

NEW AGE OF CENTRAL BANKING IN EMERGING MARKETS



Edited by

Előd Takáts

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Corvinus University of Budapest
Budapest
2023



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ISBN 978-963-503-942-5 (Print)
ISBN 978-963-503-943-2 (e-Book)
DOI: 10.14267/978-963-503-941-8

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Publisher: Előd Takáts

Print: CC Printing Kft.

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I.

INTRODUCTION

Inheritance and Innovation

Előd Takáts

Rector, Corvinus University of Budapest

A new age of central banking in emerging markets has started. As Agustín Carstens, General Manager of the Bank for International Settlements, formulated in a speech contained in this book: *“I believe it is no exaggeration to say that emerging market central banks have entered a new era.”* This is reflected in the title of this volume and the title of the related joint conference by the Bank for International Settlements, the London School of Economics and Political Science, Magyar Nemzeti Bank (the National Bank of Hungary) and Corvinus University of Budapest: *New Age of Central Banking in Emerging Markets*.

In my view, this new age is being shaped by the ‘double I’: Inheritance and Innovation and the synergies between them. How can we find the right balance between the established principle of monetary stability on the one hand and the need to meet the demands created by rapid technological progress on the other? How can central banks champion firm and unchanging commitment on the one hand and agility and openness to technology on the other?

This volume shows that there is no contradiction between pursuing inheritance and innovation simultaneously; in fact, they are mutually reinforcing. Successful central banks treasure their inheritance. They painstakingly build, one monetary policy decision at a time, their credibility in relation to preserving price and financial stability. They nurture hard-won credibility in times of crisis, defending their inheritance even when, and especially when, this is difficult. At the same time, successful central banks embrace innovation. They continuously improve their operations and services to remain relevant as technology advances. Furthermore, the ‘double I’ – inheritance and innovation – are mutually reinforcing. Credibility helps with launching new central bank products and gaining market acceptance. In turn, a new and wider range of products increases the capability of central banks of fulfilling their mission of maintaining monetary stability.

Consider inheritance first. Central banks traditionally safeguard price and financial stability, which, in turn, allow for robust economic growth. Central banks, increasingly including those in emerging markets, have established credibility to ensure price and financial stability. However, central banks' credibility is now being tested by the highest inflation in generations.

Central banking is critical because modern money is based on trust. Modern fiat money is not backed by physical assets such as gold but rather by trust. People know that the money they hold (or will accept in exchange for some goods or services) will, in turn, be accepted by others in the future. The issuance of such trusted money yields tremendous power. And with power comes commensurate responsibility. Failure to maintain trust can result in high inflation, sharp exchange rate depreciation, dollarization, or, in truly extreme cases of hyperinflation, abandoning money altogether to return to barter. Trust in money is like oxygen in the air: we notice not its presence but rather its absence.

Trust has strengthened, particularly in emerging market economies, after long periods of volatility and recurring crises. Inflation rates have declined steadily in most emerging market economies over past decades. Banks and financial institutions have become more resilient.

Notwithstanding these achievements, hard-won trust is now being tested by high inflation. Following the Covid-19 pandemic, inflation shot up globally. Most initially thought that the post-pandemic price increases would be temporary. True, central banks had tried to increase – in vain – excessively low inflation in the preceding long decade, and it seemed plausible that inflation might rise only temporarily as demand and supply restored asynchronously after the lockdowns. However, it soon became painfully clear that inflation had become more widespread. The post-pandemic recovery and the overhang of massive fiscal and monetary stimulus propelled price increases, spilling over from goods to services. The Russian invasion of Ukraine unleashed yet another round of energy and food price increases, raising inflation to levels not seen in at least a generation.

The task is clear: central banks need to reduce today's high inflation as quickly as possible so as not to endanger the hard-won trust they have built up. Central banks need to show unwavering commitment to tightening monetary policy: i.e., raising interest rates and unwinding earlier unconventional balance sheet measures. The need for tighter monetary policy is more immediate in emerging markets where central bank credibility has had less time to grow roots than in advanced economies.

To their credit, emerging market central banks have reacted appropriately. They started to raise interest rates well ahead of advanced economy central banks. As a result, inflation in emerging markets is broadly in line with inflation trends in advanced economies – a testament to the progress emerging market central banks have made.

However, the test is not over yet. In fact, central banks need to confront the potent side-effects of tighter monetary policy. Three of these seem to be particularly relevant: slowing economic growth, growing fiscal deficits, and weakening financial stability.

First, monetary tightening slows down economic growth. Decelerating economic growth is not an unintended consequence of tighter monetary policies: lower growth implies less demand and lower inflationary pressure. Still, lower growth means higher unemployment and smaller profits for investors.

Second, as bonds and loans reprice, higher interest rates increase the burden of servicing fiscal and private debt. From a fiscal perspective, the coincidence is particularly painful: interest-related expenditure rises exactly when the slowing economy increases fiscal deficits (due to smaller tax incomes and increased social transfers). Similarly, corporations face higher interest expenditure when company profits suffer from weaker growth.

Third, and finally, monetary tightening might give rise to financial stability risks. The reason is that interest rate risk is inherent in banking: banks intermediate between short-term deposits and long-term loans. If these interest-rate-related risks remain unhedged and short-term rates increase faster than long-term rates, bank profitability can suffer. In extreme cases, banks can go under, as happened with Silicon Valley Bank.

The precise size of the above three (and potentially other) side effects differ among countries. Central banks must carefully consider them when designing the appropriate monetary tightening schedule in the context of their mandate. Therefore, there is no one-size-fits-all recipe for monetary tightening. However, even when powerful, side effects are no reason to deviate from pursuing price stability. The alternative is all too painful: losing credibility and conducting monetary policy with unanchored expectations risks repeating the stagflation of the 1970s when low economic growth coincided with high inflation. And regaining lost credibility risks the recessions of the late 1970s and early 1980s. Abandoning price stability is simply not worth it.

The side effects also highlight the need for central bank independence. Economic pain can motivate pressure groups to resist the necessary monetary tightening. Central banks need to remain independent to withstand these pressures and pursue their price and financial stability objectives free of interference. Indeed, central banks were given autonomy precisely for this reason.

Central bank communication is also critical for lessening these pressures. Central banks need to communicate clearly and convincingly that monetary tightening is necessary and ultimately in the best interest of the whole economy: the short-term pain due to the side effects is worth the long-term gain of maintaining trust in money.

Challenges to innovation are also present. While today's high inflation tests central banks' resolve to adhere to their inherited price stability mandates, rapid advances in digital technology pose challenges to innovating. One key challenge is the rapid development of private money-like digital currencies, such as cryptocurrencies. Despite the potential risks and warnings from central banks and other observers, investors and citizens alike showed great enthusiasm for crypto. The various cryptocurrencies that have mushroomed in the last decade have reached a market value of around three trillion US dollars. Clearly, the market is demanding digital payment solutions.

However, cryptocurrencies are not the right digital payment solution because they lack the stability of proper money. A string of crypto failures took place in 2022 (Terra and Luna in May and FTX in November), which have exhibited crypto's inherent instability. Not only can these instruments not fully substitute central bank money, but their large-scale adoption might also undermine financial and price stability.

The right solution to supplying the market with digital money is introducing a central bank digital currency. Instead of letting markets satisfy demand with inferior products, central banks should step in. Although central bank digital currencies differ in many regards, they are essentially the digital version of traditional money. They have the same stability as traditional money. Therefore, citizens and investors can have the same trust in them. In turn, they promote economic stability and can foster robust economic development.

The case of central bank digital currency also shows that central banks do not innovate for the sake of innovation only but rather to meet economic demand with safe and trustworthy central bank solutions. Central banks advance monetary options so that the modern economy can function as efficiently as technology allows – and at the same time, generate a high level of trust in the money necessary for economic stability.

In sum, the 'double I' – inheritance and innovation – should characterize the new age of central banking as both are necessary for maintaining trust in money. This is especially the case for emerging markets: the need for unwavering commitment to monetary stability is even more important because central bank credibility and trust are more recent achievements in emerging markets than in advanced economies. Similarly, innovation can achieve multiple goals in emerging markets, such as propelling financial inclusion and creating additional impetus compared to the situation in advanced economies.

Emerging market central banks have fought hard and succeeded in establishing trust in their money. They controlled inflation over the past decade and started to tighten monetary policy soon after inflation started to rise after

the pandemic. They realized the need for digital innovation early and pioneered work on central bank digital currencies.

Yet there is no room for complacency. In the face of new challenges, central banks need to act courageously. They need to show unwavering commitment to controlling inflation and tightening monetary policy while balancing the various side effects. They must remain at the forefront of providing the new digital products and services the economy requires.

The new age of central banking in emerging markets has started. Emerging market central banks have had significant successes: they are in a strong position to excel in this new age. However, they face formidable challenges in the form of high inflation not seen in a generation, and disruptive technological advances, including new and not fully understood artificial intelligence. To succeed, they must simultaneously embrace the 'double I': inheritance and innovation. The present volume is a testament that this is possible.

II.

SPECIAL REMARKS AT THE NEW AGE OF CENTRAL BANKING IN EMERGING MARKETS CONFERENCE AND AT THE HONORARY DOCTORATE AWARDING CEREMONIAL SENATE ASSEMBLY

Corvinus University of Budapest, 2023 March 17

Welcome remark

István Kónya

Dean of Corvinus Doctoral Schools, Corvinus University of Budapest

Dear Colleagues, Dear Distinguished Guests!

We are here today to award the degree of Doctor Honoris Causa to Dr. Augustin Carstens. Please allow me to briefly explain why Corvinus University found Dr. Carstens, a distinguished scholar, policymaker, and public figure, worthy of the title.

Dr. Carstens was born in Mexico, where he obtained his bachelor's degree in economics at the Mexico Autonomous Institute of Technology. He then moved to the United States, where he completed his Ph.D. in Economics at one of the world's leading programs at the University of Chicago. The Chicago Economics Department is famous for its rigorous analytical training and incredible intellectual environment for scholarly and policy discussions. These traits are useful not only in academic research but also in economic policymaking, an area where Dr. Carstens found his calling.

After completing the Ph.D., he moved back to his native Mexico, where he started his career at the Central Bank of Mexico. He quickly rose through its ranks, becoming treasurer and then Director General of Economic Research, responsible for steering bank policy after the infamous Tequila Crisis in the mid-1990s. He wrote several influential articles about the impact of the crisis on the Mexican economy.

After a three-year role at the International Monetary Fund as a deputy managing director, Dr. Carstens again returned to Mexico and was appointed Secretary of Finance. In 2009, he was nominated and confirmed as Governor of the Bank of Mexico, where he served until 2017. As Governor, he became a member of the Bank of International Settlements Board from 2011 to 2017, chairing the Global Economy Meeting and the Economic Consultative Committee from 2013 until 2017. Since 2017 he has served as General Manager of the BIS.

Besides his distinguished career as a policymaker at the highest level, Dr. Carstens is a respected expert on emerging economies. He has published papers on the financial crisis, exchange rates, banking regulation, and payment systems, among other topics. His strong academic background, versatility, and long experience in facing challenges in macroeconomic and financial policy have put him at the forefront of discussions on key current issues facing central banks, finance ministries, and international institutions. Recently, he has highlighted the importance of supply-side responses to the resurgent inflation problem – for example, in a speech at the famous Jackson Hall Economic Symposium in the summer of 2022. Given the inflation situation in Hungary, I do not have to convince anyone about the importance of this issue.

Corvinus University is the leading institution in Hungary with a long alumni list of past, current, and hopefully future economic leaders of the country. Dr. Carstens perfectly illustrates the type of decision-maker we want to educate: with a very strong academic background, a passion for solving complex policy problems, and a willingness to serve at the highest level when the call comes. Please join me in congratulating Dr. Carstens as he receives his Doctor Honoris Causa degree, a title richly earned and deserved.

Economics in theory and practice

Agustín Carstens

General Manager, Bank for International Settlements

Rector Takáts, distinguished guests, faculty, students, and members of the Corvinus University community

It gives me great pleasure to accept the award of Doctor Honoris Causa from this prestigious institution. I would like to thank the nomination committee for the great honor.

This is the second time in my life that I have received a doctorate.

The first was almost 40 years ago, at the University of Chicago. I earned that degree for my academic work, including a dissertation on the foreign exchange market for the Mexican peso.

Today's award recognizes my post-academic career in policy institutions and international financial organizations, including the Bank of Mexico, the Mexican Finance Ministry, the International Monetary Fund, and, most recently, the BIS.

Reflecting on these two awards, I would like to share some thoughts on the relationship between academic research and practice in economics.

A sharp distinction is sometimes drawn between these two aspects of economics as if they were opposites; research here, practice there. At the risk of exaggeration, I would say that there is a perception that researchers dismiss the rigor of policy work, while economists in policy institutions despair at the baroque abstraction of some academic research. Certainly, in some graduate schools – although I know this is not the case at Corvinus! – students are told that they must choose one career path or the other.

This sharp distinction has always puzzled me.

I have built my career as a practitioner of economics. But that in no way implies that I dismiss the inestimable value of research or economic theory; quite the contrary. Researchers and practitioners share the same ultimate goal – to design policies that improve the lives of ordinary people. And I have always believed that both rigorous theoretical investigation and effective practical application are very much needed to achieve that goal.

At the end of the day, a virtuous circle must be created between theory, research, and the implementation of economic policies. And this interaction, this feedback cycle as it were, must occur at all stages of what I think of as the public policy life cycle. This cycle starts with the high-level conceptualization of policies. It then moves to formalization – determining the details of how policies can be applied to the real world. The next stage is implementation, as policies are actually put into practice. Monitoring then follows to make sure that policies operate as they should, and evaluation to determine if they have achieved their intended objectives. As a final stage, based on that evaluation, policies must be adapted, which may, in turn, initiate a new stage of conceptualization and design.

At each stage, close interaction between theory and practice should be sought. Economic theory can, and in many cases has been, an inspiration for public policies. But policymakers must then translate theoretical concepts into feasible plans of action. This means taking account of the political environment, social needs, the complexity of the real world, and practical constraints. At the same time, economic science cannot advance without learning from public policies that have been implemented. In some circumstances, practice advances faster than theory.

All this may sound quite abstract and theoretical. So, in keeping with the theme of my remarks, let me give you two practical, real-world examples.

The first concerns inflation.

Inflation has re-emerged over the past year as the most significant macroeconomic challenge facing central banks. Its rise has been large, rapid, and global.

Few saw it coming. Two years ago, most central banks – and other forecasters – expected that the Covid pandemic would add to the forces keeping inflation low. One year ago, inflation had risen but was expected to be transitory. Today, we are experiencing the largest and most persistent global inflationary surge since the 1970s.

What did we get wrong? Undoubtedly, a series of large unforeseen shocks played a role: the pandemic, the surprising rebound that brought a very strong economic recovery, and the Russian invasion of Ukraine. Also contributing were the enormous monetary and fiscal policy stimuli deployed early in the

pandemic, which governments and central banks found hard to calibrate in the face of enormous uncertainty.

But there is clearly much that we still don't know about inflation. Researchers have been working hard to fill the gaps. Over the past year, BIS economists have laid out an alternative view of the inflation process, one that seeks to overcome some of the limitations of conventional analytical frameworks. This view sees the inflation process as two regimes – a low- and a high-inflation regime – with potentially self-reinforcing transitions from the low to the high one.

In my view, this work is intuitively appealing and goes some way toward explaining why inflation has risen so much over the past two years. But it is only a first step, and much more research is needed to give policymakers the insights they need to head off such inflationary breakouts in the future.

In the meantime, central banks cannot wait for definitive conclusions. They have had to act decisively to bring inflation down. In this way, policy is moving ahead of theory, teaching us lessons about the inflationary process and monetary policy transmission in a high-debt environment in a way that can inform future theory and research.

My second example concerns innovation in money and payments systems.

Here too, practice has run ahead of theory. In recent years, new financial assets have emerged, including cryptoassets and stablecoins that purport to be money. Meanwhile, in many countries, big techs have enlarged their footprint on the financial system, particularly in the sphere of payments.

As technology evolves, the public will demand more functionality from money. Notes and coins will not suffice. The public will demand money that is digital, programmable, and capable of moving seamlessly across platforms and countries. They will be less tolerant of costly manual regulatory checks and sluggish intermediaries.

It is incumbent upon central banks to provide money that meets public needs and expectations. If they do not, then other, less trusted institutions will step in to meet that demand.

The good news is that central banks are awake to the challenge. Many are already experimenting with more technologically advanced forms of money, including central bank digital currencies and tokenized deposits.

Let me emphasize: This does not mean that we want to get rid of cash. The point is just that central banks should be ready, in a given case, to meet society's demand for a superior technological representation of money.

The BIS is an active partner in these efforts. Our Digital Economy and Innovation team is working on a theoretical framework with the aim of mapping out a vision of the future financial system. Meanwhile, at our Innovation Hub, we are conducting practical experiments on the technologies that will bring us closer to realizing this vision, including efforts to maximize the privacy of money.

I would encourage students and researchers – including audience members here – to join us in these efforts. Providing trusted and secure money and an efficient payments system is a basic requirement for economic growth and prosperity. If I were a student again, starting my career as a researcher today or as a practitioner in a policy or financial institution, I could think of few topics more worthy of attention.

Thank you very much.

Welcome remark

Előd Takáts

Rector, Corvinus University of Budapest

**Dear Distinguished Guests,
Mr. Carstens, recipient of the honorary doctorate,
Deputy Governor Patai,
Esteemed colleagues from abroad and Hungary, and our students, – allow me
to extend a very warm welcome to you all in our beautiful city Budapest and
its leading university, the Corvinus University of Budapest!
I am so pleased to see you all here with us today.**

We are here together to celebrate. We are here to award the Honorary Doctorate, Doctor Honoris Causa of Corvinus University of Budapest, to a truly exceptional individual, Agustín Carstens.

If I look around now, I see friends. Friends from abroad and friends from Hungary. I see leading professors from the London School of Economics and Political Science, from Cambridge University, leading economists from the Bank for International Settlements, the International Monetary Fund and the Central Bank of Hungary, and the Magyar Nemzeti Bank. I see professors from Corvinus University, members of our senate, deans, and leaders of our academic community. And I am especially glad to see our students, who bring fresh energy and a curious and open mind to studying and learning about the causes of events around us.

We have come together from many places, many countries – even from many continents. The question arises: Why are we, such a large, diverse group, now celebrating together, precisely?

We are celebrating for three reasons: achievement, possibility, and values.

The first is obvious. We came together here to celebrate the achievements of Mr. Carstens. Agustín is the general manager of the Bank for International

Settlements, in short, the BIS, an institution that plays a crucial role in the global economy. Students: when your professors discuss international bank regulatory reform, Basel III, they are referring to the BIS and Agustín. When you analyze spikes in inflation – it is also Agustín. When you learn about the digital currencies of central banks – that is also Agustín. Before the BIS, he was deputy managing director of the International Monetary Fund – another top international job.

At home, in his native Mexico, his achievements were also stellar: Agustín served as minister of finance and later as governor of the Banco de Mexico, the central bank of Mexico. He graduated from one of the top economics Ph.D. programs in the world at the University of Chicago.

Stellar achievements, indeed. Yet, we celebrate more than achievements.

The second reason we came together is to recognize Agustín for breaking a glass ceiling, thereby showing us possibilities. The possibilities that talent and hard work, as Agustín's case shows, can open up – avenues which were closed before. Agustín is one of the first economists from an emerging market to rise to be the number-one leader of a major global institution.

In this respect, Agustín's career shows similarities to that of our own Alexandre Lamfalussy. Lamfalussy went from his birthplace in Kapuvar in Western Hungary through Belgium, the United Kingdom, and the United States to Basel, Switzerland, to also become general manager of the Bank for International Settlements. And he became the father of the euro.

Mr. Carstens, like Baron Lamfalussy, shows us that everything is possible with talent and hard work. You can come from an emerging market country, and you can rise to the top of global policymaking. You can be a refugee from communist-occupied Central and Eastern Europe, and still, you can rise to the top of global policymaking.

You, Agustín, have shown us that we should not look at where we come from but rather at where we want to head. This is a lesson useful to all economists from emerging markets – and to all students here at Corvinus University.

And there is a third reason why we are convened here today. Values. When presenting the award of Doctor Honoris Causa at Corvinus University, we look beyond achievements and possibilities. We look for values. And the international career of Agustín, his work building and strengthening national policy and institutions at home in Mexico, then fostering international cooperation [...] at the IMF and the BIS, convey the value of international cooperation that we all share at Corvinus University.

Corvinus University is renewing itself now, as it has renewed itself several times in the past. Today, we are shifting our focus towards more international

research. Here is one fact: in the last three years, we have increased the number of our top international publications threefold: [i.e.] plus two hundred percent. We are looking to admit more international students. Another fact: three years ago, a little more than 10 percent of our courses were held in English, while today, more than one-half – more than 50 percent of our courses – are held in English. We are looking to hire more international faculty. Another fact: for the first time in our history, all of our departments are hiring internationally, looking to welcome twenty new professors.

We look forward to more international cooperation. We believe that there is much to gain from working together with people from other countries and other continents. We believe that international cooperation is not a zero-sum game: we can all benefit from it.

And we are glad to say that Agustín's work and life reaffirm the values of international cooperation that we fully share.

I would add that not many people have been given this honorary doctorate from Corvinus University. Nobel prizes are given every year... but our top honor is given very sparingly. Agustín is joining a list of great individuals such as Ban Ki-Moon, then secretary general of the United Nations, and Wolfgang Schäuble, then minister of finance of Germany.

May I add how grateful we all are that, despite ongoing turbulence in some areas of world finance, Agustín has taken the time to visit Budapest and our university and be with us today.

We are here to celebrate achievement, possibilities, and values. We are here to celebrate Agustín Carstens and welcome him to our university community as Doctor Honoris Causa.

Congratulations Agustín!

Welcome remark

Luiz Pereira

Deputy General Manager, Bank for International Settlements

Good Morning.

It gives me great pleasure to welcome you to this Conference on the New Age of Central Banking in Emerging Markets. I am sorry that, due to prior commitments, I cannot be with you in Budapest today.

Today's conference has two broad themes. The first is inflation – surely the most pressing macroeconomic challenge facing central banks today. The second is digital innovation and central bank digital currencies – an issue that strikes at the core purpose of central banks – namely, to provide a form of money that meets the needs and expectations of the public.

For central bankers in emerging markets, these two themes – managing inflation and ensuring trust in national currencies – have been perennial challenges.

But in recent decades, much progress has been made. Central bank autonomy has been strengthened. New policy frameworks have been developed, and new instruments added to the monetary policy toolkit. And technological innovation has allowed many emerging markets to devise new payment infrastructures to boost efficiency and enhance financial inclusion.

The events of the past few years, including the Covid pandemic, the Russian invasion of Ukraine, the emergence of BigTechs as serious financial players and the return of inflation have tested emerging market central banks. But, for the most part, they have passed those tests.

Indeed, in some respects, advanced economy central banks have much to learn from their emerging market counterparts.

After all, emerging market central banks were among the first to tighten policy rates in response to nascent inflationary pressures, helping to support their exchange rates and contain the second-round effects of higher commodity prices.

And, on the digital economy front, new infrastructures like PIX in Brazil and UPI in India have transformed the payments landscape in these countries, scaling up rapidly and spurring broader innovation within the regulated parts of the financial system.

Today's conference features a fantastic group of papers and presenters. It will give us a chance to look back and learn from the successes of emerging market central banks in navigating the choppy waters of recent years. Just as importantly, I encourage you to take this opportunity to look forward and consider how lessons learned can be applied to the challenges of tomorrow.

Thank you very much.

Are we in a new age of central banking in emerging markets?

Agustín Carstens

General Manager, Bank for International Settlements, at New Age of
Central Banking in Emerging Markets Conference

It is a great pleasure to be here in Budapest today. I would like to thank Corvinus University for awarding me an honorary doctorate this morning and for organizing this conference. I am deeply honored and look forward to our discussions today.

The title of today's conference is one that is close to my heart. After all, I spent most of my career working at an emerging market central bank, the Bank of Mexico.

I believe it is no exaggeration to say that emerging market central banks have entered a new age. In past decades, rapid rises in advanced economy interest rates of the kind that we have seen over the past year would often trigger capital flight, disrupt exchange rates, and cause economic upheaval in emerging markets. Yet most such countries have emerged from the past year comparatively unscathed. That speaks to the enormous strides that emerging market central banks have made in their policy frameworks and institutional capacity.

But even in this new age, there are certain core central banking principles that remain relevant, as well as problems that will always recur. Today, these apply as much to advanced economy central banks as their emerging market counterparts.

The most important of these principles is the essential need for trust in money. And that is what I would like to talk about today.

Why did I choose this topic?

Well, recent years have seen several troubling developments which, if not addressed, could start to threaten society's trust in money. I speak specifically of challenges to fiat money, the return of inflation, and threats to financial stability.

In the past week alone, we have seen bank runs, the near collapse of a major cryptocurrency, and huge volatility in bond and equity markets, all amid stubborn global inflation. These events prompt me to underline at this conference the indisputable importance of trust as a key element of our current financial system.

I will begin by recalling the most fundamental aspect of central banking: the nature of money. The social convention of money, as we know it today, is based on the trust placed in it by the public. And, as money is the basis of the entire financial system, the system's stability depends on that trust.

Fiat money is an asset with no intrinsic value. Its value derives from the social convention that underpins it, together with the institution that enables it to function – the central bank. Money only has value today if the public knows that others will respect that value today and in the future. This ensures that when a person wants to use money, it will be accepted, and that the payment will be final. Thus, its value clearly comes from trust. This is why the issuer of money is so powerful. However, this power carries with it a great responsibility: those who abuse their authority to issue currency deprive money of its value and will be rejected by society.

The consequences of the state abusing its privilege of issuing money can be disastrous. As is well known in emerging market economies, abuses can range from high inflation and sharp exchange rate depreciations to the abandonment of the national currency in favor of a foreign one (dollarization) or, in the extreme, a return to barter (after hyperinflation). Further consequences can include severe financial instability, with severe costs for society in terms of economic growth, employment, inequality, and wealth. All these consequences of the loss of trust in money have been the main motivation for the autonomy of central banks. After all, autonomous central banks are nothing more than an institution of the state with the key mandate of preserving the national currency's purchasing power. Autonomy is the social device whereby society's trust in the central bank is maintained. It is encouraging that most emerging market central banks are now autonomous.

But autonomy by itself is not enough. Central banks also have to earn the credibility they need. Let's consider what monetary authorities must constantly do to preserve people's trust in money. They must make monetary arrangements that allow them to anchor inflation expectations and thus keep up the purchasing power of the currency they issue. Over recent decades, most central banks,

including many in emerging markets, have converged on inflation-targeting regimes as the best way of doing this.

How does inflation targeting work?

Central banks do not directly control inflation. However, their policy tools can influence it. An inflation-targeting central bank commits itself to using its tools to achieve the targets. If the public trusts the central bank to do what is required to keep inflation close to target, then that target, rather than current inflation, becomes a key reference for people in making their price and wage decisions, leading to low and stable inflation. In this situation, variations in inflation are usually transitory and reflect changes in relative prices. Inflation becomes self-equilibrating.

But trust gained can easily be lost if society doubts the central bank's commitment to the objective of maintaining price stability. This is one of the reasons why the recent rise in inflation in virtually every country is a cause for concern. Some generations are experiencing the risk of the economy shifting to a high-inflation regime for the first time. And once this transition starts, it can become increasingly difficult to stop. Therefore, it is appropriate that most central banks have been prudently tightening monetary policy through higher interest rates to restore price stability. This response should continue as necessary, for only by resolve, perseverance, and success in this task can trust in money be preserved.

It is well known that the money issued by the central bank, known as primary money, is not the only money that circulates in a modern economy. Commercial bank money, the result of commercial bank intermediation, is also fundamental to the monetary system. This type of money takes the form of bank deposits and credits. For most people, primary and commercial bank money are indistinguishable, which is by design. Over time, institutional arrangements have been developed to ensure that society's trust in primary money also extends to bank money.

A two-tiered monetary system is the crucial element. The central bank lays the foundation, and on the first floor are commercial banks. The keys are that interbank payments are ultimately settled on the central bank balance sheet through the exchange of primary money between commercial banks, and that the public can freely convert commercial bank money into central bank money – as when you withdraw cash from an ATM. These arrangements guarantee the finality of payments and the 'singleness' of bank money. The ultimate settlement of the banking system at the central bank is made possible by the central bank's high degree of discretion in creating liquidity through its lending to the banking

system. At times of great instability, it can provide liquidity through its well-known lender-of-last-resort function. Thus, insofar as there is trust in primary money, the central bank transfers this to the banking system.

Settlement on the central bank's balance sheet and free exchange into central bank money are not, however, enough to ensure trust. The banking system must also remain clearly solvent and be perceived as such. As we saw in recent days with Silicon Valley Bank, even the slightest doubt about a bank's financial condition can be deeply destabilizing. Reflecting the high social costs of banking crises, the system is extensively regulated and supervised. There is also deposit insurance and the central bank's ability to act as lender of last resort, which exists to mitigate potential bank runs. All these layers of protection are intended to safeguard the public's savings, and they are essential to anchor the trust in both primary and commercial bank money.

To put into perspective the enormous value of the framework I have described, all of which supports trust in primary and commercial bank money, it is useful to refer to recent failed attempts to issue private money through technologies that allow transactions based on decentralized ledgers. These alleged forms of money function without central bank intervention, a lender of last resort, or a reliable regulatory and supervisory framework. These have resulted in the proliferation of so-called cryptocurrencies, which guarantee neither payment finality nor a stable value, and so clearly do not possess the fundamental attributes of money. The collapse of the Terra-Luna crypto coins last year, and the behavior of the so-called USDC stablecoin, which fell more than 10% below its par value at one point last week, are only the most recent examples. This is a further confirmation, if one is needed, that what sustains fiat money over alternatives based on novel technologies is the institutional framework and the social conventions that support it, which are precisely what makes money reliable for the public.

Let me conclude. In the foreseeable future, monetary policy should focus on bringing inflation back to levels consistent with central bank objectives. This process may run into obstacles, particularly in the final stretch toward eventual convergence with inflation targets. But it is essential to achieve this objective. Otherwise, the credibility of monetary policy will be called into question, as will the credibility of the autonomous central banks responsible for implementing it. At the same time, effective regulation and supervision of the financial system are essential for allowing central banks to take the decisive monetary policy actions required to bring inflation down.

III.

CONTRIBUTIONS TO THE NEW AGE OF CENTRAL BANKING IN EMERGING MARKETS CONFERENCE

1. OVERVIEW

New Age of Central Banking in Emerging Markets

Piroska Nagy Mohácsi

London School of Economics and Political Science (LSE)

Central banks face multiple challenges today, chief among them persistent inflationary pressures and radical digital innovation. Both raise questions about existing monetary frameworks, and the latter also challenges countries' monetary sovereignty. How well are central banks prepared for this new era? Are they rethinking their monetary frameworks? How are central banks adapting to financial innovation, including the development of their own central bank digital currencies (CBDCs)? How are emerging market central banks faring overall in this new era of central banking?

