

Endogenous Money Supply Theories and Their Main Implications*

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Contrary to earlier exogenous approaches, it is now accepted, particularly among monetary experts, that the creation and the putting into circulation of money in modern financial systems is an endogenous process. However, there is still a significant delay in drawing a number of conclusions. This article presents what we consider to be the most important implications for the monetary policy toolbox, the implementation of monetary policy and international capital flows. An endogenous money creation approach can help to provide a more solid foundation for analyses and avoid possible economic policy mistakes.

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1. Introduction

The 2007–2008 global financial crisis caught the economists who applied the traditional macroeconomic frameworks presented in the best-known textbooks by surprise. Equally unexpected was the response of central banks, which increased their balance sheets to an extent previously only seen in times of war and other disasters. Analysts applying the traditional framework feared runaway inflation and a complete loss of credibility for central banks.¹ For the central banks, this situation created a communication trap that was difficult to avoid, because, while they considered their extraordinary measures justified, officially, they adhered –

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¹ Tensions between central bank leaders are well illustrated by the resignation of Bundesbank President Axel Weber in February 2011 and Jürgen Stark from the European Central Bank (ECB) Executive Board in September 2011. In 2021, they were followed by Bundesbank President Jens Weidmann, who also resigned. Some German economics professors' fear of inflation was widely shared in other Member States, which went to court on a number of occasions (Treec 2021). They requested the court to declare that the ECB's purchases of securities were contrary to the German constitution and the EU's founding treaty. The case came before the European Court of Justice, which found the action unfounded.

either explicitly or implicitly – to the traditional analytical framework used in normal circumstances. This is probably the reason why leading central banks published a series of articles² pointing out the limitations and even the misleading nature of the traditional approach, the importance of which suddenly grew with regard to the effectiveness and credibility of crisis management.

The central bank communication of the past is no longer sufficient to properly interpret the functioning of the financial system and monetary policy on a broader basis. This is best reflected in the fact that the price shocks that followed re-opening after the Covid epidemic and that were amplified by the disruption of supply chains and the Russo-Ukrainian war, give the impression that the period of low inflation prior to the pandemic was only temporary, and that the increase in central banks' balance sheets was bound to be reflected in runaway prices sooner or later. In what follows, we briefly summarise the main findings of the endogenous monetary theory. Without going into detail,³ we aim to illustrate its broader implications for macroeconomic theory and economic policy, i.e. the aspects that have not received sufficient attention so far.

2. Differences between the endogenous and the exogenous monetary theory

The most important finding of endogenous monetary theory is that in modern financial systems money is created in response to the demand of non-monetary agents in the economy as a result of the lending activities of authorised institutions, hereafter referred to as banks. Endogenous money creation happens when, in response to actors' demand for credit, banks lend not only pre-existing money and savings, but also new money, which they create. This is where banks differ from other financial intermediaries; the latter can collect and invest only existing money and pre-existing savings. According to the 'financial intermediary' approach of the exogenous money theory, banks cannot create money either collectively or individually, they can only lend and borrow money. Modern banks do not feature in the 'loanable funds' theory.

If, however, pre-existing savings do not limit the lending activity of banks, i.e. they can 'create money out of nothing', is there any other limit to this activity? In what is termed as the multiplier model of the traditional exogenous monetary approach, banks are required to maintain a certain deposits-to-reserves ratio called the reserve requirement ratio set by central banks. This means that, in addition to the effective reserve requirement ratio, the amount of central bank reserves held by individual banks also limits lending. Monetary policy can also influence banks' lending by changing reserve requirements and the supply of reserves for banks.

² See, for example, *Carpenter and Demiralp (2010)*; *McLeay et al. (2014)*; *Deutsche Bundesbank (2017)*; *Banque de France (2016)*; *Abel et al. (2016)*.

³ For details, see the central banks' documents referenced in the previous footnote.

Thus, according to the traditional approach, the banking system can create more credit at the level of the system as a whole through the multiplier than the savings represented by existing reserves. However, it was assumed that this option was not available to individual banks. Literature in English-speaking countries calls it ‘fractional reserve banking’, referring to the role that reserves were assigned to play in money creation.

According to the endogenous monetary theory, the above textbook approach is misleading. The first conspicuous problem is that some central banks (such as the Bank of England or the Bank of Canada) never set reserve requirements, while other central banks reduced them from earlier double-digit levels to 1–2 per cent, which does not seem to be an actual constraint on money creation.⁴ A more serious problem is also the ability of individual banks to generate more credit than savings. As *Werner (2014)*’s case study demonstrated, when loan applications are considered, the bank administrators do not know whether the bank happens to have offsetting funds on the deposit side at that very moment. It is the organisationally independent liability management department (treasury) that must have such knowledge. At this point, the nature and circulation of central bank reserves are worth discussing.

2.1. The interbank market

Private commercial banking, which evolved as a result of the institutional development of modern financial systems spanning centuries, needed a non-profit-maximising institution that could ensure a smooth flow of payments (*Goodhart 1988: 45–46*). The circulation of central bank reserve money between banks is a special type of circulation in which, in addition to the central bank only banks and a few institutions can participate. The central budget also keeps its account with the central bank.⁵ This closed payment system works on a clearing basis, which means that offsetting items within and between institutions are netted, and only remaining balances have to be achieved exclusively with central bank reserves. Central bank reserves, which can only be issued by central banks, may ‘circulate’ exclusively in this market, purely in the form of bank account money.

Commercial banks must close their positions at the end of a trading day. In addition, if applicable, they must also comply with the mandatory reserve requirements. Finally, whether or not there is a reserve requirement, they aim to maintain the level of reserves that they set for themselves in order to meet their interbank obligations. Therefore, demand for reserves by banks short of reserves is not interest-sensitive,

⁴ Responding to the severe financial crisis, the Magyar Nemzeti Bank (MNB) increased the reserve requirement ratio for deposits with a maturity of less than two years from 1 per cent to 10 per cent in several steps. As we will see later, subsequent to the Great Financial Crisis, central banks switched to a regime based on the abundance of interbank liquidity, i.e. requirements impose even fewer external quantitative constraints on banks’ ability to create money. Even before the crisis, the MNB operated with ample liquidity (on the liabilities side).

⁵ In some countries, the government budget also has accounts with commercial banks. For example, the Bank of Canada also influences interbank liquidity conditions by absorbing or reinvesting these deposits.

i.e. they must borrow on the interbank market at whatever interest rate is charged to them. If other commercial banks are unwilling to lend, the central bank will lend against eligible securities as collateral. Because of demand-side insensitivity to interest rates, central banks put a cap on interbank interest rates. In the event of excess liquidity (excess supply) in the interbank market, interbank interest rates are stopped by the ‘floor’ set by central banks.

