PREVENTING FINANCIAL RISKS: CHINESE AND EUROPEAN PERSPECTIVE

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Preventing Financial Risks:

Chinese and European Perspective

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Governor's Preface

Bilateral relations between Hungary and China have historically been strong. In 1949, Hungary was among the first countries to acknowledge the People's Republic of China, and political and diplomatic relations were established. Two main steps strengthened the Sino-Hungarian partnership in the last decade. Firstly, in 2011, Hungarian Prime Minister Viktor Orbán announced the "opening to the East" policy and so officially set a goal of encouraging the development of relations with Asian countries. Besides that, in 2013 China put forward the idea of the Belt and Road Initiative (BRI), which was a clear element in the country's "opening to the West" policy, creating a suitable environment for deepening partnerships with European countries. Hungary was the first European country to join the BRI. Nowadays, we can say that Hungary – as a bridgehead – is leading the way in building East-West, and thus Sino-European, relations and co-operations. Many high-level meetings, high-value investments and people-to-people exchanges have enriched our relationship with high potential benefits for both countries. Supporting the views of the Hungarian Government, the Central Bank of Hungary – the Magyar Nemzeti Bank (MNB) – joined the efforts to build fruitful long-term relations and help the country become a hub for Chinese financial institutions and investments at the gateway to Europe.

In past years the Magyar Nemzeti Bank has taken a structured approach in opening towards the Chinese market. Consequently, the MNB has developed and achieved wide-ranging relations and results, of which the central bank's renminbi programmes form the core elements. In 2013 the

MNB was the first in continental Europe to sign a bilateral currency swap agreement with China to facilitate trading and investment relations, thereby also contributing to the internationalisation of the renminbi.

When the Renminbi Programme was launched in 2015, the MNB declared its approach towards China and the renminbi. The central bank deemed it essential to formulate a comprehensive approach toward the Chinese markets and investment opportunities and financial system issues in response to the great transformation of the global financial and economic system. Several goals have been identified within the framework of the programme, such as building up a renminbi foreign exchange reserve portfolio, providing the central bank with renminbi liquidity instruments in the event of market disturbances, developing the renminbi settlement infrastructure and ensuring financial stability aspects.

In conjunction with the Central Bank's Renminbi Programme the MNB has also launched the Budapest Renminbi Initiative, which aims to give a platform for discussions and also to strengthen cooperation amongst the stakeholders in policy-making, finance, the real economy and academia.

As part of the academic cooperation, the MNB and the Chinese Academy of Social Sciences cultivate an outstanding relationship enriched with high-level visits, lectures and conferences. In April 2017, the CASS opened its unique China-CEE Institute in Budapest. This establishment was warmly welcomed and supported by the MNB, as the institute widens Sino-European academic literacy through knowledge sharing between different nations. In November 2017, the MNB and the CASS sealed their cooperation through a Memorandum of Understanding. Later in July 2018, a conference volume of studies dedicated to the internationalisation of the RMB was published. It provided a deep analysis of the Chinese currency and the steps it has taken on its global march. This book was the first

tangible outcome of scientific cooperation between the MNB and the China-CEE Institute.

As part of the cooperation, the MNB and the China-CEE Institute held two workshops in November 2018 in Beijing and in September 2019 in Budapest to continue knowledge sharing between the stakeholders. Both workshops were dedicated to the topic of this new book "Preventing Financial Risks: Chinese and European perspective" where the second event gathered not only CASS and MNB experts, but also experts from our partner central banks of the V4 region.

The economic losses caused by the global financial crisis in 2008 caused the focus of prudential interventions in the financial system to widen in a holistic manner. This new approach has effectively mitigated numerous legacy risks in the global financial system, leading to higher resilience and more prudent risk taking. However, in today's fast-changing environment, the financial system – along with its regulators and supervisors – faces new challenges that also require the continuous improvement of business models and regulatory approaches. The low interest rate environment, the boom in credit cycles, the rise in asset prices and the increasing spread of digitalisation all call for the continuous fine-tuning of current regulations.

Given the interconnectedness within the financial system, similar risks may affect numerous parts of the world, pointing in the direction of a common framework for financial regulation. At the same time, different countries may also face specific challenges, which require an adaptive and innovative approach when it comes to maintaining financial stability. Therefore, international cooperation is of vital importance, as exhibited in the case of China and Hungary, two countries that celebrated 70 years of diplomatic relations in 2019.

In the CEE region, the residential property market continued its robust expansion. The historically low interest rate environment in several countries led to high credit growth often accompanied with high house price inflation and the increase of households' indebtedness and leverage. Overall, the financial cycle has reached its upswing stage, which is increasingly addressed by proactive macroprudential measures in the region. The most common measures introduced involve the countercyclical capital buffer and borrower-based measures.

The CEE banking sector has increased its resilience in recent years, but slow progress in improving profitability and renewed cyclical headwinds may hamper banks' ability to respond to downside risks to growth. Forward-looking action will therefore be key from a policymaking point of view in ensuring sustainable economic growth in the region.

In line with global developments, digitalisation is also becoming an important issue in the region, as it can increase consumer satisfaction and value added; it also improves operational efficiency, competitiveness and the stability of the financial system. Although the CEE banking sectors have advanced financial infrastructure, the slow transformation of the traditional operations of incumbents may cause profitability and sustainability risks. Institutions of CEE financial systems should enhance their digitalisation efforts, in which the evolving FinTech sector could act as a catalyst. The increasing spread of digitalised solutions could become the engine of sustainable economic growth in the region. Regulators in CEE countries should therefore incentivise partnerships between incumbent institutions and FinTech firms for exploiting opportunities in digitalisation while reducing potential risks.

In China, regulatory authorities have also faced many challenges in recent years. Rapid credit expansion, both in the traditional and the shadow

banking sector, have resulted in rising corporate indebtedness. The risk level of banks that finance construction projects has increased parallel to the growing penetration of mortgage lending. At the same time, the level of household indebtedness cannot be deemed high by international standards; the supervisory authority is currently trying to prevent the problem escalating by means of regular and strict actions and rigorous audits, while the central bank is applying a macroprudential policy built on an increasingly wider information base.

Intensifying competition among financial institutions along with the growing presence of shadow banking has recently led to declining profitability in the banking sector. The previously permissive attitude towards shadow banking activity has been replaced by increasing tightening. The source of the problem was first managed by the more concerted action and then by the partial integration of the supervisory bodies in 2018.

The digital maturity of the Chinese population and the less developed banking infrastructure of the country have contributed to the rapid rise of technology-based alternative financial service providers. Several Chinese FinTech firms are already dominant domestic and regional market players, resulting in China being the leading nation in FinTech consumer adoption. Besides improving competition and financial inclusion, the sudden growth of these companies can also pose risks in the financial system; therefore, regulators should focus on strengthening their financial risk control tools alongside the support mechanisms already in place.

Although the solutions to the above challenges may vary by country, the common goal is clear: enhancing the competitiveness of the financial system while maintaining its stability. This highlights the importance of international relations and sharing best practices among countries. The

publication of this study book and the two workshops jointly arranged by the MNB and the CASS China-CEE Institute will contribute to an exchange of experience on this topic. Analysing and sharing information on the risks and policies in CEE countries and China may benefit authorities in all countries involved and can support successful cooperation between them in the future. In addition, I hope that the publication of this study book will convey a thorough understanding to the public as well on the activities and goals of the MNB in this topic.

I would like to express my sincere gratitude to all the experts and scholars who participated in the previous two workshops and shared studies with thoughtful insights on topics to publish this study book, and to all those who contributed to its success.

György Matolcsy
Governor
Magyar Nemzeti Bank

Executive President's Preface

On 24 September 2019, China-CEE Institute and the Central Bank of Hungary (MNB) coorganized an workshop entitled "Preventing Financial Risks: Chinese and European Perspective". During the workshop, experts from both Chinese and European sides joined the discussions, including Chief Economist of the Central Bank of Hungary (MNB) Mr. Dániel Palotai, Executive president of China-CEE Institute and Deputy Director-General of Institute of European Studies of Chinese Academy of Social Sciences (CASS) Dr. Xin CHEN, and other representatives from Institute of World Economy and Politics of CASS, Institute of Finance and Banking of CASS, National Bank of Poland (NBP), National Bank of Slovakia (NBS), Czech National Bank (CNB). The discussions mainly focused on (1) financial stability and challenge of FinTech and (2) Risks in Banking Industry and Housing Market. Following the workshop, China-CEE Institute and the MNB decided to make further efforts and translate the panel discussions into tangible research results so that a wider range of audience could benefit from the discussions. Now I have the pleasure to present this book as the result of our joint work. Meanwhile, I'd also like to give a brief introduction to all the articles included in the book.

Peter Faykiss, Norbert Kiss M., Benjamin Nagy and Peter Sajtos' article, entitled "How regulation can promote digitalisation in the financial sector: the MNB approach", sheds light upon (1) the definition of FinTech and the main drivers behind the spread of FinTech services, such as strong demand factors and supply-side factors behind FinTech innovations, (2) possible benefits and risks of FinTech services for consumers and traditional financial services providers, (3) the development and current situation of the FinTech sector in China, Europe and Hungary, (4) the role of financial regulators including financial stability, competitiveness and consumer protection issues, (5) supporting international regulatory

initiatives, including innovation hubs and regulatory sandboxes, and more importantly (6) the MNB approach for financial innovation and digitalisation: MNB Innovation Hub and Regulatory Sandbox, and MNB FinTech strategy.

In the article entitled "Targeted application of borrower-based measures: the case of Hungary", **Laura Komlóssy, Alexandr Palicz and János Szakács** review and analyse the current challenges of operating the borrower-based measures (BBM) framework in Hungary regarding the targeted application of the measures addressing new risks and maintaining their effectiveness.

László Kajdi's article, "Risk Management on the Payments Market: Experiences from Hungary", discusses the measures taken by the central bank of Hungary (MNB) in relation to liquidity, fraud and operational risks. According to Kajdi, the unique method of liquidity management in the Hungarian instant payment system, the regulated mode of market-entry for new non-bank service providers and the widespread application of stricter authentication methods support the reliable operation of payment services on the one hand, and these factors are also ensuring favourable changes for customers on the other hand.

Ádám Banai, Gábor Hajnal and Sándor Winkler analyse the causes and consequences behind the rise of Hungarian house prices. In their study, authors examined three aspects of house prices, considering competitiveness and social effects in addition to financial stability. According to their analysis, although the price increase was not a threat to the banking sector, its potential impact on competitiveness is considerable. The study shows that difficulties in accessing housing may drain both financial and human resources from the national economy, urge young people to leave the country, postpone the time of establishing their own homes and parenting, and may also negatively affect performance at work. Therefore, economic policy must respond in such situations.

In the article "Digital Currency: Technology, Nature and Prospects", **Dong CHENG** develops a conceptual analysis of the economic properties and technical characteristics of digital currency and discusses future development prospects of digital currency. Since the inception of Bitcoin in 2009, digital currency not merely becomes an important concept in the IT and financial sectors, but also brings some challenges and problems, such as digital currency speculation, the issuance of digital currency and the transaction of digital currency.

Haihong GAO's article "China's financial opening and stability" addresses the policy aspects of China's financial opening up and stability. Since the introduction of its opening up and reform policy in 1978, China has followed a gradual approach to liberalising its capital account. According to Gao, the gradualism reflects the reality that China has a relatively weak domestic financial sector and shallow financial market, and a transitional system featuring distorted factor allocation, but financial opening is also beneficial because it invited foreign competition and brought pressure for domestic reform. Gao's analysis focuses on how China managed the tradeoffs between capital account liberalisation and financial stability, especially in the context of China's ambition of internationalising its currency.

In the article entitled "Risks of China's Banking Industry and Relevant Suggestions", **Guangzi LI's** article deals with the risks in China's banking industry. Following an overview of China's banking industry, authors analyse risk status in China, including credit risk, market risk (interest rate risk and foreign exchange risk) and liquidity risk in the first section. In the second section, authors cover some risks in key areas, including liquidity risk of small and medium-sized banks, credit risk of rural financial institutions, and risks of complex organisational structure. In the third section, authors provide five relevant suggestions: China's banking industry needs to focus on its conformity to its orientation and on services for the real economy; (2) analysis of the credit risk of key industries and

areas should be performed; (3) banks' corporate governance needs to be further improved; (4) further improvement for the governance of banking groups and their complex structures is expected to be made, and (5) an effective salary incentive mechanism plays a role of vital importance.

Jinguo GONG and Yan LUO's article, entitled "Reflections on Interest Rate Risk Management and the Development of Treasury Bond Futures in China", covers non-negligible interest rate risk with expansion of the bond market, influencing mechanism and research status of interest rate risk, value and market development of treasury bond futures in interest rate risk management and the possible problems in the development of treasury bond futures market. According to the authors, treasury bond future market in China is still at the early stage of its development, and there remains significant room for improvement in the aspects of market activity, covered term range and market trading rules.

I would like to thank all the experts and scholars who participated in the previous workshops and shared studies with thoughtful insights on topics covered in this book. I would also like to extend my gratitude to our partner MNB and all those who made great efforts for this publication. Finally, I hope this book and its perspectives will be very helpful to enrich the knowledge of understanding financial risks.

Prof. Dr. CHEN Xin
Executive President and Managing Director, China-CEE Institute
Deputy Director General, Institute of European Studies, CASS

How Regulation Can Promote Digitalisation in the Financial Sector: The MNB approach

Peter Faykiss; Norbert Kiss M.; Benjamin Nagy; Peter Sajtos

1. The definition of FinTech and the main drivers behind the spread of FinTech services

The widespread application of innovations in the financial sector is not a new phenomenon. Financial institutions have a long history in relying on technological innovations to improve their operations, products and services. In the 20th century, many new solutions – such as the credit card, the ATM or the electronic payment settlement system – were developed and implemented (*Arner et al., 2016*). However, in recent years the extremely rapid development and application of information and communication technologies have made a whole set of innovations essential in various sectors of the economy. By comparison, due to several factors, the financial institutions have become inadequate at implementing new technologies and it became less typical for innovation to be applied in this field (*MNB, 2018*).

The term "FinTech" typically refers to technology-related financial innovations which have become increasingly common in recent years. A very broad definition of FinTech has been used in the literature; therefore, we can identify multiple layers of FinTech based on several factors. In general, by FinTech we mean the exploitation of innovative technology in the framework of financial services. According to the report of the Financial Stability Board (FSB), FinTech is a technology-driven financial innovation which may result in new business models, applications or products that could have a meaningful effect on financial institutions, financial services and financial markets (*FSB, 2017; Nicoletti, 2017*).

FinTech innovations are supported by strong demand factors. As both internet and smartphone penetration are steadily growing, the widespread usage of online technologies is gradually becoming part of our everyday lives and general thinking, and the consumer society already assesses that satisfying customer needs through digital channels is vital in all areas. Therefore, customers – especially those from the younger generations – are willing to purchase financial products online, especially on mobile devices (*EY, 2019*). The significant presence of large technological companies in people's lives has also contributed to changes in consumer expectations: there is considerable demand for high quality customer experience in every activity, which means that the use of financial services should become easier, simpler and more convenient, preferably through online channels (*MNB, 2019*).

Several supply-side factors could boost the proliferation of financial innovations. Given that intense technological change is affecting a number of aspects of life, financial service providers should also exploit the possibilities in that change. With the opportunity to offer services in the online or digital area, financial institutions can exploit many benefits for their operations. On the one hand, the integration of innovations, FinTech solutions or cutting-edge technologies can improve banks' cost efficiency through various channels (e.g. AI techniques can boost effectiveness in back-office functions, online administration methods can decrease the demand for bank branches, etc.). On the other hand, with technological developments, institutions can adjust their business model effectively to be able to cope with the challenges of the 21st century, while becoming more flexible and agile in their operations. Thanks to the various effects, FinTech innovations have the opportunity to improve the competitiveness of the whole financial system permanently and significantly. As we have indicated, FinTech innovators can influence financial markets not only through new products and services, but also by establishing new business models and operating structures. Besides new FinTech companies, this

entails opportunities for incumbent market participants if they utilise the solutions appropriately.

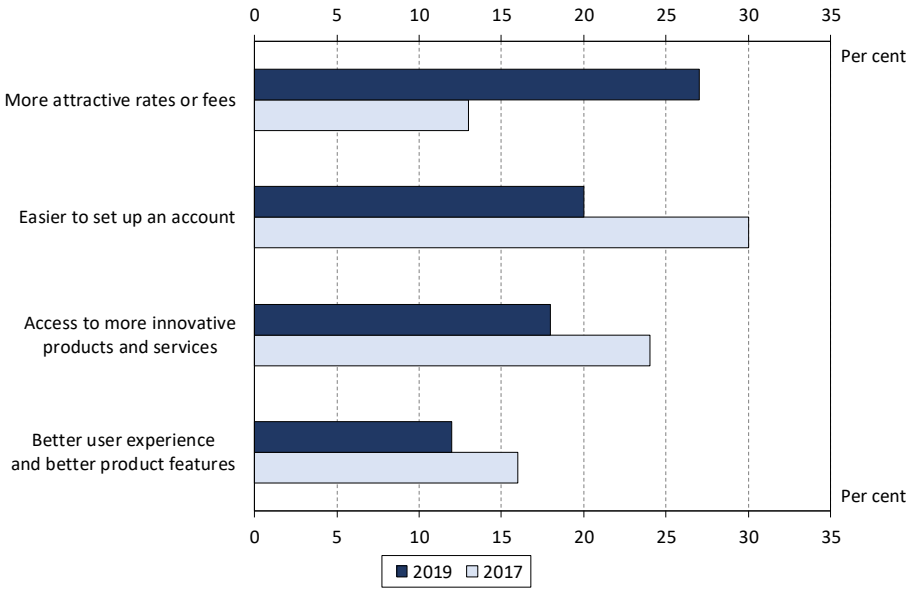
Traditional service providers have huge potential for using FinTech innovations. After the crisis of 2008, there were several factors that hindered the financial sector from taking advantage of the opportunities of the digital revolution more enthusiastically. On the one hand, the crisis resulted in a dynamic increase in non-performing loans, which negatively affected banks' capital positions through impairment, and crisis management also soaked up significant human resources. On the other hand, the long-lasting low interest rate environment resulting from the crisis put the revenue side of banks under pressure, which could pose profitability challenges in the longer term with an unchanged cost level. However, traditional service providers or incumbents still have a significant user base and the trust towards them is considerably high when it comes to data and money protection. Considering these facts, incumbents can exploit the benefits of digitalisation and technological revolution effectively, if they act appropriately within a short period of time.

2. Possible benefits and risks of FinTech services for consumers and traditional financial services providers

FinTech solutions offer financial services that are easier to use, more convenient and available online for a wider range of consumers at a lower cost. There are several reasons for the attractiveness and dynamic growth of FinTech services among consumers. On the one hand, these services are typically available online, which allows them to reach consumers without a bank connection, but who have internet access and smart devices. In addition, consumers with bank connections can also access financial services via these channels, so saving them considerable amounts of time (*EC, 2017; Frost, 2020*). On the other hand, these innovative services offer a better-quality consumer experience in general.

This means easier, faster and more convenient usage compared to products offered by traditional financial institutions (*MNB, 2018*). Furthermore, FinTech services are becoming increasingly available at lower rates or fees than banking products with the same or similar function (*EY, 2019*). Consumer feedbacks also confirm this: while simpler account opening was the most important factor among FinTech users in 2017, by 2019, lower costs and attractive rates had become the most decisive one (Chart 1). According to a consumer survey conducted by EY, nearly 30 percent of users use these innovative products because they can manage their finances with a more attractive cost structure than at incumbent institutions.

Chart 1: The main reasons for using FinTech services



Source: EY Global FinTech Adoption Index 2019. Note: The Charts show the percentage of users across 27 countries who chose each answer as the primary reason for using a FinTech service.

However, spread of innovative financial services without a proper regulatory framework may create consumer protection risks. Increasing usage of FinTech solutions with no license for financial service provision threatens the enforcement of consumer interests in the absence of a supervisory authority. Enforcing consumer interests, even for licensed financial service providers, can be difficult, as they often provide cross-border services and are overseen by a foreign authority. In case of account management, which is one of the most basic financial services and most used FinTech solution, the lack of deposit guarantee can be a serious problem. In addition, there may be concerns in these cases regarding the management and appropriate protection of users' personal and financial data (*FSB, 2017*).

Active usage of digital solutions can also improve the competitiveness of traditional financial service providers against FinTech challengers. With the appearance of FinTech companies in financial markets, competition has intensified, forcing incumbent players to adapt to changing market conditions and consumer needs (*BIS, 2018b*). Traditional service providers can strengthen their market position through their own internal developments or cooperation with external partners, B2C and B2B FinTech companies. There is room for digital development in both front office areas — such as customer relations, product development and sales — and back office functions, so that incumbent institutions can increase their operational efficiency. Financial institutions that are well developed in terms of digital maturity or in applying cutting-edge technologies can operate more cost-effectively, offer better quality and more competitive services to their clients, and respond more flexibly to new challenges of FinTech companies (*MNB, 2019*).

The dynamic market penetration of FinTech companies may put pressure on the profitability of traditional financial service providers. Several innovative payment service providers have shown extremely rapid growth and gained millions of customers in Europe and in China over only

the last few years thanks to their widely available online services. In the absence of the appropriate adaptation of traditional institutions, the dynamic market penetration of FinTech companies may threaten the market share of traditional service providers and challenge the sustainability of their business models. In this case, the supervisory authorities shall only intervene if the activities of the innovative service providers are detrimental to the interests of the consumers or do not comply with regulatory requirements; in other cases, they do not (and should not) restrict the development of market competition.

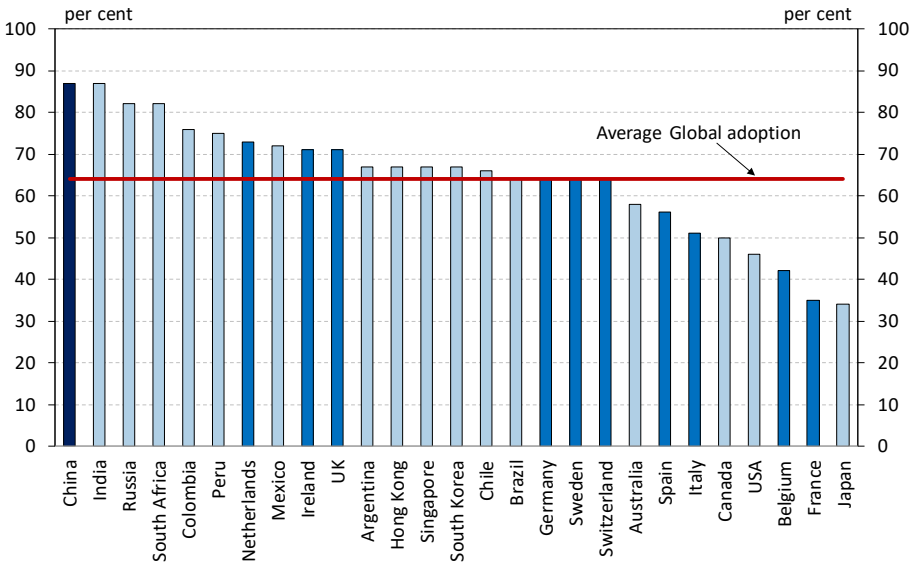
3. The development and current situation of the FinTech sector in China, Europe and in Hungary

The FinTech sector is growing rapidly locally and globally. Over the last ten years, the number of innovative financial service providers that have emerged in the market as a complement or even as an alternative to incumbents, has increased significantly. These FinTech companies are coming to prominence in a wide variety of financial fields: payment services, banking, insurance, capital markets, and wealth management. Nowadays, the FinTech sector offers a wide range of innovative services, and these applications are very well-known among consumers. While some developments and services from Fintech firms stay within the country borders, a number of service providers are already present in several markets worldwide, making the FinTech development a global phenomenon. In the long run, the technological progress of cross-border services may further encourage the spread of products and services that are popular all over the globe.

China is the leading nation in FinTech consumer adoption. According to EY's research, globally 64 per cent of people are actively relying on FinTech solutions. Several consumer groups are open to using innovative elements in financial services, but there can be significant regional

differences. The financial embeddedness of the public varies widely across regions; therefore, the development options of FinTech firms are strongly influenced by the sophistication of the specific region's financial infrastructure and its technological readiness. Asian countries currently dominate the rapid rise of the FinTech industry, as several FinTech firms are already dominant players in financial intermediation. Currently, China and India are the two main hubs of growth, while South East Asia's role is also central in digitalisation. By contrast, barriers to entry to financial intermediation in European countries are still relevant, but some FinTech firms have already been able to achieve spectacular results in certain segments and in many European countries, FinTech adoption is above the global average (Chart 2).

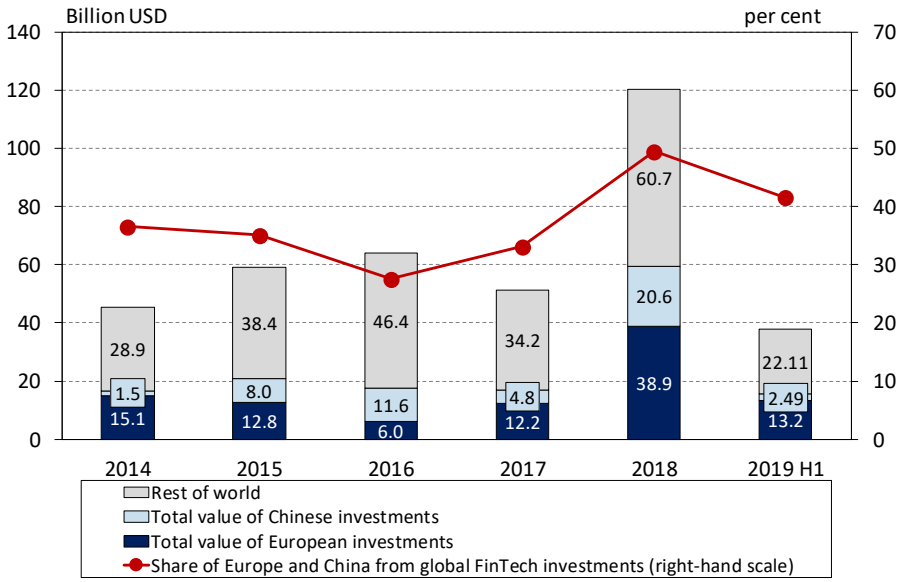
Chart 2: FinTech adoption rates globally



Source: EY, 2019. Note: For the consumer surveys, FinTech services are grouped in ten different buckets. A FinTech adopter is someone who has already used FinTech solutions from two or more buckets.

In recent years, investment attractiveness of FinTech companies has grown significantly. Globally, FinTech innovations have not only generated strong consumer interest, but investors already view most of these innovative companies as appealing prospect. Although investors took little interest during the early stages of FinTech sector' growth, in recent years, given that many FinTech companies have introduced successful solutions in different markets, these companies have become engaging prospects also for investment opportunities. So in recent years, the ability of these disruptive providers to raise capital has increased rapidly; there has been a significant flow of investment into the segment through venture capital or direct equity investments, and also through mergers and acquisitions. By comparison, global investments to the FinTech sector in 2018 amounted more than double compared to 2017 (in Europe the value of these investments nearly tripled). However, there are substantial differences across the various economic regions, which can be attributed to either consumers' attitude or the historical development of the financial system. In North America – which is leading the FinTech investment market – the development of the FinTech market is driven by an outstanding investment activity. Nevertheless, other regions have already started to catch up, as European and Chinese FinTech investment has started to increase. Currently, Europe performs better in FinTech investments than China, whereas banks have already recognised the importance of FinTech developments and have established several cooperation agreements with FinTechs (Chart 3).

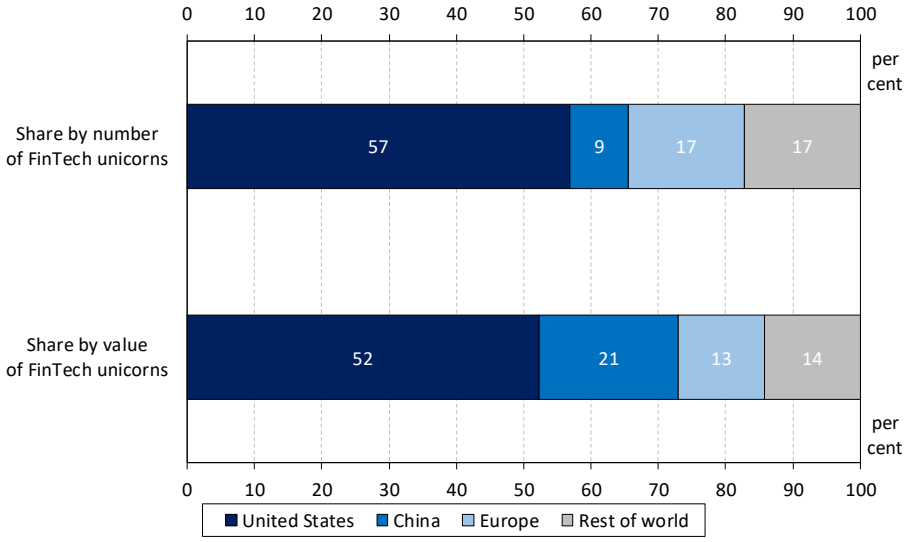
Chart 3: FinTech investments in different regions



Source: KPMG.

FinTech unicorns are emerging in China. According to CB Insights research, there are 58 FinTech companies globally, which can be considered unicorns (valued at more than $1B). Most of the unicorns are located in the United States and US FinTechs are also leading in summarised valuations (Chart 4). Although China is lagging behind the US in the number of FinTech unicorns, in terms of total value the Chinese companies perform better relative to their share based on number of firms. In Europe there are 3 countries from which FinTech unicorns have already emerged, but their overall market share is limited. European FinTech landscape is somewhat fragmented, but the biggest markets are United Kingdom and Germany.

Chart 4: Share of FinTech Unicorns by number and valuation in different regions



Source: CB Insights Global FinTech Report, Q3 2019.

Hungarian FinTech sector is at the beginning of its growth trajectory. Established Hungarian FinTech companies are already active in several segments, and their activities are having an impact across almost the entire financial landscape. Domestic FinTech solutions mainly focus on digital payment methods, but innovations providing online wealth management services (personal finance management – PFM), used for optimising investment strategies, are also typical. On account of the growing retail and corporate demand for FinTech solutions, FinTech firms are very open towards further developments. Despite several success stories and many forward-looking ideas, the Hungarian FinTech sector is somewhat lagging behind the European and especially the CEE region average, both in terms of the number of FinTechs and in venture capital investments (*Raiffeisen Bank, 2019*). However, according to research conducted by the MNB, recently the number of FinTechs has grown rapidly and has already reached the milestone of 100. Numerous start-ups offering financial innovations are

gaining regional recognition among foreign consumers and investors. Moreover, in the long run, the increasing openness of venture capital funds to FinTechs and the central bank's initiatives already under way suggest significant growth potential (*MNB, 2019*).

Future FinTech growth can be supported by consumers' openness towards digital solutions. The Hungarian population is increasingly demanding simple financial solutions, and this can incentivise the use of innovative and digitalised solutions. For more than 75 percent of respondents, easy access to banking and credit solutions is of key importance, while this number among the young generation (18-29 years) is over 85 percent (*Nagy – Zágonyi, 2019*). A substantial proportion of consumers are already interested in financial innovations: 20 per cent of the Hungarian population would consider using digital solutions for banking and financial administration and this tendency will presumably increase further in the future. Accordingly, strong consumer demand for digitalised financial services can boost FinTech adoption in Hungary in the long run (*MNB, 2019*). As innovative developments are becoming more common, the most flexible and agile consumer group would even be ready to change service provider for the option of a fully online administration process (e.g. via a smartphone). Despite the considerable openness, consumers are highly aware of privacy and trust issues; therefore, the existence of legal safeguards significantly influences the population's attitude towards financial services (*MNB, 2017*).