Policy frameworks often develop in response to crises. This is certainly the case in central banking (Coure and Katz, 2021). Created in the first place to safeguard financial stability and payment systems, central banking after the late 1980s evolved to focus on delivering price stability, increasingly in the context of the so-called inflation targeting framework. Then came the global financial crisis of 2008-9, teaching policymakers the lesson that focusing only on inflation can lead to the costly neglect of financial stability. The financial stability objective thus had to be put back on the policy agenda of central banks.

The Covid crisis of 2020-22 created its own unique challenge with the resurgence of inflation in the context of high debt and frequent supply and demand shocks, unknown to the advanced world since the 1980s (Brunnermeier, 2023). Advanced economy central banks struggled to recognise the risks of surging inflation and wasted valuable time figuring out whether persistent price increases from the end of 2020 were 'temporary' or 'permanent.' This delay led to the highest inflation in a generation. Central banks in advanced

economies (AEs) finally started one of the most aggressive monetary tightening cycles in recent economic history only in mid-2022.

In contrast, central banks in emerging markets (EMs) were better prepared to recognise the problems of sustained price increases early for two main reasons. First, they had modernised their monetary frameworks, bringing them up to speed with those of advanced economies by the time of the pandemic (Nagy Mohácsi, 2020). Second, given their not-too-distant inflation experience and still weaker institutional credibility, EM central banks felt the pressure to react much earlier to the signs of emerging inflation than their advanced economy counterparts. Consequently, they started to tighten already from the spring of 2021, and their timely action appears to have limited the negative consequences of the US and other AEs' eventual monetary policy tightening (Velasco, 2023), which used to be devastating in the past. Even as the US Federal Reserve (Fed) and the European Central Bank (ECB) eventually started tightening, capital outflows from EMs and associated exchange rate pressures remained manageable, in sharp contrast to past tightening cycles. The wide availability of currency swaps and repos by globally systemic central banks – the Fed, the ECB, and, to an extent, the People's Bank of China – also helped EMs to maintain their economic stability during the Covid crisis.

Overall, EM central banks seem to have outperformed AE counterparts both in addressing inflation in an early and decisive manner and avoiding major banking sector stress in the process (Evdokimova et al., 2023).

Meanwhile, another regime-challenging shift is underway. Digital innovation has reached the financial sector, leading to major transformations during the past decade. Mobile banking, digital payments systems, digital non-bank institutions, and more generally, artificial intelligence (AI) are transforming financial systems worldwide. And, importantly, blockchain technology and digitalisation have resurrected private currencies, which had been a thing of the very distant past. Cryptocurrencies and crypto assets, particularly those at the intersection of Fintech and Bigtech, have posed a veritable challenge to countries' monetary sovereignty and central banks' money-creating monopoly. Furthermore, digital innovation has opened up a new arena of global monetary competition in the form of central bank digital currencies. In this area, too, emerging markets have advanced, and to date, only emerging markets have officially launched CBDCs, though with mixed success.

Another looming challenge for central banks concerns their role in addressing climate change and the green transition, which may require rethinking inflation targets now (Takáts, 2023).

This book's ambition is to contribute to the pressing debate about how central banking should respond to the new era of multiple challenges. It focuses

in particular on addressing high inflation and digital innovation. It contains analyses by leading academics, policymakers, and private-sector participants both from advanced economies and emerging markets, drawing on a joint conference by the Bank for International Settlements (BIS), the London School of Economics and Political Science (LSE), the Corvinus University of Budapest, and the Magyar Nemzeti Bank (MNB - National Bank of Hungary) in March 2023.

The new era of high inflation

Claudio Boris, Marco Lombardi, James Yetman, and Egon Zakrajsek of the BIS discuss what they call a “two-regime view” of inflation: one with low inflation and another with high inflation, and then analyse the delicate transition process from a low to a high-inflation regime with self-reinforcing dynamics. They argue that inflation behaves very differently in the two. In a low inflation regime, sector-specific price increases are only loosely correlated, and wages and prices are only loosely linked. Inflation is “self-stabilising,” with any relative price shock to the system liable to recede fast. In contrast, in a high-inflation regime, price changes are closely correlated, and price and wage increases are closely linked. In a high inflation regime, overall prices become sensitive to food and energy prices and fluctuations in the exchange rate. Such a high inflation regime is self-entrenching. The policy implications are that low inflation regimes can tolerate more deviation from central bank targets, while high inflation regimes must be prevented, which requires strong preemptive policy action.

Christopher Erceg of the International Monetary Fund (IMF) focuses on the challenging transition period from an already high inflation regime back to low inflation. He investigates the appropriate monetary policy strategy for reducing inflation that also takes account of financial stresses that may arise during a rapid shift out of a low-inflation environment. The advice is crystal clear: policy must respond aggressively to upside inflation pressures, even if financial sector stress occurs, as it did recently in the US, where several mid-sized banks failed in the spring of 2023. As a result, advanced economies may face fragmentation risks, while emerging markets may need to fend off excessive exchange rate pressures in response to developed countries’ aggressive tightening. Related, though hitherto less researched, questions are why markets remain more optimistic about reducing inflation than central banks do and how this affects monetary policy outcomes. Mr. Erceg also stresses that broad-based fiscal restraint can ease the burden of inflation-fighting central banks while still accommodating support for the most vulnerable.

Ricardo Reis of LSE considers the potentially treacherous path ahead of the European Central Bank (ECB) as it strives to bring down and hit its inflation target of 2% by the end of 2024. He focuses on factors that can prevent the interest-rate-setting central bank from raising rates enough due to being dominated by other agents or factors. He identifies six types of “dominance” that can prevent central banks from lowering inflation: fiscal; financial; fear of recession; external; expectations; and simple misjudgment. To date, the ECB has avoided most of these “dominance” factors, with one serious exception: household inflation expectations seem to have become entrenched at a higher level. In other words, households do not seem to believe that inflation is about to come down quickly. This is a critical factor for the ECB to watch.

Zsolt Kuti of the MNB analyses the Hungarian central bank’s inflation battle in what may be one of the most complex monetary policy scenes among the world’s emerging markets. In close proximity to the Russia-Ukraine war, deep energy dependence on Russia, as well as fiscal expansion, inflation started to rise in early 2021 after a long period of price stability. The MNB was the first central bank in the European Union to start a tightening monetary policy cycle in June 2021, and since then has made gradual but persistent increases 17 times, raising the effective interest rate from below 1% to 18% in a matter of little over one year. Sources of inflation have shifted from dominantly external to domestic factors. The experience with price caps holds a lesson for other countries as well: although price caps kept the prices of directly targeted goods low, producers and retailers compensated by raising the prices of substitute goods. Exchange rate depreciation also played a role in fuelling inflation during periods of market stress. Inflation is still high and well above the MNB’s target of 3% (with a tolerance band of +/-1%), requiring sustained focus on the central bank’s primary objective of price stability.

Andres Velasco explores the central role of the exchange rate in emerging markets. Even under the current US dollar-driven global financial cycle where domestic financial conditions mainly depend on US monetary policy, the choice of the exchange rate regime – flexible or fixed – still matters. In case of external shocks, countries with currency pegs suffer a larger GDP loss and their stock market falls more than those with flexible exchange rates. However, balance sheet effects of an exchange rate depreciation in the context of financial dollarisation can also have contractionary effects, and until recently, often resulted in banking sector crisis. This may be changing though as leading emerging markets such as Brazil or Chile now borrow predominantly in their local currency. Balance sheet problems from depreciation thus having a flexible exchange rate regime appear to be manageable. Taken together, flexible exchange rate regimes seem to offer insulation to a significant, but not full, extent under the US dollar-led

global financial cycle. At times of stress, therefore, emerging markets need dollar liquidity, for which the best solution is currency swaps with the US Federal Reserve.

Central bank innovation for the digital age

Andrei Kirilenko of Cambridge University provides a deep dive into the origins and characteristics of central bank digital currencies. The concept attracted serious policy attention when Facebook announced in 2019 its plan to launch a private digital currency Libra (later renamed Diem), to an estimated two billion global users. Several big names from the financial sector joined in, including Visa, MasterCard, and PayPal. The threat of competition from a cross-border, truly global private currency reignited central bank efforts to move forward with plans for their own digital currency (the CBDC) and launch a series of regulatory demands concerning Libra/Diem. The regulatory onslaught worked, and the project ended in the failure of crypto-focussed bank Silvergate, where Libra/Diem property rights had earlier landed. Yet digital technology is now there to provide a viable private alternative to the monopoly of central bank money should there be a political appetite for it.

Piroska Nagy Mohácsi of LSE argues that the *raison d'être* of CBDCs is political. In a rapidly digitalising world, without CBDCs, central banks may not be able to protect their monetary sovereignty and would not have an effective programmable crisis management tool. As such, CBDCs are not simply payment-system-enhancing tools as often portrayed, but a fight for the 'soul' of the monetary and financial system and money creation monopoly in the digital age. CBDCs are also set to be part of geopolitical competition, often called the "digital currency arms race." Because of their political nature, CBDCs are not simply for central banks to decide on; governments and parliaments should get more involved. Whether CBDCs are introduced will shape future digitalised monetary and financial systems and governments' capacity to deal with macroeconomic and financial sector stress. While introducing CBDCs is associated with risks, without CBDCs, policymakers could be ill-equipped to deal with future shocks.

Priscilla Koo Wilkens of the BIS examines the factors that led to the development of CBDC initiatives globally and the growing public interest in CBDCs. She draws insights from the implementation of Pix, a public payment infrastructure initiative in Brazil. Pix has successfully increased the digital footprint of payments in Brazil, and the Central Bank of Brazil has played a major role in designing and implementing a payment system that aligns with social objectives and benefits the population. Launched only in 2020, Pix has

thus far allowed over 64 million individuals to make their first credit transfer, and more than 80% of Brazil's adult population has initiated or received a Pix transaction. The paper also explores how collaboration between the public and private sectors can lead to improved welfare outcomes and how lessons from Pix can be applied to the next generation of financial market infrastructures (FMIs) and CBDCs. Finally, she emphasises the importance of central banks establishing a strong governance structure with clear regulations to align societal objectives with new FMIs.

Anikó Szombati of the Magyar Nemzeti Bank (MNB) notes that emerging market central banks are well-advanced in researching CBDCs, and Hungary's central bank MNB has been at the forefront. The MNB's overarching objective is to prepare the central bank for the new digital age and the future of money. Specific drivers include digital financial inclusion and fostering innovation for a more efficient payment system. Ms. Szombati describes the elaborate framework and decision-making process behind CBDC plans in Hungary. Through its Innovation Hub and Regulatory Sandbox, the MNB has been testing CBDC variants in a safe manner. One specific innovation is outreach to the very young associated with the MNB's Digital Student Safe application, which engages 8-14-year-olds – i.e., pre-high school-age students – along with their parents. Beyond fostering digital financial inclusion from a young age, this project allows for full-scale retail-type CBDC testing. While the MNB does not see the urgency of introducing its CBDC at present, testing the digital infrastructure and the public's appetite for a potential CBDC are getting the central bank ready for the new digital age.

Radovan Jelasy of Erste Bank, Hungary, warns that introducing CBDCs would profoundly change the current monetary policy framework and the financial sector as we know it. Financial intermediation by banks would decline, reducing banks' credit provision. Banks would need to reconsider their business models and transition to new ones – and this transition implies risks to financial stability. The efficiency of the current monetary transmission mechanism would also change. There would also be severe doubts about privacy, although appropriate design could alleviate some of these concerns. Furthermore, a clear user case for CBDCs needs to be established. All these issues warrant a very cautious, measured approach to introducing CBDCs and a flexible one that allows for their rollback if things go wrong.

Overall, central banks face tremendous challenges today forward. This book aims to contribute to the much-needed debate on how to rethink and adapt central banking for the new age. A few general points emerge to inform that debate:

- Today's big challenges in central banking may require a major rethink of monetary frameworks, if not 'regime change';
- Many emerging market central banks have caught up, if not outperformed, advanced countries in fighting inflation in the post-Covid era and avoiding major banking sector stress while moving out of the low-interest rate environment;
- Major changes may call for rethinking the governance arrangements for central banks so that their accountability remains commensurate with their mandate, including with regard to the launch of central bank digital currencies;
- Finally, central bank communication and engagement with the public at a time of rapid change is particularly critical.

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2. CENTRAL BANKS FIGHTING INFLATION IN ADVANCED AND EMERGING MARKET ECONOMIES

The two-regime view of inflation: a synopsis

Claudio Borio, Head of the Monetary and Economic Department,
Marco Lombardi, Principal Economist
James Yetman, Principal Economist
Egon Zakrajšek, Senior Adviser
Bank for International Settlements

Abstract

This paper summarises Borio et al. (2023b), whose empirical analysis characterizes the inflation process as two regimes – a low- and a high-inflation regime – with self-reinforcing transitions from the low- to the high-inflation one. It documents some of the stylised facts describing the two regimes and the transitions between them based on disaggregated price dynamics and the joint behaviour of wages and prices, before highlighting monetary policy implications. These include the desirability of conducting monetary policy in a flexible manner in a low-inflation regime; tolerating moderate, even if persistent, deviations from narrowly defined targets; but being pre-emptive when the risk of a transition to the high-inflation regime increases.

Keywords: inflation, disaggregated price dynamics, wages and prices, monetary policy.

JEL classification: E31, E58.

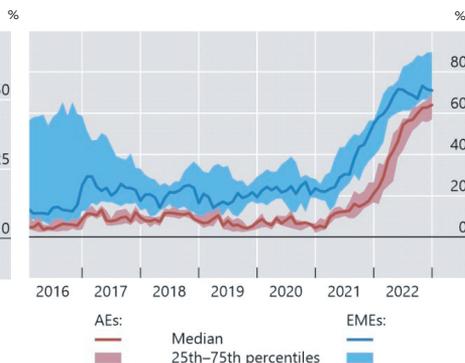
Introduction

Few economists and policymakers had anticipated the rapid return of inflation, and even fewer had foreseen its vigour and persistence. Once it flared up, most observers took it as transitory but subsequently, reading after reading turned out stronger than expected. And as time passed, the surge gathered speed, and inflation became more broad-based across both countries and categories (Graph 1).

A. Proportion of countries with high inflation



B. Share of consumer baskets with high inflation²



¹ AEs: AU, CA, CH, GB and SE. EMEs: AR, BR, CL, CO, HU, ID, IL, IN, KR, MX, MY, PE, PH, RU, SA, SG, TH, TR and ZA.

² High inflation corresponds to a 12-month percentage change in an item's price of more than 5%.

Graph 1 – An unanticipated surge in global inflation¹

Sources: IMF; OECD; Datastream; national data; authors' calculations

While the debate has yet to be settled, prevailing models of inflation arguably did not prove fit for purpose.¹ They were too aggregated to capture the subtleties of the pandemic-induced shifts in demand patterns. In addition, in their construction, they generally assumed that inflation would return to meet central banks' targets and that the underlying model parameters would remain invariant even as inflation rose sharply. To be sure, shocks, by definition, cannot be anticipated. And shocks there were aplenty, not least the spike in food and energy prices sparked by the war in Ukraine. That said, changes in the inflation process were already well under way.

Against this backdrop, the BIS Annual Economic Report published in June 2022 (BIS 2022), further elaborated in Borio et al. (2023b), provided a view of inflation that complements that of standard models. This view plays up the

¹ See e.g., Reis (2022b) for a discussion of possible explanations for the recent inflation surge.

features that the standard models play down – disaggregated price dynamics and behavioural adjustments to the evolution of inflation itself. We term this the “two-regime view” of inflation – with one regime characterised by low inflation and the other by high inflation and with self-reinforcing transitions from low to high.

Why two regimes? Because empirical evidence indicates that inflation behaves very differently in the two. In a low-inflation regime, measured inflation mainly reflects sector-specific price changes that are only loosely correlated. Thus, the component of price changes that is common across different goods and services is small, and price changes tend to leave only a temporary imprint on the inflation rate itself. Equally important, wages and prices are only loosely linked. As a result, inflation tends to be self-stabilising. In contrast, a high-inflation regime has no such properties: the importance of the common component of price changes is much greater, wages and prices are more tightly linked, and inflation is especially sensitive to changes in salient prices, such as those of food and energy, as well as to fluctuations in the exchange rate. Thus, while in a high-inflation regime, the *inflation rate* is not self-stabilising, *the regime itself* is self-entrenching, just as is its low-inflation counterpart.

Why are the transitions from low- to high-inflation regimes self-reinforcing? For one thing, as inflation moves out of the zone of “rational inattention”, where it is hardly noticed by economic agents, it snaps into sharp focus. In addition, it becomes more representative of the change in the price indices that individual agents care about since price changes across different goods and services become more similar and synchronised. As a result, inflation plays more of a coordinating role in the behaviour of economic agents. In addition, as inflation increases, so do the costs of lagging profit margins or falling living standards, which heighten agents’ incentive to catch up. All this increases the likelihood of wage-price spirals, which lie at the heart of the inflation process.

The main value that is added by the two-regime view of inflation is precisely how it highlights the elements that prevailing approaches downplay. And while the very idea of two regimes is a simplification, it has the merit of putting the spotlight on that elusive zone in which inflation begins to have a material impact on economic agents’ behaviour. After all, both Volcker (1983) and, subsequently, Greenspan (1996) defined price stability as a situation in which the inflation rate does *not* have a significant influence on behaviour – broadly analogous to our low-inflation regime.

The rest of this paper summarises this perspective on the inflation process. Section 1 documents the differences in price dynamics in high- and low-inflation regimes. Section 2 zeroes in on the link between prices and wages. Section 3 interprets the findings and explores the implications for transitions across regimes. Section 4 turns to monetary policy.

1. Price dynamics in the two regimes: stylised facts

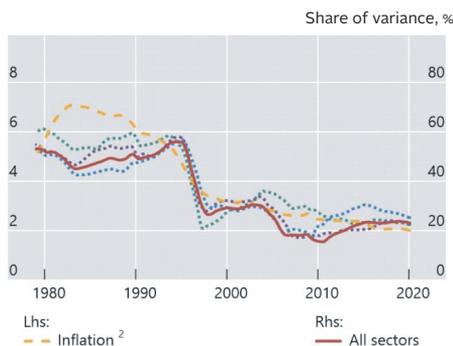
A look at disaggregated price dynamics at different levels of inflation points to the usefulness of characterising the inflation process in terms of two regimes. What follows sequentially considers how the inflation regime affects the degree of price co-movement, the pass-through of individual price changes along the “price chain” and the response of the inflation rate to especially salient prices, such as those of energy or the exchange rate.

Co-movements of sector-specific price changes

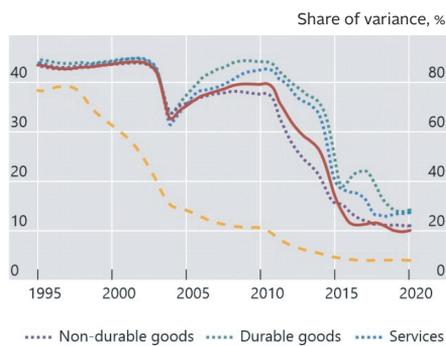
One simple way to characterise the commonality among price developments in different sectors is to look at the first principal component of sectoral (log) price changes. We illustrate this using two countries with sufficient histories of detailed sectoral price data: the United States and Mexico.

In the high-inflation regime, disparate sectoral price changes are approximated remarkably well by the first principal component. Graph 2 shows the percentage of the total variance of sectoral price developments that it explains. For the United States (panel A), this is around 60% of the total variability in sectoral PCE price changes during the high inflation years, i.e., until around the mid-1990s. That percentage subsequently drops to between 20% and 30% as we enter the low-inflation regime. For Mexico (panel B), the results are even starker: the common component explains around 80% of total volatility in sectoral CPI price changes when the moving window includes periods of high inflation, but it falls to 20% when these drop out.

A. Unites States



B. Mexico



¹ Time-varying fraction of total price-change variance due to the common component of 12-month percentage changes in prices across all sectors and within each specified subsector, estimated using a 15-year moving window.

² Fifteen-year moving average of 12-month headline inflation.

Graph 2 – The importance of the common factor underlying price changes has declined¹

Sources: National data; authors' calculations

This decline in the relevance of the common inflation component is also at the root of another well-documented stylised fact: the significant decrease in the volatility of inflation as inflation falls. To be sure, as it does so, the volatility of individual price changes declines as well. However, this is dwarfed by the decline in the covariance between them, highlighting that a smaller degree of co-movement in price changes across sectors is a defining feature of a low-inflation regime.

When inflation is low, sectoral price changes continue to display variation, but these changes are generally idiosyncratic and independent. In other words, they tend to reflect *relative* price changes rather than broad-based changes in the underlying price level – the component that better approximates the theoretical notion of “true” inflation.²

Spillovers across sectoral price changes

As inflation falls, the decline in the co-movement of sectoral price changes goes hand in hand with a decline in price spillovers across sectors, which helps to keep a lid on inflation and thereby reinforces the low-inflation regime.

Broad-based inflation ultimately depends on both sector-specific price increases (discussed above) and the transmission of those increases across

² See Humpage (2008) and Reis and Watson (2010), who take this argument and measurement further.

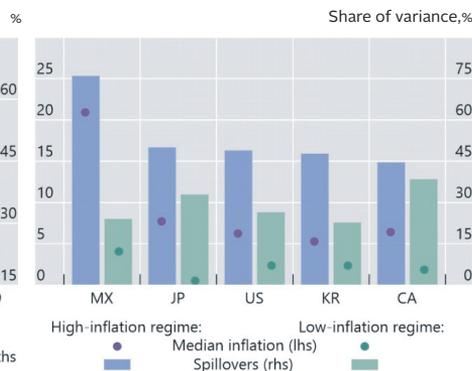
sectors. Without transmission, increases in the price level due to price shocks in one sector will tend to die out over time rather than leading to sustained inflation.

One way to assess price spillovers is to look at how idiosyncratic shocks of each sectoral price index affect the variability of other sectoral price indices within a given horizon.³ The results from applying this idea to rolling 20-year samples for the United States are shown in Graph 3A. These point to a steady decline in the spillover index until the mid-1990s, a moderate increase thereafter, followed by another decline after 2000. Spillovers have since increased somewhat, notably in the wake of the Great Financial Crisis (GFC) but again moderated in the years immediately preceding the COVID-19 pandemic. This result is also seen in other countries (Graph 3B), with total spillovers declining as inflation subsided.⁴

A. Total spillovers at different horizons in the US¹



B. Spillovers across different inflation regimes²



¹ Share of the variance of sectoral price changes over the specified horizon explained by shocks to prices in other sectors.
² Based on quarterly CPI data for CA, JP, KR and MX, monthly PCE deflator data for the US. High-inflation regime samples: CA, Q4 1971–Q4 1990; JP, Q4 1970–Q4 1979; KR, Q4 1985–Q4 1997; MX, Q1 1983–Q4 2002; and US, Jan 1969–Dec 1984. Low-inflation regime samples: CA, Q1 1991–Q4 2019; JP, Q1 1980–Q4 2019; KR, Q1 1998–Q4 2019; MX, Q1 2003–Q4 2019; and US, Jan 1991–Dec 2019.

Graph 3 – Spillovers of sectoral price changes declined as a low-inflation regime prevailed

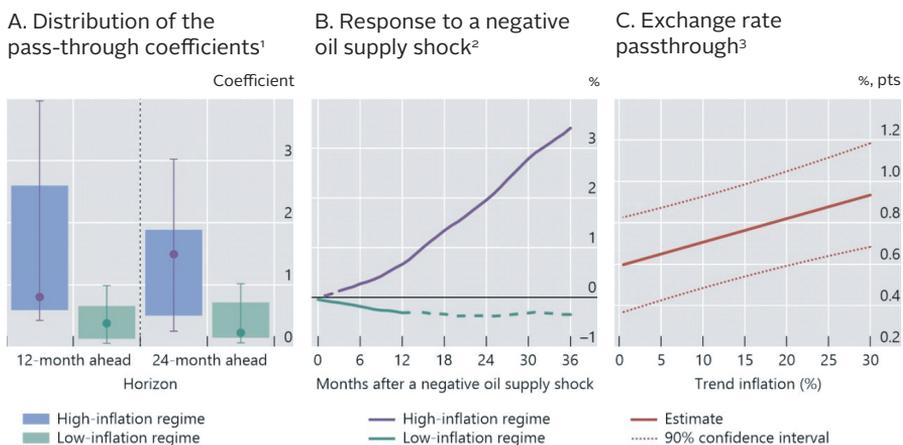
Sources: Board of Governors of the Federal Reserve System; FRED; OECD; World Bank; CEIC; Datastream; national data; authors' calculations.

³ This is based on a Bayesian VAR, in which sector-specific price changes react to their own lags, as well as to those in other sectors. For the technical details, see Borio et al. (2023b).
⁴ A period of high inflation is defined here as one in which the five-year moving average of inflation exceeds 5%.

The pass-through of relative price changes into inflation

The decline in the intensity of price spillovers across sectors documented above reflects a broader and very important property of low-inflation regimes: they are self-stabilising. In a low-inflation regime, individual price changes are generally unlikely to have consequences for underlying inflation.

This is true even for particularly large relative price changes – those that, due to their magnitude, are most likely to attract the attention of economic agents. Borio et al. (2021) show this using a two-step procedure: first, by identifying the largest US PCE sectoral price increases; and second, by assessing their effect on subsequent core inflation. Graph 4A shows the distributions of the statistically significant positive pass-through coefficients at various horizons for the low- and high-inflation subsamples. At both 12- and 24-month horizons, the distribution of the pass-through coefficients is significantly tighter and closer to zero in the low-inflation regime.



¹ Box plots show the median, minimum, maximum and interquartile range of the statistically significant (at the 5% level) positive pass-through coefficients at the specified horizon.

² The solid lines indicate horizons where the inflationary response is statistically significant at the 10% level.

³ Effect of a one per cent exchange rate depreciation in month t on annualised headline inflation from month $t-1$ to month $t+2$. Trend inflation is defined as a five-year moving average of 12-month headline inflation.

Graph 4 – A low-inflation regime dampens the pass-through of large relative price changes, oil price shocks and exchange rate changes

Sources: Baumeister and Hamilton (2019); Federal Reserve Bank of St Louis, FRED; IMF; national data; BIS.

This finding – that pass-through into higher inflation is weaker in a low-inflation regime – also holds for price changes in sectors that are generally important sources of spillovers. For example, when we consider the effect of negative oil supply shocks in a local projection regression of inflation for a set of advanced and emerging market economies over a sample encompassing both high- and low-inflation regimes yields, our estimates show that these shocks are strongly inflationary in a high-inflation regime, with an influence that builds up steadily over time (Graph 4B). In contrast, in a low-inflation regime, their impact on inflation is even (mildly) negative, possibly due to the contractionary effects that higher oil prices have on economic activity. In a similar vein, a low-inflation regime is also a better safeguard against imported inflation in the face of exchange rate depreciations: the pass-through to inflation is lower when inflation is lower (Graph 4C).

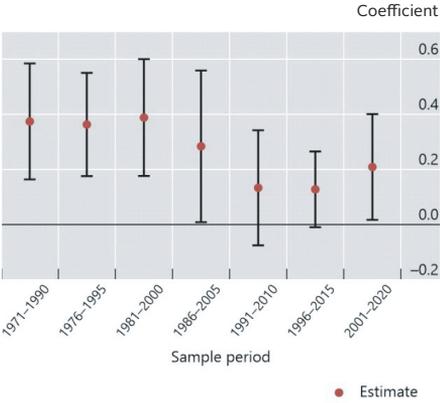
2. The wage-price nexus in the two regimes: stylised facts

So far, the analysis has focused on the dynamics of inflation across the two regimes at both aggregated and disaggregated levels. We now delve into the dynamics of wages and their relationship to prices. The reason is simple: the engine of sustained inflation is ultimately a self-reinforcing feedback loop between price and wage increases – wage-price spirals, for short. There are limits to how far real wages can fall as inflation takes hold or how far profit margins can narrow as wages rise.

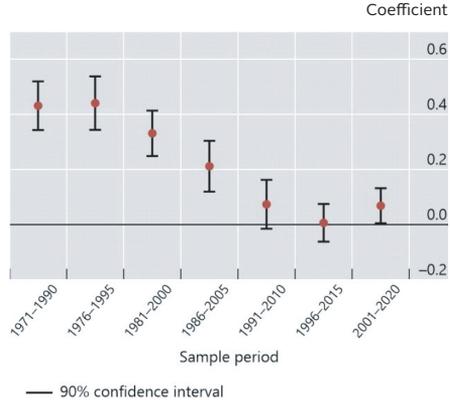
Just as with price dynamics, the wage-price link varies systematically with the inflation regime. The link is tight in a high-inflation regime and loose in a low-inflation one. This emerges from statistical exercises that consider the reaction of wages to prices and, separately, of prices to wages. And it becomes even clearer once we explore the joint behaviour of the two variables, including the speed of adjustment to each other.

Graph 5 displays the sensitivity of wages to past inflation and vice versa for a panel of 14 advanced economies. It highlights how the sensitivity of wages to prices, and even more so prices to wages, has been declining over time, in parallel with the decline in inflation.

A. Sensitivity of wage growth to past inflation



B. Sensitivity of inflation to past wage growth



³ AEs: AU, BE, CA, DE, DK, ES, FR, GB, IE, IT, JP, NL, SE and US.

Graph 5 – Wages have become less sensitive to inflation in AEs¹

Sources: OECD; national data; authors' calculations

We also examine the joint relationship between prices, wages and labour productivity, based on a cointegration model. This allows for a long-run stationary relationship between trending variables and for temporary, but possibly persistent, deviations from this relationship.

We estimate the cointegrating model on a panel of advanced economies for two separate subsamples – 1970–1995 and 1996–2019 – corresponding roughly to the high- and low-inflation periods in the countries examined. The speed of adjustment to the long-run relationship is governed by separate sets of coefficients depending on whether wages, prices and productivity are above or below the common trend.

The results reveal three interesting patterns. First, reversion to the common trend was much stronger in the pre-1995 subsample, when inflation was higher, indicating that wages and prices were more tightly linked in the high-inflation regime. Before 1995, it took workers two and a half years on average to recoup half of the purchasing power lost when wages had fallen behind prices. However, this half-life increases by about 50 percent in the post-1995 subsample, indicating a much slower adjustment speed. A similar pattern is also seen with the reversion of prices.

Second, the short-term sensitivity of wages to prices (and vice versa) follows a similar pattern across regimes. When we compare the low-inflation regime against the high, the short-term feedback between prices and wages is more muted and even becomes statistically insignificant.

