubled and huge losses are avoided during the stock market crashes. Moreira and Muir (2017) further demonstrate that scaling positions by volatility also increase Sharpe ratios of other equities portfolios and the currency carry trade. Therefore, it is interesting to know whether the same risk management by volatility timing (VT) could improve the performance of investments in mutual funds. Wang et al. (2021) apply the VT technique to mutual funds and find that VT also improve the performance of mutual fund portfolios.

In our study, we extend the analysis of Wang et al. (2021) in two aspects. First, we compare the performance of VT in mutual fund portfolios with different investment styles. More specifically, we follow Hunter et al. (2014) to divide the mutual funds into different active peer groups by investment styles, small capitalization (cap) core, small cap value, small cap growth, mid cap growth, large cap core, large cap value, large cap growth, and compare the performance of VT for those different groups.[1] Second, we compare the performance of VT in different sample periods. Figure 1 plots the cumulative excess return of equal weighted equity mutual funds from January 1998 to December 2020. Obviously, the trend of the cumulative mutual fund excess return changes after June 2009. More specifically, the return grows faster. A formal structural break test (Chow test) confirms that the excess return of the equal weighted equity mutual funds portfolio experienced a mean shift in June 2009 (the test p value is 0.042). Hence, it is interesting to compare the performance of VT before and after June 2009.

Figure 1 Cumulative equal-weighted excess returns of equity mutual funds
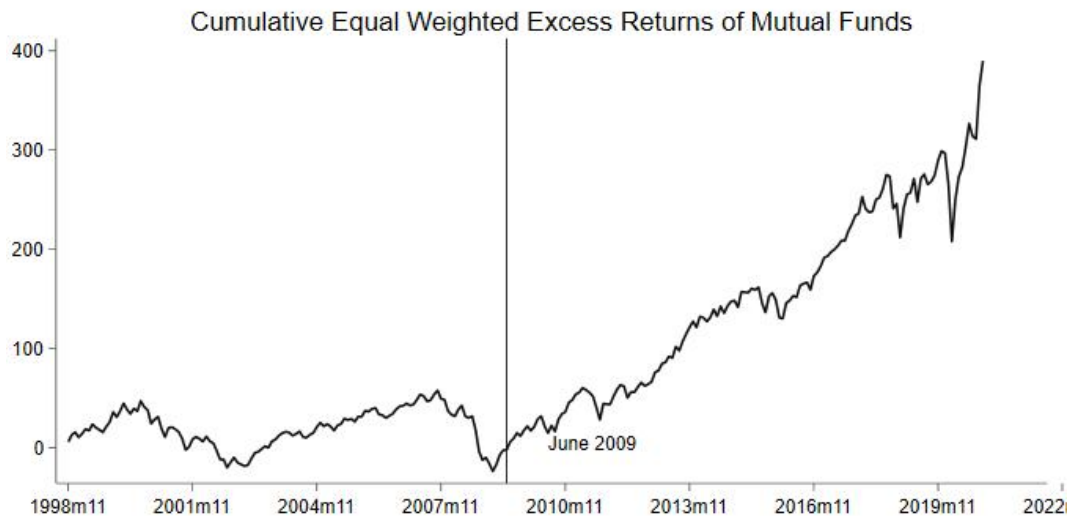
Source: WRDS.

We follow the methodology by Barroso and Santa-Clara (2015) to dynamically scale the position in mutual fund investments by the return volatility of the past six-month and compare the excess return series of the scaled portfolios of mutual funds with the unscaled portfolios. The results are mixed. In the period from September 1998 to June 2009, the volatility timing (VT) technique significantly raises the Sharpe ratios of mutual fund portfolios which invest in growth stocks. It also raises Fama-French five-factor alphas of those

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1 Hunter et al (2014) also consider the mid cap value and mid cap core groups. However, there are insufficient observations of those two groups for some of our OOS tests, so we do not include those groups in our analysis.

portfolios. Return distributions of volatility-managed portfolios are also less left-skewed than the original portfolios.   However, the performance of VT is mixed when applied to mutual fund portfolios which is balanced in growth and value stocks or focused on value stocks. Particularly, VT increases Sharpe ratio and skewness in these fund portfolios and reduces their kurtosis, but VT also reduces the Fama-French five-factor alphas of mutual fund portfolios which is balanced or focus on value stocks. More importantly, VT fails in the period from July 2009 to December 2020. It reduces the Sharpe ratios and Fama-French five-factor alphas of all mutual fund portfolios while raises the crash risk.

Moreira and Muir (2017) suggest that the fact that volatility timing improves portfolio return challenges the risk-based theory of asset pricing. Economically speaking, taking on more risk when volatility is high reduces investor utility, therefore, the volatility timing strategy which reduces risk-taking should require lower risk premium. Our tests using the mutual fund portfolio somehow reduces the puzzle posed by Moreira and Muir (2017). In some mutual fund portfolio groups, volatility timing does decrease the Fama-French five-factor alphas. Moreover, VT fails to improve performance in more recent years. What drives the change in VT performance is an interesting question for future theoretical research.

To further explore the reasons behind this difference, we investigate the out-of-sample (OOS) exposures to factor risks of the mutual fund portfolios. The exposures to factor risks significantly differ between the scaled portfolios and the unscaled ones.

We find that the changes in the exposure to market risk brought about by scaling tend to increase the Sharpe ratios of the growth stocks-focused mutual fund portfolios before June 2009. After June 2009, this effect weakens. Actually, the ability of VT to assume market risk in proper time is worse for all fund portfolios after June 2009.

Before June 2009, the changes in the exposure to Fama-French SMB factor and HML factor brought about by scaling increase the Sharpe ratios of all mutual fund portfolios, except for the SCG group in which scaling improves its Sharpe ratio through changing loadings to SMB factors, but does not through the HML factor. After June 2009, the effect remains in most mutual fund portfolios but not in the small-cap stocks-focused mutual fund portfolio for SMB factor and not in the LCV group for HML factor.

The changes in the exposure to the Fama-French RMW factor only increase Sharpe ratios in LCV group before June 2009, and LCG and MCG groups after June 2009. While changes in the exposure to the Fama-French CMA factor brought about by scaling do not improve fund portfolio performance before June 2009, they improve the Sharpe ratios of all mutual fund portfolios after June 2009.

Those results suggest that the contrasting performance of VT before and after June 2009 is affected by its time-varying ability to assume different factor risks. In particular, the poorer ability of VT to assume market risk after June 2009 is an important reason why it could not improve the Sharpe ratios of the mutual fund portfolios.

Wang and Yan (2021) propose another way to understand the performance of the VT technique. First, following Moreira and Muir (2017), they regress the volatility-managed portfolio return on the unmanaged return to obtain the alpha. Second, they decompose the alpha into a volatility timing (VT*) component and a return timing (RT) component. The VT* component is positive if volatility exhibts positive serial correlation. The RT component is positive if lagged volatility is negatively correlated to futurn returns. Interestingly, the return timing ability of the volatiltiy management technique is superior in the sample before June 2009, but contributes negatively to the portfolio return after June 2009. This result suggests that past volatility is negatively correlated to future returns before June 2009, but positively correlated to future returns after June 2009. The VT* component is negative in many cases before June 2009 while postive after June 2009. However, the RT component dominates both before and after June 2009, which explains why the volatility management strategy performs better before June 2009.

The rest of this paper proceeds as follows: Section 2 describes our empiric model; Section 3 outlines the dataset in this study; Section 4 illustrates and discusses the empirical results; Section 5 concludes the paper.

2. Empiric model: an APB-augmented five-factor model

Following the literature (Carhart, 1997; Hunter et al., 2014), we construct mutual funds portfolios based on the ranking of alphas from an estimated factor model. Jordan and Riley (2015) documented that the Fama and

French (2015) five-factor model has an advantage of eliminating the volatility anomaly to avoid mis-measurement of fund alphas. However, there is potentially another source of mis-measurement that is not addressed by Fama and French (2015): the tendency of mutual funds to use correlated investment strategies. This phenomenon typically leads to correlated residuals from commonly used factor models and reduces estimation efficiency. A study by Hunter et al. (2014) proposes an active peer benchmark (APB) to eliminate the residual correlation. It shows that the APB-augmented Carhart four-factor model (Carhart, 1997) generates high out-of-sample alphas. In this study, we combine the Fama-French five-factor model with the APB so that our benchmark is free from measurement errors due to both the volatility anomaly and correlated residuals. Doing so can not only improve estimation efficiency by correcting the cross-sectional correlation in the error term but also eliminate the estimation bias from the omitted variable bias in the four-factor model. This combination is important because we do not want our results to come from econometric problems caused by model specification errors.

Specifically, this study follows Hunter et al. (2014) to estimate the APB of a certain fund group by the following equation:

$$r_{APB,t} = \alpha_{APB,t} + \beta_{APB,t,rmrf}r_{rmrf,t} + \beta_{APB,t,SMB}SMB_t + \beta_{APB,t,HML}HML_t + \beta_{APB,t,RMW}RMW_t + \beta_{APB,t,CMA}CMA_t + \varepsilon_{APB,t} \quad (1)$$

where, $r_{APB,t}$ is the averaged excess return of the active peer group of funds in period t; $r_{rmrf.t}$, SMB_t, HML_t, RMW_t and CMA_t are the five factors in Fama and French (2015)[2]. All the betas in Equation (1) represent the corresponding (time-varying) factor loadings, $\alpha_{APB,t}$ is a group intercept and $\varepsilon_{APB,t}$ is the error term (the APB factor). We then use the APB factor to revise the five-factor model as follows:

$$r_{i,t} = \alpha_{i,t} + \beta_{i,t,rmrf}r_{rmrf,t} + \beta_{i,t,SMB}SMB_t + \beta_{i,t,HML}HML_t + \beta_{i,t,RMW}RMW_t + \beta_{i,t,CMA}CMA_t + \lambda_{i,t}\varepsilon_{APB_i,t} + e_{i,t} \quad (2)$$

where $r_{i,t}$ is an excess return of fund i at time t. According to Hunter et al. (2014), the term $\lambda_{i,t}\varepsilon_{APBi,t}$ helps eliminate commonalities in risk-taking by funds in the same active peer benchmark group. Hence the APB adjustment as shown by Equation (2) should improve the estimation efficiency relative to a standard five-factor model.

Hunter et al. (2014) suggest that forming mutual fund portfolios on the basis of their investment styles and in-sample alphas generate superior out-of-sample (OOS) performance. More specifically, their strategy is to choose the quartile of mutual funds which has the highest in-sample alphas from each category of investment style. In this paper, we use their strategy to form mutual fund portfolios and evaluate the performance of the VT technique. Section 4.4.1 shows that our main results remain if we form fund portfolios using other quartile of mutual funds.

3. Dataset and fund categorization

We collect a monthly dataset from September 1998 to December 2020 for model estimation. The excess fund return is defined as the return of dividend-adjusted net asset value (NAV) minus the rate of six-month Treasury bills. Following the study of Hunter et al. (2014), we add back 1/12 of the annual expense ratio to the NAV return to obtain the prior-expense fund return. Time series of dividend-adjusted NAV returns and the expense ratios of mutual funds are obtained from the Center for Research in Security Prices (CRSP) database. Following Hunter et al. (2014), we only include no-load mutual fund share-classes. Table 1 reports the summary statistics on fund characteristics. The five factors of Fama and French (2015) are taken from French's webpage.[3] All funds are categorized using an approach proposed by Hunter et al. (2014) which is based on the best-fitting benchmark of Cremers and Petajisto (2009). Specifically, funds in our sample are categorized into seven groups: small-cap core (SCC), small-cap value (SCV), small-cap growth (SCG), mid-cap growth (MCG), large-cap core (LCC), large-cap value (LCV), and large-cap growth (LCG).[4]

Table 1 Summary statistics on fund characteristics

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2 The five factors in Fama and French (2015) are: the market (rrmrf.t), size (SMBt), book-to-market (HMLt), profitability (RMWt) and investment (CMAt) factors.
3 http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html
4 Appendix A describes how those groups are formed.

This table report summary statistics on fund characteristics. The sample period starts from 1998 and ends by 2020.

Characteristics	Mean	Std. Dev	10th percentile	Median	90th percentile
Expense Ratio as of Fiscal Year-End (%)	1.15	0.52	0.64	1.12	1.68
Fund Turnover Ratio (%)	73.23	80.24	13.00	54.00	151.00
Total Net Assets as of Month End (millions)	1,935.01	6,691.79	29.10	330.40	3,783.10

4. Empirical results

As discussed before, past literature (Barroso and Santa-Clara, 2015; Moreira and Muir, 2017) has documented that the technique of scaling investment positions in the equity market (and the currency market) by past volatility reduces the OOS volatility and increases the Sharpe ratio at the same time. It also helps reduce crash risk. In this subsection, we investigate whether this volatility timing (VT) technique works well in terms of improving performance (Sharpe ratios) while mitigating crash risk. Therefore, a volatility-managed[5] OOS holding-period return of a fund portfolio is defined as follows:

$$r_{i,t}^* = \frac{k}{\sigma_t} r_{i,t} \qquad (3)$$

where σ_t is the sample standard deviation of the portfolio returns in the past 125 trading days (six calendar months). The parameter k is a target level of standard deviation set by the investors. Following the literature (Moreira and Muir, 2017; Wang et al. 2021), we impose a value for k so that the portfolios tuned by the volatility timing (VT), which we shall call volatility-managed portfolios, have the same full sample volatility as the portfolios absent of VT (the original portfolios).

4.1 Volatility scaled vs. unscaled fund portfolio performance
4.1.1 Results before June 2009

Empirical results for the sample period from September 1998 to June 2009 are listed in Panel A of Table 2. The columns labeled "VT" in Table 2 reports the main characteristics of the returns of the volatility-managed portfolios. In each "VT" column, we highlight the cases in which the volatility timing (VT) improves the performance by assigning # as upper notations to the numbers. In general, the VT technique improves the portfolio performance in large-cap (LC) and mid-cap (MC) groups. It is clear in Panel A of Table 2 that all volatility-managed portfolios within the Growth groups, compared with their original counterparts, enjoy higher Sharpe ratio, larger skewness, smaller kurtosis, and higher mean alpha. In particular, the VT procedure turns the Sharpe ratios from negative or zero to positive numbers. Core groups and Value groups also get better return distribution characteristics after volatility-timing, though their mean alphas decrease. The phenomenon indicates that in these groups volatility-timing works through market-timing. Specifically, time-varying factor loadings induced by scaling bring higher Sharpe ratio, larger skewness, smaller kurtosis to these groups. The improvement brought by volatility-timing is smaller in the small-cap groups compared with large-cap and mid-cap groups. While in all the large-cap and mid-cap groups, the rise of Sharpe ratio brought by scaling is 0.5, the enhancement of Sharpe ratio is only 0.2 in SCC, SCG group, and 0.4 in SCV group. Besides, in SCC and SCG groups the enhancement of skewness and decrement of kurtosis caused by volatility-timing are also lower than in other groups compared with the original ones.

Figure 2 presents the cumulative returns of the unscaled and scaled portfolios during the subprime crisis. VT helps reduce the loss at the trough for all fund portfolios. Its loss-reducing effects are particularly strong for those portfolios which heavily invest in value stocks. The loss-reducing effects are weaker for those portfolios which have a focus on growth stocks.

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[5] This study mainly focuses on the volatility timing (VT) as a technique to manage the portfolio risk, so the "volatility-managed" portfolios and portfolios with "VT" are used interchangeably in all discussions.

Table 2 Performance of scale versus unscaled mutual fund portfolios (baseline)

Numbers labeled "Original" ("VT") are performance indicators of the portfolios without (with) volatility timings. #s indicate that VT contributes to improve the performance. Fund portfolios are sorted into 7 investment style groups: Small-cap core (SCC); Small-cap value (SCV); Small-cap growth (SCG), Mid-cap growth (MCG), Large-cap core (LCC), Large-cap value (LCV), and Large-cap growth (LCG). And in each group of investment style, we only report the portfolios with the highest in-sample t-value of alphas in that group. The sample starts from September 1998 and ends by December 2020.

