# Making Sense of Exchange Rate Pressures in Macroeconomic Statistics

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**Received** 2.7.2024 (revision received 30.8.2024), **Accepted** (reviewed) 30.9.2024, **Published** 14.3.2025

***Abstract***

The paper explores new statistical approaches for studying links between cross-border financial flows and the exchange rate. The paper first discusses limitations of the balance of payments statistics in analysing foreign exchange market imbalances by explaining the methodological principles that drive a wedge between balance of payments transactions and cross-border flows. Then it continues with a discussion on the analytical potential of the so-called monetary presentation of the balance payments. Visual analysis tentatively suggests that in the case of the CZK/EUR currency pair, net external flows (an aggregate identified by the monetary presentation) can explain reasonably well past exchange rate developments, if adjusted for central bank intervention.[3]

| ***Keywords*** | ***DOI*** | ***JEL code*** |
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| *Balance of payments, monetary presentation, monetary aggregates, foreign exchange* | *https://doi.org/10.54694/stat.2024.33* | *F31, F32, E00* |

## INTRODUCTION

In 2022, elevated inflation engulfed the Czech economy, invoked by a multitude of factors among which the aftermath of the COVID-19 crisis, the outbreak of the war in Ukraine and loose monetary policy in the preceding period feature high on the list. Aiming to curb growing prices, the Czech National Bank raised interest rates to 7%, which provided an incentive for profit-seeking investors to move their capital into assets denominated in the Czech koruna. In result, the large 2022 current account deficit (4.9% of GDP) was accompanied by the Czech koruna appreciating on the foreign exchange market (hereinafter: "FX market") . Such evolution of the current account and the exchange rate seems to be rather counter-intuitive.

For decades, the current account balance has been seen as a proxy of the demand and supply of foreign exchange (Dornbusch and Fischer, 1980). As proposed by Gourinchas and Rey (2007), the intertemporal approach to the current account suggests that high current account deficits today will

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need to be compensated for in the future. That could happen via trade or valuation channels, in both of which depreciation of the currency plays a vital role. In fact, at times these theories were elaborated upon, capital flows recorded on the financial account were relatively unimportant and thus current account balance could have served as a proxy for FX market imbalances relatively well. However, this is not currently the case. The binding capital controls that were present during the 20th century[4] were lifted in the late 1990s[5]; capital is therefore broadly free to move across jurisdictions around the world.

Indeed, according to the BIS survey (BIS, 2022), global FX trading rose to $7.5 trillion per day in April 2022, with 14% annual growth. To put this figure into perspective, the world trade reached $25.3 trillion in the whole year 2022 (WTO, 2023). Not least, foreign direct investment (FDI) flows increased globally from 0.55% of the world's GDP in the 1970s and 1980s to 3.11% in the 2000s and early 2010s[6] (World Bank).[7] The financial integration was further supported by the emergence and growth of international organizations such as the International Bank for Reconstruction and Development (IBRD), whose task is to promote the flow of long-term loans to less developed countries. By 2010, the average daily turnover on the foreign exchange market was 36 times the balance of trade according to King et al. (2012). Comparing these volumes suggests that FX changes are dominated by capital flows rather than by traded commodities or income flows. In other words, with global FX trading clearly surpassing the world trade volume, most FX movements must be tied up with financial transaction (Miller, 2002). As Miller (2002) further points out, economic fundaments such as economic growth dominate in the long run, while short term drift in the spot rate depends rather on the interest rate differential.

Rather weaker link between the current account balance and the evolution of the exchange rate creates a need to find another statistical tool how to analyse demand and supply for foreign exchange. In fact, strengthening interconnectedness of global financial markets introduced increased complexity to the financial account. Consequently, when analysing the BoP to determine the excess demand for foreign currency, the financial account cannot be overlooked, as doing so would result in biased conclusions.

In 2008, the ECB paper presenting so-called monetary presentation of the balance of payments has been published, suggesting an alternative presentation meant to complement the analysis of the monetary aggregates development. Reflecting on the expanding volume of capital flows highly surpassing the flow recorded in the current account, the paper suggests a statistical system monitoring domestic monetary development in relation to external transactions. The aim is to identify transactions contributing to the net external assets of domestic banks and hence having an impact on the level of money holdings in the domestic economy (Be Duc et al., 2008). Although meant for monetary aggregates analysis, the monetary presentation could potentially be useful in analysing supply and demand on the FX market, for it better reflects FX relevant transactions compared to the current account alone (Drahozalová, 2023).

In the following chapters, we will thus firstly explain the classification of transactions in the balance of payments model, then we will describe the basic structure of the monetary presentation of the balance of payments and, in the last chapter, we will analyse the development of the key elements of the monetary presentation in Czechia.

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[4] During the 20th century capital controls were implemented for various reasons, starting with the Great Depression (1930s) to Bretton Woods system (1944–1971) and Cold War era (1945–1990s).

[5] The effectiveness and duration of capital controls varied across countries and time periods under consideration, however from the late 1990s the trend has generally been toward liberalization and the relaxation of capital controls, driven by globalization and the increased integration of financial markets.

[6] The period considered here ends with the year 2017, while the peak in FDI flows was in 2007 (5.33% GDP). From 2018 the worlds' FDI is on a decline as increased economic uncertainty (US-China trade war, covid pandemic or Russian invasion of Ukraine) dampens investor confidence.

[7] The respective data were retrieved from the World Bank database in June 2023: <*https://data.worldbank.org/indicator/BX.KLT.DINV.WD.GD.ZS*>.

## 1 BALANCE OF PAYMENTS AND THE FX MARKET

Macroeconomic model named "Balance of Payments" (thereafter "BoP") represents a statistical statement covering transactions and positions between residents and non-residents over a certain period. Practical compilation of the BoP follows the accounting rules laid down in the Balance of Payments Manual whose sixth edition is currently in effect (thereinafter "BPM6"). Despite being named as "Balance of payments", the model however does not capture only transactions involving the payment of money but any transactions that reflect underlying resource flows.