For many FinTech solutions, markets of Central and Eastern European countries such as Hungary may prove to be small on their own for achieving fast and sustainable growth. In countries, where the market is relatively small, but an advanced financial infrastructure exists, FinTech firms and banks are expected to cooperate closely in the near future. Therefore, development in the Hungarian FinTech sector might differ from that of large countries like China and United States. As the relatively small Hungarian market has adequate coverage regarding bank

branches, administration in banks may remain dominant for consumers. Therefore, the interaction with customers is expected to be conducted mainly through banks. Another possibility is that the initially independent companies will start cooperating with banks in order to optimise their operations, more frequently than is the case in China or the United States (*MNB, 2018*). Domestic incumbents and the Hungarian investor community are increasingly recognising the potential in companies applying financial innovations and are increasingly eager to cooperate with them. In the expanding and developing FinTech ecosystem, innovation labs set up by incumbent institutions play a key role in establishing close partnerships with innovative companies in the form of infrastructural, professional and sometimes financial support (*MNB, 2019*).

The above mentioned tendencies imply that the widespread use of FinTech innovations may fundamentally transform the operation of the financial intermediary system. The direction of developments is difficult to predict; the main question is whether FinTech firms enter the market in cooperation with incumbents, or the latter should expect to be crowded out, at least to some extent. Considering current trends, it seems that the development of market structure will vary from region to region (*MNB, 2018*).

4. The role of financial regulators: Financial stability, competitiveness and consumer protection issues

Technological development needs greater attention by public authorities as they may bring about many advantages, but new risks can also arise. Innovations developing as a result of technological progress usually appear in the financial system in an unregulated form, and therefore regulatory authorities have no clear picture about them or influence over them. Within these companies, possible risks can arise both on micro and

macroprudential level, and consumer protection issues should also be addressed (*FSB, 2017*).

- **As for the microprudential level**, considerable growth of newly established companies could result in a significant increase in funding risks, while a substantial maturity mismatch can develop between assets and liabilities. Leveraged and growth-demanded operation can increase risks in profitability and operation (e.g. deficiencies of information systems, external interventions and human errors). In parallel, it can create false, unsustainable incentives for other players. This can also generate a higher appetite for risk appetite on the market, which could lead to significant spread of unsustainable business models (*BIS, 2018b*).
- The above mentioned issues also could be relevant at the **macro level,** leading to a more vulnerable financial system. Moreover, boosting market competition may encourage lending institutions and service providers to engage in pro-cyclical operations, which accentuates real economy fluctuations. The increasing interconnectedness of market participants may result in elevated cyber risks, while the channels of contagion between sectors of the economy may increase (*BIS – FSB, 2017*).
- When it comes to technological innovations, proper handling of the **consumer protection** issues arising is an absolutely crucial factor as consumers are confronted with increasingly automated solutions which use large amounts of data. The inappropriate handling or even the unauthorised use of personal or transactional data could deceive or harm consumers or even investors. Consumer protection issues may also be of key importance in the case of cross-border, foreign transactions and services (*BIS – FSB, 2017*).

Financial regulators have a significant role in providing a safe FinTech development environment. Financial innovations require an appropriate regulatory response in order to have positive effects in the financial sector,

while efficiently addressing risks. As FinTech innovations can improve the competitiveness of the financial system permanently and significantly, regulators should find the right balance between excessively flexible and overly restrictive approaches, in order to facilitate safe innovation. Several aspects should be reviewed, on the grounds that creating an adequate regulatory and supervisory framework may be difficult due to the potential lack of expertise necessary for understanding the new technologies. Regulators also should consider the fact that technological solutions that have appeared on the FinTech scene are already characterised by a high degree of heterogeneity, and new ideas emerging in the future may result in an even more complex market. Overall, a proactive regulatory approach that supports the safe spread of digital innovations could have a significant effect on the long-term performance and competitiveness of the economy.

Financial regulators should be committed to the promotion of FinTech innovations. Although developments could have significant positive results when the possible risks are handled adequately, market entry still could be somewhat difficult for new market players. As various risks can arise in financial intermediary systems, institutions of financial markets and their activities are regulated on a broad scale. While regulation can secure safe functioning of the system, it can hamper innovation initiatives on the market. Also, it should be noted that the current financial regulatory frameworks continuously evolved during the past 30 years, but solutions involving financial innovation have not yet been sufficiently integrated into it. For this reason, the feasibility of FinTech innovations is legally undefined or even impeded in several cases. Therefore, regulators and supervisors should establish channels to improve efficiency of communication with innovators, and should support easier and faster market entry by facilitating cooperation between market participants and creating innovative ways in which they can contribute. Strengthening the link between regulatory authorities and innovators can, on the one hand, support companies in finding an optimal legal solution for innovations; on

the other hand, it can help regulators to understand the related risks and reform the current legal environment when necessary.

5. Supporting International regulatory initiatives: Innovation hubs and regulatory sandboxes

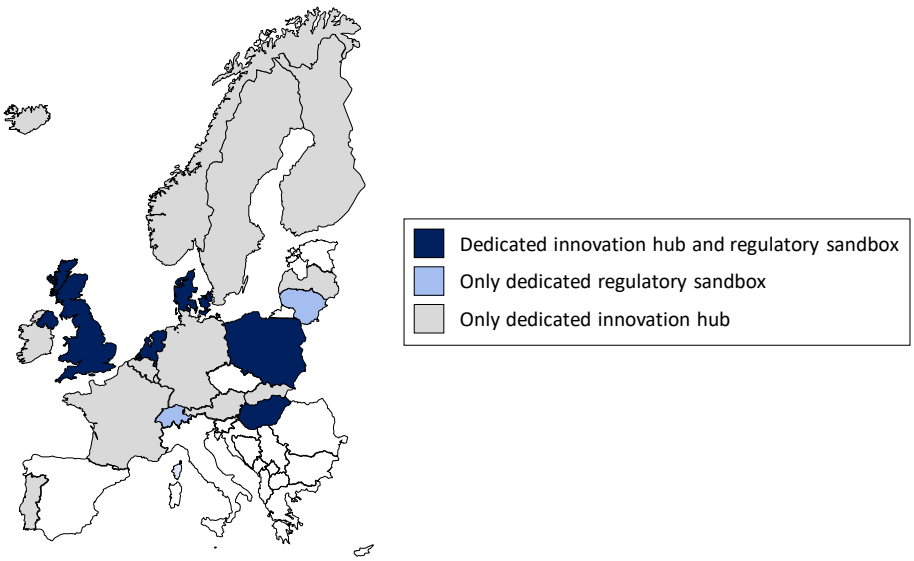
Financial regulators can contribute to the development of the FinTech sector by making information required for regulatory compliance transparent via innovation hubs, and by enabling safe testing via regulatory sandboxes. Central banks and regulatory authorities have a key role to play in supporting digitalisation and financial innovation in several respects, including consumer protection, financial stability and market competition. Recognising that the development of the FinTech sector is primarily hampered by barriers to market entry, two innovative regulatory tools have become widely used internationally: innovation hubs and regulatory sandboxes. An innovation hub, as a communication platform, facilitates the flow of information between FinTech companies and the regulator, regarding the regulatory compliance required before market entry. Within this framework, innovative firms may request guidance directly from the supervisory authority on the interpretation of regulations regarding their product or service. In some cases, they can find all the legislation that applies to financial services provision gathered on one platform. A regulatory sandbox serves as a test environment and allows innovators to test their business models and services for a predetermined time period on a limited number of real customers, with certain regulatory exemptions and under the close control of the supervisory authority for a limited time (*Fáykiss et al., 2018; UNSGSA, 2019*). In order to keep risks low, only FinTech firms and financial institutions meeting the criteria set by the supervisory authority can be admitted to a Regulatory Sandbox (*MNB, 2017*).

Regulatory Sandboxes seem to be efficient in creating a balance between too restrictive and too lenient regulatory approaches. As the adequately controlled framework provides the opportunity for market entry with fewer resources, the testing entities can efficiently identify viable business solutions while being able to gauge potential demand on their innovative product or service. The test environment can thus provide appropriate guidance for identifying those – typically costly – improvements that could have the greatest positive impact in the

short and long term (*MNB, 2018*). Especially on the side of start-ups, the regulatory sandbox test results can incentivise investors' activity, as they are able to analyse start-ups' traction and the business model in operation. The sandbox framework also can be beneficial for regulators, because active and deep cooperation provides an up-to-date information base on market developments, and the benefits and possible risks of innovations. This knowledge, along with appropriate current legislation can guide the design of support mechanisms, meaning that innovative developments can take place in a safe manner (*EC, 2017; Zetzsche, 2017*).

Innovative regulatory tools are becoming more widespread in Europe in order to support the rapid market penetration of FinTech services. In most Western and Northern European countries, central banks or supervisory authorities have a dedicated innovation hub, providing guidance for market entry planners on both banking, insurance and capital market innovations on a single platform (Chart 5). In addition, a handful of European countries (such as Cyprus, Croatia, Greece, Italy, Romania and Spain) have communication platforms related to just a limited range of financial services. Countries showing the way in supporting financial innovation with regulatory tools also have regulatory sandboxes, which are capable of testing in a safe and controlled environment and validating regulatory compliance of innovative products. In this respect, besides Hungary, Denmark, the United Kingdom, the Netherlands and Poland provide the most favourable regulatory environment for the growth of the FinTech sector in Europe (*EBA, 2019*).

Chart 5: Innovation hubs and regulatory sandboxes across Europe



Source: MNB; based on EBA and the websites of the national authorities. Note: The map identifies innovation hubs and regulatory sandboxes as follows. Innovation hubs provide guidance for banking, insurance, and capital market innovation on a single platform. Regulatory sandboxes allow testing with exemptions from certain rules or with a limited scope license.

When FinTech first emerged, Chinese and European regulators applied different approaches. In Europe, the majority of financial institutions were established a long time ago; therefore, entities had become actively involved in economic circulation and by the 2000s, a high share of the population had established bank connections (*Gaspar et al., 2003*). As financial service providers are long standing institutions, the build-up of the regulatory regime also focused on these incumbents, and a broad and hierarchic regulatory framework was created that defines the prudent operation of institutions involved (*Fáykiss et al., 2018*). Within this situation, safety of the financial system and its consumers was feasible in practice, however, the complex system made market entry difficult for

newcomers and only cautious steps were made by the authorities to foster innovation. Compared to Europe, Chinese financial system was somewhat underdeveloped at this time, but the country experienced a high economic growth with a rapid development of a digitally mature society (*Frost, 2020*). Under these circumstances, financial regulators developed a very permissive attitude towards digital-first FinTech innovations, with the aim of developing financial embeddedness in society.

As FinTechs forge ahead, Chinese and European regulatory policies have started to converge. In recent years several smart and powerful FinTech solutions emerged in China, proving that digital and innovative business models are feasible on financial markets. However, the relaxed regulatory approach gave space for major risk accumulation within the system (*Xiang et al., 2017*). As a response, Chinese financial authorities have started to focus on strengthening their financial risk control tools alongside support mechanisms (*BIS, 2018a*). In the meantime, as Europe was applying a more prudent approach, FinTech development was fragmented and less intense, but risk mitigation techniques proved to be efficient. Experience gathered from Europe and China shows that while there are several forward-looking incentives supporting developments in the FinTech field, the soundness of financial systems should be maintained with the use of various regulatory tools focusing on financial innovation. Experience also suggests that in the future those regulatory tools will be viable which provide significant room for innovative developments, but at the same time maintain safety and trustworthiness in the financial system. Recognising the importance of these, both China and Europe started to converge their regulatory and supervisory approaches for innovative issues, while both regions are considering frameworks such as regulatory sandboxes as an example to follow.

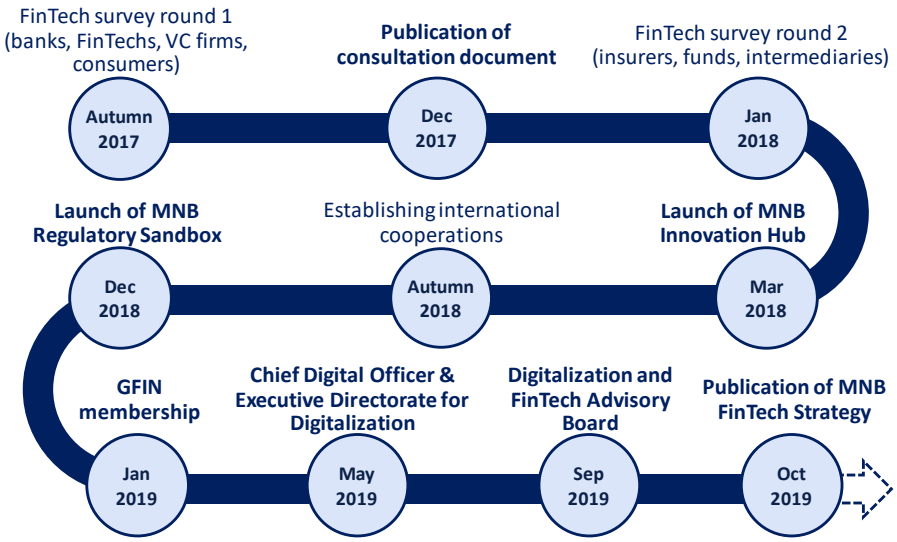
6. The MNB approach for financial innovation and digitalisation: MNB Innovation Hub and Regulatory Sandbox, MNB FinTech strategy

The MNB is committed to the promotion of FinTech innovations, which – besides reducing the costs of financial intermediation – incentivises a higher-level of client service. The MNB intends to support the safe adoption of FinTech innovations in the Hungarian financial system, through its active engagement and has taken decisive steps to steer the Hungarian financial system in a more innovative direction.

The central bank has been developing a framework for supporting FinTech innovations since 2017. It started this task by assessing Hungarian stakeholders' needs and best international practices. During this exercise, the starting point was to assess consumers' openness towards innovations in financial services, as it determines market opportunities for innovations. In parallel, the MNB also carried out a survey of financial institutions', FinTech companies' and venture capital firms' opinions about innovations and the evolving regulatory challenges. Based on the results of market consultations conducted by the MNB, there is a strong demand for regulatory support of FinTech innovations

MNB has already established various regulatory instruments for facilitating safe market innovation. The central bank considers the following as key priorities: facilitating the digitalisation of the domestic financial system, developing the FinTech sector and improving the general level of financial awareness and professional training. In line with these efforts, the MNB uses various innovative regulatory instruments to contribute to proliferation and widespread use of financial innovations in the market under safe circumstances (Chart 6). The two key channels used by the MNB to interact with innovators are the innovation hub and the regulatory sandbox.

Chart 6: Main FinTech initiatives by MNB



Source: authors' own graphic.

6.1 MNB Innovation Hub

The MNB Innovation Hub is a unique platform, provided by the central bank of Hungary, **to facilitate dialogue with innovators targeting the financial sector.** Market participants can obtain guidance from the regulatory authority on how they can operate their innovative solution, in the current regulatory environment.

The MNB Innovation Hub started operating in March 2018, with the mission of supporting Hungarian financial innovations by providing guidance on the interpretation of regulatory requirements related to innovative products or business models. Through its information repository, communication hub and regulatory support platform, the MNB Innovation Hub helps to identify legal obstacles and impediments, and to increase the feasibility of innovative ideas. At the same time, it raises the awareness of international best practices. The platform provides a connection between

the supervisory authority and innovative institutions (FinTech firms, banks, insurers, etc.) via a flexible, goal-oriented approach, and offers the opportunity for active and direct dialogue between the parties involved. Through the regulatory support platform, the MNB has received more than fifty queries, both from incumbents and FinTech companies, covering several innovative topics such as online customer identification, P2P loans, crypto assets and cloud-services.

The MNB Innovation Hub also focuses on international cooperation to forge ties to foreign authorities active in the FinTech arena and possessing relevant experience. This facilitates the efficient identification of potential risks and the exploration of the relevant best practices and may even contribute to the swifter spreading of successful ideas. As a part of these efforts, the MNB – being the first in the CEE region – has become a Member of the Global Financial Innovation Network (GFIN), along with some of the leading institutions, such as FCA (UK), MAS (SG), which have developed specific frameworks for supporting FinTech innovations.

6.2 MNB Regulatory Sandbox

MNB introduced its Regulatory Sandbox framework in December 2018. This was supported by both international experience and the results of the consultation held earlier among Hungarian actors. In this manner, the central bank became aware that there was significant interest in a regulatory sandbox: almost half of the relevant market players expressed their intention to participate in a testing environment in Hungary. The experience stemming from operating the innovation hub also proved that a regulatory sandbox would be beneficial for the Hungarian financial system. As a result, at the end of 2018, the MNB started operating its regulatory sandbox framework, which is considered to be an efficient way of assessing the real-life viability of novel business solutions.

The MNB Regulatory Sandbox offers temporary exemptions for innovative financial institutions. The MNB Regulatory Sandbox is a controlled environment for testing innovative solutions, where the participating actors can receive temporary exemptions from certain prudential requirements. As a first step in establishing the framework, the temporary exemptions can occur with respect to those regulatory requirements that fall within the competence of the MNB. Therefore; financial institutions or incumbent-FinTech partnerships ready for testing may receive the opportunity for temporary deviation from the requirements of certain key MNB decrees (e.g. detailed rules on the Know Your Customer (KYC) process, debt cap rules, data reporting requirements, guideline on cloud servicing, etc.). Within this model, recently established firms with no licence can benefit from the MNB Regulatory Sandbox via joint testing with a licensed institution.

Risk prevention is also an important feature of the MNB Regulatory Sandbox. As real clients are involved in the tests, the central bank has introduced limits in order to prevent excessive risk taking. The possible exemptions from corresponding legislation rules are limited to a maximum of 10,000 clients and are provided for up to 12 months, which period may be extended by a maximum of 6 months. During these testing periods, strong consumer protection and close regulatory monitoring receives increased attention, as well as client information and reporting being highlighted from the side of the participants.

6.3 Organisational reforms for supporting innovations

The MNB has established a dedicated executive directorate responsible for the digitalisation of the financial system and the development of the domestic FinTech sector. With the aim of putting emphasis on the digital transformation in the financial system and the central bank alike, the MNB created the Chief Digital Officer position and

– under its coordination – an executive directorate for digitalisation and FinTech development. The unit's tasks include comprehensive analysis of possible future directions for innovation and digitalisation in the financial sector, as well as the establishment and ongoing development of central bank instruments. As for the supervisory side, the Supervisory Lab for Financial Innovations monitors international best practice in supervisory technology innovations and proposes their implementation into the domestic supervisory practice. A high-level forum, i.e. the Advisory Board on Digitalisation and FinTech Development, consisting of renowned domestic and international experts, has also been established to channel the views of external experts into the activity of the MNB.

6.4 MNB FinTech Strategy

MNB has published its own FinTech Strategy to demonstrate its deep commitment towards financial innovation and digitalisation. Realising that MNB could assume a key role in stimulating digitalisation and the proliferation of FinTech solutions, the central bank of Hungary published a FinTech Strategy in October 2019. The MNB FinTech strategy has been drawn up with a view to providing an overarching framework for the directions and initiatives relating to digitalisation objectives, in order to keep inevitable changes expected in the financial sector on a controlled and regulated track. The strategy includes incentives and proposals for the short, mid and long-term. While it serves as an action plan for the MNB, it suggests possible developments for the government and the domestic FinTech community as well. Due to the comprehensive focus, some of the suggestions demand changes in the legislation; however, many of them only depend on the intention of sector participants.

The MNB considers it especially important to develop the digitalisation of the financial system and support the market introduction of innovative financial services in a secure way, as in addition to creating value for consumers, it also

strengthens the financial sector and contributes to supporting economic growth in a sustainable way. In this context, the MNB has identified its key priorities, which include increasing the competitiveness of financial services offered to consumers; improving the efficiency and stability of the financial system; supporting the creation of an advanced and active domestic FinTech ecosystem; promoting overall financial awareness; and developing professional training. In pursuit of the strategic objectives considered relevant and specified by the MNB, 24 specific initiatives and proposals have been put forward in the strategy.

7. References

Arner, D.W. – Barberis, J.N. – Buckley, R.P. (2016): *The evolution of FinTech: A new post-crisis paradigm?* UNSW Law Research Paper, No. 62.

BIS (2018a): *Fintech credit markets around the world: size, drivers and policy issues, BIS Quarterly Review, September 2018. https://www.bis.org/publ/qtrpdf/r_qt1809e.pdf.* Downloaded: 16 January 2020.

BIS (2018b): *Sound Practices, Implications of fintech developments for banks and bank supervisors. Basel Committee on Banking Supervision, February. https://www.bis.org/bcbs/publ/d431.pdf.* Downloaded: 16 January 2020.

BIS – FSB (2017): *FinTech credit, market structure, business models and financial stability implications. http://www.bis.org/publ/cgfs_fsb1.pdf.* Downloaded: 16 January 2020.

EBA (2017): *Discussion Paper on the EBA's approach to financial technology (FinTech). https:// www.eba.europa.eu/-/eba-publishes-a-discussion-paper-on-its-approach-to-fintech.* Downloaded: 16 January 2020.

EBA (2018): *The EBA's Fintech Roadmap. http://www.eba.europa.eu/-/eba-publishes-itsroadmap-on-fintech.* Downloaded: 16 January 2020.

EBA (2019): *FinTech: Regulatory sandboxes and innovation hubs https://eba.europa.eu/file/26697/download?token=HguSPQ02. Downloaded: 16 January 2020.*

EC (2017): FinTech: *A more competitive and innovative European financial sector. European Commission Consultation Document. https://ec.europa.eu/info/sites/info/files/2017-fintech-consultation-document_en_0.pdf.* Downloaded: 16 January 2020.

EC (2018): *FinTech Action plan: For a more competitive and innovative European financial sector. European Commission.*

https://ec.europa.eu/info/publications/180308-action-planfintech_en. Downloaded: 16 January 2020.

EY (2019)*: Global FinTech Adoption Index:* https://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/financial-services/ey-global-fintech-adoption-index-2019.pdf?download. Downloaded: 16 January 2020.

Fáykiss, P. – Papp, D. – Sajtos, P. – Tőrös, Á. (2018): *Regulatory Tools to Encourage FinTech Innovations: The Innovation Hub and Regulatory Sandbox in International Practice.* Financial and Economic Review, Vol. 17 Issue 2, June 2018.

Frost, J. (2020): *The Economic Forces Driving FinTech Adoption across Countries, DNB Working Paper, No. 663 / January 2020.* https://www.dnb.nl/en/binaries/Working%20paper%20No.%20663_tcm47-386774.pdf. Downloaded: 16 January 2020.

FSB (2017): *Financial Stability Implications from FinTech: Supervisory and Regulatory Issues that Merit Authorities' Attention. 27 June. https://www.fsb.org/wp-content/uploads/R270617.pdf.* Downloaded: 16 January 2020.

Gaspar, V. – Hartmann, P. – Sleijben, O. (2003): *The transformation of the European financial system, Second ECB Central Banking Conference.* https://www.ecb.europa.eu/pub/pdf/other/transformationeuropeanfinancialsystemen.pdf. Downloaded: 16 January 2020.

MNB (2017): *Innovation and stability, a FinTech overview in Hungary. Consultation document, Magyar Nemzeti Bank. https://www.mnb.hu/letoltes/consultation-document.pdf.* Downloaded: 16 January 2020.

MNB (2018): *Banks in history: innovations and crises.*

MNB (2019): *Financial Innovation and Stability: FinTech Strategy of the Magyar Nemzeti Bank,* https://www.mnb.hu/letoltes/mnb-fintech-strategy-eng-cov.pdf. Downloaded: 16 January 20.

Nagy, B. – Zágonyi, Á. (2019): Hitel gyorsan, kényelmesen? Digitálisan!, https://www.mnb.hu/letoltes/nagy-benjamin-zagonyi-adam-hitel-gyorsan-kenyelmesen-digitalisan.pdf. Downloaded: 16 January 2020.

Nicoletti, B. (2017): *The future of FinTech, Integrating Finance and Technology in Financial Services.* Palgrave Macmillan.

Raiffeisen Bank (2019): *CEE Fintech Atlas 2018*

UNSGSA FinTech Working Group and CCAF. (2019). *Early Lessons on Regulatory Innovations to Enable Inclusive FinTech: Innovation Offices, Regulatory Sandboxes, and RegTech.* Office of the UNSGSA and CCAF: New York, NY and Cambridge, UK.

Xiang, X. – Lina, Z. – Yun, W. – Chengxuan, H. (2017): *China's Path to FinTech Development*, European Economy, 2017.2, FinTech and Banking: Friends or Foes?

Zetzsche, D. – Buckley, R.P. – Arner, D.W. – Barberis, J.N. (2017): *Regulating a Revolution: From Regulatory Sandboxes to Smart Regulation. European Banking Institute (EBI) Research Paper Series, 2017–11.* https://doi.org/10.2139/ssrn.3018534. Downloaded: 16 January 2020.

Targeted Application of Borrower-based Measures: The Case of Hungary

Laura Komlóssy; Alexandr Palicz; János Szakács

***Abstract**: The financial crisis highlighted the severity of risks stemming from excessive lending to households and focused regulators' attention on the potential application of borrower-based measures (BBMs) to limit household indebtedness. As the MNB has been operating its BBM framework since 2015, its primary focus has shifted from the implementation of the BBM framework to the optimal operation of the measures. In parallel with recovering household lending and the turnaround in the financial cycle, the effect of the applicable BBMs is starting to be more pronounced, although no overindebtedness can currently be identified. Hence, the motivation to circumvent the measures is also increasing, while new risks have also emerged in the housing market. In this paper, we review and analyse the current challenges of operating the BBM framework in Hungary regarding the targeted application of the measures addressing new risks and maintaining their effectiveness.*

Keywords: financial stability, housing market overheating, excessive lending, macroprudential policy, borrower-based measures, loan-to-value ratio, debt-service-to-income ratio, interest rate risk

1. Introduction

The financial crisis of 2008 clearly underlined that the operation of the banking system is highly procyclical. Due to market frictions in the banking system and changing risk perceptions, banks and their customers are exposed to excessive risk-taking in certain periods and, if this gives rise to

a financial crisis afterwards, too low risk-taking becomes characteristic. The financial crisis also highlighted that microprudential supervision alone is unable to prevent financial disruptions and systemic problems. Therefore, the focus of prudential interventions in the financial system needs to be widened in a holistic manner (Allen at al., 2015). One of the primary tasks of newly emerging, so-called macroprudential policies is to mitigate the procyclicality of the banking system and curb excessive indebtedness (Lim et al., 2011).

The potential adverse effects of excessive risk-taking are well demonstrated by the consequences of the pre-crisis lending in Hungary. In the pre-crisis years, both the increase in domestic household borrowing and the spread of foreign currency loans in Hungary indicate that the systemic acceleration in lending took place in conjunction with excessive indebtedness on the customer side, and excessive risk-taking on the side of the banking sector. The number of customers facing payment problems rose dramatically after the outbreak of the crisis due to the significant deprecation of the HUF. Due to the surge in non-performing loans, banks' impairment losses became so substantial that they required a series of capital injections in the years following the crisis. As a result, the decline in the banks' disposable capital and the falling risk appetite due to the worsening economic outlook led to a dramatic decline in new lending. FX lending, as the main driver behind these mechanisms, was responsible not only for the elevated credit risks, but also for the excessive use of short-term external fund on the financing side (Szombati, 2017).

Excessive indebtedness can have particularly serious consequences if it is accompanied by a housing market price bubble, i.e. a general, persistent and often explosive overvaluation of residential property prices (Claessens et al., 2009; Reinhart – Rogoff, 2009; Abdul et al., 2011; Schularick – Taylor, 2012; Jordà et al., 2016). Financial crises can also occur if the price adjustment following the overvaluation is accompanied by excessive household indebtedness. As residential property usually accounts for a

significant part of households' assets and household mortgage loans represent a significant part of the banking sector's assets, a large amount of housing loan default can have a serious negative impact on banks' profitability via impairment, which also reduces the lending capacity of the entire banking sector due to declining capital levels. As a result of a fall in housing prices, households and – via decreasing collateral value – banks suffer significant losses on their assets.

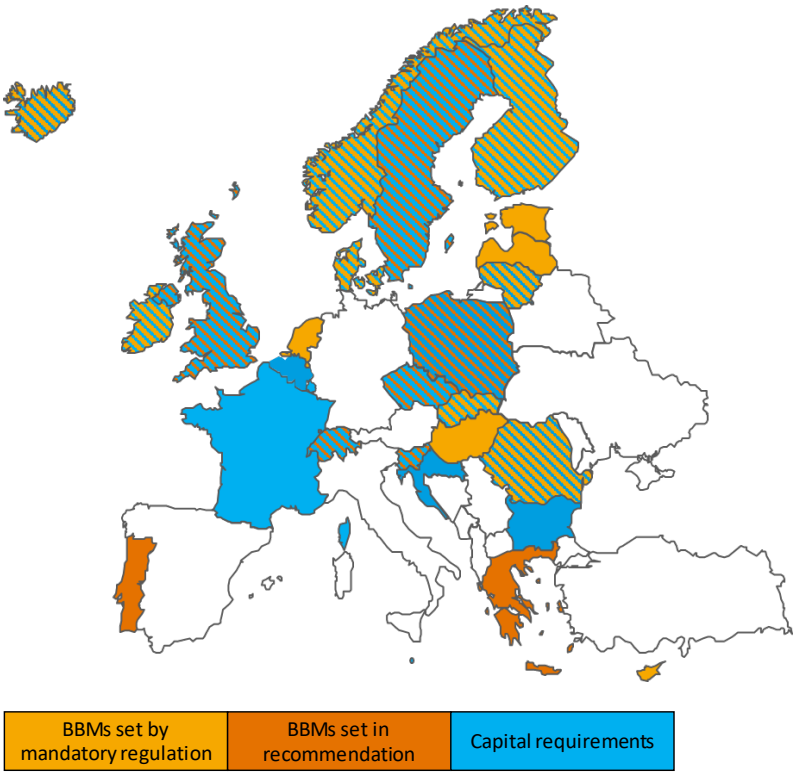
Financial stability risks related to the residential property market have been in the focus of regulatory authorities in many EU countries. Several tools may be available to reduce housing market overheating. While fiscal instruments can address the risks related to high house price appreciation regardless of whether this is fuelled by strong credit growth, macroprudential instruments can mitigate the risks of real estate price booms by constraining excessive lending to households (Claessens et al., 2013; Alpande et al., 2014; Kuttner – Shim 2016; Akinci – Olmstead-Rumsey, 2015; Alam et al., 2019). Two possible directions of this latter intervention are the application of borrower-based measures (BBMs) and the application of capital requirements. BBMs can reduce the volume and systemic risk of over-lending by limiting the disbursement of excessively risky loans, while capital requirements increase banks' resilience and may have an impact on new lending via the increased cost of funding.

The two rules are complementary in terms of effectiveness: BBMs increase the loss-absorbing capacity of debtors and lenders by restraining the disbursement of overly risky loans, while capital requirements increase lenders' resilience in proportion to their total exposure. The advantage of BBMs is that they exert their effect at the contract level, so they can be calibrated in a targeted manner; however, they only apply to the new credit flow. By contrast, in most cases capital requirements affect the entire loan portfolio, which means that their calibration can be less targeted. BBMs are also relevant from a consumer protection aspect, as they not only mitigate

excessive risk taking and leverage at the aggregate level, but also limit the risk of excessive indebtedness at the level of individual consumers.

Several EU Member States have introduced macroprudential measures to mitigate potential risks stemming from the real estate and credit markets in recent years. The countries of Central and Eastern Europe and Northern Europe were particularly active in this respect. Most countries have some form of BBMs, and some also seek to mitigate residential property market risks via indirect and direct capital requirements (Chart 1).

Chart 1: Borrower-based measures and capital requirements



Note: In Denmark and Latvia, LTV limits are mandatory, while DSTI limits have been set in the form of recommendations. Striping means the use of two instruments at the same time. Source: ESRB

2. Borrower-based measures in Hungary

The MNB was among the first in Europe to adopt legally binding, comprehensive BBMs, which were calibrated by covering a broad range of criteria. The debt-service-to-income ratio (DSTI) and the loan-to-value ratio (LTV) limits entered into force on 1 January 2015. The rules are intended to prevent the overstretching of debtors' incomes and collateral values: the amount of new household mortgage loans may not exceed 80 percent of the collateral value and, as a general rule, the total debt service of borrowers may not exceed 50 percent of their regular, legal income (Fáykiss et al. 2018) (Table 1).