Portfolio	Sharpe Ratio		Skewness		Kurtosis		Mean Alpha	
	Original	VT	Original	VT	Original	VT	Original	VT
Panel A. September 1998-June 2009								
LCC	-0.06	-0.01#	-0.63	-0.39#	3.71	2.57#	-0.02	-0.05
LCG	-0.07	-0.02#	-0.47	-0.31#	3.39	2.58#	0.30	0.39#
LCV	0.02	0.07#	-0.58	-0.41#	4.30	2.72#	0.10	0.05
MCG	-0.04	0.01#	-0.67	-0.47#	4.06	2.94#	0.23	0.27#
SCC	0.10	0.12#	-0.61	-0.58#	4.38	3.62#	0.22	0.15
SCG	0.00	0.02#	-0.47	-0.45#	3.74	3.06#	-0.14	-0.07#
SCV	0.12	0.16#	-0.70	-0.45#	4.72	3.46#	0.07	-0.01
Panel B. July 2009-December 2020								
LCC	0.29	0.25	-0.41	-0.93	4.28	5.02	-0.02	-0.08
LCG	0.34	0.31	-0.18	-0.43	3.37	4.32	0.17	0.06
LCV	0.24	0.18	-0.41	-1.17	4.98	5.86	-0.04	-0.13
MCG	0.37	0.31	-0.34	-1.12	4.66	6.31	0.07	-0.14
SCC	0.19	0.10	-0.46	-1.46	5.37	8.10	-0.09	-0.35
SCG	0.27	0.21	-0.37	-1.44	4.93	7.66	0.27	0.14
SCV	0.20	0.11	-0.73	-1.48	7.11	7.94	0.09	-0.24

Figure 2 Cumulative mutual fund portfolio returns by investment style (June 2008-June 2009)

Mid Cap Growth

Small Cap Core

Small Cap Growth

Small Cap Value
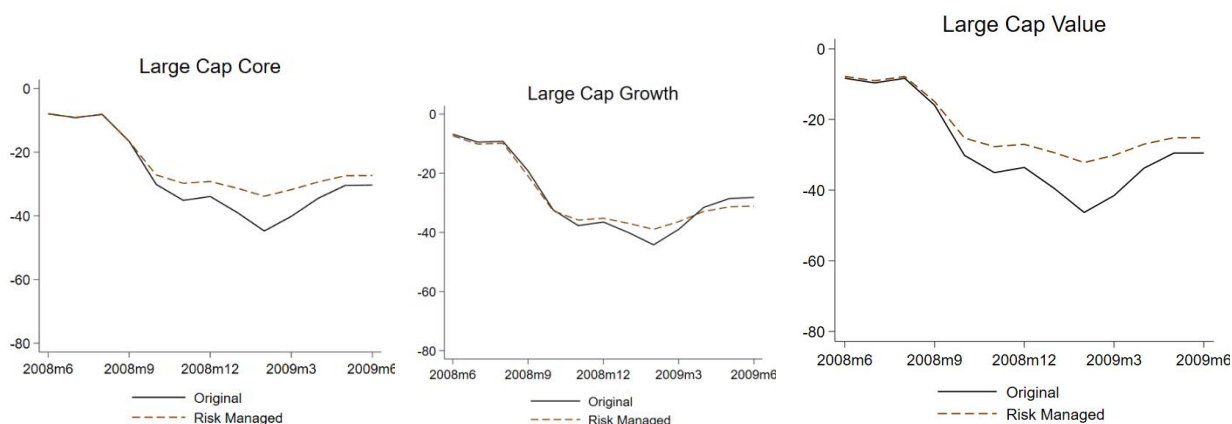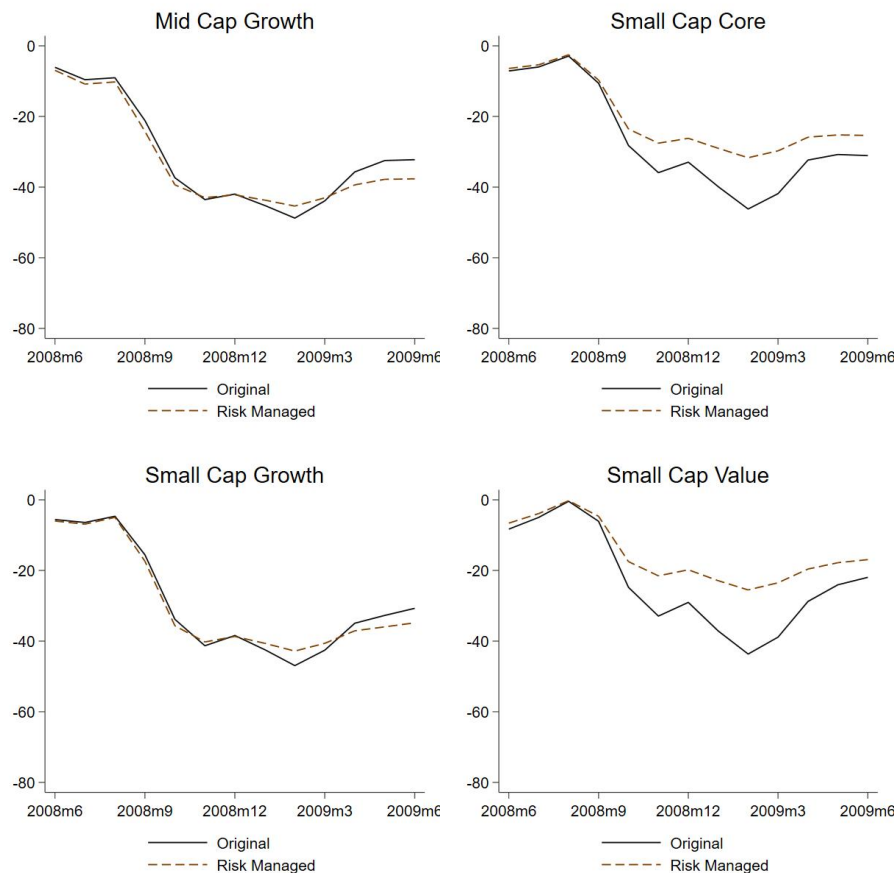
Notes: Authors' calculations, %.

4.1.2 Results after June 2009

Empirical results for the sample period from July 2009 to December 2020 are listed in Panel B of Table 2. Contrasting to the results in Table 2 and previous literature, VT does not work well.[6] It not only reduces Sharpe ratios and alphas of all fund categories, but also increases the crash risk. The poor performance is especially dramatic in the fund portfolios which focus on small-cap funds. The Sharpe ratio of the SCC group is reduced by 0.09. Its mean alpha is reduced by 0.26. Its skewness is decreased by 1 to -1.46. The Sharpe ratio of the SCV group is reduced by 0.09. Its mean alpha is reduced by 0.33. Its skewness is decreased by 0.75 to -1.48. The Sharpe ratio of the SCG group is reduced by 0.06. Its skewness is decreased by 0.97 to -1.44. Its mean alpha is reduced by 0.13.

4.2 Contributions of factor exposures brought about by VT to changes in the Sharpe ratios

According to Equation (2), apart from the alpha, the other part of the OOS portfolio return is generated by a combination of factor exposures. In order to examine the contribution of each factor loading, we carry out the following experiment. First, we keep the factor loading of that specific factor at the same level as the original portfolios. Second, we set all the other factor loading and the alpha to the values that are equal to their counterparts in the volatility-managed portfolios. The above two steps enable us to build a restricted model. Third, we use this restricted model to simulate the portfolio returns. Finally, we calculate the corresponding Sharpe ratios from the simulated portfolio returns. The difference between the Sharpe ratios of the simulated

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6 Table A1 presents the overall results from September 1998 to December 2020. There, we could see that VT's overall performance is weaker than in the first subsample while stronger than in the second subsample.

returns and the volatility-managed portfolios are then compared. A formal description of the above steps can be described as follows[7]:

$$E\left(r_{o,t}\right) = \alpha_{o,t} + \beta_{o,t,rmrf}r_{rmrf,t} + \beta_{o,t,SMB}SMB_t + \beta_{o,t,HML}HML_t + \beta_{o,t,RMW}RMW_t + \beta_{o,t,CMA}CMA_t + \lambda_{o,t}\varepsilon_{APB_j,t} \quad (4)$$

$$E\left(r_{v,t}\right) = \alpha_{v,t} + \beta_{v,t,rmrf}r_{rmrf,t} + \beta_{v,t,SMB}SMB_t + \beta_{v,t,HML}HML_t + \beta_{v,t,RMW}RMW_t + \beta_{v,t,CMA}CMA_t + \lambda_{v,t}\varepsilon_{APB_j,t} \quad (5)$$

where $r_{o,t}$ denotes the original portfolio return and $r_{v,t}$ denotes the volatility-managed portfolio (portfolio adjusted by VT) return and there are restrictions:

$$\beta_{v,t,j} = \beta_{o,t,j} \text{ or } \lambda_{v,t} = \lambda_{o,t} \quad (6)$$

where j stands for different factors (market, SMB, HML, RMW or CMA factors). So, if the restriction as in Equation (6) are imposed to Equation (5), a restricted model can then be constructed as follows :

$$E\left(r_{R,t}\right) = \alpha_{v,t} + \beta_{o,t,rmrf}r_{rmrf,t} + \beta_{v,t,SMB}SMB_t + \beta_{v,t,HML}HML_t + \beta_{v,t,RMW}RMW_t + \beta_{v,t,CMA}CMA_t + \lambda_{v,t}\varepsilon_{APB_j,t} \quad (7)$$

where $r_{R,t}$ is the portfolio excess return of the volatility-managed portfolio by assuming: $\beta_{v,t,rmrf} = \beta_{o,t,rmrf}$.

The Sharpe ratio calculated by using the simulated $E(r_{R,t})$ series is denoted by $S_{R,t}$, and the Sharpe ratio of the volatility-managed portfolio is denoted by $S_{v,t}$. The gap between the two ratios, $(S_{R,t} - S_{v,t})$, is then used as an indicator to measure how much does the VT technique contribute to improve the performance, if any, through changing the loading of the market factor. Here, a negative value of $(S_{R,t} - S_{v,t})$ implies that if the VT technique had not changed the loading of the market factor in the original portfolio, the Sharpe ratio would be lower. And we can repeat the procedure for every factor loading. All the results are reported in Table 3.

Table 3 The effects of changes in factor loading caused by VT on the Sharpe ratios
The column "Factor loading" indicates that we keep all other parameters at the same level as the volatility-managed portfolios with volatility timing but change the factor loading indicated in that column to the same level as the original portfolios. The numbers outside the parentheses are the simulated Sharpe ratios. The numbers inside the parentheses are the difference between the simulated Sharpe ratios and the Sharpe ratios of the volatility-managed portfolios. Therefore, a negative number in the parentheses suggests that the Sharpe ratio would be lower if the volatility timing had not changed the factor loading indicated in the column "Factor Loading". #s indicate that VT contributes to improve the performance. 7 investment style groups are considered: Small-cap core (SCC); Small-cap value (SCV); Small-cap growth (SCG), Mid-cap growth (MCG), Large-cap core (LCC), Large-cap value (LCV), and Large-cap growth (LCG).

Factor loading	LCC	LCG	LCV	MCG	SCC	SCG	SCV
	Panel A. September 1998-June 2009						
MKT	-0.04	-0.04	0.05	-0.02	0.13	0.00	0.17
	(-0.03)#	(-0.03)#	(-0.02)#	(-0.04)#	(0.01)	(-0.03)#	(0.01)
SMB	-0.03	-0.03	0.03	0.00	0.11	0.02	0.12
	(-0.02)#	(-0.02)#	(-0.04)#	(-0.01)#	(-0.01)#	(0.00)	(-0.04)#
HML	-0.03	-0.04	0.04	0.00	0.09	-0.02	0.10
	(-0.02)#	(-0.02)#	(-0.03)#	(-0.01)#	(-0.03)#	(-0.04)#	(-0.06)#
RMW	-0.01	0.00	0.05	0.01	0.11	0.04	0.16
	(0.00)	(0.02)	(-0.02)#	(0.00)	(0.00)	(0.02)	(0.00)
CMA	0.00	0.00	0.07	0.05	0.17	0.07	0.19
	(0.01)	(0.02)	(0.00)	(0.04)	(0.05)	(0.05)	(0.03)

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7 Here, for illustration purpose, we restrict the loading of the market factor (βv,t,rmrf = βo,t,rmrf) in this example.

	Panel B. July 2009-December 2020						
MKT	0.24	0.31	0.19	0.32	0.12	0.20	0.13
	(-0.01)#	(0.00)	(0.00)	(0.02)	(0.02)	(-0.01)#	(0.01)
SMB	0.22	0.28	0.17	0.28	0.10	0.21	0.11
	(-0.03)#	(-0.03)#	(-0.01)#	(-0.03)#	(0.00)	(0.00)	(0.00)
HML	0.22	0.30	0.19	0.29	0.09	0.19	0.10
	(-0.03)#	(-0.01)#	(0.00)	(-0.02)#	(-0.01)#	(-0.02)#	(-0.02)#
RMW	0.26	0.30	0.20	0.28	0.10	0.22	0.12
	(0.01)	(-0.01)#	(0.02)	(-0.03)#	(0.00)	(0.00)	(0.01)
CMA	0.22	0.27	0.15	0.26	0.08	0.17	0.10
	(-0.03)#	(-0.04)#	(-0.03)#	(-0.04)#	(-0.02)#	(-0.04)#	(-0.01)#

Results in Panel A of Table 3 suggest that if we were to restrict the loadings on the market factor to the identical values as in the original portfolios, the simulated Sharpe ratios would be lower in the LCC, LCG, MCG and SCG groups before June 2009. This suggests that VT increases the Sharpe ratios of the all mutual fund portfolios which invest mainly in growth stocks or large-cap stocks before June 2009. Comparing the row labeled "MKT" in Panel A and Panel B of Table 3, it is easy to notice that changes in the exposure to the market risk brought about by VT has weaker ability to increase the Sharpe ratio in all fund categories after June 2009 except for the SCV group. The contrast is most dramatic in the LCG and MCG groups. Changes made to the loading to the market factor by VT are the most important source of increase in the Sharpe ratios of the LCG and MCG groups in the period before June 2009. After June 2009, changes in the exposure to the market risk brought about by VT alone have no impact on the Sharpe ratio of the LCG group. Those changes even reduce the Sharpe ratio of the MCG group. Although those changes still improve the Sharpe ratio of the LCC and SCG groups after June 2009, its impact is much smaller than before June 2009. They also no longer improves the Sharpe ratio of the LCV group.

Changes in the loading to the SMB factor brought about by VT increase the Sharpe ratio for LCC, LCG, LCV, MCG groups both before and after June 2009. They help improve the Sharpe ratio for the SCC and SCV groups before June 2009 but no longer work for these groups through the SMB factor after June 2009. VT increases the Sharpe ratio through changing HML factor loadings in all groups before June 2009, and it also works through the channel to improve the performance of mutual fund portfolios after June 2009 except for the LCV group.

Before June 2009, VT improves the Sharpe ratios of the LCV group through the RMW factor. In the period from July 2009 to December 2020, LCG and MCG groups have a higher Sharpe ratio through RMW after scaling. While VT does not improve the Sharpe ratios through the CMA factor before June 2009, it works through the CMA factor after June 2009.

In summary, VT still improves the Sharpe ratios of many mutual fund portfolios, through the SMB, HML, RMW and CMA factor after June 2009. However, the net effects of VT on all portfolios are not positive. This indicates that VT's contrasting effects on the loading of the Market factor is a crucial reason why it stops to improve the Sharpe ratios.

The role of VT's contrasting effects on the loading of the Market factor is also visible from Figure 3 and 4.[8] The dashed lines are the cumulative market returns. The solid lines with no marker are the loading of the volatility-managed portfolios on the market factor. The solid lines with "+" markers are the loading of the original portfolios on the market factor. The first notable pattern is that the loading of the volatility-managed

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[8] As it is required to have at least 30 observations for a fund in a 3-year rolling window to be included in a fund portfolio and a portfolio is required to have at least five funds in a month to implement our trading strategy, there are some months that the strategy cannot be executed. In Figure 4, if the lines of loadings become dotted, it indicates that in these months the strategy are not implemented due to few observations.

portfolios on the market factor is much more volatile than the original load both before and after June 2009. Second, it is also easy to observe that in our sample before June 2009, cumulative market return is volatile and low, being negative most of the time. The volatility management successfully increases the loading of the portfolios on the market factor when the market return starts to climb after the first half of 2003. It also successfully decreases the loading of the portfolios on the market factor before the market return starts to decline in 2007. Those good timing cases should have contributed to VT's superior performance before June 2009. After June 2009, the cumulative market return has an upward trend. VT keeps the loading of the portfolios on the market factor too low at the beginning of the sample period. It also reduces the loading of the portfolios on the market factor at the end of the sample period when the growth of market price accelerates. For those reasons, volatility management gives up a large share of the profits from the original portfolios. This at least partially explains the inferior performance of the VT technique after June 2009.

Figure 3 Cumulative returns of the market factor and loading of the scaled and unscaled portfolios on the market factor
(before June 2009)
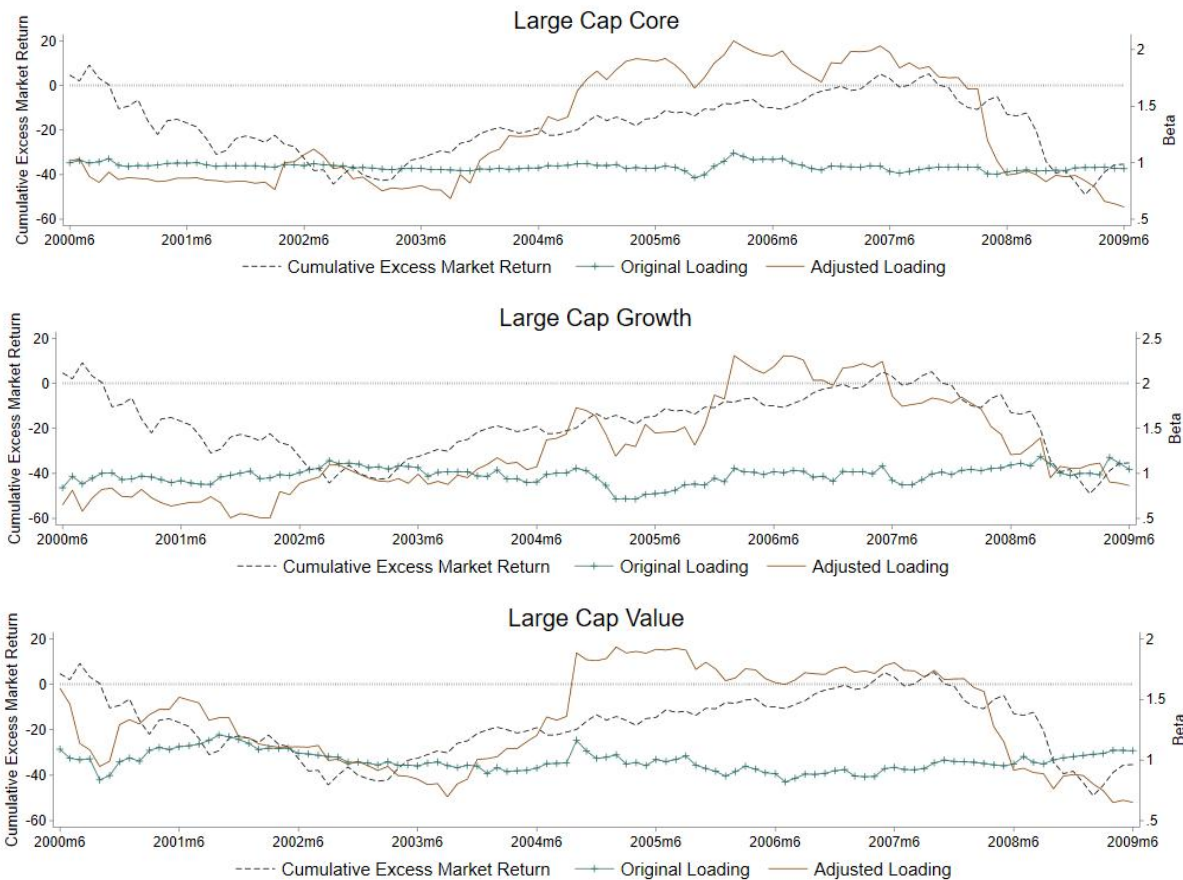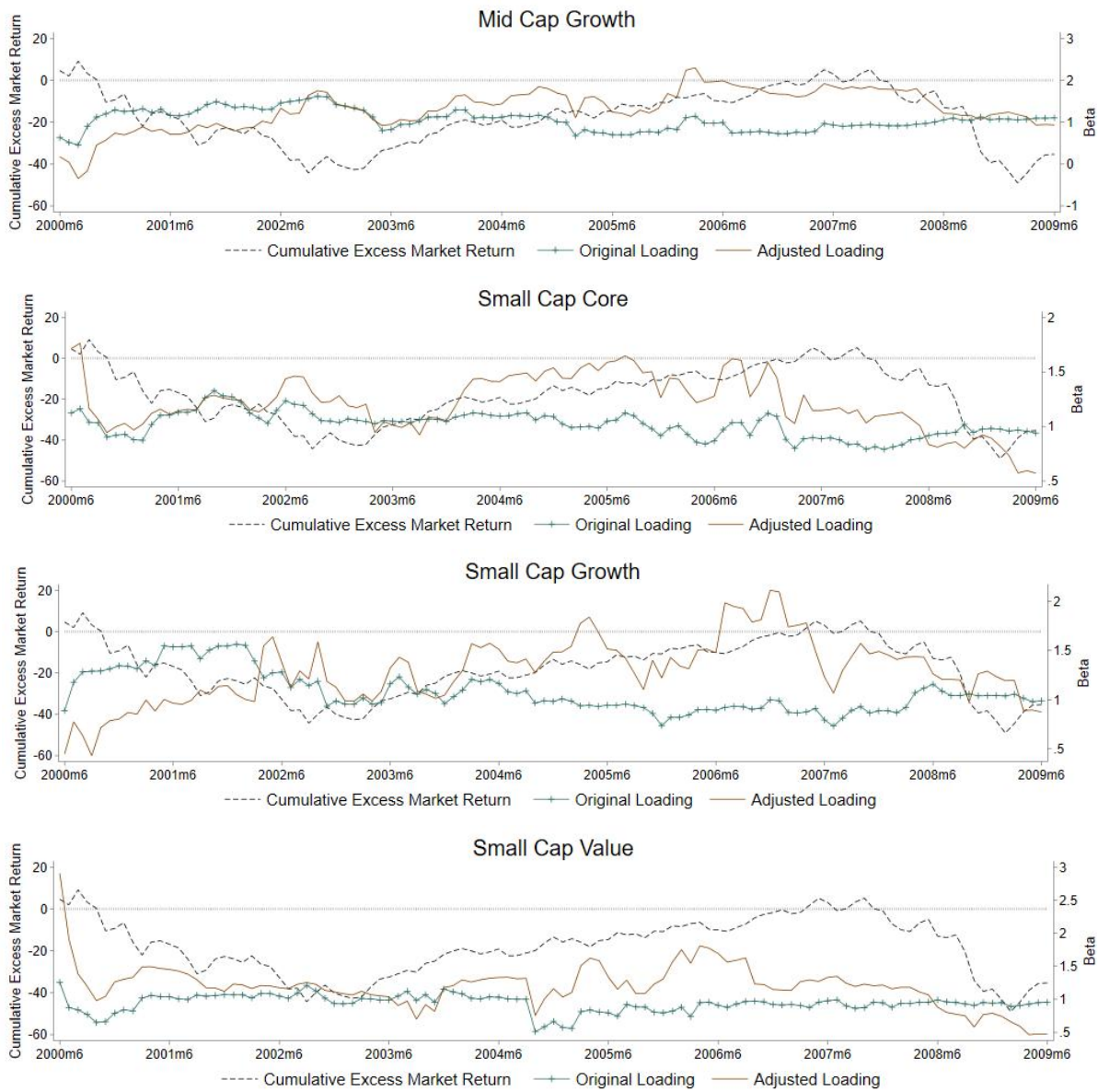
Notes: Authors' calculations, cumulative market return on the left vertical axis (%), loading on the right vertical axis.