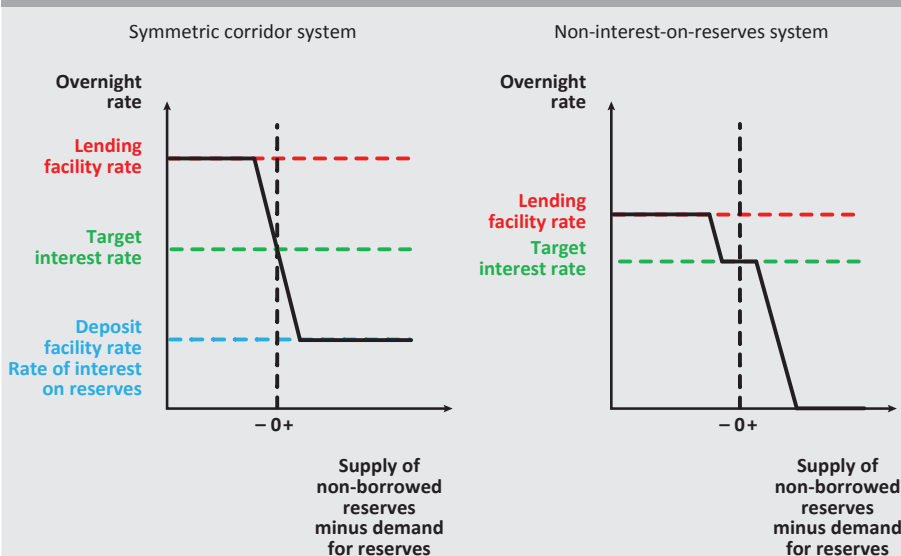
Today, the most important instrument (‘operational target’) for implementing monetary policy is the central bank base rate, which influences the interbank interest rates applied to reserves and banks’ funding costs, and also reflects central banks’ monetary policy stance. Central banks use securities operations (open market operations) and standing facilities (marginal lending facility and deposit facility) to ensure that interbank market interest rates are close to their interest rate target.

Taking recent unconventional practice into account, *Lavoie (2022)* argues that central banks have four systems at their disposal to achieve their interest rate target: a symmetric interest rate corridor, an asymmetric interest rate corridor (no interest is paid on reserves), an interest rate cap and an interest rate floor.

2.1.1. The symmetric interest rate corridor

In this system, central banks set a symmetric interest rate corridor around the central bank’s interest rate target, with the upper bound being the interest rate on the marginal lending facility and the lower bound being the interest rate on the deposit facility or the interest rate paid on reserves (*Figure 1, left*).

Figure 1
Symmetric (left) and asymmetric interest rate corridor with no interest rate paid on reserves



Source: Lavoie (2022)

The interest rate charged on interbank market transactions is set within a range between the central bank's interest rate target and the interest rate on the lending facility, and may even reach the latter if the reserve deficit is large enough. If the banking system is faced with a surplus of reserves at the end of the day, the reserves not lent on the interbank market may be placed in the central bank's deposit facility. In the event of excess reserves, the interbank market interest rate is set between the central bank's interest rate target and the deposit rate/interest rate paid on reserves. The more excess reserves the banking system has, the more closely the interbank market rate approaches (or even reaches) the interest rate on the deposit facility.

In a symmetric interest rate corridor regime, central banks can shape their interest rate policy independently of reserve conditions, as the interbank market interest rate follows changes in the central bank's interest rate target closely with the help of the standing facilities.

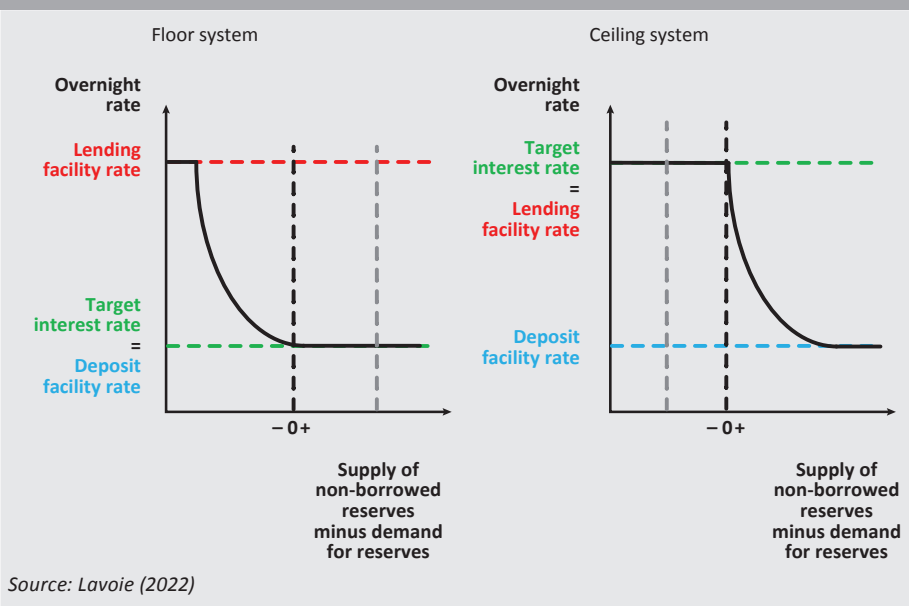
2.1.2. The no interest paid on reserves regime

In this regime commercial banks can lend an unlimited amount through the marginal lending facility, but the central bank does not pay interest on reserves and/or it does not have a deposit facility (*Figure 1, right*). The effective application of the regime may face difficulties because if the horizontal part of the curve close to the interest rate target is not sufficiently long, central banks have to adjust the supply of reserves continuously to reach the interest rate target, given the lack of a deposit facility.

2.1.3. The interest floor regime

In the floor regime, central banks' interest rate target is identical to the interest rate on the deposit facility, and the banking system has a structural reserve surplus; therefore, the interbank market interest rate is close to the deposit rate (central bank interest rate target) (*Figure 2, left*). The advantage of the floor regime is that central banks can increase their balance sheet, and hence the supply of reserves in an unlimited amount, without the interbank market interest rate falling below the target level.

Figure 2
Interest floor (left) and interest cap (right)



2.1.4. The interest cap regime

In the interest rate cap regime, central banks keep the banking system in structural reserve deficit, forcing commercial banks to rely on the lending facility continuously. The central bank interest rate target is identical to the interest rate on the lending facility; as a result, if the reserve deficit is large enough, the interbank market interest rate will be close to the central bank interest rate target (*Figure 2, right*). In the cap regime, it is the marginal lending facility that ensures the independence of interest rate and balance sheet policy.

2.1.5. Reserve maintenance period

To smooth the interbank market interest rate over time, central banks gradually transitioned to a system of delayed (overlapping, ex-post) compliance, i.e. banks had to comply with their reserve requirements ex-post. The length of the delay is the number of the days that elapse between the last day of the calculation period and the first day of the compliance period. The advantage of these regimes is that banks can adjust their reserves with less uncertainty and thus with lower interest rate volatility over the reserve maintenance period. Delayed compliance also demonstrates that, contrary to what the multiplier theory claims, reserves cannot be a basis for lending.