Table 1: Borrowing-based measures as implemented in 2015

	Hungarian BBMs (calibration in 2015)				ropean practice
	Category	HUF	EUR	Other FX	Various differentiation
DSTI (Debt-service-to-income)	Monthly net income below HUF 400k*	50%	25%	10%	~50% (min. 30%, max. 80%)
	Monthly net income at least HUF 400k*	60%	30%	15%	
LTV (Loan-to-Value ratio)	Mortgages	80%	50%	35%	~85% (min. 60%, max. 100%)
	Car loans	75%	45%	30%	

*Note: The BBM regulation has been fine-tuned several times since its implementation. *Approx. 1210 EUR. Source: MNB*

Hungarian borrower-based measures were calibrated by covering a broad range of criteria, along the lines of various risk dimensions. Hungarian BBMs cover all credit products offered to households in Hungary. Their

application is mandatory for all creditors (both credit institutions and non-bank financial institutions) and consequently the possibility of circumventing these measures is limited. In order to offset the difference in the riskiness of loans, the Hungarian regulation is stricter for foreign currency loans. Furthermore, as the growth rate of consumption typically falls behind the growth rate of income (Hosszú, 2011), a higher portion of the income can be allocated to debt servicing, and thus in the case of lower probability of default the limits are higher. In addition, to facilitate prudent lending, only legal, certifiable income may be considered in the application of the BBMs.

In October 2018, the MNB modified its DSTI regulation to account for the interest rate risk of households. To increase households' shock resilience and to preserve an adequate income buffer of borrowers enabling them to absorb the potential rise in debt servicing costs in the event of an interest rate increase, the MNB differentiated its DSTI limits by the interest rate risk exposure of the loans. Accordingly, since 1 October 2018 lower DSTI limits are applicable for new mortgage loans with a maturity of over 5 years depending on the length of the interest rate fixation period (Table 2). In parallel with the introduction of the differentiated limits, the income threshold of HUF 400k applicable to higher DSTI limits was also increased to HUF 500k from 1 July 2019 to align the limits to the raising nominal and real wages, thereby preserving their effectiveness.

Table 2: DSTI rules for newly disbursed HUF mortgage loans from 1 October 2018

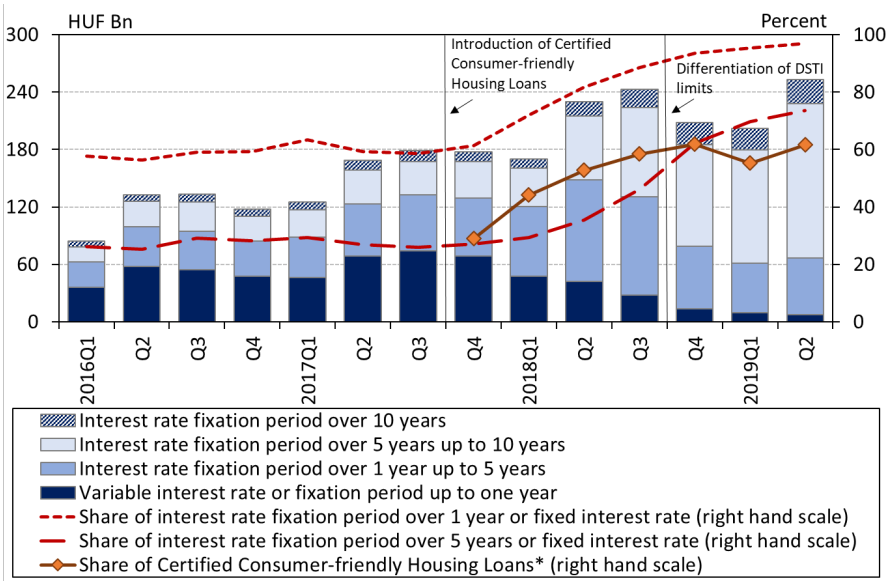
Monthly net income	Interest rate fixation period		
	Floating or fixed for less than 5 years	At least 5 years, but less than 10 years	At least 10 years or fixed for the whole term
Limits set for loans denominated in HUF set from 1 October 2018			
Below HUF 400k*	25%	35%	50%
At least HUF 400k*	30%	40%	60%
Limits set for loans denominated in HUF set from 1 July 2019			
Below HUF 500k**	25%	35%	50%
At least HUF 500k**	30%	40%	60%

*Note: For new mortgage loans with a maturity of more than 5 years. The DSTI limits for mortgage loans denominated in other currencies have also been modified. * Approx. EUR 1,210. ** Approx. EUR 1,515. Source: MNB*

The new DSTI requirement effectively diverts debtors towards loans with longer interest rate fixation periods, while the measure's lending impact remained marginal. The structure of housing loans shifted towards longer fixed interest periods from the end of 2017, while lending growth remained dynamic in the first half of 2019 (Chart 2). Due to the several steps of the MNB, the proportion of mortgage loans with the interest rate fixed for over 1 year within new housing loans increased to above 90 percent from the 40-50 percent share seen before 2018. The certification programme of the MNB covering Certified Consumer-friendly Housing Loans (CCHL), which are only available with a longer interest rate fixation, played a significant role in catalysing competition in the mortgage market and pushing new lending towards longer interest rate fixation. Furthermore, in

2016, the MNB introduced the Mortgage Funding Adequacy Ratio in order to reduce the maturity mismatch related to mortgage financing, which indirectly encouraged the spread of fixed-rate loans by deepening the market of mostly fixed-rate mortgage-based funding. Additionally, in 2018 the MNB contributed to the further increase in mortgage bond issuance and the continuation of loose monetary conditions over the longer end of the yield curve with the MIRS and a mortgage bond purchase programme. Therefore, when the differentiated DSTI limits became effective, the mortgage loan market had already shifted to a healthier structure. This means that the lending impact of the measure was negligible, while it ensures that interest remain fixed for longer terms in the future. At present, the upswing in housing loans does not threaten a build-up of systemic debt problems, as new home loan issues are coupled with predictable repayments over the long term.

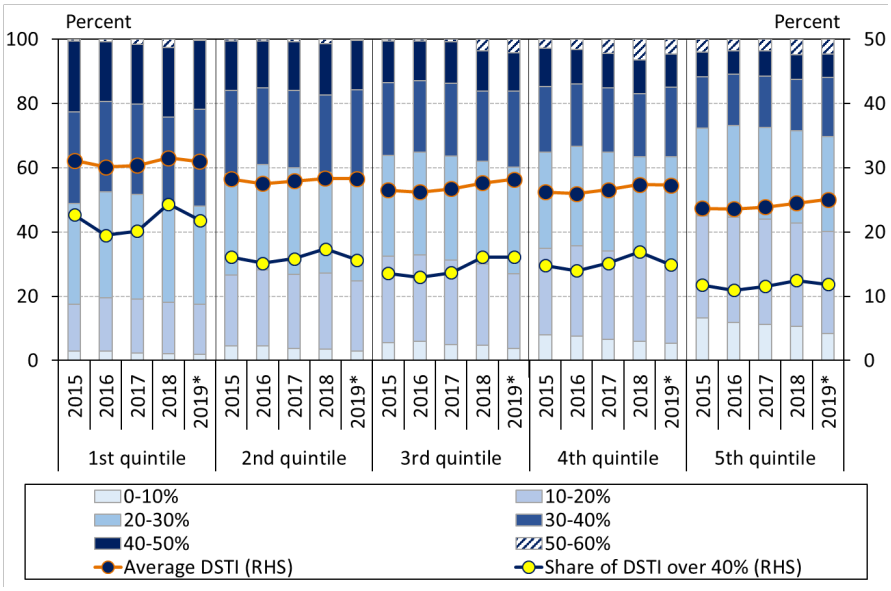
Chart 2: New housing loans by length of the interest rate fixation period



*Note: *Without loans disbursed by building societies. Source: MNB*

A significant increase in households' indebtedness cannot be seen so far, even for lower-income borrowers. Since 2015, the DSTI value of housing loans has fluctuated at around 28 percent. A rise in indebtedness could not be identified among borrowers: the share of housing loans with a DSTI value over 40 percent has remained steadily between 20-25 percent even among low-income borrowers in recent years (Chart 3). As for the LTV distribution of new housing loans, a gradually increasing effectiveness of the limits could be seen. Within the total housing loan lending, by the second quarter of 2019 an increasing clustering of contracts could be observed around the regulatory LTV limits. In the first half of 2019, 23 percent of housing loans were disbursed with a high LTV, 11 percent with a high DSTI, while 5 percent showed high values for both indicators. The DSTI distribution of consumer loans has remained stable over the last 5 years.

Chart 3: DSTI distribution of newly disbursed housing loans by income quintiles



*Note: Distribution by contract number. The income quintiles were determined by the income distribution of borrowers. * 2019 data pertains to the first half of the year. Source: MNB*

3. Current challenges

Following the introduction of the BBMs and with the upswing in the financial cycle, the focus of the MNB's regulatory approach is shifting from the establishment of its macroprudential framework to the optimal operation of its BBMs and managing the potential build-up of new risks. Although no signs of excessive indebtedness can currently be observed in the household credit market, new challenges may arise with the upswing in the financial cycle. First, improving the efficiency of lending processes would support the risk identification capabilities of credit institutions and the competitiveness of the banking sector. Second, the rising effectiveness of the limits would increase the pressure on the market participants to find ways to circumvent the specified LTV and DSTI limits. Moreover, the potential build-up of new risks would necessitate the further improvement of the analytical capabilities of the MNB by an increased reliance on granular data collections and contract-level monitoring. Lastly, the BBM framework can serve as one of the major tools in ensuring that financial inclusion is improved without hampering financial stability.

3.1 Enhancing the applicability of the BBM framework

Reducing information asymmetry is paramount to increasing the efficiency of the credit market. Lending activity is inherently characterised by information asymmetry between lenders and borrowers (Djankov et al., 2007; Jappelli – Pagano, 1993; Jappelli – Pagano, 2002; OECD, 2010; Yan et al., 2015). On the one hand, during the lending process borrowers face signalling costs related to obtaining the data proving their creditworthiness; lenders on the other hand face searching costs related to obtaining data on the borrowers and the validation of the provided data. Thus, lenders will assess the creditworthiness of borrowers only to the point where the marginal cost of further searching equals the marginal benefit of the obtained information. In the presence of high signalling and searching costs,

several adverse effects arise due to the high level of informational asymmetry. These adverse effects result in higher entry costs on the credit market leading to lower competition between market participants, who would in turn apply more conservative pricing and higher interest rates, lower credit supply and reduced financial inclusion. Accordingly, the MNB has already initiated several steps to improve data availability for lenders and hence to contribute to the efficiency of the lending market and support application of the BBM framework:

- **Mandatory positive credit data sharing:** The widespread availability of credit-related information supports financial deepening and more efficient credit pricing, improves portfolio quality and thus increases competitiveness. Credit information systems could materially reduce the information asymmetry in the lending market and thus might improve the efficiency of the financial market and enhance the competitiveness of market participants (Jappelli – Pagano, 1993; Jappelli – Pagano, 2002; Djankov et al., 2007). Even though the Hungarian credit registry has internationally outstanding data coverage, its effectiveness is limited as lenders can only access the positive credit data with the borrowers' consent. As lenders calculate the total debt servicing costs of the borrowers relying mainly on credit registry queries or on the statement of the borrowers, the effectiveness of BBMs (DSTIs in particular) can be increased by ensuring that the data on borrowers' debts are freely available to lenders. When borrowers can freely decide on consenting to provide access to their credit registry data, in parallel with the upswing in the financial cycle, stronger risk-taking by both lenders and borrowers could lead to an increasing share of loans that are disbursed without a thorough assessment of the borrowers' credit history. Hence, making access to positive credit data mandatorily available to all lenders not only increases the efficiency of lending processes it also supports the effectiveness of the DSTI regulation.

- **Online income statement:** Obtaining income certificates that are typically still paper-based greatly hinders the efficiency of the lending processes with households and calculation of the DSTI values. Income certificates tend to be issued based on lengthy customer interference, typically using non-digital channels requiring several days in certain cases. The cost of income certification can be significantly reduced by the establishment of an online income statement reporting service operated by the tax authority that would enable verifying the income and DSTI eligibility of borrowers within seconds. To this end, the development of such a service has already been started at the initiative of the MNB and is expected to be launched in 2020.
- **Digitisation of land registry processes:** Access to the current land registry data requires significant manual work on the part of credit institutions and is only possible during business hours. Currently, the land registry queries of lenders cannot be fully automated due to the outdated data storage and management processes, which increases the length of the mortgage lending procedures and the related costs. Building on international practices, providing continuous querying in a standardised, electronic format along with completely digital processes for making new entries in the registry would greatly improve the efficiency and flexibility of the system, and help with bank automation.
- **Development of a central real estate valuation database and the use of statistical-based models in valuation:** Currently, one of the most burdensome steps in the mortgage lending process both in terms of time and cost is associated with the valuation of the encumbered property, which can take several weeks in some cases. Statistical modelling and providing the required database centrally would decrease both the costs and time requirements of real estate evaluations, speeding up lending processes and increasing overall efficiency in the banking sector.

- **Replacing notarial authentication with a central digital platform:** In Hungary, as a rule, mortgage loan contracts are notarised, which enables the lenders to initiate the execution of the property mortgage lien without the need for lengthy court trials. The notarial deeds currently require 1-2 business days and cost close to HUF 100,000 for an average HUF 10 million home mortgage. The cost of notarial deeds therefore makes the upfront cost of property transactions significantly higher for borrowers. The cost of notarial deed registration could be significantly reduced by the development of a central digital system for enforceability and online notarial deeds. Such a digital notarial platform could also have a positive impact on loan refinancing, further increasing competition among lenders.

3.2 Minimising regulatory arbitrage

In parallel with their increasing effectiveness, the primary focus in the application of the BBMs shifted from implementation to the optimal operation of the measures. While BBMs exert their effect at the contractual level, potential regulatory leakages cannot be ruled out completely. According to the IMF (2014, 25 pp.) "*leakages refer to the migration of financial activity outside the scope of application and enforcement of the macroprudential tool, potentially undermining the objectives of the policy measures*". On the one hand, leakages can be domestic if financial activity shifts to unregulated sectors, consumers adapt to the regulation against policy objectives without breaching the regulation or if lenders find a way to bypass the regulation mainly through financial innovation. On the other hand, lending could also shift to cross-border lenders, in which case the financial activity leaves the authority of the national regulators. Table 3 summarises these leakage channels.

The Hungarian regulatory framework addresses many of the possible adaptation channels. As the Hungarian regulation covers all loans disbursed

in the territory of Hungary irrespective of the organisational form of the lender, borrowing through non-bank entities is addressed. Additionally, borrowers that intend to maximise the contractual loan amount might shift to FX loans or shorter interest rate fixation periods with a more favourable interest rate or might lengthen the maturity of their loans to improve their DSTI ratio. The BBM rules applied in Hungary, however, specify lower limits for FX loans and shorter interest rate fixation periods, thus precluding these potential leakages.

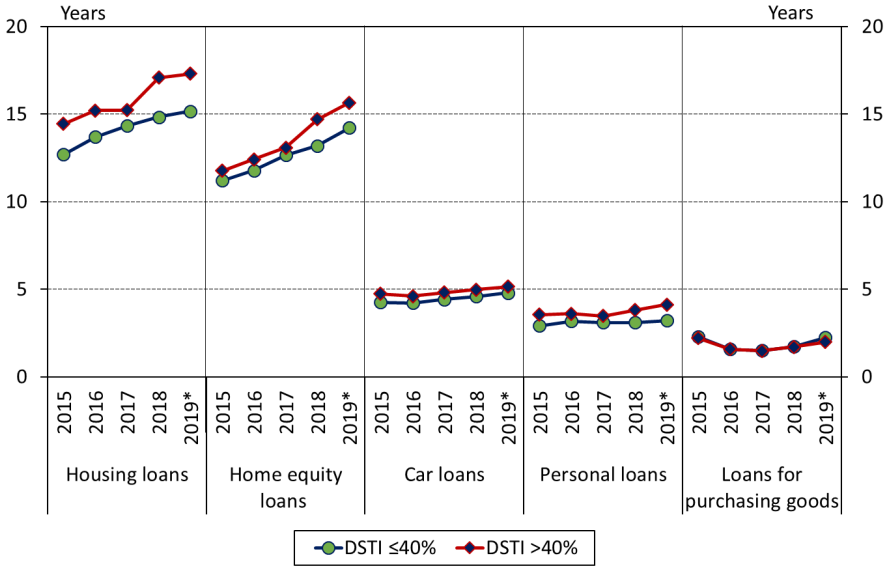
Table 3: Debtors' potential adjustment options to the Hungarian borrower-based measures rules and their assessment

	DSTI	LTV
Borrowing through non-bank intermediaries	*relevant but addressed by the regulation*	*relevant but addressed by the regulation*
Selection of a currency with a more favourable interest rate	*relevant but addressed by the regulation*	*not relevant*
Selection of a shorter interest fixation period	*relevant but addressed by the regulation*	*not relevant*
Maturity extension	*relevant but currently not prevalent*	*not relevant*
Withholding the information about the debt servicing costs of outstanding loans	*decreasing due to supervisory measures*	*not relevant*
Involvement of further co-signatories	*relevant but currently not prevalent*	*not relevant*
Unsecured borrowing	*not relevant*	*closely monitored and addressed with supervisory measures*
Cross-border borrowing	*relevant but currently not prevalent*	

Source: IMF (2014), Fáykiss et al. (2018)

Limited maturity extension can be observed in case of mortgage loans taken up with high DSTI values. While the average maturity of housing loans and home equity loans disbursed with a DSTI value up to 40 percent was 15 and 14 years respectively in 2019, the same average maturity for loan with a DSTI above 40 percent was almost 2 years higher in case of housing loans and 1.5 years higher in case of home equity loans in the same period (Chart 4). The scope of maturity extension is expected to remain limited, as the instalment gain from maturity extension decreases with the increase in the length of the loan and becomes limited above 20 years and marginal above 30 years, while the total repayable amount increases rapidly at the same time.

Chart 4: Evolution of the average maturity by DSTI value and loan type

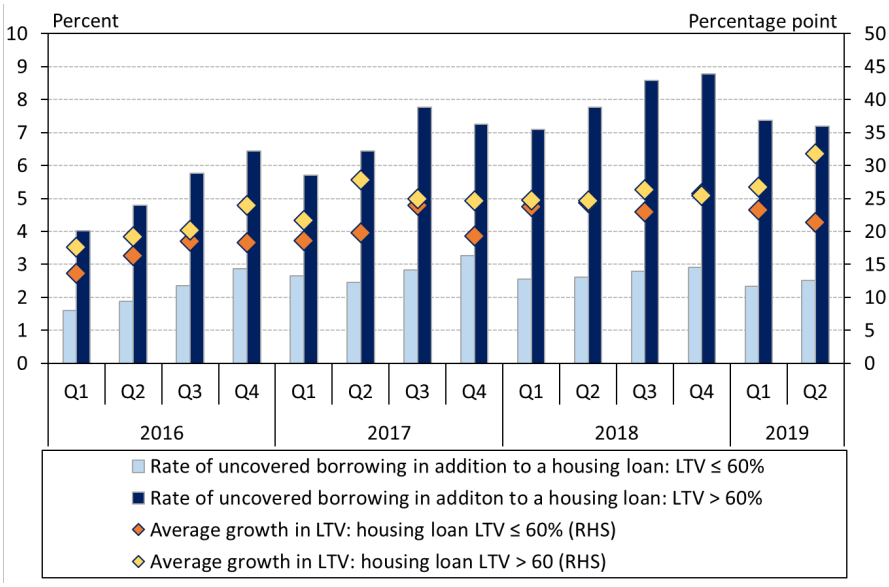


*Note: *2019 data pertains to the first half of the year. Source: MNB*

Another way of bypassing regulatory objectives to some extent is for the borrowers to provide the requested downpayment by taking up uncovered

loans in advance of the mortgage credit application. This way the borrowers bypass the objective of the LTV regulation, i.e. the limitation of leverage and curbing excessive indebtedness. The share of housing loans that were preceded with personal loan borrowing presumably for the purpose of supplementing the required downpayment was continuously rising since 2016 and stabilised around 7 percent of the total number of housing loans by Q2 2019 in case of housing loans lent with high LTV ratios (Chart 5). However, the LTV ratio limit still mitigates the possible losses of lenders in the case of non-payment, and the potential usage of this adjustment channel is limited by the DSTI regulation, since that also covers the debt servicing cost of the borrowed personal loan. Nonetheless, the MNB issued an executive letter in June 2019 that expects lenders to refrain from such activity. Furthermore, the MNB closely monitors the evolution of uncovered borrowing used for downpayment, purposes and can act with more direct measures if warranted.

Chart 5: Estimated evolution of uncovered loans taken out in addition to a housing loan



Note: The columns represent the share of those housing loans within the total number of housing loans in each category of LTV for which a personal loan was requested at most 180 days before the disbursement. Source: MNB

Apart from the domestic regulatory leakages, cross-border lending could also arise in the event of the high effectiveness of the applied borrower-based measures. However, currently this kind of adaptation to the regulations is negligible in Hungary: the share of foreign loans within the household credit stock has been rather stable in the recent years, accounting for 1-2 percent of the total household credit since 2000.

3.3 Enhancing the analytical capabilities of the MNB

Transaction-level data, as opposed to aggregate data reporting, allows for more targeted monitoring of real estate market processes and a more accurate exploration of causation. Accordingly, using granular data, in a timely manner the MNB can detect the build-up of systemic risks arising

from retail and corporate lending, and if necessary, may mitigate such risks by developing targeted measures. In addition, the availability of more detailed data can provide significant support for measuring and fine-tuning the effectiveness of existing macroprudential tools.

The MNB intends to build a central bank credit registry (through its so-called HITREG project) as a transition to transaction-level reporting. The aim of the MNB is to gradually move from aggregated data reporting to transaction-level data reporting for more detailed analysis. Within the project, individual aggregated data services will gradually be replaced by transaction-level data services starting in 2020, with a focus on maintaining data quality. Transaction-level data will contain a broad range of indicators for anonymised loans involving the principal characteristics of the loans disbursed, their credit risk data, the collateral parameters and the balance sheet data of the reporting agents. In this way, the MNB will be able to analyse the identified market movements more deeply and assess and address the identified systemic risks if warranted.

3.4 Proactive regulatory approach

Currently, one of the most prominent financial stability issues on the Hungarian household lending market is the elevated risk of potential overheating on the housing market in Budapest. Housing prices in Budapest have been on the rise since the end of 2013 and now exceed the level from 2013 by 123 percent. In Budapest, house prices have been steadily moving away from fundamentally justified levels, and by the end of 2018, they may have exceeded such levels by 15 percent.

However, the potential risk of rapid house price appreciation is mitigated by the fact that the share of loans financed by mortgage credit remained stable over time, at around 45 percent. Furthermore, the dynamic house price appreciation has not entailed significant indebtedness of households. The domestic household credit-to-GDP ratio, which currently stands at 14

percent, is among the lowest in the European Union. The indicator is also significantly below the average of the EU Member States and the values of the Visegrád countries, which range from 23 to 34 percent. Additionally, the share of housing loans disbursed with high LTV ratios (LTV between 70 and 80 percent) is lower in Budapest than in the other regions of the country.

To address the high house price appreciation seen in Budapest, which is outstanding in an international comparison, the regional differentiation of the loan-to-value ratio (LTV) limit may arise as a potential regulatory approach (Fáykiss et al., 2017). However due to the high proportion of buyers without borrowing, LTV limit differentiation would only have a modest impact on Budapest price dynamics and residential lending, while significant spillovers might occur in other policy areas, such as labour mobility and infrastructure.

3.5 Supporting financial inclusion

Ensuring the proper functioning of the financial intermediation system and strengthening confidence can support the sustainable expansion of financial inclusion. However, by improving financial inclusion, financial stability risks might also arise due to the involvement in the credit market of further, previously excluded consumers often characterised by higher credit risk (Mehrotra – Yetman, 2015; Khan, 2011). Hence in the course of broadening financial access, the development of financial stability risks may be mitigated both by programmes aimed at raising consumers' financial awareness and by regulatory actions aimed at preventing excessive risk-taking mainly involving the application of BBMs.

Raising financial awareness increases confidence in the institutional system, and thus consumers become more willing to use financial services. This on the one hand contributes to the deepening of financial intermediation, and on the other hand it helps consumers to choose products

that are suitable for their own risk-taking. In this way, stakeholders become more conscious in their choice of financial services, which contributes to increased competition in the banking sector and to more efficient customer service.

Macroprudential policy tools can effectively prevent the emergence of excessive systemic risks and limit excessive risk-taking. If risk appetite is too low, the measures may be able to increase it by reinforcing confidence in the financial system; however, when market participants are inclined to take too excessive risks, the established limits can prevent such a course of action. The measures thus sustain the supply of financial services and the consumer demand for financial products and services. From a regulatory aspect, BBMs are the most suited to enhancing broader financial inclusion, as they exert their effect at the contract level. As they can be calibrated in a flexible and a targeted manner, they can affect a wide range of loan characteristics.

Currently, the recovery in household lending is mainly taking place via the increase in average loan amounts, while the number of disbursed loans remain low levels. This phenomenon highlights the room for manoeuvre for further financial deepening that should also entail a rising number of borrowers. Increased credit penetration would contribute to competitiveness and could improve the profitability of the Hungarian financial sector. In Hungary, BBMs were determined with a broad coverage and were set at relatively low levels at the bottom of the financial cycle, hence they do not materially hinder financial inclusion.

4. Conclusion

The BBM framework of the MNB and the detailed credit reporting requirements pertaining to thereunto have helped to maintain the healthy structure of household lending since 2015, without unnecessarily hindering the recovery of the credit market. Continuous revisions of the measure have

contributed to efficient lending processes and to ensuring that the currently healthy lending processes continue in the future as well.

Apart from addressing possible regulatory arbitrage channels, in the future the MNB will focus on new challenges related to the operation of its BBM framework and to the rise of new risks in the financial system.

Application of the BBM framework can be improved by alleviating the compliance cost of lenders. The effectiveness and efficiency of the DSTI limits can be improved among others through the establishment of a mandatory positive credit data sharing framework and by establishing an online income statement framework.

Additional challenges are related to the mitigation of possible risks related to the high house price growth in Budapest. Based on international examples, lower, differentiated LTV limits could be set for mortgage loans financing real estate purchases in Budapest. However, as currently the share of mortgage loans with high LTV values is limited within total real estate transactions, such a measure would have a limited impact on housing prices, while having serious spillover effects related to labour mobility, transportation and infrastructures.

Finally, supporting financial inclusion while maintaining financial stability is also expected to be a pivotal issue in the future. BBMs might offer an opportunity to enhance financial inclusion in a targeted manner with certain constraints that ensure that borrower indebtedness remains limited at a systemic level.

5. References

Abdul, A. – Dell'Ariccia, G. – Li, G. (2011): *Creditless Recoveries.* IMF Working Papers, Vol. 11, No. 58, March.

Akinci, O. – Olmstead-Rumsey, J. (2015): *How effective are macroprudential policies? An empirical investigation*. Board of Governors of the Federal Reserve System, International Finance Discussion Papers, No 1136

Alam, Z. – Alter, A. – Eisemann, J. – Gelos, G. – Kang, H. – Narita, M. – Nier, E. – Wang, N. (2019): *Digging Deeper—Evidence on the Effect of Macroprudential Policies from a New Database.* IMF Working Paper 19/66.

Allen, F. – Carletti, E. (2015): *Systemic risk and macroprudential regulation*. In: Micklitz, H-W. – Tridimas, T. (eds.): Risk and EU law. Edward Elgar Publishing Ltd., United Kingdom, pp. 197-219.

Alpande, S. – Zubairy, S. (2014): Addressing household indebtedness: monetary, fiscal or macroprudential policy? Bank of Canada Working Paper 2014-58, Bank of Canada

Claessens, S. – Kose, M.A. – Terrones, M.E. (2009): *What Happens During Recessions, Crunches and Busts?* Economic Policy, Vol. 24, No. 60, pp. 653–700.

Claessens, S. – Ghosh, S.R. – Mihet, R. (2013). *Macro-Prudential Policies to Mitigate Financial System Vulnerabilities*. Journal of International Money and Finance, Vol. 39, pp. 153–185.

Djankov, S. – McLiesh, C. – Shleifer, A. (2007): *Private Credit in 129 Countries*, Journal of Financial Economics 84, 299–329

Fáykiss, P. – Nagy, M. – Szombati, A. (2017): *Regionally-differentiated debt cap rules: A Hungarian perspective*. In: Macroprudential frameworks, implementation and relationship with other policies. BIS Papers vol. 94, pp 153–178. Bank for International Settlements.

Fáykiss, P. – Palicz, A. – Szakács, J. – Zsigó, M. (2018): *Experiences of debt cap regulations in Hungarian Retail Lending*. Financial and Economic Review, Vol. 17, No. 1. pp. 34-61.

Hosszú, Zs. (2011): *Pre-crisis household consumption behaviour and its heterogeneity according to income, on the basis of micro statistics*. MNB Bulletin, October, Magyar Nemzeti Bank, pp. 28–35

IMF (2014): *Staff Guidance Note on Macroprudential Policy.* IMF, December 2014

Jappelli, T. – Pagano, M. (1993): *Information sharing in credit markets*. The journal of finance, 48(5), 1693-1718.

Jappelli, T. – Pagano, M. (2002): *Information Sharing, Lending and Defaults: Cross-Country Evidence*, Journal of Banking and Finance 26, 2017–45.

Jordà, Ò. – Schularick, M. – Taylor, A-M. (2016): *The Great Mortgaging: Housing Finance, Crises and Business Cycles*. Economic Policy, Vol. 31, No. 85, pp. 107–152.

Khan, H.R. (2011): *Financial inclusion and financial stability: are they two sides of the same coin?* Address by Shri HR Khan, Deputy Governor of the Reserve Bank of India, BANCON 2011, the Indian Bankers Association and Indian Overseas Bank, Chennai, 4 November 2011.

Kuttner, K.N. – Shim, I. (2016): *Can Non-Interest Rate Policies Stabilize Housing Markets? Evidence from a Panel of 57 Economies*. Journal of Financial Stability, Vol. 26, pp. 31–44

Lim, C. – Columba, F – Costa, A. – Kongsamut, P. – Otani, A. – Saiyid, M. – Wezel, T. – Wu, X (2011): *Macroprudential policy: What instruments and how to use them? Lessons from country experiences*. IMF Working Paper 11/238, International Monetary Fund

Mehrotra, A.N. – Yetman, J. (2015): *Financial inclusion-issues for central banks*. BIS Quarterly Review March. https://www.bis.org/publ/qtrpdf/r_qt1503h.pdf

OECD (2010): *Discussion Paper on Credit Information Sharing.* Facilitating Access to Finance, OECD, 2010

Reinhart, C.M. – Rogoff, K.S. (2009): *The Aftermath of Financial Crises.* American Economic Review, Vol. 99, No. 2, pp. 466–72.

Schularick, M. – Taylor, A.M. (2012): *Credit Booms Gone Bust: Monetary Policy, Leverage Cycles, and Financial Crises, 1870–2008*. American Economic Review, 102(2): 1029–1061

Szombati, A. (2017): *The theoretical basis of using macroprudential instruments*. In: Lehmann, K. – Palotai, D. – Virág, B. (eds.): The Hungarian Way – Targeted Central Bank Policy. Magyar Nemzeti Bank, Budapest pp. 689–736.

Yan, J. – Yu, W. – Zhao, J.L. (2015): *How signaling and search costs affect information asymmetry in P2P lending: the economics of big data*. Financial Innovation, 1(1), 19.