Figure 4 Cumulative returns of the market factor and loading of the scaled and unscaled portfolios on the market factor (after June 2009)
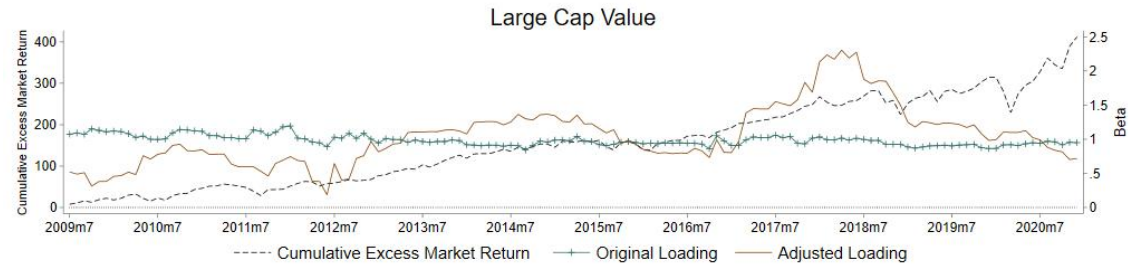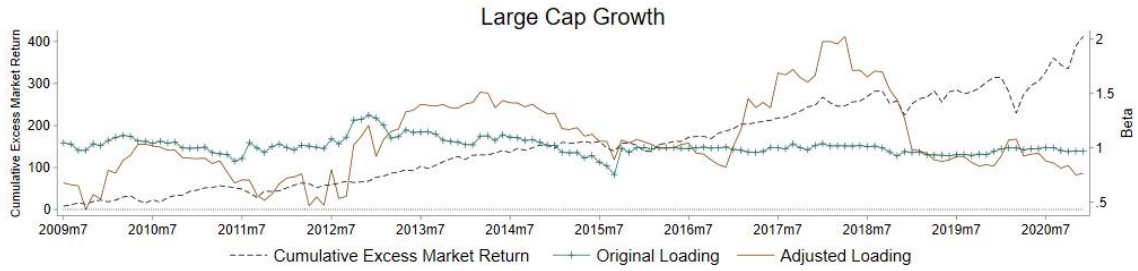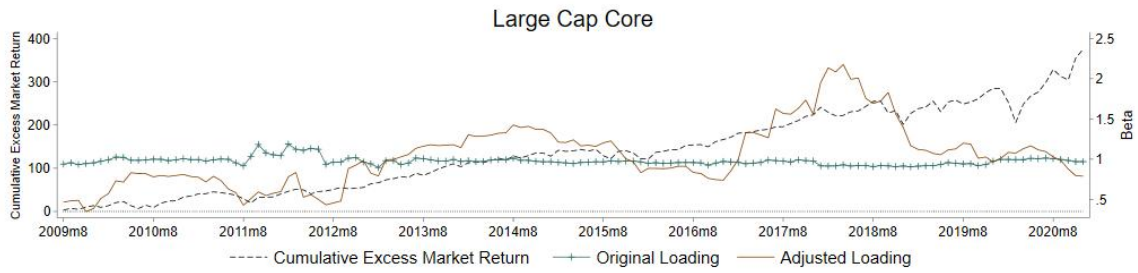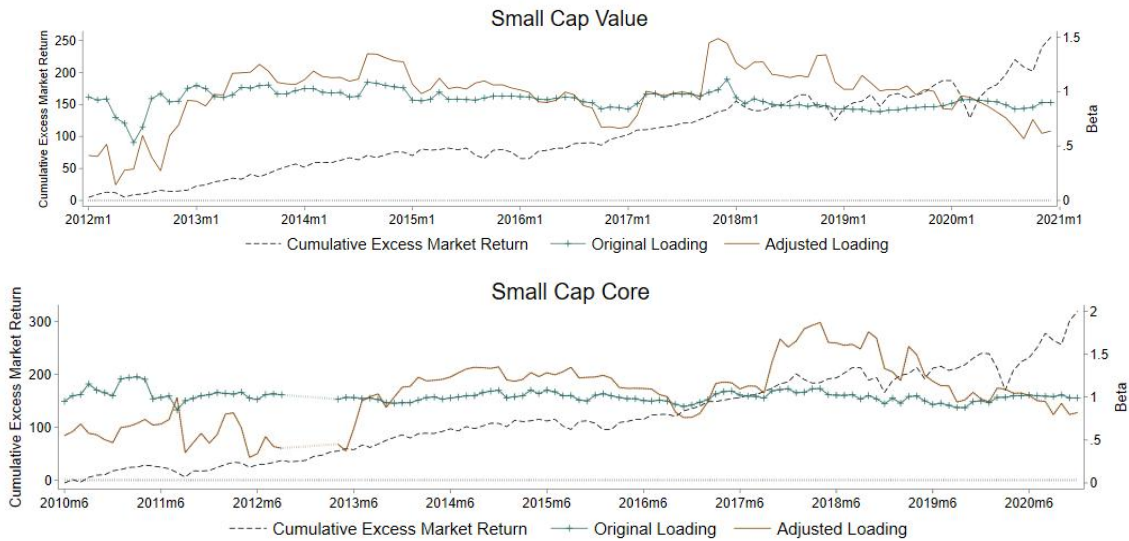
Large Cap Core

Large Cap Growth

Large Cap Value

Mid Cap Growth

Small Cap Growth

Small Cap Value

Small Cap Core

Notes: Authors' calculations, cumulative market return on the left vertical axis (%), loading on the right vertical axis.

Sample starts from June 2009 except when there are insufficient fund observations to implement the strategy.

4.3 Return timing versus volatility timing

Wang and Yan (2021) suggest that we could better understand the performance of the VT strategy by decomposing the alpha from a spanning regression of the volatiltiy managed portfolio return on the unmanaged portfolio return. More specifically, they run the following regression:

$$r_{v,t} = \alpha_d + \beta_d r_{o,t} + \varepsilon_{d,t}, \tag{8}$$

where $\varepsilon_{d,t}$ is the error term. Wang and Yan (2021) show that

$$\hat{\alpha}_d = RT + VT^*, \tag{9}$$

where $RT \equiv \left(1 + \dfrac{E^2(r_{o,t})}{Var(r_{o,t})}\right) cov(\dfrac{k}{\sigma_t}, r_{o,t})$, $VT^* \equiv -\dfrac{E(r_{o,t})}{Var(r_{o,t})} cov(\dfrac{k}{\sigma_t}, r_{o,t}^2)$. RT and VT^* measure the relatively contribution of return timing and volatility timing ability of the volatility management strategy to the alpha of regression (8), respectively. A positive RT suggests that high past volatility predicts low future return. A positive suggests that high past volatility predicts high future volatility.

Table 4 reports the decomposition results. It is easy to notice that the alpha of the spanning regression is positive in all style groups before June 2009 while turns negative in all groups after June 2009, confirming our key result that VT performs better in the pre-June 2009 subsample. The decomposition provides two explanations for the contrasting performance of VT before and after June 2009. First, the RT component are positive before June 2009 while negative after June 2009. This suggests that after June 2009, high past volatility actually predicts high future return. Hence, reducing investment position conditioning on high past volatility decreases rather than increases portfolio return. Second, the VT* component is negative in the LCC, LCG, MCG, and SCG group before June 2009. This result suggests that before June 2009, high past volatility in those groups predicts low future volatility. By contrast, VT* is positive in all groups after June 2009, implying a better volatility timing ability of the volatility management strategy in the second subsample. However, the RT component dominates both before and after June 2009, leading to a higher alpah in all groups before June 2009.

Table 4 Results of alpha decomposition

Fund portfolios are sorted into 7 investment style groups: Small-cap core (SCC); Small-cap value (SCV); Small-cap growth (SCG), Mid-cap growth (MCG), Large-cap core (LCC), Large-cap value (LCV), and Large-cap growth (LCG). And in each group of investment styles, we report the relative performance of volatility-time portfolios compared to the baseline portfolios without volatility timing and alpha decomposition results. Numbers labeled "Alpha" are the estimated constant term from a regression of volatility-timing portfolios' returns to baseline portfolios' returns. Numbers labeled "RT" ("VT*") are the return-timing (volatility-timing) components of estimated alphas. The sample periods are from September 1998 to June 2009 and from July 2009 to December 2020 in panel A and panel B, respectively.

Portfolio	LCC	LCG	LCV	MCG	SCC	SCG	SCV
Panel A. September 1998-June 2009							
Alpha	0.19	0.18	0.26	0.26	0.15	0.12	0.25
RT	0.32	0.32	0.24	0.34	0.07	0.14	0.13
VT*	-0.13	-0.14	0.02	-0.08	0.08	-0.02	0.13
Panel B. July 2009-December 2020							
Alpha	-0.07	-0.01	-0.17	-0.13	-0.34	-0.18	-0.37
RT	-0.31	-0.31	-0.35	-0.43	-0.47	-0.42	-0.44
VT*	0.23	0.30	0.18	0.30	0.13	0.24	0.07

4.4 Robustness of baseline results

4.4.1 Results for the funds with alphas in other quartile

In our baseline study, we adopt the mutual fund investment strategy of Hunter et al. (2014) to choose the quartile of mutual funds which has the highest in-sample alphas from each category of investment style. The evaluation of VT is based on this strategy. However, our main results are not sensitive to this specific choice of fund investment strategy. Table 5 presents the performance of scaled and unscaled fund portfolios which are formed using alphas in other quartiles.[9] VT still does not work after June 2009 while work quite well in improving distribution characters of returns before June 2009, with some exceptions in the SCG and SCC groups. More specifically, VT increases the Sharpe ratios, skewness while reduces the kurtosis in most groups before June 2009. It reduces the skewness of all SCG groups formed with other quartiles. There is only one slight difference. When the fund portfolios are formed in the lowest alpha quartile, VT has one more failure for improving Sharpe ratio, skewness, and kurtosis before June 2009. It decreases the skewness of the SCC group. Besides, VT only enhances the mean alpha of portfolios in the Growth groups.

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9 The table only reports the Sharpe ratios and alphas. Results on skewness and kurtosis are available upon request.

Table 5 Performance of scale versus unscaled mutual fund portfolios
(portfolios formed in the second highest, second-lowest, and lowest quartiles by in-sample t-value of alphas)

In each group of investment style, we report the portfolios with the second highest, second-lowest, and lowest in-sample t-value of alphas of that group in panel A, panel B, and panel C, respectively. Numbers labeled "Original" ("VT") are performance indicators of the portfolios without (with) volatility timings. #s indicate that VT contributes to improving performance. The sample starts from September 1998 and ends by December 2020.

Portfolio	Panel A. Second Highest				Panel B. Second Lowest				Panel C. Lowest			
	Sharpe Ratio		Mean Alpha		Sharpe Ratio		Mean Alpha		Sharpe Ratio		Mean Alpha	
	Original	VT	Original	VT	Original	VT	Original	VT	Original	VT	Original	VT
September 1998-June 2009												
LCC	-0.07	-0.03#	0.05	0	-0.07	-0.03#	0	-0.06	-0.07	-0.02#	-0.02	-0.08
LCG	-0.09	-0.06#	-0.05	-0.06	-0.07	-0.03#	0.22	0.23#	-0.09	-0.05#	0.04	0.02
LCV	0.02	0.07#	-0.04	-0.13	0.01	0.06#	-0.1	-0.19	-0.01	0.05#	0	-0.09
MCG	-0.04	0.00#	0.25	0.22	-0.01	0.02#	0.32	0.2	-0.04	0.00#	0.2	0.14
SCC	0.07	0.10#	0.01	-0.07	0.06	0.08#	-0.04	-0.09	0.04	0.06#	-0.15	-0.21
SCG	-0.02	0.00#	-0.01	0.05#	-0.02	0.00#	-0.15	-0.08#	-0.02	0.00#	-0.14	-0.13#
SCV	0.05	0.09#	-0.16	-0.31	0.11	0.15#	0.18	0.03	0.07	0.10#	-0.15	-0.34
July 2009-December 2020												
LCC	0.29	0.26	-0.03	-0.07	0.31	0.26	0.03	-0.03	0.29	0.24	-0.01	-0.04
LCG	0.34	0.31	0.18	0.07	0.35	0.32	0.19	0.1	0.31	0.27	-0.02	-0.15
LCV	0.23	0.17	-0.01	-0.18	0.23	0.17	-0.07	-0.13	0.22	0.17	-0.08	-0.18
MCG	0.35	0.3	0.11	-0.07	0.32	0.28	-0.07	-0.24	0.33	0.27	0.07	-0.19
SCC	0.19	0.12	0.01	-0.25	0.18	0.1	-0.05	-0.26	0.19	0.12	0.09	-0.16
SCG	0.2	0.19	-0.37	-0.27#	0.24	0.19	-0.13	-0.32	0.24	0.18	0.12	-0.04
SCV	0.18	0.1	-0.08	-0.28	0.17	0.09	-0.06	-0.33	0.16	0.09	-0.09	-0.3

4.4.2 Results for the downside volatility-managed strategy

Wang et al. (2020) show that the performance improvement from volatility scaling is even greater when fund returns are scaled by past downside volatility. In this subsection, we check if the baseline results changes when we switch to downside volatility timing (DVT). Table 6 summarizes the results.[10] Similar to VT, DVT does not work after June 2009 but increases the Sharpe ratios of all groups before June 2009. It turns the Sharpe ratio of the LCC, LCG, and MCG groups from negative to positive. It also increases the skewness of all groups before June 2009. Compared with VT, DVT appears to be more effective in reducing crash risk after June 2009. While VT fails to increase the skewness of the all groups after June 2009, DVT successfully increases the skewness of the lap-cap and MCG groups.

Table 6 Performance of scale versus unscaled mutual fund portfolios (downside volatility scaling)
Numbers labeled "Original" ("DVT") are performance indicators of the portfolios without (with) downside volatility timings. #s indicate that DVT contributes to improve the performance. Fund portfolios are sorted into 7 investment style groups: Small-cap core (SCC); Small-cap value (SCV); Small-cap growth (SCG), Mid-cap growth (MCG), Large-cap core (LCC), Large-cap value (LCV), and Large-cap growth (LCG). And in each group of investment style, we only report the portfolios with the highest in-sample t-value of alphas in that group. The sample starts from September 1998 and ends by December 2020.

Portfolio	Sharpe Ratio		Skewness		Kurtosis		Mean Alpha	
	Original	DVT	Original	DVT	Original	DVT	Original	DVT
Panel A. September 1998-June 2009								
LCC	-0.06	0.05#	-0.63	-0.24#	3.71	3.61#	-0.02	-0.38
LCG	-0.07	0.05#	-0.47	0.02#	3.39	4.15	0.30	0.16
LCV	0.02	0.11#	-0.58	-0.18#	4.30	3.01#	0.10	-0.22
MCG	-0.04	0.07#	-0.67	-0.15#	4.06	4.72	0.23	0.00
SCC	0.10	0.12#	-0.61	-0.43#	4.38	4.01#	0.22	-0.06
SCG	0.00	0.05#	-0.47	-0.32#	3.74	4.82	-0.14	-0.19
SCV	0.12	0.16#	-0.70	-0.13#	4.72	3.81#	0.07	-0.23
Panel B. July 2009-December 2020								
LCC	0.29	0.21	-0.41	0.49#	4.28	14.78	-0.02	-0.10
LCG	0.34	0.28	-0.18	1.50#	3.37	13.80	0.17	0.01
LCV	0.24	0.14	-0.41	-0.24#	4.98	13.22	-0.04	-0.31
MCG	0.37	0.25	-0.34	0.43#	4.66	11.95	0.07	-0.28
SCC	0.19	0.03	-0.46	-2.22	5.37	12.07	-0.09	-0.78
SCG	0.27	0.19	-0.37	-1.62	4.93	9.06	0.27	0.05
SCV	0.20	0.04	-0.73	-1.99	7.11	10.70	0.09	-0.64

4.4.3 Results for scaling using volatility over the prior month

Previous literature uses volatility over the prior month to scale the investment position. In this subsection, we show that our baseline results are robust if we use the same window as in the literature to calculate past volatility. Table 7 reports the performance of unscaled portfolios versus portfolios scaled using volatility estimated over the past one month. VT still generates higher Sharpe ratios in all groups before June 2009. It also increases the skewness of portfolios in all style groups and reduces kurtosis in most groups before June

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10 Here we only reports the results for the portfolios with the highest alphas. Other results are similar and available unpon request.