2.2. Clearing money and endogenous money creation

Understanding the nature of payments between participating banks, i.e. the clearing mechanism (Kregel 2019; Lavoie 2022) is key to the endogenous monetary theory. In the textbook model, central banks could achieve their inflation target more easily by regulating the quantity of reserves than by setting interbank interest rates. However, this option is not available to central banks, as central banks cannot deny access to reserves to banks which are short of reserves because this would lead to a halt in payments and other disruptions to the functioning of the economy. Instead, they can influence demand for reserves ex post through their interest rate and other conditions.

Commercial banks operate as if they were also clearing institutions. Within their own organisation, each bank can match transactions between their customers; as a result, only transfers between customers of different banks appear in the interbank market. If transactions between banks cancel each other out, banks do not need central bank reserves even for transfers between themselves to expand their balance sheets to an even unlimited extent. Such expansion is limited only by micro- and macro-prudential requirements. The more concentrated a country's banking sector is, the lower the proportion of the interbank transfers that is actually needed. Some banks may be in a net deficit or surplus position in certain periods, and others in other periods, however, the amount of the resulting net interbank lending and, hence, increase in demand for reserves does not necessarily imply that excessive lending occurs at the macroeconomic level, which the central bank should curb. By contrast, there may be no significant demand for interbank reserves due to the increase in banks' balance sheets⁶ at a roughly identical pace. Yet lending in the banking system is excessive. In a period of general optimism, this is a rather likely scenario.

The interbank market is segmented in some countries. There are banks whose customers usually or structurally hold net surplus (net savers, as is traditionally the case with banks with predominantly retail customers) and those whose customers are typically net borrowers, mainly firms, which transfer more into the accounts of others than they receive into their own. In such a case, banks with a structural surplus lend to banks with a deficit in the interbank market. These structural features may persist, but at the macroeconomic level this does not necessarily imply that deficit banks are overheating, as the amount of transfers between banks is not in itself a proxy for the risk of overheating at the aggregate level. Finally, if a bank's customers transfer more to another bank's customers, that is not necessarily because that bank has an excessively lax, even aggressive, lending policy. It is possible that the interbank market is in deficit only because of the distribution of customers.

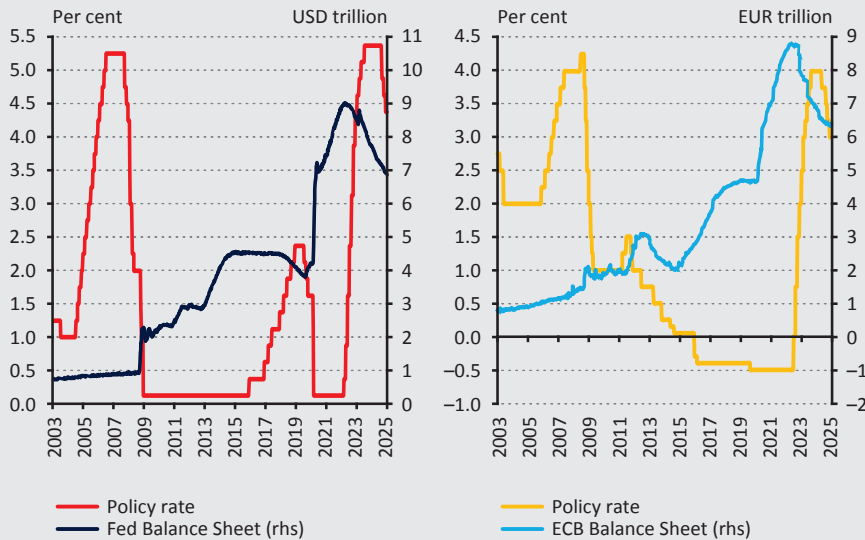
It can be seen, therefore, that there *is a multi-leveraged relationship between the aggregate level of lending and the level of reserves*. This is why it would be

⁶ In Keynes' words, 'in step'. Keynes (1930: 26), Lavoie (2022: 204).

unreasonable for central banks to deny banks' demand for central bank reserves in the context of a quantitative monetary aggregate targeting framework. Following experiments in the 1970s and 1980s, central banks abandoned strategies based on monetary aggregates and moved to direct inflation targeting.

Another consequence of clearing money is that there is no economically meaningful relationship between the size of central banks' balance sheets and the policy rate (Figure 3).⁷ This is best illustrated by the central banks' actions following the Great Financial Crisis. The increase in central bank reserves resulting from 'quantitative easing', which led to a manifold increase in central banks' balance sheets, did not lead to a pick-up in bank lending, as many had expected on the basis of the multiplier theory, often fearing a surge in inflation. The reserves cannot be 'lent' by banks, as they cannot leave the interbank market. At the aggregate level, only central banks can decrease or increase the amount of money, and banks cannot collectively influence its amount. However, as we have seen, banks' lending activity is influenced by the amount of reserves only indirectly, which central banks provide endogenously in response to banks' demand.

Figure 3
Trends in the central bank balance sheet and policy rates in the US (left) and the euro area (right)



Note: For the Fed, the centre of the policy rate is shown before December 2008, and the centre of the policy target range is shown in the figure. For the ECB, before 2016 the interest rate on the main refinancing operations is used as the reference rate, while from 2016 onwards the interest rate on the deposit facility is used as the reference rate.

Source: Federal Reserve, ECB

⁷ This separation between the policy rate and the central bank balance sheet is referred to in the literature as 'decoupling'. See Borio – Disyatat (2009).

The mechanism of endogenous money creation is now generally accepted, even if many have not yet updated what they learned from traditional textbooks.⁸ Although ten years have passed since the Bank of England published its article in 2014, the old exogenous monetary analysis framework remains in place in respect of the following issues. This is not a purely theoretical problem; rather, it unnecessarily complicates central banks' communication with economic agents, erodes central bank credibility and may lead to economic policy mistakes.

3. Some consequences of endogenous money creation in a closed economy

In this section, assuming a closed economy, we present cases in which using the traditional exogenous money creation framework leads to erroneous empirical model specifications or misleading interpretations.

3.1. Crowding out effect

It follows from the above that what is termed as the 'crowding out effect' often mentioned in connection with budget deficits does not exist in the usual quantitative sense, since it assumes that the government borrows the extra money needed to meet its expenditure exceeding tax revenues from a fixed amount of savings already existing independently of it, similar to the case of loanable funds. Given that the government budget is less interest-sensitive than the private sector, it crowds it out of the savings market. This crowding out will then cause private investment to fall short of what would otherwise be possible. According to a more sophisticated argument, which acknowledges the endogenous nature of money creation, crowding out takes place through interest rates. This means that, even if the amount of 'savings' is not quantitatively limited, demand for credit in the interbank market will raise interbank interest rates. A third, even more sophisticated version suggests that central banks respond to increased demand for credit by raising interest rates. However, based on what we said earlier about the operation of interbank markets, central banks change interbank interest rates in line with their inflation target and the maintenance of such. In other words, the budget deficit affects interbank interest rates only through its possible impact on the central bank's inflation forecast (outlook), to which central banks adjust interbank market conditions. If, for example, there is still surplus capacity, and the budget deficit is not an inflationary factor in the central bank's forecast, the central bank will keep interbank interest rates at the previous level despite the budget deficit.