The fundamental principle of the BoP compilation is double-entry accounting. Each transaction is recorded twice in the BoP: once as a credit entry and once as a debit entry. This dual principle ensures that the total value of credits is always equal to the total value of debits, resulting in a net balance of zero for all BoP entries. Furthermore, records entering the BoP must follow precise rules. Typically, credit entries record non-financial transactions such as exports of goods, income receivable from cross-border work, one-time transfers from abroad, as well as financial transactions involving a decrease in financial assets or an increase in financial liabilities. Conversely, debit entries represent the opposite.[8]

For example, when a domestic resident imports goods from abroad, the debit entry recorded on the current account represents the obligation to pay the rest of the world, while the credit entry recorded on the financial account mirrors it as the payment to foreign exporter is executed. Furthermore, the obligation to pay essentially represents the demand for foreign currency, while the entitlement to a payment from abroad represents the supply of foreign currency.[9] This simple concept can be expanded to include other current account items, such as trade in services, claims arising from cross-border work, or returns on capital. Assuming that all claims and obligations must be settled immediately, the current account deficit indicates a current excess in demand for foreign currency over its supply. In fact, at times this theory was elaborated upon, capital flows recorded on the financial account were relatively unimportant and thus current account balance could serve as a proxy for FX market imbalances relatively well.

### 1.1 Accrual principle of the BoP weakens the link between current account and the exchange rate

Nevertheless, in the previous example, we assumed that the transactions in the BoP are recorded on a payment basis, where revenues are recognized when cash is received and expenses are recognized when cash is paid. However, this simplified approach does not fully account for the common business practices, when payments are made in advance or deferred, as well as for the development of new financial products designed to facilitate international business activities, including trade credit arrangements. To sum up, the payment approach fails to recognize outstanding obligations or non-cash transactions.

To provide a fuller picture of the international flows of economic values, the BoP methodology employs an accrual approach recording transactions at the time they are incurred, regardless of the timing of cash flows (BPM6, par. 3.35). For instance, if goods are purchased on trade credit payable in three months, the corresponding entry reflects the import of goods (at the time of change of ownership) as a debit on the current account, while the financial account recognizes the trade credit due in three months.[10] Although the accrual principle allows us to consider outstanding obligations, barter trade, or transactions without a quid pro quo, it further complicates the situation. Under this principle, the current account includes not only exchange rate-relevant items that signal the current demand or supply of currency but also

[8] Debit entries record e.g. import of goods, income payable, gifts to abroad, increase in financial assets or decrease in financial liabilities.

[9] Here we need to differentiate between current and future demand for (supply of) currency. If the payment is deferred, the transaction implies a future demand for or supply of foreign currency.

[10] Note that this type of entry signals future (rather than current) demand for foreign currency.

outstanding obligations that contribute to future exchange rate movements. Additionally, it encompasses barter trade and transactions without a quid pro quo, which have no impact on the FX market, neither in the present nor in the future.[11]

### 1.2 Furthermore, the current account itself does not fully capture all cross-border financial flows

The differentiating between credit and debit transactions helps to explain the overall balance of accounting entries in the BoP. Analytically, in order to get better understanding of the imbalances in the transactions vis-à-vis the rest of the world, another breakdown of transactions is to be considered. The macroeconomic models such as national accounts or balance of payments make distinction between non-financial and financial transactions.[12] The former are often referred to as "above the line", while the latter "below the line". The transactions "below the line" can be further broken down into those associated with or financing the transaction "above the line", e.g. the receipt of money for selling goods abroad, and those having the nature of pure financial transactions. By drawing the line between both types of transactions, we arrive at the well know BoP identity:

$$CA + KA = FA, \tag{1}$$

where CA denotes the current account balance, KA refers to the capital account balance and FA to the financial account balance.[13] Leaving aside the item "errors and omissions", which conceptually reflect imperfections in the compilation process and data sources, we can formulate that FA encompasses both pure financial transactions and those that are a mere reflection of the transactions "above the line". In case of pure financial transactions,[14] the investing party expects the financial means originally provided to be returned at some point of time in the future, along with a certain compensation being regularly paid during the lifetime of financial instrument (more commonly in the form of interests or dividends). Leaving aside the income element, these transactions themselves exert no direct impact on the current account balance but increasing/decreasing demand/supply on the exchange rate on the FX market. Therefore, while being recorded out of the scope of the current and the capital accounts, these transactions may exert a strong pressure on the FX market.

The other group of financial transactions is associated with the transactions recorded on the current and the capital account where the paying party does not expect these financial means to be returned. In the logic outlined above, these transactions may be referred to as "not-purely financial transactions". This is the case of payments for the goods exported or imported, or for the payments of primary or secondary income. This group of transactions is simply mirroring the non-financial transactions

[11] It is worth noting that the aforementioned difficulties can be effectively mitigated if a country operates within a fixed exchange rate regime. Under such a framework, measuring the excess demand for foreign currency becomes more direct, precisely corresponding to the volume of foreign exchange that the central bank must introduce into the market to maintain exchange rate stability. In essence, when the demand for foreign currency exceeds its supply, the central bank intervenes by purchasing the excess liquidity from the market while simultaneously providing foreign currency to meet the market's needs. Conversely, a surplus supply of foreign currency prompts the opposite response. While examining external imbalances is an important task in the presence of the fixed exchange rate, we often wonder about the implications in the absence of central bank interventions. This is where the monetary presentation of the BoP, which is discussed further in the text, can provide valuable insights.

[12] Being consistent with the SNA and other macroeconomic statistics, this presentation is commonly referred to as „standard presentation" (BPM6, par. 14.15).

[13] The balances on both side of identity 1 are commonly referred to as net lending (+)/net borrowing (–) either from non-financial transactions (capital and current account) or from financial transactions (financial account). However, further in the text, the sum of current and capital account balance (left-hand side) will be referred to as „external balance".

[14] Such as purchases of securities, provisions of loans or depositing money in the bank.

and showing how the transactions "above the line" were financed whether in cash or in other ways. The fact that transactions do not need to take the form of cash transfer only brings us to another element weakening the linkage between the BoP fundamentals and the FX rate movements which is the capturing of non-cash transactions in the system. Methodologically, the involvement of non-cash transactions is necessitated by the application of so-called accrual principle, as prescribed in the BPM7 (par. 3.34).[15] Following this requirement of the methodology, all economic events are to be recorded in the period in which they occurred, irrespective of whether a corresponding flow of cash was observable or not. If no cash flow followed the event, the time lag between the occurrence of this economic event and corresponding cash payments is bridged by recording of a non-cash transaction such as loan, trade credit, other receivable, etc.