Risk Management on the Payments Market: Experiences from Hungary

László Kajdi[1]

Abstract: *In recent years, the payments market has faced fundamental changes which will transform both payment services provided to customers and the market shares of payment service providers. Two sources can be identified behind the changing circumstances: 1) regulatory requirements – especially PSD2 – intended to promote secure operation and boost market competition; and 2) infrastructure developments in connection with the introduction of instant payments, which require substantial investments by market participants. These main factors are expected to enhance the efficiency of payments, but certain new types of risk may also emerge. This study discusses the measures taken by the central bank of Hungary (MNB) in relation to liquidity, fraud and operational risks. The unique method of liquidity management in the Hungarian instant payment system, the regulated mode of market-entry for new non-bank service providers and the widespread application of stricter authentication methods support the reliable operation of payment services, while also ensuring favourable changes for customers.*

Keywords: payment systems, fintech, instant payment

1. Introduction

In the past decade, the payments market has undergone enormous changes, including transformation of the way electronic payments are processed,

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expansion of consumers' options to use cashless payment methods in different situations and changes to the roles of both incumbent market stakeholders and central banks. In parallel with the surge in consumer demand for real-time, convenient payment solutions mainly based on smartphone applications, new fintech challengers have appeared on the market, disrupting key areas of banks' payment services. On the one hand, this development can also be traced back to deficiencies in central payment infrastructures i.e. communication channels, clearing and settlement systems, which in some cases were established decades ago and cannot meet current user expectations. On the other hand, traditional banks also did not pursue development of their own internal systems, due to the low level of market competition and high market-entry barriers, which deterred other market stakeholders from emerging in the field of payments.

Despite the issues with central payment infrastructures and the market failures concerning payment services, after 2000 new fintech companies appeared, promising private and corporate clients fast, cheap, easy-to-use payment solutions. Along with changes on the demand side, it was also important that information and communication technology took a huge leap forward and while the capacity of IT systems increased exponentially, they also became considerably cheaper. On the basis of this, fintech companies started providing various payment services such as cross-border money transfers, card-based mobile wallets, e-money systems, etc. While in certain respects these solutions were indeed innovative, they were not able to reform all of the steps in the payment chain from the underlying infrastructure to the user interfaces.

However, two recent major developments occurred on the payment market which may cause fundamental changes both in the operation of electronic payment methods and the market share of the participants involved. Instant payment systems became more and more prevalent around the world and are currently being implemented or under development in most developed countries. The other factor involves the legal background of payments. In

most cases, legal regulation serves a dual purpose in this field: in parallel with ensuring the safe, reliable operation of the payment systems, regulators also aim to facilitate innovation and boost market competition. Viewed from this perspective, the new European payment directive[1] (so called 'PSD2') promises entirely new opportunities.

This study introduces the recent changes on the payment market, the new types of risks attached to them and the way these risks can be effectively mitigated. In the second section, I present a broad overview of the payment market focusing mainly on the case of Hungary and introduce the main points of interest concerning instant payments and PSD2. In the third section, I review the major sources of risks and the way they are managed within the Hungarian instant payment system and on the basis of PSD2. In the final section, I draw the general conclusions which may also be useful for central bankers in other countries.

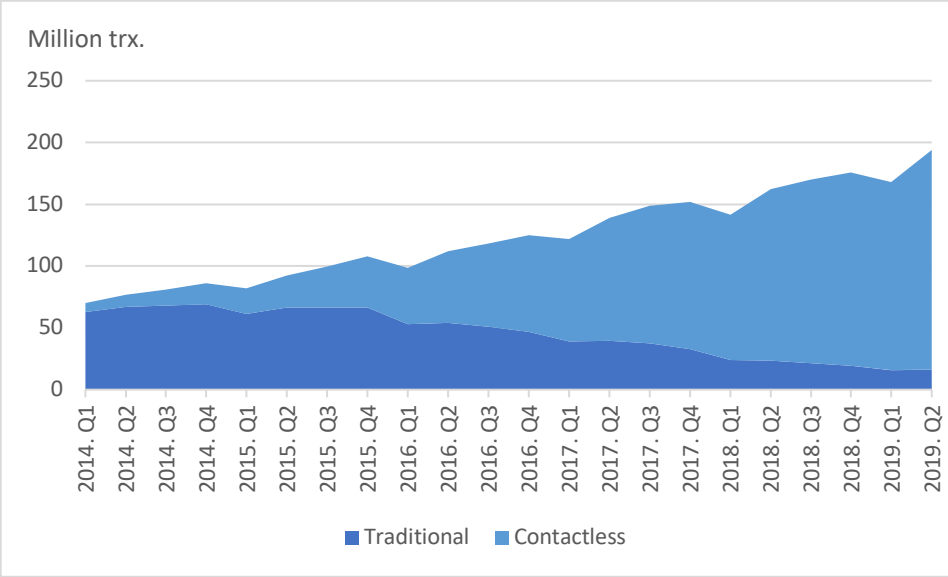
2. Recent changes on the payment market: instant payments and PSD2

As a comprehensive study of the European Central Bank (ECB) (Esselink – Hernández, 2017) shows, apart from the Nordic countries, Estonia and the Netherlands, cash is still king in most European states: the ratio of cash usage within all payment transactions is generally around 70 per cent on the continent. Hungary is no exception from this trend, the analyses by the MNB (Ilyés – Varga, 2015; MNB, 2019a) demonstrate that the ratio of cash usage is approximately 80 per cent according to the different estimations. Currently, the main alternative to cash is card payment, which can be used at online and physical merchants, apart from certain rarely used card-based person-to-person (P2P) money transfer solutions. The emergence of

[1] Directive (EU) 2015/2366 of the European Parliament and of the Council of 25 November 2015 on payment services in the internal market: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015L2366&from=EN

contactless card technology can be considered as a major breakthrough in this aspect, since card payments became rather convenient and fast with the application of the 'tap and go' process. This is especially the case in Hungary and other Eastern European countries in the region, where contactless card payments have become the major driving force behind the development of electronic payments. As the MNB data (2019b) show, while card payments grew by an annual rate of 20-25 per cent in the last couple of years, the share of contactless payments within all card purchases has also increased significantly.

Chart 1: Number of domestic contactless and traditional card payments at physical points of sale in Hungary



Source: Author's calculation based on MNB (2019b) data

Although the dynamic growth in the turnover of card payments is an important step towards more effective electronic payment methods, this considerable increase (20-25 per cent yoy) is likely to slow down in the

coming years. The introduction of contactless technology and the robust growth in the card acquiring network – largely supported by the POS-terminal implementation programme of the Hungarian government – is more of a one-off factor, and the card payment method may reach its limits over the medium term. This was already recognised in several countries where instant payments were introduced or under implementation. Several studies emphasise (e.g. BIS CPMI, 2016; The Paypers, 2019) that the uptake of instant payments is a global trend, and central banks play a major role in this process in many countries. The ECB stresses that instant payments should become the new normal payment method (Hartmann et al., 2019), and this was the main goal of MNB as well, when the operational model of the Hungarian instant payment service (MNB, 2016) was elaborated. One unique feature of the Hungarian model is that the real-time process (within 5 seconds) of domestic individual and consumer batch credit transfers under HUF 10 million will be mandatory for payment service providers (PSPs) by legal regulation. This is to ensure that the new payment method, which can serve as an alternative for cash basically in all payment situations will be the new normal level service for Hungarian private and corporate clients. This may entirely transform the Hungarian payment market, but the same changes can be expected in most European countries as well after the common SEPA Instant scheme rules (EPC, 2018) and the establishment of ECB's new instant payment infrastructure ('TIPS'[1]).

Another major source of change comes from the regulation side. Since the payment markets are characterised by certain typical failures such as high market-entry barriers, a high concentration of market shares or a suboptimal level of development, European regulators started to take

[1] Target Instant Payment Settlement

measures to resolve these issues. The SEPA end-date regulation[1] was an important step towards the standardisation of European credit transfer and direct debit transactions. Then the new Payment Accounts Directive[2] (PAD) aimed to boost market competition through the introduction of payment accounts with basic features and the easier comparability of fees charged by PSPs. However, it may be that a third regulation will trigger the most fundamental changes in the European payment market: PSD2 covers basically all fields of payments e.g. consumer protection, security of electronic payments and the market-entry of fintech companies. PSD2 will facilitate open banking i.e. it will force PSPs to open their systems to third-party service providers (TPPs), thus supporting the development of a flourishing fintech scene. This approach is rather the opposite of the one which was applied in China, where after the initially loose regulatory situation the legal requirements became gradually stricter, which channelled the newly emerging fintech companies into secure and prudent operation (Kajdi, 2017). The European approach focuses on the regulated, safe market-entry and service provision of TPPs from the beginning, nevertheless hopefully the outcome will be similar to the Chinese one: strong market competition between banks and fintechs and an increase in innovation.

3. Major risks on the payments market and their mitigation

The above two major sources of change on the payment market – i.e. the introduction of instant payments and the entry into effect of PSD2 – will

[1] Regulation (EU) No 260/2012 of the European Parliament and of the Council of 14 March 2012 establishing technical and business requirements for credit transfers and direct debits in euro and amending Regulation (EC) No 924/2009

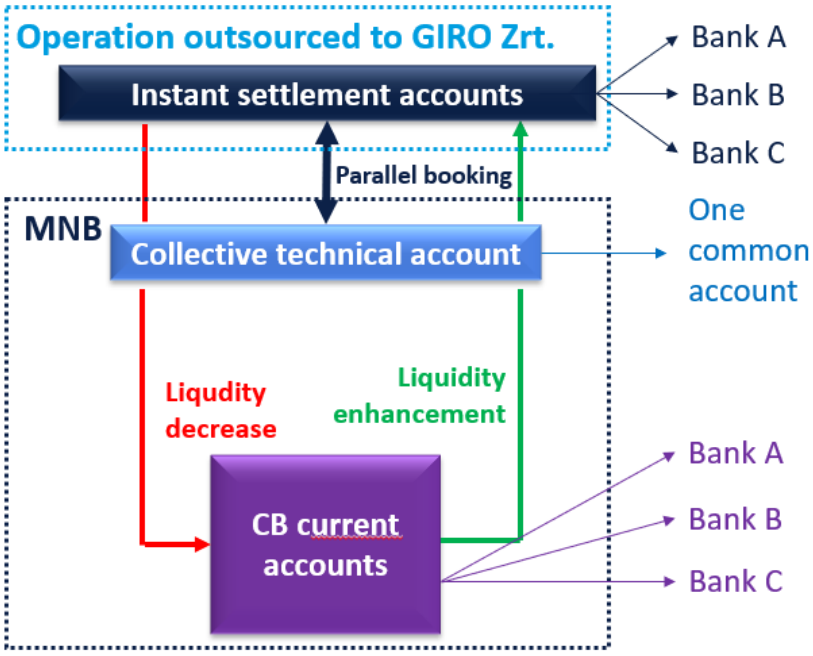
[2] Directive 2014/92/EU of the European Parliament and of the Council of 23 July 2014 on the comparability of fees related to payment accounts, payment account switching and access to payment accounts with basic features

also cover certain related risks. In the following, I introduce the main types of risks and how they are mitigated within the Hungarian and European systems.

3.1 Liquidity risks in the instant payment system

While no central clearing or settlement is needed for intrabank instant payment transactions, in the case of interbank transfers the settlement of the Hungarian instant payment system will operate in a prefunded manner from the liquidity management perspective. Prefinancing is applied in several countries; in the case of the Hungarian system, it means that PSPs will separate the liquidity required for instant payment transactions on a separate collective technical account in advance, which is held at the MNB (thus liquidity remains in the MNB's balance sheet). The liquidity on this account is possessed collectively by PSPs in accordance with the prefunded amount of each direct participant and can only be handled by instructing GIRO ACH (Automated Clearing House). Technically, the booking of instant payment transactions – which was outsourced from the MNB – is carried out on the instant settlement accounts in GIRO, and banks can modify their disposable liquidity by transferring money from or to their central bank current accounts. The balance of the banks' instant settlement accounts is booked parallel on the collective technical account at the MNB. It is important that prefunding can only be carried out by instructing GIRO, since only GIRO will have information on the PSPs' individual balances at any moment, so if PSPs intend to transfer money from their current accounts to the collective instant payment prefund account (or transfer liquidity back to their current accounts), they can only do this by instructing GIRO in order to facilitate GIRO in adjusting their disposable balances. Another constraint is the operational hours of the MNB's RTGS, since when the RTGS is closed (i.e. on weekday nights, weekends, bank holidays) PSPs will not be able to prefund additional liquidity from their current accounts at the MNB to cover instant payments.

Chart 2: Liquidity management in the Hungarian instant payment system



Source: MNB

Although according to the MNB's previous calculations, under the current circumstances the liquidity needs of instant payments will be rather moderate compared to the total available liquidity of Hungarian PSPs, theoretically it can occur that PSPs miscalculate their liquidity needs for weekday nights or weekends and holidays. This would result in a situation when consumers are not able to execute instant payments although they have an adequate disposable personal balance, since the liquidity needed for their PSPs to cover interbank settlement is not available. Needless to say, this implies serious financial stability risks by increasing the chance of bank runs for instance.

To mitigate this risk, the MNB introduced a collateralised instant credit facility that will be available for IPS participants outside the operating hours of the RTGS. With this option, PSPs can access additional liquidity if they run out of previously prefunded liquidity for instant payments. However, it is important that the MNB intends to provide this credit facility only in the case of emergencies, but not as a usual instrument of its monetary policy operation; therefore, the interest rate on the instant credit is rather high (overnight (O/N) loan + 2 per cent). During RTGS operating hours, IPS participants' liquidity management is less challenging, partly because the MNB provides collateralised intraday loans for free of charge, and partly because the system participants are in full operation.

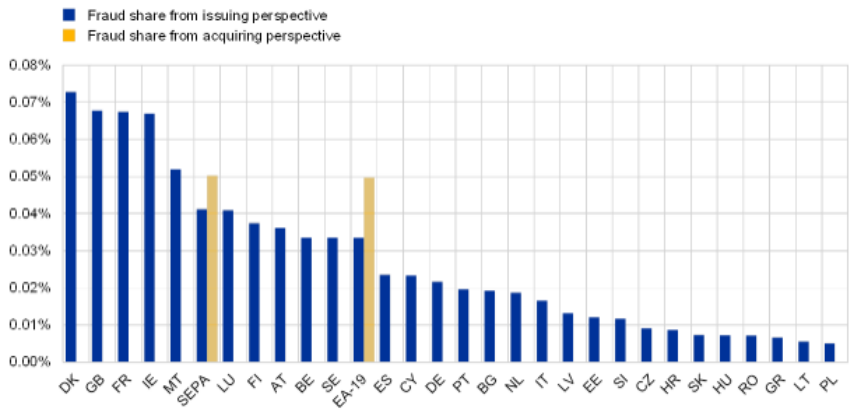
Another way to orient PSPs towards a conservative, low-risk liquidity management in instant payments is that prefunded liquidity for instant transactions can be seen in the minimum reserves of PSPs. Since the MNB pays the base rate on the money held on banks' current accounts up to the amount of their minimum reserve requirements, if the prefunded instant payment liquidity would bear no interest, it would incentivise PSPs to hold the lowest possible level of liquidity on the collective technical account. This would lead to the aforementioned risks, i.e. PSPs could easier run out of liquidity to cover instant transactions and clients would not be able to execute credit transfers. In order to handle this, PSPs can optionally designate a certain amount from their prefunded midnight balances by submitting a 'reserve statement' via SWIFT message. The designated amount will be part of the minimum reserve and subject to that remuneration method (i.e. base rate).

3.2 Fraud and security risks of electronic payments

One important risk of electronic payments is related to fraud. Besides causing losses to corporate and private clients, PSPs can also suffer significant financial damages. However, perhaps the most important effect is the loss of trust in electronic payment methods, which will materialise in

changing consumer habits and rising cash usage. To avoid these effects, PSPs and card companies take strict security steps, but central banks also initiate further measures aimed at reducing frauds. Thanks to the joint efforts of the relevant stakeholders, Hungary is in a rather good position in this field. Fraud related to credit transfers and direct debits is negligible both in terms of numbers and value. In most countries, card payments are affected the most, especially online cross-border transactions, and Hungary is no exception in this regard. Nevertheless, looking at the comparative data of the ECB (2018), one can see that the Hungarian card payment market is among the most secure even in an international comparison (Chart 3). A high fraud ratio is somewhat understandable in countries such as Denmark or the United Kingdom, where card usage is extremely prevalent. However, the achievement of a low fraud ratio is especially important, taking into account that fraudsters tend to attack the weakest points i.e. those countries where PSPs' security measures and the education of consumers is the poorest. Thus, Hungary's favourable data also shows the effective mitigation of fraud risks in the domestic payment market in general.

Chart 3: Fraud share for transactions with cards issued in a specific country and acquired anywhere (blue) vs fraud share with cards issued anywhere and acquired within the country (yellow)



Source: ECB (2018)

In order to further enhance security, regulatory changes were recently introduced at the European level. The new PSD2 and the related Regulatory Technical Standard on strong customer authentication and secure communication (RTS on SCA and CSC) of the European Banking Authority (EBA)[1] require PSPs to implement new security measures in order to ensure the secure execution of electronic transactions, to avoid phishing and fraud, and to extensively use Strong Customer Authentication (SCA) from 14 September 2019. This latter provision is perhaps the most important one, which aims to verify the identity of customers in a more reliable manner. According to the aforementioned RTS on SCA and CSC, stricter authentication must be applied if a payer accesses its payment account online, initiates an electronic payment transaction or carries out any action through a remote channel that may imply fraud risk i.e. in these cases, SCA must be used as a general rule. SCA is a process, in the course of which payment service user authentication is executed by the examination of at least two authentication elements, from at least two separate categories of possession, knowledge and inherence. A device which is enabled to generate one-time-passwords (OTP) may be regarded as a possession factor, knowledge can be a password or PIN code for instance, while certain characteristics of a client like a fingerprint, voice or vein recognition can be considered as inherence elements. The widespread use of such authentication solutions provides more efficient fraud protection, since for instance stealing card data will not be enough for fraudsters to execute online purchases. However, it is also important to note, that the application of SCA can be omitted in certain limited cases, such as

[1] Commission Delegated Regulation (EU) 2018/389 of 27 November 2017 supplementing Directive (EU) 2015/2366 of the European Parliament and of the Council with regard to regulatory technical standards for strong customer authentication and common and secure open standards of communication: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018R0389&from=EN

payments at unattended terminals used for transport fare and parking fees, or low-value payment transactions. Clients also have the option to put certain beneficiaries (such as merchants) on a 'white list', which implies that no SCA is needed in the case of payment transactions with these partners. Exemptions from strong customer authentication process in certain limited payment situations will significantly enhance the user experience, while for those transactions where mandatory SCA is required the higher security level will improve consumer trust in the use of electronic payment methods. Thus, the balance between fraud risk mitigation and supporting business interests such as a convenient user experience is ensured by PSD2.

As described above, another fundamental point of PSD2 is to facilitate the market-entry of TPPs. The new types of PSPs, such as payment initiation service providers (PISP), account information service providers (AISP) and TPPs issuing payment cards will be able to access customer data in the systems of account servicing payment service providers (ASPSPs, currently mainly banks) through so-called APIs.[1] These new interfaces support the possibility that open banking can be a reality in the near future, when banks and non-bank PSPs can provide a wide scope of value added services to customers who hold accounts in different financial institutions. On the one hand, this will promote market competition which is favourable for end-users, and on the other hand open banking, the use of APIs and market entry by TPPs can also lead to new types of fraud and security risks. This was recognised by the EBA as well as the National Competent Authorities, and thus guidelines were issued on security measures and fraud monitoring to PSPs to effectively manage these risks. In Hungary, the MNB also issued such a guideline,[2] on the basis of the relevant EBA document.

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[1] Application Programming Interface

2 https://www.mnb.hu/letoltes/26-2018-penzforgalmi-biztonsagi-intezkedesek.pdf

The emergence of new TPPs entails risks apart from APIs as well, and thus the regulation also covers the registration or licensing issues. While in the case of traditional banks, strict licensing and supervisory rules are enforced by central banks and other NCAs, a less strict regulatory environment for TPPs could lead to regulatory arbitrage i.e. new types of PSPs have to meet lower conditions. This could result in higher fraud levels in the operation of TPPs, which on the one hand could cause losses to clients and on the other hand would weaken the original intention of increased market competition, since properly operating TPPs would suffer from reputational risks. In order to mitigate this, AISPs must be registered at the NCAs, while for PISPs stricter rules are applied: they must obtain a license from NCAs, meet a capital requirement of HUF 15 million and have liability insurance.

The new TPPs may access personal and payment data, which also implies certain additional fraud and data protection risks. The regulation manages these risks in a way that access to personal and payment data is restricted to those parties, which are necessary for service provision or the client has directly accepted access to such data. It should be noted that – in line with the regulatory requirements – the name of the account owner, the account number and all other data that are necessary for the provision of the account information service required by the customer do not constitute sensitive data. It is also important that TPPs must provide to their clients an accurate, comprehensive description of the data which they access, also marking the purpose of their access.

As described above, the other major change in the payments market will come from the introduction of instant payments in Hungary. Along with the real-time processing of credit transfers, the central infrastructure will also support the secondary account ID (‘proxy’) and request-to-pay (RTP) functions. Clients can register their mobile phone numbers, email addresses or tax IDs in a central database as secondary account identifiers for their payment accounts. This will enable these clients receive credit transfers from their partners in an easier manner, since IBAN numbers are not

necessary to initiate the instant credit transfers. On the one hand, it is important to emphasise that this service does not pose an additional fraud risk, since with the possession of phone numbers or other secondary IDs fraudsters cannot initiate credit transfers (i.e. cannot steal money from the accounts), this service only supports the smoother receipt of incoming transactions. On the other hand, only ASPSPs and PISPs can access the central database with the purpose of initiating an instant payment, thus the restricted and supervised circle of stakeholders reduces fraud and security risks to the minimum level. The scope of stakeholders which can initiate RTPs is wider, since private consumers or merchants for instance will also have the option to send such messages. Nevertheless, since RTPs are non-clearing messages and for the initiation of actual money transfers an additional user approval is needed, the fraud risk is expected to be limited. This means that although RTP messages might be sent with a fraudulent purpose, payer parties will have to approve all transaction, and thus with proper user education the level of fraud risk seems manageable compared to the advantages which the RTP service implies.

3.3 Operational risks and service levels

From the users' perspective (either private or corporate), it is of utmost priority that the electronic payment methods can be used reliably i.e. downtimes occur as infrequently as possible. The importance of this is shown when payment card systems or the internet banking interfaces of certain PSPs become unavailable for a couple of hours, blocking the execution of a large amount of retail payments. As the ratio of the usage of electronic payment methods is expected to grow in the near future with the introduction of instant payments, this type of risk will also increase. The MNB considers the smooth operation of the payment systems and trust in electronic payment methods to be fundamentally important, and thus recent steps further improved the situation in this area. On the one hand, the aforementioned MNB guidelines supports the mitigation of operational risks at PSPs. On the other hand, the introduction of instant payments in

Hungary will be carried out in a manner which also facilitates the reduction of this risk.

Unlike the current processing of credit transfers, which is executed within hours or days, one main feature of the payment method will be real-time processing. It is important to note that this is not simply an increase of the pace of transaction handling: this feature enables the usage of instant payments in a wide variety of payment situations. Nevertheless, another key characteristic of the new service is that it will be available continuously i.e. on a 24/7/365 basis. While at present credit transfers are executed during weekdays from morning till the evening in several countries (also in Hungary), PSPs have to provide real-time processing at any time of the day, independently whether it is on weekday, weekend or holiday. This is a major development challenge for PSPs, since it will require even higher standards compared to card payments. While in the case of card payments e.g. certain software updates can be executed with operational downtimes (e.g. during the dawn hours), and only a response message has to be sent for balance inquiries, in the case of instant payments the task is more complex. First, according to the regulation, PSPs can only have 24 hours of planned downtime annually for software updates or any other reason, but planned downtimes are not acceptable and thus the operational requirements are stricter. Second, it will not be enough to simply send a response message to balance inquiries, the real-time crediting on the beneficiary side must also be ensured, which includes the provision of immediate usability of incoming funds for beneficiary users. Although the original launch date of the Hungarian instant payment service was 1 July 2019, the Financial Stability Board of MNB decided to provide an 8-month grace period for PSPs in order to thoroughly test their new systems and internal operations. As a result of this, after the new deadline of 2 March 2020, instant payments are expected to provide higher service levels to customers in a more reliable manner.

4. Conclusions

As discussed above, major changes have occurred on the payments market in recent years. Most of these originated from changing regulatory requirements, which were intended to boost market competition and increase the service level provided to clients. This is supplemented with fundamental infrastructure developments coming from the introduction of instant payments.

In addition to favourable changes for private and corporate clients, certain additional risks may also be related to the new services and operational models. Instant payments can pose new liquidity risks, but these are managed in the Hungarian model in a unique manner. The MNB provides the option of a new collateralised instant credit, which – along with the rules for minimum reserve requirements – ensures reliable liquidity management for instant payments. The widespread usage of SCA facilitates the mitigation of fraud risks in parallel with the provision of a convenient user experience in certain cases. Finally, the new infrastructure developments will support more reliable operation in addition to an increased service level.

These examples highlight that the recently initiated fundamental transformation of the payments market will be executed in a secure manner, minimising the emerging additional risks. Central banks and other competent authorities play a crucial role in the effective management of different sources of risks in the payments market. A further research topic may be the introduction of the practical experiences concerning instant payments, open-banking and SCA.

5. References

Bank for International Settlements, Committee on Payments and Market Infrastructures [2016]: Fast payments – Enhancing the speed and availability of retail payments. November 2016.

European Central Bank (ECB) [2018]: Fifth report on card fraud. European Central Bank, 2018.

European Payments Council (EPC) [2018]: SEPA Instant Credit Transfer (SCT Inst) Scheme Rulebook 2019 Version 1.0. November 2018.

Esselink, H. – Hernández, L. [2017]: The use of cash by households in the euro area. European Central Bank, Occasional Paper Series No 201, November 2017.

Hartmann, M. – Hernandez-van Gijsel, L. – Plooij, M. – Vandeweyer, Q. [2019]: Are instant payments becoming the new normal? A comparative study. ECB Occasional Paper Series No 229, August 2019.

Ilyés, T. – Varga, L. [2015]: Show me how you pay and I will tell you who you are – Socio-demographic determinants of payment habits. Financial and Economic Review, Vol. 14 Issue 2., June 2015, pp. 25–61.

Kajdi, L. [2017]: A Western Diet with Chinese Spices –The Specificities of Payments in China. Financial and Economic Review, Vol. 16. Special Issue, January 2017, pp. 140–169.

Magyar Nemzeti Bank (MNB) [2016]: Operational model of the instant payment service in Hungary. December 2016.

Magyar Nemzeti Bank (MNB) [2019a]: Payment Systems Report 2019.

Magyar Nemzeti Bank (MNB) [2019b]: Payment data, downloaded: 02. October 2019. https://www.mnb.hu/en/statistics/statistical-data-and-information/statistical-time-series/xiv-payment-systems/payment-data

The Paypers [2019]: Payment Methods Report 2019. Innovations in the Way We Pay. June 2019.

Rising House Prices in Hungary: Causes and consequences

Ádám Banai[1]; Gábor Hajnal[2]; Sándor Winkler[3]

***Abstract**: After prolonged adjustment following the crisis, the past 5 years have been characterised by a strong boom in the Hungarian housing market. Compared to the bottom of the cycle, Hungarian house prices have more than doubled, increasing nearly threefold in the capital. As the current boom has not been driven by lending, it is not causing a financial stability problem, but it does nevertheless raise serious economic policy issues. In our study, we examined three aspects of house prices, considering competitiveness and social effects in addition to financial stability. We showed that, although the price increase was not a threat to the banking sector, its potential impact on competitiveness is considerable. Difficulties in accessing housing may drain both financial and human resources from the national economy. In particular, young people have stronger incentives to leave the country when house prices are excessive. Additionally, young people may postpone starting their own homes, and consequently also parenting. Increasingly difficult access to housing may also negatively affect performance at work. Accordingly, economic policy must respond in such situations. That said, there is no tested recipe for intervention. A targeted programme is needed that is tailored to the needs of the region concerned.*

Key words: housing market, house prices, competitiveness

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1. Introduction

In 2019, the ESRB issued warnings or formulated proposals to 11 countries due to excessive increases in their house prices. Especially in the light of the lessons learned from the economic crisis, this move indicated that the housing market would remain a key driver in the development of European banking regulations. However, it would be a mistake to look at the housing market only from the aspect of financial stability, and to make decisions solely depending on whether the financial system is functioning adequately. This is because, apart from their links to financial stability, trends in the housing market are at least as relevant from a social and competitiveness point of view. Prices in the free market are often out of touch with the options available to the community. This may prevent access to adequate housing in certain income brackets, potentially leading to severe social problems. For that reason, our assessment of house prices covers three aspects. In addition to the aspect of financial stability, we also consider social aspects and effects on competitiveness.

From a central bank perspective, the most relevant issues are raised by financial stability implications. For households, their homes are among their principal assets (this applies across the region and particularly in Hungary), which is why the development of prices has a considerable influence on households' decisions about consumption and savings. In the corporate sector, the development of property prices and the number of transactions have an effect on demand for new investments, and ultimately on the construction industry and its suppliers. This strong effect is also felt in the banking sector. Accounting for a major portion within household loans, the quality of mortgage loans is determined by the property market in several respects. A fall in prices will cause banks' expected loan losses to increase because, first, the collateral value will drop, which will increase the loss given default ratio (LGD), and second, the probability of default (PD) will also increase as it becomes less worthwhile for the borrower to repay the debt. In the corporate sector, a decline in property prices may

exert a negative effect particularly through construction participants, because it reduces the number of investments and the profitability of construction firms, which will ultimately also have a negative effect on the performance of bank exposures to the sector. These factors will affect both capital requirements and – through impairment – banks' results, eroding the stability of financial institutions. Conversely, when property prices rise, the very opposite developments may occur, leading to the reinforcement of banks' positions. This relationship was shown by Gibilaro and Mattarocci (2016).

Apart from the above obvious impact mechanisms, rising property prices may also potentially have the effect of driving risk. Rising house prices make property purchases more attractive, while also motivating banks to increase their lending activity. One possible result of that is for the banking sector to keep serving less prudent borrowers while marketing increasingly risky loan schemes, as shown by the example of the US subprime market. It should be noted that foreign currency lending in Hungary also shared these features in 2007–2008 (Balás et al., 2015). Additionally, with the rapid rise in house prices, banks actively engaged in mortgage lending will become increasingly exposed to a potential downturn in the property market, which – particularly given borrowers' high indebtedness – will pose a major risk to the stability of such banks. Koetter and Poghosyan (2010) appear to have confirmed the latter scenario.

The distinction between social and competitiveness aspects is less marked, and the problems they produce at macro level, as reported in the literature, are also very similar. The unaffordability of adequate housing may manifest itself in the form of various problems. It may impose a direct burden on the social benefits system e.g. through redundancies, or by forcing people to live in areas where the only opportunities for a livelihood are offered by public benefit schemes. Consequently, in disadvantaged areas, insufficient job opportunities and inadequate housing may be mutually reinforcing developments. In turn, the low value of property

reduces opportunities to break out. As Van Weesep (2000) has shown, the availability of good housing in a settlement itself appeals to investors and may attract additional investments. By contrast, inadequate housing will produce the opposite effect by intensifying the problems that already exist. Chakrabarti and Zhang (2014) reach similar conclusions. Examining the Californian housing market, they found that better affordability (i.e. a lower price-to-income ratio) resulted in faster employment growth, creating more benefits for the local economy overall. At the same time, the authors point out that the policy measures adopted for that purpose had to be designed with the utmost care. A more rigorous administrative measure aimed at better affordability may, at the same time, erode a region's appeal to economic operators and investors, ultimately making the measure counterproductive. Research carried out by Wang et al. (2013) on Beijing data also underlined the powerful impact of affordability on the real economy. They showed that while affordability had a positive influence on economic growth, excessively high price-to-income ratios were unsustainable over the long term both economically and socially.

The literature thus confirms that in order for an analysis of housing market developments to be adequate, its focus must be wider than the effects on financial stability. In the following, therefore, trends in the domestic housing market are examined from three perspectives. First we consider the social effects, then the effects on financial stability, and finally the effects on competitiveness. At the end of the study, conclusions are made that are also relevant to policy makers.