Third, there is evidence of an inflationary bias, regardless of regime. Specifically, once a gap opens between wages and prices due to exogenous shocks, it tends to close because the variable that falls behind starts growing faster and catches up rather than through a slowdown of the faster-growing variable. This highlights the relevance of non-linearities and points to a degree of “downward stickiness” in wages and prices.

3. Understanding the facts and transitions across regimes

So much for the stylised facts. What about their interpretation and the implications for transitions across regimes? The place to start is the degree to which self-sustaining spirals can take hold. This depends critically on the “pricing power” of both firms and workers. All else being equal, greater pricing power will go hand in hand with higher inflation.

Some of the factors that determine pricing power are independent of the inflation rate – they cause it but are not caused by it. Some are cyclical, like the degree of slack in labour and product markets that the Phillips curve focuses on. Others are structural – e.g., globalisation, technology, demographics and political priorities.⁵ These factors influence the structure of labour and product markets and the behaviour of participants therein.

But a key factor determining pricing power is inflation itself. All else being equal, the higher the inflation rate, the greater the pricing power. This is because higher inflation increases agents’ incentives and ability to raise wages and prices, which in turn helps to sustain inflation. It is precisely the influence of inflation on pricing power that helps to explain why transitions from low- to high-inflation regimes can be self-reinforcing. In general, when inflation increases, behavioural changes raise the probability that higher inflation will become entrenched, not least by amplifying the impact of relative price increases. Several mechanisms are at work.

First and foremost, when inflation is very low, it may cease to be a significant factor influencing economic decisions. After all, agents’ bandwidth is limited and acquiring information is costly – leading to so-called “rational inattention”.⁶ But once the general price level becomes a focus of attention, workers and firms will initially try to make up for the erosion of purchasing power or profit margins that *they have already incurred*. And once inflation becomes sufficiently

5 For the effects of globalisation, see, e.g., Auer et al. (2017), Borio and Filardo (2007), Forbes (2019) and Gilchrist and Zakrajšek (2020); technology, see Paciello (2011); and demographics, see Juselius and Takáts (2018) and Goodhart and Pradhan (2020).

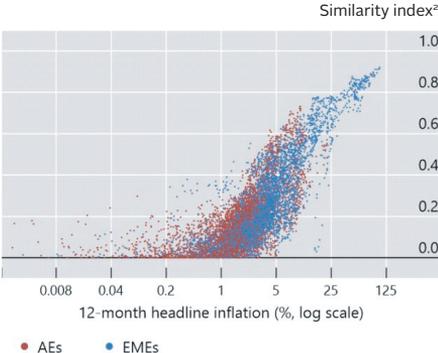
6 See the discussions in Sims (2010) and Maćkowiak et al. (2023), for example.

high and is expected to persist, they will also try to *anticipate future changes* in the general price level, as these will erode purchasing power and profit margins before contracts can be renegotiated.

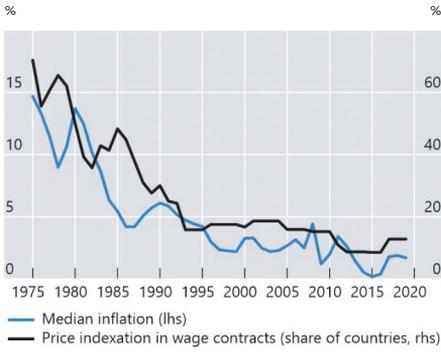
Consistent with this rational inattention hypothesis, Goodspeed (2023) finds that the average consumer’s forecasts of inflation in the United States perform poorly when inflation is low. But when inflation is high, such forecasts become unbiased, rational and efficient, and inflation moves one-for-one with them.⁷

Second, and closely related, the degree to which the *general* price level becomes relevant for *individual* decisions increases with the level of inflation. Wage earners do not care about the general price level per se but only about their own cost of living. Similarly, firms care about the general price level only insofar as it carries information about how competitors might react or about their own costs, not least indirectly, through wages. But when inflation is high, price changes become more similar (Graph 6A) and more closely linked to wages. As a result, differences in consumption patterns across consumers and input costs across firms matter relatively less.

A. Advanced and emerging market economies¹



B. Indexation in wage contracts



¹ AEs: AT, BE, CA, CH, DE, DK, ES, FI, FR, GB, IE, IT, JP, NL, NO, PT, SE and US. EMEs: BR, CL, CO, CZ, HU, KR, MX, PE, PL, RO, SG and TR.
² See Mink et al (2007).

Graph 6 – Higher inflation means more similar sectoral price changes and more indexation

Sources: OECD/AIAS ICTWSS database; CEIC; national data; authors’ calculations.

7 See Cavallo et al. (2017), Niu and Harvey (2023) and Coibion et al. (2020) for further empirical evidence.

Third, if sufficiently high and persistent, inflation will influence the *structural* features of wage- and price-setting. As inflation increases, prices and wages are likely to become less “sticky” – that is, to be changed more frequently since the cost of keeping them constant increases.⁸ In addition, indexation practices tend to be more prevalent in countries with a higher inflation history, and when reliance on indexation has declined along with the inflation rate (Graph 6B).

The bottom line is that transitions are self-reinforcing and regimes self-entrenching. When inflation settles at a low level, it loses traction on agents’ behaviour. When it increases from those levels, it tends to feed on itself. And when it becomes persistently higher, it can more easily spin out of control.

4. Monetary policy in a two-inflation-regime world

Monetary policy is a key determinant of whether a low- or a high-inflation regime prevails.⁹ The features of the monetary policy framework ultimately determine the central bank’s credibility and its ability to deliver on its mandated objectives. Within a given framework, the appropriate management of the monetary policy stance ensures that the policy response is adequate and brings inflation back to the target once it moves away.

So much is clear. What may be less appreciated is that the different behaviour of inflation in high- and low-inflation regimes has first-order implications for the conduct of monetary policy. Those implications have relatively limited consequences for the conduct of policy in a high-inflation regime: in those circumstances, there is little choice but to tighten policy in order to bring inflation down. Rather, the more interesting implications relate to the conduct of policy in a low-inflation regime and when the risk of a transition to the high-inflation one increases. Let us consider each in turn.

Monetary policy in a low-inflation regime

The dynamics of prices in a low-inflation regime allow the central bank considerable flexibility. This is because inflation has valuable self-stabilising properties: its evolution largely reflects changes in sector-specific relative prices that, for the most part, leave only a transitory imprint on the inflation rate itself. Partly as a result, wages and prices do not tend to chase each other

⁸ See, e.g., Alvarez et al. (2019) and Riggi and Tagliabracci (2022) for evidence using Argentinian and Italian micro data, respectively.

⁹ See e.g., Bianchi (2013) and Clarida et al. (2000).

higher. Flexibility in this context means that the central bank can afford to have greater tolerance for moderate, even persistent, deviations of inflation from narrowly defined targets. It is as if, having succeeded in bringing inflation under control, the central bank can enjoy the fruits of its hard-earned credibility.¹⁰ This flexibility also applies to shortfalls from targets and hence, arguably, to gradually declining prices – i.e. deflation: after all, the empirical evidence suggests that there is no systematic link between mild, if persistent, deflations and output weakness.¹¹ Indeed, episodes of sharp price declines are exceedingly rare – the Great Depression being the notable exception.

In addition, the evidence suggests that in a low-inflation regime it becomes difficult for monetary policy to steer inflation precisely. This, in turn, increases the costs of trying.

One reason for the difficulties with steering inflation is the very nature of the price changes. One would expect monetary policy to operate through the common component of inflation, which tends to reflect the driver that all price changes share. Indeed, based on a standard local projections exercise, we find this appears to be the case. Thus, since the common component declines relative to the sector-specific one when inflation settles at a low level, the traction of changes in the policy stance declines with it. In addition, at least when inflation is low, monetary policy operates through a rather narrow set of prices: when we look at the overall effect of monetary policy surprises on sectoral prices, the impact is statistically different from zero for only around one-fourth of sectors, even after three years.

Another piece of corroborating evidence is that monetary policy loses traction when nominal interest rates are very low (e.g., Ahmed et al. (2021)). Because nominal interest rates and inflation rates tend to move together, this implies more limited monetary policy traction in low-inflation regimes. Moreover, once interest rates are low, the effect tends to intensify the longer they remain low. It is not just the level but the duration that matters, i.e., the regime itself.

The more limited traction of monetary policy at low levels of inflation means that bigger moves in policy instruments are needed to produce the same impact on inflation, generating larger side effects for the real economy. This has been in evidence in the post-GFC period, during which central banks have faced difficulty lifting inflation back on target, partly owing to the structural disinflationary forces at play. Hence the need to maintain an exceptionally easy policy stance for exceptionally long – the so-called “low-for-long” phenomenon. This has been one factor behind the build-up in risk-taking and financial vulnerabilities (e.g., Borio (2022)).

¹⁰ See related arguments in Rajan (2023).

¹¹ See Borio et al. (2015) and references therein. Feldstein (2015) and Rajan (2015) go as far as talking about a “deflation bogeyman”.

Monetary policy when transitions threaten

The self-reinforcing nature of transitions from low- to high-inflation regimes puts a premium on timely and forceful responses when the risk of a transition increases. All else being equal, the cost of doing too little too late outweighs those of doing too much too early. Bringing inflation under control has generally proven costly. And the higher and more entrenched the initial inflation rate, and hence the larger the required disinflation, the greater the cost is likely to be. A broad political consensus that inflation must be brought back under control would greatly help the central bank's task. But this consensus may take time to emerge and may waver once the effects of central banks' activities necessary for bringing inflation under control take their toll on the economy.

Thus, a key challenge for central banks is how to identify the risks of a transition to a high-inflation regime sufficiently promptly and reliably. Ultimately, of course, signs of wage-price spirals are the most reliable signal of a regime shift. But by the time reliable signs of wage-price spirals emerge, the transition may have already taken place: it could be too late to limit the costs substantially.

The challenge of identifying transitions in real-time is particularly tough because it is precisely around those periods that standard models perform more poorly at predicting inflation (De Fiore et al. (2022)). For one thing, many of these models take for granted that inflation is mean-reverting. In addition, as noted above, standard models tend to assume that the parameters governing the inflation process are independent of the level of inflation itself, hence cannot change to generate self-reinforcing dynamics. Exacerbating the problem is that those parameters may well have been estimated on a sample when inflation was mainly low and stable, as is the case for many estimates available today. Put differently, the models are least valuable when needed most. No doubt, this helps to explain persistent forecasting misses as inflation surged recently, especially given the specificities of the post-pandemic recovery (Carstens (2022), BIS (2022)).

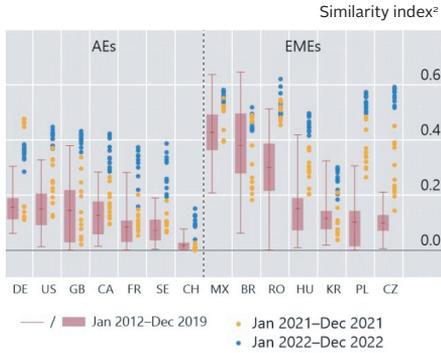
In the end, the central bank has no option but to rely on all the information that is available, both hard and soft, to form its views. What follows considers, in turn, the signals provided by disaggregated price dynamics, by measures of inflation expectations and by relatively model-free indicators, such as monetary aggregates.

Disaggregated price dynamics

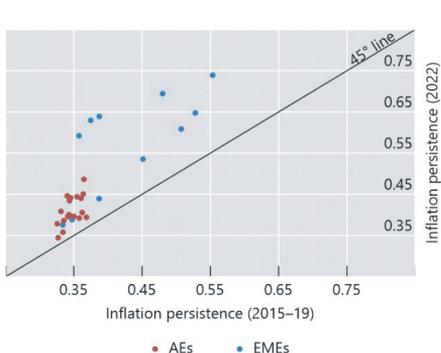
A common practice for capturing the likely evolution of inflation is to exclude the more volatile prices from the aggregate price index and calculate "core" measures of inflation. The idea is to capture only the more long-lasting influences on inflation trajectory.

Arguably, however, this practice could backfire when the risk of transition to the high-inflation regime is greatest. Salient prices play a key role around the time of transitions, and these prices tend to be precisely those volatile ones excluded from measures of underlying inflation. Around transitions, it is more likely that, in contrast to the usual pattern, headline leads core. In fact, rather than narrowing the set of prices on which to focus, looking at the more granular disaggregated behaviour of all prices may provide useful information.

A. Similarity of 12-month sectoral price changes¹



B. Pre- vs post-pandemic inflation persistence³



¹ Box plots show mean, minimum, maximum and interquartile ranges.
² See Mink et al. (2007).
³ AEs: AT, BE, CA, CH, DE, DK, ES, FI, FR, GB, IE, IT, JP, NL, NO, PT, SE and US. EMEs: BR, CL, CO, CZ, HU, KR, MX, PE, PL, RO, SG and TR.

Graph 7 – Signs of low-inflation regime being tested

Sources: CEIC, national data; authors' calculations.

Key indicators include the size of spillovers between sectors and the degree of commonality of price changes. For example, adding just a few post-Covid observations to the measure of spillovers reported in Graph 3 indicates that spillovers increased in the majority of countries (BIS (2022)). A more timely indicator, which does not require long estimation windows and relies only on cross-sectional information at each point in time, is an index of similarity of price changes across sectors (Graph 7A). This measure reinforces the same message: the similarity index was relatively high in 2021 (yellow dots) by recent historical standards (red bars) and moved even higher in 2022 (blue dots).

Another sign of a possible transition towards a high-inflation regime is an increase in the persistence of inflation. Complementing the persistence measured on aggregate data with the more granular information used to

generate the similarity index elucidates this point: persistence has increased along with the level of inflation recently in all countries examined (Graph 7B).

Inflation expectations

A complementary signal of regime transitions is the behaviour of inflation expectations.

Inflation expectations have several merits. They can provide a clear signal of changes in inflation psychology. They can be measured in a timely way. They can yield a better sense of how inflation is seen to evolve at different horizons – in contrast to measures based on price indices alone, which tend to work best over shorter horizons. And, as long as firms and workers have sufficient pricing power, they are likely to be reflected in actual inflation as prices (and wages) are reset.

At the same time, expectations need to be interpreted with caution. First, conceptually, wage-price spirals can take place even if inflation expectations do not adjust: all that is required is for workers to catch up with losses in purchasing power or firms to compensate for profit margin squeezes *that have already occurred*. Second, inflation expectations are only imperfectly measured: those inferred from market prices are contaminated by time-varying risk premia, while those of households and firms are based on surveys, which may not be very reliable.¹² Finally, the information content of expectations from different sources varies.

In the end, the proof of the pudding is in the eating. In general, inflation expectations are only noisy indicators of future inflation (e.g., Stock and Watson (2020); Binder and Kamdar (2022)). But what is their signalling value around *transitions*? The limited available evidence points to some interesting patterns. For example, a look at the behaviour of long-term inflation expectations in the United States suggests that the reduction that took place as the Fed brought down inflation through the 1980s can help explain changes in the relationship between headline and core inflation (see Box E in Borio et al. (2023b)). In addition, Goodspeed (2023) finds that, during regime changes in the United States, consumers revise their expectations more than professional forecasters do and start to expect recent inflation rate changes to persist rather than revert. Meanwhile, Reis (2022a) reports that a creeping de-anchoring of US households' expectations went hand in hand with the transition towards a high-inflation regime in the 1970s.

¹² See Weber et al. (2022) for a discussion of the challenges with such surveys.

Monetary aggregates

A once-familiar but long-forgotten possible leading indicator of inflation is monetary aggregates. This has received particular attention in the current episode after falling out of favour during the low-inflation regime period. A key reason is that money growth accelerated in many countries before the recent inflation flare-up.¹³

Indeed, there is clear evidence that the link between money growth and inflation is regime-dependent. To illustrate the point, we considered the relationship between inflation and excess money growth – the difference between the growth rates of money and real income – in a sample of countries for the period 1960–2022. When we split the observations into high- and low-inflation ones (based on different ten-year average inflation rate thresholds), we see that this relationship exists only when the inflation threshold moves out of the “low-inflation regime region” – indeed, it is one-to-one above that threshold, whether that threshold is drawn at 2% or 20%.

More to the point, the link also appears to survive around possible transitions, at least based on the current episode. For one thing, across countries, there is a statistically and economically significant positive correlation between excess money growth in 2020 and average inflation in 2021 and 2022, and also between excess money growth in 2020 and professional forecasters’ misses of inflation in 2021 and 2022 (Borio et al. (2023a)). That is, the underprediction of inflation was greater for those countries that saw higher excess money growth during the pandemic. While promising, it is hard to assess how reliable this indicator is likely to be in future. The results reported here are based on a single episode that is not yet over. In addition, during the low-inflation regime that preceded the recent flare-up, it was not uncommon for money growth to provide misleading signals.

Conclusion

This paper summarises the two-regime view of inflation. This view characterises the inflation process as two regimes – a low- and a high-inflation regime – with self-reinforcing transitions from the low- to the high-inflation one. The two regimes tend to become entrenched unless severely tested. But while inflation tends to be self-stabilising in the low-inflation regime, it is especially sensitive to relative price increases in the high-inflation one.

This view of inflation has significant implications for monetary policy. First, it suggests that it would be desirable to conduct monetary policy flexibly

¹³ See, e.g., Congdon (2022), Issing (2021) and King (2021).

in low-inflation regimes, tolerating moderate, even if persistent, deviations from narrowly defined targets. Second, it highlights the importance of being pre-emptive when the risk of a transition to the high-inflation regime increases, although assessing this risk in real-time remains challenging.

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Battling High Inflation

Christopher Erceg

Deputy Director, Monetary and Capital Markets Department,
International Monetary Fund

Abstract

Central banks face a formidable challenge in reducing inflation to their targets. This paper focuses on the appropriate monetary policy strategy for lowering inflation that takes account of sizeable upside inflation risks. It also considers how central banks should address financial stress, and highlights the benefits of fiscal restraint. With persistent inflation, risk management considerations call for maintaining a tight monetary policy stance and responding aggressively to upside inflation pressures.

This paper is based on a presentation that I gave at a conference at Corvinus University on March 15, 2023, that was sponsored jointly by the Bank of International Settlements and the London School of Economics. I would like to thank Tobias Adrian, David Hofman, Daniel Leigh, and Jesper Linde for helpful input and suggestions, as well as the conference participants. The views expressed in this paper are those of the author and should not be attributed to the IMF, its Executive Board, or IMF Management.

Central banks have taken many steps to reduce inflation from multi-decade highs, including through raising policy rates substantially and initiating reductions in their balance sheets. And EMs were quick to tighten policy, boosting their credibility and helping to curtail inflation.

But core inflation remains very high, and central banks clearly face a formidable challenge in bringing inflation down to their targets. In this paper, I focus on the appropriate monetary policy strategy for lowering inflation that takes account of very significant upside inflation risks. The paper also devotes

some attention to the important related issues of how to address financial stresses that may arise in the rapid shift out of a low-interest rate environment and how fiscal policies can help in the battle against inflation.

I argue that financial markets are probably too optimistic in their assessment that inflation can be brought down quickly without much of a slowdown in economic growth. Inflation pressures appear broad-based in many economies, and high inflation in services is likely to be difficult to bring down quickly.

Using a stylized New Keynesian model in the spirit of Clarida, Gali, and Gertler (1999), I outline conditions under which inflation may recede fairly quickly, in line with market forecasts, but also show what factors can fuel more persistent inflation. Notably, two years of very high inflation may have changed the dynamics of the inflation process so that the inflation arising from “cost-push” shocks and elevated resource pressures may have larger and more persistent effects on inflation (i.e., “intrinsic” persistence is higher). An appropriate risk management strategy – drawing on economic theory as well as the experience of the Great Inflation – calls for maintaining a tight monetary policy and acting aggressively against new upside inflation pressures. Central banks must be particularly attentive to the risk of underestimating resource pressures (Orphanides, 2002) and concluding prematurely that a modest slowdown in growth will be enough to bring inflation back to target.

The rapid shift to a higher interest rate environment may generate ongoing financial stresses, as already evidenced by the problems in UK pension funds last fall and recent US bank failures. Central banks may use a range of financial tools, including broad-based liquidity support and asset purchases, in response. These tools can be very helpful in reducing financial stress and improving the scope for central banks to achieve their mandated objectives. Even so, they have limitations, especially when solvency may be at stake (IMF, 2023b and 2023c). Thus, dealing with financial stress may pose some challenges.

Finally, broad-based fiscal restraint can ease the task of central banks in reducing inflation while ensuring that vulnerable populations are protected (Adrian and Gaspar, 2022, and IMF, 2023a). A tighter fiscal stance, by lessening the need to raise interest rates as sharply, can reduce both public debt and mitigate financial vulnerabilities.

Section II: Markets optimistic about inflation

Financial markets and many central banks continue to remain optimistic that inflation will decline fairly quickly without a significant hit to growth. Market-based inflation expectations at short horizons have declined from highs of 5-6

percent in the spring of 2022 for the euro area and the U.S. to close to 2 percent. And current market forecasts of inflation over the next couple of years, shown relative to central bank targets in Figure 1, indicate sharp drops even for many EMs still experiencing torrid inflation well into double digits. These sanguine expectations for inflation underpin an expected easing of policy rates later this year or next.

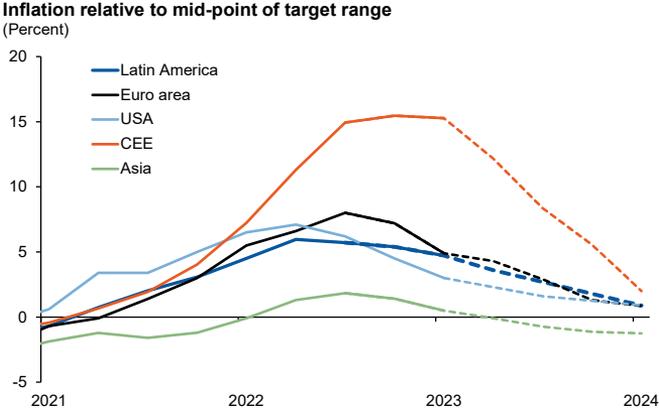


Figure 1: Markets forecast inflation will decline fairly quickly

Sources: Bloomberg Finance L.P., IMF WEO, IMF staff calculations

Market forecasts seem consistent with the view that inflation is largely driven by supply shocks associated with higher energy prices and pandemic-related supply-side disruptions. While the supply shocks are clearly more persistent than initially envisioned, they are still expected to gradually dissipate with little need for much of a contraction in activity or employment.

It is comforting that measures of longer-term inflation expectations – both survey and market-based – have remained close to target even as realized inflation has run persistently high. This stands in sharp contrast to the Great Inflation period when high inflation realizations – including the ramping up in food and energy prices in the late 1970s – had large effects on inflation expectations, including at longer horizons, and made the task of taming inflation much more costly (Levin and Taylor, 2013). The strong anchoring of longer-run inflation expectations reflects a high degree of confidence in the credibility of central banks to meet their inflation objectives. This confidence has been nurtured through major improvements in monetary policy frameworks over the last few decades, including the adoption of explicit inflation targets and enhanced central bank communication about how they will achieve their

goals. These efforts – which have taken place in many emerging markets as well as advanced economies – should ease the task of reducing inflation and mitigate the fallout to the real economy. But that doesn't mean that the task will be easy.

Section III: Risk management with upside inflation risks

Financial markets have probably taken too much signal from falling energy and non-energy goods prices and appear to be too sanguine in their view – often broadly shared by central banks – that inflation can be reduced quickly, even without much slowing of economic growth.

While supply-side factors have played an important role in fueling inflation, a sizeable component of inflation seems to be demand-driven and spurred by the combination of massive fiscal stimulus and monetary easing during the pandemic. These easing measures were pivotal in avoiding a much sharper downturn and helped facilitate a rapid recovery, but they have left a large overhang of inflationary pressure. While the demand stimulus initially fell on goods and resulted in sharp increases in goods prices, the re-opening of economies in mid-2021 spurred a pivot to services, where demand pressures remain strong. Services inflation is running at roughly six percent in the United States and many advanced economies, far above the roughly three percent that prevailed for two decades before the pandemic. Services have a large labor component, and inflation in services has been underpinned by strong labor markets and robust wage growth.

While it is possible that these inflation pressures will ebb fairly quickly, it seems much more likely that real activity will have to slow markedly – and labor markets cool – in order to bring down these stickier components of inflation. There's little historical precedent for reducing inflation from high levels without fairly sizeable growth slowdowns, as was well-documented by extensive literature following the Great Inflation; Ball (1994), for instance, considered a large number of disinflationary episodes in advanced economies and found a sacrifice ratio averaging 1.4. Recent research by Chari and Henry (2023) shows how policy tightening aimed at reducing inflation in emerging markets has also typically been accompanied by pronounced output contractions.

Policymakers must also be highly attentive to upside inflation risks and maintain a tight monetary policy stance, at least until there is clear evidence of a sustained decline in inflation, including in services and nominal wages (Adrian, Erceg, Natalucci, 2022). While a new spate of adverse supply shocks is an obvious risk, several factors also pose key upside risks to inflation and require close

attention. First, real activity hasn't slowed enough to create the resource slack needed to bring down inflation. Second, the natural rate of unemployment may have risen – and potential output fallen – meaning that even more slowing of activity and labor market cooling will be required to reduce inflation. Third, two years of high inflation may have altered the dynamics of price- and wage-setting so that inflation responds more persistently to output gaps or cost shocks. And fourth, the short-run interest sensitivity of the economy may have diminished so that a given-sized policy hike has less braking power.

Structural models offer useful perspective for considering how these factors could influence inflation outcomes, as well as shed light on the conditions that could deliver an inflation path close to what markets envision. For concreteness, it's helpful to explore the potential sources of inflation risk in the context of a stylized New Keynesian Phillips Curve in the spirit of Clarida, Gali, and Gertler (1999):

$$\pi_t = i_p \pi_{t-1} + \delta(\pi_{t+1|t} - i_p \pi_t) + \kappa(y_t - y_t^*) + \mu_t \quad (1)$$

Here, inflation π_t depends on its own lag, on expected inflation $\pi_{t+1|t}$, on the current output gap $y_t - y_t^*$, and on markup or “cost-push” shocks μ_t ¹. The IS curve, in turn, links output to its own lag – reflecting habit persistence – and to the gap between real interest rate $i_t - \pi_{t+1|t}$ and the equilibrium real rate r_t^* :

$$x_t = \phi x_{t-1} + (x_{t+1|t} - \phi x_t) + (1 - \phi)\sigma(i_t - \pi_{t+1|t} - r_t^*) \quad (2)$$

Solving the aggregate supply curve (1) forward yields:

$$\begin{aligned} \pi_t = & i_p \pi_{t-1} + \delta^T (\pi_{t+T|t} - i_p \pi_{t+T-1|t}) + \kappa \sum_{j=0}^{T-1} \delta^j (y_{t+j|t} - y_{t+j|t}^*) \\ & + \sum_{j=0}^{T-1} \delta^j \mu_{t+j|t} \end{aligned} \quad (3)$$

Assuming that medium-run inflation expectations are well-anchored at target, this specification indicates that inflation will remain above target if past inflation has exceeded the target, if current and discounted future output gaps are expected to be positive, or if cost-push shocks are expected to persist. The lag of inflation captures both standard accelerationist channels, such as the indexation of price or wage contracts, as well as the possibility that some component of inflation expectations may be adaptive and depend on past

¹ For expositional simplicity, the aggregate supply curve (1) omits the lag of the output gap that arises due to habit persistence.

inflation. These features tend to make disinflation costly because they imply that resource pressures in the past – or cost-push shocks – can have long-lived effects on inflation that intensify as i_p rises.

Viewed from this perspective, the market forecast – that inflation will come down quickly without much slowing in activity – can be understood as predicated on several key factors. These factors include that adverse supply shocks continue to dissipate, and medium-term inflation expectations remain well-anchored (as, in fact, seems consistent with both market-based measures and household expectations at a medium-term horizon). Crucially, the market forecast is predicated on the view that the “intrinsic” inflation persistence parameter i_p is not very high, so that high past inflation – whether due to tight labor markets or cost-push shocks – has little relevance for current inflation. Thus, output doesn’t need to fall below potential to bring inflation down – monetary policy just has to avoid persistent overheating going forward.

Empirical estimates of Phillips Curves based on data during the Great Moderation period are generally supportive of limited intrinsic inflation persistence. Rearranging equation (1) to facilitate comparison with the literature, the coefficient on the lag of inflation can be written as $\gamma_L = \frac{i_p}{1+i_p\partial}$ and the coefficient on the lead of inflation as $\gamma_F = \frac{\partial}{1+i_p\partial}$, with these reduced form coefficients summing to one if either i_p or ∂ equals one. Estimates of the coefficient γ_L in the range of 0.2-0.3 are common using quarterly data (Baba et al., 2023). These estimates are consistent with inflation falling quickly once supply shocks dissipate and without much need for output or employment to contract. Such an outcome is illustrated in Figure 2 (solid lines), which shows the effects of a persistent cost-push shock, assuming that monetary policy follows the Taylor rule (here we set $i_p = 0,4$ and $\partial = 1$, so that γ_L is a little under 0.3, $\kappa = 0.015$, and the IS curve parameters $\emptyset = 0,7$ and $\sigma = 1$). The quick decline in inflation – and small output hit, at least relative to the large initial rise in inflation – seems broadly in line with the path envisioned by markets shown in Figure 1. While the responses shown are based on a Taylor rule, they would be similar under an optimal policy rule derived from a quadratic loss function assuming low intrinsic persistence. This reflects that it doesn’t make sense to try to offset much of the shock given that it is costly and takes time to cool aggregate demand, while inflation is expected to be fairly short-lived.

