Bank i Kredyt 56(3), 2025, 309-338

BANK I KREDYT
BANK & CREDIT

Creation of central bank money in the European Union

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Submitted: 25 October 2024. Accepted: 11 December 2024.

DOI: 10.5604/01.3001.0055.1462

Abstract

The aim of the article is to determine what part of the money created in the economy – from the point of view of the sources of its creation – is the responsibility of the central bank, and what part – of other monetary financial institutions. In other words, the aim of the study is to determine the size of the central bank's share in money creation and to indicate the factors that determine it. Therefore, a method of calculating the total amount of money creation by the central bank and its allocation to individual sources of creation has been proposed. The calculations were made for the central banks of Bulgaria, the Czech Republic, Poland and the Eurosystem, for the period from 2002 to March 2024. The results showed that central banks create money in the economy directly or indirectly if they perform functions other than providing liquidity to credit institutions for their mutual payment settlements, and as a result of the usage of unconventional monetary policy instruments. The size and structure of the sources of money creation depended on the conditions in which the analysed central banks operated.

Keywords: money creation, sources of money creation, central bank, credit institutions, monetary aggregates

JEL: E40, E51, E58, G21

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1. Introduction

Modern money in the economy, regardless of its form – tangible (cash issued by the central bank) or intangible (cash in bank accounts – deposits), is created through credit (so-called outside money, see Lagos 2006). Credit, on the other hand, is granted by banks (credit institutions, other monetary financial institutions), while the central bank's task is to provide liquidity to banks for their mutual payment settlements. This is reflected in the current two-tier banking systems.

Limiting the central bank's tasks to providing liquidity to credit institutions results in a liquidity deficit in the banking sector, which in turn ensures that the central bank is not directly involved in money creation. However, it is not uncommon for central banks to be assigned additional functions, such as the management of state reserves. Moreover, as a result of the global financial crisis of 2008 and the subsequent COVID crisis of 2020, central banks used unconventional monetary policy instruments as part of their activities. These actions were referred to as balance sheet policy, because they resulted in an increase in the balance sheet totals of central banks. An increase in balance sheet totals as an effect of balance sheet policy or the performance of other functions, results in the creation and subsequent increase of excess liquidity of the banking sector. On the other hand, the excess liquidity of the banking sector means that central banks not only provide liquidity to credit institutions for payment settlements, but also contribute directly or indirectly to the creation of money in the economy.

The aim of the article is to determine what part of the money created in the economy, from the point of view of its sources, is the responsibility of the central bank, and what part – of other monetary financial institutions. In other words, the aim of the study is to determine the size of the central bank's share in money creation and to indicate the factors that determine it. The article attempts to indicate that the bundle of functions and tasks other than the conduct of monetary policy, which are assigned to the central bank, results in an increase in its role in the creation of money in the economy. The calculations were based on selected central banks of the European Union in the period after 2002.

The article is divided into three parts. At the beginning, preliminary issues concerning money creation are presented as well as how money creation by the central bank will be identified. In the next part, calculations were made of the amount of money created by the central bank and its share in the size of the money supply in the economy (between 2002 and beginning of 2024) based on selected European Union central banks. Four central banks were selected for this purpose: one from the developed countries, i.e. the Eurosystem as a whole monetary union, and three from the developing countries of Bulgaria, the Czech Republic and Poland. The Eurosystem was selected because it has an international recognized currency and used unconventional monetary policy instruments in the form of debt securities purchase programmes. The central bank of the Czech Republic was included due to its foreign exchange interventions to prevent the appreciation of the national currency. Bulgaria's central bank, on the other hand, is an example of a country using a currency board. On the other hand, Narodowy Bank Polski is an example of a country with a floating exchange rate, which in almost all the years covered by the analysis applied conventional monetary policy. The last part presents the conclusions of the analysis. The appendix presents the detailed results obtained for individual central banks in a synthetic form.

2. Theoretical approach to money creation in the economy

Undoubtedly, modern money is debt (Lewiński 1932; Hicks 1989; Kucharski, Rączkowski, Wierzbicki 1973; Lagos 2006). This means that each owner of money has potentially a financial claim against the issuer of this debt. And the value of this claim becomes the value of money. However, not every financial receivable is money. This debt should perform specific functions – such as a means of payment (to release from other debts) or a measure of value. However, it is not important here to focus on the functions that define money.[1] For further considerations, the issuer of this debt is important (Bindseil 2019). Cash (banknotes and coins) used in everyday transactions is a debt issued by the central bank (although there are some opinions on the contrary – see e.g. Bholat 2024; Kumhof et al. 2020) and the government.[2] Funds deposited in a bank that are (current accounts) or can be used in a relatively short period of time (term deposits) for payments, i.e. to settle its own obligations, are liabilities of the bank. Therefore, it is assumed that the issuer of money is the banking sector, including both the central bank and other banks.[3] The term banking sector will be used interchangeably with the term monetary financial institutions, which consist of the central bank and other monetary financial institutions.

If modern money is a liability of the banking sector as a whole, then the next question that naturally arises is how this relationship between the debt of the bank and the claim of the owner of the money arises, in other words, how money is created. Wicksell had already noted that the source of modern money is credit (Wicksell 1951; Schumpeter 1960; Kucharski 1968). There are two ways of explaining money creation – creation in the monetary multiplier terms and in terms of the consolidated balance sheet of the banking system (Pietrzak, Polański, Woźniak 2015). While the first way presents the dynamic mechanism of money creation and reaching its target size, the latter emphasizes the static indication of the amount of money created at a given moment and the identification of individual sources of its creation. However, there is no direct relationship between credit granted and money issued as a debt.

Money creation according to the first method (the monetary multiplier approach) assumes the existence of a primary deposit in the bank, e.g. in the form of a cash deposit into a bank account, i.e. de facto the money originally created by the central bank. With the additional assumption that the bank maintains an adequate reserve in the form of cash or funds placed in an account with the central bank,[4] money creation occurs in the process of multiplying the primary deposit in the form of granting loans. The "multiplier" money creation can be written in the form of an equation comparing the money created by the banking system (D) depending on the size of the central bank money (i.e. the issued cash and the banks' funds held in the central bank account; primary deposit – B; Pietrzak, Polański, Woźniak 2015).

$$D = m \cdot B \tag{1}$$

where:

D – money created by the banking system,

B – central bank money (cash and banks' funds held in a central bank account),

m – monetary multiplier, which is a reflection of the multiplication of the primary deposit.

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[1] These are analysed in economics textbooks.

[2] In those countries where the government issues coins.

[3] The government issuing coins is also included here, but from the perspective of the entire economy, the issuance of coins is so insignificant that the attention will continue to focus on the banking sector as the issuer of money.

[4] This applies to both the minimum reserve required by the central bank and the voluntary holding reserve for possible settlements.

Equation (1) allows us to see that the size of the money finally created depends on the size of the central bank money (B) and the monetary multiplier (m), the size of which in turn is influenced by many other factors (for more information, see Pietrzak, Polański, Woźniak 2015). It is also worth noting, however, that if we remove the assumption of the existence of the primary deposit and assume, following Wicksell, that the primary source of money is granted credit, then equation (1) can be written as follows.

$$B = 1/m \cdot D \tag{2}$$

where the shortcuts as before.

Although equation (2) is the same as equation (1), its interpretation is slightly different. First of all, it is not the amount of money created (D) that adjusts through the monetary multiplier to the original size of central bank money (B). It is the other way around. It is the money created by the banking system (D) that determines the desired amount of central bank money (B) needed to service the money created (demand for the monetary base). On the other hand, the amount of central bank money (B) depends on the inverse of the monetary multiplier (1/m). The reverse direction of the relationship between the money ultimately created by the banking system (D) and the size of the monetary base (B) confirms the existence of the identity in question, but does not allow us to clearly indicate what is the cause (exogenous quantity) and what is the effect (endogenous quantity; for more on the endogenous and exogenous nature of money, see Sieroń 2019).

The above considerations may lead to the conclusion that the central bank and banks acting jointly and individually are behind the volume of money creation. This, in turn, leads to a second way of explaining money creation, i.e. the recognition of the consolidated balance sheet of the banking system (monetary financial institutions), including the central bank and other banks (Pietrzak, Polański, Woźniak 2015). The sources of this approach can be traced back to the studies of Polak (1957), which formed the basis for the International Monetary Fund's analyses of money creation in individual economies. An extensive analysis of money creation can be found in McLeay, Radia and Thomas (2014).