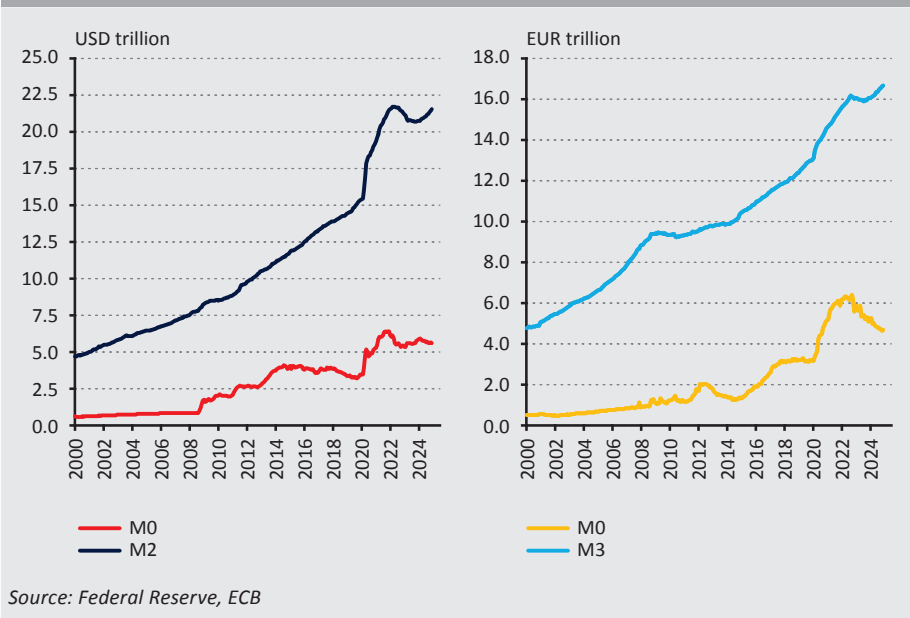
⁸ Olivier Blanchard, former IMF chief economist and professor emeritus of economics, asked tweeters whether he should present the multiplier theory of money creation in the forthcoming new edition of his book (X (formerly twitter) 14 May 2023): <https://x.com/ojb Blanchard1/status/1657779919613460482>).

3.2. Quantitative easing

Central banks responding to the Great Financial Crisis used ‘quantitative easing’. With QE, they purchased securities from banks and the non-bank private sector, in exchange for which central bank reserves were created. However, as has been discussed, banks cannot ‘lend’ reserves. The most that happens is that the reserves available to them increase; however, they would only need this if, despite clearing, there were a sudden increase in demand for reserves. The likelihood of such a scenario is only moderate even during a strong economic recovery; however, responding to the Great Financial Crisis, nearly all actors reduced their demand for credit, and, taking advantage of low interest rates, even made efforts to repay existing loans.

Benjamin Bernanke, then chairman of the US Fed, tried to change this misnomer repeatedly, recalling (*Bernanke 2009*) that it was not simple ‘quantitative’ easing that the Fed had introduced, but rather, following the decades-old practice of the Japanese central bank (*Ito 2006*) known as quantitative and qualitative easing, the Fed sought to directly ease credit conditions by buying securities (‘credit easing’). In other words, the Fed wanted to reduce risk premia, i.e. to achieve an ‘interest rate’ or ‘price’ effect, and to make the terms of riskier and longer-term corporate loans more favourable. In other words, it is the composition of central banks’ asset portfolio that is important, not only liabilities and the amount of central bank reserves. In Europe, where bank loans play a larger role in corporate lending than corporate bonds, the ECB eased the conditions of corporate financing mainly through long-term loans and favourable interest rates and other conditions for such (*ECB 2010*). Nevertheless, the terminology persists, and it is feared that it has contributed to the spread of perception among the wider public that central banks increased money supply, thus significantly increasing the risk of inflation.

Figure 4
Monetary base and M2–M3 monetary aggregates in the US (left) and the euro area (right)



The traditional analytical framework made it difficult to understand central bank actions and eroded the credibility of central banks. Central banks cannot directly make commercial banks increase lending (*Figure 4*). Unlike the multiplier model, they can stimulate lending only indirectly by offering favourable interest rates. Due to the special dynamics of the financial system, the price of financial assets (such as shares) rose. Increasingly high asset prices were financed by credit. By contrast, investment in the real economy remained subdued. Lending remained demand-driven and demand for credit was depressed as previously indebted actors strove to strengthen their balance sheets by repaying their loans.

3.3. Helicopter money

In light of the hardly noticeable impact on aggregate demand and inflation, which was consistently below the target, the idea of using what is called ‘helicopter money’ emerged. Those in favour of the proposal argued that the measure would have the expected effect, because it would be ‘financed’ by money created by the central bank rather than by relying on pre-existing savings, for example through bond issuances. This means that domestic actors (e.g. households) would receive money from the central budget or directly from the central bank, i.e. of course not from a helicopter, but rather as an electronic signal sent to their bank accounts. The unspoken assumption is that it is the method of financing, i.e. central banks’

creating money ‘out of nothing’ or the government’s issuance of bonds, that determines whether the operation, i.e. an injection of free money, will have an inflationary effect and/or any impact on aggregate demand. The idea underlying this is the assumption of ‘loanable funds’. Accordingly, if money creation by the central bank (‘printing’ of excess money) increases the amount of money available to economic actors at unchanged interest rates, as in the helicopter metaphor, that has an inflationary effect. Conversely, it is assumed that in the case of bond financing, the budget competes for pre-existing savings; the only difference is that savings are borrowed and spent by either the private sector or the government, and therefore, bond financing does not lead to inflation.

However, as has been pointed out, the banking system and banks’ clients can subscribe bonds to be issued on credit; thus, there are no amounts of savings fixed in advance for which the state has to compete. However, as a result of quantitative easing, the banking system had already plenty of central bank reserves when the proposals were made. Interest rates are influenced by central banks in order to achieve and maintain their inflation target, which bond issuance alone does not influence. In this respect, helicopter money alone does not bring about any change. Central bank interest rates and their impact on other interest rates are determined by the central bank’s assessment of inflation in the wake of increased aggregate demand resulting from money creation, regardless of how helicopter money is ‘financed’.⁹ This is no different from deficit financing presented earlier. In this case, too, it is the impact on inflation via aggregate demand rather than the manner of financing that is crucial.