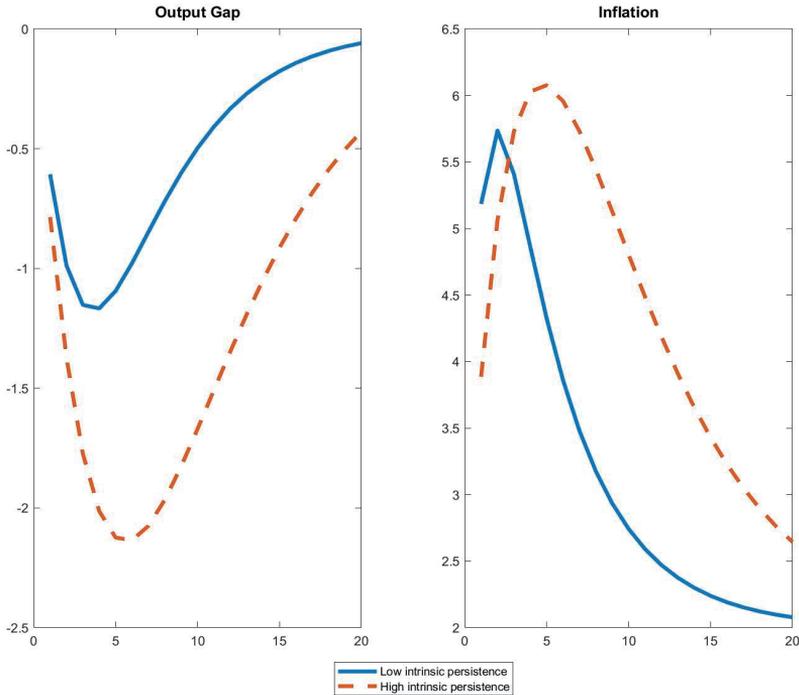


Figure 2. Cost-Push Shock: Low vs. High Intrinsic Inflation Persistence

However, policymakers face a more formidable task if inflation has more intrinsic persistence than suggested by historical estimates and the economy proves difficult to slow down. In particular, the low intrinsic inflation persistence of the pre-pandemic environment likely reflected some degree of rational inattention: households and firms didn't have much reason to take account of inflation in their decision-making, including in wage and price-setting decisions. For much of the Great Moderation period, inflation fluctuated around central bank targets and showed little autocorrelation. Thus, even a sizeable rise in inflation above 2 percent – which would depress real wages, *ceteris paribus* – wouldn't be expected to be accompanied by much additional inflation and corresponding real wage declines. But with large and persistent deviations of inflation from the target for two years running, households may demand more catch-up adjustments when negotiating wages, and firms may be much more willing to pass on cost increases – developments that find empirical support in an insightful recent paper by Borio et al. (2023).

The risk that inflation persistence could increase is likely to be more acute for emerging market economies where inflation expectations are less well

anchored and can be more easily dislodged by prolonged periods of above-target inflation. These economies often make more widespread use of indexation in wage and price contracts, a legacy of high past inflation.

A higher level of intrinsic inertia implies that cost-push shocks have much more persistent “second-round” effects. The dashed lines in Figure 2 show the effects of the same cost-push shock as before but with a considerably higher degree of intrinsic persistence so that the backward-looking coefficient γ_L equals 0.5 (here we set $i_p = 1$ and $\partial = 1$). Inflation rises persistently even though output falls well below potential, with the latter reflecting that real interest rates rise as prescribed by the Taylor rule.

The inflation rise would, of course, be larger and more pronounced if the central bank pursued a less aggressive stance so that output contracted by less, or let output run persistently above potential. The latter may occur if the central bank overestimates potential output y^* , and unintentionally lets the economy run hot for some time (Orphanides, 2002). Such a mistake would have transient effects on inflation if intrinsic persistence were low, at least presuming that the central bank caught on fairly quickly and had the scope to slow the economy fairly quickly. But it could have more pernicious effects if intrinsic inflation turned out to be high and if monetary policy had limited power to “break” the economy in the near term without very sharp rate hikes (i.e., the short-run interest-elasticity of the economy is low).

Such an environment captures some of the key risks that policymakers face at the current juncture and which pose sizeable upside risks to inflation. Notably, despite significant policy tightening, resource pressures may still be quite high given that real activity hasn’t declined much in many economies and labor markets remain strong. And these pressures may be understated by standard metrics to the extent that the pandemic may have raised the natural rate of unemployment (Blanchard, Domash, and Summers, 2022). If intrinsic inflation persistence has risen markedly relative to the Great Moderation period, then the confluence of resource pressures and earlier cost-push shocks could translate into much slower progress in bringing inflation to target, as suggested by Figure 2. As a corollary, while allowing output to run near potential makes eminent sense if intrinsic persistence is low, it would be highly problematic if intrinsic persistence were higher: inflation could get stuck at a high level if monetary policy is only tight enough to push output back to its potential level from above.

Given these upside risks, there is a strong case for monetary policy to maintain a tight stance to curtail persistent inflationary pressures and react aggressively to further upside surprises. This intuition is well captured by an optimal policy rule based on a quadratic objective function in which the welfare loss depends on the variances of the inflation and output gaps –often called a

‘targeting rule’ in the seminal contributions of Svensson (2003) and Woodford (2003). Specifically, using the aggregate supply function given by (1) but assuming for simplicity a purely backward-looking specification for inflation so that $\delta = 0$, the rule calls for the policymaker to depress output by more, and thus push output further below potential, to the extent that inflation is expected to persist:

$$x_t = -\frac{\kappa}{\lambda} \sum_{j=0}^{\infty} i_p^j \pi_{t+j} \quad (4)$$

where λ is the weight on the output gap term in the loss function. If intrinsic inflation persistence is high, then the benefits of pushing output below potential are higher because doing so reduces inflation not only today but in future periods.

Applied to the current environment, a central bank may have a modal assessment not far from that of the markets – viewing intrinsic inflation persistence as limited so that inflation will come down fairly quickly as cost pressures dissipate and economies cool. But even so, risk management considerations would call for taking out substantial insurance against the plausible risk that inflation pressures prove more persistent by maintaining a tighter policy than suggested by the modal outlook and reacting more aggressively to new upside inflation pressures. And more tightening may be needed if demand remains too robust to be consistent with inflation returning to central bank targets.

Section IV: Tight monetary policy and financial stress

Maintaining a tight monetary policy stance can have obvious costs for activity and employment – as seen in Figure 2 – but may also generate financial stresses that require navigating difficult tradeoffs between achieving price, employment, and financial stability objectives. Of course, some tightening of financial conditions – beyond that reflected in the policy rate – is a salient feature of monetary tightening. Given that what matters for activity is the interest rate faced by households and firms, the central bank can lower the policy rate path if credit spreads widen moderately while still keeping overall financial conditions consistent with its policy objectives.

But the problem is more formidable if the stresses threaten to spiral and create serious downside risks. Recent events – including the failure of several U.S. banks in March – suggest that there may be ongoing strains in the coming months, given the rapid exit from a low interest rate environment. In the Euro

Area, fragmentation risks may resurface. And while emerging markets have fared well so far, they could face financial stresses arising from the need to fight high domestic inflation pressures that may be compounded on the external side by advanced economy tightening.

Central banks may use a range of familiar tools to counter significant financial stresses. These tools may include various forms of liquidity support and asset purchases. Treasuries and other public authorities may also need to play a key role, including to address solvency issues and to provide equity backstops for central banks (IMF, 2023c). Such backstops can facilitate more aggressive central bank action by underscoring political support and limiting risks to central bank balance sheets.

The use of multiple instruments can reduce financial tail risks and allow the central bank to tighten more forcefully if needed to restore price stability – and, by corollary, reduce the risk that policy will be too accommodative due to concerns about financial stability risks. For instance, tools such as the ECB’s TPI can improve outcomes both at an aggregate level and potentially across regions: while the benefits for more vulnerable economies are clear, it could also help contain overheating in core economies by allowing the ECB to raise policy rates more quickly.

While these tools can be very useful for easing financial stresses and improving policy tradeoffs, they have limitations, and there are tangible risks associated with using them (IMF, 2023c). As noted, if there is a solvency issue, it must be addressed by government action. And while central banks have broad scope to provide liquidity to banks, their ability to address financial stresses in the nonbank sector is typically much more circumscribed. For example, they have much less ability to assess whether the nonbank institution is even solvent, given that they don’t have supervisory oversight (IMF, 2023c).

Concerning the risks, central bank actions to offset financial stresses present particularly difficult communication challenges in the context of a fight against inflation. Providing liquidity support and expanding the balance sheet in the midst of a battle against inflation could lead to confusion about the policy stance and whether the central bank is truly committed to inflation reduction (especially if the liquidity support is coupled with some reduction in the policy path to keep overall financial conditions broadly unchanged). And, as emphasized by a long literature, the use of liquidity support and asset purchases may raise both moral hazard and political economy concerns – ‘picking winners and losers’ – depending on how they are deployed. These risks can be allayed through well-designed programs that are temporary and targeted but nonetheless merit substantial consideration in gauging what specific approaches to use and their modalities.

All in all, while these financial tools help, central banks may still face challenges in dealing with financial stress.

Section V: The role of fiscal policy in reducing inflation

While the central bank must control inflation irrespective of the stance of fiscal policy, fiscal restraint can also be helpful in reducing inflation (Adrian and Gaspar, 2022 and IMF 2023a). Given that monetary policy works heavily through its effects on interest-sensitive sectors and the exchange rate, a stringent monetary stance can generate financial stresses both at home and abroad. Because fiscal restraint reduces the need to raise interest rates as much, it improves debt sustainability and reduces the risk of financial stresses – with particularly beneficial effects on EMs. Fiscal restraint can and should be deployed in a way that achieves these benefits while still protecting vulnerable populations.

The benefits of fiscal consolidation can be illustrated using simulations of a multicountry DSGE model that draws on the model of Chen et al. (2022). The responses shown are relative to a baseline in which inflation runs well above target due to a combination of positive demand and adverse supply shocks. The fiscal and monetary tightenings are scaled to have the same effect on output but also turn out to imply nearly the same effect on core inflation, as can be seen by comparing monetary tightening shown by the blue bar and fiscal tightening by the red bar in the left panel. But the middle panel shows that fiscal consolidation has very different implications for the interest rate – which falls rather than rises – and also implies a sizeable contraction rather than a rise in public debt (the right-hand panel).

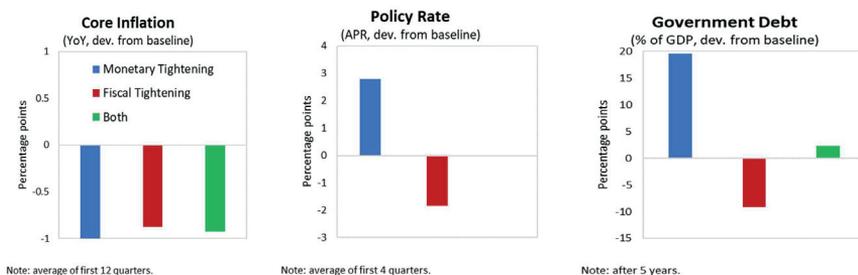


Figure 3. Fiscal tightening can cool inflation and reduce public debt

Source: Chen, Goncalves, Jakab, and Linde (2022)

It is important to differentiate standard fiscal policy actions – expenditure cuts and broad-based tax increases – from more heterodox approaches to fighting inflation that may involve energy subsidies, export restrictions designed to lower domestic prices, or policies that directly restrain wage or price adjustment. Notably, energy subsidies have been widely used in Europe and around the globe to cushion

the income effects of massive energy price increases and reduce inflation. These policies may appear attractive from the standpoint of individual countries and can reduce inflation, at least in the short term, under some conditions – for example, when nominal wages are indexed to consumer prices.

However, these policies have important downsides. They typically reduce the incentive to conserve energy and may be counterproductive if used by a broad set of countries – by pushing up the pre-subsidy energy price, they may raise core inflation as well as have adverse spillovers to vulnerable countries that don't have the fiscal capacity to deploy subsidies (IMF, 2022 and Auclert et al. 2023).

Section VI: Conclusion

In conclusion, I'll simply note that the tradeoffs associated with policy tightening may become more difficult as the adverse effects on output/employment become more pronounced and if financial stresses intensify. Central banks may face increasing pressure to ease policy as unemployment rises and inflation keeps falling. But loosening prematurely could risk a sharp resurgence in inflation once activity rebounds. Hence, central banks should remain resolute and focus on bringing inflation back to target, and it is crucial that they continue to maintain a high level of operational independence to enable them to do so.

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What can keep euro area inflation high? An update, six months later*

Ricardo Reis

A. W. Phillips Professor of Economics,
London School of Economics and Political Science

Abstract

In October of 2022, I laid out the different dangers that could prevent the ECB from hitting its inflation target by the end of 2024. This note reviews which of these seem to be applicable six months later. It concludes, optimistically, that the ECB has so far avoided most forms of dominance.

Keywords: monetary policy, interest rates, central bank independence.

JEL codes: E58, E50, E31.

1. Introduction

Almost exactly six months ago, I wrote, presented, and discussed an article at the *Economic Policy* conference on inflation in the euro area (Reis, 2023*b*). The question I asked was this: Starting from a situation of high inflation, when would an interest-rate-setting central bank fail to raise policy rates enough because it became dominated by other factors or agents (with

* Am grateful to Előd Takáts for the invitation to contribute to this event and volume, and to Andrés Velasco and Agustín Carstens for their comments and discussions. This research was financially supported by UKRI grant 109166. Contact: r.a.reis@lse.ac.uk.

application to the challenges facing the ECB in 2023-24)? More succinctly: *what could prevent the ECB from achieving its 2% inflation target by the end of 2024?*

Because I was taking a medium-term perspective that looked 26 months ahead, the ability and the desire to hit this target were uncontroversial. After all, the mandate of the ECB is clear, and the fact that it can hit its target in the medium term was confirmed repeatedly during the successful first twenty years of the euro's life. Central banks always face trade-offs, and they must balance the multiple consequences of their actions in the short term. But, in the medium term, these trade-offs should be milder or absent altogether. If inflation is not 2% by the end of 2024, then the central bank must have found itself overwhelmed by another economic force or have given in to another economic agent with an irreconcilable goal. Following a long tradition in economics, I used the word *dominated* to describe such a situation. Starting with the presumption that the ECB will succeed, I went through a series of scenarios in which it might fail to hit its medium-term inflation target. These are summarized in Table 1, reproduced below.

That paper made no forecasts or even showed any data with which one could make a diagnosis. It simply raised red flags about what could go wrong. This short note looks at the developments in the data over the last six months to assess whether some of these forms of dominance were present and how they resolved themselves.

To start the discussion, Figure 1 shows the familiar headline inflation series for the euro area. The figure also plots percentiles of inflation in individual sectors for the components of the harmonized index of consumer prices. Clearly, this period has involved large variability in relative prices, and there are no signs of this slowing down. Also in the figure is a measure of pure inflation calculated using the method of Reis and Watson (2010). It is close to a flat line, consistent with most of the variation in inflation within the last two years being correlated with changes in relative prices. This relative-price variability testifies to the large shocks that have hit the euro area during this time to which monetary policy had to respond.

Table 1: Signs of dominance preventing a Central Bank from lowering inflation

Type of dominance	Obstacle to raising policy rates
Misjudgment	<ul style="list-style-type: none"> persistently underestimating how high rates must be raised excessive reliance on low r-star
Expectations	<ul style="list-style-type: none"> failing to talk tough because of desire to be popular failing to act tough and neglecting the need to overshoot the neutral rate
Fiscal	<ul style="list-style-type: none"> tempted by the short-term fiscal benefit of higher inflation, neglecting long-term fall in debt revenue overusing balance-sheet policy leading to large losses that require recapitalization jeopardizing the legality of the euro by engaging in large transfers across regions
Financial	<ul style="list-style-type: none"> yielding to groups lobbying for respite from redistribution impacts unwilling to use macro-prudential and liquidity policies to handle financial stress getting caught in a diabolic loop between banks and sovereigns
Recession	<ul style="list-style-type: none"> over-relying on the Phillips curve, which gets steeper as inflation persists overestimating potential output
External	<ul style="list-style-type: none"> following foreign central bank that lets inflation drift to prevent adjustments in exchange rates and capital flows
	<ul style="list-style-type: none"> being too averse to relative-price and relative-output adjustments that are needed

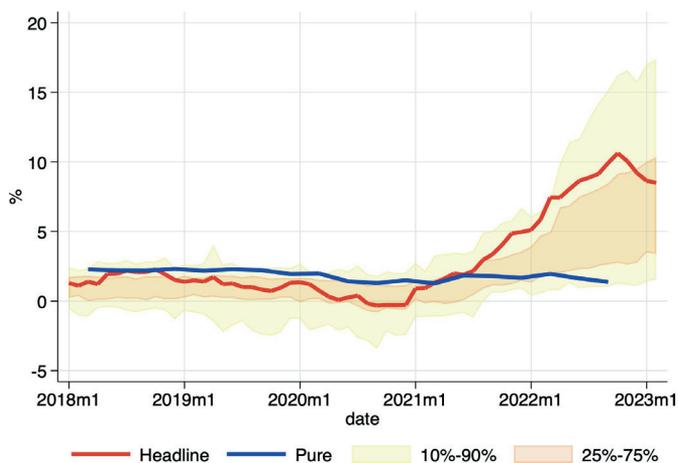


Figure 1: Euro area inflation: headline, pure, and sectoral

2. Misjudgment dominance

As I wrote six months ago, a central bank is *dominated by old ideas* when it clings to out-dated theories or measurements of the economy, finding excuses for why inflation is rising that absolve its policymakers from their responsibility. The first main misjudgment that I identified was a reluctance to realize that bringing down inflation required raising interest rates sharply. The second was sticking to the pre-pandemic belief that the long-term trend in the rate of return, “r-star” as it is called, would be low forever. This would trigger the temptation to cut policy rates too quickly to converge to that r-star plus the inflation target.

Figure 2 shows the euro’s short-term rate, which is almost always close to the policy rate set by the ECB, and the forward curve for it at different dates over the last twelve months. With regard to the first concern, it has clearly not been there. The ECB has not been reluctant to raise rates. In fact, it has done so more aggressively than at any time in its (admittedly short) history. Moreover, the ECB has, throughout this period, been more resolute than markets expected it to be. According to the latest forecast, the ECB has convinced those market participants that interest rates will stay high for a long time.

This determination shows a central bank not dominated by old ideas and one that is using the right judgment to bring down inflation. At this point, it is less clear whether hitting the medium-term inflation target requires many more increases in interest rates. Also, for this reason, the ECB shows no obvious signs of suffering from misjudgment dominance on either side.

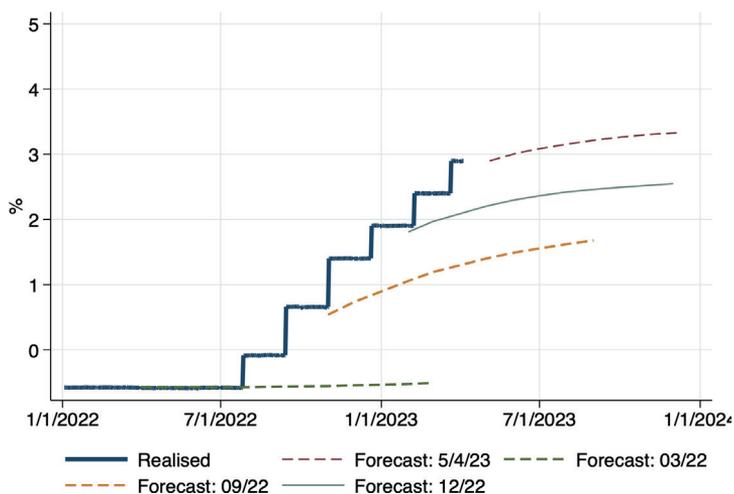


Figure 2: Euro area short-term rates: actual and forecasted

3. Expectations dominance

From the previous paper: a central bank is *dominated by expectations* when expected inflation is persistently high and the central bank does not talk tough and act tough enough to re-establish its credibility and reputation.

The ECB has certainly started talking and acting tough on inflation, even if this makes it unpopular in some circles. As the previous section discussed, the ECB has raised rates, and they are today likely near or above the neutral rate. Is this working?

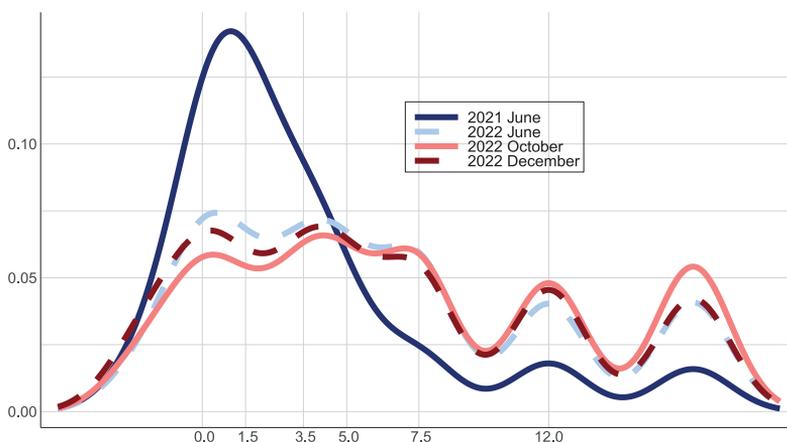
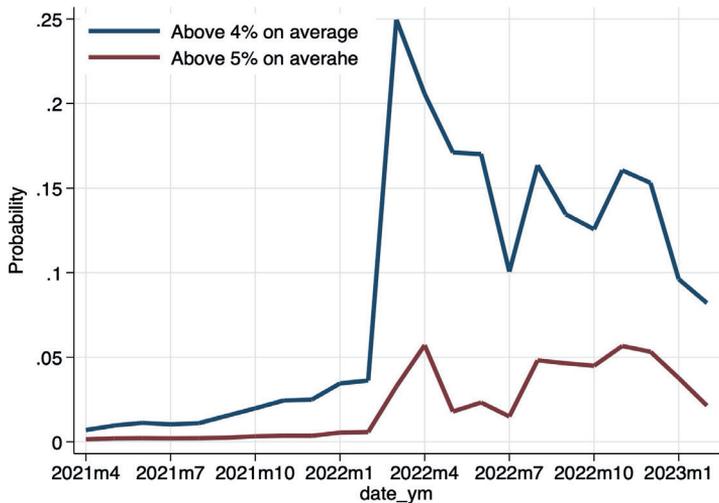


Figure 3: Expected inflation in the euro area
(a) Densities across respondents of the ECB consumer survey

The top panel of Figure 3 shows the distribution of expected inflation one year ahead in the ECB's survey of households (for more details, see Reis, 2023a). Progress has been modest. Unlike in the US, where there has been a clear decline in the mass on the right tail, an increase in mass in the left tail, and a shift of the median to the left, for the euro area there are still only modest signs of improvement over the last six months of 2022. Households do not believe that inflation is about to come down quickly.

The bottom panel shows instead the view from the markets, in the form of the probability that there will be an inflation disaster over the next five years according to inflation swaptions (see Hilscher, Raviv, and Reis, 2022, for details). Here the news is a little rosier, as there has been a clear decline in the last six months. Whether this arose from a fall in inflation risk premia or subjective expected inflation, both should be welcome.

Altogether, the signs from the expectations data are only tentatively positive.



(b) Tail probabilities from options, 5-year horizon

4. Fiscal dominance

A central bank is *fiscally dominated* when it does not bring inflation under control because this would put a strain on the government's budget.

One of the fears of this dominance taking over was that the ECB would keep buying long-term government bonds to keep its yields down, even as it was raising short-term interest rates. The intention of such a policy would be to make those bonds scarce, increasing their specialness and keeping debt revenue high in the fiscal accounts. The dominance would arise because, inevitably, this would lead to losses by the central bank, jeopardizing its solvency. The top panel of Figure 4 shows the evolution of the ECB's balance sheet. Since October, it has been falling sharply in nominal terms (and even more sharply in real terms, given the high inflation) as the ECB ended or reverted some of its previous asset purchase programs. In contrast to earlier fears, this caused no run on public debt.

The bottom panel shows instead the evolution of public debt, where the numbers for 2023 and 2024 come from the IMF forecasts in its Fiscal Monitor. The inflation of the last year and a half allowed for a sharp reduction in real public debt in 2022. But, have governments responded by raising spending or cutting taxes to take advantage of this new fiscal space, neglecting that this is a one-off gain that will disappear as soon as inflation is brought down? And, if so, does this provide an early warning of fiscal dominance that is about to come in the form of the short-term temptation to inflate even more of the debt?

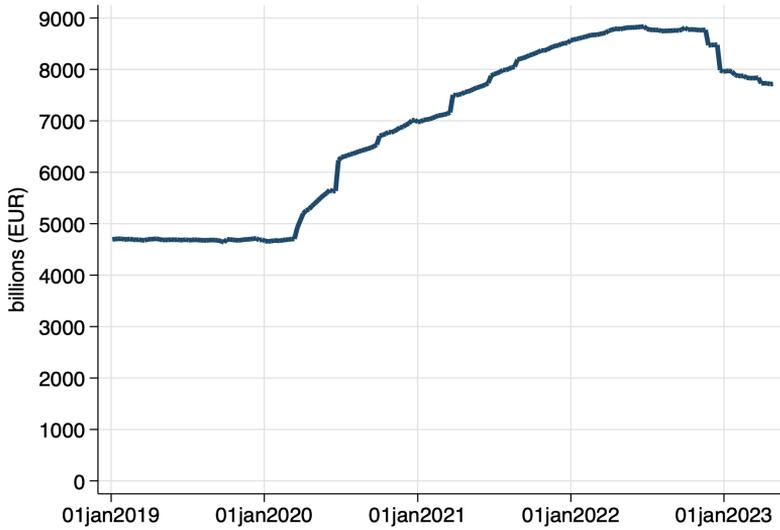
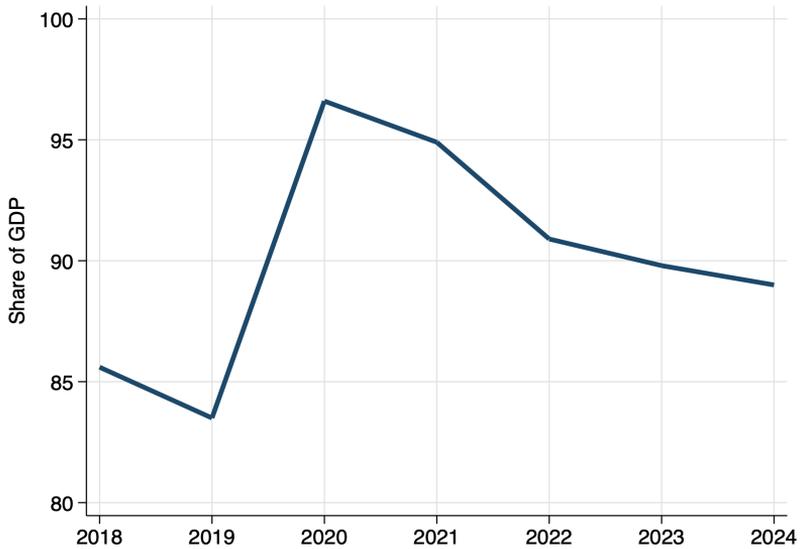


Figure 4: Liabilities of the ECB and the Euro area governments
(a) ECB balance sheet in billions of Euros



(b) Euro area gross government debt as a share of GDP

Using the IMF's Fiscal Monitor calculations for France, one of the largest members of the euro area, this does not seem to be the case, at least for now. In 2022, inflation lowered the debt by 3.2%. The primary deficit was 3.0% when it had been 1.7% in 2019, before the pandemic and without any of the measures for dealing with the energy crisis. So, the primary deficit increased by less than half of the fall in debt. For the euro area as a whole, the cyclically adjusted primary deficit is forecast to be 1.9% in 2023 and 0.9% in 2024, when it was a surplus of 1.3% in 2018 and 0.7% in 2019. Here as well, the fall in the public debt due to inflation is a little less than twice as much. Of course, these are just forecasts. But, at least for now, governments do not seem to be heading toward triggering fiscal dominance.

5. Recession dominance

The central bank is *dominated by the fear of a recession* if it persistently raises policy rates too little or too late because it will not tolerate even a mild recession along the way. As I wrote, this may come in two forms. Sometimes, the central bank starts believing that the Phillips curve is so flat, even in the medium-term, that bringing inflation down will bring about an intolerably deep recession. At other times, the central bank overestimates potential output or underestimates the natural rate of unemployment, so it starts seeing a recession and pauses its hike in interest rates too early.

Figure 5 shows the Beveridge curve for the euro area; an imperfect way to measure the tightness of its labor markets. Through 2021 and the first half of 2022, unemployment fell, while vacancies rose almost monotonically, a path consistent with a tight labor market in an overheated economy where monetary policy had been too loose. In the second half of 2022, there was a small decline in vacancies with unchanged unemployment. Throughout the ECB's tightening cycle, significant unemployment did not materialize, and the Beveridge curve turned out to be steeper than anticipated. Likewise, in the first months of 2023, inflation has fallen with no appreciable increase in unemployment, consistent with a steeper Phillips curve. It is much too early to tell, but so far the predictions from theory that a deep recession would not be necessary for bringing inflation down have been borne out. The ECB did not let itself get dominated by the fear of a recession.

This is not to say that a recession is not on the way. It may well be. Whether, when unemployment rises, the ECB will overreact because of an underestimate of the natural rate will only be known when it happens. But, for now, the signs are encouraging.

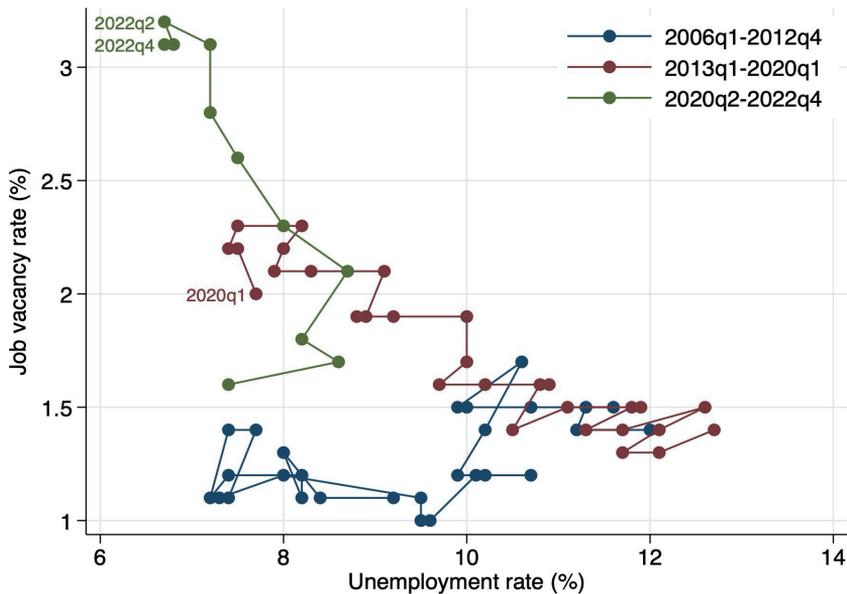


Figure 5: Euro area labor market tightness – the beverage curve

6. Foreign dominance

The central bank is *dominated by external forces* if it resists bringing inflation down because it fears the flows of capital and movements in exchange rates that might result. The main concern I raised was that the Federal Reserve would not be committed to bringing inflation down, and the ECB would follow its lead, away from its own mandate.

So far, the Federal Reserve has also avoided the forms of dominance discussed so far. Moreover, judging by expectations, it is slightly closer to being on track and hitting the inflation target by the end of 2024 than the ECB. Figure 6 shows the distributions of US inflation outcomes on average over the next five years according to financial markets. Between the start of 2021 and the middle of 2022, these worsened considerably. The median shifted rightwards, and the mass on the right tail became thicker. By October, when I wrote my article, there was already some significant improvement. Since then, the improvement has been more marked. In fact, according to these market forecasts, there is almost as much likelihood of the Fed significantly overdoing its efforts to bring inflation down as there is of it underdoing it.