The analysis of money creation in terms of the consolidated balance sheet of the banking sector can begin with determining what liabilities of this system will be identified as the amount of money created. It is customary to use monetary aggregates in statistics, especially in the European Union, referred to as M (M1, M2...). Therefore, the broadest of the monetary aggregates M3 will be used for further analysis, which in simple terms includes cash (G) issued by the central bank and held by entities of the non-banking system, current deposits (Dc) and term deposits (Dt) of the non-banking system and other liabilities of the banking system considered as money equivalent (O).

$$G + Dc = M1 \tag{3}$$

$$M1 + Dt = M2 \tag{4}$$

$$M2 + O = M3 \tag{5}$$

$$\underbrace{G}_{\text{Central bank}} + \underbrace{Dc + Dt + O}_{\text{Commercial banks}} = M3 \quad \Big\} \text{ Issuer} \tag{6}$$

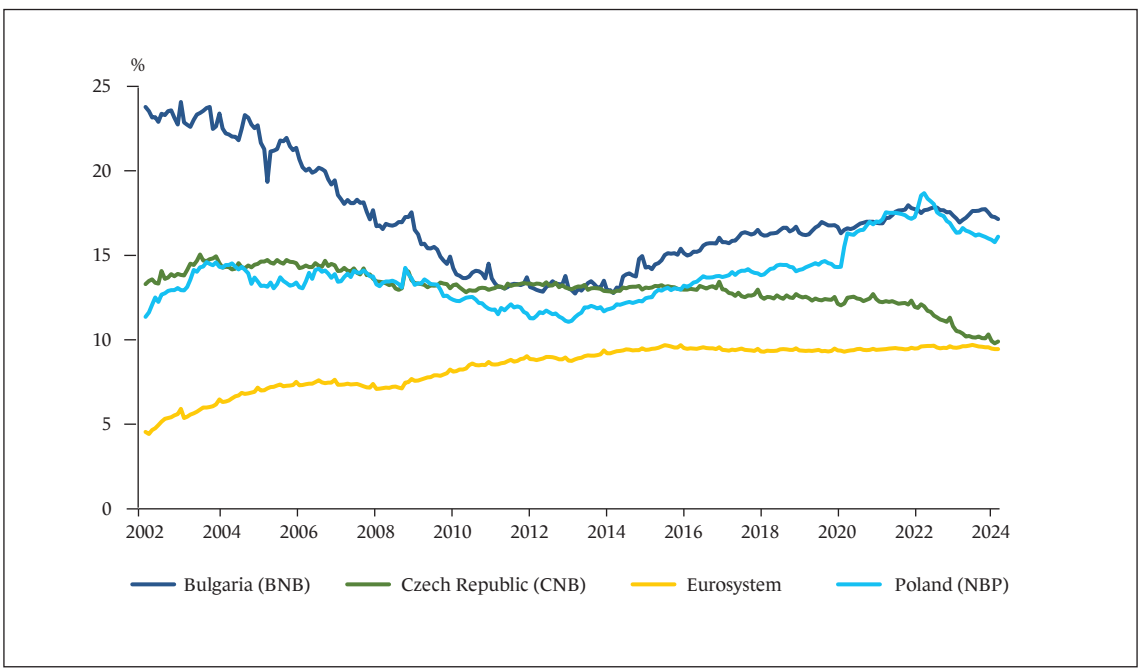
where:

G – cash in circulation (outside bank cash desks),
Dc – current deposits,
Dt – deposits with an initial term of up to two years / termination of up to three months,
O – other (repo operations, issued debt securities with an initial term of up to two years, etc.).

It should be noted that the analysis of the structure of money from the point of view of its supply does not have much cognitive significance. The structure of the money created in a given economy is the result of the decision of money holders, i.e. what part of the money they decide to hold in the form of cash and what part in the form of other financial instruments (liquid deposits). In turn, the above decisions depend, inter alia, on the customs and development of various payment techniques in a given country or currency area, or the current interest rate. More on cash issues can be found, for example, in Jobst and Stix (2017) or Ashworth and Goodhart (2020), and on the impact of the COVID pandemic on the increase in demand for cash in selected countries, see Polański and Szadkowski (2020).

A change in the structure of the demand for money (cash versus deposits) can only show an increase in demand or preferences among its users. For illustrative purposes only, but also to confirm the above considerations, Figure 1 presents the relation of the use of cash to the broadest monetary aggregate, i.e. M3, for selected economies/currency areas.

Figure 1
The role of cash in the money supply of selected countries / monetary union during the period 2002 – March 2024 (cash share in M3)



Source: own calculation based on data available on the websites of the indicated central banks.

With the above in mind, it is necessary to turn to the factors of money creation. These can be assigned either to the central bank (CB) or to other institutions of the banking system (BK). However, this approach is not without its drawbacks. However, they will be discussed later in the article.

The money supply in the economy, as it has already been signalled, is generated as a result of the lending activity of the banking system to:

– the national non-financial system (K),

– foreign entities (AZN).

Credit creation in relation to the national non-financial system (K) can be conventionally divided into:

– net loans to the government, which are the surplus of loans granted/purchased government securities over the value of deposits held by this sector in the banking system (Kb),

– loans to other domestic non-financial entities, which, as in the case of the government sector, also take into account purchased debt securities issued by the non-government sector (Kn).

Thus, the money created by the banking system from the point of view of the factors of money creation should be presented as follows:

$$M3 = Kb + Kn + AZN \tag{7}$$

where the new symbols:

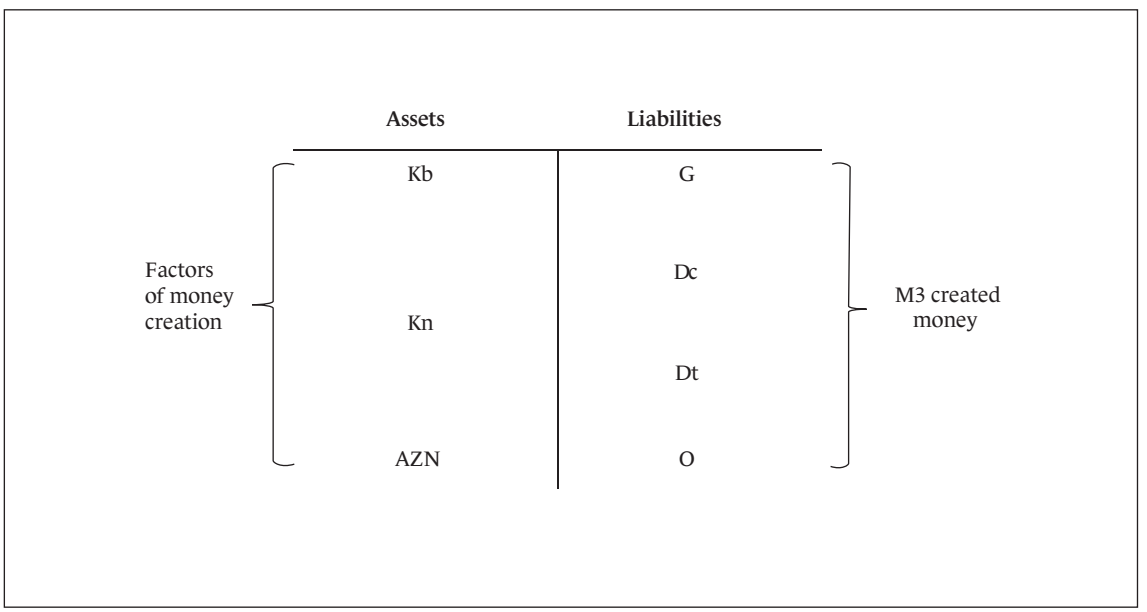
Kb – net debt of the government sector in the banking sector,

Kn – loans to domestic private non-financial entities (including debt securities issued by this sector and held by the banking sector),

AZN – net debt of the foreign sector in the banking sector.

Figure 2

Simplified balance sheet of the consolidated banking system



Note: the shortcuts as before.

Source: own elaboration.

Translating the structure of money in the economy (liabilities of the banking system) and the factors of its creation (receivables of the banking system) into the consolidated balance sheet of the banking system, the picture presented in Figure 2 can be obtained (see also Picón Aguilar, Oliveira Soares, Adalid 2020). However, the relationship between the source of money creation and money holders is indirect. It means that the claim due to credit granted is not necessarily to the present holders of money issued. Therefore, this identity occurs for the entire economy and not for individual economic units.

As mentioned earlier, the factors of money creation can be divided into those whose source is the central bank (BC) and those whose source is the other entities of the banking sector (BK). As a result, the following equations can be obtained:

$$M3 = Kb + Kn + AZN = Kb^{BC} + Kb^{BK} + Kn^{BC} + Kn^{BK} + AZN^{BC} + AZN^{BK} \tag{8}$$

$$M3 = (Kb^{BC} + Kn^{BC} + AZN^{BC}) + (Kb^{BK} + Kn^{BK} + AZN^{BK}) \tag{9}$$

$$M3 = \underbrace{M3^{BC}}_{\text{Central bank}} + \underbrace{M3^{BK}}_{\text{Commercial banks}} \tag{10}$$

where the new shortcuts in the footnote mean:

BC – the money creation factor on the central bank's balance sheet,

BK – the money creation factor found in the balance sheet of other monetary financial institutions.

It should be noted, however, that the signalled assignment of money creation factors to individual entities is of a simplified nature, as it can only be indicated for a given moment in time. Such a static approach presents who at a given moment has a given factor of money creation on its balance sheet. However, there is no information as to which entity was responsible for the direct (original) creation of money caused by this factor. In other words, which entity of the analysed banking system created the new money by means of a given factor of creation.

To illustrate the above considerations, it is worth presenting a few examples of the possibilities of shaping the structure of the central bank's balance sheet and its impact on the creation of domestic money. The first is the structure of the central bank's balance sheet, whose sole purpose is to conduct monetary policy using conventional instruments. On the asset side, such a bank presents financial instruments that result from providing liquidity to the domestic banking sector. On the liabilities side, on the other hand, the balances of domestic banks deposits (reserves) and cash in circulation are presented. From the point of view of the sources of money creation, central bank assets consist of claims from the banking system. Despite the presence of cash in circulation, its only source of creation are financial assets (loans granted) of commercial banks. In such a situation, from the point of view of the sources of money creation, the central bank does not create money in the economy.