In recent decades, central banks have been banned from directly financing the budget; they must ‘finance’ a deficit by issuing bonds. However, this measure did not eliminate the financial system’s ability to create money endogenously. All that has changed is that private sector operators, i.e. banks and/or the non-bank private sector, must subscribe government securities first. Central banks will continue to set interbank interest rates and the liquidity situation, and therefore the conditions for underwriting government bond issuance. Prior to the crisis, leading central banks operated under structural reserve constraints. Although commercial banks maintained minimum central bank reserves, they received the liquidity from central banks needed for subscription when government securities were issued.¹⁰ If there is an abundance of reserves, providing the necessary liquidity for bond purchases is a matter-of-course issue; in fact, central bank had already provided it.

⁹ *Borio et al. (2016)* arrived at the same conclusion as did post-Keynesians. This is not surprising, because the BIS staff also assume an endogenous money supply.

¹⁰ In modern systems, government securities are bought by primary dealers for later ‘distribution’ or for their own account. They undertake to underwrite the issuances and support the secondary market liquidity of the bonds. Prior to issuance, central banks regularly consult primary dealers and ensure that the banking system has sufficient reserves for underwriting. See *Nersisyan – Wray (2020)*, described in *Szalai (2020)*.

3.4. Sterilisation

Sterilisation refers to the absorption of central bank reserves (for example, by selling government securities) that have increased in the interbank market as a result of central bank purchases of foreign exchange. When commercial banks convert increased amounts of foreign currency into domestic currency, the amount of domestic money increases in the interbank market. Central banks absorb such excess reserves, for example by selling government bonds to keep interbank interest rates at the desired level. This is a typical central bank operation in fast-growing, small, open economies, where capital flows in in response to the business cycle. By buying foreign currency, central banks often aim to prevent an excessive appreciation of their own currency in order to protect international competitiveness.

Looking at the extent of ‘sterilisation’, analysts monitor the impact that central banks’ intervention in the foreign exchange market may have on domestic inflation, for example through domestic lending and the exchange rate of the domestic currency. Such analyses typically examine the quantitative relationship between the growth of interbank reserves and the change in central bank reserves. If the increase in reserves due to foreign exchange purchases is fully offset by sterilisation (with an identical decrease in interbank reserves), sterilisation was complete (*Filardo – Grenville 2012; Disyatat 2008*). The term implies that the conversion of capital inflows into domestic currency cannot be a means of additional lending.

Such quantitative analyses are potentially misleading. If, for example, the observer deems that the intervention has only partially been ‘sterilised’ by the central bank, they conclude that it may have undesirable effects on inflation or the exchange rate. However, as has been pointed out, this is misleading because there is no such a direct link between macroeconomic variables and central bank reserves. Central banks seek to influence the macroeconomy through their policy rates rather than through the amount of the reserves they maintain; there is also no meaningful link between interest rates and reserves (see *Figure 5*). Central banks ‘sterilise’ their intervention in the foreign exchange market when and to the extent that they consider it necessary to keep the central bank interest rate at a desirable level. This means that 100% ‘sterilisation’ is not necessarily desired; on the other hand, it may not be sufficient to keep the central bank interest rate at the intended level. It is even more important to realise that ‘sterilisation’ is not a matter of a separate decision, rather it is automatic: the level of intervention is influenced by capital inflows and banks’ demand for reserves, which, in turn, is influenced by many other factors at any given time (*Disyatat 2010; Angrick 2017; Lavoie 2022*).

Adler et al. (2021) analysed data from 140 developed and less developed countries from the perspective of sterilisation. They found that, despite capital inflows, 84 per cent (90 per cent in developed countries) of central bank interest rates did not fall, and may even have risen, while interbank reserves were only 42 per cent ‘sterilised’ in quantitative terms.

What provides meaningful information for analysts is not the extent to which central banks offset excess liquidity quantitatively, but rather the way monetary conditions evolve as a result of capital inflows and exchange rate developments.

3.5. Impossible trinity

The economic policy options for small, open economies are usually described by a trilemma known as the 'impossible trinity'. According to the impossible trinity, from among the three 'freedoms', i.e. floating exchange rates, independent interest rate policy and free capital flows, economic policy can only pursue two at the same time, but not the third. A related dilemma is that there are only two extreme solutions in the exchange rate policy: either a floating or a fixed rate, with no managed floating in between the two.

The traditional theory plays a key role in explaining the trilemma and the dilemma; in fact, it is extended to cover open economies. Here again, the main problem is the assumption that central banks influence bank lending and inflation by regulating the level of reserves. Thus, if a central bank strives to curb further appreciation of the domestic currency driven by capital inflows into a strengthening economy by intervening in the foreign exchange market, it will increase the domestic currency-denominated reserves in the interbank market, which, according to the money multiplier theory, will lead to excessive lending, overheating and inflation, as well as to a current account deficit, and eventually to currency depreciation and economic slowdown and contraction. Furthermore, the conversion of inflows into domestic currency leads to an excessive build-up of international reserves, which over time leads to significant losses, as the returns on the investment of reserves are usually lower than the interest on domestic currency. For this reason, it is argued that an intermediate floating exchange rate regime is unstable and potentially unsustainable.

However, contrary to the traditional trilemma and dilemma approach, as was stated earlier, central banks do not aim to achieve their goal by focusing on the quantity of reserves. Key policy rates are the primary tool of central banks even in less developed and converging countries. Moreover, central banks have a number of tools at their disposal to absorb excess liquidity, which obviates the need for raising interest rates. In the past, they mainly resorted to increasing the mandatory reserve ratio, but after the liberalisation they switched to operations involving central bank bonds or the interest rate paid on excess reserves. Taking also into account what we presented in connection with sterilisation, central banks have more room for manoeuvre than what follows from the trilemma and the dilemma theories, to adjust domestic financial conditions in line with their inflation target, in an environment of free capital flows, and there is also room for the managed floating of the exchange rate (*Filardo – Grenville 2012*).

4. Some consequences of endogenous money creation in an open economy

In what follows, assuming an open economy, we show why it is important to revise the traditional analytical framework in the light of endogenous money creation.

4.1. International capital flows and the current account

Analyses of international capital flows and the balance of payments in most macroeconomic studies have yet not been modified in line with the analytical framework of endogenous money creation. Typically, developments in the balance of payments are presented as the (current) balance of exports and imports of goods and services and of income transfers, and capital flows are treated only as a passive item offsetting the current account balance thus defined. Domestic savings are implicitly equated with financial savings, as if part of the real wealth produced were set aside for future consumption or export. The extension of $I=S$ (investment=savings) to an open economy (net exports= $S-I$) corresponds to this, where the part remaining over and above domestic consumption is exports. In a number of analyses, this relationship is interpreted as if exporting countries financed their own exports to importing countries, analogous to the 'loanable funds' model.¹¹ In reality, however, importers may take out bank loans (import credit) either in the exporting country, in their own country or from a third bank in a country not involved in the export-import transaction, and the currency of payment is also a matter of agreement. Just as domestically, internationally, too, all trade in goods must be financed, constrained by the ability of banks to finance it, and so it is independent of the savings recorded in national accounts. It is more accurate to say that the savings recorded in the national accounts unlock real funds for use (unconsumed income), but they do not constitute financing (*Borio – Disyatat 2011, 2015; Kumhof et al. 2020; Felipe et al. 2022*).