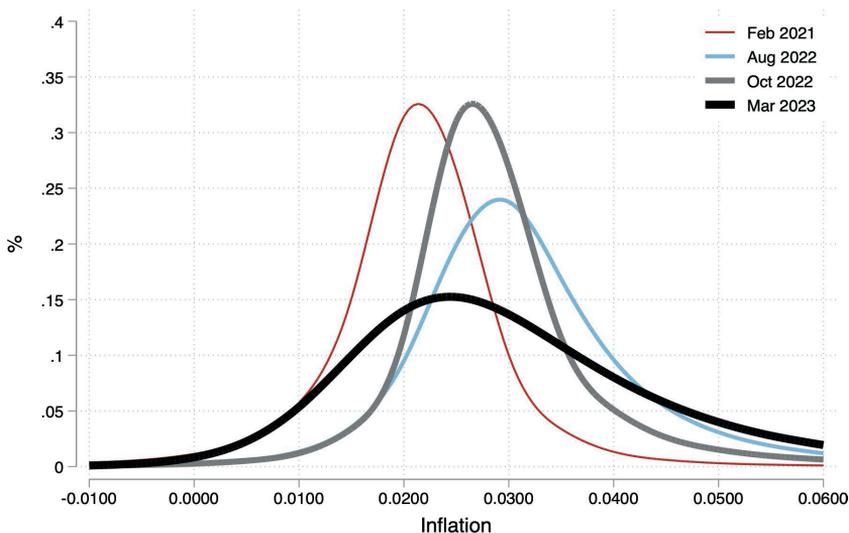


Figure 6: Probability densities for US 5y inflation from financial prices

On the one hand, uncertainty about future inflation is high. On the other hand, it is two-sided and consistent with the Fed sticking to its inflation target. Either way, the foreign dominance of high inflation is not showing up.

7. Conclusion

This note is a progress report, not a diagnosis. The previous article contained a clear date for that diagnosis—the end of 2024—and we are still far from this. Using the warning posts laid out in that article, this report operationalized them to provide an interim progress report six months later. So far, the signs from the data are encouraging: most of the forms of ECB dominance have been avoided. The missing form, not covered here, is financial dominance. It is too early to judge it.

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Central banks fighting inflation in advanced and emerging markets – The case of Hungary

Zsolt Kuti

Executive Director, Central Bank of Hungary

Abstract

In 2021-2022, a surge in inflation was observed in most economies across the world. Nearly all central banks responded to this by tightening their monetary policy stance. The Magyar Nemzeti Bank (the central bank of Hungary) was one of the first to do so. We review the main factors behind inflation in Hungary and the steps the Magyar Nemzeti Bank took to fight excessive price growth in line with its mandate. Although several effective measures have helped bring inflation down and contribute to financial market stability, there are some challenges that remain. We propose that if these obstacles are overcome, Hungarian inflation can be reduced to the single-digit range by the end of 2023.

Keywords: inflation, monetary policy, financial markets

JEL classification: E31, E52, E58, E66

1. Introduction

For most of the previous decade, central banks needed to take measures to reach their inflation targets from 'below'. Following the Global Financial Crisis and the European sovereign debt crisis, most countries in the euro area experienced

inflation well below the target of the European Central Bank, while some faced the danger of possible deflation. At the same time, central banks around the world – including the Bank of England and the Federal Reserve – struggled to hit their respective inflation targets. Consumer price indices remained moderate despite loose monetary conditions and several so-called unconventional measures aimed at further easing financial conditions.

Following the coronavirus pandemic, the inflation picture changed as successful crisis management led to a quick economic recovery. Lockdowns caused fragmentation in international supply chains and a postponement of economic activity, while several measures were implemented by central banks and governments to ease financial conditions in order to keep households and businesses afloat. After the lockdowns were lifted, demand for goods and services was virtually unscathed while supply struggled to match it. As a result, a surge in inflation has been observed in several economies across the world in recent months.

At first, the world's leading central banks thoroughly considered the challenges posed by rising inflation. Inflation was initially thought to be transitory and liable to quickly decrease with the easing of supply bottlenecks. On the other hand, central banks in some emerging economies, such as the Magyar Nemzeti Bank (the central bank of Hungary, henceforth MNB) and the Czech National Bank, were some of the early birds who pointed out the upside risks surrounding the inflation outlook. Eventually, as consumer prices continued to soar, most central banks recognised that inflation would be persistent unless decisive action was taken.

In line with their mandates, a great number of central banks took on the task of putting an end to soaring prices by tightening their monetary policy stance. In addition to raising interest rates, many phased out their quantitative easing programmes, while some – including the Bank of England, the Federal Reserve and the European Central Bank – introduced quantitative tightening measures in order to scale down their balance sheets.

The Magyar Nemzeti Bank was prepared to fight inflation as well. In addition to being the first in the European Union to begin a cycle of interest rate hikes, the MNB was also one of the most hawkish central banks at a time when “hawkishness” was needed (Baksay, 2022). Meanwhile, the central bank also took measures to stabilise financial markets and thus successfully prevented inflation from spiralling out of control when markets became turbulent in early October 2022.

In this article, we review the main factors behind the inflation in Hungary and the steps the MNB took to stabilize price growth at 3 percent annually, to remain in line with its mandate. We conclude that although numerous effective

measures have helped bring inflation down, the fight is not over yet. There are several challenges that remain; however, if they are overcome, Hungarian inflation can be reduced to the single-digit range by the end of 2023 (MNB, 2023).

2. Inflation in Hungary

Until 2021, the MNB had a good track record of keeping inflation at bay. Between January 2017 and December 2020, domestic inflation remained within the MNB's 2–4 percent tolerance band in 44 out of 48 months. In addition, average inflation was exactly 3 percent in this period, perfectly matching the 3 percent inflation target of the MNB. In this period, Hungary successfully achieved price stability (Matolcsy, 2022a).

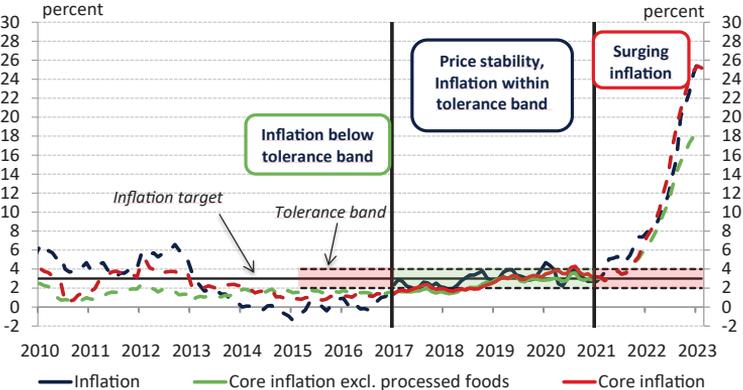


Chart 1: Developments of inflation indicators in Hungary

Source: HCSO, MNB

However, following the coronavirus pandemic, inflation reappeared. As economies started to reopen, demand strengthened again, which, combined with supply chain disturbances and rising commodity and energy prices, resulted in a rapid surge in inflation globally. In addition, the domestic economic recovery was particularly rapid compared to Hungary's regional peers, accelerating the development of inflation risks. By December 2021, price growth in Hungary exceeded 7 percent, while core inflation was at 6.4 percent, far exceeding the central bank's inflation target.

Currently, the structure of inflation is changing in Hungary. Domestic factors have started to dominate inflation developments recently. According to MNB estimates, the share of external factors in inflation – explained by

imported inflation, oil and gas prices and agricultural commodity prices – was approximately 83.6 percent in 2021 (Matolcsy, 2022b). Since 2022, the share of domestic factors has been growing steadily as a result of lower external inflation resulting from decreasing energy and commodity prices, easing supply bottlenecks and slowing global economic activity. The share of external factors had fallen back to 43.9 percent by H2 2022.

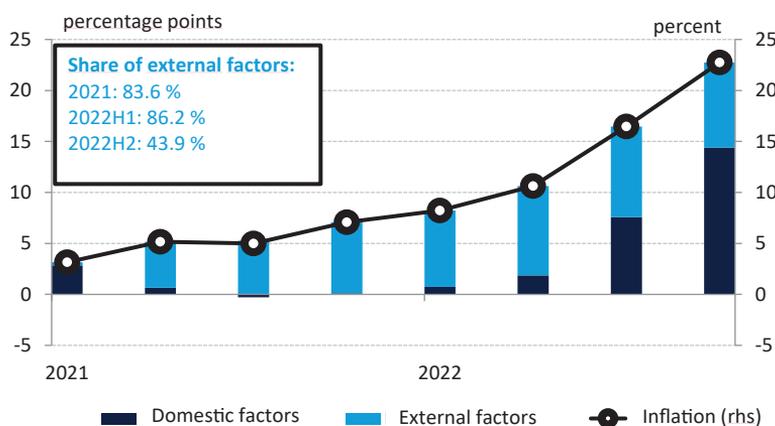


Chart 2: External and domestic effects on inflation-related developments in Hungary

Source: MNB

Note: External factors: Imported inflation, oil prices, TTF gas prices, agricultural commodities prices. Domestic factors: domestic demand, productivity, labour cost, inflation expectations, exchange rate, regular prices, estimated profit margin, and effects of indirect taxes.

In 2022, the yearly average inflation was moderately higher in Hungary than in its regional peers. While Czechia, Poland and Slovakia posted yearly average inflation figures of 14.8, 13.2 and 12.1 percent, respectively, domestic annual inflation was 15.3 percent in 2022. In addition, the intra-year dynamics of inflation were significantly different in Hungary. In the first half of the year, domestic price increases were muted compared to the regional inflation figures. However, in H2 2022, inflation climbed further in Hungary while it was already largely plateauing in regional countries.

Currently, higher food and fuel price inflation explain most of the excess inflation in Hungary compared to its regional peers. Decomposing regional January 2023 HICP inflation data shows that approximately 75 percent of the differential between the inflation developments in Hungary and the region is explained by these two factors. The situation is particularly pronounced

compared to Czechia, where higher domestic food price inflation explains 4.7 percentage points of the differential (66.2 percent), while higher fuel prices explain 2.9 percentage points (40.8 percent of the total differential). Components of the consumer basket, the prices of which were affected by price caps in Hungary, especially contributed to excess inflation compared to the countries of the region.

Difference in HICP inflation (January 2023)	7.1	
Explained by food prices	4.7	66.2%
Explained by fuel prices	2.9	40.8%
Explained by household energy prices	-2.8	-39.4%
Explained by services inflation	1.2	16.9%
Explained by manufactured goods inflation	0.7	9.9%
Other	0.4	5.6%

Table 1: Decomposition of domestic excess inflation compared to Czechia (January 2023)

Source: Eurostat

Note: In percentage points, based on HICP data.

Higher domestic food and fuel inflation are driven by multiple factors. Globally, profit-driven inflation has become more pronounced in recent months (Bivens, 2022) and has appeared in domestic inflation processes as well. Additionally, Hungary is highly dependent on imported energy and was adversely affected by the growing expense of gas imports throughout 2022. In addition, price caps imposed on a number of products by the Hungarian government modified the trajectory of food and fuel inflation both over the short and the long term (Balatoni, 2022).

Although price caps kept the prices of some food items low in regional comparison, producers and retailers compensated by raising the prices of substitute goods. In addition, the depreciation of the forint in H1 2022 and the disruptions in supply chains affected a number of food items, resulting in excess price pressure while also generating a competitive disadvantage for producers (Balatoni, 2022). The productivity of domestic food manufacturing is low in regional comparison, also contributing to higher food inflation (Matolcsy, 2022a). A decline in both food production and sales suggests that

the sector's performance and competitiveness have deteriorated. The domestic price dynamics of a number of food items exceeded those of regional peers significantly due to increased market concentration, reduced export capacity and a number of other structural problems.

In the March 2023 Inflation Report of the MNB, the central bank projected that inflation would moderate slowly in the months following February and that the decline would accelerate in the second half of 2023. It was highlighted that tight monetary conditions were expected to have increasingly widespread effects, leading to a substantial slowdown in inflation, while the decline in Hungarian consumer demand would reduce companies' room for manoeuvre regarding price increases. In the report, the MNB expected price growth to return to within the tolerance band for 2024. Annual inflation was expected to be 15.0-19.5 percent in 2023 and 3.0-5.0 percent in 2024 (MNB, 2023).

In the following chapter, we explore the measures the MNB took to achieve price stability while maintaining financial market stability.

3. Monetary policy of the MNB

3.1 Several guidelines for fighting inflation

The shifting structure of inflation poses a risk to price stability that has to be addressed by the central bank. Overall, inflation developments in Hungary warrant a tight monetary policy. The MNB identified a set of guidelines it must follow to defeat inflation.

First, in order to defeat inflation, central banks have to be committed to their purpose. For the MNB, this means that the primary objective of achieving and maintaining price stability must be dealt with first and foremost. The achievement of additional objectives has to be made without prejudicing but ideally supporting the primary objective.

Another key attribute of successful monetary policy is the appropriate timing of policy measures. Scholars have pointed out that, despite rich historical experience, major central banks were once again slow to raise their interest rates (Bordo and Levy, 2022; Walsh, 2022). These delays in themselves might not be particularly costly, given that inflation expectations are firmly anchored; however, when paired with a later aggressive response, the return of the economy to a steady state is more turbulent, likely resulting in a recession (Walsh, 2022).

In addition, fighting inflation requires decisive action. Price stability can only be reached by utilizing all available central bank instruments to reduce

inflation (Matolcsy, 2022a). Across Europe, the MNB responded in the most decisive way to the heightened price dynamics, raising its base rate by 1,240 basis points in total.

To reduce inflation, central banks must also remain consistent with their goals and purpose. To achieve price stability in an inflation-targeting framework, monetary policy has to stay on track until the achievement of the target is guaranteed over the monetary policy horizon (Svensson, 2010). According to modern new Keynesian economic models, by stabilizing inflation over the horizon, the central bank guarantees the lowest possible economic cost of returning to equilibrium (Blanchard and Galí, 2007).

Additionally, monetary transmission must function adequately. To effectively fight inflation, interest rate moves need to have the effect intended by the monetary authority. Credit and financial market frictions – such as credit spreads and the wedge between the effective policy rate and submarket interest rates – affect the decisions of economic actors and therefore alter the monetary transmission mechanism (Taylor, 1995; Cúrdia and Woodford, 2016). By improving transmission, the economic effects of interest rate steps can be amplified.

Finally, a coordinated response between different branches of economic policy is required to reduce inflation (Matolcsy, 2022b). As noted by some scholars, monetary policy alone does not provide a nominal anchor (Canzoneri et al., 2010; Cochrane, 2023), but it is the combination of fiscal and monetary policies that does. It is therefore imperative that these two branches of economic policy work together to achieve their shared goal of price stability faster.

3.2. The MNB was the first central bank in the European Union to begin its cycle of interest rate hikes

In the current period of inflation, MNB has followed these guidelines. The Hungarian central bank was the first in the European Union to identify upside risks to the outlook on inflation and the first to begin its cycle of interest rate hikes in June 2021. Between June 2021 and September 2022, the Monetary Council of the MNB hiked interest rates in 17 consecutive steps. The MNB used a variety of different tools in order to tighten monetary conditions and improve the effectiveness of the transmission mechanism. As a result, the effective interest rate rose by more than 17 percentage points to 18 percent. Accordingly, the domestic forward-looking real interest rate is now the highest in the European Union, ensuring a persistent decrease in inflation (Matolcsy, 2022a).

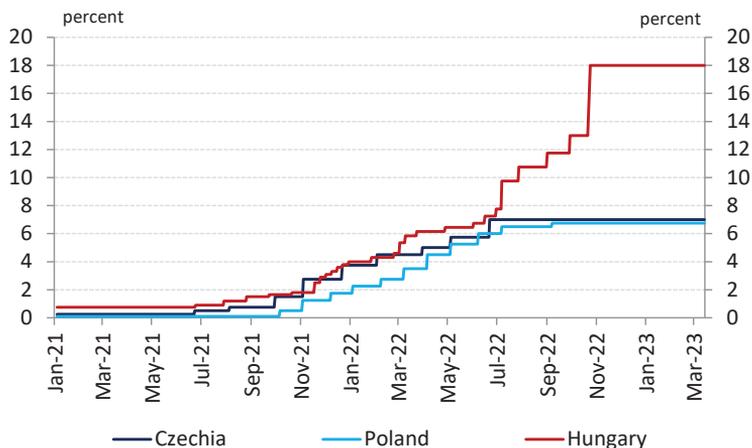


Chart 3: Effective interest rate in Hungary, Poland and Czechia

Source: CNB, NBP, MNB

Note: Effective interest rate in Hungary: between January 2021 and 14 October 2022, 1W deposit rate and base rate, O/N quick deposit tender rate afterwards.

3.3 The measures of the MNB prevented a currency crisis from unfolding

In early October, global market sentiment started to deteriorate abruptly and rapidly. Due to domestic vulnerabilities – notably, close proximity to the Russia-Ukraine war, the import-dependence of the energy sector, and the sizable current account and fiscal deficit, – extremely adverse effects were present in Hungarian financial markets. The forint weakened significantly while displaying enormous volatility. In parallel, domestic participants’ trust in the forint was temporarily shaken, while foreign participants took on large speculative positions against the domestic currency. Household trust in the forint also faded, and a spontaneous process of euroization unfolded. Government securities markets came under pressure, too; bond yields at all maturities rose by several basis points.

In order to preserve financial market stability, the MNB introduced a one-day quick deposit instrument with an 18 percent interest rate. Tenders have been held every day since 14 October, and the interest rate has been unchanged. This substantial increase in the effective interest rates broke the self-perpetuating negative feedback loops in financial markets, which resulted in a substantial strengthening of the Hungarian forint. In addition, the MNB directly met foreign

currency liquidity needs related to the energy account, which contributed to achieving the market balance.

These measures of the MNB were crucial for calming down turmoil and ensuring stability in domestic financial markets. Since October 2022, the forint has been strengthening, and so far, in 2023, has been one of the best-performing currencies worldwide. The measures also contributed to a significant increase in short-term interest rates, further strengthening monetary transmission.

3.4 The MNB used a variety of instruments to improve the transmission of monetary policy

In addition to its interest rate policy, the MNB has also strengthened monetary transmission by using various instruments. Since July 2022, the central bank has been announcing O/N FX-swap tenders, providing euro liquidity. In October 2022, the MNB raised the required reserve ratio and announced discount bill auctions and long-term deposit tenders. On 14 October, the central bank introduced one-day swap and deposit tenders and committed to directly meeting foreign currency liquidity needs to reach a market balance related to energy account. A deposit tender with a maturity of two months was introduced in November 2022, and in December, the MNB held foreign exchange swap tenders and discount bill auctions over the year-end period. In January 2023, the central bank announced its long-term deposit instrument with a maturity of one month, taking into account the feedback of banks. Since February 1, discount bill auctions have been held on a weekly basis. The Monetary Council of the MNB also decided to further raise the reserve requirement ratio with a tiered interest rate system on reserve accounts, effective from 1 April 2023. Looking ahead, tenders and auctions will continue to be held in line with the measures introduced by the central bank in the autumn.

3.5 The measures of the central bank resulted in an increasing domestic yield environment

As a result of the measures discussed above, there has been a general and broad-based increase in the domestic yield environment. O/N FX-swap tenders stabilised swap yields around the level deemed optimal by the central bank, while the commitment to meeting energy account-related currency needs directly contributed to balancing the supply-demand conditions in the domestic FX market in October. The restructuring of the reserve system, the long-term deposit

instrument and the discount bill serve to tie up liquidity on a longer-term basis, subsequently raising longer-term interest rates. Consequently, several submarket interest rates have been closely following the development in the effective interest rate, a sign that monetary transmission has become more effective.

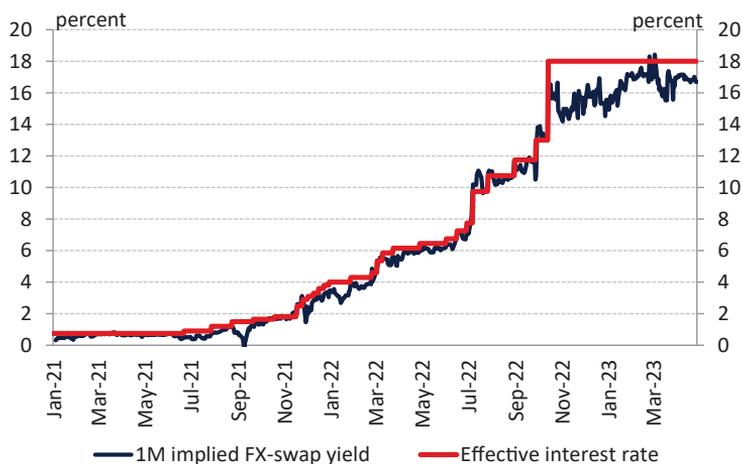


Chart 4: Effective interest rate and one-month implied FX-swap yield in Hungary

Source: MNB

Note: Effective interest rate in Hungary: between January 2021 and 14 October 2022, 1W deposit rate and base rate, O/N quick deposit tender rate afterwards.

3.6 Tight monetary conditions are warranted until persistent changes in risk perceptions occur

The MNB's fight against inflation is not over yet; there are several challenges that remain. On the one hand, considering inflation, the question of its dynamics and persistence has emerged. In particular, energy and food price inflation, service-related inflation, and wage dynamics are key factors that will determine the trajectory of the consumer price index in the coming months.

On the other hand, the market turmoil in October 2022 showed that without the stability of financial markets, price stability cannot be guaranteed. Consequently, the MNB takes into account the dynamics in risk perceptions regarding the Hungarian economy.

There are several particularly important risk factors that the MNB considers. The consequences of the Russia-Ukraine war have a significant influence on

financial market sentiment in the region. In connection with this, the possibility of a European energy crisis still poses a threat to domestic economic activity. Additionally, general developments in global investor sentiment influence capital inflows in the region, the latter of which are needed to maintain financial market stability. The monetary policy of globally influential central banks can also have spillover effects, significantly altering the dynamics of risk perceptions. Finally, country-specific vulnerabilities, such as developments regarding EU funds and the dynamics of the domestic current account balance, can also threaten financial market stability. In order to achieve price stability, decreasing overall vulnerability is a must.

A main pillar of efforts to decrease vulnerability is restoring the external balance of the domestic economy (Matolcsy, 2020, p. 25). The current account deficit has started to diminish due to lower gas prices and the adjustment of domestic demand and is expected to halve in 2023 compared to 2022 (MNB, 2023). Nevertheless, a further improvement in the external balance position of the economy is required (Matolcsy, 2022a). Reducing the government deficit in the coming years will also support the recovery of the current account. In conjunction with investment projects that lead to production starting in the second half of the MNB's current forecast horizon, the normalisation of the global economic environment will further improve Hungary's external balance position (MNB, 2023).

The Monetary Council assesses the risk perceptions regarding the domestic economy. During its March 2023 meeting, the Council concluded that it was necessary to maintain monetary conditions at the level prevalent since October 2022. Keeping the base rate on this level over a prolonged period will ensure that inflation expectations are anchored and that the inflation target is achieved in a sustainable manner. On the other hand, the current level of the effective interest rate will be maintained until a trend improvement in risk perceptions occurs. The MNB is also constantly assessing incoming data and developments in relation to the outlook for inflation and is ready to take appropriate action if risk perceptions change.

It can be concluded that with an adequate economic policy mix, victory over inflation is indeed possible. In the March Inflation Report of the MNB, the central bank expects price growth to be reduced to the single-digit range by the end of the year (MNB, 2023), in line with regional inflation figures. In order to achieve this, tight monetary conditions are warranted until persistent changes in risk perceptions occur.

4. Conclusion

Since recognizing the upside risks to the outlook on inflation in early 2021, the MNB has gone a long way towards achieving price stability. The central bank was the first in the European Union to begin its rate hike cycle and undertook the most significant tightening of monetary conditions. Moreover, the MNB introduced a range of measures to improve monetary transmission, further enhancing the effect of implemented interest rate increases. In addition, the central bank recognized that without financial market stability, price stability could not be achieved. Consequently, the MNB successfully restored financial market stability at a critical time in an environment characterized by significant vulnerability.

Although much has been done by the MNB to fight inflation, some challenges remain. Overcoming these will be the task of the central bank in the upcoming period. However, the result of the appropriate measures will be a decrease in the trajectory of the price index. In March 2023, the MNB forecast that inflation would return to the single-digit range by the end of the year, showing that a victory over inflation is definitely possible. For now, though, the central bank is keeping the base rate at its current level to anchor inflation expectations and achieve the inflation target in a sustainable manner. In addition, effective interest rate conditions will remain unchanged until persistent improvements in risk perceptions occur.

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Flexible exchange rates and emerging markets

Andrés Velasco

Dean of the School of Public Policy at the London School of Economics and Political Science

Half a century ago, the Bretton Woods system collapsed. By March 1973, the world's major currencies were floating. Emerging market economies (EMs) made the transition more slowly, but starting in the 1990s, and more rapidly since the start of the new century, they too moved to floating exchange rates.

The new regime promised EMs insulation from shocks emanating from the rest of the world. It also promised monetary policy autonomy, freeing local authorities to set interest rates to meet domestic objectives. Have floating exchange rates delivered?

Only partially. We know from the work of H el ene Rey at London Business School that domestic financial conditions remain very much correlated with US interest rates and the value of the dollar. The global financial cycle, powered by the mighty greenback, tends to govern local financial cycles, even in countries with flexible exchange rates.

This finding is related to another one that Guillermo Calvo, Carmen Reinhart, and Leonardo Leiderman made a long time ago: for EMs, external conditions are the main driver of capital flows from abroad. Domestic policy actions are of secondary importance. This is very different, of course, from the textbook model, in which domestic consumption and investment-smoothing pin down current accounts, and capital flows respond endogenously to fill whatever current account gaps emerge.

So the reality of flexible exchange rates is less rosy than Milton Friedman and others suggested. But this does not mean flexible rates are useless. A recent paper by Maury Obstfeld and Hoan Zhou makes the point.

Obstfeld and Zhou argue that the way changes in international conditions affect EM financial markets depends on a number of factors. And the most important is, in fact, the exchange rate regime. The paper finds that “in response to a 10 percent dollar appreciation, GDP, investment, and the stock market fall more sharply for pegs.” I conjecture that there are three plausible explanations for this finding. The first is that a peg requires more extensive tightening in response to dollar appreciation.

The second is that shock is associated with lower risk appetite and a higher required excess return on emerging market bonds. As Sebnem Kalemli-Özcan has shown, with flexible rates the required adjustment is achieved via depreciation, and under fixing via a damaging domestic interest rate spike.

Third and last, expenditure-switching still matters: under flexing, it is easier to realign relative prices and export your way out of the problem.

So a system of flexible rates is not perfect, but it does some of the required work. It does not allow EMs to survive episodes of dollar appreciation and lower risk appetite unscathed. It simply provides partial but welcome insulation.

What about balance sheet* effects? Most EMs borrow heavily abroad for good reasons. One definition of what it means to be an EM is that the country has too little capital, so it needs to invest. And if the economy is growing, it will be richer tomorrow than it is today. It makes sense to finance some of that investment by borrowing from the rest of the world. To this day, 80% of external emerging market debt remains in U.S. dollars.

After the Tequila crisis of 1994 and the Asian crisis of the 1990s, a large academic literature on balance sheet effects developed. Its main message was that whenever a shock hits, and nominal and real exchange rates depreciate sharply, the domestic currency value of debt service jumps, and firms that have income in domestic currency suffer. Therefore, depreciation can be contractionary, and flexible exchange rates do not necessarily have desirable insulation properties.

Back then, that line of argument seemed persuasive, but it has not survived the test of time very well. During the COVID episode, emerging market currencies tanked, and no financial crisis followed. The same seems to have been true of the most recent episode of dollar appreciation.

Whatever happened to balance sheet effects? One answer is that hedging markets have turned out to be deeper and more affordable than anyone anticipated, and many EMs are using them. Another answer is that the 80% dollar share is an average and therefore a bit misleading. There are plenty of countries where debts —particularly public debt— are denominated largely in

domestic currency. This is the case in Brazil, Colombia, Chile, Mexico, South Africa, and several other emerging nations.

But there are also more academic explanations for the apparent balance-sheet-effect puzzle. Two decades ago, I co-authored a paper that argued that even in the presence of the balance sheet effects, depreciation need not be destabilizing. There are two forces at work, pushing in different directions, and it is an empirical matter which one prevails. Plus, under a peg, the same shock would cause a sharp increase in domestic rates which, given the short maturity of many debt profiles, would also do great damage to the finances of local banks and corporates.

The impression that emerges, both from the academic literature and practical experience, is that the balance sheet problem is manageable. But the problem has not disappeared. Borrowing in domestic currency, as Agustín Carstens and his colleague Hyun Song Shin of the BIS have argued, simply shifts the currency risk to lenders. Now international investors have to bear duration, default, and currency risk. And this means that in the aftermath of a large depreciation, they may head for the exit. Carstens and Shin report that dollar appreciation episodes amplify the sell-off in EM local currency bonds but not dollar-denominated bonds. This is, in their terminology, “original sin redux.” Emerging nations are still vulnerable to the risk of the dollar cycle, even if they borrow in domestic currency.

The conventional wisdom is that a well-behaved country should pursue inflation targeting —a regime where the interest rate is targeted at internal balance and the exchange rate floats freely. This is what almost all central banks say they do. But in South America, South-East Asia, Southern Africa, and Eastern Europe, few central banks actually abstain from intervention. Whenever the currency is perceived to be grossly misaligned, they buy or sell reserves to push it back to ‘normal’ terrain.

Why would central banks pursue what looks like a target zone with fuzzy intervention boundaries? I am not sure we have very good models that explain this kind of behavior. The obvious conjecture is that intervention is triggered by concerns about balance sheet effects. But that would seem to call for an asymmetric rule – intervening when the currency depreciates but not otherwise.

The only other conjecture I can offer at this point is that just as in models of speculative hyperinflation —think of the justly famous Obstfeld-Rogoff 1983 paper— the price level is not uniquely determined, and there is perhaps an equivalent result for nominal exchange rates: if agents expect the currency will depreciate, they sell it and prompt the depreciation, and this process goes on until the central bank steps in and puts an end to it.

The obvious theoretical question is what happens over time in the absence of central bank intervention. In closed economy models, expectations about inflation are self-fulfilling because there is no terminal condition that rules them out. In an open economy, if prices are sticky, then large nominal depreciations mean large real depreciations, and if the process is persistent, it will violate a terminal condition. But if prices have been made flexible by an inflationary history, then the price level and the nominal exchange rate can move in tandem without causing the real exchange rate to explode.

This suggests that, in this context, sticky prices are a blessing. Or, put differently, the less inflationary a country's history is, the less it requires the central bank to run an implicit or explicit target zone. This seems to accord with practical experience: repeated intervention is common among EMs that float but less so among advanced economies that float.