The situation will be slightly different if the central bank, in addition to conducting monetary policy, also performs other functions. If the central bank is responsible for managing foreign exchange reserves, then it is the foreign credit on the central bank's balance sheet that is the source of domestic

money creation. It is the central bank, while buying foreign currencies in exchange for domestic currency, that at the same time creates domestic money. Moreover, it is the original creation of money by the central bank.

On the other hand, if the central bank provides banking services to the state budget, then its net liabilities to the government sector are treated as a negative factor of money creation. The situation is different when the central bank uses unconventional monetary policy instruments in the form of the purchase of debt securities on the secondary market (quantitative easing – QE). In this case, it is important to determine two issues: who is the issuer of the purchased securities and from whom the central bank buys them. In the case of Treasury securities, the creation factor is the debt of the government sector. However, in the case of securities issued by the non-financial private sector – it is the debt of the private sector. On the other hand, looking at the counterparty to the securities purchase transaction, if it is the banking sector, then there is no money creation. In this case, money was originally (directly) created by the domestic banking sector, and the central bank became the secondary (indirectly) owner of the factor of its creation. If, on the other hand, the securities were purchased from entities other than the banking sector, then money is created directly by the central bank.

To sum up, central bank is responsible for direct money creation in the economy when it performs functions other than conventional monetary policy and the counterparty to its transactions is not the domestic banking sector.

The situation is different with central bank income and expenses and their impact on money creation. Generally, central bank income and expenses can be seen as transfers between different sectors of the economy (see e.g. Kruszewski, Szadkowski 2021). As long as the central bank's income is higher than its expenses, then depending on which sector is the source of income, the debt from this sector becomes the source of money creation (at least in part related to the incurred expenses by the central bank). On the other hand, if the central bank incurs a loss, there is a situation in which the source of money creation is the central bank's equity, i.e. the undistributed surplus of income over expenses from previous years (i.e. retained profits), and thus the credit granted to various sectors of the economy, which was not reflected in the creation of money.

3. Adopted research methodology

From the theoretical considerations made so far, it can be assumed that the more additional functions are fulfilled by the central bank, the greater the part of the money supply it is responsible for. This view is analysed in the following part of the article, where for selected countries/monetary area it is determined which part of the money supply the central bank is responsible for.

The analysis used the balance sheets of the central bank, other monetary financial institutions, and the entire banking sector. The analysis assumes that the amount of money supply for which the central bank is responsible equals the sum of cash issued by the central bank, the central bank's liabilities due to deposits of the domestic private non-financial sector, and the net liabilities to other monetary financial institutions. From the point of view of the sources of money issuance, it is equal to the sum of the amount of net foreign assets held by the central bank, the net debt of the government sector to the central bank, the central bank's claims to the domestic private non-financial sector, and other sources.

Cash issued by the central bank held by the non-financial private sector is part of the money supply and is taken into account in the calculation of each monetary aggregate.[5] However, it should be borne in mind that if the source of cash issuance is the liability of other monetary financial institutions to the central bank, then the primary source of the issue of this cash are credits granted to the private non-financial sector by private banks. Moreover, the net receivable of other monetary financial institutions from the central bank is also a source of non-financial private sector deposits. Deposits of the private non-financial sector, depending on their maturity, are also taken into account in the calculation of money supply monetary aggregates. Therefore, it can be assumed that in the part in which these deposits are the source of financing the banks' net receivables from the central bank, the source of money creation is in the central bank. However, one caveat should be made here. The same explanation regarding the source of creation can be presented for other liabilities (liability items) of banks that are not taken into account when calculating aggregates of the money supply (e.g. long-term liabilities, equity of private banks). However, it should be borne in mind that banks' receivables from the central bank are usually liquid. Therefore, it is legitimate to assume that these funds are primarily used to settle banks' short-term liabilities to the non-financial private sector (i.e. to settle deposits on an ongoing basis). This, in turn, supports the assumption that the net debt of private banks to the central bank is primarily a source of deposit creation, i.e. the money supply.

Therefore, in the presented example and in the analysis carried out in the following part of the article, the following assumptions were made:

- **Money supply:**
  supply according to the adopted monetary aggregate – in the presented example it was the sum of cash held by the non-banking sector and deposits of this sector in private banks
- **Factors of money supply creation on the part of private banks:**
  loans to the non-financial private sector (including local government) + net government debt + net external assets + other (excluding net debt to the central bank)
- **Net debt of banks to the central bank:**
  cash on hand in banks' vaults + reserves on central bank accounts + net debt related to the monetary policy operations – debt securities issued by banks held by the central bank
- **Money created by the central bank:**
  cash held by the non-bank sector + net debt of banks to the central bank + loans to the non-financial private sector =
  = cash held by the non-bank sector + cash on hand by banks + reserves on central bank + net debt related to the monetary policy operations – debt securities issued by banks held by the central bank + loans to the non-financial private sector =
  = central bank issued cash + reserves on central bank + net monetary policy debt – central bank-held debt securities issued by banks + loans to the non-financial private sector
- **Factors of money supply creation on the part of the central bank:**
  net government debt + net external assets + domestic private non-financial sector claims + other (excluding banks' net debt to the central bank).

[5] While banks' reserves held in the central bank are included in the money supply only in the case of M0, they are not treated as money in economic circulation (M1–M3 aggregates).

4. The role of central bank money in the money supply – an analysis of selected cases

Four central banks, all belonging to the European Union, were selected for the analysis, i.e. the Eurosystem, and the central banks of the Czech Republic (CNB), Bulgaria (BNB) and Poland (NBP). The Eurosystem was chosen not only as the representative of the central bank of a developed country and an example of a monetary union, but above all because of the unconventional operations conducted by the European Central Bank during the recent global financial crisis. The Czech National Bank was chosen because of its foreign exchange interventions made in recent years, which allows to present its impact on the money supply and the role of the central bank in its creation. The Bulgarian National Bank, on the other hand, was chosen because of the currency regime applied in Bulgaria, i.e. the currency board and the pegging of the Bulgarian lev to the euro. The selection of this central bank allows to indicate the role of the central bank in the creation of money in such cases. Finally, the choice of Narodowy Bank Polski results from the need to take into account the central bank, which had not used unconventional monetary policy operations until March 2020, and at the same time pursued a policy of a floating exchange rate. Moreover, the selection of such a sample of central banks also made it possible to compare a central bank with a strong currency (Eurosystem) with central banks in which foreign reserves play an important role (CNB, BNB and NBP). Finally, the choice of the central banks of the European Union made it possible to move within the same or similar definitions of the money supply, which ensures the comparability of the presented results.

The monetary aggregate M3 was chosen as the money supply, published together with the factors of its creation by individual central banks on their websites. To calculate the amount of money creation by individual central banks, the balance sheets of these banks, the balance sheets of other monetary financial institutions (banks), as well as the aggregated and consolidated balance sheets of monetary financial institutions published on their websites, were used. January 2002 was chosen as the beginning of the research period, and the last available data are for March 2024. So this is a period spanning the 21st century since the introduction of the euro as cash. Data are available on a monthly basis, as data as at the end of the month.

Appendices 1–4 presented in the form of figures and tables concern individual central banks, together with an indication of the method of calculating the amount of central bank money creation and the factors of its creation, as well as the data sources used to calculate them. Here, a comparative analysis is presented. Figure 3 (Panels A–D) shows the aggregate results.

An analysis of the central banks' contribution to the M3 aggregate, calculated either in relation to GDP (Panel A) or directly as a share in the M3 aggregate (Panel B), in both cases allows us to see similar trends. This may indicate that it was primarily the changes in the central bank's money creation (Panel A) that influenced the development of its share in M3, and not the changes in the M3 aggregate (Panel B).

What can also be noticed is primarily the very large share of the Czech National Bank in the creation of M3 money. Throughout the analysed period, it was at the highest level. Only in the years 2010–2014 a comparable level was recorded for the central bank of Bulgaria and a slightly lower level for Narodowy Bank Polski. However, since 2014, a very large increase has been visible for the Czech National Bank, measured both by the share in GDP and in the size of the M3 aggregate itself. In recent years, it has risen to around 70% of the size of money measured by M3, only to fall to around 50%

after the outbreak of the pandemic. Such a large increase was the result of interventions carried out at that time by the Czech National Bank in the foreign exchange market in order to prevent the appreciation of the Czech koruna, and the main source of money creation in the Czech Republic was net foreign assets (see Appendix 2).