4.1.1. Intertemporal approach to the balance of payments

One major exception is a study by *Obstfeld (2012)*, according to which capital inflows are not only a passive result of the flow of goods and services; they may also be active, for example in response to yield spreads, and play a dominant role in current account developments. For example, in a fast-growing economy, foreign capital may flow into the economy in the form of portfolio or direct fixed capital investment in anticipation of higher returns, and this excess investment may emerge as an import surplus in the trade of goods, contributing to the current account deficit.

The reversal of the causality is significant, because traditional analyses treat the current account deficit as an obvious indicator of competitiveness, identifying a deficit with poor competitiveness. Assuming intertemporal optimising behaviour, *Obstfeld's* analytical framework allowed to treat persistent deficits as future consumption brought forward, which does not necessarily have to be adjusted and is not a sign of poor competitiveness. This means that it is optimal for faster growing

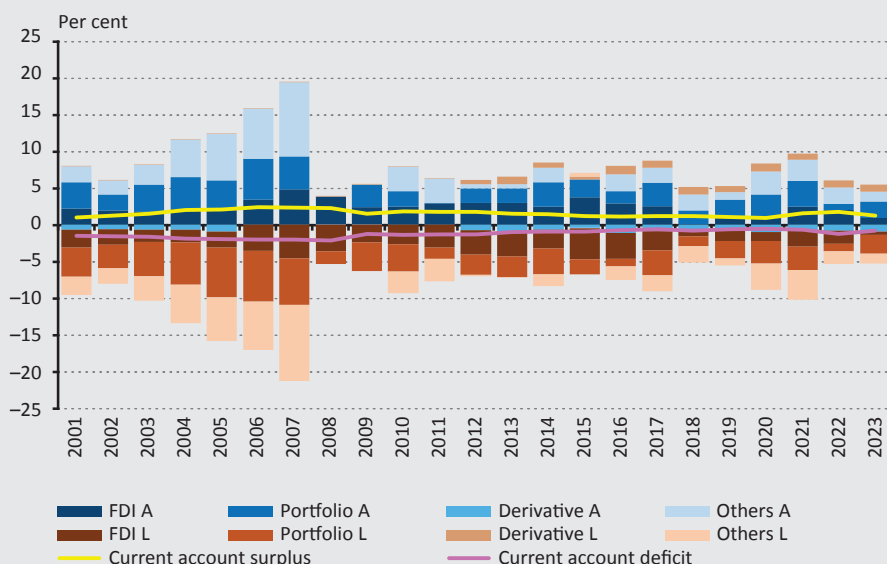
¹¹ For example *Bernanke (2005)* or *Gourinchas – Rey (2013)*.

countries (or countries with younger populations) to incur indebtedness, while it is optimal for countries with a slower growth rate (or aging populations) to save and lend. This is an important step forward, but such an analysis of the international balance of payments does not break with the theory of ‘loanable funds’ in the domestic context and the treatment of banks as passive intermediaries (*Borio – Disyatat 2011, 2015*). Gross capital flows are still understood here as intertemporal barter in real terms.

4.1.2. Addressing global imbalances before the financial crisis

However, even this revised analytical framework proved spectacularly inadequate after the Great Financial Crisis. In a modern, liberalised international financial system, capital flows are only very indirectly linked to the flows of goods and services and income flows that make up current account items. It is true that after the Second World War, even the most developed countries tended to restrict international capital flows and link them to trade in goods. Over the decades, however, foreign direct investment (FDI), portfolio investment (minority purchases of securities), foreign exchange transactions and direct foreign currency lending by banks (other flows) underwent gradual liberalisation. As a result of external and internal financial liberalisation, compared to historical capital flows, current account balance items or even GDP growth rates, international capital flows increased by many times (see *Figure 5*, where global gross capital flows relative to GDP far exceed global current account balances as a proportion of GDP).

Figure 5
Global gross capital flows and current account balances as a percentage of global GDP



Note: Gross capital flow data indicate outflows with a positive sign and inflows with a negative sign

Source: IMF Balance of Payments Statistics

A large and growing proportion of capital flows is not linked to trade in goods and services or net income flows; rather it is directed, for example, at assets (stocks): minority shares (less than 10-per cent stake) and bond purchases (i.e. portfolio investment), majority-owned business investment (FDI) and other financial flows (e.g. bank loans). Such items are recorded as gross capital flows (gross inflow and gross outflow), which represent net acquisitions of debt (sales and purchases) and net changes in liabilities (increases and decreases in debt). The balance of gross flows results in net capital flows (and changes in international reserves), which often have little to do with the current account balance.¹²

In particular, the financing of foreign governments' deficits and the share of various investment vehicles, including real estate lending, increased. Like domestic lending, these international capital flows often reflect the creation of money by foreign banks, rather than a mere transmission of 'pre-existing foreign savings'. Therefore, it is misleading to analyse capital flows in the context of the international savings-investment framework, an extension of the loanable funds theory.

Prior to the Great Financial Crisis, the example of Japan in particular was a striking refutation of this approach: while Japan's internal indebtedness was blatantly high due to the bursting of the real estate bubble, the Japanese yen was nevertheless a popular foreign currency of financing (carry currency) due to its low interest rates (*Borio – Disyatat 2011; MNB 2014: Chapter 1*). Japanese banks were able to lend to foreign countries despite domestic debt. In the wake of the Great Financial Crisis, further patterns of capital flows emerged, revealing the misleading nature of the usual approaches. One of the most important patterns is the true nature of Chinese capital flows to the US. It is widely believed that Chinese capital flows to the US were due to excessive Chinese savings¹³ which financed the US deficit. But the reality is that the capital flowing into the US significantly exceeded the current account deficit or even the budget deficit. That the bulk of the inflows came from the UK (London) and euro area banks was even more striking, as the former had had a current account deficit and the latter an overall current account balance of around zero before the crisis (*Johnson 2009*) (see *Table 1*).

¹² For more details, illustrated with examples, see *Kohler (2020)*, and the studies by *Avdiyev et al. (2016)* and *Borio – Disyatat (2009)* (the latter reviewed by *Szalai 2019*).

¹³ Fed chairman Bernanke's famous 'savings glut' explanation for globally too low interest rates (*Bernanke 2004*). To be fair, Bernanke himself later moved somewhat away from this current account thesis and began to emphasise the role of the capital account, insofar as he stressed the role foreign countries' demand for safe assets issued by the US. *Barsky – Easton (2021)* documents the evolution of Bernanke's view. Nevertheless, the thesis persists: see, for example, a recent article by Martin Wolf, a highly respected financial journalist for the Financial Times (*Wolf 2024*).