From the FX market perspective, the application of accrual principle weakens the explanatory power of the BoP balancing items, such as current account balance, towards the FX movements. The reason is obvious, if no cash is transferred between both parties concerned, no pressure on the exchange rate on the FX market is exerted as no currency conversion was carried out. Transactions with no cash movement constitute only future demand or supply of the currency.[16] The occurrence of purely accrual transactions therefore suggests that e.g. current accounts surplus does not automatically implies a pressure on the domestic currency to appreciate and, if the situation is reversed, depreciation of the domestic currency does not necessarily follow current account deficit. The link between the external balance and FX changes is further weakened by imputed values such as reinvested earnings or the EU flows as, following the agreement between economic policy authorities, the financial means from the EU do not enter the FX market but are converted by the central bank instead.

To sum up, there are many methodological aspects of the model that step in between the current account balancing items and the FX rate movements. That is the application of the accrual principle, which does not allow for a straightforward interpretation of the current account balance, paired with the fact that financial transactions, that are not to be found on the current account, play an equal role in FX determination. These methodological conceptions help in explaining seemingly puzzling evolution of the FX and the current account in the Czech Republic over the year 2022 where the Czech economy experienced a massive current account deficit accompanied by appreciating foreign exchange rate. In the following section, we use the monetary presentation of the balance of payments to better understand these concepts within a common methodological framework.

## 2 THE MONETARY PRESENTATION OF THE BALANCE OF PAYMENTS

The monetary presentation of the BoP was designed to analyse the monetary aggregate M3 and money creation in the economy through the intersection of two different statistics: consolidated balance sheet items of monetary financial institutions (MFIs)[17] and balance of payments statistics. By examining the intersection of a bank's net external assets, an external counterpart to the M3 aggregate (Aguilar et al., 2020), with the balance of payments statistics, we can examine changes in money supply in detail.

To detect the impact of the BoP on the monetary aggregate M3, it is necessary to decompose it for individual economic sectors which is another way of analysing the BoP (BPM6, par. 14.18). However, unlike the sector accounts in national accounts, where the balancing item on the capital account (B.9n) and on the financial account (B.9f) are to be balanced for each individual economic sector, this is essentially

[15] Except for the BoP, the application of accruals is applied also for other major macroeconomic models as national accounts or government finance statistics.

[16] Or no demand or supply of the currency at all, as is the case for barter trade and transactions without a quid pro quo.

[17] According to Regulation (EU) 2021/379 of the ECB, the term „monetary financial institutions" covers central banks, deposit taking corporations and money market funds (see Article 2 of the Regulation).

not the case in the BoP. Transactions in the current or in the capital accounts, and corresponding financial transactions in the financial accounts, are in the BoP routinely performed by different economic sectors, and recorded accordingly.[18]

For this purpose, we can decompose the right-hand side of Formula (1) in the following way:

$$CA + KA = FA_{MFI} + FA_{nonMFI} . \quad (2)$$

Sectoral split by the type of the resident enables compilers and users to monitor the economic position of individual sectors towards the rest of the world. The BoP statistics here follows the classification as laid down in the manuals of national accounts SNA2008 and ESA2010. For the monetary presentation of the BoP, the sector dimension is essential as it distinguishes between monetary and non-monetary sectors. The former, which factually embraces sectors entitled to issue money (monetary and financial institutions entitled to issue money, commonly referred to as "MFI"), covers the sub-sectors S121, S122 and S123[19] as these are defined in the SNA/ESA/BPM. The latter, i.e. "non-MFI" therefore encompasses all other economic sectors which may be in the positions of money-holding or money-neutral sectors.

The sectoral breakdown allows us to separate the financial account for MFIs, which summarizes all transactions on the financial account made by MFIs and non-MFIs. Formula (2) can be further adjusted:

$$CA + KA - FA_{nonMFI} = FA_{MFI} . \quad (3)$$

The right-hand side ($FA_{MFI}$) provides a conceptual link between the two statistical sets, i.e. the BoP statistics and the aggregate M3. Concretely, the aggregate $FA_{MFI}$ can be equated to the transaction component of the changes in the net external assets[20] (hereinafter NEA) which is meant to quantify the inflow and outflow of money in/from the economy from an external perspective.

NEA represent a consolidated MFI's net position, i.e. the assets minus the liabilities vis-à-vis the rest of the world. External assets include loans and advances to customers, investments in securities, and cash and balances with other banks. External liabilities encompass deposits from customers, borrowings from other financial institutions, and other forms of funding obtained by the bank from external sources. In all cases, the counterparty is always a non-resident. By subtracting external liabilities from external assets, we arrive at NEA, a variable showing the net result of the MFIs interaction with the rest of the world.

What is important for our purposes is that transactions captured in NEA represent an inflow and outflow of money from an external sector, therefore affecting domestic money supply. Formally, we can write:

$$M3 = Credit + NEA + OA - CGD - LTFL , \quad (4)$$

where the aggregate Credit covers loans granted to residents[21] as well as holdings of securities issued by residents. The item OA denotes "other net assets",[22] CGD refers to "deposits of central government"

[18] Suppose a household wishing to make an online purchase of a book from abroad. Once the product is delivered and paid for out of the buyer´s deposit held in the domestic bank, the corresponding entry is booked in the current account (import) and the households accounts (consumption of imported good). In the financial accounts, the counterparty of a decrease in the household´s financial asset is, however, the domestic bank, i.e. a resident. The final settlement of this purchase would then be recorded in the BoP as a transaction between domestic bank and its counterparty abroad, generally a correspondent bank where resident banks hold their accounts.

[19] See par. 2.67, ESA2010.

[20] One of the counterparts to monetary aggregate M3.

[21] Private sector and general government.

[22] Such as fixed assets, reverse repos, etc., in the stylized MFI consolidated balance sheet.