2009. By contrast, VT seldom improve the original portfolio after June 2009. Therefore, our key results are robust to the window choice for past volatility calculation.

Table 7 Performance of scale versus unscaled mutual fund portfolios
(volatility estimated over the past one month)

Numbers labeled "Original" ("VT") are performance indicators of the portfolios without (with) volatility timings. #s indicate that VT contributes to improve the performance. Fund portfolios are sorted into 7 investment style groups: Small-cap core (SCC); Small-cap value (SCV); Small-cap growth (SCG), Mid-cap growth (MCG), Large-cap core (LCC), Large-cap value (LCV), and Large-cap growth (LCG). And in each group of investment style, we only report the portfolios with the highest in-sample t-value of alphas in that group. The sample starts from September 1998 and ends by December 2020.

Portfolio	Sharpe Ratio		Skewness		Kurtosis		Mean Alpha	
	Original	VT	Original	VT	Original	VT	Original	VT
Panel A. September 1998-June 2009								
LCC	-0.05	0.00#	-0.55	-0.22#	3.58	2.41#	-0.02	-0.16
LCG	-0.05	-0.01#	-0.37	-0.20#	3.23	2.60#	0.30	0.27
LCV	0.02	0.09#	-0.54	-0.28#	4.30	3.21#	0.10	0.05
MCG	-0.01	0.04#	0.13	0.20#	4.98	4.12#	0.22	0.21
SCC	0.11	0.14#	-0.55	-0.19#	4.28	6.35	0.22	0.09
SCG	0.00	0.04#	0.02	0.13#	4.05	3.73#	-0.12	-0.18
SCV	0.12	0.16#	-0.70	-0.61#	4.85	5.01	0.08	-0.13
Panel B. July 2009-December 2020								
LCC	0.29	0.27	-0.41	-1.21	4.28	6.62	-0.02	-0.05
LCG	0.34	0.35#	-0.18	-0.63	3.37	4.74	0.17	0.25#
LCV	0.24	0.23	-0.41	-0.72	4.98	4.25#	-0.04	-0.13
MCG	0.37	0.33	-0.34	-0.99	4.66	5.41	0.07	-0.24
SCC	0.19	0.10	-0.46	-1.06	5.37	6.88	-0.09	-0.42
SCG	0.27	0.25	-0.37	-0.96	4.93	5.07	0.27	0.24
SCV	0.20	0.10	-0.73	-0.84	7.11	5.96#	0.09	-0.31

5. Conclusion

In this paper, we apply the volatility timing (VT) technique to mutual fund portfolios of different investment styles. We show that VT is useful not only in the stock and currency markets as documented in the literature but also in mutual fund investments before June 2009. Its effects differ across fund investment styles. For fund portfolios which focus on large-cap and mid-cap stocks, VT universally increases the Sharpe ratio, and skewness while reduces the kurtosis before June 2009. It also increases the Sharpe ratios of the small-cap stocks focused fund portfolios, but the enhancement is smaller compared with large-cap and mid-cap groups. While all the groups have higher Sharpe ratio, higher skewness, and lower kurtosis before June 2009, VT only increases the mean alphas of portfolios focused on growth funds. The fact shows that VT improving portfolios' performance through market-timing and changing factor loadings but not by anomalies.

Moreira and Muir (2017) suggest that the superior performance of the volatility management strategy poses a challenge to the risk-based asset pricing theory. In our mutual fund context, a similar puzzle exists in the sample before June 2009. However, the puzzle disappear after June 2009. Volatility management by scaling the mutual fund positions by past volatility can no longer improve the performance of the fund portfolios. A notable difference between the sample before and after June 2009 is that the stock market return grows much

faster after June 2009.   We find that the ability of VT to improve Sharpe ratios through changing the portfolio loading on the market factor weakens after June 2009. Hence, how the changing stock market trend affects the effectiveness of the VT technique deserve further theoretical and empirical research.

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Appendix A:

As pointed out by Hunter et al. (2014), mutual funds with similar investment strategies will have correlated residuals from factor models like they share a common idiosyncratic risk factor. This in-group correlation will reduce the efficiency of estimation. Hunter et al. (2014) proposed an approach to group mutual funds with similar investment strategies and use the commonalities of funds' returns in the group to deal with the problem about the in-group correlation of residuals.

Specifically, they use the methodology proposed by Cremers and Petajisto (2009) to measure the deviation between the portfolio held by a fund and a passive equity index's constituents, which is called active share of the fund concerning the index as the benchmark, and categorize funds into different styles groups based on their closet matching equity index. The groups are defined as active peer group benchmark (APB). After that, the authors estimate the residuals of the regression of equal-weighted return of each styles groups to Carhart 4 factors (similar to formula 1 in the main text), and the residuals are augmented to the Carhart 4-factor model to adjust residual correlation between individual funds and enhance the efficiency of estimation (similar to formula 2 in the main text). Their empirical results show that the APB-augmented Carhart 4-factor model substantially reduces time series in-group correlation of residuals compared with the original model.

We follow Hunter et al. (2014) to deal with the econometric problem and group funds into seven groups: small-cap core (SCC), small-cap value (SCV), small-cap growth (SCG), mid-cap growth (MCG), large-cap core (LCC), large-cap value (LCV), and large-cap growth (LCG).

Before September 2009, data of active share is obtained from Petajisto's website. From October 2009 to December 2020, when the data of the best fit index is not provided by the author, we use a similar method as Hunter et al. (2014) and Cremers and Petajisto (2009) to construct the data. More Specifically, we use Russell 1000, Russell 1000 Value, Russell 1000 Growth, Russell Midcap, Russell Midcap Value, Russell Midcap Growth, Russell 2000, Russell 2000 Value, Russell 2000 Growth as the benchmark passive indexes, and for every fund, every benchmark passive index, and in every quarter, we calculate active share with the data of fund's portfolio holdings and the data of the index's constituents and weights in that quarter, the benchmark index that makes a fund have minimum active shares is defined as the best fit index of the fund, we categorize funds according to their best fit indexes. For example, funds whose best-fitted index is Russell 1000 Growth will be categorized into the group of large-cap growth, since Russell 1000 Growth is an index heavily weighted in large-cap growth stocks. Groups with Russell 1000 series index best-fitted funds are named

Large-Cap. Groups with Russell 2000 series index best-fitted funds are named Small-Cap. Index constituents are download from Bloomberg and the weights are estimated by us following the methodology manual of Russell index. Data on mutual funds' holdings are downloaded from WRDS.

Table A1 Performance of scale versus unscaled mutual fund portfolios
(from September 1998 to December 2020)

Numbers labeled "Original" ("VT") are distributional characteristics and Sharpe ratios of the excess returns of the portfolios without (with) volatility timings. #s indicate that VT contributes to improve the performance. And in each group of investment style, we only report the portfolios with the highest OOS alphas in that group. The sample starts from September 1998 and ends by December 2020.

Portfolio	Sharp Ratio		Skewness		Kurtosis		Mean Alpha	
	Original	VT	Original	VT	Original	VT	Original	VT
LCC	0.12	0.14#	-0.56	-0.68	4.09	4.14	-0.02	-0.07
LCG	0.13	0.17#	-0.48	-0.34#	3.74	3.55#	0.23	0.19
LCV	0.14	0.14#	-0.52	-0.90	4.69	4.98	0.02	-0.06
MCG	0.12	0.17#	-0.81	-0.79#	5.09	4.56#	0.14	0.01
SCC	0.14	0.11	-0.53	-1.12	4.91	6.51	0.06	-0.13
SCG	0.13	0.13	-0.54	-0.98	4.49	5.38	0.09	0.06
SCV	0.16	0.14	-0.72	-1.08	5.78	6.46	0.08	-0.13

Note: a. The performance of a given portfolio becomes better if either one (or a combination) of the followings happens (conditional on other variables holding constant): the mean increases, standard deviation decreases, skewness increases, or the Sharpe ratio increases. b. Small-cap core (SCC); Small-cap value (SCV); Small-cap growth (SCG), Mid-cap growth (MCG), Large-cap core (LCC), Large-cap value (LCV), and Large-cap growth (LCG).

Exchange Rate Co-movements and Corporate Foreign Exchange Exposures: A Study on RMB [*]

By HE QING, WANG WENQING AND YU JISHUANG [*]

Abstract

We estimate the time-varying co-movements of large set of bilateral exchange rates/the RMB and explore their relationship with the firm-level exchange rate exposure in China.

Empirical evidence reveals that firms' exposure to exchange rate fluctuations increases during periods of heightened co-movements in exchange rate. The co-movements of emerging market currencies have a weaker effect on exposure compared to the co-movements of developed market currencies. This effect becomes more pronounced after the launch of One Belt One Road initiative, RMB inclusion in SDR basket and in highly multinational firms, providing evidence that the RMB's internationalization (i.e., its anchoring effect) has generally helped to reduce Chinese firms' exposure to exchange rate fluctuations of emerging market currencies.

JEL Classification: G32, G39, G15
Keywords: exchange rate co-movements, exchange rate exposure, RMB internalization

1. Introduction

Amid China's burgeoning economy, the international use of the RMB in global markets has risen significantly in recent years (Cheung et al, 2018; Cheung, 2021). As of end-2019, about 19.15% of China's trade was settled using the RMB. According to the Society for Worldwide Interbank Financial Telecommunication (SWIFT), the transactions share of the RMB in the global financial market has increased to 1.94%, ranking 6th in the world (SWIFT, 2020). It is clear that the RMB is playing an increasing role as an anchor currency. A growing number of studies have found that the RMB has substantially driven the movements of regional and other emerging market currencies since its detachment from the USD in July 2005 (Caporale et al., 2018; Marconi, 2018).[11]

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11 Caporale et al. (2018) show that the RMB is increasingly replacing the USD as an anchor currency in emerging market economies.

More recent evidence has found stronger RMB impacts by observing strikingly similar movements between the RMB and a set of emerging market economies after the outbreak of COVID-19. During the period of the RMB's appreciation against the USD, Asia's emerging market currencies have experienced similar movements (Wei et al., 2020). The RMB's increased flexibility and its driving role in emerging market currencies raise an important question which has yet to be understood: whether and how exchange rate co-movements against the RMB influence Chinese firms' exchange rate exposure.

Theoretically, it would be straightforward to have a positive relationship between currency co-movements against the RMB and Chinese firms' exchange rate exposure since foreign exchange rate risks are not fully diversified if the currency movements in an international portfolio are highly correlated (Goldberg and Heflin, 1995; Krapl, 2017, 2020). However, the driving force behind co-movements against the RMB can manifest in two distinct ways. Changes in bilateral exchange rates/the RMB are determined by both the value of the RMB and the value of respective currencies. From the perspective of Chinese firms, if the RMB drives the dynamics of other currencies, the movements of multiple exchange rates (or a currency portfolio) are determined by the RMB's value changes. Nevertheless, currency co-movements against the RMB can also emerge simply because the values of other currencies move in the same direction, for instance, if their values are predominantly influenced by changes in the USD.

To answer our research question, we examined the relationship between currency co-movements against the RMB and corporate exchange rate exposures in China. In the foreign exchange market, the return and volatility of different currencies will be affected by various shocks, resulting in the similarity of returns and fluctuations of different currencies. The currency literature has referred this similarity as exchange rate co-movement (Chiang et al., 2007; Billio et al., 2017; Krapl, 2020). From the perspective of Chinese firms, exchange rate co-movement is reflected in the return similarity of various currencies against RMB (McCauley and Shu, 2019). Drawing from prior studies (Billio et al., 2017; Krapl, 2020), we employ unconditional correlation coefficients of bilateral exchange rates to gauge co-movements. A higher positive correlation coefficient indicates a stronger degree of exchange rate co-movement between currencies.[12]

Specifically, we estimated multiple currency co-movements for developed economies (DE) and emerging market economies (EME). There are significant differences between the co-movements of DE and EME currencies. The integration of emerging market economies with global markets varies, with some, such as South Africa, China, and India, only partially linked to global financial markets, resulting in low correlations with developed economies' assets (Bekaert et al., 2011; Donadelli and Paradiso, 2014; Billio et al., 2017). Conversely, certain emerging market economies, like Korea and Thailand, experience heightened vulnerabilities during DE countries' economic turbulence due to their high integration with international financial markets[13]. Of particular significance, an increasing number of EME currencies are incorporating the RMB into their currency baskets, indicating the RMB's progression towards anchor currency status (Keddad, 2019). The anchoring effect should increase EME currency co-movements as their values are closely tied to the value of the RMB. Moreover, the anchoring effect increases the benefits of using a particular anchor (e.g., the RMB) for international trade and asset settlements with countries using the same anchor (Eichengreen et al., 2007; Meissner and Oomes, 2009). Consequently, this mitigates Chinese firms' exchange rate exposure by offsetting foreign currency revenues with costs denominated in the same currency. As a result, the co-movements of EME currencies are anticipated to exert a weaker impact on exchange rate exposure compared to those of DE currencies.

Using a large sample of all Chinese public firms from 2005 to 2019, we empirically examined the effects of currency co-movements on firms' exposure to exchange rate fluctuations. We found that currency co-movements against the RMB are time-varying. Notably, as the RMB attains status as a regional currency and undergoes increased flexibility, we observe a reduction in co-movements of developed economies' currencies against the RMB, juxtaposed with a noteworthy escalation in co-movements of emerging market economies' currencies against the RMB.

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12 This simple correlation measures co-movements as well or better than more sophisticated measures (Billio et al., 2017)
13 Highly Integration of emerging market economies and the risk aversion of international investors are important reasons for EME vulnerability to the global financial crisis
 (Calvo et al., 2006; Reinhart and Rogoff, 2009; Aizenman et al. 2016). We thank the suggestions of an anonymous referee.

Our evidence is consistent with the prediction that exchange rate co-movements heighten firms' exchange rate exposure, while the anchoring effect of the RMB weakens the relationship between exchange rate co-movements and exposure to emerging market economy (EME) currencies. In particular, we found that exposure increased with DE currencies and EME currencies' co-movements, with the impact being economically smaller for the latter group. Notably, the influence of EME currency co-movements on firms' exchange rate exposure diminished following the implementation of the Belt and Road Initiative (BRI) and among highly multinational firms.

Similar results were obtained across multiple measures of exchange rate co-movements and exposure as well as with a variety of specifications. Furthermore, we find that these results remain unaffected even after controlling for other conventional determinants of exchange rate exposure, and incorporating fixed effects to account for industry, year, and firm-specific factors.

Finally, we provide further evidence on how the RMB's internationalization and movements affect our results. We found that the impact of exchange rate co-movement on exposure to EME currencies was more pronounced prior to the RMB's inclusion in the Special Drawing Right (SDR) and during periods characterized by RMB depreciation and heightened volatility. These results reinforce our previous findings that the RMB's internationalization (i.e., its anchoring effect) has generally helped to reduce the impact of exchange rate co-movements on Chinese firms' exchange rate exposure.

Our research is related to the growing body of economic and policy research on the RMB's internationalization. Existing research has predominantly focused on several key inquiries, including the RMB's impact on the dynamics of emerging market economy (EME) currencies (Kawai and Pontines, 2016; Keddad, 2019), its role as a safe haven currency (Fatum et al., 2017; McCauley and Shu, 2019), and its effects on the international monetary system (He et al., 2016; Batten and Szilagyi, 2016; Marconi, 2018). In this context, our study advances this field of research by demonstrating that the RMB's internationalization can significantly influence the time-varying diversifiability of Chinese firms' exposure to exchange rate fluctuations involving EME currencies.

Our study also adds to the existing literature on exchange rate exposure, as it represents the first academic endeavor to directly examine the association between firms' exchange rate exposure level and exchange rate co-movements relative to the RMB. Recent empirical evidence indicates the significant relevance of undiversifiable currency risk arising from currency co-movements for numerous US firms (Krapl, 2020). Our findings suggest that this may be attributed to the prevalent inability of many firms to effectively hedge foreign revenue with costs denominated in the same currency. Consequently, future research should consider incorporating the invoicing currency utilized in international transactions to accurately estimate a firm's exposure to exchange rate fluctuations.

Our study underscores the significance of currency risk exposure and emphasizes the importance for firms to be vigilant about potential currency mismatches between their revenues and costs. The interplay of currency co-movements may result in fluctuations in a firm's exposure to exchange rate risk, thereby posing challenges to its risk management strategies. Furthermore, our research yields evidence supporting the added advantages of currency internationalization. Specifically, a higher level of currency internationalization, particularly the use of domestic currency in cross-border transactions, can serve to alleviate the undiversifiable risk arising from such co-movements.

The paper is structured as follows: Section 2 provides an overview of the institutional background relevant to our study and formulates our main hypotheses; Section 3 outlines the data and methodology employed in our analysis; Section 4 presents the empirical findings; Section 5 conducts various robustness checks to validate the results; and Section 6 offers concluding remarks to summarize the key insights of the paper.

2. Institutional background and hypothesis development
2.1 Institutional background
Prior to July 2005, China adhered to a fixed exchange rate system, pegging the RMB to the value of the USD. During the period from 1994 to 2005, the RMB's exchange rate remained relatively stable at approximately 8.28. In an effort to reduce the influence of the USD on the formulation of RMB exchange rate policies, the People's Bank of China (PBOC) announced on 21st July 2005 its adoption of a managed floating

exchange rate regime with reference to a basket of currencies. The composition of this basket comprised currencies of countries with significant trade, external debt, and foreign direct investment exposure to China (Zhou, 2005). Under this new regime, the daily trading price of the USD/RMB exchange rate was allowed to fluctuate within a 0.3% band around the central parity. Subsequently, on 18th May 2007, the trading bandwidth of the RMB against the USD was extended to 0.5%.