Table 1
Changes in holdings of US securities held abroad (billion USD)

	2016	2017	2018	2019	2020	2021	2022	2023
Europe	7,094	7,768	8,127	8,522	9,201	12,089	10,833	11,921
of which								
Euro area countries	4,037	4,497	4,819	4,950	5,339	6,853	6,146	6,720
United Kingdom	1,427	1,493	1,598	1,776	1,988	2,617	2,434	2,627
Asia	5,901	6,154	6,445	6,932	7,519	8,420	7,699	8,055
of which								
China	1,630	1,541	1,607	1,543	1,569	1,575	1,473	1,432
Japan	1,960	1,998	2,044	2,280	2,553	2,765	2,474	2,494
Latin America	565	565	625	645	589	642	614	678
Canada	951	1,061	1,210	1,262	1,335	1,977	1,844	2,055
Caribbean financial centres	2,100	2,290	2,338	2,496	2,559	3,181	2,916	3,092
Other	528	574	655	677	751	880	987	1,071
Total	17,139	18,412	19,400	20,534	21,954	27,189	24,893	26,872

Source: U.S. Department of the Treasury

As can be seen in *Figure 5* in general, capital flows (in gross terms) at the global level cannot be derived from or limited to, current account balances. This is why a country's financial vulnerability, the exchange rate of its currency and interest rates (*Borio – Disyatat 2011; Barsky – Easton 2021*) also moved away from what could be predicted on the basis of the current account alone.

The traditional approach has had unnecessarily serious consequences, most recently during the European financial crisis, when the credit crisis, which was the result of capital flows, was seen as a current account crisis or competitiveness crisis and austerity measures were adopted to resolve it. But, as *Borio and Disyatat* note, austerity measures-driven savings recorded in national accounts cannot finance financial obligations on their own, and often make matters worse.¹⁴

4.2. Gross capital flows and the 'puzzles' of the international financial system

In the examples below, the lack of distinction between net capital flows included in the current account balance and gross capital flows makes analyses misleading.

¹⁴ *Borio – Disyatat (2015: p. 25)*. See also *Febrero et al. (2019)* and *Virág (2020: pp. 99–105)* and the literature cited there.

4.2.1. The Feldstein-Horioka puzzle

The Feldstein-Horioka ‘puzzle’ refers to the close link between investment and savings in the national economy. This means that in a well-functioning international capital market, investment should not take place where savings are generated, but rather where the best investment conditions are (*Borio – Disyatat 2011*). In their estimated equation, they examined the investment ratio (I/Y) as a function of the savings ratio (S/Y), that is ($I/Y = a + b S/Y + e$, where b is the ‘retention ratio’). The retention ratio for 16 OECD countries is estimated at 0.89 for the years 1960–1974 (*Feldstein – Horioka 1980*). The study launched an extensive research programme that continues to this day, with a variety of hypotheses for a high b ranging from financial market frictions to the imperfections of host country institutions.

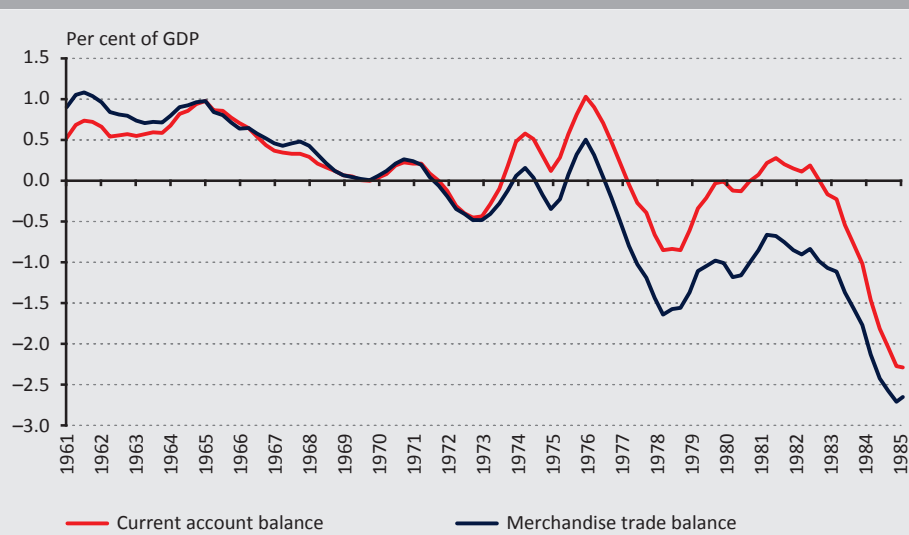
The Great Financial Crisis showed that European countries were rather integrated financially with the US economy, even though they were in balance in terms of national accounts savings and investment (foreign trade). Conversely, while for many years and decades China had a significant export surplus with the US, it was financially more closed under long-standing capital controls. In other words, savings and investments recorded in the current account and national accounts, respectively, do not reflect the degree of financial integration (*Borio – Disyatat 2015; Felipe et al. 2022*).

4.2.2. The Triffin dilemma

In the case of the *Triffin dilemma*, Triffin’s original problem was placed in a framework with the current account at its centre, and it was assumed that the only way for a state issuing international money to supply the global economy with international money was to run a current account deficit – to become indebted – compared to countries that demand its money. That is, it was assumed that net exports (like closed real economic savings) would finance the import surplus of the country running the deficit.

Under endogenous money creation and liberalised international capital flows, the relationship between capital flows and net investment in the real economy or savings is so indirect that their magnitude and direction may be opposite. *Triffin’s dilemma* is also explained if we agree that the banks of the state issuing international money are able to supply the world economy with the money it needs, regardless of current account developments. In the years following the establishment of the Bretton Woods system in 1944, when the US dollar became the official international currency and demand for it was huge, the US current account was positive, only to turn negative much later, after the break-up of the system in 1971–1973 (*Bordo – McCauley 2019:13*) (*Figure 6*).