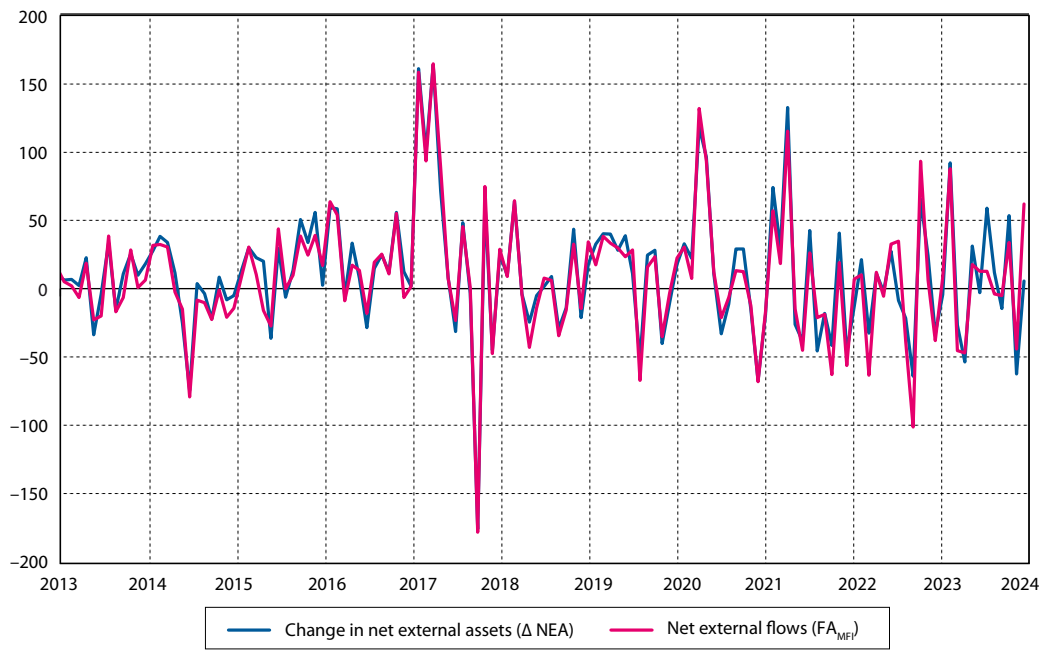
and LTFL to long-term financial liabilities such as long-term debt securities, capital and reserves or long-term deposits of government. Importantly, equation 4 holds both for positions and for net transactions (Aguilar et al., 2020). By deriving respective transactions from corresponding changes in the stocks of NEA, a conceptual link between the BoP and NEA is found and quantified.

The mechanism enabling this breakdown is based on the intersection of the two aforementioned statistics. While MFIs document all transactions – both domestic and external – in which they are involved, the BoP encompasses all transactions with the rest of the world for both MFI and non-MFI sectors. Therefore, by definition, the common intersection refers to the external transactions conducted by the MFI sector. We can therefore link the change in the stock item "NEA" in Formula (4) to the flows item "$FA_{MFI}$" in Formula (3). Then, we can further substitute in the following way to arrive at a formula showing the changes in M3:

$$\Delta M3 = \Delta Credit + CA + KA - FA_{nonMFI} + \Delta OA - \Delta CGD - \Delta LTFL\,.^{23} \quad (5)$$

Figure 1 shows change in the net external assets compared to net external flows as identified by the monetary presentation. We can see that the two time series are almost identical, except for minor inconsistencies that stem from different statistical approaches used to compile these statistics.

**Figure 1** Change in net external assets and net external flows, Czechia, CZK bn, 2013–24

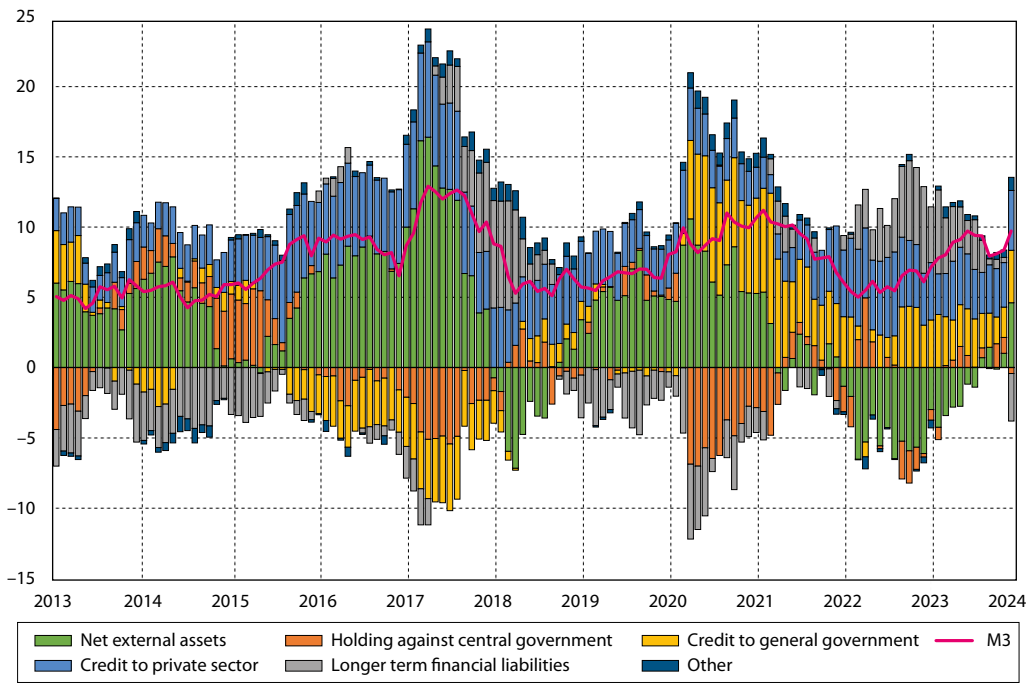



**Source:** CNB, own calculations

[23] Whether a transaction will impact M3 also depends on how it affects the MFI consolidated balance sheet as a whole. For instance, when a resident sells foreign share to a domestic bank, this leads to an increase in NEA. If the proceeds are then invested into long-term government bonds, where the government holds the money raised on its deposits in a domestic bank, than an increase in NEA will be offset by a corresponding increase in LFTL. As both changes cancel each other, M3 will remain unaffected.

As NEA is one of the counterparts to the M3 aggregate, separating $FA_{MFI}$ from the rest of the BoP can helps us explain the changes in the money supply from the perspective of external developments. The following chart illustrates the contributions of NEA to the dynamics of the M3 monetary aggregate. Figure 2 depicts the annual percentage changes in M3 and the contribution of its counterparts to these changes, including the NEA aggregate. Pronounced contributions are observable within the period leading up to the second quarter of 2017, during which the central bank exited its intervention regime. The end of the currency cap regime was preceded by a substantial influx of capital as foreign investors heavily engaged in investing into domestic assets, anticipating future currency appreciation. Simultaneously, the current account registered a surplus, thereby providing an additional impulse to the expansion of the money supply. Nonetheless, the inherent characteristics of these transactions are not readily apparent when relying only on the MFI's statistics. Consequently, for a more detailed analysis, it becomes pivotal to explore the relationship between the evolution of the NEA and the $FA_{MFI}$.