It is also worth mentioning the case of the Eurosystem for at least three reasons. First, the Eurosystem made the smallest contribution to M3 creation of all four central banks analysed. Second, despite unconventional instruments in the form of quantitative easing programmes, resulting in large purchases of debt securities, the share of money created by the Eurosystem did not exceed 20% of both GDP and M3. Thirdly, and finally, it is worth noting that the amount of money created by the Eurosystem at the end of 2008 fell to almost zero. This was due to the operation of providing the euro area banking sector with liquidity both in euro and in foreign currencies (mainly the US dollar). The foreign currency liquidity obtained by the Eurosystem from other central banks was transferred to commercial banks in exchange for euro. At the central bank, this resulted in a decline in net foreign assets. Commercial banks' liquidity from the Eurosystem in foreign currency was exchanged for euro. As a result, the Eurosystem's claims on commercial banks for monetary policy operations (due to euro injections) increased at a higher rate than the Eurosystem's liabilities to commercial banks for holding their accounts in euro. This, in turn, resulted in a decline in the Eurosystem's share of M3 supply. On the other hand, the share of the banking sector in the creation of M3 increased, and its source was the increase in net foreign assets. It should be noted here that despite the fact that the Eurosystem performed functions other than monetary policy, the cumulative effect of these actions resulted in the fact that the Eurosystem did not create money in the economy at that time, but only other monetary financial institutions did so (it could be somewhat correlated to the development of net financial assets in the Eurosystem during this period of time – see e.g. Kowalewski, Szadkowski 2024).

Figure 3
Money supply by central bank and private banks, and central bank money creation factors for selected countries

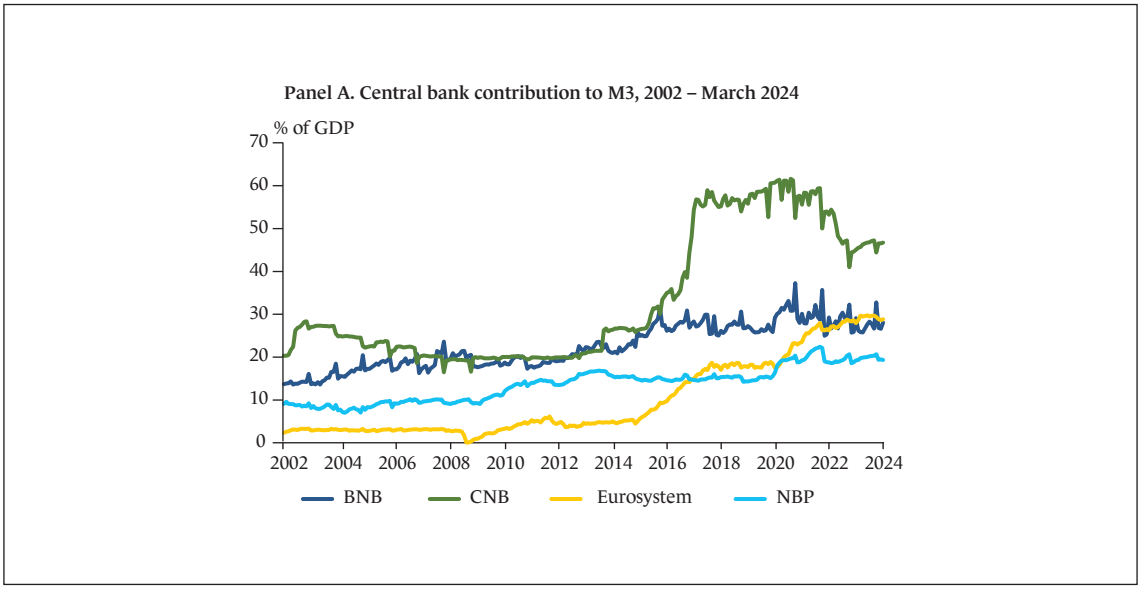
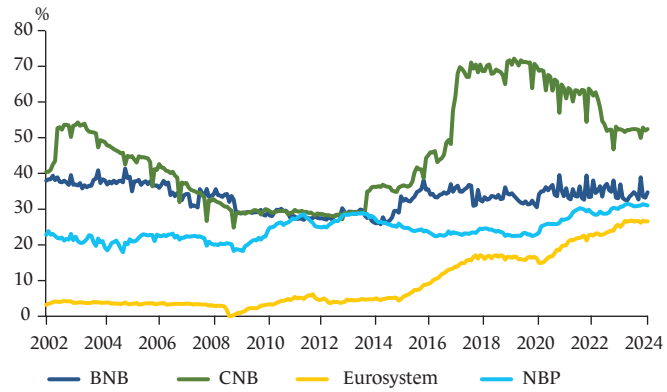
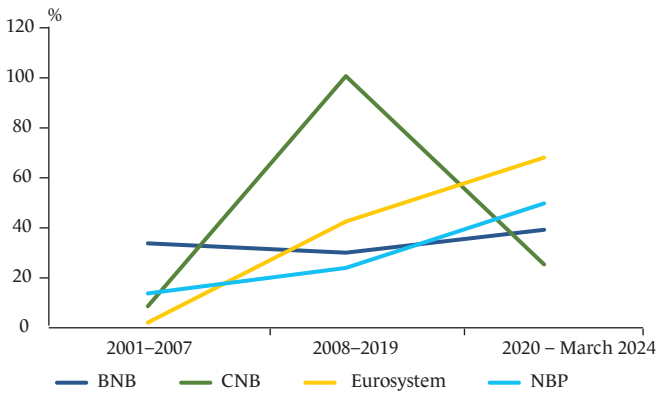


Figure 3, cont'd

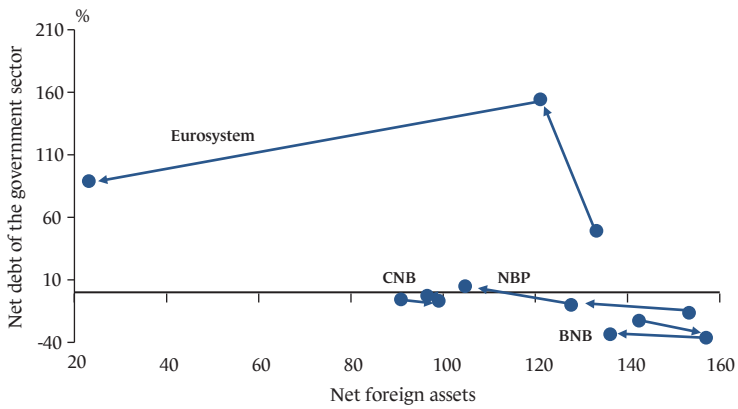
Panel B. Share of central bank contributions in M3, 2002 – March 2024



Panel C. Share of central bank contribution in the change of M3 in three sub-periods: 2002–2007; 2008–2019; 2020 – March 2024



Panel D. Evolution of central bank money creation factors in three sub-periods: 2002–2007; 2008–2019; 2020 – March 2024 (% of central bank contribution from a given money creation factor in M3)



Source: own calculation based on data available on the websites of the indicated central banks and AMECO (May 2024).

Moreover, when considering the share of central banks in the volume of money supply, it should be noted that NBP is at a relatively stable level. It ranged from 20–30% of the size of the M3 aggregate. Since the main source of money creation in the case of NBP are net external assets, this means that the central bank's external assets grew in the analysed period at a pace similar to the growth of M3 (see Appendix 4). On the other hand, in relation to GDP, the money created by NBP, similarly to the aforementioned M3 aggregate, doubled, i.e. it increased from 10% to almost 20% of GDP. It should be noted that if NBP did not have the obligation to manage foreign exchange reserves, i.e. an additional task to its basic function, i.e. to conduct monetary policy, then its role in the creation of money would be negligible (see Appendix 4 and the Act on NBP, art. 3.2.2).[6]

An analysis of the change in the size of the M3 aggregate and the role of the central bank in its creation in three sub-periods was also carried out: before the global financial crisis (2002–2007), after the outbreak of the crisis (2008–2019) and after the outbreak of the pandemic (2020 – March 2024). It should be noted that in the first period, when central banks conducted conventional monetary policy, their contribution to money created was small. Moreover, if the central bank's main task at that time was to conduct monetary policy, such as in the case of the Eurosystem, then in principle the bank did not create money, but only conducted operations with the domestic banking sector (Panel C). On the other hand, if the central bank performed functions other than conducting monetary policy, such as accumulating and managing foreign exchange reserves, then the creation of money by the bank was greater (e.g. in the case of the central banks of Poland and the Czech Republic). Importantly, in this case, money creation is primary, because the central banks of Poland and the Czech Republic were converting foreign currencies into domestic currencies at that time and thus creating money in the economy.

During the global financial crisis, two significant changes can be observed. Firstly, the drastic increase in money creation by the Czech National Bank, which at that time constituted almost all of the money created in the economy. This was related to the aforementioned currency interventions carried out by the central bank at that time. Second, there was also an increase in the Eurosystem's contribution to monetary creation then in the economy. This time, however, this creation was of a secondary nature and was related to unconventional monetary policy operations, resulting in the purchase of mainly government securities from commercial banks on the secondary market.

By contrast, in the pandemic and post-pandemic period, there was a further increase in money creation on the part of the Eurosystem, driven by further purchases of government securities on the secondary market. Throughout the period under review, the Eurosystem also made purchases of commercial papers, which, if made outside the banking market, constituted the original creation of money. It is worth noting, however, that the amount of credit created in this way was insignificant (see Appendix 3). At the same time, there was a drastic decline in the share of the Czech National Bank in money creation, which can be explained by the termination of foreign exchange interventions. On the other hand, NBP's share in money creation continued to grow, which was related to the continuous exchange of euro coming from EU funds into Polish zloty, as well as the purchase of securities on the secondary market in 2020–2022 (see Polański 2025).