2. POST-crisis Trends in the housing market

In 2014, Hungary experienced a turnaround in its housing market: after the steady decline in house prices seen in the previous years, residential property prices started to rise, accompanied by a gradual increase in the number of housing market transactions. On average, house prices as

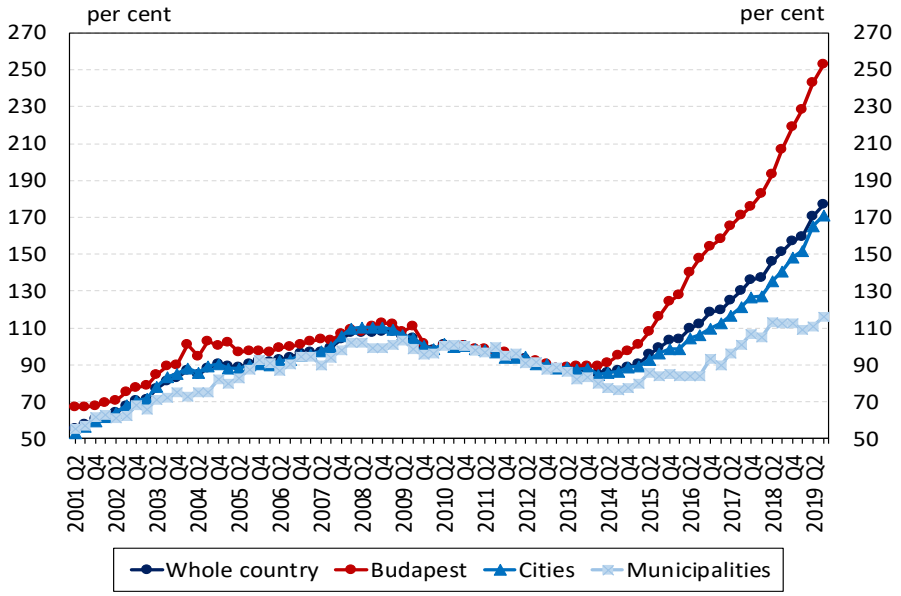
measured by the Magyar Nemzeti Bank (MNB) increased by 108 per cent nationwide between the end of 2013 and 2019Q2 in nominal terms, corresponding to a real increase of 90 per cent over the same period. A comparison of house price levels to the peak of the previous cycle also shows a significant rise. Compared to the end of 2008, in 2019 Q2 house prices were 64 per cent higher in nominal terms and 24 per cent higher in real terms, meaning that in the current cycle house prices reached a historic high in real terms as well.

On the demand side, the housing market boom was driven by a number of factors. On the one hand, from 2014 onwards the market witnessed a surge in demand due to the realisation of previously postponed purchases. Between 2009–2013, the number of housing market transactions was around 100,000 to 110,000 per year, while in the mid-2000s it exceeded 200,000 at an annual level. In the meantime, households' accumulated savings increased continuously, with the net financial wealth of the sector growing from 60 per cent of GDP at the end of 2008 to 80 per cent at the end of 2013, and then to 100 per cent in 2016. Apart from savings, favourable conditions in the labour market and wage inflation also supported the sustained demand in the housing market. Since 2013, real household disposable income increased at an average annual rate of 4 to 5 per cent, while the unemployment rate fell from 11 per cent in 2013 to 3.4 per cent in 2019 Q2. Households' income prospects were positive, and the low interest rate environment also stimulated housing market demand. On the one hand, favourable financing costs provided an incentive for households to borrow, while on the other, in the low yield environment investors were ready to switch from financial instruments to a property market that generated higher returns (MNB, 2019).

From 2014 onwards, major geographical differences emerged in the Hungarian housing market. In Budapest, prices increased at a substantially higher rate compared to the national average. In nominal terms, house prices in the capital appreciated by 184 per cent between 2013 and 2019

Q2 against an average increase of 108 per cent recorded nationally. At the same time, the increase was 102 per cent in rural towns, and a mere 45 per cent in villages (Chart 1). The stronger increase in Budapest resulted in a significantly wider price gap between the capital and rural settlements. While in 2013 average square metre prices in county seats and villages amounted to 63 and 33 per cent of those in the capital, respectively, as a result of the increasingly disproportionate price dynamics by 2019 H1 the two ratios dropped to 49 and 18 per cent, respectively.

Chart 1: Aggregated nominal MNB house price index by settlement type (average for 2010 = 100%)

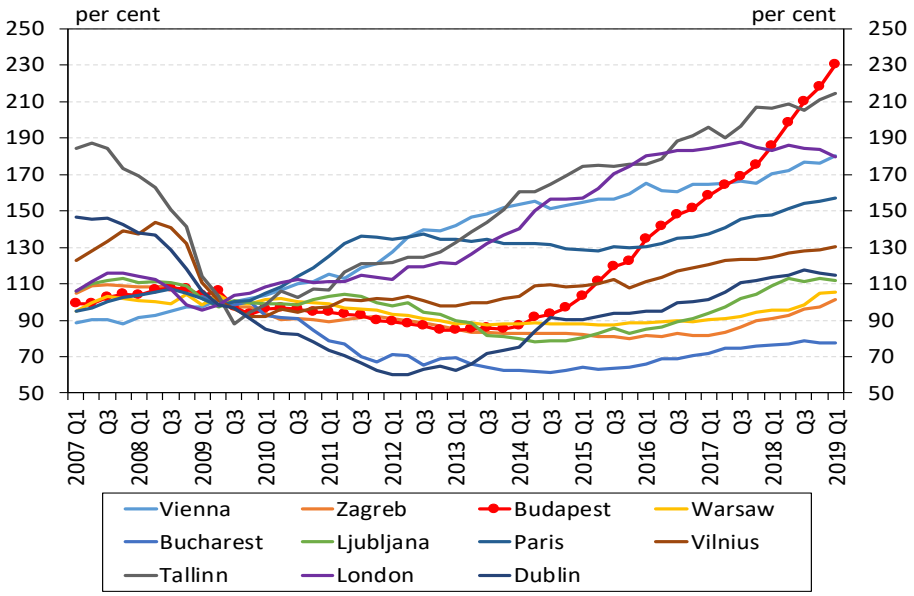


Source: MNB

The increase in house prices seen in Budapest is significant both by Hungarian and international standards. Of the capitals with available data on the development of house prices, Budapest has witnessed the highest rate of increase among European capitals since 2009. Between 2009 and

2019 Q1, the price increase was 130 per cent in Budapest, 114 per cent in Tallinn, 80 per cent in both Vienna and London, and only 57 per cent in Paris (Chart 2).

Chart 2: Development of nominal house prices in European capitals (average for 2009 = 100%)



Note: Austria, Poland, France and Estonia average square metre prices, the rest of the countries according to pure price change. Source: BIS, MNB

Although the boom in the Hungarian housing market, and specifically the sharp increase in house prices was accompanied by a steady improvement in households' incomes, the rate of property price appreciation was faster than income growth. This led to a significant deterioration in housing affordability in Hungary, particularly in Budapest. While in 2013 buying a home in the median price bracket took 6.5 years worth of net average earnings in Budapest and 5.5 years on average nationwide, by 2019 the same ratios deteriorated to 12 and 7.5 years, respectively. All of this clearly shows that although the rate of increase in house prices was also faster than

wage growth on average nationwide, the ratio deteriorated to a particularly high degree in Budapest. Although from a borrower perspective the deterioration in housing affordability is offset by low interest rates, they are insufficient to balance the outstandingly high price increase in Budapest.

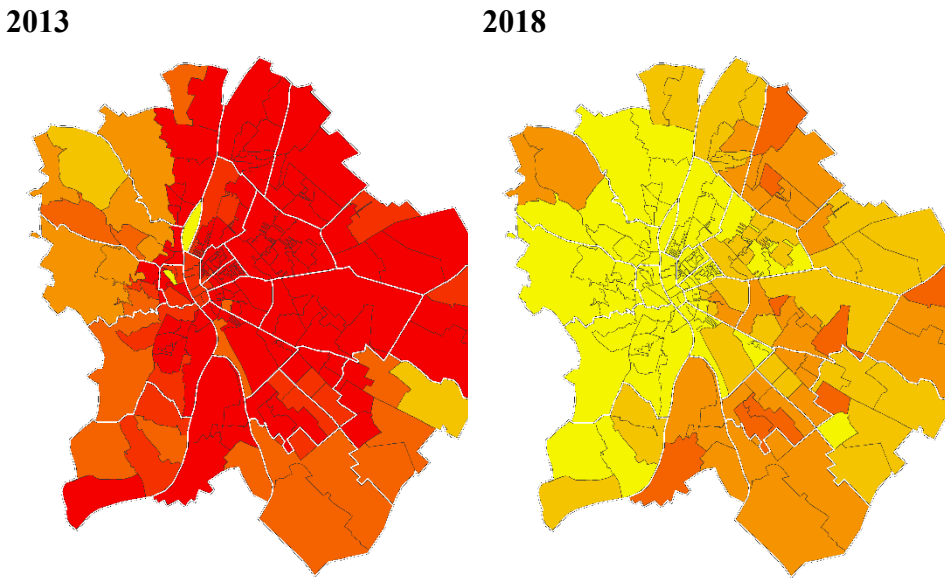
The supply of new homes could not catch up with the strong demand seen in the Hungarian housing market since 2014. Although in 2016, after the introduction of a lower VAT rate of 5 per cent for new homes, a significantly higher number of new building permits were issued and many projects started for the development of new homes, due to the limits of the construction industry the rate of housing construction has been unable to keep abreast of demand. In Budapest, the number of available homes has remained level since 2017, i.e. whatever number of homes go on sale in a given period are actually sold, driving a price increase of more than 20 per cent in annual terms. The Hungarian construction industry is suffering from a shortage of skilled labour, while public investments and commercial property developments also drain substantial construction capacities from housing projects. The combination of these circumstances caused major delays to housing projects. Looking ahead, from 2021 onwards, primarily due to the temporary low VAT rate losing effect, the supply of new homes is expected to tighten, as a result of which the supply side of the housing market is even less likely to dampen the rise in house prices.

3. The Social Aspect

People with lower incomes are hit particularly hard by the structure of the current increase in house prices. They find it increasingly less viable to live in more frequented areas of the city that offer better transportation facilities. As shown in Chart 3, transactions of up to 350,000 HUF/sqm, which are still generally considered affordable, hardly exist anymore in Budapest. As a result, low-income groups are driven to the outskirts or the agglomeration

to face resulting additional costs (such as those related to commuting) that represent a much higher share in their consumer baskets.

Chart 3: Share of transactions under 350,000 HUF/sqm within all Budapest transactions in 2013 and 2018, by postal code

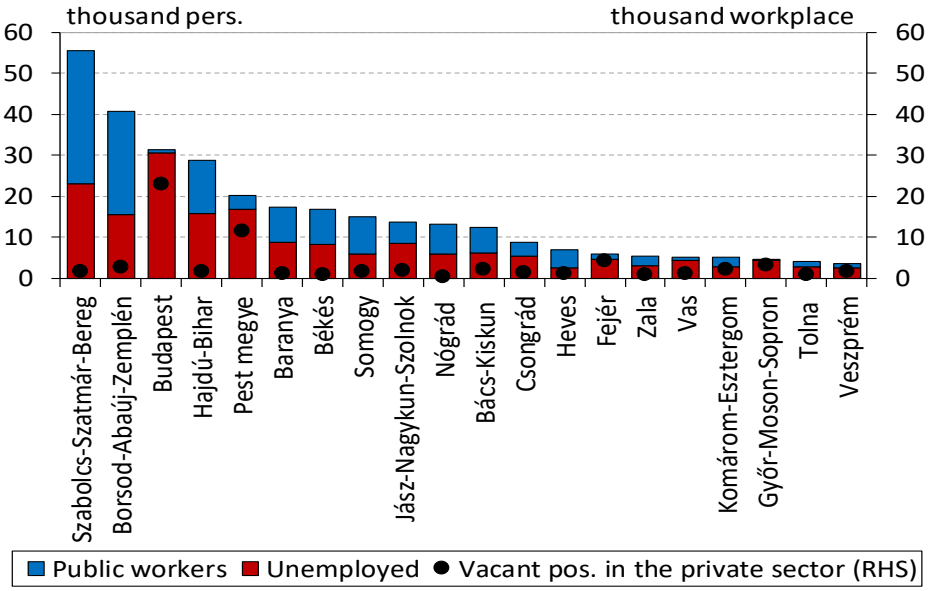


Source: MNB

From the social aspect, recent years' developments entail risks primarily in Hungarian settlements other than Budapest, particularly in villages. The widening price gap has further eroded opportunities for mobility between rural areas and Budapest, and between towns and villages. This problem is especially important because despite the significant improvement in the labour market and a historically low unemployment rate, there is still a significant concentration of unemployment mainly in smaller settlements, and for the most part in disadvantaged regions. For these groups, a relative deterioration in housing creates a disadvantage in the labour market. In

these settlements, given the highly heterogeneous housing market, redundancy is a greater risk even for those who are currently employed.

Chart 4: Private sector vacant jobs and spare labour capacities (unemployed and public employees) by county (2018Q3)



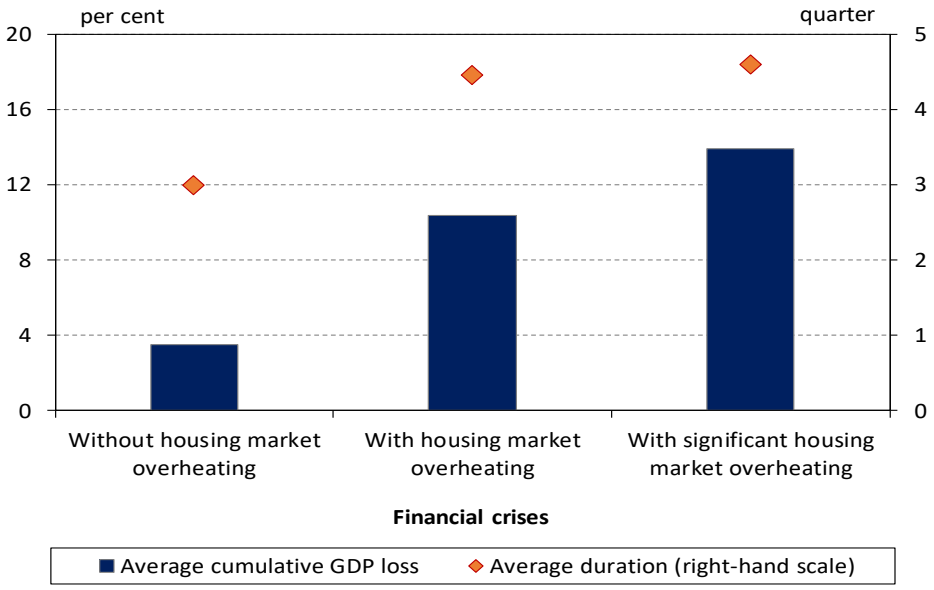
Source: MNB

In addition to the labour market, another important social aspect is that a large part of non-performing loans is still linked to smaller settlements, where the effects of the property market boom are more moderate or absent. For such debtors, the current increase in property market prices does not provide a way out of debt.

4. Stability

The overvalued housing market may have severe macroeconomic and financial stability consequences. Overvaluation is often followed by a similar boom in lending, after which, when prices start to fall (recession), the excessive volume of credit and those granted to risky customers may give rise to macroeconomic risks. Past experience shows that the costs incurred in a period of recession tend to be much more severe when the upturn in the property market cycle is accompanied by excessive lending (Chart 5). In such cases, both borrowers and lenders see a significant deterioration in the quality of their assets, and deteriorating asset quality causes financers to cut their credit supply, which in turn hampers real economy activity (Crowe et al., 2011).

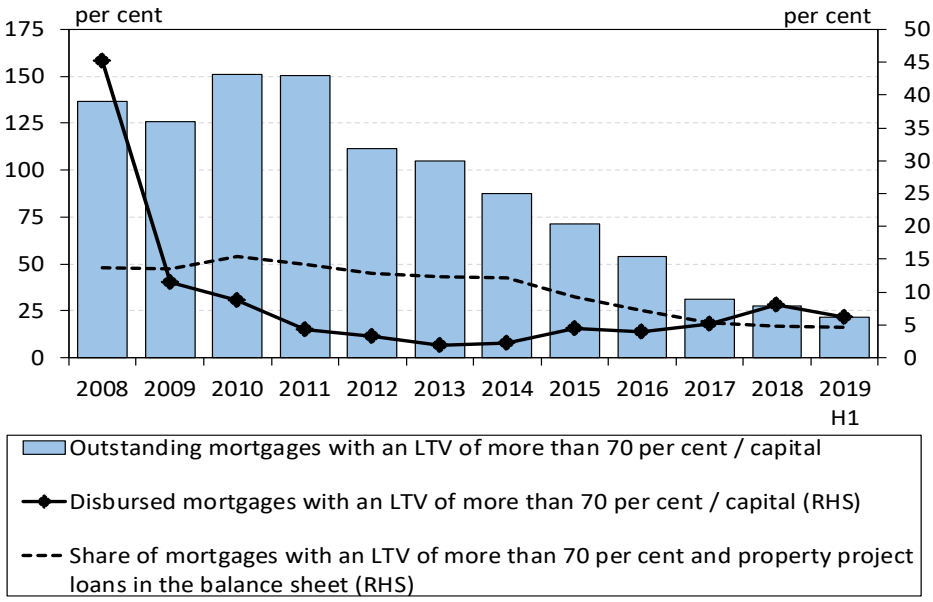
Chart 5: Comparison of crises with and without overheated property markets



Note: Based on a comparison of data for 40 countries. Source: Crowe, C. – Dell'Ariccia, G. – Igan, D. – Rabanal, P. (2013).

It is also particularly important to monitor trends in the property market on a regular basis, as a large ratio of property transactions are carried out using bank financing, and financed property purchases tend to have higher leverage ratios than the levels seen in the case of any other investment activities (Crowe et al., 2011). From the perspective of financial stability, excessive increases in property prices carry particularly high risk when accompanied by overheated and risky lending, because in the event of a negative price shock most bank losses are incurred on loans with high loan-to-value (LTV) ratios. Hungary is currently not facing this problem for two reasons: first, the risks undertaken by borrowers are limited by debt cap rules, and second, the banking sector's high-risk exposure to the property market is also significantly lower now than it was in the previous cycle. In 2008, the volume of mortgage loans with a current LTV of more than 70 per cent amounted to 137 per cent of the banking sector's regulatory capital, the ratio is at present very low at 22 per cent (Chart 5). The low ratio of mortgage loans with high LTVs thus limits the effect of a housing market shock on the banking sector.

Chart 6: Mortgage loans with LTVs above 70 per cent as a percentage of regulatory capital



Source: MNB

From a stability perspective, another positive circumstance is that although the risk from the overvaluation of Budapest properties can be considered high, the price increase in the capital is not primarily driven by higher-risk lending. In Budapest, the share of financed home purchases is roughly equivalent to that in the countryside, while the share of new risky loan agreements with LTVs and payment-to-income (PTI) ratios approximating the regulatory limits is not significant, and is even lower than in the countryside. In 2019 H1, 23 per cent of all new housing loan agreements had LTVs of more than 70 per cent, and a mere 7 per cent of all agreements had PTI ratios above 40 per cent. Relative to nationwide trends, these indicators do not point to excessive risk-taking in residential real estate lending in Budapest.

Additionally, in Hungarian household lending, new agreements have a low share of transactions associated with areas affected by high price

appreciation and LTVs approximating the regulatory limit. In 2018, a mere 24 per cent of the contracted volume belonged to the category that represents a higher level of risk in terms of both the conditions of lending and the local conditions prevailing in the housing market (Table 1). However, for the maintenance of financial stability it is particularly important to monitor the segment of loan agreements that are made on high-risk terms in a strong housing market boom, because in the event of a negative adjustment in prices the highest loss ratio is expected on these agreements.

Table 1: Mortgage loans contracted in 2018 by level of price appreciation in each district and by LTV

%		LTV ratio					
		below 50%	50-60%	60-70%	70-80%	above 80%	Total
Change in average prices of square metres between 2013 and 2018	increased by more than 100%	3.6	1.5	1.9	3.1	0.5	10.6
	increased by 75-100%	19.3	7.3	9.1	14.5	2.9	53.2
	increased by 50-75%	6.8	3.0	4.1	6.1	1.1	21.2
	increased by less than 50%	4.6	2.1	3.1	4.4	0.8	15.1
	Total	34.3	13.9	18.2	28.1	5.4	100.0

Note: Distribution by contractual amount; values above 80 per cent are possible for loan replacements. Figures based on the districts where the collateral properties are located. Source: MNB

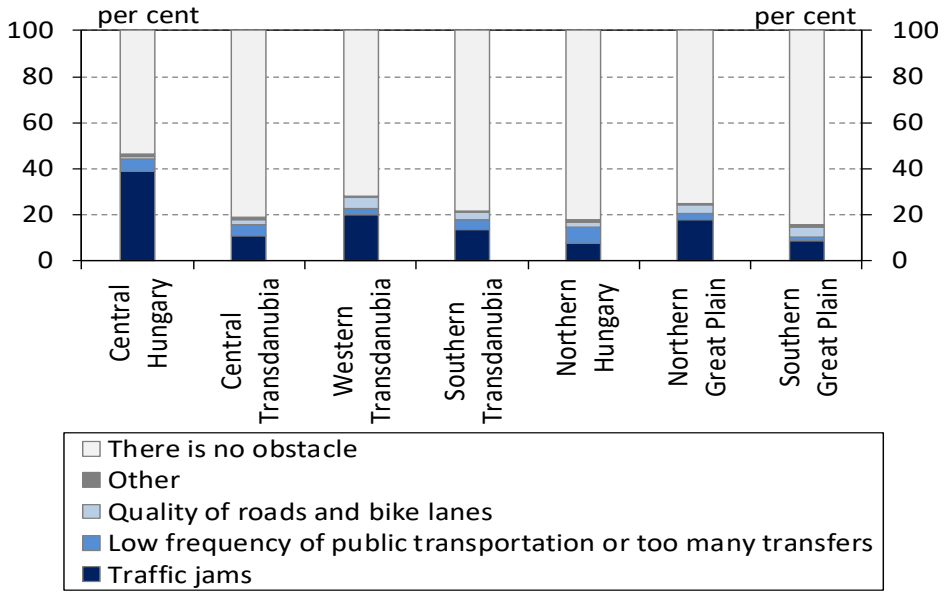
5. Competitiveness

From the perspective of competitiveness, the deterioration in housing affordability gives rise to a number of problems. Given the high prices,

housing arrangements are an excessive burden on households both as tenants and as buyers. As a result, less is left over for consumption, whereas in the case of ownership, the housing arrangements themselves take up an excessive volume of wealth. Both may have a direct negative effect on economic performance. Although less directly, an excessively high share of financial resources allocated to housing may also be detrimental to work performance due to the narrower opportunities for adequate recreation.

In Budapest, the affordability of housing forces many people to move to the agglomeration or to outer and therefore cheaper districts of the capital, while those insisting on more central locations can only afford properties of lower quality. Additional negative effects of moving out include the environmental impact, deterioration in the quality of life and the sense of accomplishment (Stutzer and Frey, 2008). For example, close to one-half of residents in Central Hungary perceive a problem concerning some aspect of commuting to work.

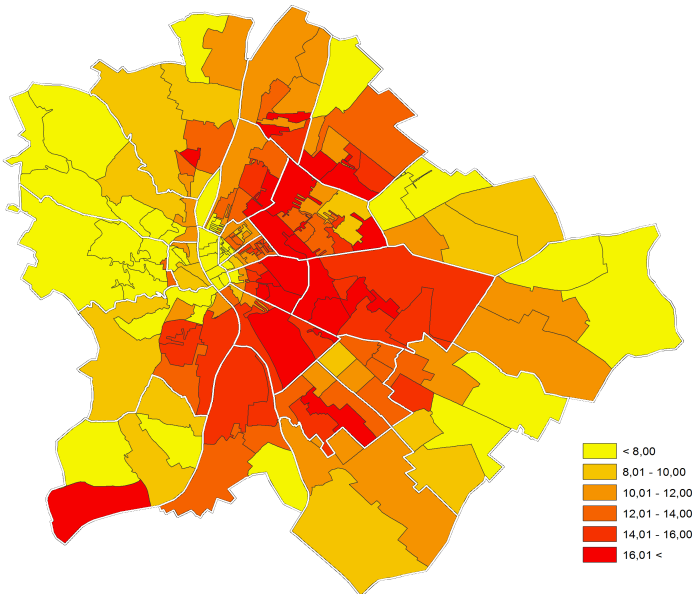
Chart 7: Commuters by aspect representing the key problem in commuting to work (2017Q4)



Source: HCSO

One key issue is what high house prices mean to young people. In the case of Budapest, it is readily apparent that they cannot afford the high prices of the city centre, but would prefer not to move to outer districts. The result is a narrow strip to which people of the working-age young generation are keen to move. However, the strong demand in such locations cannot be met by the available supply. This is particularly important in the case of the young generation because that is where the threat of moving abroad is the greatest. Due to narrow housing opportunities, young people either choose to live longer with their parents, which means postponed parenting, or move abroad. Both scenarios involve a major negative impact on the national economy.

Chart 8: Share of people under 30 within transactions made in 2018 in Budapest, by postal code (%)



Source: MNB

The increase in house prices and the deterioration in housing affordability are also driving households to the rental market, which, in Hungary, is underdeveloped and expensive by international standards. Rental supply is currently dominated by private individuals, with a significant volume of unofficial letting, and a low share of long-term rental agreements that could guarantee tenant security. Additionally, in Budapest the ratio of typical rents to typical incomes is one of the highest among European capitals. The rental market is thus not a real alternative for many. This phenomenon is even more pronounced in large rural towns. The absence of a widely accessible rental market also reduces labour mobility, which also has a negative effect on economic performance.

6. Conclusion

While the Hungarian housing market has undergone major changes in recent years, it is apparent that the current boom is not driven by excessive lending. First, the banking sector is currently much more resilient to a negative shock from the property market than it was in the late 2000s. Second, the risks are also perceived to be lower on the customer side, which may be due both to banks' lower risk appetite and the better situation of current borrowers in terms of income and wealth.

However, the boom in the housing market, and the steady and rapid increase in house prices raise a number of problems from social and competitiveness perspectives, which still need to be addressed. Residents of the capital and larger rural towns are being forced to spend an increasing share of their incomes or savings on housing, which is leading to a deterioration in affordability. There is a steady decrease in the ability to afford homes representing quality or situated in locations that are appropriate to current life situations. Additionally, more expensive housing may result in the outward migration of young people at the start of their

careers, worsening the problems of businesses faced with a shortage of labour.

However, to address the above problems there is no clearly-defined economic policy toolkit that would enable policy makers to help in the most effective way. The root cause of the problem, i.e. the significant increase in house prices can be influenced from two different directions: by cooling demand, and by driving the supply of homes.

On the demand side, discouraging home purchases for investment may appear to be an obvious targeted solution. The low interest rate environment has channelled large volumes of savings to the property market, with home purchases for housing accompanied by a large number of purchases for letting or future sale, which has put additional pressure on house prices. Nevertheless, it is important to see that investor presence may also benefit the housing market. On the one hand, by driving strong demand for condominium units, investors help the implementation of projects in that segment, while one the other, by increasing the rental stock, they ease the upward pressure on rents. Thus, the excessive restriction of investment demand could potentially decelerate the construction of new housing, which would not be desirable.

The other possible way is to increase housing supply, which appears to be viable primarily through incentives for new construction, and by eliminating the factors that are currently inhibiting a healthy boom in housing development. Incentives for new housing could be targeted at the construction of affordable homes, while improving the productivity of the construction industry would significantly increase the development volume.

7. References

Crowe, C. – Dell'Ariccia, G. – Igan, D.∗ – Rabanal, P.(2013): How to deal with real estate booms: Lessons from country experiences. Journal of Financial Stability, 9 (2013), pp. 300–319.

MNB (2019): Financial Stability Report (May 2019). https://www.mnb.hu/kiadvanyok/jelentesek/penzugyi-stabilitasi-jelentes/penzugyi-stabilitasi-jelentes-2019-majus. Accessed: 25 October 2019

MNB (2019): Housing Market Report (May 2019). https://www.mnb.hu/kiadvanyok/jelentesek/lakaspiaci-jelentes/lakaspiaci-jelentes-2019-majus. Accessed: 25 October 2019

Balás, T. – Banai, Á. – Hosszú, Zs. (2015): Modelling probability of default and optimal PTI level based on a household survey. Acta Oeconomica 2015, 65(2), pp. 183–209.

Gibilaro, L. – Mattarocci, G. (2016): Are Real Estate Banks More Affected by Real Estate Market Dynamics? International Real Estate Review, Asian Real Estate Society, 19(2), pp. 151–170.

Koetter, M. – Poghosyan, T. (2010): Real Estate Prices and Bank Stability, Journal of Banking and Finance, June 2010.

van Weesep, J. (2000): Housing policy – the link between welfare and economic development. Journal of Housing and Built Environment, 2000/15, pp. 165–181.

Stutzer, A. – Frey, B.S. (2008): Stress that doesn't pay: The commuting paradox. Scandinavian Journal of Economics, 110(2), pp. 339–366.

Digital Currency: Technology, Nature and Prospects

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Abstract: Since the invention of Bitcoin in 2009, digital currency has received widespread attention from the IT and financial industries and even society. In China, due to the financial risks engendered by digital currency speculation, the regulatory authorities have adopted a strict prohibition on the private issuance of and transactions in digital currency. However, this does not affect the interest of the government and academia in digital currency technology. This article undertakes a conceptual analysis of the economic properties and technical characteristics of digital currency and discusses its future development prospects based on this.

Keywords: digital currency, currency function, currency competition

1. Introduction

Since the invention of Bitcoin in 2009, digital currency has received widespread attention from the IT and financial industries, as well as society. Recently, Facebook announced the Libra cryptocurrency plan, making digital currency a hot topic again. The rise of digital currency has also aroused the interest of mainstream economics circles, spawning a great deal of academic research, including the technical principles of digital

currency,[1] the impact of digital currency on monetary policy,[2] the financial and economic effects of digital currency,[3] digital currency as an alternative to fiat currency,[4] exchange rate dynamics and transaction patterns of digital currency,[5] the regulation of digital currency, and so on.[6] Digital currency is also a hot issue in China. Due to the financial turmoil brought by speculation in digital currency, the regulatory authorities have adopted a strict prohibition on the private issuance of and transactions in digital currency. However, this does not mean that China's negation of digital currency technology itself. On the contrary, the blockchain technology as the basis of digital currency is receiving great attention in China, and is also being tentatively applied in some areas. The government's intention to issue

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[1] 如 Rainer Böhme, Nicolas Christin, Benjamin Edelman, and Tyler Moore: "Bitcoin: Economics, Technology, and Governance," Journal of Economic Perspectives, Vol. 29, No. 2, 2015, pp.213-238；David Easley, Maureen O'Hara, and Soumya Basu: "From Mining to Markets: the Evolution of Bitcoin Transaction Fees", Journal of Financial Economics, Vol. 134, No. 1, 2019, pp. 91-109.

[2] 如 Beate Sauer: "Virtual Currencies, the Money Market, and Monetary Policy", International Advances in Economic Research, Vol. 22, No. 2, 2015, pp.117-130; Adib Rahman: "Deflationary Policy under Digital and Fiat Currency Competition", Research in Economics, Vol.72, 2018, No. 2, pp. 171–180.

[3] 如姚前：《法定数字货币的经济效应分析:理论与实证》，《国际金融研究》，2019 年第 1 期；Jacek Mizerka, Agnieszka Stróżyńska-Szajek, and Piotr Mizerka: "The Role of Bitcoin on Developed and Emerging Markets – on the Basis of a Bitcoin Users Graph Analysis", Finance Research Letters, forthcoming.

[4] 如 William Luther and Alexander Salter: "Bitcoin and the Bailout", Quarterly Review of Economics and Finance, Vol.66, 2017, pp.50–56.

[5] 如 Andrew Urquhart: "The Inefficiency of Bitcoin", Economics Letters , Vol.148, 2016, pp.80–82；Igor Makarov and Antoinette Schoar: "Trading and Arbitrage in Cryptocurrency Markets", Journal of Financial Economics, Vol. 135, No. 2, 2020, pp. 293-319.

[6] 如 Joshua Hendrickson and William Luther: "Banning Bitcoin", Journal of Economic Behavior & Organization, Vol. 141, 2017, pp. 188-195；李文红、蒋则沈：《分布式账户、区块链和数字货币的发展与监管研究》，《金融监管研究》，2018 年第 6 期。

central bank digital currency is also heard. It is possible that in the future digital currency will be formally introduced into our economic life and profoundly affect the development of the society. To this end, this article undertakes a conceptual analysis of the economic attributes and technical characteristics of digital currency and discusses its future development prospects.