**Figure 2** Changes in monetary aggregate M3 (in %) and contribution of its counterparts (in p.p.), Czechia, 2013–24




**Source:** CNB, own calculations

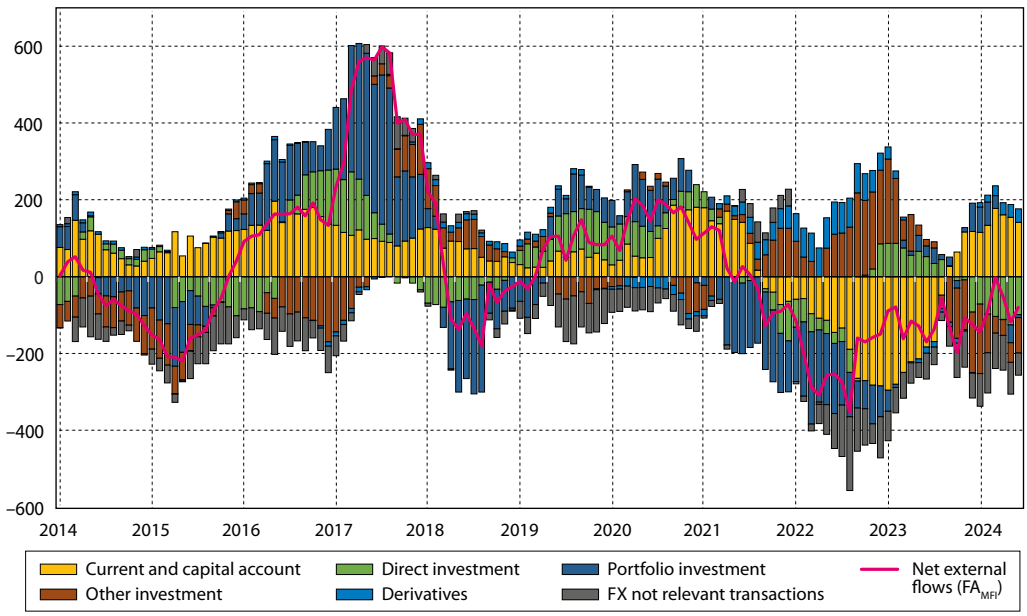
### 2.1 The evolution of monetary presentation of the BoP

Using the link between the change in NEA and $FA_{MFI}$, we can now dissect the growth rate of M3 during the currency cap regime in detail. Figure 3 clearly illustrates that within the first half of the intervention regime, capital flew out of the economy as the outlook of depreciated currency dissuaded foreign investors from investing in domestic assets. Conversely, the weakened currency bolstered the current account, which recorded stable surpluses during that period. The trend reversed at the beginning of 2016, as domestic assets became more appealing with the approaching end of the currency cap regime and anticipated currency appreciation. The influx of capital into the domestic economy during the final year

of the intervention regime can largely be attributed to portfolio investments,[24] complemented by positive external balances and the inflow of foreign direct investments. This trend, despite the ongoing external balance surpluses, shifted in the latter half of 2017 (i.e. after the intervention regime was discontinued), primarily due to a slowdown in capital inflow.

After years of stable capital inflow, the situation substantially changed in 2021 when money inflow came to a halt.[25] The initial outflow of portfolio investments was swiftly followed by accumulated trade balance deficits, driven by the surge in energy prices. Additionally, exports suffered from supply chain bottlenecks and decreased external demand. The outflow of capital was somewhat mitigated by other investments, where the positive contributions to M3 development can be largely attributed to foreign loans taken by the government, such as the SURE loan. Moreover, the interest rate differential and the appreciated domestic currency made it profitable for firms to secure their financial needs in foreign currency. Simultaneously, the positive contributions of foreign direct investments largely stemmed from inflows of debt capital, as foreign direct investors were trying to exploit the high interest rate differential within their affiliated enterprises, and from reinvested earnings, which are concurrently offset by their counterparts recorded on the current account.[26]

**Figure 3** Monetary presentation of the BoP (12m moving sum), CZK bn, Czechia, 2013–24




**Note:** i) Net inflow of capital into the Czech Republic is denoted with positive values. ii) Correction of FX not relevant transactions includes income from EU purchased by CNB, returns on reserve assets (both otherwise present on the current and capital account), reinvested earnings (moved from direct investment for better clarity), and the item errors and omissions.
**Source:** CNB, own calculations

[24] The biggest influx of capital was, in fact, due to non-residents opening deposit accounts in the Czech banks. However, the monetary presentation does not fully reflect these operations, which is a weakness that we will address in the following chapters.

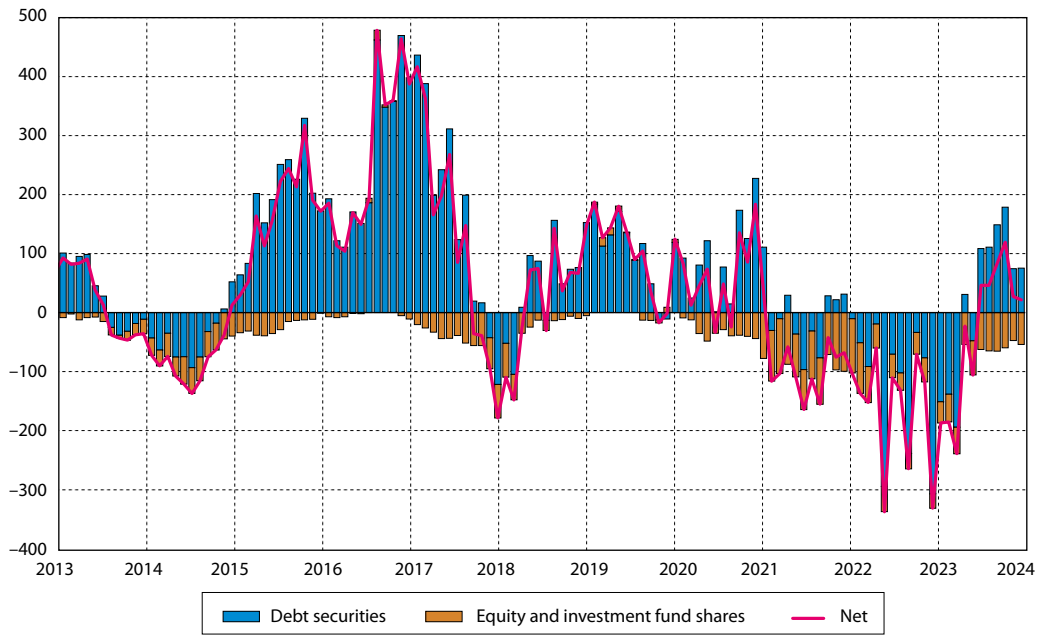
[25] Similarly to the currency cap regime, there was a sharp increase in non-residents' holdings in Czech banks due to expectations of earlier tightening of monetary policy conditions in Czechia compared to the Eurozone and the USA.