It is also worth noting the continued contribution of the Bulgarian National Bank to money creation regardless of the period analysed (see Figure 3, Panels B and C). This is related to the currency regime that prevailed in this country all that time.

[6] The Act on Narodowy Bank Polski of 29 August 1997, Journal of Laws of 2022, item 2025.

An analysis of central bank money creation can also be carried out from the perspective of its sources. In case of the analysed central banks there can be identified two main sources: net external assets and net government debt (see Appendix 1–4). Panel D (Figure 3) presents for individual central banks the evolution of the share of individual sources of money creation calculated in the total money created by a given central bank. The individual points show the average values for the three previously introduced sub-periods: 2002 2007, 2008–2019 and from 2020 to March 2024. Two sources of money creation are indicated: on the horizontal axis – net external assets, and on the vertical axis – net government debt.[7] It can be observed that net foreign assets play the most important role in the central banks of Bulgaria, the Czech Republic and Poland. This means that the task of managing foreign exchange reserves imposed on these banks results in the fact that it is the most important reason for the issuance of money in the economy by these banks. It is worth noting that the share of net debt of the government sector is insignificant (apart from BNB). Moreover, this share is mainly negative, which indicates that it is caused by keeping state budget accounts by central banks. The situation is different for the Eurosystem. Before the crisis, net foreign assets were the most important factor in money creation similarly as in the previous cases. On average, foreign exchange reserves accounted for more than 120% of the money created by the Eurosystem in the economy at that time. The share of net government debt was also positive, but on average it was 40%. It is worth noting that this was in most cases a consequence of the creation of the Eurosystem from the individual NCBs and the starting point of their balance sheets at the time (government securities purchased by the NCBs before the creation of the euro area). As shown in Panel C, in the period before the economic and financial crisis, the Eurosystem was practically focused on the conduct of conventional monetary policy and did not create money. This means that not only did it not buy government securities, but it also did not significantly change the balance of its net foreign assets. However, during the crisis and after the outbreak of the pandemic, these relations changed. As a result of the launch of the Eurosystem's debt purchase programmes, the importance of the government's net debt increased, with the average contribution to money creation for which the Eurosystem accounted for around 90%. On the other hand, the share of net foreign assets fell to just over 20%. Slight changes are observed for the Czech Republic and Bulgaria, where net foreign assets continue to be the main source of money creation of these banks. On the other hand, the above-mentioned purchase of securities by NBP resulted in a change in the structure of money creation by this bank: a decrease in the share of net foreign assets (primary money creation) and an increase in the importance of net government debt (secondary money creation).

5. Summary

The theoretical analysis of money creation, as well as the empirical analysis based on selected European Union central banks, made it possible to present how and in what size central banks issue money in the EU economy in the 21st century (for the last more than 20 years). The source of money creation in the economy is credit granted to the private non-financial sector, the government sector and abroad (foreign reserves). In the event that the only task of the central bank is to maintain the liquidity of the domestic banking sector and to conduct conventional monetary policy, the central bank has no share in the creation of money in the economy. On the other hand, if the central bank is given

[7] The credit granted to the domestic private non-bank sector was omitted as insignificant (see Appendix 1–4).

additional functions, such as the management of foreign exchange reserves, the provision of banking services to the state budget, or finally the use of unconventional monetary policy instruments (such as debt securities purchase programmes), i.e. when a central bank makes transactions with non-bank institutions, then the role of the central bank in money creation increases. In other words, it is the bundle of functions assigned to the central bank, beyond the conduct of conventional monetary policy and ensuring the liquidity of the domestic banking sector, that results in an increase in the role of the central bank in the creation of money in the economy (e.g. Kochalski, Kruszewski, Szadkowski 2024).

The analysed cases of four EU central banks allowed us to observe that in the case of developing economies, where central banks are obliged to manage the foreign exchange reserves of a given country, net external debt is the main factor of money creation by the central bank in the economy. In these countries, central banks account for an average of 20–40% of the money supply (Bulgaria, Poland), with the exception of the Czech Republic, where as a result of foreign exchange interventions, its share increased to 50% of the volume of the money supply. On the other hand, the Eurosystem's unconventional operations, despite their large scale and the observed increase in central bank money creation, did not allow the central bank to come close to the levels reported by other analysed central banks. In addition, the Eurosystem has witnessed a change over the years. While before the crisis the most important source of money creation by the central bank was net foreign assets, during the crisis, as a result of the purchase operations of mainly government securities, the share of net debt of the government sector increased significantly. Moreover, money creation in the form of the purchase of debt securities on the secondary market, if it is made in transactions with other monetary financial institutions, does not have a direct impact on the change in the size of money in the economy. However, it should be borne in mind that the growing role of the central bank in the creation of money in the economy by recognition of claims against non-bank sectors on its balance sheet may lead to a situation in which decisions taken by the central bank in the performance of functions other than monetary policy may affect the entire economy (e.g. Jordan 2022; Sławiński 2023).

References

Ashworth J., Goodhart Ch.A.E. (2020), *Coronavirus panic fuels a surge in cash demand*, CEPR Discussion Paper, DP14910, https://ssrn.com/abstract=3638014.

Bholat D. (2024), How to modernise central bank balance sheets: no notes, *Financial Times*, 29 November, https://www.ft.com/content/832e7dca-5a0d-4f8f-9311-e274e90f2da9.

Bindseil U. (2019), *Central Banking before 1800. A Rehabilitation*, Oxford University Press.

Hicks J. (1989), *A Market Theory of Money*, Clarendon Press.

Jobst C., Stix H. (2017), *Doomed to disappear? The surprising return of cash across time and across countries*, CEPR Discussion Paper, DP12327, https://ssrn.com/abstract=3042640.

Jordan T. (2022), *Current challenges to central bank independence. Annual O. John Olcay lecture on ethics and economics at the Peterson Institute,* Swiss National Bank, 11 October, https://www.snb.ch/en/publications/communication/speeches/2022/ref_20221011_tjn.

Kochalski C., Kruszewski K., Szadkowski M. (2024), Pomiar konsekwencji finansowych działalności banku centralnego, *Bank i Kredyt*, 55(5), 551–574.

Kowalewski P., Szadkowski M. (2024), The role of net financial assets in the euro area in the scope of Agreement on Net Financial Assets (ANFA), *Bank i Kredyt,* 55(2), 99–162.

Kruszewski K., Szadkowski M. (2021), *Impact of the central bank's financial result on the transfers of benefits across sectors of the economy*, NBP Working Paper, 340, Narodowy Bank Polski.

Kucharski M. (1968), *Pieniądz, dochód, proporcje wzrostu*, Państwowe Wydawnictwo Ekonomiczne.

Kucharski M., Rączkowski S., Wierzbicki J. (1973), *Pieniądz i kredyt w kapitalizmie*, Państwowe Wydawnictwo Naukowe.

Kumhof M., Allen J., Bateman W., Lastra R., Gleeson S., Omarova S. (2020), *Central bank money: liability, asset, or equity of the nation?*, Cornell Legal Studies Research Paper, 20-46, DOI: 10.2139/ssrn.3730608.

Lagos R. (2006), *Inside and outside money*, Federal Reserve Bank of Minneapolis Research Department Staff Report, 374, May.

Lewiński J.S. (1932), *Pieniądz, kredyt i ceny*, Wyższa Szkoła Handlowa w Warszawie.

McLeay M., Radia A., Thomas R. (2014), Money creation in the modern economy, *Bank of England Quarterly Bulletin*, Q1, https://www.bankofengland.co.uk/-/media/boe/files/quarterly-bulletin/2014/money-creation-in-the-modern-economy.pdf.

Picón Aguilar C., Oliveira Soares R., Adalid R. (2020), *Revisiting the monetary presentation of the euro area balance of payments*, Occasional Paper Series, 238, European Central Bank.

Pietrzak B., Polański Z., Woźniak B., eds. (2015), *System finansowy w Polsce,* vol. 2, Wydawnictwo Naukowe PWN.

Polak J.J. (1957), *Monetary analysis of income formation and payments problems*, IMF Staff Papers, 6(1), DOI: 10.2307/3866128.

Polański Z. (2025), Monetary policy under permanent excess liquidity, in: S. Kappes, L.-P. Rochon (eds.), *Central Banking and Monetary Policy Implementation*, Edward Elgar (forthcoming).

Polański Z., Szadkowski M. (2020), *Seigniorage and central banks' financial results in times of unconventional monetary policy*, NBP Working Paper, 331, Narodowy Bank Polski.

Schumpeter J.A. (1960), *Teoria rozwoju gospodarczego*, Państwowe Wydawnictwo Naukowe.

Sieroń A. (2019), Endogenous versus exogenous money: Does the debate really matter?, *Research in Economics*, 73(4), 329–338, DOI: 10.1016/j.rie.2019.10.003.

Sławiński A. (2023), *Bankowość centralna. Ewolucja i przyszłość*, CeDeWu.

Wicksell K. (1951), *Lectures on Political Economy,* vol. 1*, General theory*, Routledge & Kegan Paul.

Appendix 1. Calculations for the Bulgarian National Bank (BNB)

Table A.1 presents the sources and method of calculations.