2. The history of digital currency

One of the ultimate questions debated between supporters and critics of digital currency is: "Is digital currency a currency?" A very common approach to this problem is to trace the historical origins of currency. By examining those characteristics that do not change with the form of currency, the core elements supporting its performance of monetary functions are confirmed. After the emergence of currency, the first leap was the evolution from commodity money to token money: a bag of salt became a receipt for a bag of salt signed by a neighbour, or one liang (50 grams) of silver became a note for one liang of silver issued by the bank. Originally, token money was tangible, mostly in the form of paper and base metals, and could be exchanged for the materials it represented to the original issuer. Since then, token money has evolved on two paths. One path is the abstraction of the symbol. For example, the cash held becomes the number on the bank account. The other path is the decoupling of the symbol from the debt and debt relationship it represents, which means the currency can no longer be cashed as a credit collateral. This is also the path most governments take. The two paths meet at non-cashable intangible token money, which becomes a long-term form of modern currency.

After the implementation of electronic accounts and electronic payment processes, the stored value forms in certain non-bank-operated commercial platform accounts have purchasing power beyond the scope of this platform's commodities and become a more general transaction medium.

The most typical examples are M-Pesa and XRP. The stored value forms in this type of non-bank account system can be regarded as "traditional" digital currency based on the Internet: it is issued by institutions other than the fiat currency authority, but is still based on a centralised pattern of issuance, cooperating with traditional banks or licensed transactions, and usually has a value-preservation mechanism. Such "traditional" digital currency is often used as an important channel for non-financial institutions to obtain financial power, but the operation still needs to rely on the existing currency and financial system. The competition within this centralised system seems very applicable to Hayek's theory of private money.[1]

Compared with such "traditional" digital currencies, Bitcoin, Litecoin and other "narrow" digital currencies or "virtual currencies" represent a bigger leap in the evolution process of currency. The particularity of the latter is not only reflected in decentralised issuance methods or anonymity, but more importantly, they are independent of the existing financial system (at least theoretically). Ideally, even if all banks, financial institutions, and the government disappear completely, as long as the Internet is still functioning, Bitcoin owners can still use it for transactions. This seems to be a situation that has never occurred since fiat currency dominated the economy. The impact of the emergence of Bitcoin on the existing financial order or concept is therefore far greater than that of "traditional" digital currency.

In the historical evolution of currency discussed above, what factors supported different forms of currency in fulfilling their functions, especially the function of a transaction medium? Commodity currency has use value, even if its use value is not equal for everyone. However, as long as people believe that it has sufficient use value for most people, or even for just some people, its acceptability as a transaction medium can be

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[1] Friedrich von Hayek: Denationalization of Money: An Analysis of the Theory and Practice of Concurrent Currencies, London: Institute of Economic Affairs, 1990.

supported. For convertible token money, relying solely on the value of the collateral is not enough. Trust is also needed. In order to overcome the obstacles to the trust of cashing ability and willingness, a complex currency issuance preparation mechanism was born. The trust issue about the authenticity of vouchers is a game between anti-counterfeiting technology and counterfeiting technology of the currency. So far, everything is in line with Mises' "Regression Theorem": the acceptability of the currency can be traced back to the value of the item from which it was originally derived. But once the form of currency steps into the non-cashable fiat currency stage, this retroactive chain is suddenly interrupted and replaced by ambiguous "national credit".

Among the mainstream currency theories, the acceptability of currency that lack "intrinsic value" is not a problem. The "rational bubble" model of Tirole et al. proves that even if all actors are completely rational, financial assets without any "intrinsic value" may become a means of value storage in the overlapping generations model of infinite horizon.[1] And non-cashable currency is a typical example. Similarly, in Kiyotaki and Wright's search-matching-based currency model, currency used as a transaction medium in equilibrium can also have no "intrinsic value".[2] In the context of infinite horizon, financial products can be accepted by potential buyers not because of their "internal value", but simply because of the buyer's expectation that other potential buyers will also accept such financial products in the future. It is the "Network Effect" on currency acceptability.

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[1] Jean Tirole: "Asset Bubbles and Overlapping Generations", Econometrica, Vol.53, No.6, 1985, pp.1499-1528.

[2] Nobuhiro Kiyotaki and Randall Wright: “On Money as a Medium of Exchange”, Journal of Political Economy, Vol.97, No.4, 1989, pp. 927–954.

3. Technical characteristics of digital currency

By copying and keeping the books in each participant's computer, digital currencies such as Bitcoin have achieved the decentralisation of liquidity creation and transfer while bypassing the traditional financial system. This is one of the characteristics most respected by digital currency supporters. But "decentralisation" itself is not a new concept in the history of currency, especially when discussing money creation and payment separately. In the era of commodity currency, both the creation and the payment of currency are decentralised: money can be created by anyone, and transactions can be done by only buyers and sellers anywhere. Entering the initial fiat currency era, currency creation becomes centralised, while payment is still decentralised. The centralisation of the payment process gradually expands with the establishment of the bank settlement system, and the rise of electronic payment also accelerates this trend. Part of the reason is that it is extremely difficult to prevent counterfeiting and the "double payment" problem in decentralised electronic payment, which can only be controlled through third-party authentication. Even so, the existence of cash still provides considerable space for decentralised payments. Ironically, it is the Internet characterised by "decentralisation" that helps the realisation of the centralisation of monetary payments. With the "Internet Finance" tide, the third-party payment and bank retail payment system almost completely wipe out the living space of cash, thereby incorporating all transactions into the changes of an account. In this way, the pursuit of decentralisation of digital currencies such as Bitcoin reveals their "retro" core under the packaging of modern technology.

However, even with the same decentralised payment system, the operating mechanism of digital currency is still very different from that of precious metal currency or paper money. The payment of precious metal currency or paper money is decentralised, the information is also processed locally. Transactions can be completed by only buyers and sellers, and there is no need to know the information of other traders, let alone inform them of their

transactions. In the blockchain-based digital currency payment process, the flow and storage of transaction information is global, and each user of the currency system needs to back up all transaction data in the system. Therefore, Luther and Smith believe that Bitcoin is a distributed payment system rather than decentralised payment system.[1]

More importantly, in spite of the respect for the decentralised nature of digital currency, the fact is deliberately or inadvertently ignored that the system and program of Bitcoin and other similar digital currencies written and published by their founders are centralised. The vast majority of currency users are just recipients of this system. Of course, theoretically, this system is completely transparent. If you have enough knowledge, you can check the source code of the program to confirm its rationality and security. But it is unrealistic to require all digital currency users to have this ability. In this sense, digital currency is still a centralised system. Its "centralisation" is reflected in a lower level, and thus more hidden. Similarly, trust is still essential for the operation of digital currency. The trust required is merely transferred from the government and financial institutions to the creators of digital currency and technical elites who can understand the details of the operation of this system.

Another important advertised advantage of digital currency is the anonymity of transactions. If the attempt at illegal activities is ruled out, attention to this feature should stem from fear of privacy leaks. However, at least for Bitcoin, this feature is quite a misnomer. Bitcoin's anonymity comes from the fact that transactions in it do not require any traditional financial institution's account. Therefore, it will not expose the true identity of the trader in the real world. But this line of defence is very fragile. Once a person's public key address corresponds to his real identity, then because

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[1] William Luther and Sean Smith: "Is Bitcoin a Decentralised Payment Mechanism?", Journal of Institutional Economics, forthcoming.

of the comprehensiveness of the blockchain record, tracking all of his transactions is even simpler than in traditional financial systems. Considering the connection between Bitcoin transactions and the user's real life (such as the delivery address or a wider network footprint), it is not so difficult for the financial regulatory authority or criminal investigation system to confirm the real identity of a public key address. Admittedly, users of digital currency are also aware of this problem. They launch more complex anti-tracking mechanisms in Bitcoin and the new generation of digital currencies. Among them, the most typical one is mixing, which is to mix multiple transactions to hide the real payer, and then use multiple public keys to protect the recipient's address. But such encryption measures can still be broken by traffic analysis or other social engineering methods.[1] It seems that on the issue of anonymity, digital currency falls into a cat-and-mouse tussle like the anti-counterfeiting technology of traditional currency. But its impact does not stop here. As more and more complicated encryption mechanisms are introduced in digital currency, it is increasingly impossible to confirm the authenticity of the transaction as intuitively as that of Bitcoin. In the end, people can only count on correct program design and operation to ensure the reliability of the monetary system. Once the system has potential vulnerabilities or is under attack, it will be extremely difficult to find out the cause and the full impact.

The total circulation amount of Bitcoin is 21 million. Once this limit is reached, miners will no longer receive Bitcoin rewards for creating new blocks. Instead, they rely on transaction fees as incentives. Obviously, the strict limitation of circulation is to clear the boundary with the fiat currency authorities that abuse currency issuance rights, and at the same time, to give Bitcoin a more stable value base. But just as the precious metal currency

[1] Jordi Herrera-Joancomarti: "Research and Challenges on Bitcoin Anonymity", Proceedings of the 9th International Workshop on Data Privacy Management, Springer, LNCS 8872, 2014, pp. 1-14.

system is often subject to deflation, if Bitcoin becomes the dominant currency, it will certainly face the problem of meeting the growing liquidity demand of economic transactions. In this regard, quite a few Bitcoin advocates seem to disagree, thinking that the severability of digital currency units naturally resolves the above questions. However, this self-assured idea obviously underestimates the stickiness of prices, especially the power of wage rigidity. In fact, the current high elasticity of Bitcoin's price is due to the fact that it is not the economy's main pricing currency, but rather relies on fiat currency to determine the price. Once Bitcoin has really achieved status as a pricing currency, things will be completely different. In addition, the limitation of the total amount of Bitcoin also brings a risk that the precious metal currency system never had before: as income from mining becomes lower and lower, in order to maintain the incentive for miners to create blocks to verify transactions, transaction fees need to increase significantly. And the danger will also increase that large-capacity mining pool owners turn their computing power to attack the main chain.

One problem that is closely related to the upper limit of the currency supply is the difficulty of digital currency in credit expansion, which is also a typical feature of precious metal currency. In a pure precious metal currency system (here we should pay attention to its difference from “precious metal standard currency system”), liquidity is completely determined by the total amount of precious metals. And there is no currency multiplier derived from credit, which also excludes the possibility of any monetary policy. Because for tangible currency, when you lend it, you also lose the ability to pay. As a result, in a pure Bitcoin system, there is no such financial institution as a bank. Because in this digital currency world, the "deposit certificate" is not an acceptable payment instrument. And those "Bitcoin Banks" or similar Bitcoin saving institutions that do exist in reality are derivatives of Bitcoin rather than part of the system itself. These are likely to be derivatives that the creators of Bitcoin are extremely reluctant

to see. This also reflects the dilemma of digital currencies: if they really want to become the mainstream currency in modern economies rather than a medium of exchange in a small circle, they must abandon the original ideas and re-embrace the traditional financial institutions that were discarded when they were created. Also, they should change from the Bitcoin system to the "Bitcoin standard" system, and then gradually abandon a series of carefully designed features such as decentralisation, anonymity, and the upper limit of circulation.

4. Speculative transactions in digital currency

However, even if the theoretical basis of the competitive currency system is not so reliable, or the constraints in practice make us have to accept the dominance of fiat currency, there may be a potential competitive currency that can put pressure on the central bank so that its monetary policy will not be too lax. This seemingly reasonable idea was constantly mentioned before Bitcoin was born.[1] However, whether the current digital currency, as it is envisioned, can play the role as the potential competitor and perform "real" currency functions is inconclusive.[2] Empirical research in this area focuses on the price dynamic of digital currency and its correlation with other financial indicators and tries to judge the true motivation of traders to hold currency. Some of the literature arrives at the unfavourable conclusion that digital currency is more similar to speculative assets rather than a transaction medium.[3] However, some studies provide different opinions

[1] 如 Ramon Marimon, Juan Pablo Nicolini and Pedro Teles:: “Inside-outside Money Competition”, Journal of Monetary Economics, Vol. 50, No. 8, pp. 1701-1718.

[2] Saifedean Ammous: "Can Cryptocurrencies Fulfil the Functions of Money?", Quarterly Review of Economics and Finance, Vol. 70, 2018, pp. 38–51.

[3] 如 C. Baek and M. Elbeck: “Bitcoins as an Investment or Speculative Vehicle? A First Look”, Applied Economics Letters, Vol. 22, No. 1, 2015, pp. 30-34; Dirk G. Baur, Kihoon Hong, Adrian D. Lee: "Bitcoin: Medium of Exchange or

that the large-scale demand for Bitcoin itself indicates that it has acquired the status as a widely used transaction medium, or has become favourable speculative assets due to its expectations of becoming a widely used transaction medium.[1] Although this logic does not seem very convincing (even if all traders are rational, as long as the market has a certain level of information uncertainty, unsustainable speculative bubbles may appear[2]), it raises an important question. That is the role of speculative trading in the existence and development of digital currency.

Undoubtedly, there are huge differences between the transactional demand (exchanging other goods by holding digital currency as an intermediary) and the speculative demand (receiving income by holding digital currency and selling it after its appreciation) for digital currency in respect to not only the motivation, but also the focus of market feature of digital currency. This difference makes a large influx of speculators into the digital currency market, which is easy to "crowd out" those who really have transactional demand for digital currency. But on the other hand, in the process of a currency being widely accepted, especially in its early stages, trading needs may be beneficial or even necessary as this can not only expand public awareness of the currency, but also bring market liquidity and supporting facilities. For traders outside the digital currency circle, these two points may become crucial determinants to decide whether to accept the other party to pay with digital currency.

As far as user experience is concerned, most digital currencies are more like semi-finished products that are still in the internal testing stage, with almost no interface-friendly concept. Taking Bitcoin as an example, in

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Speculative Assets?", Journal of International Financial Markets, Institutions and Money, Vol. 54, 2018, pp. 177–189.

[1] Peter Hazlett and William Luther: "Is Bitcoin Money? And What That Means", Quarterly Review of Economics and Finance, forthcoming.

[2] Antonio Doblas-Madrid: "A Robust Model of Bubbles with Multidimensional Uncertainty", Econometrica, Vol. 80, No. 5, 2012, pp. 1845–1893.

addition to understanding the mining-related technical knowledge, users must also rely on private keys composed of irregular characters to operate. The wallet address is also a string of characters. A little carelessness will cause funds to be remitted to the wrong address due to misuse. And it is also not uncommon to lose Bitcoin due to forgetting the private key or the damage to the private key file. The complexity of program operations also makes users often ignore security for efficiency, such as keeping private keys on non-encrypted hard disks, or keeping wallets online for a long time, which greatly increases the risk of losses from hacking. To make matters worse, due to the unfriendly attitude of many governments to digital currency, once digital currency suffers losses due to transaction disputes or hacking attacks, it is difficult to resort to legal protection. In addition to these interface design and system-level issues, the use efficiency of blockchain-based digital currency is also subject to a low-level technical constraint: due to the "public witness" mechanism, when the transaction volume increases with the growing number of users, the time for transaction confirmation will also rise sharply. Increases in network speed and block expansion can partially alleviate this problem, but it is still not possible to keep up with the level of transaction volume growing with the number of users so that some people think that the accuracy, decentralisation, and high cost-effectiveness ratio of transaction recording systems are in a trilemma that cannot be satisfied at the same time.[1]

In view of the above-mentioned issues, what is the reason that digital currency is sought after by the market? Just as observed by Gandal et al., there is a large amount of price manipulation in the Bitcoin market, and a significant percentage of price increases are driven by suspicious

[1] Joseph Abadi and Markus Brunnermeier: "Blockchain Economics", NBER Working Paper, No. 25407, 2018.

transactions,[1] which is obviously not the state that a trading medium should be in. Therefore, except for a small number of adherents to the Bitcoin concept and those who have special needs for digital currencies due to various reasons (such as anonymity), most traders of digital currency are more out of speculation. This also explains why Bitcoin's violent price fluctuations and highly fragmented market structure (these are the fatal flaws of the transaction medium) do not deter the influx of traders. Because price fluctuations, market distortions and opaque information are the sources of profit for speculative trading. Once the market is transparent, these arbitrage spaces will disappear.[2] However, although it may be contrary to the original intention of the creator, digital currency speculators did bring the popularity of digital currency knowledge, market liquidity, trading facilities and a better user experience. Once the right time comes, these will be the basis for digital currency to truly participate in economic life and currency competition. On the other hand, however, we also need to clearly see the dangers of speculation: the reputation and credit of digital currency might be damaged. Additionally, speculative forces may also solidify distorted market structures for continued profit and use it as a means of squeezing Bitcoin investors who lack relevant knowledge. And this is why many countries, including China, have adopted harsh attitudes towards digital currency.

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[1] Neil Gandal, JT Hamrick, Tyler Moore and Tali Oberman: "Price Manipulation in the Bitcoin Ecosystem", Journal of Monetary Economics, Vol. 95, 2018, pp. 86-96.

[2] Wang Chun Wei: "Liquidity and Market Efficiency in Cryptocurrencies", Economics Letters, Vol. 168, 2018, pp. 21-24; Igor Makarov and Antoinette Schoar: "Trading and Arbitrage in Cryptocurrency Markets", Journal of Financial Economics, Vol. 135, No. 2, 2020, pp. 293-319.

5. Development prospects of digital currency

China is playing an active role in the development and application of financial technology and leads the world in mobile payments and other aspects. The development of China's Internet finance and financial technology has the same motivations as developed countries, such as the promotion of modern information technology and the traction of new financial needs, as well as many other factors with Chinese characteristics. For example, the lack of functions of the traditional financial system leaves room for the development of Internet finance. The accumulation of private capital and the lack of investment hot spots attract a large amount of financial support to the field of Internet finance, which provides a possible form of inclusiveness for many existing private financial activities. But at the same time, it cannot be ignored that the widespread application of financial technology and some illegal financial activities under the name of financial technology also bring a lot of risks to China's financial system and real economy. The wave of defaults in P2P financing platforms in 2019 is a typical example.

It is intriguing that the rise of digital currency in China was later than that of P2P platforms brought by private funds. But regulatory authorities adopt a much tougher attitude toward digital currency than the latter. There are at least two reasons for this. First, at this stage, the actual meaning of digital currency is far from being realised. In most areas where it may be applied, its cost-effectiveness ratio cannot compete with fiat currency and new payment methods, which makes it more similar to the self-circulation of "virtual economy" rather than the "beneficial" component that can support the real economy. Second, the issuance of digital currency becomes a pure "Ponzi scheme" in many cases and its financial risks and social instability factors surpass many other Internet financial activities in grey areas. Because of the two factors and the challenge attitude of digital currency toward fiat currency, it is not surprising that it has been strictly banned by many countries including China.

Nonetheless, although regulators are sceptical of the idea and economic impact of private digital currency, they do not deny the technical basis behind this concept. Both the Chinese government department and the financial industry attach great importance to blockchain and are making practical efforts in invoicing systems, supply chain finance and other aspects. The People's Bank of China also reveals its intention to try to issue an official digital currency. After the announcement of Facebook's Libra project, the monetary authorities have discovered that the necessity of digital currency and its impact on the international monetary system are hot topics. When there is competition between countries, new technologies always have more application space. Although digital currency initially appeared as a challenge to fiat currency, it is a determined trend that it will be transformed and applied by financial institutions and government departments, which may also be the way it really plays the role.

China's Financial Opening and Stability

Haihong Gao[1]

Abstract: *This paper addresses the policy aspects of China's financial opening up and stability. Since the decision of opening up and reform in 1978, China has followed a gradual approach to liberalising its capital account. Such gradualism reflects the reality that China has a relatively weak domestic financial sector and shallow financial market, alongside a transitional system featuring distorted factor allocation. However, financial opening is also beneficial because it invited foreign competition and brought pressure for domestic reform. The paper concentrates on how China managed the tradeoffs between capital account liberalisation and financial stability, especially in the context of China's ambition of internationalising its currency. From a policy point of view, the People's Bank of China (PBC) constantly looks for a better policy mix of the traditional impossible trinity. In past practice, a flexible exchange rate was seen as being crucial for a sensible policy mix, alongside monetary policy autonomy and the free flow of capital.*

Keywords: Capital account liberalisation, financial stability, exchange rate policy

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1. Introduction

Financial opening up has been an important policy adoption for China to achieve its objective of growth and economic development. It has interacted with domestic financial reform, and played a key role in China's financial and economic integration in the world economy. Full convertibility and capital liberalisation became the Chinese leadership's commitment, as stated in the Party's 3rd plenum in 2013. Premier Li Keqiang reiterated the decision of opening up at the Summer Davos meeting held in Dalian in 2019. It is generally believed that financial opening is beneficial, because it can invite foreign competition, improve efficiency and achieve better resource allocation. However, it is a two-edged sword. A rapid approach to opening up carries risks for the stability of the domestic financial system and the economy. External factors also play a role in determining the pace of opening, especially in times of escalated trade tensions and the current highly uncertain global economic and financial conditions.

The paper concentrates on the shifting patterns of China's external financial position, and how the authorities managed the tradeoffs between capital account liberalisation and financial stability, especially in the context of China's ambition of internationalising its currency.

2. A gradual approach to capital account liberalisation

China has been following a gradual approach to its financial opening since 1978. In December 1996, China accepted the IMF's Article VIII and lifted foreign exchange restrictions in current account transactions. However, China has been very cautious about relaxing foreign exchange restrictions in capital account transactions. The country also adopted a general principle of "crossing the river by feeing the stones" and delivered simple guidelines without a timetable in respect of its currency convertibility under capital account transactions. However, the outbreak of the Asian financial

crisis in 1997–1998 interrupted the opening decision and maintained the status quo with regard to capital controls, in order to avoid the crisis experienced by other Asian countries.

2012 was a milestone in China's financial opening when China decided to seize the window opportunity for the RMB strategy (*Gao 2018*). The Chinese government began accelerating capital account openness. The PBC, which is the most liberal minded among the Chinese governmental decision-making bodies, took the first step by laying out a timetable of full currency convertibility by 2022 (*PBC Project Team 2012*). Furthermore, at the Third Plenary Session of the Eighteenth Central Committee of the Communist in 2013, the Chinese leadership committed to achieve full capital account liberalisation by 2020, alongside a full range of bold, market-driven reforms.

The establishment of Shanghai Free Trade Zone (SFTZ) in September 2013 was also an important step, aiming to serve as another experimental case for RMB convertibility and financial liberalisation, similar to Hong Kong in the early stage. But this time, the experiment was carried out in the onshore market. In January 2016, the PBC extended its framework of macro-prudential management on capital flows to other three free trade zones: Guangdong, Tianjin and Fujian, allowing 27 financial institutions and all the companies registered in those zones to enjoy free RMB transactions. In May 2016, the PBC decided to roll out its framework of macro-prudential management at the national level. It was well received as a signal that China began using price rather than administrative orders to manage its capital account. However, beginning in 2016 after the dramatic depreciation of the currency, China became hesitant and rolled back to strict bureaucratic scrutiny over cross-border capital flows. In 2017, China decided on further opening its financial sector to foreign ownership, such as commercial banks, securities, futures, asset management and insurance. The RMB-denominated oil futures contract was launched in early 2018. Such measure allowed the RMB to be used in oil future contract.

However, beginning in April 2018, the USTR took a first step to initiate a trade war by releasing a list of products subject to a potential 25% tariff. In July 2018, the Trump Administration then launched trade war against China and implemented first China-specific tariffs 25% on Chinese goods worth USD 34bn. China retaliated by imposing 25% tariffs on US goods worth USD 34bn. As the trade war escalated, the pace of service sector openness was regarded as a part of trade deal. However, according to the Chinese authorities, China would continue to follow its own timetable of financial opening up without being interrupted by the trade dialogue. China eventually decided to speed up one year earlier to allow foreign ownership to enter the Chinese financial market. There were more steps forward in the following months in 2018, as China decided to remove rules that limit the amount of funds that QFIIs can take out the country every month at 20% of their assets. China also removed the 3-month lock-up for QFIIs and RQFIIS redemptions and allowed foreign exchange hedges on investment in the country. The quota requirements were largely lifted for QFIIs and QDIIs. China also opened its credit rating market for foreign agencies.

In 2019, the domestic A-share and bond indexes were included in MSCI. Chinese government bonds and policy bank securities were also included in Bloomberg Barclays Global Aggregate Index, which on completion of inclusion will make China's RMB the 4th largest currency component. Such steps towards opening up functioned as one stone targeting three birds: it is certainly a part of China's financial openness and allows China's financial market to be integrated into the world, while also providing a boost for RMB international use. More importantly, it will develop the domestic capital market to be deeper and more liquid by attracting trillions in foreign inflows which could further enlarge China's debt market.

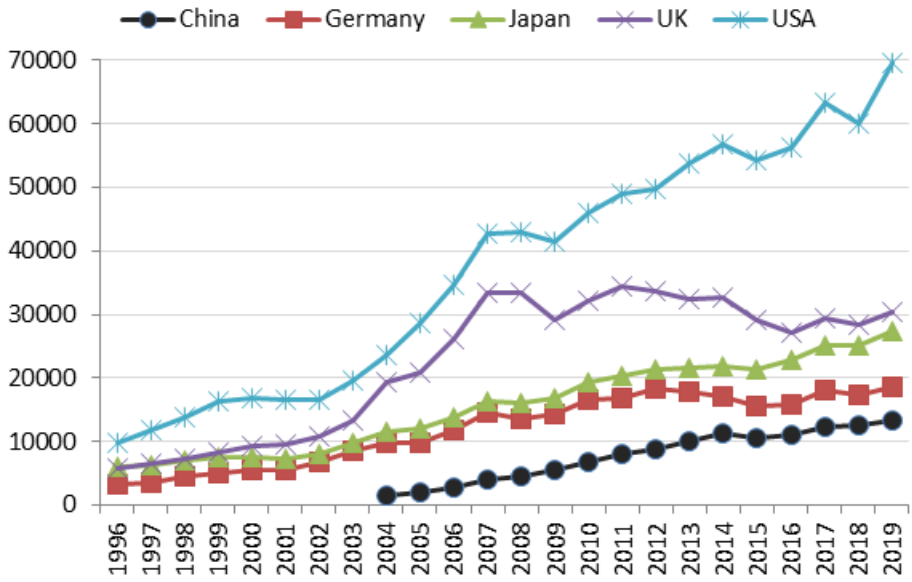
Overall, in the past thirty years, China's financial openness followed the principles of gradualism, coordinated planning, tackling easier areas before more difficult ones, and taking actions with reservation. Such gradualism

reflects the reality that China has a relatively weak domestic financial sector and shallow financial market.

3. Managing the tradeoffs of capital flow and financial stability

Although China's financial openness is relatively low, China's external sector balance measured by net IIP has been positive since the 1980s. The reason was partly because that China experienced a higher saving rate, compared to the USA and other debt countries. Such a low degree of openness also fits the relatively sluggish development of the domestic financial market. Measured in terms of International Investment Position (IIP), China's financial openness lags relatively behind compared to other countries. By the end of 2019, China's total assets and liabilities were equivalent to 19% of the US figure, 44% of UK, 72% of Germany and 49% of Japan (Figure 1). A recent report by McKinsey (*2019*) also documented the degree of China's financial opening in comparison with the USA and UK. In the report, foreign ownership accounted only 2% of the total banking system in China, whilst this figure was at 13% in the USA, 45% in the UK. Such a smaller degree of opening contrasts with the size of China's banking assets, which are comparatively the largest of all. In the stock market, foreign ownership in China only amounted to 8%, whilst in the USA and UK the share was 22% and 54%, respectively.

Figure 1: China's financial openness in comparison, measured by IIP, USD bn



Source: Wind Information (https://www.wind.com.cn/new/about.html)

In managing its capital account assets, China has adopted a prudential principle. It is noticeable that China's financial account structure features a large share of official assets. Official reserves stood at 42% of overall assets at the end of 2019, whilst FDI, deposits and others and portfolios were at 27%, 23% and 8%, respectively. China invested almost half of its reserves into low revenue assets. For instance, at the end of 2019, the PBC held USD 1.07 trillion, accounting for 16% of foreign official holdings of US Treasury marketable and non-marketable bills, bonds and notes. Such an investment pattern complied with the basic rules that China sets to manage its foreign exchange reserves following the principles of precautionary purpose as a priority. However, there has been frequent criticism that China was too precautionary in managing its reserves, based on the criteria of sufficient reserves to cover 3 months of imports of the country.

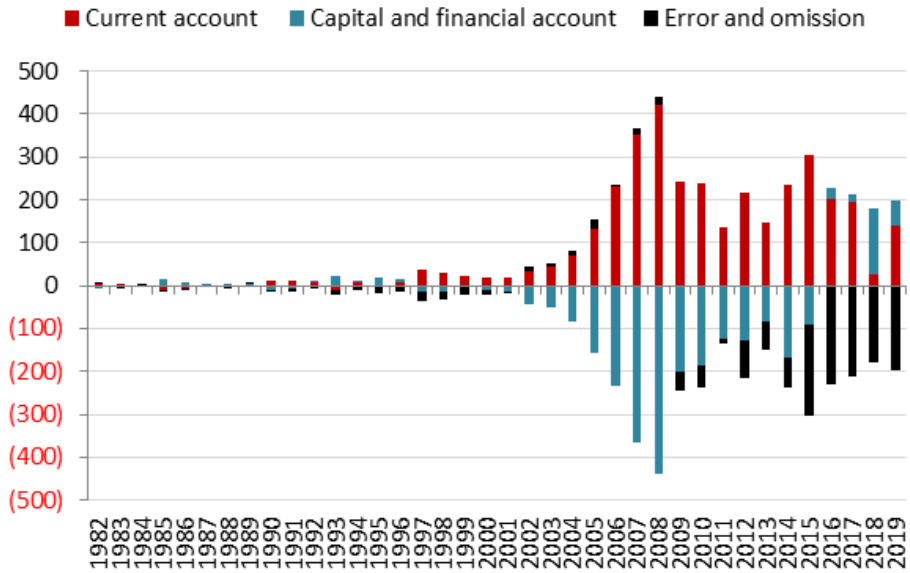
In terms of both assets and liabilities, China has suffered negative net revenue in its national wealth for a decade. Revenue on its overseas investment has been less than the revenue that foreign investors earned domestically. It is not difficult to get the picture, as FDI dominated and accounted for 53% of overall liabilities. While deposit and loans accounted for 26%, portfolio was at only 8%. For instance, at the end of 2019, the liability revenue was 4.74%, whilst asset revenue was 2.91%, rendering a negative net figure of 1.82%. Such phenomena partially supported the argument that China has suffered capital loss and a reason for boosting the RMB internationalisation because China wanted to manage its asset in a safe way and at the same time to avoid a dollar trap.

China's net capital flow has been correlated with the policy steps of opening since 2008. China experienced net capital inflow for a long time due to favourable conditions. However, the net inflow registered a large negative figure in 2012 when China began accelerating capital account convertibility. The situation accelerated in 2015, due to a combination of currency depreciation, weaker growth prospects, a domestic anti-corruption campaign, and the Fed's interest rate hike expectations. Similar drivers for outflows are identified by Horn, Reinhart and Trebesch (*2019*). Previous rapid capital account opening certainly played a role. Beginning in 2016, China decided to tighten capital management by reverting to strict bureaucratic scrutiny over cross-border capital flows in fear of massive capital outflows. The measures effectively prevented persistent outflows. Non-reserve financial net inflows rebounded in 2018 from the lowest level in 2015. Outflow declined due to a number of factors, whilst inflow increased as well (*SAFE 2019*).