However, during the 2008 global financial crisis, the market-oriented reform was interrupted, leading to the RMB being de facto pegged to the USD at a rate of 6.83. The reform resumed on 19th June 2010 when the PBOC expressed its intention to further advance the reform of the RMB exchange rate regime and enhance the RMB's exchange rate flexibility. The central objective was for the RMB exchange rate to be more reflective of market supply and demand with reference to a basket of currencies. Consequently, the trading bandwidth was further expanded to 1% on 14th April 2012 and 2% on 17th March 2014.

To enhance the influence of market forces in shaping the RMB exchange rate, the People's Bank of China (PBOC) took additional measures. On 11th August 2015, the PBOC announced its commitment to 'improve quotation of the central parity of RMB against the US dollar,' and instructed that market makers' daily reports of central parity to the China Foreign Exchange Trade System (CFETS) should reference the closing rate of the inter-bank foreign exchange market from the previous day[14].

The overhaul of the central parity quotation system marked a significant stride taken by China in its transition towards greater RMB exchange rate flexibility (Cheung et al., 2018). As depicted in Figure 1, the RMB exchange rate experienced a reversal in its downward trajectory in August 2015, the first instance since 2010. Subsequently, it resumed a downward trend in August 2017 before witnessing a renewed upswing in July 2018. The heightened fluctuation in the RMB-USD exchange rate indicates that market forces have played a discernible role in determining the RMB's value.

Furthermore, driven by China's increased prominence in the global economy, underscored by initiatives such as the Belt and Road Initiative (BRI) and the RMB's inclusion in Special Drawing Rights (SDR) baskets, the RMB has witnessed a substantial rise in its global standing. Trading in RMB has surged considerably over the past decade, growing more than sevenfold as a share of the global financial markets, from 0.25% in 2012 to 1.94% in 2019. By the end of 2019, approximately 19.15% of China's trade transactions were settled in RMB. Notably, China's RMB has surpassed the euro, securing the position of the second most widely used currency in international trade finance (SWIFT, 2020).

In summary, the enhanced exchange rate flexibility of the RMB has correspondingly intensified the co-movements of other emerging market economy (EME) currencies in relation to the RMB. Put differently, the RMB's influence on other currencies has been bolstered as the currency adopts a more flexible stance towards a range of multilateral currencies.

Figure 1 The bilateral USD-RMB exchange rate

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14 Available at http://www.pbc.gov.cn/en/3688110/3688181/a13b2cb0/index89.html.
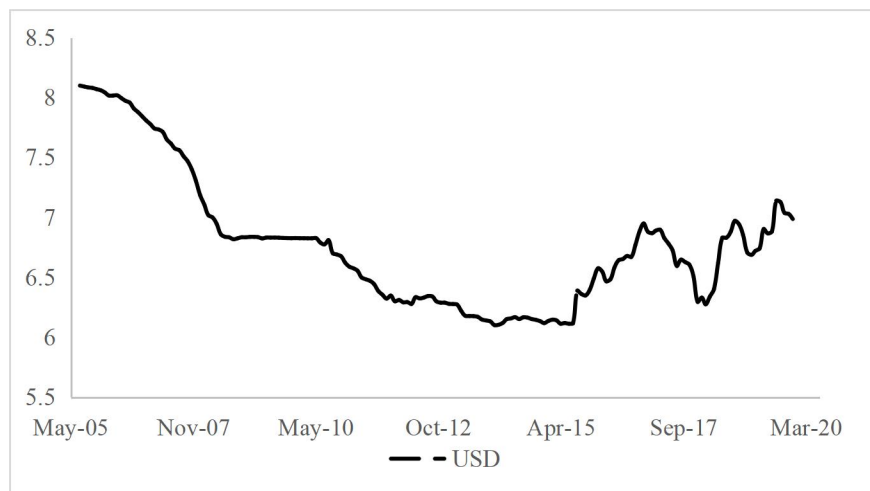
2.2 Literature review and hypothesis development

It is well accepted that foreign exchange rate risks are significantly priced in the global financial market and are important determinants of expected equity returns (Reeb et al., 1998; Carrieri et al., 2006; Krapl, 2015). This is mainly attributed to the non-diversifiable nature of foreign exchange rate risk, which exerts adverse effects on the performance of international portfolios (Eun and Resnick, 1988; Goldberg and Heflin, 1995; Dolde et al., 2012). In line with this, numerous empirical studies have consistently identified a significant negative association between the diversifiability of foreign exchange rate risks and systematic risks (Goldberg and Heflin, 1995; Krapl, 2020).

The non-diversifiability of exchange rate risks arises from the high correlation among the movements of multivariate exchanges (Eun and Resnick, 1988; Allayannis et al., 2001; Krapl, 2020). From the perspective of Chinese firms, their exchange rate exposures predominantly hinge on the correlation between foreign exchange rates vis-à-vis the RMB. If these firms are exposed to multiple foreign exchange rates exhibiting strong and positive correlations, the resulting exchange rate co-movements become substantial, leading to a lack of diversification in exchange rate exposures.

The movement of foreign currency exchange rates against the RMB depends on both the value of the RMB and the value of respective foreign currencies. Consequently, currency co-movements arise in two scenarios: firstly, when the values of multiple currencies are driven by the value of the RMB, and secondly, when there exist common factors influencing the values of multiple currencies. The latter aspect has been extensively addressed in the currency co-movements literature (Benediktsdottir and Scotti, 2009; Li, 2011; Loaiza-Maya et al., 2015; Caporale et al., 2018), whereas the former has received relatively less attention.

Significantly, the RMB's increasing prominence as an anchor currency has exerted a growing influence on other emerging market economy (EME) currencies (Kawai and Pontines, 2016; Caporale et al., 2018). EME currencies tend to closely co-move with the RMB when significant changes occur in the RMB's value, as the RMB drives the movements of these currencies. However, a more globally integrated RMB strengthens its anchoring effect and enables the offsetting of foreign currency revenues with costs in the same currency, particularly for EME currencies, resulting in a substantial reduction in exposure[15].

The currency risks associated with emerging market economies (EME) have assumed growing significance, given their pivotal role in China's international trade and finance. Should Chinese firms possess the capability to conduct transactions with EME countries using the same currency (referred to as the anchoring effect), the non-diversifiable exchange rate risks arising from the co-movement of EME currencies are expected to have a

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15 Bodnar and Marston (2002) demonstrate the offsetting effects of foreign currency revenues and costs being in the same currency.

diminished impact on firms' exchange rate exposure. Drawing from the aforementioned analysis, we have formulated the following hypothesis:

H_1: Corporate exchange rate exposures are positively correlated with exchange rate co-movements. The co-movement of EME currencies has a smaller impact on firms' exchange rate exposure than the co-movement of DE currencies.

The next question pertains to whether the launch of the BRI has changed exchange rate co-movements and their impacts on Chinese firms' exchange rate exposure. The BRI, an international economic cooperation initiative proposed by China, seeks to strengthen trade and financial collaborations with partner countries through the development of the land-based Silk Road Economic Belt and the 21st Century Maritime Silk Road[16]. This initiative has fostered international cooperation, promoted China's overseas direct investments, and amplified the significance of China's trade with its partner nations. Consequently, the RMB's influence on regional currencies has intensified, forging closer ties between the RMB and these currencies.

Several studies have identified a rise in the utilization of the RMB for cross-border transactions under the BRI (Ito, 2017). Furthermore, to uphold their price stability and international competitiveness, several emerging market economies (EMEs) have explicitly or implicitly incorporated RMB weights in their basket currencies (Lien et al., 2014; Marconi, 2018).

The implementation of the Belt and Road Initiative (BRI) is expected to augment the anchoring effect of the RMB and potentially strengthen its association with emerging market economy (EME) currencies. Additionally, the BRI is facilitating cross-border transactions for Chinese firms utilizing the RMB, consequently mitigating their exposure to currency risks. As a result, we hypothesize that the non-diversifiable exchange rate risks arising from the co-movement of EME currencies will have a reduced impact on firms' exposure under the BRI. Thus, we put forth the following hypothesis:

H_2: The co-movements of EME currencies exhibit a smaller impact on firms' exchange rate exposure after the launch of the BRI.

It is important to note that exchange rate risks not only affect multinational companies (MNCs) directly engaged in international operations, but also domestic firms that do not engage in international trade or international financial transactions (Bergbrant et al., 2014; Francis et al., 2017). Domestic firms can be affected indirectly due to competition in the markets in which they operate (Hutson and Laing, 2014)[17] and by resource allocation from domestic firms to globally engaged firms (Goldberg, 1993).

In contrast, multinational companies (MNCs) face both direct and indirect exposures to exchange rate risks, but they also have various avenues for risk reduction, such as currency diversification, offsetting currency revenue with costs in the same currency, and enhanced flexibility in managing foreign exchange risks (Pantzalis et al., 2001; Hutson and Liang, 2014; He et al., 2021). Numerous studies have indicated a negative relationship between multinationality and exchange rate exposure. For instance, Pantzalis et al. (2001) examined a sample of 220 US-based MNCs and found that exposure decreases with the number of countries in which the firm has subsidiaries. Similarly, Williamson (2001) demonstrated that within the auto industry, a firm's exposure decreases with the extent of its foreign operations. More recently, Huston and Laing (2014) observed a significant inverse relationship between firms' exchange rate exposures and the level of their multinationality.

These discussions have two significant implications. Firstly, domestic firms are susceptible to indirect exposure. Thus, we anticipate a positive relationship between the exchange rate exposure of domestic firms and exchange rate co-movements. Secondly, the impact of exchange rate co-movements on the exposure of multinational companies (MNCs) is expected to be economically smaller compared to the impact on domestic firms. MNCs have the advantage of employing alternative strategies to mitigate exchange rate risks, which is not readily available to domestic firms. Notably, Chinese MNCs can effectively reduce their exposure by

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16 The Silk Road Economic Belt Initiative and the 21st Century Maritime Silk Road Initiative were put forward by President Xi Jinping in September and October 2013, respectively. On March 28, 2015, the National Development and Reform Commission (NDRC), China's Foreign Ministry, and China's Ministry of Commerce jointly issued the Vision and Actions on Jointly Building the Silk Road Economic Belt and the 21st Century Maritime Silk Road.

17 The indirect exposure arises because domestic firms have business relationships with exporters or importers; also, they are competitors of firms that are significantly exposed to exchange rate fluctuations (Francis et al., 2017).

extensively utilizing the RMB in international transactions, thereby offsetting foreign revenue with costs. As the RMB plays an increasingly pronounced role in emerging market economies (EME), the impact of EME currency co-movements on MNCs' exposure is anticipated to be smaller than the impact of developed economy (DE) currency co-movements. In light of these expectations, we propose a third hypothesis:

H_3: Exchange rate co-movements have larger impacts on the exposure of domestic firms than on the exposure of MNCs. The exposure of MNCs should be less sensitive to the co-movements of EME currencies than those of DE currencies.

3. Data and methodology

Our sample consisted of firms listed on the two major stock exchanges in China (i.e., Shanghai Stock Exchange and Shenzhen Stock Exchange). Following the literature (He et al., 2021, Liu et al., 2021; Shi et al., 2023), we excluded financial companies[18] and companies with missing financial statements and used two currency pools, namely developed economies (DE) and emerging market economies (EME) in our analysis[19].

We calculated the monthly bilateral exchange rates against the RMB for currencies in DEs and EMEs by using exchange rates against the USD in the International Financial Statistics (IFS) database published by the International Monetary Fund (IMF). The estimation window for our analysis spanned from August 2005 to December 2019.

3.1 Estimating exchange rate co-movements

To assess currency co-movements, we adopted the approach of utilizing unconditional correlation coefficients of bilateral exchange rates, as previously employed in the literature (Billio et al., 2017; Krapl, 2020). Correlation coefficients provide an intuitive measure for capturing currency co-movements, and the currency literature has recommended their use, which has shown consistency with other sophisticated methods (Chiang et al., 2007; Billio et al., 2017).

Using a 4-year rolling period window, we estimated the bilateral Pearson correlation coefficients (UCC) for DE and EME currency portfolios[20]. The mean values of UCC were used as measures of currency co-movements for each currency portfolio. Higher mean UCC values indicate reduced diversifiability of a firm's exposure to a currency portfolio.

$$comove = mean(UCC) \tag{1}$$

Note that the existing literature encompasses various co-movement measures (Goetzmann and Kumar, 2008; Pukthuanthong and Roll, 2009; Lustig et al., 2011; Billio et al., 2017). To ensure the robustness of our findings, we employed several additional co-movement measures and conducted thorough analyses in Section 5.1.

3.2. Estimating corporate foreign exchange exposures

Following the literature (Jorion, 1990; He and Ng, 1998; Bartram et al., 2010), we estimated a linear two-factor model to measure individual firms' foreign exchange exposure:

$$LRf_{i,t} = \alpha_i + \mu_i LRm_t + \gamma_i LRc_t + \epsilon_{i,t} \tag{2}$$

where $LRf_{i,t}$ is the log monthly stock returns of firm i at time t; LRm_t is the log monthly returns of the value-weighted market index for all listed firms from both the Shanghai and the Shenzhen stock exchanges; and LRc_t is the log monthly returns of the currency index. The coefficient γ_i is a proxy for the firm's exchange rate exposure, measuring the sensitivity of the firm's value to exchange rate fluctuations. The exposure estimates largely rely on trade-weighted currency indices, such as the US Fed's MCI, OITP, and BROAD indices (Krapl, 2020). To investigate the impacts of co-movements of DE and EME currencies on

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18 Accounting standards and supervision requirements for the financial industry differ substantially from those in other industries. Both operational and financial indicators are not comparable between financial and non-financial firms.

19 For the currencies in DE, 19 developed countries and regions with sufficient data regarding the exchange rate against the RMB were selected: the United States, Canada, Australia, New Zealand, Japan, Norway, the United Kingdom, Sweden, Denmark, and the euro zone (Ireland, Austria, Belgium, Germany, France, Finland, the Netherlands, Portugal, Spain, and Italy). For EME, 54 countries and regions were selected: Albania, Afghanistan, the United Arab Emirates, Oman, Azerbaijan, Egypt, Pakistan, Bahrain, Belarus, Bulgaria, Bosnia and Herzegovina, Poland, Bhutan, Russia, Philippines, Georgia, Kazakhstan, Kyrgyzstan, Cambodia, the Czech Republic, Qatar, Kuwait, Croatia, Laos, Lebanon, Romania, Maldives, Malaysia, Macedonia, Mongolia, Bangladesh, Myanmar, Moldova, Nepal, Serbia, Saudi Arabia, Sri Lanka, Tajikistan, Thailand, Turkey, Brunei, Ukraine, Singapore, Hungary, Armenia, Yemen, Iraq, Iran, India, Indonesia, Jordan, Vietnam, Korea, and Chinese Taiwan.

20 UCC for each month is estimated using a 4-year window, from 48 months prior to the current month. We also use a 5-year rolling window, and obtain similar results. And a broad combination of DEs and EMEs is presented in the robustness check.

exposure, we utilized two exchange rate indices in our analysis. These exchange rate indices are trade-weighted averages of log changes in the bilateral exchange rates between the RMB and (i) currencies in DE; (ii) the currencies in EME. Equation (2) was estimated using 4-year rolling window regression.

3.3. Research design

To test the hypotheses put forth in this study, we employed regression analysis, following the approach adopted in Krapl (2020) and He et al. (2021). Specifically, we conducted regression of the absolute FX exposure ($|\gamma_{i,t}|$) on the co-movements of bilateral exchange rates ($comove$). The panel fixed effects model is as follows:

$$|\gamma_{i,t}| = \delta_0 + \delta_i + \theta_t + \eta_{i,t} + \beta comove_t + \rho Control + \epsilon_{i,t} \qquad (3)$$

where $|\gamma_{i,t}|$ is the absolute value of the FX exposure of firm i at month t; δ_0 is the intercept term; δ_i and θ_t are firm and year fixed effects, respectively; $\eta_{i,t}$ represents an industry dummy; $comove_t$ is the measure of the co-movements of bilateral exchange rates.

$Control$ includes a variety of firm-level exchange rate determinants used in prior studies. Firm size is considered, as smaller firms tend to exhibit higher susceptibility to exchange rate fluctuations compared to larger firms (Hutson and Laing, 2014; He et al., 2021). We controlled for firm size using the total assets as a measure ($size$). Moreover, firms' foreign sales could influence their exposure to exchange rate fluctuations. On one hand, firms with international sales tend to be more sensitive to changes in exchange rates (Jorion, 1990; Nance et al., 1993; Bartram, 2004). Conversely, international sales are linked to currency diversification and the adoption of hedging strategies (Wei and Starks, 2013; Hutson and Laing, 2014). To capture foreign sales, we employed the proportion of international sales to total sales as a proxy ($fsales$).

Indeed, highly indebted firms often face underinvestment issues (Nance et al., 1993; Froot et al., 1993). As a result, firms with high leverage are more inclined to engage in hedging activities, which can result in reduced exposure to foreign exchange rate fluctuations (He and Ng, 1998). However, contrasting findings have been observed in some studies, indicating a positive relationship between leverage and firms' exchange rate exposure, suggesting that highly leveraged firms may not hedge their foreign exchange risks (Wei and Starks, 2013). To account for this, we incorporated the ratio of debt to assets as a metric for leverage ($leverage$) in our analysis.

Certainly, profitable firms and those with sufficient liquidity possess the ability to mitigate foreign exchange rate volatility by reducing the expected cost of financial shocks. Consequently, these firms may have less motivation to engage in hedging activities, leaving them exposed to more significant foreign exchange rate risks (Froot et al., 1993; He and Ng, 1998; Bartram, 2004; Krapl, 2020). To account for this aspect, we adopted the quick ratio as a proxy for firms' liquidity ($quickratio$) and utilized the operating margin as a metric for firms' profitability ($profit$) in our analysis.

Indeed, hedging holds greater value for growth-oriented firms in alleviating the underinvestment predicament, consequently resulting in lower exposure levels (Froot et al., 1993; He and Ng, 1998; Wei and Starks, 2013). In line with the approach taken by Géczy et al. (1997), we adopted the book-to-market value of equity (BM) as a proxy to capture a firm's growth prospects ($bmratio$) in our analysis.

Finally, numerous empirical studies have established that industry characteristics exert notable influences on firms' exchange rate exposures (Allayannis and Ihrig, 2001; Bartram et al., 2010). In order to address this concern, we employed firm-level industry fixed effects, utilizing the industrial classifications issued by the China Securities Regulatory Commission (CSRC).