Allow me to make one last point. If, in fact, the dollar cycle is here to stay, and the insulating properties of flexible exchange rates are limited, then EMs will need access to dollars in times of stress. Where can they gain access to those dollars? Today, many EMs self-insure and sit on a pile of their own international reserves. But as economists, we know that self-insurance is not efficient. The current approach may be individually rational (countries accumulate reserves until they feel safe), but it is expensive and makes very little collective sense.

The handful of EMs that qualify for a swap arrangement with the Fed are able to engage in some risk-sharing. So are the handful of countries that have qualified for an IMF precautionary liquidity arrangement. But for the remaining EMs, opportunities for risk-sharing are very limited because the global financial safety net is geographically fragmented, full of holes, and simply not fit for purpose.

Take the COVID crisis. The IMF itself estimated that EMs would need access to two trillion dollars, but the Fund itself ended up lending (in additional terms) just 160 billion. We can surely do better.

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IV.

CONFERENCE AND CEREMONIAL SENATE ASSEMBLY PICTURES



Moments before the Conference
Andrés Velasco, Ricardo Reis, Andreii Kirilenko, Előd Takáts



Moments before the Conference
Ágnes Zsóka, Tamara Keszezy, György Szapáry



Moments before the Conference – Venue



Moments before the Conference – Venue



Honorary doctorate awarding



Opening – Honorary doctorate awarding



Honorary doctorate awarding



Welcome speech – Előd Takáts, Rector, Corvinus University of Budapest



Laudation Speech – István Kónya, Dean of Corvinus Doctoral Schools



Video Laudation – Ravi Menon, Managing Director, Monetary Authority of Singapore



Video Laudation – Mario Blejer, Former Governor, Central Bank of Argentina



Honorary doctorate awarding



Honorary doctorate awarding (2)



Előd Takáts congratulates Augustín Carstens



Előd Takáts and Augustín Carstens



Agustín Carstens receives honorary doctorate



Inaguration Speech – Agustín Carstens



Agustín Carstens' keynote address



New Age of Central Banking in emerging markets – Participants



Luiz Pereira's welcoming remarks



Morning panel Central banks fighting inflation in advanced and emerging markets



**Christopher Erceg, Deputy Director, Monetary and Capital Markets Department,
International Monetary Fund**



Morning panel Central banks fighting inflation in advanced and emerging markets



**Ricardo Reis, A. W. Phillips Professor of Economics,
London School of Economics and Political Science**



**Ricardo Reis, A. W. Phillips Professor of Economics,
London School of Economics and Political Science**



Egon Zakrajšek, Senior Adviser, Bank for International Settlements



Morning panel Central banks fighting inflation in advanced and emerging markets



Zsolt Kuti and Andrés Velasco



Agustín Carstens, General Manager, Bank for International Settlements



György Szapáry asks questions



Piroska Nagy-Mohácsi and Ricardo Reis



Coffee break – Anikó Szombati and Andrei Kirilenko



Coffee break – Priscilla Koo Wilkens and Egon Zakrajšek



Coffee break





Afternoon panel Central Bank & Innovation the CBDC – Andrei Kirilenko



Radován Jelasy, President, Hungarian Banking Association



Anikó Szombati, Chief Digital Officer, Central Bank of Hungary



Afternoon panel Central Bank & Innovation the CBDC – Priscilla Koo Wilkens



Afternoon panel Central Bank & Innovation the CBDC



Afternoon panel Central Bank & Innovation the CBDC



**Priscilla Koo Wilkens, Senior Economist,
Innovation and Digital Economy at Bank for International Settlements**



Afternoon panel Central Bank & Innovation the CBDC



Egon Zakrajšek, Zsolt Kuti, Piroska Nagy-Mohácsi, Ricardo Reis, Christopher Erceg, Andrés Velasco



Q&A Session

3. CENTRAL BANKS AND INNOVATION: THE CBDC

CBDCs

Andrei Kirilenko

Professor of Finance, University of Cambridge

CBDC stands for Central Bank Digital Currency. A CBDC is a new digital form of central bank money. The main purpose of a CBDC is to achieve the finality of settlement for transactions denominated in the currency of the issuing central bank. The finality of settlement is critical for trust in money. Individuals achieve the finality of settlement by using cash. Commercial banks, which digitally create private deposits, achieve the finality of settlement by using central bank reserve money. However, physical cash is being quickly replaced by digital payments, while digital reserve money is not directly available to individuals. CBDCs are envisioned as a way to fill this gap.

Like reserve money, a CBDC is a digital liability of a central bank, but the two types of digital money serve different purposes and have different characteristics. Reserve money is the money that commercial banks hold in their accounts at the central bank that they use to settle transactions with each other and with the central bank. In contrast, CBDCs are a digital form of central bank money that can be made available directly to individuals and businesses. Reserve money is only accessible to banks and financial institutions, while CBDCs can be used by anyone with a digital wallet or account. Reserve money is used for settlement; it is not designed for use as a means of payment or store of value, whereas CBDCs are specifically designed for this purpose. Furthermore, CBDCs can potentially offer greater security and efficiency than traditional reserve money because they can take advantage of recent advances in cryptography and encryption technologies.

The concept of CBDCs attracted significant attention in June 2019 when Facebook announced its plans to launch a private digital currency called Libra (later renamed Diem) for its estimated two billion global users. The announcement sparked concern among central banks around the world.

Central banks worried about a potential loss of seigniorage from issuing their own currencies, instability in their domestic banking systems, and a loss of privacy for citizens. In response to the announcement of Libra, several major central banks, including the People's Bank of China and the European Central Bank, announced plans to accelerate their research and development of CBDCs. Simultaneously, central banks and other regulators around the world intensely scrutinized Facebook's proposed project. As a result of this scrutiny, several key partners, including Visa, MasterCard, PayPal, Stripe, and eBay, withdrew from the project in October 2019. This was a significant setback for Libra, as these companies were expected to provide critical global infrastructure and support for the project. In April 2020, Facebook announced that it was scaling back its plans for Libra and would instead launch a series of stablecoins backed by individual fiat currencies. In December 2020, Facebook rebranded Libra as Diem and announced that it would launch a single stablecoin backed by the US dollar. During 2021, the Diem project repeatedly tried and failed to achieve regulatory approval. In January 2022, the Facebook (renamed Meta)-backed Diem Association sold its intellectual property and other assets to crypto-focused bank Silvergate. In March 2023, Silvergate Bank shut down its operations and went into liquidation.

Meanwhile, a number of central banks around the world have launched CBDC pilots. In China, the People's Bank of China has been conducting pilot tests of its digital yuan since April 2020 by making it initially available in several cities, including Shenzhen, Suzhou, and Chengdu, and then expanding its use in several other agglomerations. The digital yuan has been initially tested for use in retail transactions and distributed through a lottery system, with plans to eventually use it to pay salaries of public sector employees.

In the Bahamas, the Central Bank of the Bahamas launched its Sand Dollar CBDC in October 2020. The Sand Dollar is being used for retail transactions and is being distributed through a mobile app. Separately, the Eastern Caribbean Currency Union launched a pilot of its DCash CBDC in March 2021. DCash is being tested for use in retail transactions and is being distributed through participating banks. In Nigeria, the Central Bank of Nigeria launched its CBDC called eNaira in 2021. According to the country's central bank, it is the digital form of the Naira and is used just like cash. The eNaira wallet is a form of digital storage required to access, hold and use eNaira. In July 2022, Jamaica's central bank launched its CBDC called JAM-DEX. The Bank of Jamaica stated that the goal of JAM-DEX was to improve financial inclusion and to facilitate the growth of a digital economy by targeting a class of users without traditional bank accounts.

A number of central banks are in the advanced stages of planning CBDC issuance. The Riksbank, Sweden's central bank, has been testing its e-krona

since 2020. The e-krona is intended to be a complement to physical cash and other payment methods, providing a secure and efficient means of payment for individuals and businesses. The e-krona would be issued and controlled by the Riksbank. Users would store and use e-krona in digital wallets provided by commercial banks or other authorized institutions. The e-krona is designed to be fully interoperable with Sweden's existing payment systems, providing a secure and efficient finality of settlement for individuals and businesses in a unified monetary system.

In Canada, the Bank of Canada has been exploring the possibility of issuing a CBDC since 2018. In February 2020, the Bank of Canada announced that it had completed the first phase of its CBDC pilot project, which involved testing the feasibility and benefits of a wholesale CBDC for financial institutions only. In May 2023, the Bank of Canada launched an online public consultation on the features that could be included in a digital Canadian dollar, focusing on issues related to its likely use, privacy, and security.

In Japan, the Bank of Japan has also been exploring the possibility of issuing a CBDC. In October 2020, the Bank of Japan announced that it would begin experimenting internally with a proof-of-concept for a CBDC. The proof-of-concept involved testing basic functions such as the issuance, distribution, and redemption of a digital currency. In April 2023, the bank announced that it was moving to a pilot phase for its CBDC. The pilot phase will involve external parties testing the technical feasibility of CBDC integration with banks, payment systems, and other financial services providers.

In the UK, the Bank of England has been exploring the potential benefits and challenges of issuing a CBDC since 2016. In March 2020, the Bank of England published a discussion paper on the design of a CBDC. Public responses to the discussion paper were published in March 2022. In February 2023, the HM Treasury and the Bank of England issued a joint paper to consult on their approach to a CBDC. The paper stated that, if issued, "a UK central bank digital currency – a 'digital pound' – would be a new form of digital money for use by households and businesses for their everyday payments needs." According to the paper, the 'build phase' would begin in 2025 at the earliest.

The European Central Bank (ECB) has also been exploring the possibility of issuing a CBDC. In October 2020, the ECB released a report outlining its initial findings on a digital euro. The report stated that the ECB had launched a two-year investigation phase to assess the feasibility of a digital euro and to explore its potential benefits and challenges. The ECB's CBDC pilot project has been testing various aspects of CBDC issuance and use, including its impact on monetary policy, financial stability, and user experience. The pilot has also been exploring different technical solutions for CBDC issuance and use, including distributed

ledger technology (DLT) and centralized systems. While the ECB has not yet made any decisions about whether to issue a digital euro, it has stated that it is committed to ensuring that any potential CBDC would be safe, efficient, and accessible to all citizens. The results of the pilot project are expected to inform future decisions about the possible issuance of a digital euro.

In the US, in September 2022, the US Treasury released an official report entitled *The Future of Money and Payments*. The report reviews the U.S. system of money and payments, including such recent innovations as instant payments and stablecoins, and a potential US CBDC, and considers the implications of these developments for key public policy goals, including supporting US global financial leadership, advancing financial inclusion and equity, and minimizing risks. Furthermore, the Federal Reserve has publicly stated that it has established a program of work that aims to carry out policy analysis to provide perspectives on issues articulated in the Board's January 2022 discussion paper, conduct technology research and experimentation to inform potential CBDC designs and invest in engagement with the public to bring along stakeholders and obtain needed expertise.

The technology behind CBDCs is still being explored and developed, but many central banks are considering blockchain technology as a potential solution. Blockchain is a distributed ledger technology that allows for secure and transparent transactions without the need for intermediaries. There are several different approaches to using blockchain for CBDCs. One approach is to use a permissioned blockchain, whereby only authorized parties can participate in the network. This would allow central banks to maintain control over the issuance and distribution of CBDCs while still leveraging the benefits of blockchain technology. For example, the Digital Asset CBDC pilot is a project by Digital Asset, a blockchain software company, to explore the potential use of blockchain technology for CBDCs. The pilot aims to demonstrate how CBDCs can be issued and managed securely and efficiently using blockchain technology. The pilot involves creating a CBDC platform that uses Digital Asset's smart contract language, DAML, to enable secure and efficient transactions. The platform is designed to be interoperable with existing payment systems and can be customized to meet the specific needs of different central banks. The pilot has been tested with several central banks, including the Bank of Thailand and the Hong Kong Monetary Authority. In these tests, the platform demonstrated its ability to process transactions quickly and securely while maintaining compliance with regulatory requirements.

Another approach is to use a hybrid system that combines elements of both centralized and decentralized systems. Under this approach, the central bank would issue and manage the CBDC, but transactions would be processed on a decentralized network. For example, the ConsenSys CBDC pilot is a project

by ConsenSys, a blockchain software technology company, that explores the potential use of a hybrid blockchain system for CBDCs. The pilot demonstrates how CBDCs can be used to improve financial inclusion and reduce costs within the payment system. The pilot involves creating a CBDC platform that uses blockchain technology to enable secure and efficient transactions. The platform is designed to be interoperable with existing payment systems and can be customized to meet the specific needs of different central banks. The pilot has been tested with several central banks, including the Monetary Authority of Singapore and the South African Reserve Bank. In these tests, the platform demonstrated its ability to process transactions securely while maintaining compliance with regulatory requirements.

It's worth remembering that central banks and national regulators did not initiate work on CBDCs in pursuit of innovation on the future of money. As our lives become more digital, the future of money is likely to be shaped by a combination of technological innovation, changing consumer preferences, and evolving policy frameworks. Bitcoin and Ethereum have demonstrated that cryptocurrencies can provide a viable digital alternative to traditional fiat currencies. Libra demonstrated that a private global payment and settlement system is fully technologically possible. The widespread use of smartphones has led to a surge in mobile payment solutions that make it easy to send and receive money digitally. As more people around the world gain access to financial services through mobile devices and other technologies, there is a growing focus on improving financial inclusion for billions of people who are not being served by the existing financial system designed by and for national central banks.

On the last point, Friedrich Hayek argued that private money could be a viable alternative to central bank-issued currency. In his book *The Denationalization of Money*, published in 1976, Hayek proposed the idea of competitive currencies, whereby private entities would be allowed to issue their own currencies and compete with each other and with government-issued currencies. Hayek believed that competition among currencies would lead to greater efficiency and innovation in monetary and payment systems. He argued that government-issued currency was subject to political manipulation and inflationary pressures, while private currencies would be subject to market discipline and would have to maintain their value through strict monetary policies. While Hayek's ideas of a fully denationalized monetary system are yet to be realized, the technology is finally here to make it possible.

Political Economy of CBDCs

Piroska Nagy Mohacsi

Visiting Professor at the London School of Economics and
Political Science

Abstract

CBDCs should exist primarily for political economy reasons. In a rapidly digitalising world, without CBDCs, central banks may not be able to protect their monetary sovereignty and would not have a digital, thus programmable, crisis management tool. As such, CBDCs are not simply payment system-enhancing tools as often portrayed, but a fight for the “soul” of the monetary and financial system and money creation monopoly in the digital age. CBDCs can also be a tool for geopolitical competition. The benefits of CBDCs outweigh their costs, assuming safeguards are introduced from the outset regarding privacy and governmental overreach. CBDCs are only as credible as the governments behind them. CBDCs are not simply for central banks to decide on – they are national political and even geopolitical projects that require the material involvement of governments and parliaments. Whether CBDCs are introduced will shape the future digitalised monetary and financial systems and the government’s capacity to deal with macroeconomic and financial sector stress.

Introduction

Most central banks around the world are considering introducing a central bank digital currency (CBDC) with varying design features, and a handful of them have already done so (IMF 2022, Auer et al. 2021). CBDC is a digital form of government-issued fiat currency. CBDCs can be “wholesale”, where households

do not have access to it, or “retail”, where they do. The real innovation comes from the latter, and this is the form that this article considers.

The discussion about CBDCs is now rightfully shifting from central bank circles to open public political arenas because, at the core, CBDCs are national political projects. This paper summarises the pros and cons of CBDCs, proposes preconditions for their introduction, and outlines the future of the financial sector in the digital age with or without CBDCs.

Arguments for CBDCs

There are strong political economy arguments in favour of CBDCs - yet they are often downplayed. Instead, CBDCs are portrayed primarily as digital technology tools for enhancing payment systems and fostering financial inclusion.¹ These functions are, of course, important but cannot be the decisive reasons for creating CBDCs, which are about the battle for the soul of modern money and the digital-age financial system (Nagy Mohacsi 2020, Schoenholtz and Cecchetti 2021):

- i. **Supporting monetary sovereignty and central bank capacity to deliver on its mandate** and are fundamental arguments for introducing CBDCs. Central banks exist to deliver the public good of monetary and financial stability. In a digitalised world, central banks need digital forms of their national currency, otherwise key monetary policy transmission channels may be supplanted by private forms of digital money, hampering central bank control over monetary policy (Benoit 2021).² Indeed, the proliferation of private forms of digital currencies/assets in recent years has challenged central banks’ money-creation monopoly (Nagy Mohacsi and Mandeng 2018, Prasad 2021 and Kirilenko 2023).³
- ii. **Improving monetary and fiscal policy efficiency** through targeted delivery. Retail CBDCs can help “fine-tune” monetary and fiscal policy thanks to their unlimited digital programmability (Buiter, 2023). CBDCs would be much more effective crisis management tools than what policy makers have today at their disposal.

¹ A few countries also cite the rapidly diminishing role of cash as a factor driving CBDCs (such as Sweden and China).

² CBDCs would make some of the operational aspects of the monetary policy more complex by changing the demand for bank reserves (Federal Reserve 2022). Yet such technical issues can be addressed through the specific design of the CBDC.

³ Private monies include cryptocurrencies (Bitcoin and similar) and Bigtech digital currencies such as the proposed Libra (later rebranded as Diem). The latter represents the biggest challenge to central banks’ money creation authority because it covers a large part of the real sector and the financial sectors with high concentration risks.

- iii. **CBDCs will also be the safest digital assets that domestically exist.** Within a rapidly expanding digitalised financial system, CBDCs would be the safest digital assets, without credit or liquidity risks (subject, of course, to the issuing country's sovereign risk.) For credible central banks, credit and liquidity risks would be eliminated.
- iv. **Avoiding costly deposit insurance.** CBDC, as the liability of a central bank, by definition does not need deposit insurance. This argument has been recently reinforced by the full bail-out of depositors of failed mid-sized banks in the US (Silicon Valley Bank and others), whereby the Federal Reserve and the US Treasury guaranteed *all* the deposits of these banks irrespective of insurance status and size. The deposits of *all banks* can now be considered fully backed by the Fed and the US government. With this, a major component of CBDCs already appears to be in place (Sandbu, 2023).⁴
- v. **Political/geopolitical reasons.** Competition for world reserve currency status among globally systemic central banks has recently intensified in the wake of escalating geopolitical tension such as the Russia-Ukraine war and US-China competition. In the digitalised era, CBDCs will be part of this geopolitical tug-of-war.

The Fed's 2022 report on the digital CBDC states that the *third* most important benefit of CBDC would be to "support [...] the international role of the dollar."⁵ Naturally, the strength of the US dollar is backed by the size and strength of the US economy, deep markets, strong institutions and the rule of law. A dollar CBDC can reinforce this standing for the digital age.

The ECB has been even more straightforward in this regard: supporting the geopolitical goal of strategic independence for the European Union is part of the digital euro's *first* objective; fostering the international role of the euro is listed as the fifth goal (ECB 2020).

The **People's Bank of China** formally does not list geopolitical reasons among the objectives of China's CBDC, the E-CNY, but in reality, this idea has been behind China's active support for a dollar-free cross-border payments system, including in

⁴ Martin Sandbu takes the argument further: "If we need those deposits [at commercial banks] to be backed by central bank reserves or something very much like them, what is gained by interposing private banks out to make profits on intermediation?"

⁵ The Fed's 2022 research paper put it clearly: "It is important ... to consider the implications of a potential future state in which many foreign countries and currency unions may have introduced CBDCs. Some have suggested that, if these new CBDCs were more attractive than existing forms of the U.S. dollar, global use of the dollar could decrease—and a U.S. CBDC might help preserve the international role of the dollar."

relation to the Belt and Road Initiative.⁶ Fed Vice Chair Barr and other observers called the competition in this area a “digital currency arms race” with China.

- vi. **Financial inclusion.** As well argued in papers by standard-setters and researchers, CBDCs can expand the availability of banking services to reach underserved communities (Szombathelyi, 2023, Long Chen, 2019).
- vii. **Supporting faster payments** with CBDCs, with the specific promise of more rapid cross-border payments, which remain costly and often slow.

Counterarguments

As central banks have, by and large, considered all technical issues and design options, arguments against CBDCs have also crystallised and intensified. All have merits, yet some are less convincing than others.

- i. **CBDCs threaten the business model of commercial banks and thus pose risks to financial stability.** CBDCs may create – the argument goes – “unfair” competition for deposits with traditional deposit-taker institutions and other low-interest-bearing safe assets such as treasury bonds, crowding out these activities. This has been a central argument against CBDCs, including, unsurprisingly, by commercial banks and their advocates.

The seminal 2022 Fed paper (2022) starkly but fairly put it this way: “CBDC could fundamentally change the structure of the U.S. financial system, altering the roles and responsibilities of the private sector and the central bank”. More recently, Fed communication appears to have hardened in this regard. Michelle Bowman (2023), a Member of the Fed’s Board of Governors, used apocalyptic words to characterise the risk of disruption: “There are significant risks in adopting a CBDC that *cannibalizes* rather than complements the U.S. banking system”.⁷

Taken together, this is an important objection – yet surmountable with appropriate design. These include limitations on CBDC size and areas and the

⁶ “E-CNY is China’s version of CBDC. It is mainly positioned as cash. For China, e-CNY is mainly to meet the needs of domestic retail payment, enhance the development level of inclusive finance, and improve the efficiency of the currency and payment system” (Yi Gang October 2022).

⁷ Academic research is divided; some scholars are more in favour (Prasad 2021), and others are hostile to the idea (Schoenholtz and Cecchetti 2021).

use of a “hybrid” or “intermediated” CBDC model whereby commercial banks manage all customer interface and business related to CBDC digital wallets stored with them (Auer et al. 2021, Federal Reserve 2022). Moreover, real competition for banks comes from other sources such as non-bank financial institutions and, most importantly, BigTech.

- ii. **Privacy concerns over large-scale government surveillance.** This is a valid objection (Anthony, 2023). Digitalisation is already happening fast, with recognised threats to, and sometimes breaches of, privacy. Currently, vast amounts of information are already gathered on firms and economic agents, primarily by the private sector. But there is a difference between a threat to privacy and the misuse of personal information by a political authority, and citizens may justifiably worry about governmental ill-use. In the Eurozone, the ECB has put forward proposals to ease these concerns, and so has the BIS (Auer 2021) - but worries remain.
- iii. **CBDCs may lead to political pressure for direct central-bank lending.** This may be the most powerful political economy counterargument, particularly in today’s age of populism. A significant stock of consumer deposits at a central bank may invite political pressure for direct central-bank financing of the budget or specific government pet projects and enterprises. This would be highly damaging to the integrity of the macroeconomic system, the independence of the central bank and the lending activity of banks and other financial institutions. There would be a need for the upfront, forceful prohibition of such lending activity by the central bank outside major crisis such as war or pandemic.

Record to date

To date, only four countries have officially introduced CBDC: three East Caribbean countries/units, including part of the East Caribbean Monetary Union, and Nigeria. All are emerging market economies. Success in the form of local demand so far has been limited, most likely due to the weak credibility of the introducing central bank and government. This drives home the fact that a CBDC, just like traditional forms of national fiat currency, is only as credible as the central bank and government behind it.

Importantly though, the CBDC project is finally becoming a political project. Decisions about sovereign money must be political, and in any event, technical discussions about CBDC modalities and design options are largely

over. Governments across the globe are starting to get involved. In the UK, for example, the “Bitcoin” CBDC project is jointly run by the UK Treasury and the Bank of England; in several countries, such as Sweden, parliaments are involved in the project. In the US Federal Reserve Chair Jerome Powell has repeatedly said that a retail dollar CBDC would require approval of the US Congress, while a much less transformative wholesale digital dollar would not.

CBDC and the future digital monetary system

Rapid financial sector digitalisation has put central banking at a material crossroads: should it introduce its own digital currency in the new age of digitalised financial systems or not?

A key factor to consider is that digitalisation is happening at an accelerating pace – the question is if central banks should adapt materially to it. There will be risks associated with introducing CBDCs – but also risks of *not* introducing them. The risk of introducing CBDC may be high, but that of not introducing it could be a lot higher.

But CBDC introduction must come with major *preconditions* in the form of safeguards and regulations. These must be in place from the outset: (i) the prohibition of central bank direct lending outside major crisis; and (ii) safeguards to address privacy concerns. As the latter will likely linger, regulators could continue to allow the use of private digital assets that can ensure privacy akin to today’s cash – without, however, guaranteeing such personal digital assets. Additional/stronger accountability mechanisms for a more powerful/intrusive central bank will also be needed.

What would the digital financial system look like in the future with and without the CBDC? There are two starkly opposing scenarios:

In the *scenario with CBDC*, central banks will retain and strengthen their monetary sovereignty and monetary policy effectiveness and have an appropriate tool for addressing more frequent stresses in the modern, globally integrated monetary systems. As argued above, there should be preconditions for CBDC introduction. Central bank accountability mechanisms will have to be upgraded accordingly. In particular, central banks should not be allowed to provide directed lending unless parliament authorises this during a crisis, similar to situations of war or pandemic.

Commercial banks will retain a larger share of their deposit-taking business and all lending activity. They would be part of the “intermediated” CBDC model, representing the know-your-customer (KYC) interface between the central bank and economic agents. This will require new governance structure

and accountability oversight by central banks and commercial banks. Crisis management in the digital age with CBDCs in place will be faster, more targeted, and thus more efficient. Traditional central bank cash would remain in place for reasons of continuity and possible public preference, and private digital assets such as Bitcoin and the like that grant as much privacy to clients as cash today will be regulated only for anti-money laundering and combatting the financing of terrorism (AML/CFT) purposes. There would be no reason for governments to provide backstop for private digital assets.

In the alternative *scenario without CBDC*, central banks would lose some/much of their monetary sovereignty and policy effectiveness but avoid becoming a (perceived) threat to the current status quo with regards to privacy and the model of commercial banking. However, if history is any guide, bolder/less regulated private sectors will inevitably generate more frequent financial sector stress, which in turn will call for public sector intervention. But under this scenario, central banks and governments may not have sufficient tools to address such stress or crisis in a timely and efficient manner. In the absence of digital CBDCs, we would see the repetition of COVID crisis management, with rough, non-targeted, massive interventions. With less monetary efficiency and a poor, non-digitalised toolkit to deal with financial sector stress, the future would be liable to be more inflation and crisis-prone.

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The role of central banks and the private sector in the implementation of CBDCs: lessons learned from Pix, the Brazilian Fast Payment System

Priscilla Koo Wilkens

Senior Economist, Innovation and Digital Economy at
Bank for International Settlements

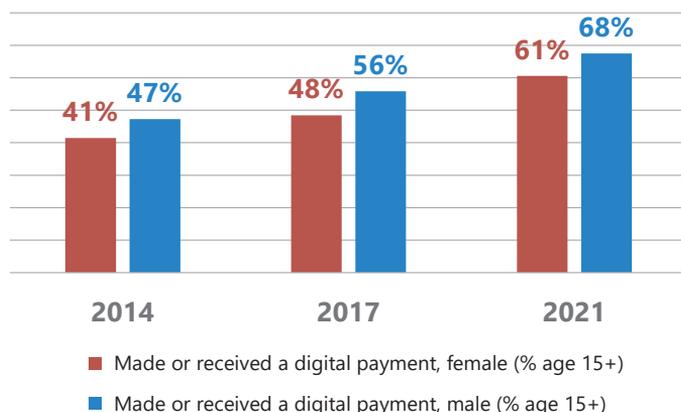
Abstract

This article examines the factors that led to the development of central bank digital currency (CBDC) initiatives globally and draws insights from the implementation of Pix, a public payment infrastructure in Brazil. It discusses Pix's success in increasing the digital footprint of payments in Brazil and the role played by the Central Bank of Brazil (BCB) in designing and implementing a payment system that aligns with social objectives and benefits the population. The article also explores how collaboration between the public and private sectors can lead to improved welfare outcomes and how lessons from Pix can be applied to the next generation of financial market infrastructures (FMIs) and CBDCs. Finally, it emphasises the importance of central banks establishing a strong governance structure with clear regulations to align societal objectives with new FMIs.

The rise of CBDCs

The rapid growth of technology has facilitated the growth of digital payments, with more than 60% of the population aged 15 or over making or receiving digital payments in 2021, according to World Bank data (Graph 1). This growth

highlights the impact of digital innovation on the financial system and the changes it has brought about in traditional finance and financial businesses. A recent transformative digital innovation was introduced in 2008 through Satoshi Nakamoto's paper on Bitcoin. Remarkably, this occurred during the global financial crisis of 2008. The introduction of cryptocurrency represented a new philosophy for many, providing a sense of freedom from traditional financial institutions.



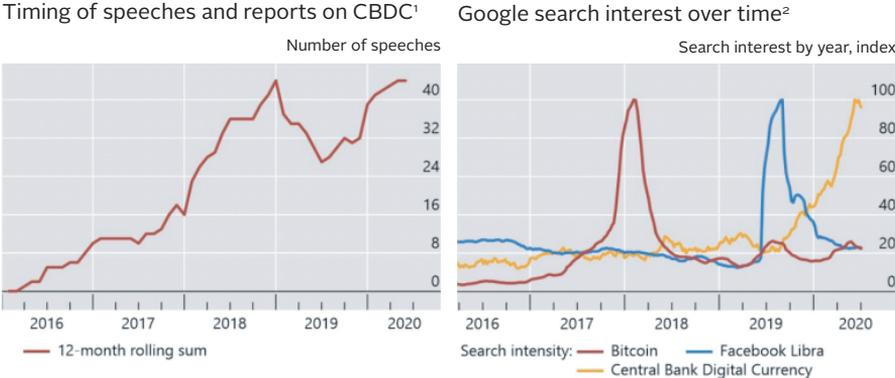
Graph 1 – Digital payments have grown steadily

Source: World Bank Financial Inclusion Dataset

In the 14 years since Nakamoto's paper, the two separate worlds of cryptocurrency and traditional finance have started to converge. There have been numerous theories about how financial intermediation would change as a result of Decentralised Finance (DeFi). DeFi has emerged as a new and flexible ecosystem that purportedly promotes freedom from a costly and rigid traditional financial system. It aims to provide financial services without using centralised entities. Moreover, it digitises and automates the contracting processes, which – according to its proponents – could improve efficiency by reducing intermediation layers (Aramonte et al., 2021).

Despite the potential benefits of DeFi, the volatility of cryptocurrencies has hindered its widespread adoption. Stablecoins emerged as a solution to this issue, seeking to leverage the stability of traditional financial systems. These digital tokens, which are backed by fiat currency, serve as a means of exchange in DeFi protocols, thereby relying on the trust associated with traditional finance. However, this interplay between the traditional and the new has garnered regulatory scrutiny.