Figure 6
US trade and current account balances as a percentage of GDP



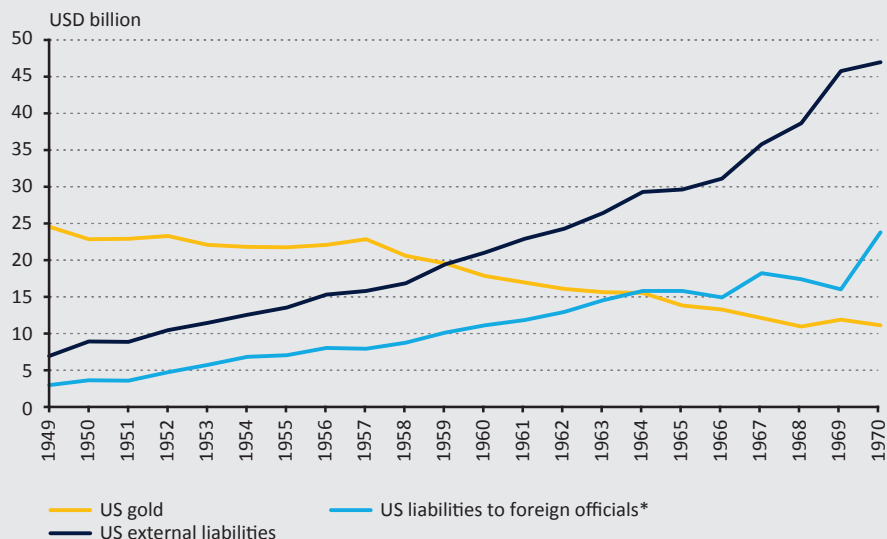
Source: *Conversable economist blog*, <https://conversableeconomist.blogspot.com/2013/11/the-triffin-dilemma-and-us-trade.html>, U.S. Bureau of Economic Analysis

It was not by assuming a current account deficit that Triffin formulated his dilemma either.¹⁵ Originally, what he considered a threat was an increase in the claims by foreign central banks from the US to a level exceeding the US monetary gold reserves, which could be caused by, but not limited to, a current account deficit. (Bordo – McCauley (2019) also present a fiscal or ‘risk-free instrument’ version of the Triffin dilemma.) Even though the Bretton Woods system collapsed only years after this point was reached in the first half of the 1960s, the international financial system did not collapse (Figure 7).

¹⁵ Bordo – McCauley (2019). In the 1950s, Triffin feared that the US would try to protect its gold reserves and limit the issuance of dollars, causing difficulties in global trade. To avoid this, Triffin proposed the separation of dollar and gold, advocating instead for the creation of a new international currency, such as the Bancor proposed by Keynes.

Figure 7

Development of US gold reserves and liabilities to the rest of the world



Note: *Official liabilities to foreign central banks and finance ministries. These are the reserves that can easily be used for foreign exchange intervention.

Source: Bordo – Maculay (2019:4)

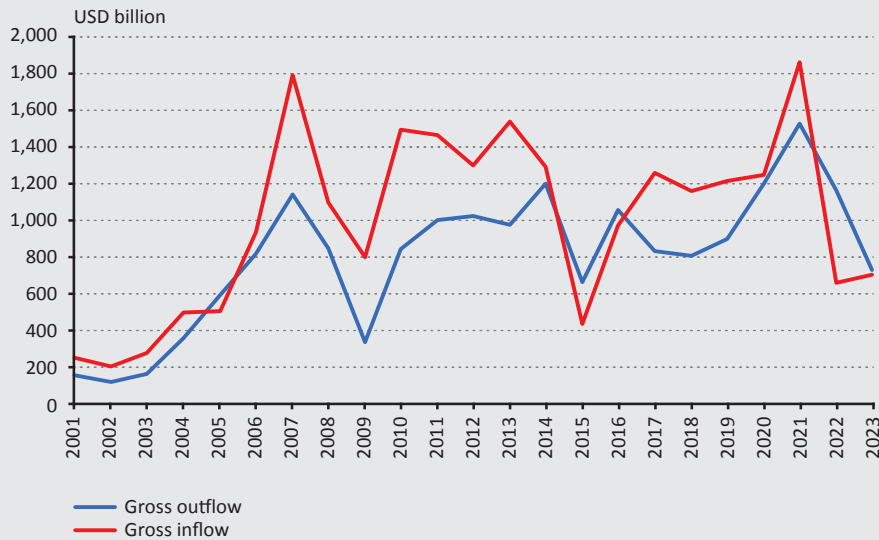
Bordo and his co-author attribute the growth of US dollar liquidity to global demand for it, in which claims on countries other than the US play a larger role than claims on the US. They point out that China's current account surplus does not prevent the Chinese currency from becoming an international reserve currency, just as it did not prevent the US dollar from doing so at the time. At the same time, contrary to expectations based on the fiscal 'Triffin dilemma', increased US public debt in the Great Financial Crisis strengthened the US dollar's role as a reserve currency and demand for it continued to rise, not fall, during the crisis.

4.2.3. Lucas' paradox

Similarly, the authors of *Lucas' paradox* (Lucas 1990) – according to which capital should flow from developed, capital-rich countries to less developed, capital-poor countries offering the possibility of higher returns – do not distinguish between 'real savings' and financially oriented 'finance'. The flow of capital from poorer countries to richer countries is deduced from developments in current account balances, as if the direction of capital flows could be determined by the current account balance. The most glaring examples are the Chinese export surplus and the US trade deficit that evolved years after Lucas' article.

However, the export-oriented strategy of less developed countries, i.e. the pursuit of a net current account surplus, may be reasonable, and it does not preclude the possibility of significant capital flows into the country (*Borio – Disyatat 2011: 19–20*). Less developed countries that have successfully converged (such as the countries of Southeast Asia) pursued an export-oriented strategy, accumulating foreign exchange earnings generated as a reserve to retard the appreciation of their currencies, which would undermine their competitiveness, and as ‘self-insurance’ against an unexpected reversal of capital flows. As was pointed out above, according to the ‘impossible trinity’, this strategy would sooner or later become unsustainable because of the difference between domestic and foreign interest rates. In reality, this difference does not always cause a loss which would make the convergence strategy unsustainable. According to *Kregel (2006)*, alternative development strategies based on net capital inflows more frequently lead to unsustainable macro-financial situations and IMF-imposed stabilisation policies, which entail higher economic losses. Both ‘anomalies’ result from the asymmetric nature of the current international monetary system, where the correction of imbalances and indebtedness is unilaterally imposed on deficit/indebted countries.¹⁶

Figure 8
Gross capital flows to emerging and developing countries



Note: For comparability, capital inflows are shown with a positive sign

Source: IMF Balance of Payments Statistics, various years and online database

¹⁶ For more details, see e.g. *Kregel (2019, 2021)*.

Despite all of these considerations, the paradox is unfounded if we examine gross capital flows rather than current account balances in emerging and developing countries. *Figure 8* shows that capital inflows exceed outflows. Accordingly, in both the Feldstein–Horioka and Lucas paradoxes, an erroneous analytical framework can lead to potentially incorrect economic policy conclusions, namely, to encourage external financing and capital investment, even at the expense of social and environmental sustainability.

5. Summary

Approximately a decade ago, following the example of the Bank of England, a number of leading central banks started to promote an endogenous money supply approach as opposed to the textbook monetary models. However, in many other areas, a change of mindset is still to come. For reasons of space, we have only briefly indicated that the change is also very important for practical economic policy. Thinking along conventional lines can easily lead to misguided or sub-optimal economic policy actions in areas such as monetary policy stance, financial vulnerability, correction of external imbalances, development policy and investment promotion, and the international monetary system.

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