3.4 Summary statistics

Table 1 provides the means, standard deviations, and percentiles for the main variables. Monthly stock returns and annual accounting variables were drawn from the WIND and CSMAR datasets[21]. Panel A of Table

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21 In the field of financial data, the Wind Economic Database has built a first-class, large-scale financial engineering and financial data warehouse with financial securities data as the core database in China. The data content covers stocks, funds, bonds, foreign exchange, insurance, futures, financial derivatives, spot trading, macro-economy, financial news, and other fields. CSMAR, China's financial database, fully draws on the success of international well-known databases and has been carefully designed with respect to China's national conditions. This database is the largest and most accurate financial and economic database in China. It is composed of eight series of stocks, funds, bonds, financial

1 presents the log monthly stock returns (LRf) and log monthly returns of the RMB as measured by DE currencies (LRc_{de}) and EME currencies (LRc_{eme}), respectively, over our sample period. The Pearson correlation coefficients of DE currencies are reported in Appendix B.

Firm-level control variables were constructed at an annual frequency and merged with monthly exchange rate exposures and currency co-movements by the previous fiscal year. In other words, for firm i, its foreign exchange exposure and currency co-movements in month t in year k is matched with its firm-level control variables in year k-1. The final sample contains 2771 unique firms and 278,598 firm-month observations.

Panel B of Table 1 reports the descriptive statistics of financial indicators, including total assets, the book-to-market ratio, the operating margin, quick ratio, the asset-liability ratio, and share of foreign sales. All financial indicators are winsorized at the 1st and 99th percentile.

Table 1 Summary statistics

This table provides the numbers, means, standard deviations, and percentiles for the main variables. Panel A of Table 1 presents the log monthly stock returns (LRf) and log monthly returns of the RMB as measured by DE currencies (LRc_{de}) and EME currencies (LRc_{eme}), respectively, over our sample period. Panel B reports the descriptive statistics of financial indicators. Variable definitions are presented in Appendix A.

Panel A Stock returns and currency portfolio returns

Variable	N	Mean	Std. Dev.	Percentiles		
				25th	50th	75th
LRc_{de}	173	0.12%	1.42%	-0.63%	0.12%	0.93%
LRc_{eme}	173	0.23%	1.52%	-0.63%	0.14%	1.02%
LRf	278598	-0.04%	15.42%	-7.26%	0.13%	8.04%

Panel B Descriptive statistics of financial indicators

Variable	N	Mean	Std. Dev.	25th	50th	75th
$size$	278598	0.109	0.253	0.016	0.035	0.084
$bmratio$	278598	0.628	0.256	0.426	0.634	0.839
$profit$	278598	0.260	0.171	0.139	0.223	0.347
$quickratio$	278598	1.343	1.439	0.566	0.911	1.491
$leverage$	278598	0.490	0.213	0.331	0.492	0.641
$fsales$	278598	0.079	0.173	0.000	0.000	0.057

Table 2 reports summary statistics for exchange rate exposure as well as exchange rate co-movements over the sample period. For the entire sample, the average firms' exposures in DE (γ_{de}) and in EME (γ_{eme}) are -0.176 and -0.183, respectively, indicating that Chinese firms are negatively affected by the appreciation of the RMB against DE and EME currencies. Overall, 13.66% (11.23%) of firms have significant exposures to DE (EME) currencies, consistent with the findings of He et al. (2021)[22]. The exposures to DE (EME) currencies are relatively negatively distributed, with 56.48% (55.49%) of exposures being negative.

Table 2 Estimated FX exposure and Exchange rate co-movements

This table reports summary statistics for exchange rate exposure as well as exchange rate co-movements of DE and EME respectively. γ_{de} (γ_{eme}) is the firms' exposures in DE (EME) currencies. % sig shows the proportion of the FX exposure that is significant at the 10% confidence level. The four rightmost columns of table report the percentage (%N) and significance level (%sig) of positive and negative FX exposures. Variable definitions are presented in Appendix A.

Variable	N	Mean	Std. Dev.	25th	75th	% sig.	Pos.		Neg.	
							% N	% sig.	% N	% sig.
γ_{de}	278598	-0.176	1.488	-1.069	0.667	13.66%	43.52%	4.86%	56.48%	8.80%
γ_{eme}	278598	-0.183	1.476	-1.022	0.635	11.23%	44.51%	3.97%	55.49%	7.26%
$comove_{de}$	173	0.438	0.042	0.405	0.464					
$comove_{eme}$	173	0.233	0.042	0.197	0.256					

Figure 2 presents the time-varying averages of $comove_{de}$ and $comove_{eme}$ respectively. Following the end of the RMB being pegged to the USD in 2005, the co-movements of DE currencies and EME currencies against the RMB changed considerably and quickly. The breakup of the RMB's fixed exchange rate regime gave rise to the flexibility of the RMB against DE currencies and decreased the co-movement of DE currencies against the RMB. In contrast, there has been a significant rise of EME currency co-movements against the RMB, which is clearly commensurate with the emergence of the RMB as a regional currency.

During the 2008 global financial crisis, a reversal in these patterns occurred as the RMB was effectively pegged to the USD from 2008 to 2010. Consequently, there was a slight increase in DE currency co-movements, while there was a significant decrease in EME currency co-movements with the RMB. This highlights the crucial role of the RMB's flexibility in influencing EME currencies.

Following the resumption of the RMB's reform on June 19, 2010, the declining trend of EME currency co-movements was altered. Both DE and EME currency co-movements remained relatively stable between 2010 and 2015. However, notable changes occurred on August 11, 2015, when China implemented reforms to enhance the transparency of the RMB's exchange rate formation mechanism. As a result, there was a significant increase in EME currency co-movements and a decline in DE currency co-movements. These patterns are evidently linked to the increased flexibility of the RMB against DE currencies and its anchoring effect on EME currencies.

Figure 2 Time-varying co-movement of DE and EME exchange rates

This figure presents the time-varying averages of $comove_{de}$ and $comove_{eme}$ respectively. based on a 4-year rolling period window. We use mean values of bilateral Pearson correlation coefficients (UCC) for DE and EME currency comments, $comove_{de}$ and $comove_{eme}$.
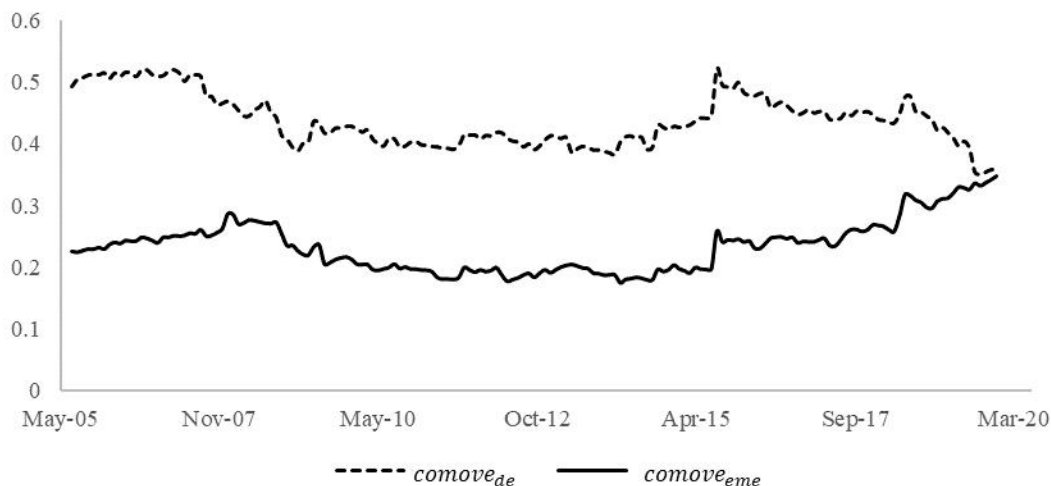
4. Empirical Results

4.1. Main results

Table 3 reports two sets of regression results for exposure corresponding to each of the two exchange rate indices. The first set (Columns (1) – (3)) contains the regression results of DE currency exposure ($|\gamma_{de}|$) on DE currency co-movements ($comove_{de}$). The second set (Columns (4) – (6)) contains the regression results of EME currency exposure ($|\gamma_{eme}|$) on EME currency co-movements ($comove_{eme}$). The results of the currency co-movements' standalone estimates are statistically significant for both co-movements at the 1% confidence level (Columns (1) and (4)), indicating on average that firms are more likely to be exposed to exchange rate risks as a result of high currency co-movements. It is worth noting that the coefficient of $comove_{de}$ is much higher than that of $comove_{eme}$. On average, a one standard deviation increase in $comove_{de}$ is associated with a 0.041 increase in DE currency exposure ($|\gamma_{de}|$). In contrast, for $comove_{eme}$, there is a 0.026 increase in EME currency exposure ($|\gamma_{eme}|$). These results are consistent with our hypotheses. Overall, the non-diversifiability of exchange rate risks due to currency co-movements leads to high exposure. Different from DE currencies, EME currency co-movements is more likely to be influenced by the RMB's anchoring effect (He et al., 2023). As matching corporate foreign revenues with costs in the same currency reduce exchange rate exposure (Bodnar and Marston, 2002), the anchoring effect of RMB in EME currencies could mitigate Chinese firms' exposure arising from the non-diversifiability of EME currencies risks.

Similar results were obtained when we controlled for various firm characteristics. These results are reported in Columns (2) - (3), and (5) - (6) of Table 3. In all specifications, the magnitude of exposure coefficients is only slightly changed and all coefficients are statistically significant at the 1% confidence level.

Regarding the control variables, our findings show that both for DE and EME currencies, firm size has a significant negative relationship with exchange rate exposure, consistent with prior research (Hutson and Laing, 2014). Moreover, quick ratio, profits, and leverage have significantly positive coefficients. This aligns with existing literature, suggesting that firms with ample liquidity and profitability are less likely to hedge, leading to higher exposure to exchange rate movements (Froot et al., 1993; He and Ng, 1998). Additionally, growth firms and highly indebted firms exhibit higher exposure to exchange rate risks, indicating a tendency to avoid hedging, possibly due to the relatively higher hedging costs in China (He et al., 2021).

Furthermore, we observe a significantly negative association between foreign sales and exchange rate exposure, which can be attributed to the strong correlation between foreign revenues and foreign costs. The practice of offsetting revenues and costs is likely to reduce a firm's exposure to exchange rate fluctuations. Interestingly, firms with foreign sales exhibit lower exposure to EME currencies compared to DE currencies. This finding aligns with our expectations, as the growing anchoring effect of the RMB enables Chinese firms to settle their foreign trade with EME countries in the RMB, thereby reducing their exposure to EME currencies.

To summarize, our empirical findings consistently support a positive relationship between exposure magnitudes and exchange rate co-movements, using both DE and EME currencies. However, the impact of co-movements on EME currencies is less pronounced compared to DE currencies. These results provide robust evidence in favor of H1, confirming that exchange rate co-movements have a significant influence on firms' exchange rate exposure, with a relatively smaller effect on EME currencies.

Table 3 FX exposure and co-movements of exchange rates

This table reports two sets of regression results for exposure corresponding to each of the two exchange rate indices. The first set (Columns (1) – (3)) contains the regression results of DE currency exposure ($|\gamma_{de}|$) on DE currency co-movements ($comove_{de}$). The second set (Columns (4) – (6)) contains the regression results of EME currency exposure ($|\gamma_{eme}|$) on EME currency co-movements ($comove_{eme}$). Different financial indicators are controlled across column (2) – (3) (column (5) – (6)). Firm, Industry and Year are firm-, industry- and year- level dummies respectively. Robust standard errors in parentheses, significance level: *** p<0.01, ** p<0.05, * p<0.1. Variable definitions are presented in Appendix A.

Variable	(1) $|\gamma_{de}|$	(2) $|\gamma_{de}|$	(3) $|\gamma_{de}|$	(4) $|\gamma_{eme}|$	(5) $|\gamma_{eme}|$	(6) $|\gamma_{eme}|$

$comove_{de}$	0.978***	0.976***	0.976***			
	(0.089)	(0.089)	(0.089)			
$comove_{eme}$				0.610***	0.613***	0.614***
				(0.118)	(0.118)	(0.118)
$size$		-0.141***	-0.139***		-0.076***	-0.074***
		(0.016)	(0.016)		(0.016)	(0.016)
$bmratio$		-0.474***	-0.473***		-0.406***	-0.405***
		(0.012)	(0.012)		(0.012)	(0.012)
$profit$		0.039**	0.038**		0.219***	0.217***
		(0.019)	(0.019)		(0.019)	(0.019)
$quickratio$		0.015***	0.015***		0.013***	0.013***
		(0.002)	(0.002)		(0.002)	(0.002)
$leverage$		0.132***	0.131***		0.273***	0.272***
		(0.016)	(0.016)		(0.016)	(0.016)
$fsales$			-0.056***			-0.082***
			(0.018)			(0.017)
Constant	0.697***	0.916***	0.921***	0.950***	1.005***	1.011***
	(0.039)	(0.041)	(0.041)	(0.028)	(0.031)	(0.031)
Firm	yes	yes	yes	yes	yes	yes
Industry	yes	yes	yes	yes	yes	yes
Year	yes	yes	yes	yes	yes	yes
Observations	278,598	278,598	278,598	278,598	278,598	278,598
R-squared	0.374	0.379	0.379	0.379	0.383	0.383

4.2. Impact of the Belt and Road Initiative

The Belt and Road Initiative (BRI) holds paramount significance for China, as it endeavors to enhance economic policy coordination, trade, and investment facilitation between China and the countries and regions encompassing the BRI areas. This initiative has witnessed a growing number of countries and international organizations participating in it by signing intergovernmental cooperation documents, predominantly in the form of memoranda of understanding, with China. The BRI serves as a pivotal strategy to foster connectivity, infrastructure development, and economic integration among participating nations, thereby fostering mutual development and cooperation on a global scale.

Note that in our study, we recognized the significance of exploring the impact of the Belt and Road Initiative (BRI) launch and the staggered entry of countries into the BRI. To achieve this, we collected data on each memorandum of understanding (MoU) signed between BRI member countries and China. This information was obtained from the official website "Belt and Road Portal,"[23] under the guidance of the leading group for promoting the Belt and Road Initiative. The data included the date of MoU signing and the respective counterpart country. To ensure accuracy, we cross-checked this data with information from various official sources, such as China's Ministry of Commerce, Ministry of Foreign Affairs, embassies, and relevant government departments of other countries.

By the end of 2019, a total of 137 countries and 30 international organizations participating in the BRI had signed memoranda of understanding with China. We constructed measures of BRI variables, $Ibr_{de(eme)}$, which is the ratio of the number of economies signing memorandum of understandings with China on BRI cooperation over the number of DE (EME) at each month. We then replicated the analysis of equation (3) with

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23　The data is available at https://www.yidaiyilu.gov.cn/.

the addition of the interaction terms of the BRI and the two co-movements measures ($Ibr \times comove$). All specifications include firm, industry and year fixed effects.

The results in Table 4 show that the coefficients of $Ibr_{de(eme)} \times comove_{de(eme)}$ are significantly positive (negative). The results indicate that the positive relationship between co-movements and exposure is stronger for DE currencies and weaker for EME currencies. These results are largely consistent with H2. By the end 2022, the number of countries that have joined BRI is 151, 97% of them are emerging market countries. The launch of the BRI has led to a significant increase in China's economic engagement with emerging market countries (Xu et al., 2022), underscoring the importance of managing EME currency risks for Chinese corporations. As a result, the RMB has assumed a more prominent role in trade invoicing, settlements, and cross-border financial transactions within EME countries. The anchoring effect of the RMB has substantially reduced Chinese firms' exposure by allowing the offsetting of foreign revenues and costs in the same currency.

Conversely, the RMB's role in cross-border transactions with developed economies, such as the US, is less pronounced. Nonetheless, the launch of the BRI may have reduced the diversifiability of Chinese firms' exposure to DE currencies. This could be attributed to the escalating trade conflicts between the US and China, leading to various economic and trade sanctions imposed by developed countries, especially the US, against China (Guo et al., 2023). These conflicts have amplified the challenges of managing DE currency risks. Following the launch of the BRI, DE currencies have exhibited increased co-movements against the RMB, contributing to reduced diversifiability of Chinese firms' exposure to DE currencies. Consequently, the impact of exchange rate co-movements on corporate exchange exposures to DE currencies has intensified.

Table 4 Impact of the Belt and Road Initiative

This table presents the regression results of the Impact of the Belt and Road Initiative (BRI). $Ibr_{de(eme)}$ is the ratio of the number of economies signing memorandum of understandings with China on BRI cooperation over the number of DE (EME) at each month. $Ibr \times comove$ represents the interaction of binary variable Ibr and exchange rate co-movement $comove$. Robust standard errors in parentheses, significance level: *** p<0.01, ** p<0.05, * p<0.1. Variable definitions are presented in Appendix A.

Variable	(1) $|\gamma_{de}|$	(2) $|\gamma_{de}|$	(3) $|\gamma_{de}|$	(4) $|\gamma_{eme}|$	(5) $|\gamma_{eme}|$	(6) $|\gamma_{eme}|$
$comove_{de}$	-0.168	-0.169	-0.168			
	(0.107)	(0.107)	(0.107)			
$Ibr_{de} \times comove_{de}$	16.000***	15.978***	15.979***			
	(0.959)	(0.955)	(0.955)			
$comove_{eme}$				3.110***	3.105***	3.105***
				(0.185)	(0.185)	(0.185)
$Ibr_{eme} \times comove_{eme}$				-6.372***	-6.363***	-6.362***
				(0.292)	(0.291)	(0.291)
Ibr_{de}	-7.031***	-7.017***	-7.017***			
	(0.413)	(0.411)	(0.411)			
Ibr_{eme}				1.850***	1.850***	1.850***
				(0.083)	(0.083)	(0.083)
size		-0.140***	-0.138***		-0.076***	-0.073***
		(0.016)	(0.016)		(0.016)	(0.016)
bmratio		-0.474***	-0.473***		-0.406***	-0.405***
		(0.012)	(0.012)		(0.012)	(0.012)
profit		0.039**	0.038**		0.219***	0.217***
		(0.019)	(0.019)		(0.019)	(0.019)
quickratio		0.015***	0.015***		0.013***	0.013***

		(0.002)	(0.002)		(0.002)	(0.002)
leverage		0.132***	0.131***		0.272***	0.271***
		(0.016)	(0.016)		(0.016)	(0.016)
fsales			-0.056***			-0.081***
			(0.018)			(0.017)
Constant	1.214***	1.431***	1.436***	0.337***	0.393***	0.400***
	(0.047)	(0.049)	(0.049)	(0.039)	(0.042)	(0.042)
Firm	yes	yes	yes	yes	yes	yes
Industry	yes	yes	yes	yes	yes	yes
Year	yes	yes	yes	yes	yes	yes
Observations	278,598	278,598	278,598	278,598	278,598	278,598
R-squared	0.374	0.380	0.380	0.380	0.385	0.385

4.3 Multinational companies (MNCs)

Most studies measure a firm's multinationality using the extent of its international activities (Pantzalis et al., 2001; Williamson, 2001; Hutson and Laing, 2014). For instance, Pantzalis et al. (2001) define firms with at least one foreign subsidiary as MNCs. Williamson (2001) defines firms as MNCs if the percentage of foreign sales to total sales is more than 11% and finds that exposure falls with foreign sales. To test H3, we first split the sample firms into those with foreign sales or subsidiaries and those without. The former group is globally engaged firms, while the latter group is purely domestic firms.