The announcement of Libra, a private alternative to publicly issued money, also raised concerns about the impact of privately issued currencies and their potential availability to billions of people worldwide. These two factors drove central banks to engage in discussion about a safer, more stable, and publicly provided version of digital currencies. Central bank digital currencies (CBDCs) have since become the focus of innovation discussions among many central banks globally. Graph 2 shows the growing interest of both the public (right-hand side panel) and central banks (measured by the rise in the number of central bank speeches and reports on CBDCs) (left-hand side panel). Graph 3 highlights the increasing interest by the central banks in the issuance of CBDCs.

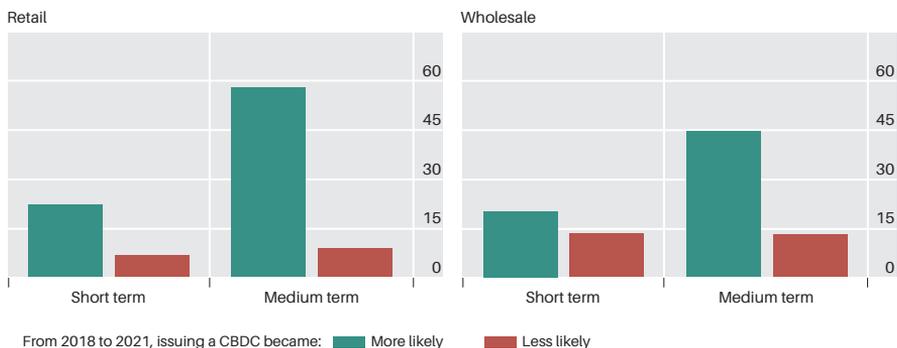


¹ 12-month moving sum of the count of central bankers' speeches resulting from a case-insensitive search for any of the following words/phrases: CBDC; central bank digital currency; digital currency and digital money.

² 12-week moving average of worldwide search interest. The data has been normalised to the 12-week moving average peak of each series. The search was run on search terms "Bitcoin" and "Facebook Libra" and topic "Central Bank Digital Currency". Data accessed on 16 July 2020. Sources: Central bankers' speeches; central banks' websites; Google Trends; authors' calculations.

Graph 2 – Interest in CBDCs has grown over time

Source: Auer R. et al. (2020)



¹ Retail CBDCs are a version of the CBDC whereby end users have direct claim on a central bank's balance sheet, whereas wholesale CBDCs are the version of the CBDC whereby financial intermediaries have the claim on a central bank's balance sheet.

Graph 3 – Likelihood of issuing a CBDC

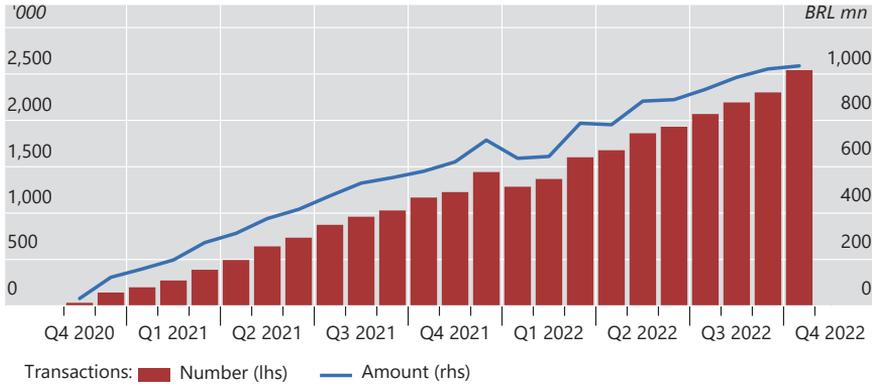
Source: Kosse and Mattei (2022)¹

The public and private collaboration in payments

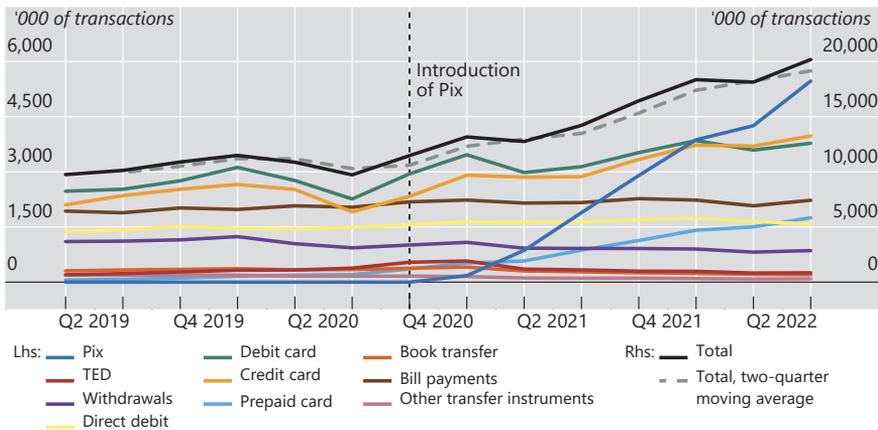
The recent interest in CBDCs has led to extensive research and discussion. The specificities of their implementation, however, remain unclear due to the necessity of assessing the associated challenges, risks, and benefits which are unique to each jurisdiction. However, regardless of the approach, a CBDC initiative can be regarded as a public good, like traditional forms of money, including banknotes, coins, digital deposits, or e-money. Therefore, the development of a new CBDC instrument and infrastructure can benefit from the lessons learned from the implementation of other public financial systems.

In the realm of payments, central banks have historically played a crucial role. However, private schemes have often driven the process of innovation and digitalisation for end consumers. In a few cases, like in Brazil (BCB, 2005), this has resulted in issues such as a lack of interoperability, market dominance, high operational costs, and financial exclusion. Public initiatives have attempted to address these issues, with most regulators striving to create a more efficient, interoperable, and stable payment system.

One such initiative is the Brazilian fast payment scheme (Pix), which has achieved widespread adoption within just two years of its launch. Pix was launched in November 2020 and was adopted rapidly both by households and companies. Graph 4 shows steady growth, with Pix not only substituting other digital instruments but further digitalising payments nationally (Graph 5).



Graph 4 – Growth in Pix transactions
 Source: Central Bank of Brazil, Pix Statistics



Graph 5 – The introduction of Pix increased the digital footprint of payments
 Source: Central Bank of Brazil, Pix Statistics

Pix has achieved significant success in Brazil, with over 64 million individuals making their first credit transfer ever with the platform and more than 80% of the adult population initiating or receiving a Pix transaction.

Several factors have contributed to the platform’s success. The key role played by the Central Bank of Brazil (BCB) in its development stands out. The BCB operates the real-time gross settlement (RTGS) system that underpins the settlement platform, a capability developed over nearly two decades of operating settlement systems. The BCB also played a critical role in ensuring that the

payment scheme met end-user needs and societal objectives through a formal governance structure that engaged stakeholders across the payment value chain. The BCB also serves as a rule-setter for the platform (Brandt and Lobo, 2022).

By mandating the participation of large payment service providers, the BCB addressed market failures, such as a lack of competition in the payment industry. Additionally, to tackle the lack of access to digital financial services, the BCB established a pricing policy with virtually no cost to individuals (Duarte et al., 2022).

Pix serves as a notable illustration of how collaboration between the public and private sectors can lead to improved welfare outcomes. In this case, the BCB, representing the public sector, joined forces with payment service providers, commercial associations, software and hardware companies, consulting companies, and other branches from the private sector. The outcome of this partnership was the development of an interoperable, standardised, and highly efficient platform that enables the private sector to create consumer-facing interfaces and services.

Applying lessons learned to the next generation of financial market infrastructures (FMs) and CBDCs

Prior to this public intervention, the market was replete with several private payment schemes that were not interoperable. For instance, prior to the emergence of Pix, only 10% of LAC jurisdictions offered full interoperability for mobile money services, compared with 75% in Asian EMEs and 25% of sub-Saharan African countries (Alfonso et al., 2020). In instances such as this, an interoperable platform may be regarded as a public good. As a public good, it is incumbent upon the public sector to take part in its governance (Duarte et al., 2022).

As previously stated, the development of CBDCs was prompted by the emergence of alternative forms of private currency, which could potentially result in market imperfections, such as monopolistic markets or a heightened risk of financial instability.

There is still no clear roadmap towards an optimal design of a monetary system that includes CBDCs that are interoperable with regulated versions of private money. Given different gaps in current payment systems and other FMs, different starting points in financial inclusion and infrastructure efficiency, distinct societal preferences for privacy, technology, governmental oversight, and even a spectrum of political interests, no clear and unique path exists.

Innovations in the field of CBDCs may involve the creation of a new programmable platform that exhibits similar features to distributed ledger

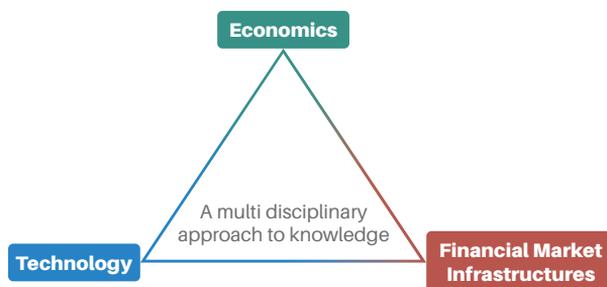
technology (DLT) but with better governance structures. This new platform may encompass the issuance of CBDCs, either retail or wholesale, where end-users or financial intermediaries have claims on the central bank, respectively. Alternatively, an approach that only includes regulation or the passing of new laws could also be used to address the rise of private currencies. It may also be feasible to consider a combination of one or more of these options.

Regardless of the combination of options chosen, central banks play a crucial role in establishing a robust governance structure that defines clear rules and regulations, aligning societal objectives with new forms of financial market infrastructures (FMIs) and currencies. It is essential to ensure a governance structure that is designed to promote financial and monetary policy stability, consumer protection, and privacy while also enabling innovation, financial inclusion, and competition. A well-designed governance structure will ensure that CBDCs can coexist with other forms of regulated digital currencies and effectively contribute to the public good.

As shown by the example of Pix, society may benefit from a governance structure that includes collaboration between the public and the private sectors. The nature of this collaboration is likely to differ across jurisdictions, but certain roles in this partnership will be better suited for the public sector, while others will be more suitable for the private sector.

Central banks are responsible for providing the safety, the stability, and the trust needed for the monetary system (BIS, 2022). This requires that the central bank guarantees the ‘singleness’ of money regardless of the design choices related to technology and standards (Garratt and Shin, 2023).

While the central bank acted as the platform operator in the case of Pix, not every jurisdiction may possess the technical capabilities required for such a role. Nevertheless, it is essential for the public sector to undertake the crucial responsibility of formulating regulations that align the structures and incentives of CBDC implementation with public objectives. This formulation demands a central bank’s increasing integration of knowledge across various domains such as technology, economics, and FMIs (Graph 6). In the technological domain, both traditional and new technologies will be required for programmable platforms to be thoroughly designed and implemented (Aldasoro et al., 2023).



Graph 6 – Different domains of knowledge for capacity building

Source: author's elaboration

Within the current 2-tier financial system, commercial banks have played a vital role in expanding the reach of financial services provided by central banks. Private actors, in turn, have historically offered the necessary flexibility to fully address the diverse needs of users, and this has become increasingly important in our modern, digital, and user-focused society. An analogy can be drawn with the distribution of physical goods, wherein the private sector excels in providing the so-called “last mile” services that cater to a wide variety of user needs and use cases, leading to customised experiences.

Like the case of the deployment of different fast payment systems (FPSs) around the world, the extent of cooperation between the public and private sectors can vary, with varying degrees of success. (Frost et al., 2023). While the implementation of FPSs globally may not be entirely applicable to the development of the various initiatives of CBDCs, it is still essential for central banks to collaborate with private sector entities to adequately address societal objectives and needs.

Central Banks as Leaders of Innovation

Throughout history, technology has played a key role in driving societal evolution and disruption. The emergence of cryptocurrencies has introduced novel technologies that have the potential to provide significant benefits to society. However, to fully realise these benefits, central banks may need to take a leadership role in driving innovation within the monetary and financial systems.

Despite the presence of more pressing issues in the current macroeconomic environment, it is crucial to recognise the importance of public goods whose rules are governed or overseen by the public sector. It could be argued that premature public sector involvement in the implementation of new technologies as a public good could result in suboptimal outcomes. However, while there may be anchoring on suboptimal equilibria, there is also a risk of late entrance by the

public sector. Such tardiness may also lead to undesirable imperfect markets. Thus, a balance must be struck between caution and proactivity to ensure that innovation is effectively leveraged for the greater good.

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The Central Bank of Hungary's Approach to Financial Innovation and CBDC

Anikó Szombati

Chief Digital Officer, Central Bank of Hungary

Abstract

Technological development and disruptive innovations have fundamentally changed our thinking about financial services. FinTech disruptors, along with incumbent innovators, are keen to make finances more convenient and accessible. In Hungary, the FinTech phenomenon is an especially relevant topic due to the significant room to improve banks' operational efficiency. MNB, the central bank of Hungary, promotes the spread of FinTech innovations in a safe manner that does not pose risks to the financial system, via the operation of the MNB Innovation Hub and Regulatory Sandbox. The MNB has ambitions to be at the forefront of the research into the potential of different forms of the future of money –especially central bank digital currencies. According to its unique seven-step decision-making framework, a successful initiative has to be based on the identification of a specific market failure or a definite policy objective that could justify intervening in the currently operational payment system. Among the motivating factors surfacing internationally, MNB's future efforts might be driven by the idea of creating a platform for innovation and digital financial inclusion. As a first step, MNB has launched pilot projects in both the wholesale and retail realms. In the latter case, the objective is to establish a relationship with real users while offering them valuable services, and increasing preparation for the in-house implementation of either a DLT-based or centralised ledger-based core banking system. Overall, the Digital Student Safe, a mobile application offered to 8–14-year-old students and their parents that helps them learn and practice basic finances in a digital form can already be seen as a fully-fledged retail CBDC platform, through which both the central bank and future generations can learn about how to operate the future form of money in a live environment.

Introduction

Technology, information-processing capacity, and the spread of the mobile internet have transformed how people manage their finances today. This evolution, in part, is brought about by Fintech disruptors – technology-based financial companies that are transforming parts or the whole value chain of financial services. Their modern, technology-enabled approach that makes user demand the focus can bring about more inclusive, flexible, convenient, and affordable banking, investment services, and insurance, but can be a source of both old and new types of risk as well. The best international practices concerning how digitalization can be harnessed in financial intermediation and risk prevention led to the revelation that MNB needed a dedicated unit to incentivise the digital transformation of the Hungarian financial system as well as the central bank itself. This led to the establishment of the Executive Directorate for Digitalisation and Fintech Support. Along the same lines, MNB was among the first regulators in Central Europe to facilitate dialogue with innovators and support them by creating the possibility – based on individual assessments – to test innovative ideas by introducing the MNB Innovation Hub and Regulatory Sandbox in 2018.

By the end of the 2010s, it turned out that FinTechs mainly support rather than challenge incumbent financial service providers as B2B partners, and that the foundations of the pre-existing financial system would not necessarily be disrupted by these new players. At the same time, the financial ambitions of BigTech companies became apparent, especially with the publication of the Facebook-initiated Libra Association's White paper, which outlines the plans for an alternative global payment platform based on a novel payment instrument, a special stablecoin called Libra, or later Diem. This prompted central banks to supplement their theoretical research by speeding up implementation-related activities and start considering the launch of direct liabilities towards retail users in digital form, also known as central bank digital currencies.

With deep knowledge of Fintech initiatives and the main developments in the digitalisation of banking products, both from a financial and technological perspective, MNB was well prepared to research the potential of CBDC for Hungary. Following the publication of a unique study book, *At the Dawn of a New Age – Money in the 21st Century*, MNB decided to deepen its knowledge by running small-scale experiments with real users. These pilot projects opened the way to exploring how a new, customer-centric architecture could be located within the central bank's infrastructure, how novel cooperation with local FinTechs and commercial banks could be developed. Overall, the aim of the central bank was to develop the capacity and skills for making the move into the next evolutionary phase of money quicker and easier.

This study will guide the reader through this journey and demonstrate how the MNB approaches complex issues like a new, direct central bank liability for citizens and what it can learn from the current experiments that can be applied in the future.

An innovation-centric central-bank approach to the age of digitalisation

MNB is devoted to maintaining and promoting the stability of the domestic financial system. In this manner, we believe new approaches may be needed as technological developments are happening rapidly, including in financial intermediation. Nowadays, financial systems must not only be capable of withstanding economic shocks, but it is imperative to handle the challenges posed by digitalisation (e.g., adapting to users' increasing preferences for digital transactions, utilizing available datasets as assets, providing more and more real-time services, and dealing with more and more frequent cyberattacks). By becoming more adaptive, more competitive, and more modern, financial actors can develop a more sustainable business model, resulting in more systemic resilience and, therefore, a more stable financial system. On the other hand, this requires changes in people, processes, and systems at each financial institution, which is cumbersome and resource intensive. As the results of these efforts tend to surface only over time, financial institutions are sometimes prone to underestimating this long term-challenge and devoting only limited effort to dealing with it. Therefore, they need an outside stakeholder to incentivize digitalisation initiatives. In Hungary, the MNB, the central bank of Hungary took up this role early on.

Setting up an executive directorate responsible for digitalization and fintech support

Given that the MNB has the mandate to promote the financial system's sustainable contribution to economic growth, it has a strong interest in strengthening the level of digitalisation of the domestic financial system, to which it intends to provide active support. The MNB published a Recommendation on the digital transformation of credit institutions. In issuing Recommendation No 4., effective from April 2021, an innovative approach by international standards, the MNB's purpose was to foster the process of digitalisation of domestic banks, thereby improving their competitiveness. The Recommendation required credit institutions to draw up and submit to the MNB a comprehensive digital

transformation strategy and timetable by 31 October 2021. Since then, the MNB has followed the respective accomplishments closely. It also requires financial institutions to review their developments, make the necessary changes in their strategic direction every year, and share these with the MNB.

Partly due to limited experience and information owing to the novelty of the services and partly because the new financial services sometimes cannot be interpreted properly according to pre-existing regulatory concepts, the role of regulators and central banks is essential in promoting innovation through their regulatory and supervisory tools, in a safe manner. It is not negligible that as innovation gains ground at an ever-increasing pace, this role is constantly expanding. Nonetheless, the primary objectives remain the same: helping innovative players and their initiatives to safely overcome the challenges that lie ahead of them, but, at the same time, maintaining consumer safety and mitigating any risks and damages that arise, thereby shaping a conscious consumer society.

Beyond supporting the development of a more competitive, efficient, and stable financial intermediary system via its innovative initiatives, MNB is making a significant effort to boost the Hungarian FinTech ecosystem. To accomplish this, (1) MNB promotes the spread of FinTech innovations in a safe manner that does not pose a risk to the financial system. The two most effective tools for this are the Innovation Hub platform, where innovators can consult the central bank, and the Regulatory Sandbox, a controlled regulatory test environment (Diagram 1).

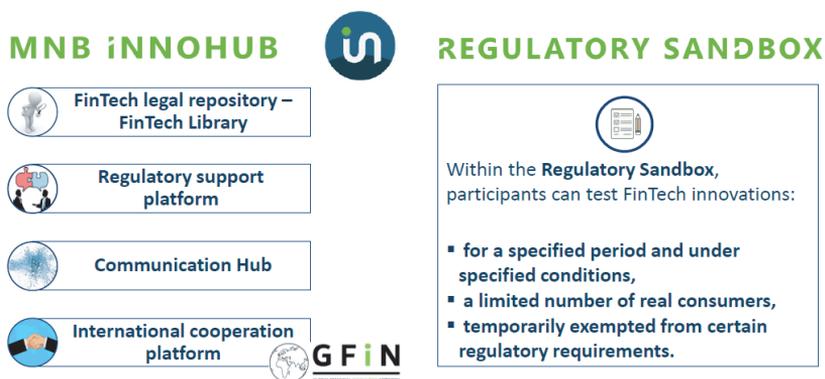


Diagram 1: Main functions of the MNB Innovation Hub and Regulatory Sandbox

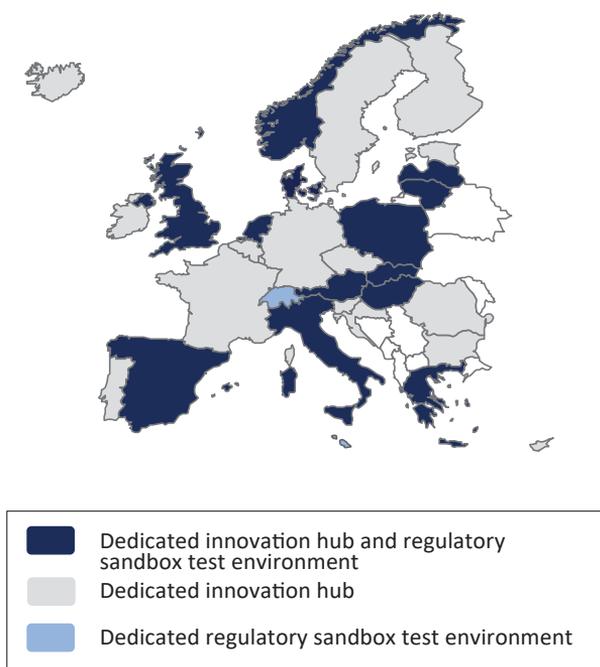
Source: MNB

Furthermore, (2) MNB is committed to fostering partnerships on a wide scale between incumbent institutions and FinTech firms. At the same time, as a central bank, (3) MNB also cooperates with the actors of this sector to promote

its own digitalisation. These partnerships with innovative companies include the CBDC pilot called Digital Student Safe, the Money Museum mobile application, which also functions as a private blockchain-based NFT (Non-Fungible Token) issuance platform and digital coin register, and the Pallas Athéné chatbot application on the central bank's website.

The MNB Innovation Hub is a platform for direct and flexible communication between financial innovators and the central bank

The process of regulatory oversight of the safe uptake of financial innovation can also be supported by the creation of innovative frameworks, mainly via the establishment of innovation hubs and regulatory sandboxes. As has now been proven, after some years, the mentioned initiatives have become internationally widespread and seen as a kind of universal solution (Map 1). The MNB was among the first authorities in Europe to establish these frameworks in 2018:



Map 1: Innovation Hubs and Regulatory Sandboxes in Europe (2022)

Source: MNB, based on EBA and the websites of national authorities

in March, the financial innovation platform, the MNB Innovation Hub, was launched, which serves as a platform for direct and flexible communication with innovators. Then, at the end of the year, the Regulatory Sandbox was also launched for the controlled testing of new ideas within a regulated framework.

During its five years of operation, MNB's framework for supporting financial innovation has already provided quick and professional guidance about various regulatory dilemmas related to financial innovations in more than 150 cases. These applications, general requests, and requests for special guidance came from domestic and foreign companies, including incumbent institutions and newly established innovative actors. The need for such a central bank approach is justified not only by the large number of participants in the program but also by the ever-widening scope of services for which participants seek, guidance from the central bank regarding payments and KYC/AML through the trading and distribution of crypto-assets, and regtech and suptech, initiatives.

The future of money: how to get it right

Besides supporting the vibrant FinTech ecosystem and an innovative environment in general in Hungary, the MNB is also keen to be at the forefront of central bank innovation. Therefore, it is researching and experimenting with new ideas and technological solutions such as central bank digital currency (CBDC) and blockchain technology. As a first step in its CBDC research, the MNB published a comprehensive study volume entitled *At the dawn of a new age - money in the 21st Century*. The study volume is quite unique internationally, as in addition to the conceptual and design considerations of the potential forms of CBDC, it also covers their monetary policy, financial stability, cash flow effects, and the issues associated with their infrastructural implementation.

Key decision points and considerations in the design of CBDC

The actual catalysts behind the increasingly serious discussions about the introduction of a central bank digital currency may include technological progress, the increase in electronic payments, as well as the appearance of private solutions that address the anomalies in payment systems. Some jurisdictions, especially smaller- or medium-sized economies, are also addressing this issue because with the evolution of the CBDC concepts of larger economies or economic regions – like China, the Eurozone or the USA – the fear of digital

dollarization, alias currency substitution in digital form, becomes a tangible risk even in the medium term. How the different countries introduce this, however, will vary considerably. It will depend largely on the particular problems that the CBDC can resolve, its relationship with monetary policy, and the extent to which the central bank wishes to involve market participants in the operation of the new payment platform. Besides this, potential user needs and the differences and options among available technologies have to be taken into consideration so that a completely new type of money can function alongside cash as it is used today, while ensuring that the targeted user base actually uses it.

The central bank management boards that are responsible for managing the process of such complex, strategic decisions while facing numerous dilemmas and, in some cases, constraints need a proper decision-making framework. The MNB digitalisation team has developed a unique framework that basically identifies seven major decision steps that represent a comprehensive, logical order for the consideration of factors when designing a CBDC project (Diagram 2). These decision steps essentially build on each other.

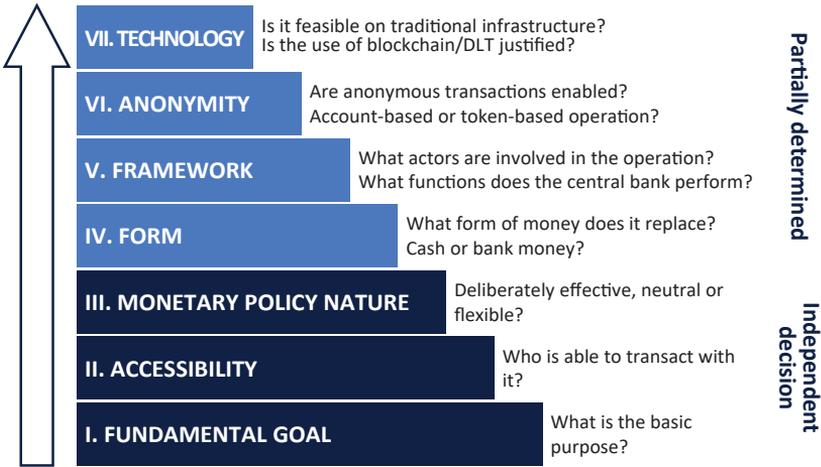


Diagram 2: Decision 'steps' when designing a CBDC

Source: Fáykiss – Szombati, 2021.

For the first three 'steps', there is still a relatively large degree of freedom for each dimension, but after that, many decisions may already be partially determined (Fáykiss – Szombati, 2021):

1. **The fundamental goal**, which can stipulate the motivation for the CBDC's introduction, i.e., the market failure that it is intended to mitigate.

- II. **Accessibility**, which determines which economic and social actors will have access to the CBDC.
- III. **Monetary policy nature**, which should specify the key monetary framework, i.e., whether the instrument is active, neutral or flexible from the perspective of monetary policy, as well as any constraints (e.g., the amount that may be held on an account, transaction size or number).
- IV. **Form of the CBDC**, which should include the form of money (cash or deposit money) it is equivalent to and, accordingly, the functions it can have.
- V. **Operating framework**, which determines the players that take part in the operation as well as the central bank's functions.
- VI. **Anonymity**, namely whether anonymous transactions can be conducted, and the framework for these (account-based or token-based approach).
- VII. **The technology**, i.e., whether the system will operate using the traditional infrastructure, or a new system, possibly one based on distributed ledger technology, should be developed.

Typical sources of policy motivation for CBDC projects

Public policy intervention in the payments system and public commitment to a new, as-of-yet unimplemented CBDC solution can be expected from central banks if a clear market problem, failure, or public policy consideration can be identified that triggers thinking outside the current framework. Based on the international literature, Diagram 3 gives an overview of the potential directions.

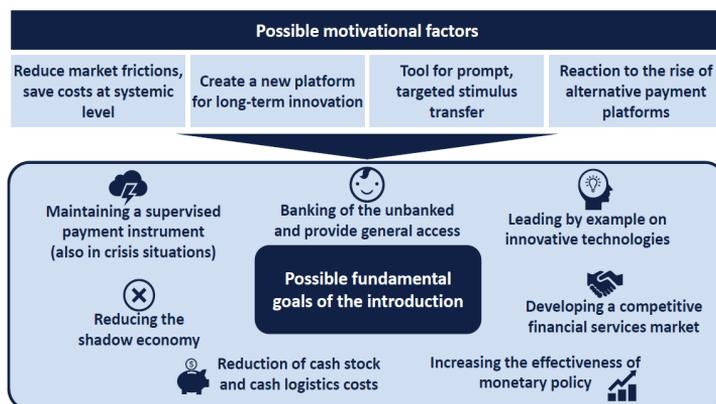


Diagram 3: Public policy considerations behind CBDC initiatives

Source: MNB based on BIS and central banks' websites

Although several of these factors are typically behind each of the ongoing central bank projects, the following can be identified as common drivers for those countries in the most advanced stage of CBDC preparation:

- **Digitisation of cash, expanding the opportunities associated with financial transactions by strengthening digital financial inclusion:** the spread of digital payment solutions has increased the need for a digital payment instrument issued and guaranteed by the state, which is widely accepted as a means of payment, similar to cash, and which can perform the function of a payment instrument in digital form. By giving access to their currency in a digital format, central banks can also maintain their monetary sovereignty against privately issued digital payment instruments. A free, uniformly accessible, secure, and fast electronic payment system operated by the central bank could also open up access to financial services for those who, previously made payments exclusively in cash.
- **Developing the financial services market via providing a new platform, stimulating competition:** a newly established, centrally operated platform embracing the latest technological achievements can support further market developments and technological innovations, for example, through smart contracts linked to payment transactions, where other processes can be triggered once payment is completed.
- **Ensuring the robust operation of a payment instrument and system, including in crisis situations:** to overcome potential malfunctions of electronic payment solutions currently provided by the private sector, it may be necessary to build and maintain a backup system, which should be operated by a central actor such as the central bank. Similarly to cash, this system would be based on a generally accepted, widely available cost-free and risk-free payment instrument, which is digital.

With the introduction of the Instant Payments System in March 2020, which was obligatory for all financial service providers in Hungary, MNB took a huge step towards creating the possibility for all citizens to opt for a digital payment solution in every payment situation. Still, this freedom of choice is only available to those who have and actively use a bank account. Based on MNB studies, approximately 13 per cent of adult population may not have access to a bank account. There may be an even larger population who formally might have a bank account but, in practice, rely only on cash payments. For these unbanked and underbanked segments, there may still be a need for a specifically designed, very convenient, easy-to-use, free-of-charge digital payments solution that a CBDC platform could offer. This **digital financial inclusion** could be one of the

most relevant sources of motivation for MNB to consider. On top of this, to lay the ground for further market **innovation**, there might be a need for a new, distributed ledger platform that can facilitate programmable payments and IoT solutions. Whatever steps MNB intends to take while designing the system, it has to bear in mind **sustainability** aspects to the maximum extent, both in terms of costs and energy consumption.