[26] Reinvested earnings is an imputed item which does not give rise to any cash movement so it is not FX relevant and correctly consolidated within the LHS of the monetary presentation (see Formula 3).

Analysis above clearly indicates that the flow of money between economies is not dominantly driven by transactions recorded in the non-financial part of the balance of payments (the current and the capital accounts). Especially portfolio investment generally represents an important driving force behind the movements of money, without the Czech economy being an exception. Let´s thus take a closer look at the composition of portfolio investment in terms of instruments. Portfolio investments are generally defined as cross-border transactions (and positions) involving tradable securities (debt and equity) which do not fall within the group of direct investments (BPM6, par. 6.54). Portfolio investments are commonly referred to as "hot capital" seeking a quick profit from interest rate differentials or exchange rate changes. For that reason, they are of particular interest of policy makers as any change in the market sentiment or policy setting may trigger a capital flight, i.e. a situation of an abrupt outflow of money with a pressure on the domestic exchange rate to depreciate.

The following Figure 4 depicts the composition of portfolio investments flows in the Czech Republic. As it appears, the dynamics are predominantly driven by transactions with debt securities while investments in shares remain relatively limited. The chart suggests that the portfolio investment flows stabilized following the period of the FX interventions conducted by the central bank until mid-2017.

**Figure 4** Monetary presentation of the BoP (12m moving sum), CZK bn, Czechia, 2013–24




**Note:** Net inflow of capital into Czechia is denoted with positive values.
**Source:** CNB, own calculations

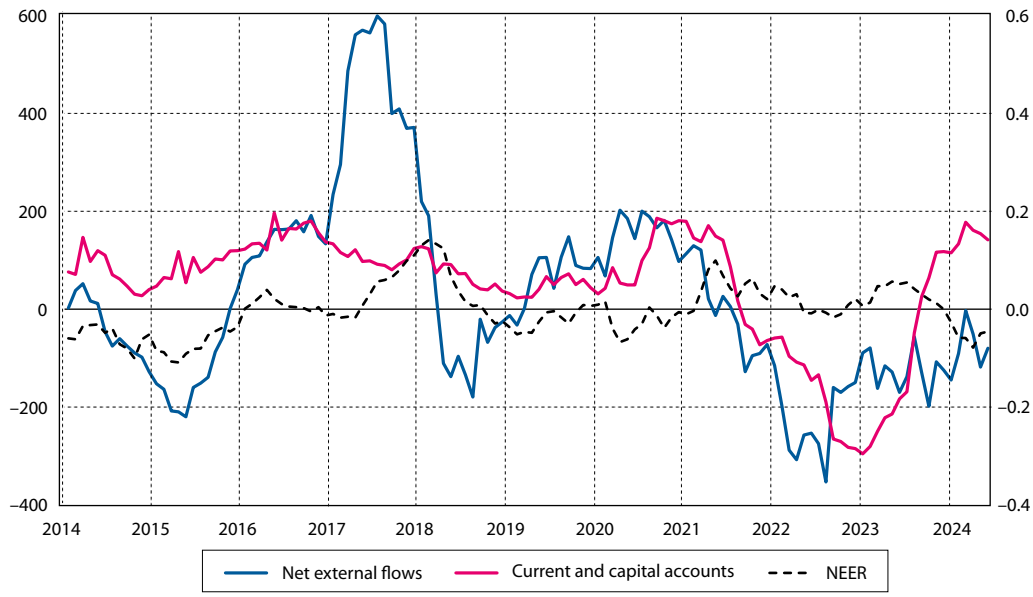
However, speculative capital also flowed into the domestic economy in the form of short-term bank loans or financial derivatives, typically secured by the MFI sector. Since these transactions are directly conducted with the banking sector, affecting both external assets and liabilities of MFIs, they do not contribute to the growth of M3 and are appropriately consolidated on the right-hand side of the monetary presentation (see Formula 3). Nevertheless, these transactions also play a role in determining the exchange rate movements.

### 2.2 The monetary presentation and the exchange rate

To investigate the driving forces behind the FX changes, we can first compare the net external flows as identified by the monetary presentation of the BoP with fluctuations in the exchange rate. In our analysis, we opt for the nominal effective exchange rate (NEER)[27] to better reflect the currency pressures stemming from the BoP. To reflect the currency pressures accrued over a one-year period we illustrate year-on-year changes, where positive values indicate appreciation and negative values denote depreciation.

The identity between the change in the net external assets and net external flows ensures that the monetary presentation serves as a valuable and reliable tool for explaining M3 changes from an external perspective.[28] However, if we aim to utilize net external flows as an estimate of the excess demand for currency over its supply, certain limitations come into play. Using the currency cap regime during 2013–2017 as an illustrative example, we observe in Figure 5 a substantial influx of capital (demand for koruna) accompanied by minimal exchange rate fluctuations. This mild appreciation is primarily attributable to the exchange rate with the U.S. dollar,[29] as the exchange rate with the euro was capped during that period. Nevertheless, the largest inflow of capital originated from euro area countries, driven by speculation on expected exchange rate appreciation. Furthermore, most transactions on the current account were also conducted in euros, as the euro area is the Czech Republic's largest trading partner.

**Figure 5** NEER (y-o-y changes, rhs), net external flows (12m moving sum, CZK bn) and current and capital account (12m moving sum, CZK bn), Czechia, 2013–24




**Source:** CNB, own calculations

[27] Weights used for NEER calculation by the Czech Statistical Office are based on the share of a trading partner's total turnover to the overall trade turnover of Czechia. However, the objective of the monetary presentation is to simultaneously consider both international trade and capital market, where the relative shares of traded currencies may differ. Additionally, trading partners do not always represent the currency in which the trade is conducted (for instance, purchases of Russian oil and petroleum are predominantly transacted in U.S. dollars). Therefore, we have recalculated the NEER using weights as suggested by the turnover on the FX market, which is published quarterly by the CNB.

[28] The minor discrepancies between both series are merely a result of different statistical approaches.

[29] The weight of U.S. dollar in the constructed NEER index represent about 40% in that period.