Table A.1
The BNB calculation of money creation

Position	Source	How to perform the calculation
Net foreign assets	BNB analytical reporting	foreign assets (net)
Net debt of the government sector	BNB analytical reporting	claims on general government (net)
Claims from the private non--financial sector	BNB analytical reporting	claims on the non-government sector
Money creation by BNB	monetary aggregates – stocks and transactions BNB analytical reporting	+ currency outside MFIs + deposits of other MFIs + liabilities included in money supply – claims on other MFIs
Other factors	own calculations	+ money creation via BNB – net foreign assets – net debt of the government sector – claims from the private non-financial sector

Source: own study.

Figure A.1 (Panels A–G) presents the results obtained.

Figure A.1
Money supply in Bulgaria and factors of its creation by money created by the central bank and other monetary financial institutions

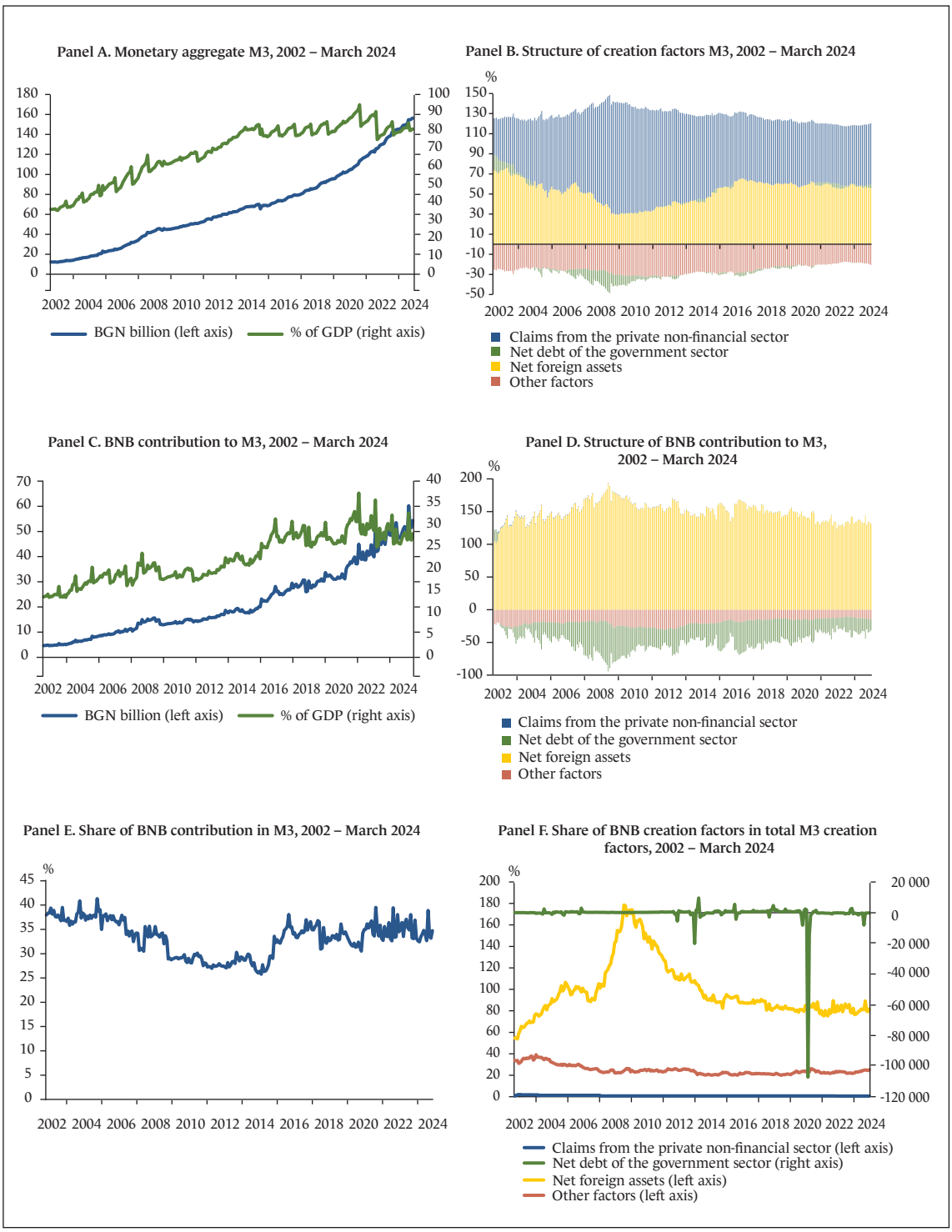


Figure A.1, cont'd

Panel G. Average annual growth rate and correlation coefficient of the average growth rate with respect to GDP in current prices, growth rate calculated from December to December (%)

	2002–2023		2002–2007		2008–2019		2020–2023	
	Average	Correlation coefficient with GDP	Average	Correlation coefficient with GDP	Average	Correlation coefficient with GDP	Average	Correlation coefficient with GDP
M3	12	63	23	82	8	49	11	42
BNB contribution to M3	13	14	20	45	7	0	17	-88
M3 without BNB	13	67	24	77	8	37	8	88
GDP	9	100	13	100	6	100	11	100

Note: last data December 2023.

Source: own calculation based on data available on the BNB and AMECO websites (May 2024).

Appendix 2. Calculations for the Czech National Bank (CNB)

Table A.2 presents the sources and method of calculations.

Table A.2
The CNB's calculation of money creation

Position	Source	How to perform the calculation
Net foreign assets	aggregated balance sheet of the Czech National Bank	+ external assets – external liabilities
Net debt of the government sector	aggregated balance sheet of the Czech National Bank	+ loans to residents – general government + holdings of securities other than shares issued by residents – general government – deposits of residents – central government
Claims from the private non--financial sector	aggregated balance sheet of the Czech National Bank	+ loans to residents – other residents + holdings of securities other than shares issued by residents – other residents + holdings of shares / other equity issued by residents – other residents
Money creation by the CNB	aggregated balance sheet of the Czech National Bank	+ M1 – currency in circulation + deposits of residents – MFIs + debt securities issued – loans to residents – MFIs – holdings of securities other than shares issued by residents – MFIs – holdings of shares / other equity issued by residents – MFIs + deposits of residents – other general government / other residents
Other factors	own calculations	+ money creation by CNB – net foreign assets – net debt of the government sector – claims from the private non-financial sector

Source: own study.

Figure A.2 (Panels A–G) presents the results obtained.

Figure A.2
Money supply in the Czech Republic and its creation factors by money created by the central bank and other monetary financial institutions

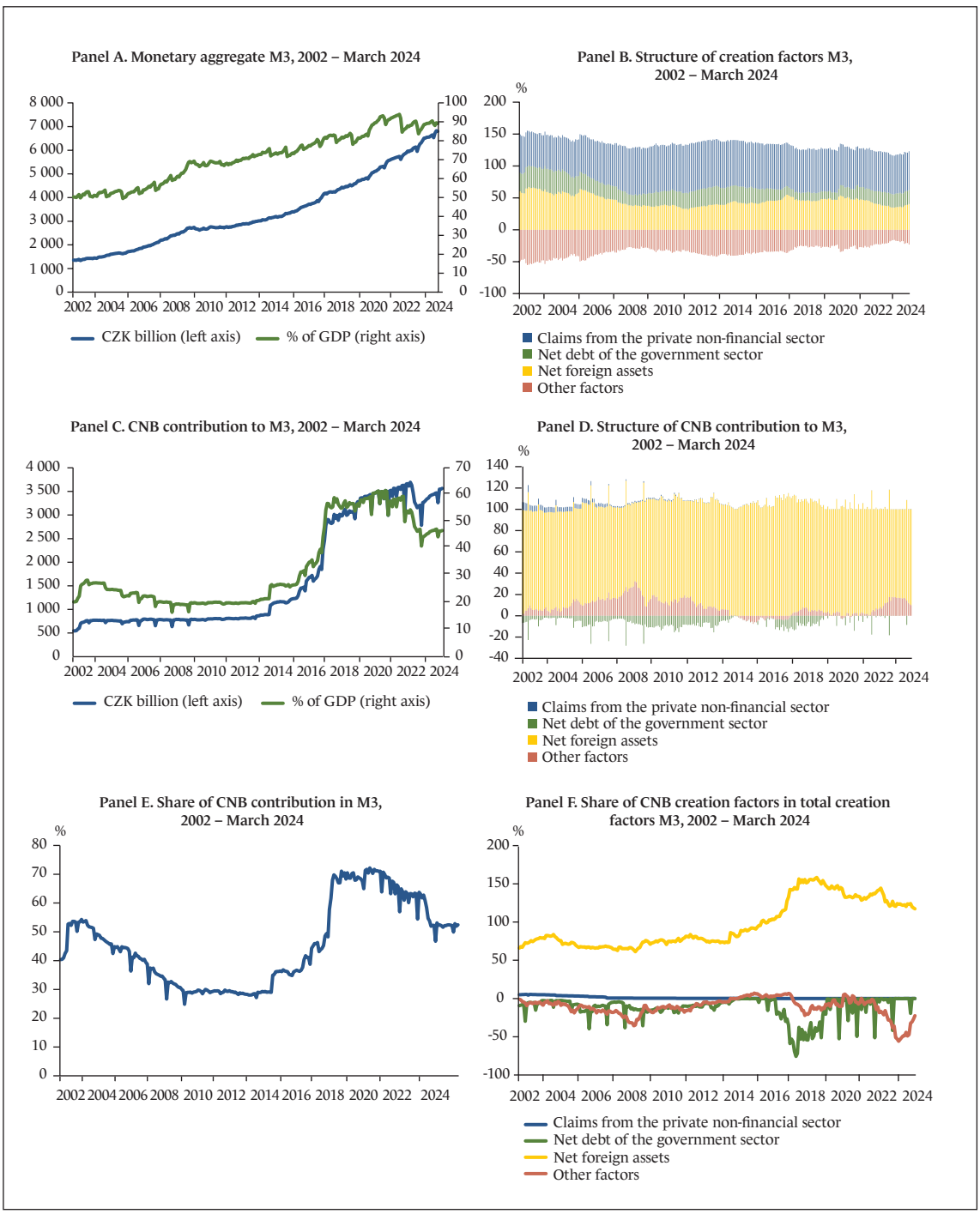


Figure A.2, cont'd

Panel G. Average annual growth rate and correlation coefficient of the average growth rate with respect to GDP in current prices, growth rate calculated from December to December (%)