The MNB's pilot projects provide an opportunity for testing within a secure framework

For the moment, the MNB does not see the urgent need to set up an implementation project for a large-scale, general retail CBDC project. Still, it wants to develop capabilities, build market and implementation knowledge and get to know about technologies to shorten the time required to issue a CBDC when economic or policy need arises. Therefore, the theoretical review and study book publication was followed by the launch of targeted pilot projects aimed at generating practical experience. Targeted pilot projects allow the MNB to gather valuable and non-simulated knowledge and know-how while also providing a secure testing environment with minimized risk by involving a small, controllable customer base.

Experiments run in parallel and designed and implemented by MNB are oriented in the retail and the wholesale CBDC direction (Diagram 4). Since the study focuses on the retail approach, what follows will further elaborate on the retail experiments.

When it comes to a retail CBDC, apart from the six preceding design choices, the following consideration about potential technological implementation usually matters: whether the CBDC is blockchain-based and/or centrally managed. Blockchain-based CBDCs might not be such an obvious choice as a CBDC is typically a central-bank-based, centrally managed structure; however, with the rise of Bitcoin and its ambition to become an alternative, distributed payments platform outside the oversight of central banks, the opportunities it offers have become popular nowadays. Especially when the rapid evolution of asset-tokenisation and Web 3 are considered, the technology might offer novel advantages – also, when future payment platforms are considered. However, just as Bitcoin itself has not fulfilled the dream of becoming a real alternative currency, distributed systems generally tend to have some drawbacks. Scalability, throughput, and latency are the most pertinent issues in most cases. Since Hungary has a small economy and the population is only ten million, in MNB's case, capacity problems do not seem to be a binding constraint. For this reason, we decided to launch an independent CBDC experiment dedicated to this technology.

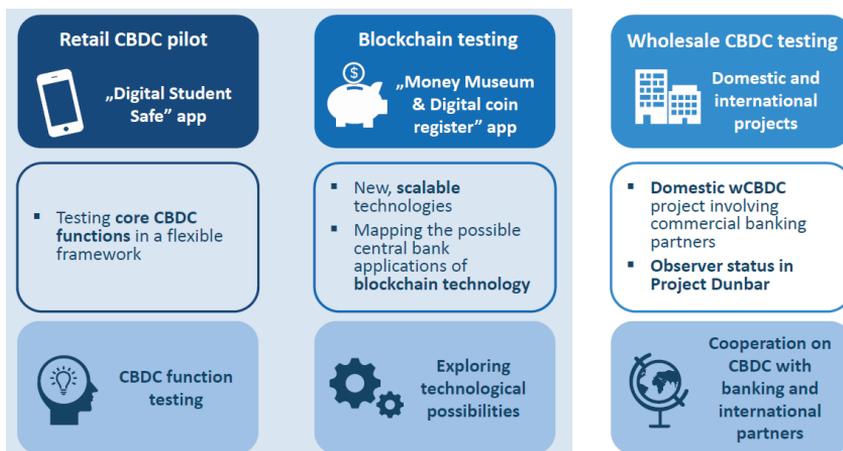


Diagram 4: Main directions of MNB CBDC experiments

Source: MNB

Blockchain-based CBDC testing: the Money Museum app

The MNB's unique, innovative mobile application, the Money Museum app, offers dual functionality: on the one hand, it works as a blockchain-based digital coin register, while on the other hand, it provides fun and professional content about the recently opened Money Museum in Budapest. The digital coin register function offers a dedicated, private blockchain-based, NFT (Non-Fungible Token) issuance and coin registry platform, where the MNB – among the first central banks to do so – has minted its own NFT series (Diagram 5) and made it available to the public. Those who want to receive and collect the NFTs issued via the app have to correctly answer quiz-based questions that measure financial literacy and familiarity with coin minting and numismatic issues. The NFTs are distributed randomly and, in most cases, are special series issued in connection with a timely topic, like the 75th anniversary of the circulation of the forint, the Hungarian currency, Christmas, or the carnival season. Those who – via exchanges on the marketplace – collect the whole series can register their collection for a lottery game and win physical sets of coins. The winners, with the help of a unique QR code located on the seal of the coin set, are provided with the opportunity to register their physical coin set on the MNB private blockchain. The scheme offers a unique and innovative opportunity for the central bank, on the one hand, (1) to experiment directly with blockchain technology and, on the other, (2) to test several functions of a CBDC. (1) The

blockchain-based architecture deployed within the central bank can support the MNB to obtain hands-on experience regarding the implementation and operation of such an innovative system and test its performance, scalability and potential regarding automated and distributed data management. (2) Since the MNB operates a proper KYC for the participating users, whose NFT accounts are managed by the system (which offers collection and exchange functionalities, redemption functions, and many others), it can replicate several of the functions that a payments platform would need to include. The continuous operation of the system, constant interaction with real users, and the UX and UI design focus all provide very valuable lessons for the central bank in terms of preparing to design a future core banking system with a retail focus. The more than 350,000 NFTs collected by the user base and the very favourable ratings provided on both the Google Play and Apple Play platforms suggest that the system serves its dual goal properly.

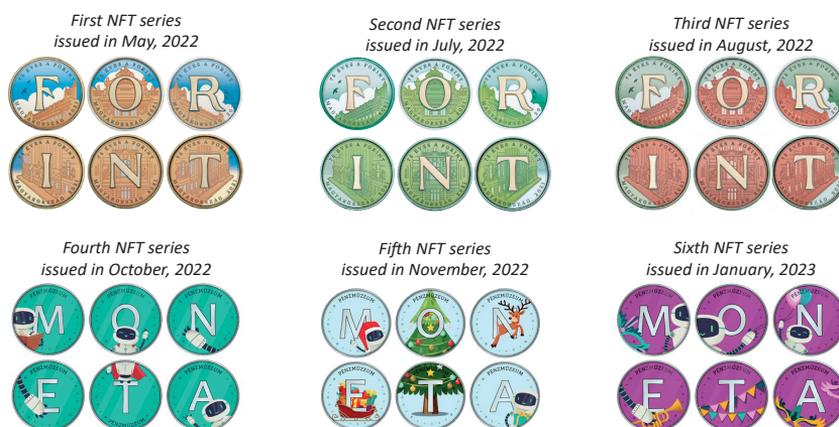


Diagram 5: The NFT series issued during the first year of operation of the Money Museum app

Source: MNB

Full-scale CBDC testing in a gamified format: MNB’s Digital Student Safe

In parallel, the MNB also decided to launch another CBDC pilot that also targets real users and can become a platform for testing a CBDC as accurately as is possible. Therefore, it implemented a pilot project whereby the two policy

goals of building an operational CBDC pilot and supporting the digital financial inclusion of a particular group of 8-14 years old students could be combined.

Savings stamps have a long history in Hungary; their first appearance dates back to the nineteenth century. The savings stamp was originally a financial instrument that allowed people to make micro-savings. Later, in the 70s and 80s, collecting savings stamps became popular in primary schools in Hungary. Collecting stamps with different designs and colours was a playful form of saving for students. At the end of the school year, students could redeem the savings stamps through their teachers. However, in the past three decades, this playful form of micro-saving has disappeared from schools.

The Digital Student Safe mobile application is an attempt to make the once very popular financial inclusion format available again to students while adapting it to the expectations of the modern digital age. The mobile application has been available to students since September 2020. With the help of targeted communication and a direct marketing campaign, the central bank first invited 45 schools to participate. With the step-by-step extension of the program, by the end of 2022, students from more than 100 schools were able to use the application actively. Based on the experiences and the feedback, the further expansion of the Digital Student Safe project has been confirmed. The official launch of the renewed mobile application took place in May 2023.

The Digital Student Safe is a publicly available mobile application on which gamified stamp collecting and actual money transactions are available to students and their parents. Via the app, students can set savings goals and exchange and collect digital assets (digital medals, digital stamps) by answering quiz questions about finance, digitalization, and environmental awareness. Additional digital medals can be earned from parents as gifts or in return for the completion of some pre-determined tasks/activities, all registered in the app. The digital medals or stamps are part of special series, e.g., on famous Hungarian kings or Hungarian Castles. Therefore, the collection of a specific series of digital assets and the exchange of excess copies has intrinsic value for the “young collectors”. The digital saving assets also represent specific values, expressed in the so-called Student Tallér. They can be redeemed for material gifts like toys or sports equipment at a specific webshop. The new Student Safe mobile app, available since February 2023, allows users to try out using real money in a digital form as well. For this, they must undergo a simpler or fully-fledged KYC and AML check. Following this, free-of-charge e-money accounts are opened for them. They can transfer money to these accounts by card payment. With this money, students or their parents are able to initiate transfers to bank accounts, save money by setting goals that are important to them, and make purchases using SimplePay Instant Transfer QR code payments. The system, which was

developed in cooperation with Hungarian FinTech companies and commercial banks, has a modular structure so that, in the future, additional functions and alternative core banking models may be implemented (Diagram 6).

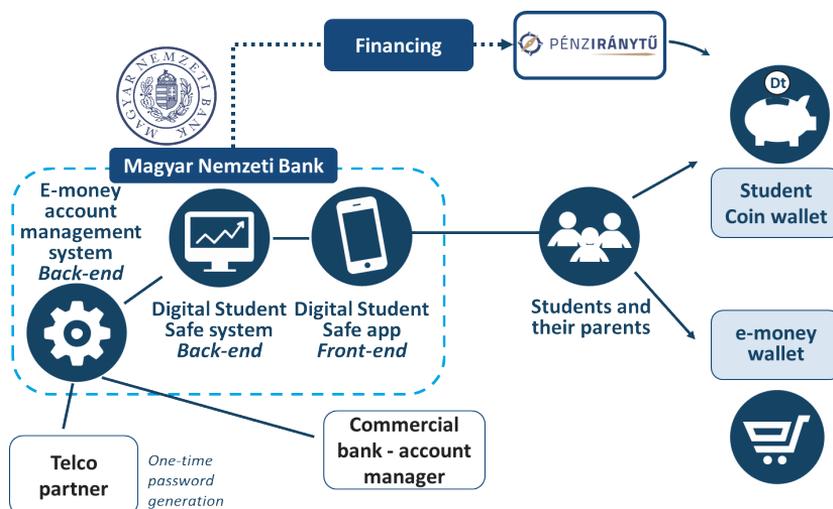


Diagram 6.: Extended version of the Digital Student Safe mobile application

Source: MNB

The MNB Digital Student Safe is a one-of-a-kind, free mobile application that targets primary school students. The creation of the application had a dual purpose. On the one hand, it supports financial awareness and promotes digital financial inclusion among children aged between 8 and 14 years old and their families. The application allows them to learn the foundations of finance in a playful way via their smartphones, including collecting and exchanging digital medals and then redeeming them for various valuable material gifts. On the other hand, the Digital Student Safe initiative helps the MNB to obtain practical, hands-on experience with a potentially operational model of a future CBDC system. In a limited but live environment, the central bank, amongst others, is able to:

- gain experience designing, developing and implementing an IT architecture involving direct customer contact;
- coordinate mobile app development and customer service operation;
- design, implement and operate proper KYC processes with a design-thinking approach;
- develop customer journeys based on real market experience;
- obtain know-how about collaborating with commercial banks, FinTechs, and other innovative actors.

Conclusion

The MNB does not currently identify any market failure or policy perspective that would make the introduction of a generally applicable retail central bank digital currency urgent; at the same time, it is committed to continuing its research on CBDC and blockchain technology. The Digital Student Safe has been operational for more than two and a half years, following which a more direct connection to real money was established. The launch of the renewed application started in Spring 2023. The central bank is keen to see how the idea is received. Since it has no direct adoption target, it can focus on continuous learning and ecosystem building with more and more technology providers and commercial banks, or other payment service providers. The modular architecture of the system helps keep open the possibility for new partnerships and to explore new technologies in a live environment. At the same time, the Money Museum app will continue to be the test environment for blockchain technology. Additional opportunities for extending the base of those who can acquire NFTs are also being explored further. The MNB is also actively looking for opportunities in the wholesale CBDC realm in the form of domestic and international cooperation, similarly to when it joined Project Dunbar as an observer. Our ambition is to build an excellent competence centre at the central bank that will be a solid base for any further steps that are required to keep pace with the future of money.

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Central Bank Digital Currency (CBDC) – a commercial banker’s view

Radován Jelasy

President, Hungarian Banking Association

Retail CBDC,ⁱ “digital money issued by the central bank directly to the general public”ⁱⁱ would represent a game changer for the financial sector. Not only would it mean that private individuals have, for the first time, direct access to central bank money that is financially risk-free (no credit, market, or liquidity risk), but it could eventually also completely replace cash. Although there is a long list of reasons why CBDC needs to be developed, from increasing financial inclusion to making cross-border transfers cheaper, reducing cash to increasing competition among banks, one still needs to be very cautious as it would also impact the functioning of the financial sector as we have known it until now. One should especially examine the case for CBDC during times of economic turmoil. The implementation of CBDC in practice definitely needs to be dosed [incrementally implemented] and carefully monitored and, if needed, urgently adjusted.

What is so different regarding CBDCs? CBDCs would be the first so-called ‘public or central bank money’ issued directly by a central bank to private individuals in addition to pre-existing good old cash. ‘Private money’, in contrast, involves a claim on a regulated private commercial bank in the form of digital bank deposits held by households, companies, or the state. By issuing CBDC (currency to be owned directly by the general public), the world we have known until now would change substantially. Monetary policy, as we have known it since the establishment of central banks, has been carried out via commercial banks, as that is where private individuals, companies, and government agencies traditionally complete transactions. Central banks, by increasing/decreasing interest rates, calibrate

monetary aggregates via commercial banks' balance sheets. By providing private individuals with direct access to central bank money, a part of the funds of the latter would be kept directly in CBDC instead of in funds in commercial banks. This could actually bring us back, to some extent, to the kind of banking system experienced in Central and Eastern Europe before the fall of communism, the so-called single / one-level banking sector (*egyszintű bankrendszer*).

Why should one look into CBDS as an alternative to cash – currently, the 'Central Bank NONE-Digital Currency' (CBNDC)? One reason is definitely the nature of the cash issued by central banks over the last decades. Around 95% of the funds held by individuals to make payments in the UK today¹ are private money, held as commercial bank deposits, and are typically spent electronically, such as by bank transfer or debit card. As spending has become more digital, the use of cash for payments has declined, falling from 55% of transactions to 15% over the past decade in the UK and to only 3% in Norway in 2021.² If current trends continue, the public's access to, or use of, central bank money will diminish, and the monetary system could become fragmented, posing a risk to monetary and financial stability. The existence of a digital currency would help ensure that central bank money remains available and useful in an even more digital economy.

Second, the recent boom in cryptocurrencies was definitely a wake-up call for the central banks at least for two reasons: a) a substantial amount of money (enough to even threaten the stability of the present financial sector) was invested, despite all the warnings of central banks and international financial institutions (a tenfold increase between early 2020 and November 2021, peaking at USD 2.9 trillion capitalization) and, b) the need to develop a digital safe (stable) asset to counterbalance the substantial interest in cryptocurrencies. The staggering amount of money invested in cryptocurrencies forced the hands of central banks: instead of sitting and waiting for policy, a decision was made to become proactive by testing out CBDCs. Third, to safeguard against criminal activity and protect consumer privacy, issues about which concern has often been raised recently – noting that bank clients are more confident about central banks than commercial banks.

Despite the recent flops in the case of cryptocurrencies, the digitalization of financial services will continue unabatedly, and the search for alternatives to cash will continue.

How would CBDCs impact the financial sector? What would happen if individuals, instead of depositing their funds with commercial banks, suddenly entrusted a central bank with their savings? What would the main impacts be?

¹ The digital pound: a new form of money for households and businesses? – Consultation paper, February 2023

² Central bank digital currencies: An active role for commercial banks, McKinsey study, October 13th, 2022.

- 1) Financial intermediation – As the introduction of a CBDC would result in households switching some of their bank deposits to digital currencies, commercial banks would have substantially less funding for financial intermediation. They would therefore provide fewer loans to private individuals and companies and buy fewer government bonds or provide less loans to municipalities. This process would not only reduce the level of lending but force banks to look for additional revenue streams or increase the cost of existing ones. The level of financial disintermediation would depend on the speed and permitted scale of CBDC usage.
- 2) Financial stability – Financial disintermediation would also have an impact on financial sector stability. With less stable and more expensive funding – thus smaller margins than before – many banks would need to rethink their business models. The latter would need to be revised as commercial banks would be competing directly for deposits with the central bank, needing to offer interest rates attractive enough to induce private individuals to switch from CBDC to commercial bank deposits.
- 3) Monetary transmission mechanisms – Bank disintermediation would also affect the efficiency of monetary policy transmission mechanisms. Central banks’ monetary tools, such as open market operations, reserve requirements, Repos, liquidity swaps, etc. that are carried out would be substantially less efficient as only part of the related funds would be with commercial banks. On the other hand, questions arise as to what extent the funds deposited directly with the central bank (i.e., in a CBDC) would be impacted by monetary policy.
- 4) KYC (Know Your Customer) and AML (Anti-Money Laundering) rules – Like current digital payments, the CBDC would not be anonymous, unlike cash, as there would be the ability to identify and verify users if needed to prevent financial crime. Personal details would not be known by the government or the central bank except in the case of legal proceedings. This is probably the only reason that people still use and most likely will continue to use ‘good old cash services’: so that anonymity may be guaranteed. While CBDC balances would be a direct liability of the central bank, commercial banks should act as the central bank’s agents in ensuring KYC and AML – this occurred during the recent pilot of the E-Krona in Sweden, the CBDC experiment in China, and the Banking for All Act in the United States as well,³ and may be offered through commercial banks.

³ BIS Working Papers, No. 1046, The case for convenience: how CBDC design choices impact monetary policy pass-through.

- 5) Online wallets – CBDCs could be used directly/indirectly (via online wallets) to carry out payment services instead of using deposits with commercial banks. Private sector companies – which could be banks or approved non-bank firms – would be able, in the case of indirect usage, to integrate into the central digital infrastructure, creating the interface between central banks and users. They would do this by offering digital ‘pass-through’ wallets to end users.

Each issue mentioned above raises several additional questions and leads us to a world not experienced before, especially if the usage of CBDCs becomes widespread.

What would I do in such a case? How would I behave in normal times and when the financial sector is under pressure? What would I take as my break-even point between using CBDC and classic commercial bank funds?

Currently, the basic understanding is that CBDCs, as risk-free assets, would pay a zero interest rate on funds deposited with the central bank. By default, this would also mean that a retail client would expect some compensation for keeping money with a commercial bank, being exposed to more risk. Today, one of the most stable instruments of commercial banks is the current account deposit, which, due to deposit insurance schemes, is the most reliable, cheap, and well-diversified funding resource. Up to the guaranteed maximum of EUR 100,000 per depositor per bank, there would only be partial competition between CBDC and commercial bank deposits due to: a) the cost of account maintenance fees, b) the interest rate paid by commercial banks, c) easy access to money, and d) additional auxiliary services offered by banks (e.g., insurance features/bonuses for using cards).

The strongest competition between CBDCs and commercial bank deposits would occur with funds above EUR 100,000 that are uninsured. How much money would clients keep with commercial banks, and at which expected rate of return above EUR 100,000? How would such an instrument behave during a time of economic turbulence? Do private individuals keep money in the bank today because they feel that it is entirely secure or only because they do not have a better alternative? It is hard to answer all these questions without understanding factors such as:

- would the amount of money available in the form of the CBDC be limited per person?
- how easy/cheap would access to such funds be?
- what would the trade between CBDC vs. commercial bank funds look like in times of stress...

Central banks today also support consumer protection institutions/referees for users of financial sector services. Could a central bank still be a referee in the case of consumer protection issues while simultaneously providing payment services? Could funds deposited with central banks be used to obtain extra financial services such as Lombard loans? As one can see, the role of central banks has to be completely redefined if CBDCs are to be implemented, especially if this happens on a large scale.

I usually start by asking the question, “why?” – i.e., why do we need to do this, if at all? If one cannot give a good and convincing answer to this question, then one should revisit the whole issue. Some countries have started doing this – i.e., they have tested CBDC in practice and decided not to implement it for the time being. I curiously look forward to what will happen next.

i I focus only on retail CBDCs that would replace cash, not ‘wholesale’ ones that would be used to settle high-value payments between financial firms.

ii Money and Payments: The U.S. Dollar in the Age of Digital Transformation, January 2022.

V.

CONTRIBUTORS

Claudio Borio

**Head of the Monetary and Economic Department,
Bank for International**



At the BIS since 1987, Mr Borio has held various positions in the Monetary and Economic Department (MED), including Deputy Head of MED and Director of Research and Statistics as well as Head of Secretariat for the Committee on the Global Financial System and the Gold and Foreign Exchange Committee (now the Markets Committee). From 1985 to 1987, he was an economist at the OECD, working in the country studies branch of the Economics and Statistics Department. Prior to that, he was Lecturer and Research Fellow at Brasenose College, Oxford University. He holds a DPhil

and an MPhil in Economics and a BA in Politics, Philosophy and Economics from the same university.

Agustín Carstens

**General Manager,
Bank for International Settlements**



Agustín Carstens became General Manager of the BIS on 1 December 2017. Mr Carstens was Governor of the Bank of Mexico from 2010 to 2017. A member of the BIS Board from 2011 to 2017, he was chair of the Global Economy Meeting and the Economic Consultative Council from 2013 until 2017. He also chaired the International Monetary and Financial Committee, the IMF's policy advisory committee from 2015 to 2017. Mr Carstens began his career in 1980 at the Bank of Mexico. From 1999 to 2000, he was Executive Director at the IMF. He later served as Mexico's deputy

finance minister (2000–03) and as Deputy Managing Director at the IMF (2003–06). He was Mexico's finance minister from 2006 to 2009. Mr Carstens has been a member of the Financial Stability Board since 2010 and is a member of the Group of Thirty. Mr Carstens holds an MA and a PhD in economics from the University of Chicago.

Christopher Erceg

**Deputy Director,
Monetary and Capital Markets Department,
International Monetary Fund**



Christopher is Deputy Director in the Monetary and Capital Markets Department of the IMF, where his responsibilities include oversight of areas that include monetary and macroprudential policies, central bank operations, monetary policy modeling, and capital flow management. Chris has been heavily engaged in Fund work on the Integrated Policy Framework and review of the Institutional View. Prior to coming to the Fund, Chris held a senior position at the Federal Reserve Board that involved advising on monetary policy and global macroeconomic issues.

Andrei Kirilenko

**Professor of Finance,
University of Cambridge**



Andrei Kirilenko is a professor of Finance at the Cambridge Judge Business School, the Founding Director of the Cambridge Centre for Finance, Technology and Regulation, and a Research Fellow in the Asset Pricing/Financial Economics Programme of the Centre for Economic Policy Research (CEPR). Prior to joining Cambridge, he held senior faculty positions at Imperial and MIT. Before that he served as chief economist of the U.S. Commodity Futures Trading Commission (CFTC) where he used modern analytical tools and methods to design and enforce an effective regulatory regime of financial markets in the aftermath of the global financial crisis. In 2010, Kirilenko was the recipient of the CFTC Chairman's Award for Excellence (highest honour). Professor Kirilenko's scholarly work has appeared in top peer refereed journals and received multiple best-paper awards. Kirilenko received his PhD in Economics from the University of Pennsylvania, with a specialization in Finance from the Wharton School.

Zsolt Kuti

**Executive Director,
Central Bank of Hungary**



Zsolt Kuti oversees monetary policy, financial analysis and statistics in the Magyar Nemzeti Bank as Executive Director. His main tasks include supporting domestic monetary policy framework development and the Monetary Council's decisions with special responsibility for Hungarian and international financial market monitoring.

Marco Jacopo Lombardi

**Principal Economist,
Bank for International Settlements**



Marco joined the BIS in June 2012 from the European Central Bank, where he worked in the Directorate General Economics. While with the ECB, Marco also spent five months as a visitor to the International Department of the Bank of Canada. Prior to joining the ECB, he was assistant professor at the University of Pisa and taught Bayesian econometrics, statistics and time series analysis. Marco holds a PhD in applied statistics from the University of Florence and has been Max Weber Fellow of the European University Institute. Before joining the BIS Monetary Policy team in 2016, he worked in the Macroeconomic Analysis unit and in the Hong Kong representative office. Marco's research covers a broad range of applied issues, including monetary policy, commodities, forecasting, econometric methods and macroeconomic models.

Piroska Nagy-Mohácsi

Visiting Professor

London School of Economics and Political Science



Piroska Nagy-Mohácsi is Visiting Professor at the London School of Economics and Political Science (LSE), where her research focuses on central banking, monetary policy, financial resilience, growth, and migration. She was Policy Director of the European Bank for Reconstruction and Development (EBRD), and co-created led the Vienna Initiative in 2008-15, a public-private crisis management and coordination platform in emerging Europe. Piroska worked in senior positions in the International Monetary Fund (IMF) between 1986 and 2008. She was guest lecturer at the Hebrew University of Jerusalem in 1996/97 and Senior Adviser at Fitch Ratings in 2003/4.

Radován Jelasy

President,

Hungarian Banking Association



Radován Jelasy has been Chairman and CEO of Erste Bank Hungary since June 1, 2011. He is a recognised banker, with a thorough knowledge of Central and Eastern Europe. He gained wide experience during his outstanding career with banks and financial authorities. From 2004 to 2010 he was Governor of the National Bank of Serbia. Previously, he served as the bank's Deputy Governor for four years. As a central banker, he played an important role in consolidating the Serbian banking sector and insurance market and strengthening the regulatory and supervisory authorities. He also played a key role in Serbia's negotiations with international monetary institutions. As Vice-President of the Banking Rehabilitation Agency, he was involved in launching the restructuring process of the Serbian banking system and the privatisation of major Serbian banks. Earlier, he worked for McKinsey & Company in Frankfurt on banking projects in Germany, Poland and Bulgaria. He started his banking career at Deutsche Bank in Frankfurt, where he worked for four years as Area Manager for Central and Eastern Europe. He became the President of the Hungarian Banking Association in May of 2020.

Ricardo Reis

**A. W. Phillips Professor of Economics,
London School of Economics and Political Science**



Ricardo is the A.W. Phillips Professor of Economics at the London School of Economics, and is an academic consultant at the Bank of England, the Riksbank, and the FRB Richmond. He has published widely on macroeconomics and won the Jahnsson medal in 2021

Anikó Szombati

**Chief Digital Officer,
Central Bank of Hungary**



Economist, graduated at Corvinus University, Budapest. Joined the central bank in 2001. She is responsible for promoting digital transformation in the financial sector as well as within the central bank, including the implementation of cutting-edge technologies and research on CBDC. She is member of the Financial Stability Council.

Előd Takáts

**Rector,
Corvinus University of Budapest**



Előd Takáts is the Rector and a Professor of Corvinus University of Budapest. He graduated from Corvinus University in 1999. After some practical banking experience, he studied at Princeton University and earned a PhD in financial economics in 2006. During his studies he worked at the European Central Bank, the Central Bank of Hungary and the Federal Reserve Bank of New York. After graduating from Princeton, he worked as an Economist at the International Monetary Fund (IMF) from 2006 to 2009 in various departments and continents. In increasingly senior roles, he organized

discussions for central bank leaders and contributed to rethinking post-crisis financial regulation at the Bank for International Settlements (BIS) from 2009 to 2021. He has been a Visiting Professor at the London School of Economics and Political Science (LSE) since 2017. He is a Board Member of the Hungarian Economic Association and founding President of the monetary policy section. His research focuses on policy questions relevant for monetary policy.

Andrés Velasco

**Dean of the School of Public Policy,
London School of Economics and Political Science**



Andrés Velasco is the Dean of the School of Public Policy at the London School of Economics and Political Science. In 2017-18 he was a member of the G20 Eminent Persons Group. He was the Minister of Finance of Chile between March 2006 and March 2010. During his tenure he was recognized as Latin American Finance Minister of the Year by several international publications. Andrés Velasco received a B.A. in economics and philosophy and an M.A. in international relations from Yale University. He holds a Ph.D. in economics from Columbia University and was a postdoctoral fellow in political economy at Harvard University and the Massachusetts Institute of Technology.

Priscilla Koo Wilkens

**Senior Economist,
Innovation and Digital Economy at Bank for International
Settlements**



Priscilla is a Senior Economist in the BIS and previously headed the Pix Management Division in the Central Bank of Brazil. She holds an Industrial Engineering degree from Universidade de São Paulo and a MPA from Cornell University.

James Yetman

**Principal Economist,
Bank for International Settlements**



James is a Principal Economist in the Monetary and Economic Department of the Bank for International Settlements (BIS), based at the Representative Office for Asia and the Pacific in Hong Kong SAR. Originally from New Zealand, James joined the BIS in May 2008 following an academic role at the University of Hong Kong. He started his career in the Research Department of the Bank of Canada. His policy and research interests relate to inflation dynamics (particularly around inflation expectations) and macro-financial stability frameworks.

Egon Zakrajšek

**Senior Adviser,
Bank for International Settlements**



Egon is a Senior Adviser in the Monetary and Economic Department at the Bank for International Settlements (BIS). A native of Slovenia, he joined the BIS in August 2019 after nearly 25 years with the US Federal Reserve System. He started his career in the research department of the Federal Reserve Bank of New York and later joined the division of Monetary Affairs at the Board of Governors of the Federal Reserve System in Washington DC, where he held a succession of senior executive roles. Egon's policy and research interests focus on macro-finance, inflation dynamics

and monetary policy. He is also a CEPR Research Fellow, a Research Fellow at the Centre for Finance, Credit and Macroeconomics at the University of Nottingham and serves as the editor of BIS Working Papers.

It works in practice, but does it work in theory? As Agustín Carstens from the BIS points out in this volume, fighting inflation and adjusting to the changes caused by financial innovation are two areas where practice has recently been ahead of theory. These are also the areas where central banks play a leading role. Recent events, from the Covid pandemic to Russia's full-scale invasion of Ukraine, have gravely tested central banks' inflation-fighting abilities. And financial technology (Fintech) has challenged them to find a delicate balance between openness to innovation and safeguarding financial stability through regulation. This collection of excellent contributions from leading scholars and practitioners brings much-needed clarity to the debate and offers a lot of food for thought.

*Beata Javorcik,
Chief Economist
European Bank for Reconstruction
and Development (EBRD)*

The book *New Age of Central Banking in Emerging Markets* offers a comprehensive view of the central bank challenges of our times. It explores the importance of price stability, the most pressing macroeconomic challenge facing central banks today, how inflation has crept higher in the last few years, and, most importantly, how central banks can and should control inflation again. While combatting inflation can imply short-term pain, the book makes it clear that unwavering commitment to price stability leads to long-term sustainable economic gain, which has been a priority for the Magyar Nemzeti Bank, the central bank of Hungary. The book also covers the implications of digital innovation, focusing on how central bank digital currencies may change the economic and financial landscape in the coming years. A must-read for economists, policymakers, and researchers, this book provides invaluable insight into shaping effective monetary policies and promoting sustainable economic development.

*Mihály Patai
Deputy Governor, Magyar Nemzeti Bank*