However, the effectiveness of capital flow management has been under debate. The evidence of loopholes is often judged by the item "errors and omissions". The size of errors and omissions was large during the time that the net inflow turned out to be smaller or even negative, as the data indicted in 2015 and 2016 (Figure 2). The item "others" in the category of capital

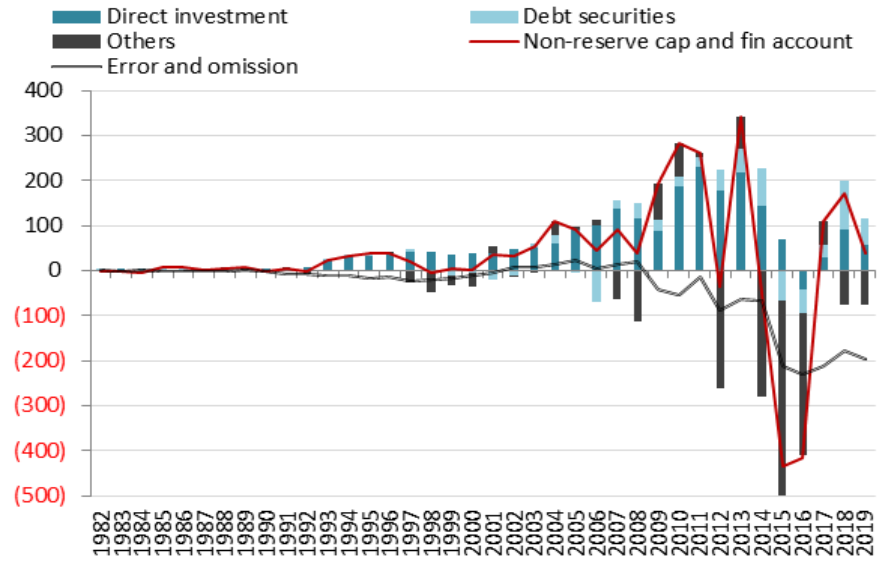
and financial account may also mirror the tendency of increasing outflows in times of tight capital controls. For instance, in the late 2015 and early 2016 when the Chinese authorities implemented strict scrutiny of cross-border capital flows, there was large amount of net outflow in the item of "others" (Figure 3). This outflow was believed to be moved by domestic investors via several channels, including that (1) Chinese businesses increased overseas money and deposits because of activities; (2) Chinese banks increased loans to their subsidiaries overseas; and (3) trade credit increased due to trade activities.

Figure 2: China's balance of payment (annual net flows, USD bn)



Sources: Wind Information

Figure 3: Decomposition of China's capital and financial account (annual net flow, USD bn)

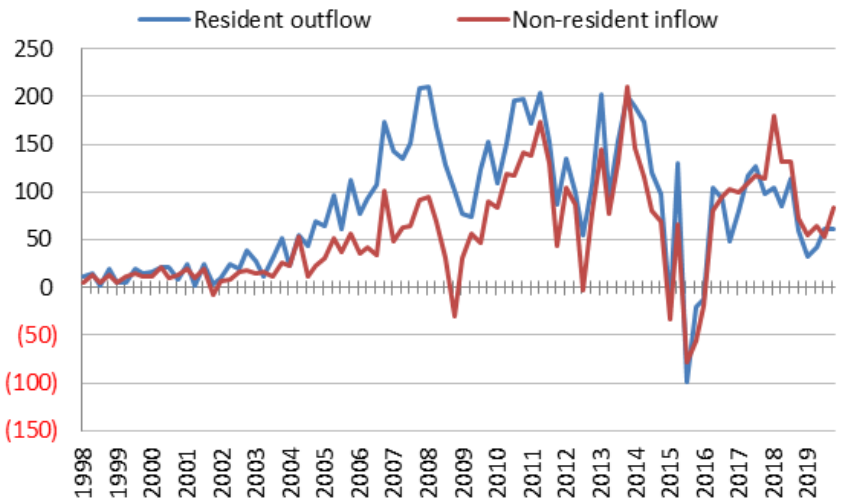


Sources: Wind Information

What about gross capital flows? Actually, gross capital flows are more relevant than net flows for understanding the relation of capital movement and the changes in capital flow management measures. As Broner et al. (*2013*) argued that, compared to net flows, gross flows are larger and more volatile, pro-cyclical, retrenched together with currency crisis and bank runs, and contagious to other forms of capital flows. In China, resident outflow tended to be more sensitive than non-resident inflow in response to changes in capital controls (Figure 4). Before 2012, China implemented relative tight capital controls. The gross resident capital flight was generally larger than the gross non-resident capital flight. Evidently, in the period of relaxing controls from 2012 to the end of 2015, both directions of gross flows increased sharply in size. Beginning in late 2015 and in 2016, the Chinese government tightened management measures on capital flows. Both resident outflow and foreign inflows began to decline. But the former

followed a faster trend than the latter. As the IMF warned, further opening of the capital account is likely to create substantially larger two-way gross flows (*IMF 2019*).

Figure 4: China's gross capital flows from 1998Q1 to 2019Q4, USD bn



Source: Wind Information

Resident outflow functions as an indicator for the pressure of capital outflow. For instance, in the first quarter of 2019, the resident private sector accumulated foreign assets faster than non-residents accumulated Chinese assets, which showed an increased pressure of capital outflow due to fears of an escalation of the trade war and the subsequent flight to safe havens. The downward US Treasury 10-year yield curve mirrored such movement, triggered by the looming economic recession.

4. Understanding the policy combination

Like many other central banks, the Chinese central bank constantly faces tradeoffs between stability and flexibility. The original form of impossible trinity – stability of the exchange rate, monetary policy autonomy and free

capital flow – was put forward by Mundell and Fleming in the 1960s. The basic argument is that it is not possible to have all three options at the same time, simply a statement of an impossible triangle. Obstfeld (*2005*) translated it into a policy trilemma: policy-makers could only choose two among three: for instance, monetary policy autonomy can only be achieved when the monetary authorities implement capital control and at the same time adopt a fix exchange rate policy. In other words, they have to forgo a flexible exchange rate in order to achieve both autonomy of monetary policy and free capital flows. The policy implication is clear: for countries with an open capital account, exchange rate policy can make a difference for the independence of monetary policy. However, a recent study by Rey (*2015*) argued that the trilemma was dead and that it is basically a dilemma: capital flows were highly correlated regardless of the normal exchange rate regime. Han and Wei (*2018*) also proposed a 2.5 –lemma: a flexible exchange rate regime without capital control may offer partial or asymmetric insulation from foreign policy shocks. Peripheral countries do not respond to the policy moves by the centre country if the latter tightens its monetary policy, but generally follow suit if the latter loosens its monetary policy, even when the domestic Taylor rule of the peripheral countries suggests otherwise.

Yi and Tang (*2001*) investigated possible middle solutions to the triangle problem. They found that the development of derivative markets for hedging activities plays an important role: the more sophisticated the market is, the more likely the triangle holds. Interestingly, Sun and Li (*2017*) tried to provide a general analytical framework for the policy options by using a Scalene Triangle model. The study assumes that capital flows play a bigger role compared to the autonomy of monetary policy and a fix exchange rate. For instance, if the monetary authority chooses full capital control, then a fixed exchange rate and independent monetary policy can be achieved at the same time. However, if it chooses free capital flow, it can only achieve a relatively stable exchange rate and a relatively

independent monetary policy. There is rich literature on both the theoretical and empirical policy mix for central banks. However, the questions remain unanswered: to what extent does the nominal exchange regime matter in cutting off from external policy shocks, and does capital control work better?

From a practical perspective, capital flow can cause two types of risk: macro-economic risk, and financial risk. The former is associated with impacts on currency value, inflation and boom-and-bust business cycles: for instance, capital outflow can depreciate the currency and reduce inflationary pressure via the expenditure-switching effect, a conventional channel of exchange rate pass-through from the tradable to the non-tradable sector. Interestingly, the widespread US dollar trade invoicing is a key factor for the declining effects of capital flow and exchange rate pass-through on domestic inflation (*Adler et al. 2019*). The latter carries risk on credit, assets, property market, financial and non-financial sectors' balance sheet, and unhedged foreign loans, etc. In practice, it is difficult to draw a line between the two types of risk – for instance, exchange rate pass-through could also have impact on the value of trade credit, especially for the countries using foreign currency in trade invoices. In the case of local currency depreciation against the US dollar, a strong dollar pushes up the value of trade credit in local currency terms, alongside general tightening financial conditions. The tightening financial conditions weaken the expansionary effect of local currency depreciation on export volumes. In the extreme, currency depreciation and its subsequent tighter credit conditions could have contractionary effect on exports through global value chains (GVCs) over the short term (*BIS 2019*).

The framework for managing capital flow provided by Ostry et al. (*2011*) is a useful guideline for policy reactions. Capital control should be a temporary measure in extreme circumstances. It results in resource misallocation, and there are always loopholes. For the time being, fine-tuned capital flow management is necessary. Specifically, in order to balance capital outflow, further opening of the domestic financial market

is needed. However, such measures are asymmetric. It is difficult to attract capital to flow in, if there are restrictions for the capital to flow out. In peaceful times, macro-prudential measures should be in place. There are a handful of tools from limits on borrowing abroad to foreign exchange related measures. A set of prudential capital management policies are important to mitigate financial risks. The tools may range from limits on borrowing abroad, maintenance of accounts abroad and different treatment of non-resident accounts to some FX related measures, such as opening FX position limits, different treatment of FX accounts, and lending and purchasing in local FX. It also includes other measures, including loan-to-value ratios, reserve requirements, credit concentration in specific sectors, etc. Such policies can work well especially when gross capital flows are more relevant than net flows (as they are more volatile, pro cyclical, retrenchment and spilled over; one extreme case is a sudden stop of non-resident inflows; the other is capital flight of resident outflows (*Broner et al. 2014*).

Over the long run, a more flexible exchange rate can be a buffer against external shocks. Mid-way solutions are possible among the triangle relation of a fix exchange rate, free flow of capital and central banks' independent monetary policy. But they are not sustainable. For a large country like China, the autonomy of monetary policy will always be the priority. Therefore, a flexible exchange rate and financial openness should be a forward-looking solution.

5. Is flexible exchange rate policy a buffer for China?

The nominal exchange rate was the main anchor for China's monetary policy for a long time from the mid-1990s to July 2005. This hard peg regime was ended in July 2005 when the PBC decided to adopt a managed regime with a reference to a currency basket. In the following years, the RMB appreciated in conjunction with China's rising twin surplus on the

current account and capital account. From 2008 to 2012, the central bank virtually rolled back to a hard fix to the US dollar because of the fear of instability caused by external shocks and the contraction of economic growth. Starting in 2012 until 2014, the central bank relaxed the trading bands several times in order to allow the exchange rate to fluctuate with market forces. The RMB moved with more flexibility. The value of the currency fluctuated in accordance with surge in cross-border capital mobility. Arbitrage activities increased because of the introduction of the RMB spot exchange rate on offshore market in Hong Kong in June 2011.

In August 2015, the PBC decided to make a bold move by stopping intervention at the middle price of the currency. The famous "8.11" action aimed to allow the RMB to move freely without central bank intervention. However, this move resulted in sharp depreciation the value of the currency. It did not take long for the central bank to step in, fearing rapid depletion of foreign exchange reserves and massive capital outflows – there were tremendous arbitrage opportunities as the RMB was priced in both onshore and offshore markets.

The FX market pressure interacted with capital flows. Beginning in mid-2015, the IMF started the process of SDR review. Whether to include the RMB was one consideration. But there were two conditions: the trade share is large enough; and the RMB should be freely usable. A flexible exchange rate was part of the deal, although it was quite implicit. For this, the central bank had good reason to show its decision to let the exchange rate go because flexibility had been a policy objective for the central bank for quite a long time. However, the right move took place at the wrong time, because around mid-2015 the Fed began considering to increasing its interest rate. The Chinese economy also showed signs of slowing down. This was also the time that capital account opening up was at fast pace. A flexible exchange rate was supposed to perform as a buffer against external shocks and at the same time allow freer capital flows with less capital control – a desirable policy combination that the PBC had longed for. However, the

market reaction was contrary to what the central bank speculated. The market reacted with overshooting depreciation. The RMB depreciated by 4.7% in one day. This move fostered larger depreciation expectations. The offshore NDF and CNH (spot) went higher, indicating strong depreciation pressure on onshore CNY (onshore spot).

In order to tame the expectations, at first the central bank used the traditional measure to inject FX reserves and at the same time tightened capital management measures. The central bank also changed the exchange rate formula by introducing a weighted currencies basket, the CFETS (China Foreign Exchange Trade System) index in December 2015 and a counter-cyclical factor in June 2017. The inclusion of the counter-cyclical factor was criticised because it makes the RMB a less market determined currency which requires a certain degree of capital controls.

Above all, exchange rate flexibility is China's long-run objective. This is especially important when considering capital flow management as well as the central bank's conduct of monetary policy with greater autonomy. In the latest external sector assessment report, the IMF (*2019*) also suggested a policy response with a flexible exchange rate and macro-prudential measures in order to mitigate the risk of growing gross flows subsequent to capital account opening.

6. Conclusion

Over the past thirty years, Chinese policy-makers have adopted a gradual approach to capital account liberalisation. This approach is characterised by a sequence that China relaxed controls on capital inflow at an earlier stage before it reduced restrictions on capital outflows. China also considered the short-term capital flow to be risker than the flow in the medium and long term. The policy options reflected that China has been carefully following the principles of gradualism, coordinated planning,

tackling easier areas before more difficult ones, and taking actions with reservation.

While China carefully managed its foreign assets, it faced volatile net capital flows. The shift in the net flow direction varies with the changes in capital account management policies. Evidently, the episodes of reduction of net inflows came along with a weak currency and loosening capital controls. The gross capital flows are more indicative than net flows for understanding the dynamic of capital movements. They are also linked to potential capital flight and sudden stop in times of financial panic. In order to mitigate the risk of capital flows, the Chinese authorities have to manage the tradeoffs between opening up and financial stability. Instead of direct capital control, a set of measures for macro-prudential capital flow management plays an essential role. These measures allow financial opening whilst managing risks through market-based price adjustments rather than administrative orders.

A flexible exchange rate can also be a buffer against unwanted capital flows and external shocks. China has been looking for some middle-way solutions for a triangle relation of the exchange rate, capital flows and the central bank's autonomy of monetary policy. In times of unfavourable conditions, a proper mixture of policy options remains a challenge for the policy-makers. However, past experiences show that for a large-sized economy, autonomy of monetary policy is the priority and thus a flexible exchange rate and financial openness should be a forward-looking solution. China will be likely to continue follow this priority, while at the same time carefully managing exchange rate flexibility and capital account liberalisation.

7. References

Adler, Gustavo, Luis Cubeddu and Gita Gopinath (2019): Tamping the Currency Hype. IMF Blog, August 21.

BIS (2019): Annual Economic Report. July.

Broner, Fernando, Tatiana Didier, Aitor Erce, and Sergio L. Schmukler (2013): *Gross Capital Flows: Dynamics and Crises*, Journal of Monetary Economics, 60, pp.113-133.

Gao, Haihong (2018): *RMB internationalization*, The New Palgrave Dictionary of Economics, online edition, September 2016; Steven N. Durlauf and Lawrence E. Blume (eds), Palgrave Macmillan 2018.

Han, Xuehui and Shang-Jin Wei (2016): *International Transmissions of Monetary Shocks: Between a Trilemma and a Dilemma*, NBER Working Paper No. 22812, Issued in November.

Horn, Sebastian, Carmen Reinhart and Christoph Trebesch (2019): China's Overseas Lending. Kiel Working Paper No. 2132. June.

IMF (2019): *External Sector Report: The Dynamic of External Adjustment,* July.

McKinsey Global Institute (2019): *China and the World: Inside the Dynamics of a Changing Relationship*, July.

Obstfeld, Maurice (2015): *Trilemma and Tradeoffs: Living with Financial Globalization*, BIS

Ostry, Jonathan, Atish R. Ghosh, Karl Habermeier, Luc Laeven, Marcos Chamon, Mahvash S. Qureshi, and Annamaria Kokenyne (2011): *Managing Capital Inflows: What Tools to Use?* IMF Staff Discussion Note, April 5.

PBC Project Team (2012): The Basic Conditions Are Mature for Accelerating China's Capital Account Opening, by People's Bank of China Survey and Statistics Division Task Force, China Securities Journal. 23 February. 中国人民银行调查与统计司课题组(2012):"我国加速开放资本账户开放条件基本成熟",《中国证券报》，2012 年 2 月 23 日。

Rey, Helena (2015): *Dilemma Not Trilemma: The Global Financial Cycle and Monetary Policy Independence,* NBER Paper No. 21162.

SAFE (2019): *2018 China International Balance of Payment Report*, by State Administration of Foreign Exchange, March. Working

Sun, Guofeng and Zhewen Li (2017): *Monetary Policy, Exchange Rate and Capital Flow — From "Equilateral Triangle" to "Scalene Triangle",* PBC Working Paper Series, No. 2017/3. Working Paper Series No. 480, Bank for International Settlements, Basel.

Yi, Gang and Tang Xuan (2001): *A Theory of Exchange Rate Regime "Conner Solution Hypothesis"*. Journal of Financial Research, No. 8, 2001, pp5-14. 易纲、汤弦 (2001)；汇率制度"角点解假设"的一个理论基础《金融研究》2001 年第 8 期，5-14 页.

Risks of China's Banking Industry and Relevant Suggestions

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1. Overview of the Banking Industry

China's financial system is dominated by indirect finance, and banks play a crucial role in it. As of the end of 2018, there were 4,588 banking financial institutions in China, mainly included in three categories. The first group consists of national commercial banks, which includes 1 development financial institution, 2 policy banks, 6 large state-owned commercial banks (with the Postal Savings Bank newly included), 12 joint-stock commercial banks, 41 foreign-funded corporate banks and so on. The second group is comprised of local corporate banks that provide services for communities, small and micro businesses, agriculture, rural areas and farmers. This group contains 134 urban commercial banks, 1 housing savings bank, 17 private banks, 1,396 rural commercial banks, 812 rural credit cooperatives, 1,616 village and town banks, 46 rural mutual financial institutions, 30 rural cooperative banks and others. The third group is made up of non-bank financial institutions, including 4 financial asset management companies, 68 trust companies, 13 loan companies, 69 financial leasing companies and 23 consumer finance companies.

Having such various banks and financial institutions, China has basically established a banking system with multiple layers and wide coverage. Although large state-owned banks still account for a significant proportion of the banking system, their relative importance has declined. As of the end

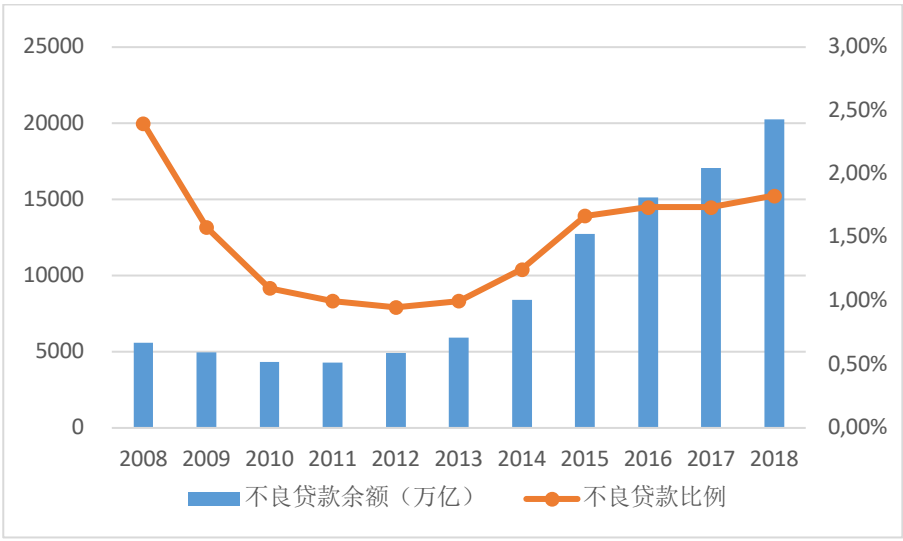
of 2018, the total assets of Chinese commercial banks were 210.0 trillion yuan, up 6.7% year on year, while total liabilities amounted to 193.5 trillion yuan, up 6.28% year on year. In 2018, commercial banks achieved a cumulative net profit of approximately 1.8 trillion yuan, up 4.72% year on year. In Q4 2018, the average asset profit margin of commercial banks was 0.90%, the average capital profit margin was 11.73%, and the net interest margin of Chinese commercial banks was 2.18%.

2. Risk Status

2.1 Credit Risk

Non-performing loans (hereinafter referred to as NPL) are the most direct indicator of commercial banks' credit risks. In recent years, the quality of China's banking assets has undergone a general deterioration, and both the amount and the proportion of NPL are on the rise. As of the end of 2018, China's commercial banks had a NPL balance of 2.03 trillion yuan, representing a year-on-year increase of 0.32 trillion yuan. This was 18.7% higher compared to the previous year, with the growth rate rising by 5.9 percentage points. The NPL ratio stood at 1.83%, an increase of 0.09 percentage points from the end of 2017. The deterioration in asset quality reflects the impact of the macroeconomic downturn on the banking industry. With the current downward pressure on the macro economy, the asset quality of Chinese commercial banks is likely to deteriorate further in the future.

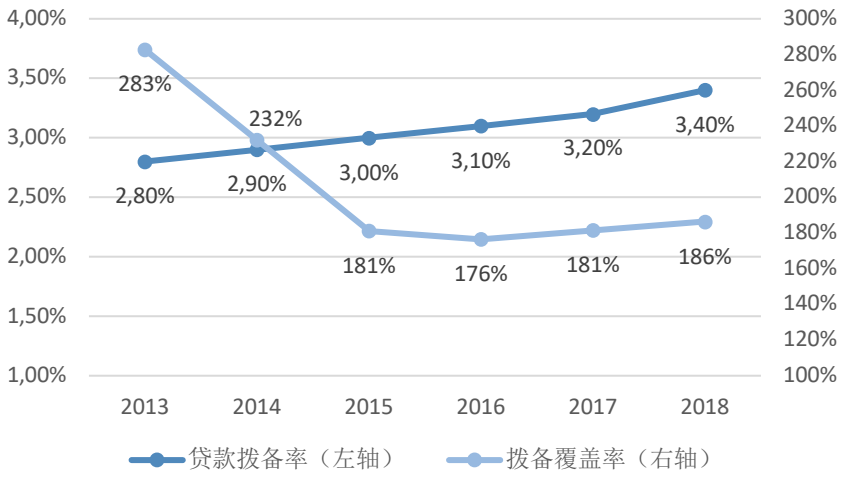
Figure 1: Changes in asset quality of Chinese commercial banks



Source: The Wind Economic Database

At the end of Q4 2018, the balance of loan loss provisions for commercial banks amounted to 3.77 trillion yuan, an increase of 100.6 billion yuan from the end of the previous quarter. The provision coverage ratio was 186.31%, up 5.58 percentage points from the end of the previous quarter. In recent years, the provision coverage ratio of Chinese commercial banks has comparatively declined. The loan provision ratio of commercial banks at end-2018 was 3.41%, up 0.03% compared to the end of the previous quarter. In terms of loan provisions, the overall risk of Chinese commercial banks is relatively stable and controllable.

Figure 2: Loan provisions of Chinese commercial banks in recent years



Source: The Wind Economic Database

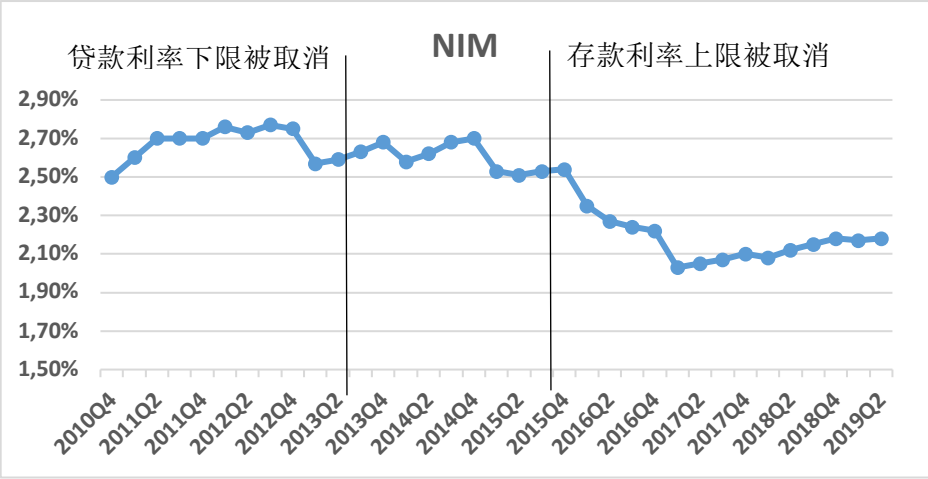
2.2 Market Risk

2.2.1 Interest Rate Risk

Along with the process of China's interest rate liberalisation, the People's Bank of China (hereinafter: PBC) has begun the deregulation of deposit and loan interest rates. Since 20 July 2013, the loan rates of financial institutions have been fully liberalised. Since 24 October 2015, there has been no floating rate cap on deposit interest rates for commercial banks and rural cooperative financial institutions. Based on these, in order to further promote interest rate liberalisation, improve the financial market benchmark interest rate system and guide the pricing of credit products, the concentrated quotation and release system of the loan prime rate (hereinafter referred to as LPR) officially started operation on 25 October 2013. Then, on 17 August 2019, the PBC announced further improvement of the LPR pricing mechanism and decided that from 20 August, the reference interest rate for medium and long-term corporate loans would be the one-year LPR, instead of the one-year benchmark interest rate.

With the deep interest rate liberalisation, commercial banks' pricing autonomy in interest rates has continued to expand. Against this background, the net interest margin (hereinafter: NIM) of China's banking industry has shown a distinct decline. As seen in Figure 3, the average NIM level in Q2 2019 had decreased by about 60 basis points compared to the end of 2012. The interest rate risks faced by banks are increasing, and thus strengthening asset-liability management and matching its term structure have become an important task for commercial banks to manage interest rate risk.

Figure 3: Impact of interest rate liberalisation on banks' net interest margins



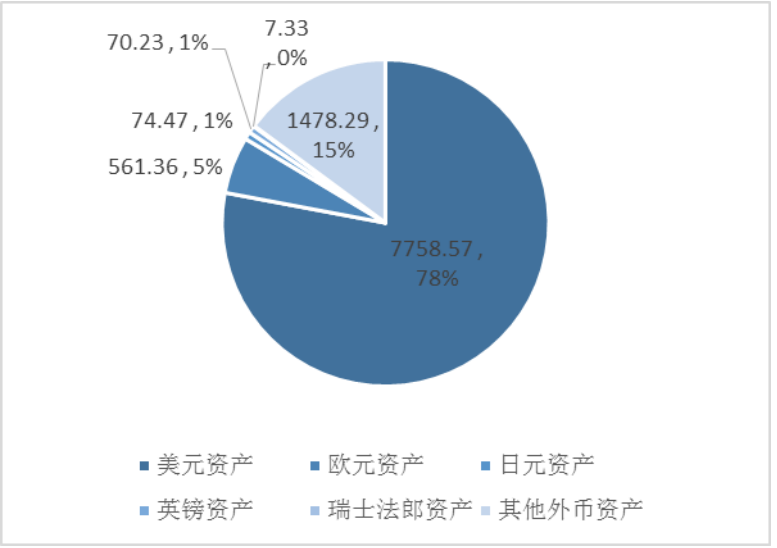
Source: Collated by author

2.2.2 Foreign Exchange Risk

Foreign exchange risk is the risk that banks may suffer possible losses in overall earnings when assets and liabilities, equity items, foreign exchange and foreign exchange derivative positions in foreign currency incur losses due to adverse changes in exchange rates. This risk mainly stems from holding foreign currency assets and liabilities and trading in foreign

exchange. The foreign currency assets of China's commercial banks in 2018 are shown in Figure 4.

Figure 4: Foreign currency asset structure of Chinese commercial banks in 2018 (USD bn)



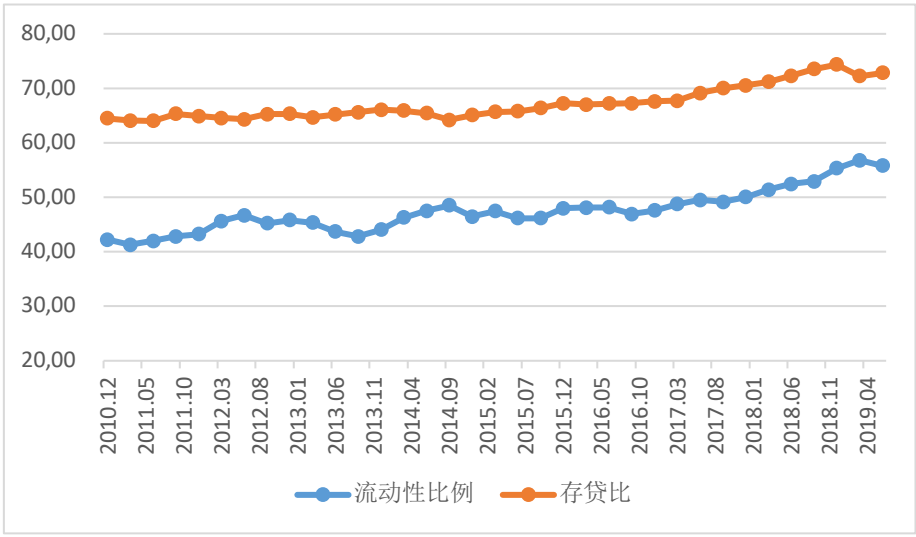
Source: China Banking Regulatory Commission and The Wind Economic Database

It can be seen that USD assets account for the largest proportion of foreign currency assets currently held by Chinese commercial banks. As of end-2018, the USD assets held by Chinese commercial banks amounted to USD 775.9 billion, accounting for 78%, followed by EUR assets, at USD 56.1 billion, accounting for 5%. The asset share and proportion of other currencies held are both comparatively low, and thus foreign currency assets are mostly USD assets. At present, because of the Sino-US trade war and other factors, there is also considerable uncertainty about the yuan-dollar exchange rate tendency, and thus holding a large proportion of USD assets also contributes to the foreign exchange risk of Chinese commercial banks.

2.3 Liquidity Risk

Liquidity risk occurs when banks are unable to obtain sufficient funds in time at a reasonable cost to pay off due debts, fulfil other payment obligations and meet other funding requirements for the operation of normal business. The liquidity ratio of commercial banks at the end of 2018 was 55.31%, marking a year-on-year increase of 3.92 percentage points, and the average liquidity of commercial banks remained relatively high. The ratio of deposits and loans was 74.34%, 3.1 percent higher than in 2017. As of the end of 2018, the average liquidity coverage ratio of Chinese commercial banks was 138.01%, well above the minimum requirement of 100%. In generally Chinese commercial banks currently face low liquidity risks.

Figure 5: Relevant indicators of commercial banks' liquidity(%)



Blue line: Liquidity ratio; Orange line: Ratio of deposits and loans

Source: China Banking Regulatory Commission and The Wind Economic Database

3. Risks in Key Areas

3.1 Liquidity Risk of Small and Medium-sized Banks

At the end of 2018, small and medium-sized banks – especially city and rural commercial banks – continued to be an important part of China's financial system. Compared to large banks, small and medium-sized banks are vulnerable to the macro environment, regional policies and industry economic fluctuations, owing to their high proportion of smaller clients, lower stability and more frequent administrative intervention. Additionally, extensive development that centres on scale expansion, high dependence on the interbank business and weaker corporate governance are perennial problems for small and medium-sized banks and have set barriers to their internal control, shareholder and equity management, and operating structure. Faced with stricter financial supervision, intermediate business restrictions and deleveraging, the vulnerability and liquidity risks of interbank debts are constantly escalating. The overall liquidity risk of China's small and medium-sized banks is relatively low at the moment, but some small and medium-sized banks are still at risk because of their tight liquidity situation for multiple reasons, of which Baoshang Bank is the most typical.