Columns (1) – (8) of Table 5 report that exchange rate co-movement increases exposure both for global firms and for purely domestic firms, with the impact being greater for the latter group. These results suggest that globally engaged firms exhibit a lower sensitivity to exchange rate co-movements compared to domestic firms.

Note that the aforementioned measures of multinationality do not account for the dispersion of a firm's international activities. Firms with operations in multiple countries have greater opportunities for operational hedging compared to those concentrated in a single foreign country (Allayannis et al., 2001; Hutson and Laing, 2014). To address this, we adopt an alternative measure of multinationality by considering the number of foreign subsidiaries a firm has, denoted as "subs," following the approach of Allayannis et al. (2001).

Columns (9) – (10) of Table 5 show that the coefficients of both $subs \times comove_{de}$ and $subs \times comove_{eme}$ are negative and statistically significant, with the impact being greater for the latter group. These findings suggest that exchange rate co-movements have a relatively smaller effect on Multinational Corporations' (MNCs) exposure, particularly regarding exposure to Emerging Market Economy (EME) currencies. These results strongly support H3, indicating that MNCs are adept at employing operational hedging and alternative strategies to mitigate the impact of exchange rate risks. Furthermore, the anchoring effect of the RMB plays a significant role in reducing MNCs' exposure to EME currencies.

Table 5 Multinational companies

This table presents the regression results of multinational and domestic firms. We split the sample firms into those with foreign sales or subsidiaries and those without. The former group is globally engaged firms, while the latter group is purely domestic firms. Column (1) – (2) and (3) – (4) report the results of firms with foreign sales and with foreign subsidiaries respectively. Column (5) – (6) and (7) – (8) report the results of firms without foreign sales and without foreign subsidiaries respectively.

Following Allayannis et al. (2001), we used the number of countries in which a firm has foreign subsidiaries, subs, as an alternative measure of multinationality. The results are reported in Column (9) - (10). $Controls$ represent the control variables we have used before, here we omit their results to save space. Robust standard errors in parentheses, significance level: *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Variable definitions are presented in Appendix A.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Multinational firms				Domestic firms				Multinational firms	
	With foreign sales		With subsidiaries		Without foreign sales		Without subsidiaries		Number of subsidiaries	
Variable	$\|\gamma_{de}\|$	$\|\gamma_{eme}\|$	$\|\gamma_{de}\|$	$\|\gamma_{eme}\|$	$\|\gamma_{de}\|$	$\|\gamma_{eme}\|$	$\|\gamma_{de}\|$	$\|\gamma_{eme}\|$	$\|\gamma_{de}\|$	$\|\gamma_{eme}\|$
$comove_{de}$	0.405***		0.461***		1.688***		1.807***		1.017***	
	(0.118)		(0.113)		(0.133)		(0.143)		(0.091)	
$comove_{eme}$		0.509***		0.428***		0.749***		0.920***		0.801***
		(0.156)		(0.148)		(0.177)		(0.191)		(0.119)
$subs \times comove_{de}$									-0.054**	
									(0.025)	
$subs \times comove_{eme}$										-0.239***
										(0.023)
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Firm	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Industry	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	152,239	152,239	170,048	170,048	126,359	126,359	108,550	108,550	278,598	278,598
R-squared	0.406	0.407	0.392	0.403	0.358	0.363	0.372	0.364	0.379	0.384

5. Robustness and additional evidence
5.1 Alternative specifications

Previous studies have suggested several measures of currency co-movements (Goetzmann and Kumar, 2008; Pukthuanthong and Roll, 2009; Billio et al., 2017). To test the robustness of our results, we employed two additional measures, namely, eigenvalues of correlation matrices and normalized portfolio variance. The first measure uses principal component analysis (PCA) for analyzing the common factors in driving exchange rate co-movements[24]. Specially, following Pukthuanthong and Roll (2009), we conducted PCA to draw the principal components (PCs) of currency portfolio returns[25] and then estimated the following multi-factor regression model using the first three PCs:

$$LRc_t = \beta_{c,0} + \beta_{c,1}f_{1,t} + \beta_{c,2}f_{2,t} + \beta_{c,3}f_{3,t} + e_t \tag{4}$$

where LRc_t are log changes of the bilateral exchange rate of the RMB to each country and $f_{1,t}$, $f_{2,t}$, and $f_{3,t}$ capture three principal components with the strongest explanatory power.

The higher the adjusted R-square of equation (4), the higher the level of exchange rate co-movements, as a limited set of common variables can explain most movements of exchange rates. We defined the co-movements as the median value of adjusted R-squares for DE and EME, respectively:

$$comove^{r2} = median(adjusted\_R^2) \tag{5}$$

Second, following the investment literature (Goetzmann and Kumar, 2008), we used portfolio variance to measure the co-movement, which is estimated as follows:

$$comove^{var} = \frac{var(LRc)}{weighted\_var(LRc_i)} \tag{6}$$

where $var(LRc)$ is the variance for the return of the currency portfolio and $weighted\_var(LRc_i)$ is the trade-weighted average of the bilateral exchange rate. The level of exchange rate co-movement increases with the value of $comove^{var}$, as portfolio variance is larger compared to individual exchange rate variance.

We should acknowledge that our analysis separately estimated the influence of co-movements in both DE and EME currencies on exposure, considering the increasing significance of the RMB in international transactions with EME countries. However, it may also be of interest to investigate the combined impacts of exchange rate co-movements in both DE and EME currencies on firms' exposure. To address this, we constructed a comprehensive trade-weighted index of bilateral exchange rates between the RMB and the currencies of all countries (referred to as comprehensive economies, CM). Subsequently, we estimated equation (3) using the CM currency co-movement in CM and exposure to CM currencies.

Panel A of Table 6 confirms that exchange rate co-movements remain statistically significant determinants of the foreign exchange rate exposure of Chinese firms, and this effect is larger for currencies in DE. In addition, the effect of co-movements on exchange rate exposure has become more (less) pronounced for DE (EME) currencies since the launch of the BRI, consistent with previous findings that the RMB's anchoring effect has been strengthening since the inception of the BRI. Interestingly, the interaction term $Ibr_{cm} \times comove_{cm}$ is significantly negative. A possible explanation is that the most of economies joining in the BRI are EME. Hence the RMB's anchoring effect mitigates overall firms' exchange rate risk exposure.

Additional support for our main findings was provided by examining the above alternative co-movement measures on the exposure of firms with and without foreign sales (i.e., global and domestic firms). The results, reported in Panel B of Table 6, are qualitatively similar to those reported in Table 5[26]. Interestingly, we found that CM currency co-movement increases the exposure of domestic firms, but has no significant impact on the exposure of global firms[27].

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24 Lustig et al. (2011) show that the first and second principal components account for most variation of currency portfolio returns.
25 The regression is based on a 4-year rolling window.
26 We also separated the sample into firms with foreign subsidiaries and those without and obtained similar results. These results are not reported but are available upon request
27 We conduct two additional robustness checks. First, we recalculated Spearman correlations between different currencies and used equation (1) in Section 3.1 to construct the co-movement of DE and EME currency portfolios. We re-estimated the equation (3) using the new co-movement indicators. Second, Szczygielski et al.(2020) point out that the return-factor model may be underspecified due to factor omission. We thus employ Fama-French three-factor model augmented with the exchange rate factor to re-estimate exchange rate exposure, and its relation with co-movement indictors. Our empirical results remain qualitative unchanged across both robustness checks. These results are not reported but are available upon request.

Table 6 Alternative measures

This table presents the regression results estimated using alternative measures of FX exposure and currency co-movement. Panel A report basic and BRI results using alternative measures. We adopt three different co-movement measures: Column (1) – (4) and column (5) – (8) report $comove^{r2}$ and $comove^{var}$ as the measure of exchange rate co-movement respectively, and column (9) – (10) report results estimating using comprehensive currencies (CM) of DE and EME. Ibr_{cm} equals the ratio of the number of economies signing memorandum of understandings on BRI cooperation over the number of sample countries at each month. Panel B report results of firms with and without foreign sales. Column (1) – (2), (5) – (6) and (9) report results of firms with foreign sales, and others report firms without foreign sales. $Controls$ represent the control variables we have used before, here we omit their results to save space. Robust standard errors in parentheses, significance level: *** p<0.01, ** p<0.05, * p<0.1. Variable definitions are presented in Appendix A.

Panel A Alternative measures: BRI effects

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	$comove^{r2} = median(adjusted\_R^2)$				$comove^{var} = \dfrac{var(LRc)}{weighted\_var(LRc_i)}$				Comprehensive currencies	
	$\lvert\gamma_{de}\rvert$	$\lvert\gamma_{de}\rvert$	$\lvert\gamma_{eme}\rvert$	$\lvert\gamma_{eme}\rvert$	$\lvert\gamma_{de}\rvert$	$\lvert\gamma_{de}\rvert$	$\lvert\gamma_{eme}\rvert$	$\lvert\gamma_{eme}\rvert$	$\lvert\gamma_{cm}\rvert$	$\lvert\gamma_{cm}\rvert$
$comove_{de}$	0.953*** (0.104)	-0.541*** (0.118)			0.774*** (0.068)	0.165** (0.075)				
$Ibr_{de} \times comove_{de}$		29.776*** (1.399)				16.771*** (0.960)				
$comove_{eme}$			0.444*** (0.058)	0.692*** (0.072)			0.204*** (0.027)	0.402*** (0.028)		
$Ibr_{eme} \times comove_{eme}$				-0.346** (0.155)				-1.997*** (0.134)		
$comove_{cm}$									0.404*** (0.129)	2.134*** (0.197)
$Ibr_{cm} \times comove_{cm}$										-7.454*** (0.434)
Ibr_{de}		-22.832*** (1.050)		0.593*** (0.100)						
Ibr_{eme}						-7.512*** (0.409)		0.704*** (0.045)		
Ibr_{cm}										2.404*** (0.130)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Firm	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Industry	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	278,598	278,598	278,598	278,598	278,598	278,598	278,598	278,598	278,598	278,598
R-squared	0.379	0.380	0.383	0.384	0.379	0.380	0.383	0.384	0.382	0.383

Panel B Alternative measure: Foreign sales

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	$comove = median(adjusted\_R^2)$				$comove = \dfrac{var(LRc)}{weighted\_var(LRc_i)}$				Comprehensive currencies	
	With foreign sales		Without foreign sales		With foreign sales		Without foreign sales		With	Without
Variable	$|\gamma_{de}|$	$|\gamma_{eme}|$	$|\gamma_{de}|$	$|\gamma_{eme}|$	$|\gamma_{de}|$	$|\gamma_{eme}|$	$|\gamma_{de}|$	$|\gamma_{eme}|$	$|\gamma_{cm}|$	$|\gamma_{cm}|$
$comove_{de}$	0.675***		1.309***		0.356***		1.287***			
	(0.138)		(0.158)		(0.092)		(0.101)			
$comove_{eme}$		0.428***		0.459***		0.195***		0.217***		
		(0.078)		(0.086)		(0.037)		(0.040)		
$comove_{cm}$									0.009	0.896***
									(0.169)	(0.197)
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Firm	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Industry	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	152,239	152,239	126,359	126,359	152,239	152,239	126,359	126,359	152,239	126,359
R-squared	0.406	0.407	0.358	0.363	0.406	0.407	0.358	0.363	0.411	0.359

5.2 Alternative model specifications

Two methodological issues need to be addressed. First, the coefficients estimated from the first stage may be influenced by a measurement error and hence may confound the results of the second stage. We addressed this issue by inversing the standard error from the first stage and using it as the weight for the second stage of the WLS regression (Allayannis and Ofek, 2001). Second, Dominguez and Tesar (2006) show that $|\gamma_i|$ changes the distribution of the original γ_i, hence deviating the resulting error term away from the normal distribution. To resolve this problem, we transform it into $\sqrt{|\gamma_i|}$ to re-estimate our main regression. Column (1) – (8) of Table 7 confirm that exchange rate co-movements remain statistically significant determinants of the foreign exchange rate exposure of Chinese public firms.

Companied could over-report international trade to evade capital controls for foreign exchange arbitrage (Liu et al., 2021), which actually influences its foreign exchange exposures. To address this concern, we include a measure of capital flow, $dcip$, deviations from covered interest rate parity between the RMB and the USD (Cheung et al., 2016). Following Cheung et al. (2016) and Liu et al. (2021), we define $dcip$ as $100 * \{\frac{r_{RMB} - r_{USD}}{1 + r_{USD}} - \frac{F-S}{S}\}$, where $r_{RMB(USD)}$ is Chinese (USD London) interbank offered rate, F is the one-month RMB/USD non-deliverable forward rate, and S is the spot RMB/USD exchange rate. Results of including $dcip$ are reported in Column (9) – (10). Our primary results remain qualitatively unchanged.

A major empirical challenge is to identify the causal effect of exchange rate co-movements on individual firm's exchange rate exposure. Exchange rate co-movement is clearly not randomly assigned. Nor, however, is it a choice variable. It is also safe to dismiss the possibility of reverse causality because each firm's exchange rate exposure is far too small to influence currency co-movements. Hence, the main identification challenge is not self-selection or reverse causality, but the omission of important variables. We thus adopted Arellano and Bover (1995)'s dynamic panel Generalized Method of Moments (GMM) procedure to address potential endogeneity in which one or more of the explanatory variables are not strictly exogenous[28]. This technique utilizes appropriate lags of the changes in both dependent variables and regressors to address the potential endogeneity of all regressors, and it can account for time-invariant unobservable heterogeneity (i.e., time-invariant firm-specific characteristics). The results, reported in Column (11) – (12) of Table 7, are qualitatively similar to previous findings. The p-values for both Sargan and Hansen J-statistics in all regressions are larger than the conventional confidence level. Thus, there is no evidence to reject the validity of our instruments. We also reported first-order and second-order serial correlations using the Arellano-Bond tests. We can reject the first-order serial correlation, but we cannot reject the null of no second-order serial correlation.

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28 Since our key variables are measured as monthly frequency, we allow dependent variable to appear with 12 lags.

Table 7 Alternative model specifications

This table presents the regression results estimated using alternative model specifications. Column (1) – (4) report the results using WLS. We use the standard error of FX exposure as the weight: $|\gamma_{de}|/\sigma_{de}$, where γ_{de} is the FX exposure in DE estimated using a OLS model and σ_{de} is the standard error of FX exposure. Similar as EME. Column (5) – (8) report the result using the square root of absolute values of FX exposure as dependent variable. Column (9) – (10) report the result including a measure of capital flows, $dcip$, deviations from covered interest rate parity between the RMB and the USD. Column (11) – (12) report the results using Arellano and Bover (1995)'s dynamic panel Generalized Method of Moments (GMM). $Controls$ represent the control variables we have used before, here we omit their results to save space. Robust standard errors in parentheses, significance level: *** p<0.01, ** p<0.05, * p<0.1. Variable definitions are presented in Appendix A.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					Square root of absolute values of FX exposure				Capital control			
	Weighted least square										GMM	
Variable	$|\gamma_{de}|$	$|\gamma_{de}|$	$|\gamma_{eme}|$	$|\gamma_{eme}|$	$\sqrt{|\gamma_{de}|}$	$\sqrt{|\gamma_{de}|}$	$\sqrt{|\gamma_{eme}|}$	$\sqrt{|\gamma_{eme}|}$	$|\gamma_{de}|$	$|\gamma_{eme}|$	$|\gamma_{de}|$	$|\gamma_{eme}|$
$comove_{de}$	1.667***	1.657***			0.480***	0.479***			0.857***		0.863***	
	(0.083)	(0.082)			(0.042)	(0.042)			(0.098)		(0.211)	
$comove_{eme}$			0.829***	0.843***			0.336***	0.338***		0.247**		0.657*
			(0.103)	(0.103)			(0.056)	(0.056)		(0.123)		(0.379)
$dcip$									-0.005***	-0.019***		
									(0.002)	(0.002)		
Controls	no	yes	no	yes	no	yes	no	yes	yes	yes	yes	yes
Firm	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Industry	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	278,598	278,598	278,598	278,598	278,598	278,598	278,598	278,598	278,598	278,598	214,975	214,975
R-squared	0.343	0.349	0.342	0.347	0.324	0.329	0.329	0.333	0.379	0.384		
p(AR1)											0	0
p(AR2)											0.600	0.976
Hansen											150.1	134.7
P(Hansen)											0.348	0.700

5.3 Additional evidence

In this subsection, we attempt to deepen our understanding of the relationship between exchange rate co-movements and exposure by examining whether the RMB's internationalization and movements weaken the above relationship.

5.3.1 The effects of RMB inclusion in SDR

Effective October 1, 2016, the IMF added the Chinese RMB to the basket that composes SDR, an international reserve asset. The initial share of the RMB in the SDR basket was 10.9%, ranking the RMB third among five SDR basket currencies (USD, EUR, RMB, JPY, and GBP). On one hand, adding the RMB to SDR baskets benefits the SDR for both official and commercial reasons. A number of studies have shown that adding the RMB increases the attractiveness and broadens the usage of the SDR in international transactions (Mccauley and Shu, 2019; Wei et al., 2020)[29]. On the other hand, it is an important step in China's integration into the global financial system, reflecting China's significant progress in its reform toward becoming a liberalized and market-oriented financial market (IMF, 2015). The RMB's inclusion has significantly increased its acceptance among central bank holders of foreign exchange rate reserves. Before its addition to the SDR, the RMB accounted for less than 1% of the global foreign exchange reserves in 2015. The RMB's share of foreign exchange reserves rose to about 2% by the end of 2019. Some reasons for this are that international investors strengthened their confidence in holding RMB assets, as the RMB's exchange rate formation became more market-oriented after a series of reforms and due to the RMB's inclusion in the SDR. In addition, a number of EME countries have started to purchase Chinese government bonds as part of their reserve holdings. The RMB appears to have become one of the world's reserve currencies.