The reason for such significant capital influx and simultaneously minimal FX changes lies in the intervention regime itself. For capital flows not to influence the exchange rate, the central bank must have provided additional liquidity to the market by offering to purchase excess euros from financial institutions. However, this is not captured by the monetary presentation, as it represents transactions between two MFI sectors – commercial banks and the central bank – and is therefore consolidated on the right-hand side of Formula (3).

However, official interventions that are explicitly defined by the central bank, such as a currency cap or other forms of commitments where the central bank pledges to intervene in the market as needed, are not the only means by which a central bank can influence the FX market. In fact, any action – or inaction – by the central bank on the FX market can be considered a form of intervention. We identify three distinct ways in which CNB engages in FX market operations.

The CNB operates under a managed float regime, where it may buy or sell foreign currency to mitigate short-term fluctuations, prevent excessive depreciation or appreciation, or achieve specific economic objectives, such as controlling inflation or boosting exports. For example, between 2013 and 2017, the CNB intervened to weaken the exchange rate at the zero lower bound, and in 2022, it intervened to manage high inflation. This type of intervention, where the central bank utilizes its reserve assets as a monetary policy tool to achieve specific short- to mid-term objectives, is considered standard practice under a managed floating exchange rate regime. From a broader perspective, interventions can also be understood as any action where the central bank systematically prevents the domestic currency from moving in a particular direction, such as purchasing the income from European Union. Finally, both inaction and action can be viewed as a form of intervention in the FX market. Over the past years, the CNB has accumulated substantial reserve assets, generating significant revenue. Whether these flows should be converted into domestic currency – following standard market behaviour – or be retained as reserves depends on whether we consider the central bank as a unique market participant with the discretion to either sell or hold its income. Over the last decade, the CNB has primarily accumulated these revenues, with the exception of last year, when it began selling its income on the FX market.

The way we conceptualize interventions is crucial, as it determines how they are treated in the monetary presentation. As previously discussed, the type of intervention deemed standard under a managed floating exchange rate regime involves a transaction between two (MFIs) sectors, which is consequently netted on the rhs of Formula (3). The selling of revenues gained from reserve assets is recorded similarly in the monetary presentation, with one additional entry. Since the sale of these funds originates from actual revenues accrued on reserve assets, these flows are also simultaneously recorded on the current account under primary income. We default to treating these flows as being accumulated into reserves. However, if the central bank opts to sell these revenues, we classify it as an intervention in the FX market.[30] Consequently, revenues on reserve assets must be subtracted from the current account. This is because when these revenues are accumulated, they do not influence the exchange rate. Conversely, when they are sold in the FX market by the central bank, we categorize them as standard interventions and move them to the response side – an EMP index that will be discussed further in this paper.

Finally, income from the European Union, recorded under both the current and capital account, represents a standard economic transaction that would exert an appreciating effect on the exchange rate. Therefore, when the CNB converts this income into domestic currency, it can also be considered a form of intervention. Following the logic outlined earlier, it would be consistent to retain this income on the current and capital account and treat the CNB's purchases as an intervention.

[30] This is consistent with the central bank's own perception of reserve income sales.

However, for the sake of simplicity, we have chosen to subtract these incomes from the lhs of Formula (3) for two reasons. First, unlike income from reserve assets, the CNB itself does not perceive this as an intervention. Second, the purchases of EU income by the CNB have been carried out based on a prior agreement with the government since the Czech Republic joined the EU. This agreement remains unchanged, in contrast to the treatment of income from reserve assets, where the CNB has full discretion. The policy regarding the latter has been altered several times over the past 20 years and more closely resembles standard interventions.

Following the adjustments outlined above, we derive a variable that reflects currency pressures originating from the economy, which the central bank can choose to address. The central bank has the option to intervene in the full amount (keeping the exchange rate fixed), partially intervene (allowing the exchange rate to adjust for the remaining imbalance), or not intervene at all (letting the exchange rate fully accommodate the imbalance). To capture this dynamic, we construct an Exchange Market Pressure (EMP) index.[31] This index measures the excess supply or demand in the FX market, which must be balanced either through adjustments in the exchange rate or through the central bank's interventions. The general form of the EMP index can be expressed as follows:

$$\mathrm{EMP} = \frac{\sigma R}{\sigma R + \sigma e} \cdot \frac{\triangle et}{et-1} - \frac{\sigma e}{\sigma R + \sigma e} \cdot \frac{\triangle Rt}{Rt-1}, \tag{6}$$

where $e_t$ is the exchange rate, $R_t$ are central bank's foreign currency reserves, $\sigma_e$ and $\sigma_R$ are standard deviations of respective series and *t* denotes the time. The interpretation is as follows: Net external flows variable captures pressures arising from imbalances in the FX market. These pressures can be fully or partially mitigated by interventions from the central bank. If the central bank opts not to intervene, these pressures will be entirely absorbed by adjustments in the exchange rate.

We can see from Formula (6) that outflow of capital (EMP index is positive) is reflected through exchange rate depreciation (i.e. an increase in $e_t$) or through the purchases of the excess liquidity from the market by the central bank (i.e. decrease in reserve assets $R_t$).[32] Moreover, to ensure that both components contribute equally to the overall index, both the exchange rate and FX interventions are scaled using precision weights.[33]

Figure 6 depicts the EMP index (plotted with the opposite sign for convenience, i.e., positive values signal appreciation pressures), alongside both net external flows and the external balance (current and capital account). The data in the chart reveals that net external flows could potentially serve as a better indicator for currency pressures compared to the external balance alone.

Focusing on the latest development, at first glance, it might be striking that from the beginning of 2021 up to mid-2023, NEER almost constantly appreciated amid large current account deficits, and as our analysis shows, somewhat milder capital inflows. The reason is that to keep the exchange rate from depreciating (and thus to fight high inflation), the central bank intervened in the foreign exchange market and purchased additional liquidity from the market by selling euros. Indeed, EMP index shows depreciation pressures in this period as illustrated in Figure 6.