Established in December 1998, Baoshang Bank is not only the earliest joint-stock commercial bank in Inner Mongolia, it is also the first medium-sized financial institution to be taken over in the 21st century. It now has 18 branches and 291 banking offices and has initiated the establishment of Baoyin Consumer Finance Limited Corporation, financial service centres for small enterprises and 29 village banks. By the end of March 2017, the Baoyin Consumer Finance Limited Corporation’s registered capital was 4.731 billion yuan. Its top three shareholders were Baotou Taiping Trading Group, Baotou Dagan Investment Company and Baotou Jinggong Science Company; with respective shareholding ratios of 9.07%, 5.51% and 5.32%. Having relatively dispersed shareholding and shareholders mainly

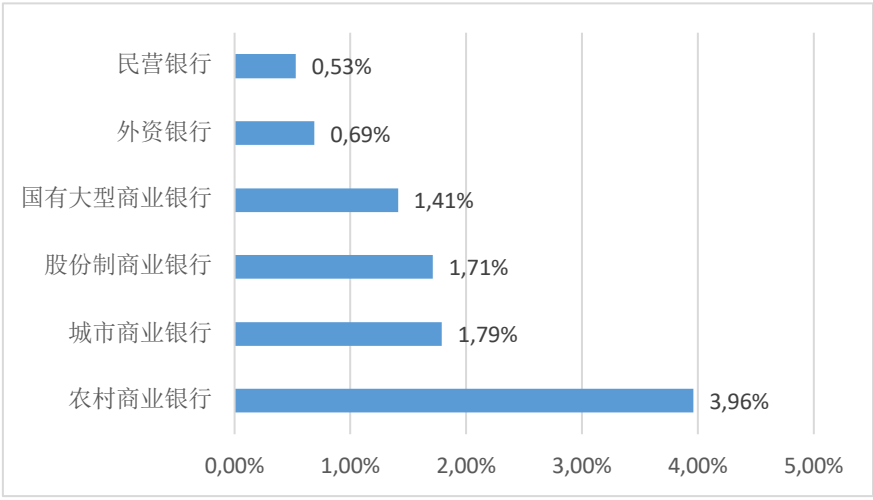
composed of private enterprises, the company was an important financial institution of Tomorrow Holdings, a privately owned financial management group.

On 24 May 2019, the PBC and China Banking Regulatory Commission jointly announced the formation of a team for taking over Baoshang Bank in light of its serious credit risk. The take-over would last from 24 May 2019 to 23 May 2020, with full control and management of PBC and CBRC, and the trusteeship of China Construction Bank.

3.2 Credit Risk of Rural Financial Institutions

Although the credit risk of China's banking industry generally remains stable, the asset quality of different banks is significantly differentiated, in which rural small and medium-sized financial institutions stand out. Figure 6 shows the NPL ratios of different commercial banks at the end of 2018. It can be seen that by the end of 2018 the average NPL ratio of rural commercial banks reached 3.96%, which was 2.13 percentage points higher than the industry's average ratio of 1.83%, or more than twice as high. This means that the quality of rural commercial bank loans is far below that of other banks. By comparison, at the end of 2018 the average NPL ratio of large state-owned commercial banks remained at a low level of 1.41%, exhibiting a decline of 0.12 percentage points from the end of 2017.

Figure 6: Asset quality of different types of commercial banks in 2018



Source: The Wind Economic Database

Rural regional financial institutions, including rural commercial banks, mainly have higher credit risks due to the following four factors. Firstly, the agricultural sector itself is characterised by high risks, and rural commercial banks have significant funds invested mainly in this sector, leading to the overall high risk. Along with the advancement of China's urbanisation process, the continuous population outflow in rural areas has caused financial demand to decline there. Secondly, the business scope of rural regional financial institutions is usually limited to their local area, and their asset allocation is consequently concentrated, leaving them unable to spread risk in a wider range of places and thus they are affected strongly by downturns in the regional economy. Thirdly, large banks and Internet financial institutions are having significant impacts. The large state-owned commercial banks have squeezed the business of regional rural financial institutions with their sustainable work on financial inclusion; at the same time, emerging Internet financial institutions have also been a threat as they

are breaking into the rural market. Rural financial institutions suffer from serious customer churn in the retail business. Fourthly, strong intervention by local governments. For historical reasons, Provincial Rural Credit Cooperatives Unions (hereinafter referred to as PRCCU) currently perform administrative and supervisory functions over small and medium-sized rural financial institutions, such as personnel appointments, salary management and performance evaluations. In fact, PRCCU are funded by rural small and medium-sized financial institutions, which means there are legally no subordinate relationships between the two. Currently, unwarranted intervention by PRCCU is present in two aspects. On the one hand, the appointments and removals of senior executives do not conform to market rules. Viewing bank executives as local administrative officials, some PRCCU frequently replace bank executives, bringing about ineffective implement of the long-term development strategy. On the other hand, many PRCUU require banks to achieve unreasonable performance indicators. In spite of the current downward pressure on the economy, rural small and medium-sized financial institutions are still asked to maintain high performance, forcing them to expand or even practise fraud.

3.3 Risks of Complex Organisational Structure

Since the reform and opening up, China's financial industry has gone through a cycle that began with mixed operation, then separate operation, and finally back to mixed operation. A wave of mixed operations swept over China in the 1980s and 1990s and resulted in financial disorder. Therefore, the State Council decided to reform the financial system in 1993, and separate operation and supervision started in the financial industry since then. When it comes to the 21st century, the trend of mixed operation has prevailed in the financial industry, and financial holding companies have been emerging, which are mainly divided into four categories. The first are financial holding platforms. These companies do not operate

specific businesses themselves but focus on strategy formulation and equity investment management. The second are bank holding companies. As parent companies, commercial banks set up and invest in subsidiaries to expand their comprehensive operations and establish financial holding companies, similar to universal banks. Another two categories are local financial holding platforms and industrial financial holding platforms. Against this background, apart from traditional banking business, major banks are involved in other financial businesses through holdings and equity participation. Table 1 presents the financial licenses held by major banks at the end of 2018.

Table 1: Financial licenses held by major banks/holding companies in 2018

	Bank	Securities	Futures	Insurance	Fund	Trust	Lease
Industrial and Commercial Bank of China	Y	Y		Y	Y		Y
China Construction Bank	Y	Y	Y	Y	Y	Y	Y
Agricultural Bank of China	Y	Y		Y	Y		Y
Bank of China	Y	Y		Y	Y		Y
Bank of Communications	Y	Y		Y	Y	Y	Y
China Merchants Bank	Y	Y		Y	Y		Y
Industrial Bank	Y	Y	Y		Y	Y	Y
Shanghai Pudong Development Bank	Y				Y	Y	Y

China Minsheng Bank	Y				Y		Y
China Citic Bank	Y	Y	Y	Y	Y	Y	Y
China Everbright Bank	Y	Y	Y	Y	Y	Y	Y
Ping An Bank	Y	Y	Y	Y	Y	Y	Y
Hua Xia Bank	Y	Y					
China Zheshang Bank	Y	Y	Y	Y	Y		Y

Source: collated by the author

As seen in Table 1, it has become a common practice for major banks to carry out mixed operation by holdings and equity participation. Banks like China Construction Bank, China Citic Bank, China Everbright Bank, Ping An Bank or their affiliated financial holding groups have obtained full licenses for various financial businesses. As a result, the organisational structures of commercial banks are becoming increasingly complex and the operation of different businesses within the financial companies promotes cross-financial risk.

Specifically, the complexity of the organisational structure encourages the following four risks. First, principal-agent risk. Compared with conventional financial institutions, financial holding companies have a diversified organisational structure and internal hierarchy; the principal-agent problem is consequently more prominent. The principal-agent relationships of a financial holding company include two types, namely the principal-agent relationships between shareholders and operators and between the parent company and its subsidiaries. Because of the over-credit issue, the latter principal-agent relationship is not available for conventional financial institutions.

Second, risk of related-party transactions. The complicated organisational structure leads to companies having a large number of internal organisations, more intricate relationships and more frequent related-party transactions. Hence, the risk associated with related-party transactions is more conspicuous. At the same time, related-party transactions will intensify the expansion of risk. Once the subsidiaries is in face of the capital chain rupture, the funding of the entire financial holding company will be affected and trigger a crisis.

Thirdly, transparency risk. The complicated organisational structure tends to make the overall financial information of the financial group opaque, making it difficult for investors and regulators to clarify internal relationships and accurately understand the real operating condition. Fourthly, arbitrage risk. commercial banks are subject to stricter regulations and restrictions than other financial institutions in China. However, taking advantage of complicated organisational structures, financial holding companies are able to carry out some strictly-controlled businesses in their loosely-regulated subsidiaries. While this may promote overall business interests, it also increases the risks faced by the company.

4. Relevant Suggestions

Firstly, China’s banking industry should conform to its orientation and focus on services for the real economy. On the 13th group study of the Party's Political Bureau of the Central Committee in February 2019, General Secretary Xi Jinping stressed the necessity of correctly grasping the essentials of finance so as to deepen financial supply-side structural reforms and improve financial services for the real economy. Moreover, General Secretary Xi Jinping particularly emphasised that finance must serve the real economy and meet the needs of the people and socioeconomic development. In order to further advance the structural reform of the financial supply side, we must comply with the new

development concept and improve financial services, focusing on financial services for the real economy and people's lives. Taking risk prevention into consideration, the banking industry also should stick to the services for the real economy, thus reducing financial risks of unnecessary financial innovation. At the same time, implementation of the financial deleveraging policy should be further promoted, and the clearance and management of interbank business and shadow banking should be strengthened, which could consolidate the achievements of previous work.

Secondly, analysis of the credit risk of key industries and areas should be performed. Analysing key areas where credit funds are comparatively concentrated such as real estate can help to follow up and keep track of the financial standing of borrowers in a timely manner and to formulate corresponding risk disposal plans based on customers' assessed risk levels. When it comes to new credit funds, it is necessary to further optimise the asset portfolio and appropriately reduce the concentration ratio of certain industries' loan funds for risk diversification.

Thirdly, improve banks' corporate governance. To start with, the government should prevent excessive intervention in commercial banks. In particular, more efforts should be made to reduce inappropriate intervention by the PRCCU in rural financial institutions. Reform of the PRCUU could be a breakthrough. Relations between the PRCCU and rural small and medium-sized financial institutions should be standardised according to the law, including corporate governance as well. Restructuring the PRCCU into organisations that serve small and medium-sized rural financial institutions and delegating powers such as personnel appointment and salary management to rural banks are an approach to making rural small and medium-sized financial institutions real legal entities.

Furthermore, the governance of banking groups and their complex structures should be improved. As for this, the Basel Banking Supervision Committee (BCBS) sets clear requirements in the 2015 edition of "The

Principles of Bank Corporate Governance". It is included that the parent company's board of directors take full liability for the corporate governance of the bank group. The specific responsibilities range from establishing the corporate governance framework of the group, clearly defining the scope of responsibilities of different governing entities within the group and establishing a suitable subsidiary board and management structure, to evaluating whether effective policies and procedures for evaluation are included in the corporate governance framework. The board of directors of a subsidiary needs to execute the decisions of the parent company and revise the feasibility of the decisions after evaluation if necessary. Similarly, the PBC released a draft of the trial measures for the supervision and administration of financial holding companies in July 2019, which clarified the market access, shareholder qualification supervision, equity structure and the related-party transactions of financial holding companies. In the future, it is very important to implement the above guidance and regulations to improve the governance of banking groups and their complex structures.

Finally, an effective salary incentive mechanism also plays a role of vital importance. The board of directors needs to strengthen the evaluation and supervision of the compensation system and redress the distorted compensation system in a timely manner, guaranteeing the stable operation of banks over the long term. The management should change the short-sighted thinking and adopt long-term incentive methods such as a gradual increase in options and equity, paying attention to the long-term interests of bank operations and establishing an all-round benefit balance mechanism. Explorations and plans of employee stock ownership should also be made to promote long-term employee incentives.

Reflections on Interest Rate Risk Management and the Development of Treasury Bond Futures in China

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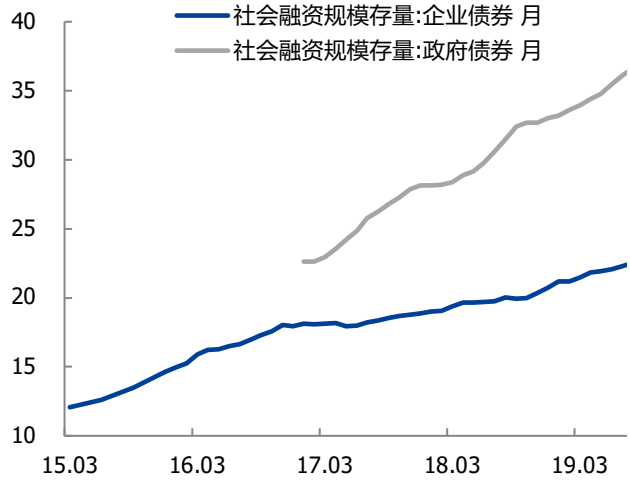
Abstract: *As China's bond market is undergoing rapid development in scale, various institutions such as insurance companies and funds are increasing their amount of investment in bond products, followed by the gradually prominent issue of interest rate risk. Interest rate risk is usually caused by the institution's duration gap, which will have a significant impact on the asset value of the institution in the case of abnormal interest rate fluctuations. As seen from developed countries' experience, interest rate derivatives such as Treasury bond futures can provide effective tools for interest rate risk management. Since China restarted the Treasury bond futures market in 2013, the operational rules and categories of terms are being gradually improved currently. However, China's Treasury bond futures market is still in the early stage of development, and there remains significant room for improvement in the aspects of market activity, covered term range and market trading rules.*

1. Non-negligible interest rate risk with expansion of the bond market

With China's bond market in a stage of rapid development, institutional investors from banks, insurance companies and funds are increasing their demand for various bond products, as well as their investment scale. According to the current scale growth of the bond market and the

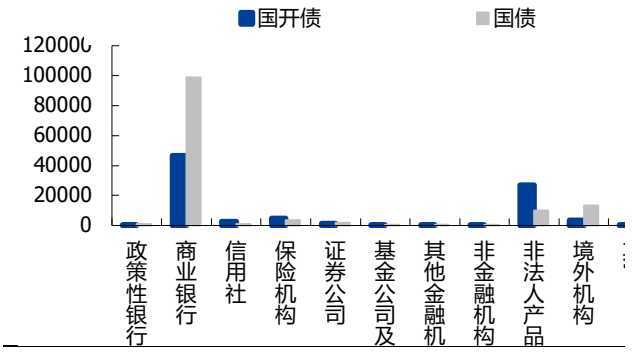
breakdown of social financing scale disclosed by the People's Bank of China, as of January 2020, China's stock of corporate bonds and government bonds reached 23.93 trillion yuan and 38.49 trillion yuan respectively, a year-on-year increase of 2.77 trillion yuan and 5.31 trillion yuan respectively, which also underlines that China's bond market scale is still undergoing rapid expansion. Seen from the current holder structure of China's bond market, commercial bank institutions are the most important participants. Taking rate securities as an example, according to data on the structure of inter-bank bondholders based on China's bond statistics, commercial banks are the most important holders of inter-bank Treasury bonds and CDB (China Development Bank) bonds, with the trusteeship size reaching 4.68 trillion yuan and 9.87 trillion yuan respectively by February 2020. Also, unincorporated institutions, mainly securities investment funds, overseas institutions and insurance institutions have a large amount of trusteeship.

Figure 1: Expanding scale of China's bond market



Source: The Wind Economic Database

Figure 2:



Source: The Wind Economic Database

With the increasing amount of investment in the bond market, the potential risks faced by institutional investors during the process of participating are gradually standing out, among which interest rate risk is one of the main risks faced by financial institutions in bond investment. By definition, interest rate risk reflects the potential risk that investors will suffer losses due to fluctuations in market interest rates. Interest rate risk is not unknown to bond market participants. As early as in the global financial crisis of 2008, the interest rate risk faced by institutional investors in the bond market had become a hot issue in their risk management. With the outbreak of the global financial crisis in 2008, the USA and many European countries adopted the quantitative easing monetary policy to countervail the shock of the crisis. However, extremely loose monetary policy made many countries' long-term deposit rate continuously decrease, raising the issue of a serious asset shortage. It inflicted great damage on institutions' assets and liabilities and their duration matching. Even in developed markets such as Germany, a duration gap of over ten years is widespread in the life insurance industry, which means that bond market participants are faced with great risk exposure to interest rate fluctuations (*Wu Jie 2019*). In order to deal with the interest rate risk caused by the duration gap,

Allianz and other institutions have to hedge the interest rate risk as much as possible by a large amount of debt allocation and the introduction of a large number of alternative assets on the asset side.

2. Influencing mechanism and research status of interest rate risk

The impact of interest rate risk on bond investment is mainly reflected in two aspects: price effect and reinvestment effect. On the one hand, as a rate-sensitive asset, bond prices change significantly with fluctuations in market interest rates. When the market interest rate rises or falls, bond prices will fall or rise accordingly. Although in theory, if an institution chooses to hold a bond to maturity and there is no default, the institution will receive the future coupon and principal in return. At this moment, the future cash flow will not be affected by market interest rate fluctuations, but bond market participants do not usually adopt this kind of investment strategy. Therefore, each rise in the market interest rate means that the price of the bonds it holds falls, leading to a loss in the asset value of the institution. On the other hand, bond yields to the expiration day are calculated on the assumption that the interest from each period is reinvested. When the market interest rate rises, the reinvestment return increases, and when the interest rate falls, the reinvestment return also decreases. Hence, the longer the holding period of the bond, the greater the reinvestment risk will be. Institutional investors need to balance the two risks when participating in the bond market. According to the current characteristics of China's bond market, the price effect is the stronger of the two factors when interest rate risk affects the bond market investment.

The duration gap of institutional assets and liabilities is an important cause of interest rate risk. In bond investments, duration is the holding period that balances the price effect and the reinvestment effect, and it is often used to measure the average time it takes investors to recover their principal. When the duration of institutional assets and liabilities does not match, there is a

duration gap, which may result in the exposure of institutional investors to interest rate risk. When the duration gap is 0, the market value of the institution is theoretically unaffected by interest rate fluctuations. As the duration gap expands, institutions' sensitivity to interest rate changes escalates, thus increasing their exposure to interest rate risk.

As for the basic research on interest rate risk, the measurement of risk is the starting point of interest rate risk management. At present, the interest-rate sensitive gap model, duration gap model, and derivative models are widely used to measure interest rate risk around the world. According to the existing achievements, the developed countries promoted interest rate liberalisation earlier and have developed a mature research system after decades of analysis. By contrast, China's interest rate liberalisation is still in the early stage, and interest rate derivatives have only experienced a short development, so there is relatively inadequate research on relevant theories and practices in China. With the rapid expansion of China's bond market scale, the investment proportion of institutional investors such as insurance companies and funds will continue to rise. Meanwhile, China's accelerated promotion of interest rate liberalisation may also result in larger interest rate risks to institutional investors when they participate in bond investments.

Development of the measurement of interest rate risk has laid a solid theoretical foundation for the interest rate risk management of Chinese bond market participants. However, in the real interest rate risk management, appropriate tools are still needed to hedge interest rate risk. At this moment, interest rate derivatives dominated by Treasury bond futures have become the first choice of many institutions to serve as a tool for resolving interest rate risk.

3. Value and market development of Treasury bond futures in interest rate risk management

From the experience of bond market development in mature markets such as Europe, America and Japan, interest rate derivatives are an effective management tool to mitigate interest rate risk. The development of China's interest rate derivatives has been accompanied by the process of interest rate liberalisation. Compared to the period of policy interest rate control, the gradual advance of interest rate liberalisation has resulted in more significant interest rate fluctuations, which also makes Chinese market participants increasingly need interest rate risk management tools and interest rate derivatives such as Treasury bond futures, and interest rate swaps have also developed rapidly. China has now developed the market of in-field interest rate derivatives that is dominated by Treasury bond futures, and the market of OTC interest rate derivatives that is dominated by interest rate swaps. The coordinated development of on-site and OTC interest rate derivatives plays a role in managing interest rate risk. From the current development, Treasury bond futures are more widely used in interest rate risk management. Wu Xiaoqiang (*2019*) pointed out that Treasury bond futures, as in-field interest rate derivatives, have a more varied structure than OTC derivatives such as interest rate swaps in terms of investors. In addition, the investment threshold of OTC derivatives is high and the types of participating institutions are relatively consistent. When there is an obvious trend in the interest rate, the market is likely to be lacking liquidity. Compared to OTC interest rate derivatives such as interest rate swaps, Treasury bond futures have higher liquidity and better price tracking, so they are more helpful for bond market investors to hedge interest rate risk.

As a relatively mature instrument of interest rate derivatives, Treasury bond futures are now one of the most important interest rate risk management instruments in the world. Investors can hedge their interest rate risk by hedging between the spot and futures markets for Treasury bonds. The

hedging of Treasury bond futures mainly occurs through the Treasury bond futures instrument to obtain the opposite position with the cash bond, so as to hedge the risk of medium and long-term interest rate fluctuations as much as possible. In general, although the application of Treasury bond futures has been common in developed countries, there is not much research on it in China. This is not only because of the short development of interest rate derivatives in China but also the "327" event, which directly led to the stagnation of China's Treasury bond futures market for nearly 20 years. The research group of Shanghai Bank of Communications (*2013*) elaborated the principles of hedging, arbitrage and speculation in Treasury bond futures, and introduced the method to evaluate the risk management effect of interest rate futures, taking the US market as an example.

China's Treasury bond futures market has experienced about seven years of development since it was restarted in 2013, and currently has three categories of two-year (TS), five-year (TF) and ten-year (T) contracts. On 6 September 2013, the five-year Treasury bond futures contract (TF) was listed on the stock exchange of CFFEX, marking the reopening of China's Treasury bond futures market. After the "327" event, the newly listed Treasury bond futures contract was redesigned, with more rigorous supervision and restrictions on systems of price limits, position limits and delivery. After the restart, the five-year contract for the first quarter was TF1312, with the remaining term of deliverable bonds set as 4 to 5.25 years. In March 2015, the ten-year Treasury bond futures contract T was listed on CFFEX. The 10-year contract in the first quarter was T1509, and the remaining term of deliverable bonds was set as 6.5 to 10 years. On 17 August 2018, the two-year Treasury bond futures contract was listed, marking the official operation of the short-term Treasury bond futures products, and the term structure of Treasury bond futures products was further improved. With the launch of the two-year Treasury futures product in 2018, the coverage of Treasury futures as a risk hedging tool has been further completed.

Table 1: Details of Treasury Bond Futures Contracts of Each Term

	TS	TF	T
Object	Nominal short and medium term Treasury bonds with a face value of RMB 2 mn and a coupon rate of 3 percent	Nominal Treasury bonds with a face value of RMB 1 mn and a coupon rate of 3 percent	Nominal long-term Treasury bonds with a face value of RMB 1 mn and a coupon rate of 3 percent
Deliverable Treasury bond	The issue term is no more than 5 years; the residual maturity to the first day of expiration months is 1.5-2.25 years; Treasury Coupon Bond	The issue term is not higher than 7 years; the residual maturity to the first day of expiration months is 4 to 5.25 years; Treasury Coupon Bond	The issue term is not higher than 10 years; the residual maturity to the first day of expiration months is not less than 6.5 years; Treasury Coupon Bond
Mode of Quotation	100 yuan Net price quotation	100 yuan Net price quotation	100 yuan Net price quotation
Minimum price change	0.05 yuan	0.05 yuan	0.05 yuan
Contract Months	The last three months at the end of each season; the last three months of March, June, September and December are cycled	The last three months at the end of each season; the last three months of March, June, September and December are cycled	The last three months at the end of each season; the last three months of March, June, September and December are cycled
Trading hours	9:15 - 11:30, 13:00 - 15:15	9:15 - 11:30, 13:00 - 15:15	9:15 - 11:30, 13:00 - 15:15
Trading hours on the last trading day	9:15 - 11:30	9:15 - 11:30	9:15 - 11:30
Daily price limit	Last trading day's settlement price ±0.5%	Last trading day's settlement price ±1.2%	Last trading day's settlement price ±2%
Minimum trading margin	0.5% of the contract value	0.1% of the contract value	0.2% of the contract value
The last trading day	The second Friday of the expiration month	The second Friday of the expiration month	The second Friday of the expiration month
The last delivery day	The third trading day after the last trading day	The third trading day after the last trading day	The third trading day after the last trading day

Delivery	Physical delivery	Physical delivery	Physical delivery
Transaction code	TS	TF	T
Listing exchanges	CFFEX	CFFEX	CFFEX

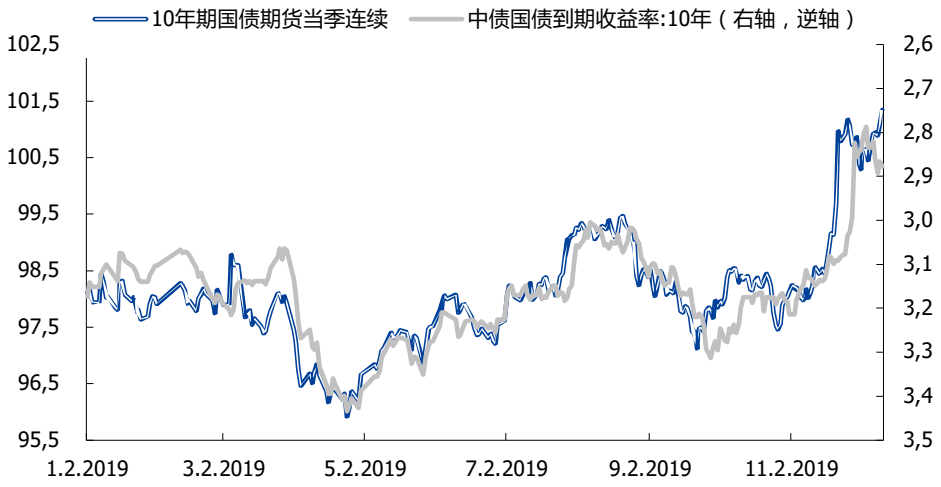
Source: China Financial Futures Exchange

Note: The details of the contract have been adjusted from the initial stage.

It is worth noting that the short-term Treasury bond futures is set as two years, instead of one year, the active term of short-term domestic interest rate bonds. According to CFFEX, this design is largely based on two aspects as follows. One is that the overall design idea of Treasury bond futures products mainly refers to the ones of developed countries such as the German market, so the term limit is consistent with theirs. On the one hand, it can maintain the integrity and consistency of the design framework of domestic Treasury bond futures, while on the other hand, it can help to guide the active maturity of interest rate bonds in China to close to the characteristics of developed countries. The other one is that Treasury bond futures products are initially designed as effective hedging tools for institutional investors, and the two-year term can better meet the demand of institutional investors for hedging market risks in terms of duration match.

At present, the price of Treasury bond futures in China is strongly correlated with the trend in cash bond prices, which guarantees the actual role Treasury bond futures play in hedging. At the same time, due to the strong trading activity, Treasury bond futures tend to react faster to information such as economic fundamentals and market sentiment compared to Treasury cash bonds, which means that many events and policy changes that affect the trend of interest rate can be quickly reflected in the price trend of bond futures, further promoting the day trading of Treasury bond futures.

Figure 3: Highly consistent trend of Treasury bond futures and spot bond prices (yuan, %)



Source: The Wind Economic Database

On the other hand, the introduction of Treasury bond futures in bond investment can effectively help investors to supplement the duration gap. In the previous paper, we introduced the basic concept of the duration gap. From the calculation formula, the duration gap is equal to the difference of the weighted average duration of assets minus the weighted average duration of liabilities and the asset-liability ratio.

Duration gap=the weighted average of assets-(gross liabilities/total assets)*the weighted average duration of liabilities

With the introduction of Treasury bond futures into the portfolio, institutional investors can effectively manage the duration gap. Although the bond futures product has no real coupon rate, its price is affected by interest rates and is highly similar to the trend of cash bonds. Therefore, its

duration can still be defined as the percentage change in the price of bond futures due to a 100-bp interest rate change (*Wang Wei and Yao Yuan 2015*); it is similar to the modified duration of cash bond in terms of its connotation, and it is usually close to the cheapest to delivery (CTD) in figure. After obtaining the approximate duration of Treasury bond futures, the Treasury bond futures can be included in the portfolio of institutions, so the calculation formula for the duration gap can be converted into:

Duration gap=the weighted average duration of assets -(gross liabilities/total assets)*the weighted average duration of liabilities+(futures assets/total assets)*the duration of Treasury bond futures

Hence, it can be seen that after introducing Treasury bond futures with appropriate term and position, the original duration gap can be adjusted to be as close to 0, so as to hedge the potential interest rate risk caused by the duration gap (*Wang Wei and Yao Yuan 2015*).

4. Problems in and Reflections on the Development of Treasury Bond Futures Market

Since the restart of Treasury bond futures, China's Treasury bond futures market has made great progress. Nevertheless, while the existing products have been able to play a significant role in interest rate risk management, for a market that is still in its early stage of development, the domestic Treasury bond futures products still needs further improvement, to help bond investors more flexibly manage interest rate risk.

Firstly, there is a gap between trading activity and the scale of China's Treasury bond futures market and that of the mature markets. If Treasury bond futures products do not have sufficient liquidity, their impact on interest rate risk management will also be affected, especially in the case

of large scale. According to the data for 2018, the ratio of the amount traded in US Treasury futures to the amount traded in spot is 1.04, the ratio in Germany is 12.46, and the ratio in China is only 0.55. From the perspective of absolute transaction amount, the scale of China's Treasury bond futures market is only 1% of that of the United States and 2% of that of Germany.

The problem of trading activity is more prominent in the new products of the two-year period. According to the existing transaction data, its market activity is significantly lower than the old products of five-year and ten-year period, as well as its stock size. To this end, the China Financial Futures Exchange (CFFEX) has launched a series of promotion measures such as “Exchange for Physicals” in response to the commonly used term strategy in the market. In the follow-up development, the cross-category and cross-period strategies commonly used in Treasury bond futures can also be introduced with corresponding convenient trading schemes to improve the overall liquidity of the market.

Table 2: Development of China's Treasury bond futures market still lags behind that of developed countries

(USD trillion)	China	United States	Germany
Stock of Treasury bonds	1.98	15.55	1.13
Turnover of Treasury bonds	2.73	137.5	5.25
Annual turnover rate of Treasury bonds	1.38	8.84	4.64
Trading volume of Treasury bond futures	1.51	142.47	65.39
Turnover ratio of bond futures and cash bonds	0.55	1.04	12.46

Source: Wind, SIFMA, Federal Republic of Germany

Second, in light of the lesson learned from the "327" incident, there are still strict restrictions on the participation rules of institutional investors in

China. How to gradually open up the market on the premise of maintaining its smooth operation is another focus to improve market scale and trading activity in the future.

By February 2020, CFFEX had allowed many bond investors, including banks, insurance companies, public funds and brokers, to participate in the trading of Treasury bond futures. However, in order to avoid overspeculation, CFFEX still has numerous restrictions on many participating institutions. For instance, public funds are subject to additional restrictions on their holdings and trading volumes in Treasury bond futures products. In 2013, China Securities Regulatory Commission (CSRC) issued guidelines for publicly raised securities investment funds to participate in the trading of Treasury bond futures, which clearly stipulated that public funds could only hedge when participating in the trading of Treasury bond futures, and restricted the public funds from holding and trading. On the one hand, these measures ensure the safe and stable operation of the market; on the other hand, they also curb the reasonable investment demand of institutions, and limit the scale and transaction activity of China's Treasury bond futures market to some extent.

In the early stages, smooth, safe development is the focus to be considered in the trading rulemaking, but with the deep development of the market, trading rulemaking needs to make a trade-off between security and flexibility. Especially after the introduction of large institutions such as banks and insurance companies, how to make the market as smooth as possible while gradually opening up the market becomes the major problem faced by the market. At present, in order to further improve the market environment, CFFEX has introduced the market maker system and planned to increase products of thirty-year period. However, from the current situation, the perfection of market rules still has much room for improvement.

Third, for institutions with large hedging demand such as banks and insurers, the research on basis risk should be promoted. Similar to other futures products, Treasury bond futures cannot hedge all of the impact of interest rate risk on the value of cash bonds, in which basis risk is one of the major factors influencing the effect of risk management. Because of the basis, the price change of Treasury bond futures in hedging will deviate from cash bonds, so relevant research on how to reasonably split the basis becomes a key problem that institutions need to pay attention to when involved in hedging. The existing study of the basis risk bond futures market in China is still relatively inadequate, and relevant theory remains to be further reinforced.

5. References

吴杰,欧美保险巨头的资产负债管理经验及启示[J].中国保险, 2019(6):60-64.

交通银行上海分行课题组.利率市场化下国债期货在商业银行利率管理中的应用[J].上海金融, 2013(11).

王玮, 姚远.国债期货在商业银行久期缺口管理中的应用[J].上海金融 2015(4):93-97.

吴小强.商业银行参与国债期货市场研究——美国经验和中国策略[J].新金融, 2019(07):29-34.