To the extent that our findings are associated with the RMB's role in cross-border transactions, the inclusion of the RMB in the SDR, which has had a substantial influence on the RMB's internationalization, could potentially weaken the relationship between EME currency co-movements and exposure. To examine the effects of the RMB's inclusion in the SDR on the impact of currency co-movements on exposure, we augmented equation (3) with the interaction term $Isdr \times comove$ (an SDR dummy), where $Isdr$ is defined as a one in the period after the RMB's inclusion (October 2016 and beyond) and a zero prior to its inclusion. If the RMB's inclusion is associated with a decrease in the impact of co-movement on exposure, the interaction term of one should be negative and statistically significant, whereas the interaction term of zero should be different. The standalone coefficient represents the pre-SDR estimates of co-movement effects, while the post-SDR effect is the sum of the coefficients for co-movement and the interaction terms.

The results are reported in Columns (1) – (2) of Panel A in Table 8. The positive relationships between co-movement and exposure are more pronounced following the RMB's inclusion in the SDR for DE currencies, whereas they are weaker for EME currencies. Consistent with our expectation, the RMB's inclusion in the SDR has strengthened the RMB's anchoring effect on EME, hence weakening the effect of co-movement on exposure.

5.3.2 Depreciation and appreciation

Although the RMB has exerted a growing influence on EME currencies, several researchers have found that the influence of the RMB is asymmetrical and relies on the status of the RMB's exchange rate. More specifically, EME currencies tend to depreciate more when the RMB depreciates and to appreciate less when the RMB appreciates (Pontines and Siregar, 2012; Keddad, 2019).

The rationale for this is that the pace of the RMB's internationalization appears to be closely related to its value. For a number of years before mid-2015, the RMB had a "one-way" movement of appreciating against the USD. Investors sought to take advantage of the higher returns of the RMB and thus boosted the holdings of RMB assets in non-residents (Lowe, 2017). However, during the post-811 reform period, the RMB experienced a few months of depreciation against the USD, and investors turned to holding more foreign currency assets rather than converting them to the RMB. The use of the RMB as a vehicle for cross-border transactions slowed and even reversed in some respects.

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29 The Central Bank of Russia took the lead in saying that it would include the RMB in its official reserves.

China has become a large source of EME imports, creating heightened incentives for EME to let their currencies be anchored by the movements of the RMB and to increase the use of the RMB as a vehicle currency when the RMB appreciates. In addition, many EME "fear appreciation against the RMB," and instead allow their currencies to remain stable with relation to the RMB in order to maintain their firms' competition in exports (Levy-Yeyati et al, 2013; Keddad, 2019). As a result, it is expected that the RMB's appreciation should weaken the impacts of exchange rate co-movements on firms' exposure. In contrast, the depreciation of the RMB is likely to create a downward pressure of EME currencies due to the possibility that investors may expect a slowing down of regional economies (Keddad, 2019). This commonly leads to greater EME currency depreciation against the RMB during the RMB's depreciation episodes. We therefore expect that the RMB's depreciation should strengthen the impacts of exchange rate co-movements on firms' exposure.

To examine these implications, we split our sample into different periods of the RMB's appreciation and depreciation according to trade-weighted DE and EME currency indices. Specifically, LRc_{de} and LRc_{eme} are the log monthly returns of the trade-weighted RMB index. The RMB appreciates against DE (EME) currencies if LRc_{de} (LRc_{eme}) is positive or equal to zero, and the RMB depreciates if otherwise. The results in Columns (3) – (6) of Panel A of Table 8 show that exchange rate co-movements have a greater (smaller) impact on a firm's exposure to DE currencies (EME currencies) when the RMB appreciates against DE currencies (EME currencies). Consistent with our expectation, the impact of the RMB's anchoring effect on EME currencies increases with the RMB's appreciation.

5.3.3 Volatility of the RMB exchange rate

Clearly, the atypical volatility observed in the exchange rate of the RMB may diminish its effectiveness as a vehicle currency for cross-border transactions. Consequently, if the effects of exchange rate co-movements on exposure tend to diminish with the increased internalization of the RMB, we would anticipate a more noticeable impact during periods characterized by unusual RMB exchange rate volatility. To investigate the influence of RMB volatility on the association between co-movement and exposure, we conducted three supplementary tests.

First, we calculated rolling (annual) deviations of LRc_{de} and LRc_{eme} for the whole sample period and split the sample into normal and unusual exchange rate volatility periods. Specifically, we defined a dummy variable, $Ivol_{de}$ ($Ivol_{eme}$), which equals one if the volatility of LRc_{de} (LRc_{eme}) is outside the interval of its mean plus or minus one standard deviation, and zero otherwise. We then augmented equation (1) with the interaction terms $Ivol_{de} \times comove_{de}$ ($Ivol_{eme} \times comove_{eme}$). If unusual exchange rate volatility is associated with a decline in the RMB's anchoring effect, the coefficient on the interaction term will be positive and statistically significant.

The results are reported in Columns (1) – (2) of Panel B of Table 8. We found that the effect of co-movement on exposure is magnified during the unusual volatility period more than it is during the normal period, consistent with the expectation that the RMB's anchoring effect on EME currencies decreases with the RMB's volatility.

Second, we used the Chicago Board Options Exchange (CBOE) volatility index (VIX), the measure of implied volatility of S&P 500 options, as our indicator of market uncertainty (Bekaert et al, 2013; Ouyang, 2019; Albrizio et al, 2020)[30]. We defined a dummy variable, $Ivix$, which equals one if the VIX index is above the median, and zero otherwise. We then included the interaction terms ($Ivix \times comove$) in the main regression. Despite the growing global importance and internationalization of the RMB, the RMB is still not a safe haven currency. For instance, Fatum et al. (2017) have found that the value of the RMB relative to the USD and the JPY decreases with market uncertainty, suggesting that the RMB is less safe than other major world currencies. If the RMB's anchoring effect decreases with the VIX index, the coefficient on the interaction term will be significant and positive. The results in Columns (3) – (4) of Panel B of Table 8 confirm the positive coefficients on the interaction terms. The evidence indicates that the

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30 From Investopedia, https://www.investopedia.com/terms/v/vix.asp, a real-time market index that represents the market's expectation of 30-day forward-looking volatility.

positive impacts of exchange rate co-movements on exposure strengthen in periods of high market uncertainty.

Third, we focused on one year of data surrounding the 811 reform. This reform represents one of China's biggest steps in the transition process toward RMB exchange rate flexibility, but the RMB experienced a short period of high volatility during this time. The mean standard deviations of the RMB against DE and EME currencies between September 2015 and August 2016 are 1.414% and 1.226%, respectively, while the means after August 2016 are 1.356% and 1.179%. Accordingly, we constructed a dummy variable, $Ireform$, which equals one in the sample period between September 2015 and August 2016, and zero otherwise. The results in Columns (5) – (6) of Panel B of Table 8 show that the coefficients on the interaction terms $Ireform \times comove$ are positive and statistically significant. The evidence indicates that the elevated exchange rate volatility may undermine the RMB's anchoring effect. As a result, co-movement has a larger impact on firms' exposure in periods of high RMB exchange rate volatility.

5.3.4 Anchoring effects

In this section, we delve deeper into the influence of RMB anchoring effects on the association between exchange rate co-movements and exposure. Our primary focus is on understanding how currency co-movement positively affects corporate foreign exchange exposure, with a particular emphasis on the currency mismatch between corporate income and costs. The extent of RMB internationalization, as reflected by the strength of the RMB anchoring effect, plays a crucial role in mitigating the currency mismatch faced by Chinese corporations, particularly in the case of EME currencies, where the RMB anchoring effect is more pronounced.

To offer additional empirical validation, we partitioned our sample of EME currencies into two distinct groups based on the findings of He et al. (2023)[31] regarding RMB anchoring effects. Currencies that exhibit significant anchoring with the RMB are categorized into the high anchoring group (HA), while those without such pronounced anchoring are placed in the low anchoring group (LA)[32]. Subsequently, we conducted separate re-estimations of equation (3) within each group. The outcomes of these analyses are presented in Panel C of Table 8.

The coefficient on $comove_{ha}$ is significantly positive, while the coefficient on $comove_{la}$ is significantly negative. This outcome aligns with our anticipated hypothesis. In the high anchoring group, exchange rate co-movement is predominantly influenced by RMB movements, signifying that higher currency co-movement corresponds to a greater impact of the RMB and an extensive utilization of the RMB in cross-border transactions. Consequently, both corporate income and costs are settled in the same currency, leading to a reduced exposure of firms to exchange rate risks. On the other hand, in the low anchoring group, currency co-movement arises due to other currencies moving in the same direction, indicating that the exchange rate risk faced by firms is more challenging to diversify.

Table 8 Additional evidence

Column (1) – (2) of Panel A reports the results of the RMB's inclusion in the SDR on the impact of currency co-movements on exposure. $Isdr$ is a binary variable, that takes the value of 1 since October 2016, and 0 otherwise. Column (3) – (6) of Panel A report the results of exchange rate co-movements on firms' exposure in periods of the RMB's appreciation and depreciation. Panel B reports results of RMB volatility on the relationship between co-movement and exposure. Column (1) – (2) of Panel B report impacts of RMB volatility on the relationship between co-movement and exposure. $Ivol_{de}(Ivol_{eme})$ is a binary variable that takes the value of 1 when the volatility of $LRc_{de}(LRc_{eme})$ is outside its mean plus or minus one standard deviations interval, and zero otherwise. Column (3) – (4) report the impact of market uncertainty on the relationship between co-movement and exposure. $Ivix$ is a binary variable that takes the value of 1 when the VIX index exceeds its median value, and 0 otherwise. Column (5) – (6) report the impacts of 811

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31 He et al. (2023) estimates the anchoring effects of RMB on other developing economies from 2006 to 2020, and find that the RMB has become influential anchor currency in developing countries.
32 The high anchoring group consists of 21 economies: Albania, Belarus, Bulgaria, Poland, Russia, Philippines, Georgia, Kazakhstan, Kyrgyzstan, the Czech Republic, Malaysia, Macedonia, Bangladesh, Nepal, Thailand, Turkey, Brunei, Singapore, India, Indonesia and Korea. The low anchoring group consists of 33 economies: Afghanistan, the United Arab Emirates, Oman, Azerbaijan, Egypt, Pakistan, Bosnia and Herzegovina, Bhutan, Cambodia, Qatar, Kuwait, Croatia, Laos, Lebanon, Romania, Maldives, Mongolia, Myanmar, Moldova, Serbia, Saudi Arabia, Sri Lanka, Tajikistan, Ukraine, Hungary, Armenia, Yemen, Iraq, Jordan, Vietnam, and Chinese Taiwan.

reform on the on the relationship between co-movement and exposure. $Ireform$ is a binary variable that takes the value of 1 between September 2015 and August 2016, and zero otherwise. Panel C reports results of the relationship between co-movement and exposure in high anchoring group and low anchoring group. When a currency significantly anchors the RMB, it is classified into the high anchoring group (HA). Otherwise, it belongs to the low anchoring group (LA). $comove_{ha(la)}$ is exchange rate co-movement of currencies in high (low) anchoring group. γ_{ha} (γ_{la}) is the firms' exposures in HA (LA) currencies. $Controls$ represent the control variables we have used before, here we omit their results to save space. Robust standard errors in parentheses, significance level: *** p<0.01, ** p<0.05, * p<0.1. Variable definitions are presented in Appendix A.

Panel A RMB inclusion into SDR, appreciation and depreciation

	(1)	(2)	(3)	(4)	(5)	(6)
	Inclusion into SDR		Appreciation		Depreciation	
Variable	$|\gamma_{de}|$	$|\gamma_{eme}|$	$|\gamma_{de}|$	$|\gamma_{eme}|$	$|\gamma_{de}|$	$|\gamma_{eme}|$
$comove_{de}$	0.085		1.408***		0.556***	
	(0.112)		(0.123)		(0.143)	
$comove_{eme}$		3.168***		0.333*		1.427***
		(0.154)		(0.172)		(0.208)
$Isdr \times comove_{de}$	2.445***					
	(0.188)					
$Isdr \times comove_{eme}$		-5.696***				
		(0.237)				
$Isdr$	-1.091***	1.440***				
	(0.087)	(0.059)				
Controls	yes	yes	yes	yes	yes	yes
Firm	yes	yes	yes	yes	yes	yes
Industry	yes	yes	yes	yes	yes	yes
Year	yes	yes	yes	yes	yes	yes
Observations	278,598	278,598	150,866	150,574	127,695	127,996
R-squared	0.380	0.385	0.380	0.370	0.392	0.419

Panel B Volatility of the RMB exchange rate

	(1)	(2)	(3)	(4)	(5)	(6)
	RMB volatility		VIX volatility index		811 reform period	
Variable	$|\gamma_{de}|$	$|\gamma_{eme}|$	$|\gamma_{de}|$	$|\gamma_{eme}|$	$|\gamma_{de}|$	$|\gamma_{eme}|$
$comove_{de}$	-0.275***		0.865***		0.624***	
	(0.103)		(0.102)		(0.097)	
$comove_{eme}$		0.503***		0.515***		0.110
		(0.123)		(0.120)		(0.124)
$Ivol_{de} \times comove_{de}$	2.062***					
	(0.146)					
$Ivol_{eme} \times comove_{eme}$		1.440***				
		(0.301)				
$Ivol_{de}$	-0.931***					

	(1)	(2)	(3)	(4)	(5)	(6)
	(0.061)					
$Ivol_{eme}$		-0.314***				
		(0.070)				
$Ivix \times comove_{de}$			0.255***			
			(0.088)			
$Ivix \times comove_{eme}$				0.254***		
				(0.074)		
$Ivix$			-0.085***	-0.054***		
			(0.038)	(0.018)		
$Ireform \times comove_{de}$					3.847***	
					(0.479)	
$Ireform \times comove_{eme}$						4.276***
						(0.903)
$Ireform$					-1.806***	-0.945***
					(0.230)	(0.219)
Controls	yes	yes	yes	yes	yes	yes
Firm	yes	yes	yes	yes	yes	yes
Industry	yes	yes	yes	yes	yes	yes
Year	yes	yes	yes	yes	yes	yes
Observations	278,598	278,598	278,598	278,598	278,598	278,598
R-squared	0.380	0.385	0.379	0.383	0.379	0.384

Panel C Anchoring effect

	(1)	(2)	(3)	(4)
	High anchoring group		Low anchoring group	
Variable	$|\gamma_{ha}|$	$|\gamma_{ha}|$	$|\gamma_{la}|$	$|\gamma_{la}|$
$comove_{ha}$	-2.021***	-2.021***		
	(0.087)	(0.086)		
$comove_{la}$			0.266***	0.264***
			(0.075)	(0.074)
Controls	no	yes	no	yes
Firm	yes	yes	yes	yes
Industry	yes	yes	yes	yes
Year	yes	yes	yes	yes
Observations	278,598	278,598	278,598	278,598
R-squared	0.385	0.389	0.344	0.347

6. Conclusion

This paper explores the relationship between exchange rate co-movements and firm-level exchange rate exposure in China, and it investigates how the RMB's internationalization affects this relationship. Our findings reveal a positive association between exchange rate co-movements and firms' exchange rate exposure. Notably, the impact of EME currency co-movements on exposure is smaller in comparison to DE currency co-movements. Furthermore, the impact of

EME currency co-movements on firms' exchange rate exposure appears to be diminished after the introduction of the BRI, particularly for highly multinational firms.

Our supplementary analyses have yielded robust evidence supporting the proposition that the effects of exchange rate co-movements on Chinese firms' exposure diminish with the extent of the RMB's internationalization. Notably, the correlation between currency co-movements for a portfolio comprising EME currencies and exposure has exhibited a weakened positive association following the RMB's inclusion in the SDR, during periods of RMB appreciation, and when the RMB maintains stability. These findings further highlight the importance of the RMB's internationalization in shaping firms' exchange rate exposure dynamics.

The empirical findings of our study carry significant policy implications, shedding light on the advantages of currency internationalization for non-financial companies in their home countries. Regardless of a firm's underlying fundamentals, its exchange rate exposure can fluctuate due to currency co-movements, presenting a risk management challenge. However, the adoption of the home currency for international transactions, or currency internationalization, seems to mitigate the temporal variations in undiversified risks arising from co-movements. This suggests that currency internationalization can reduce non-diversified risks for firms operating in the global market.

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Appendix A
Table A.1 Variable definitions and data sources
Note: this table presents the abbreviation, definition and source of variables we have used.

Variable	Definition	Source
Exchange rate exposure and currency co-movement		
LRc	Log monthly return of trade-weighted currency index.	FX data from IMF IFS Trade data from CSMAR
LRf	Log monthly return of stocks	CSMAR
LRm	Log monthly return of value-weighted market index	
γ	The coefficient of LRc using OLS, as the proxy for the firm's exchange rate exposure	
$comove$	The mean value of unconditional correlation coefficients for log monthly return of bilateral exchange rate, as the proxy for currency co-movement	
$comove^{r2}$	The median value of adjusted R-squares using three-factor regression model, as the proxy for currency co-movement	Estimated
$comove^{var}$	The ratio of the variance for log monthly return of currency portfolio over the trade-weighted average variance for log monthly return of bilateral exchange rate, as the proxy for currency co-movement	
Controls		
$size$	Total assets (100 billion RMB)	
$bmratio$	The ratio of the book value of equity over the market value of equity	
$profit$	The ratio of the operating revenue minus operating cost over the operating revenue	
$quickratio$	The ratio of the quick assets over the current liabilities	CSMAR
$leverage$	The ratio of the total liabilities over the total assets	
$fsales$	The ratio of the overseas business income over the operating revenue	
$subs$	The average number of foreign countries that a firm's subsidiaries lie in during each year of 2004 - 2019	

Appendix B
Table B.1 The correlation coefficients of currencies in DE
Note: this table presents the Pearson correlation coefficients of log monthly return of bilateral exchange rate between RMB and currencies in DE from September 2001 to December 2019. Austria represents log monthly return of bilateral exchange rate between RMB and Australian dollar, others are similar.

country	1	2	3	4	5	6	7	8	9	10
1 Australia	1.000									
2 Denmark	0.649	1.000								
3 Canada	0.681	0.496	1.000							
4 United States	0.034	0.081	0.130	1.000						
5 Norway	0.662	0.760	0.573	-0.005	1.000					
6 Japan	0.106	0.219	0.082	0.245	0.128	1.000				
7 Sweden	0.691	0.850	0.580	0.029	0.820	0.168	1.000			
8 New Zealand	0.809	0.620	0.550	0.027	0.556	0.074	0.641	1.000		
9 United Kingdom	0.531	0.631	0.443	0.093	0.586	0.052	0.619	0.501	1.000	
10 Euro Area	0.656	0.995	0.511	0.082	0.782	0.216	0.862	0.621	0.641	1.000

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