	2002–2023		2002–2007		2008–2019		2020–2023	
	Average	Correlation coefficient with GDP	Average	Correlation coefficient with GDP	Average	Correlation coefficient with GDP	Average	Correlation coefficient with GDP
M3	8	53	11	52	6	72	8	-68
BNB contribution to M3	9	-17	-2	-59	15	17	2	3
M3 without BNB	9	26	20	63	1	5	18	-51
GDP	5	100	7	100	3	100	6	100

Note: last data December 2023.

Source: own calculation based on data available on the CNB and AMECO websites (May 2024).

Appendix 3. Eurosystem calculations

Table A.3 presents the sources and the method of calculations.

Table A.3
Eurosystem's calculation of money creation

Position	Source	How to perform the calculation
Net foreign assets	Eurosystem aggregated balance sheet	+ external assets – external liabilities
Net debt of the government sector	Eurosystem aggregated balance sheet	+ loans, general government + debt securities held, general government – deposit liabilities, central government
Claims from the private non--financial sector	Eurosystem aggregated balance sheet	+ loans, non-MFIs excluding general government + debt securities held, non-MFIs excluding general government
Eurosystem money creation	Eurosystem aggregated balance sheet	+ currency in circulation + deposit liabilities, monetary financial institutions (MFIs) + debt securities issued, unspecified counterpart sector – loans, monetary financial institutions (MFIs) – debt securities held, monetary financial institutions (MFIs) – MMF shares/units, monetary financial institutions (MFIs)
Other factors	own calculations	+ Eurosystem money creation – net foreign assets – net debt of the government sector – claims from the private non-financial sector

Source: own study.

Figure A.3 (Panels A–G) presents the results obtained.

Figure A.3
The money supply in the euro area and the factors of its creation by the central bank and other monetary financial institutions

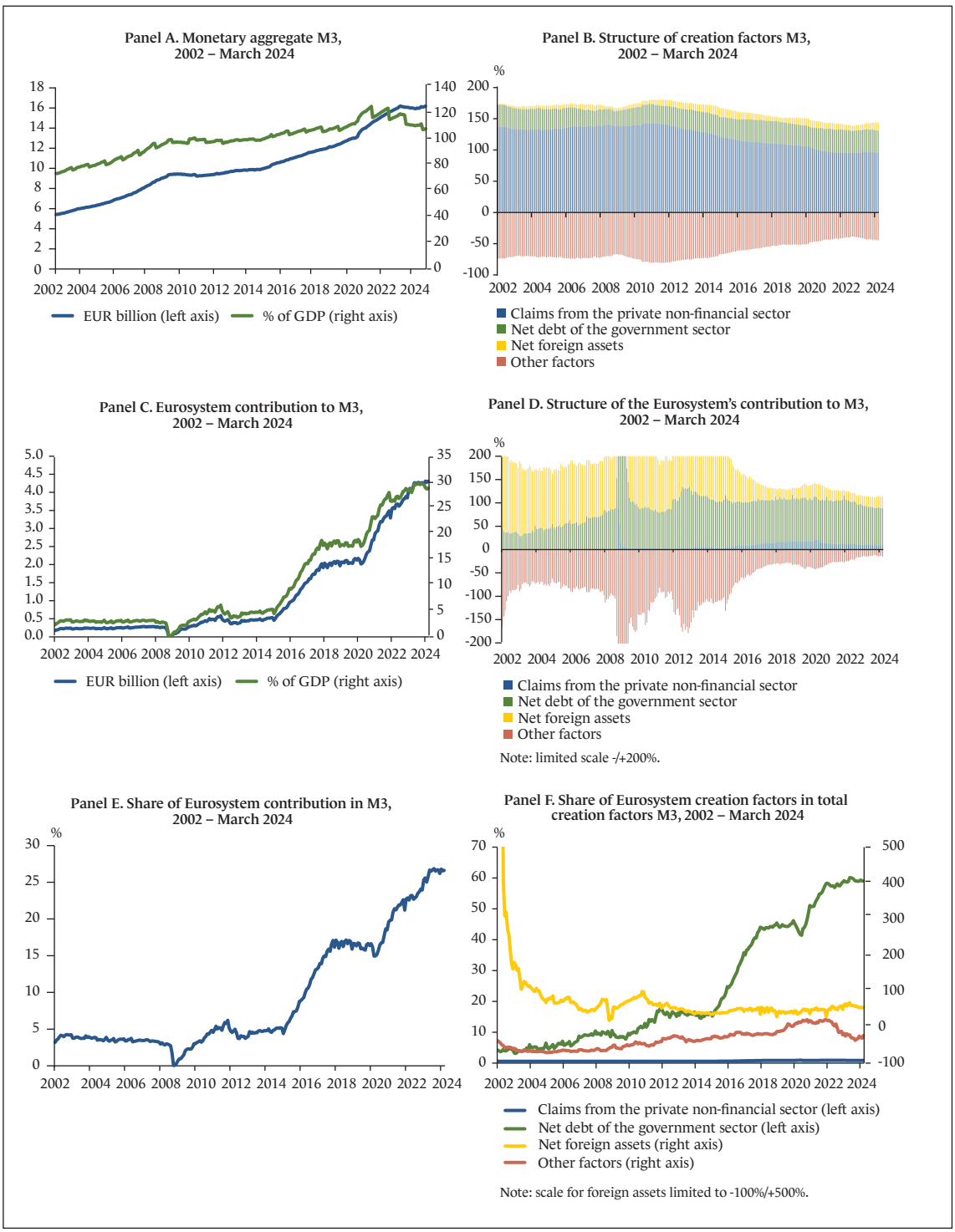


Figure A.3, cont'd

Panel G. Average annual growth rate and correlation coefficient of the average growth rate with respect to GDP in current prices, growth rate calculated from December to December (%)

	2002–2023		2002–2007		2008–2019		2020–2023	
	Average	Correlation coefficient with GDP	Average	Correlation coefficient with GDP	Average	Correlation coefficient with GDP	Average	Correlation coefficient with GDP
M3	5	25	8	64	3	72	6	-71
Eurosystem contribution to M3	102	-10	5	39	177	-2	20	-70
M3 without Eurosystem	4	19	8	58	2	65	2	-69
GDP	3	100	4	100	2	100	6	100

Note: last data December 2023.

Source: own calculation based on data available on the website of the European Central Bank and AMECO (May 2024).

Appendix 4. Calculations for Narodowy Bank Polski (NBP)

Table A.4 presents the sources and method of calculations.

Table A.4
NBP's calculation of money creation

Position	Source	How to perform the calculation
Net foreign assets	balance sheet of the NBP (monetary approach)	+ NBP's foreign assets – NBP's foreign liabilities
Net debt of the government sector	balance sheet of the NBP (monetary approach) assets and liabilities of monetary financial institutions	+ loans and other receivables of NBP from the government sector + Treasury bonds held by NBP – government deposits at NBP
Claims from the private non-financial sector	assets and liabilities of monetary financial institutions	+ loans and other receivables of NBP – other sectors
Money creation by NBP	balance sheet of the NBP (monetary approach) aggregate balance sheet of banks assets and liabilities of monetary financial institutions	+ money in circulation (outside bank cashiers) + bank accounts at NBP + NBP bills (purchased by banks) – NBP's receivables from the banking sector – debt securities issued by the banking sector held by NBP + deposits and other claims on domestic entities – other sectors
Other factor	own calculations	+ money creation by NBP – net foreign assets – net debt of the government sector – claims from the private non-financial sector

Source: own study.

Figure A.4 (Panels A–G) presents the results obtained.