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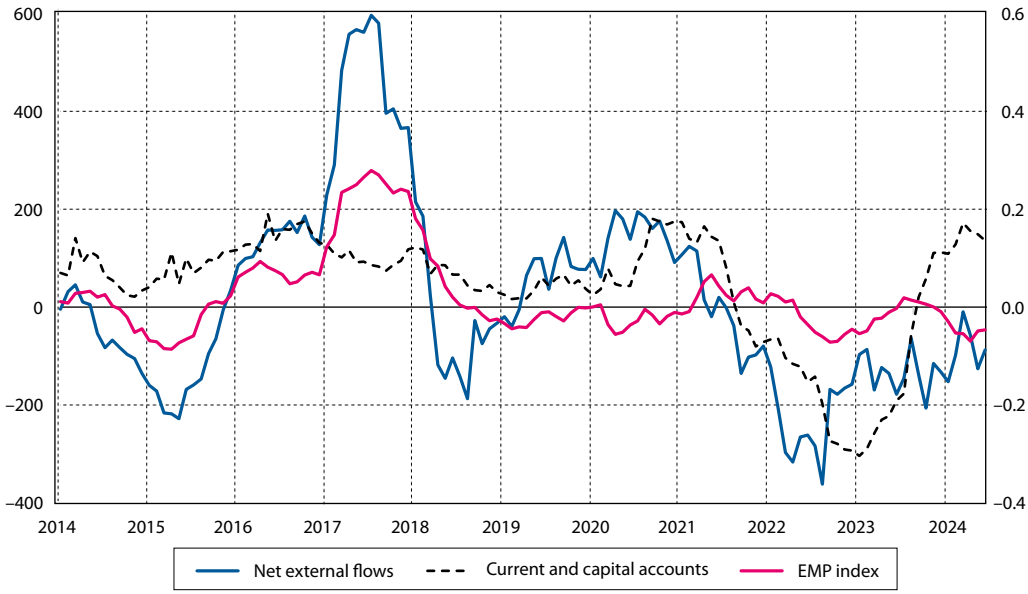
[31] The EMP index was developed to determine and to analyze a currency crisis in more detail as the usual data on realized capital flows are generally imprecisely measured, incomplete and often available only in quarterly frequency (Goldberg and Krogstrup, 2018).

[32] It is problematic to rely on the difference over time in the market value of reserves because their value does not change only as a result of interventions. Instead it is influenced by revaluation changes generated by price or exchange rate movements, the accumulated return on reserves, foreign currency transactions with the government (incl. purchasing the income from the EU) and other factors.

[33] Precision weights weight the individual variables by the relative shares of their standard deviations to level the different volatilities with which they enter the overall index.

**Figure 6** EMP index (y-o-y changes, rhs), net external flows (12m moving sum, CZK bn) and current and capital account (12m moving sum, CZK bn), Czechia, 2013–24




**Source:** CNB, own calculations

Although the monetary presentation seems to be more instrumental in explaining the FX movements compared to current account itself, there are still several limitations making the link between the net external flows and the FX changes weaker.

First problem relates to the fact that the BoP is based on the sector approach, not on the currency approach. Thus transactions and positions between residents and non-residents can be equally well denominated in foreign currencies instead of in the domestic currency (CZK). However, in most of the cases the domestic currency is demanded in the market regardless of the currency in which the invoices are issued. In instances where exports are denominated in the domestic currency, foreign importers demand domestic currency to meet their obligations for debt repayment. Conversely, when export invoices are denominated in foreign currency, domestic exporters demand the domestic currency in order to cover their domestic expenses (e.g. labour or material costs).[34]

A second issue arises when banks do not serve as intermediaries in payments, such as when non-residents take out loans from domestic banks or open deposit accounts within these banks. Consider a scenario where a non-resident opens a bank account denominated in Czech koruna at a domestic bank. The domestic bank receives their deposits in euros, which leads to an increase in the bank's external assets. However, at the same time, the bank's external liabilities also increase since the owners of these financial assets are non-residents. As a result, NEA remain unchanged, despite an actual inflow of financial capital and the subsequent currency appreciation.

[34] Consider a firm that conducts all its external operations in euros. If the firm purchases materials from abroad for 1 billion CZK and sells its products abroad for 2 billion CZK, then the domestic value added (and net trade balance) equals 1 billion CZK. One could argue that a positive change in NEA therefore indicates appreciation pressures, even though no currency conversion took place. However, the domestic value added consists of domestic inputs (labor and capital) that are paid in CZK. Similarly, residents working abroad may receive their compensation in foreign currency, but since most of their expenses are related to the domestic economy, they will likely convert it into Czech koruna.

Following this event, two possible scenarios may occur. In the first scenario, non-residents decide to use these funds immediately, for example, to purchase government bonds. In this case the external liabilities of the banks decrease (while domestic deposits increase). This results in a rise in NEA, with both events occurring within the same period, leading to currency appreciation accompanied by an increase in NEA.

In the second scenario, if these two events occur with a time lag and are recorded in different periods, they may each provide misleading signals regarding exchange rate pressures. Initially, the NEA remains unchanged despite the currency conversion, and later, the NEA increases without any real currency pressures.

Both of these factors weaken the relationship between net external flows and the resulting exchange rate pressures. This issue tends to be particularly pronounced during turbulent times when specific economic events may trigger sudden and massive outflows (or inflows) of short-term capital that may not be captured by the net external flows variable. One example is the currency cap regime during which NEA registered inflows of hundreds of billions of Czech koruna (Figure 6), while the amount of capital the central bank absorbed into its reserves during that time was more than double that amount. With this in mind, it can be concluded that part of the money inflow was in the form of short-term deposits and hence not captured by the monetary presentation. As a result, the net external flows variable does not serve as a precise indicator of currency pressures, although it may be more instrumental in explaining exchange rate changes than the current account alone.

## CONCLUSION

The recent developments in the Czech economy have provided evidence indicating a relatively weaker link between the exchange rate and the external balance, defined as the balance of the current and capital accounts. The weaker explanatory power of the external balance concerning FX changes may be partially addressed by the monetary presentation of the Balance of Payments (BoP), an analytical tool designed to explain contribution of net external assets to the growth rate of the monetary aggregate M3 from the BoP perspective. The monetary presentation serves as a more convenient tool for identifying FX-relevant transactions recorded in the BoP. However, even this improved analytical tool has its limitations. It does not encompass the full scope of FX-relevant transactions, such as transactions within the monetary financial institutions (MFI) sector. To address these limitations, the Exchange Market Pressure (EMP) index emerges as a potentially better indicator of exchange rate movements for measuring currency pressures arising from FX demand and supply imbalances.

## ACKNOWLEDGMENT

The authors would like to thank to Martin Kábrt, a former employee of the Czech National Bank, for his valuable and insightful comments on a draft of the paper, which significantly assisted in refining the argument presented in the paper as well as the factual elements.

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