Figure A.4
Money supply in Poland and factors of its creation by money created by the central bank and other monetary financial institutions

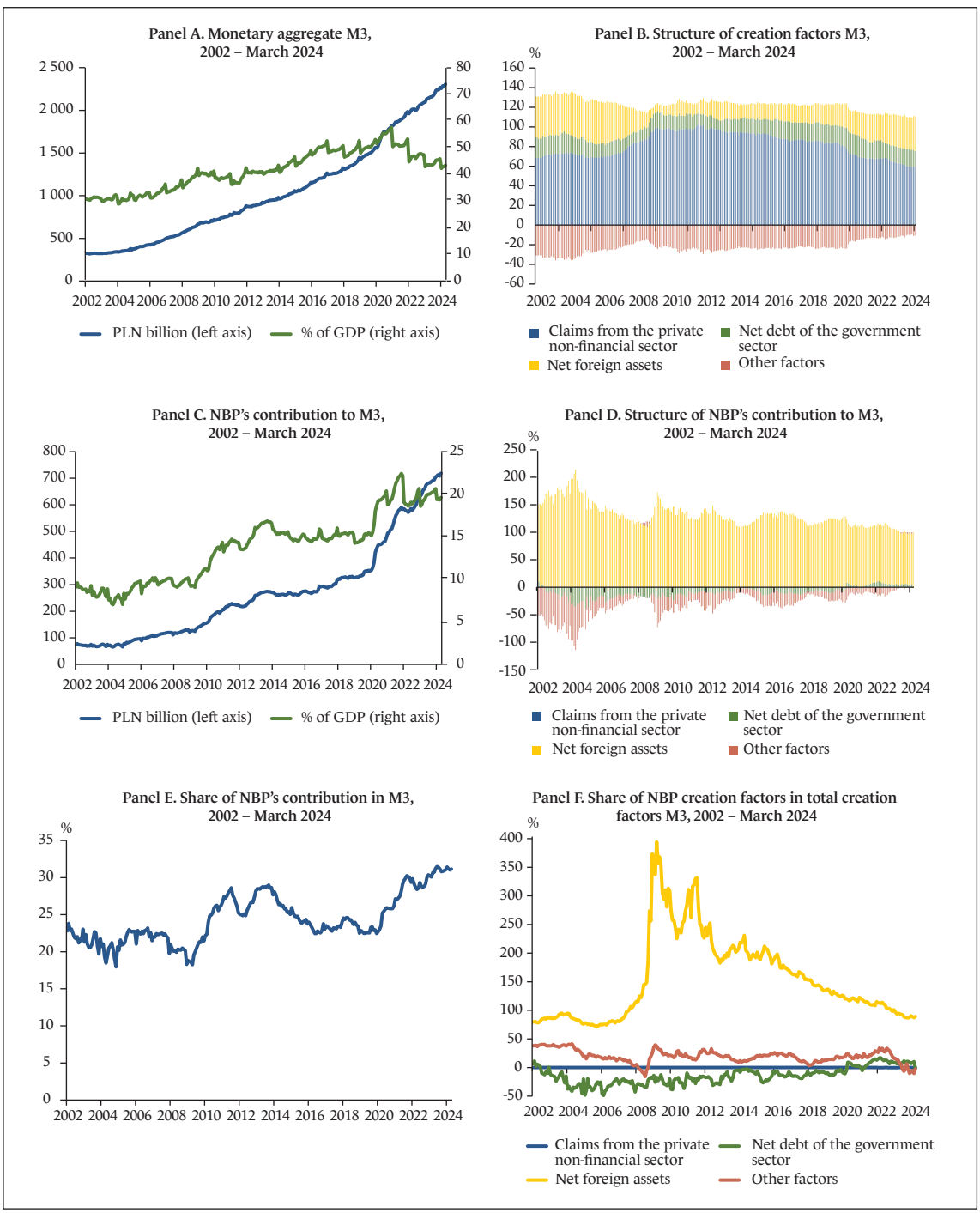


Figure A.4, cont'd

Panel G. Average annual growth rate and correlation coefficient of the average growth rate with respect to GDP in current prices, growth rate calculated from December to December (%)

	2002–2023		2002–2007		2008–2019		2020–2023	
	Average	Correlation coefficient with GDP	Average	Correlation coefficient with GDP	Average	Correlation coefficient with GDP	Average	Correlation coefficient with GDP
M3	9	10	9	66	9	50	10	-99
NBP contribution to M3	11	-5	6	15	11	3	19	-87
M3 without NBP	9	10	10	75	9	40	7	-95
GDP	7	100	7	100	6	100	11	100

Note: last data December 2023.

Source: own calculation based on data available on the website of the European Central Bank and AMECO (May 2024).

Kreacja pieniądza banku centralnego w Unii Europejskiej

Streszczenie

Celem artykułu jest określenie, za jaką część pieniądza znajdującego się w gospodarce odpowiada bank centralny (z punktu widzenia źródeł kreacji pieniądza), a za jaką odpowiadają pozostałe monetarne instytucje finansowe. Współczesny pieniądz w gospodarce, bez względu na to, jaką przyjmuje postać – materialną (gotówka emitowana przez bank centralny) czy niematerialną (środki pieniężne na rachunkach w bankach – depozyty), kreowany jest poprzez kredyt. Z kolei kredytu udzielają banki (instytucje kredytowe, pozostałe monetarne instytucje finansowe), podczas gdy zadaniem banku centralnego jest zapewnienie im płynności do ich wzajemnych rozliczeń płatniczych. Znajduje to odzwierciedlenie we współczesnych dwuszczeblowych systemach bankowych.

Ograniczenie zadań banku centralnego do zapewnienia płynności instytucjom kredytowym powoduje występowanie deficytu płynności w sektorze bankowym, co z kolei zapewnia, że bank centralny nie bierze bezpośrednio udziału w kreacji pieniądza. Nierzadko jednak bankom centralnym przyznaje się dodatkowe funkcje, jak na przykład zarządzanie rezerwami dewizowymi państwa. Co więcej, na skutek kryzysu finansowo-ekonomicznego z 2008 r., a następnie kryzysu pandemicznego banki centralne w ramach prowadzonych działań wykorzystywały niekonwencjonalne instrumenty polityki pieniężnej. Działania te były określane jako polityka bilansowa, ponieważ powodowały wzrost sum bilansowych banków centralnych. Następstwem tego – czy to na skutek polityki bilansowej, czy też pełnienia innych funkcji – jest powstanie, a następnie wzrost nadpłynności sektora bankowego. Nadpłynność sektora bankowego oznacza, że banki centralne nie tylko zapewniają instytucjom kredytowym płynność do rozliczeń pieniężnych, lecz także same przyczyniają się, bezpośrednio lub pośrednio (pierwotnie lub wtórnie), do kreacji pieniądza w gospodarce. Wiązka funkcji pełnionych przez bank centralny, które wykraczają poza prowadzenie konwencjonalnej polityki pieniężnej, powoduje powstanie w bilansie ekspozycji wobec sektorów niebankowych, czego skutkiem jest z kolei kreacja pieniądza w gospodarce. W związku z tym w artykule podjęto próbę określenia wielkości udziału banku centralnego w kreacji pieniądza oraz wskazano czynniki, które ją determinują.

Na przykładzie wybranych banków centralnych Unii Europejskiej obliczono wielkość pieniądza wykreowanego przez bank centralny i jego udział w wielkości podaży pieniądza w gospodarce w XXI w. (po 2002 r.). Do tego celu wybrano cztery banki centralne: jeden z krajów rozwiniętych – Eurosystem – oraz trzy z krajów rozwijających się: z Bułgarii, Czech oraz Polski. Eurosystem został wybrany z powodu posiadania międzynarodowej waluty oraz przeprowadzonych po 2008 r. operacji niekonwencjonalnych w postaci programów skupu dłużnych papierów wartościowych. Bank centralny Czech znalazł się w próbie z uwagi na przeprowadzone interwencje walutowe, służące zapobieżeniu aprecjacji waluty krajowej. Z kolei Bułgaria jest przykładem kraju stosującego izbę walutową. Polska to natomiast przykład kraju z płynnym kursem walutowym. W okresie objętym analizą NBP prowadził konwencjonalną politykę pieniężną.

Przeanalizowane przypadki czterech banków centralnych pozwoliły zauważyć, że w gospodarkach rozwijających się, w których banki centralne są zobowiązane do zarządzania rezerwami dewizowymi kraju, zadłużenie zagraniczne netto jest głównym czynnikiem kreacji pieniądza przez bank centralny w gospodarce. W Bułgarii i w Polsce banki centralne odpowiadają średnio za 20–40% podaży pienią-

dza, natomiast w Czechach w wyniku interwencji walutowych przeprowadzonych przez tamtejszy bank centralny jego udział wzrósł do 50% wielkości podaży pieniądza. Z kolei operacje niekonwencjonalne przeprowadzane przez Eurosystem, pomimo ich dużej skali i obserwowanego wzrostu kreacji pieniądza przez bank centralny, nie pozwoliły bankowi centralnemu zbliżyć się do poziomów obserwowanych w pozostałych analizowanych krajach. Ponadto w Eurosystemie następowała zmiana w czasie. O ile przed kryzysem najważniejszym źródłem kreacji pieniądza przez bank centralny były aktywa zagraniczne netto, o tyle w trakcie kryzysu, w wyniku przeprowadzanych operacji skupu skarbowych papierów wartościowych, znacznie wzrósł udział zadłużenia netto sektora rządowego. Poza tym kreacja pieniądza w postaci skupu dłużnych papierów wartościowych na rynku wtórnym, jeżeli jest dokonywana w transakcjach z pozostałymi monetarnymi instytucjami finansowymi, nie ma bezpośredniego wpływu na zmianę wielkości pieniądza w gospodarce.

Słowa kluczowe: kreacja pieniądza, źródła kreacji pieniądza, bank centralny, instytucje kredytowe, agregaty pieniężne