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On the stabilizing role of cash for societies

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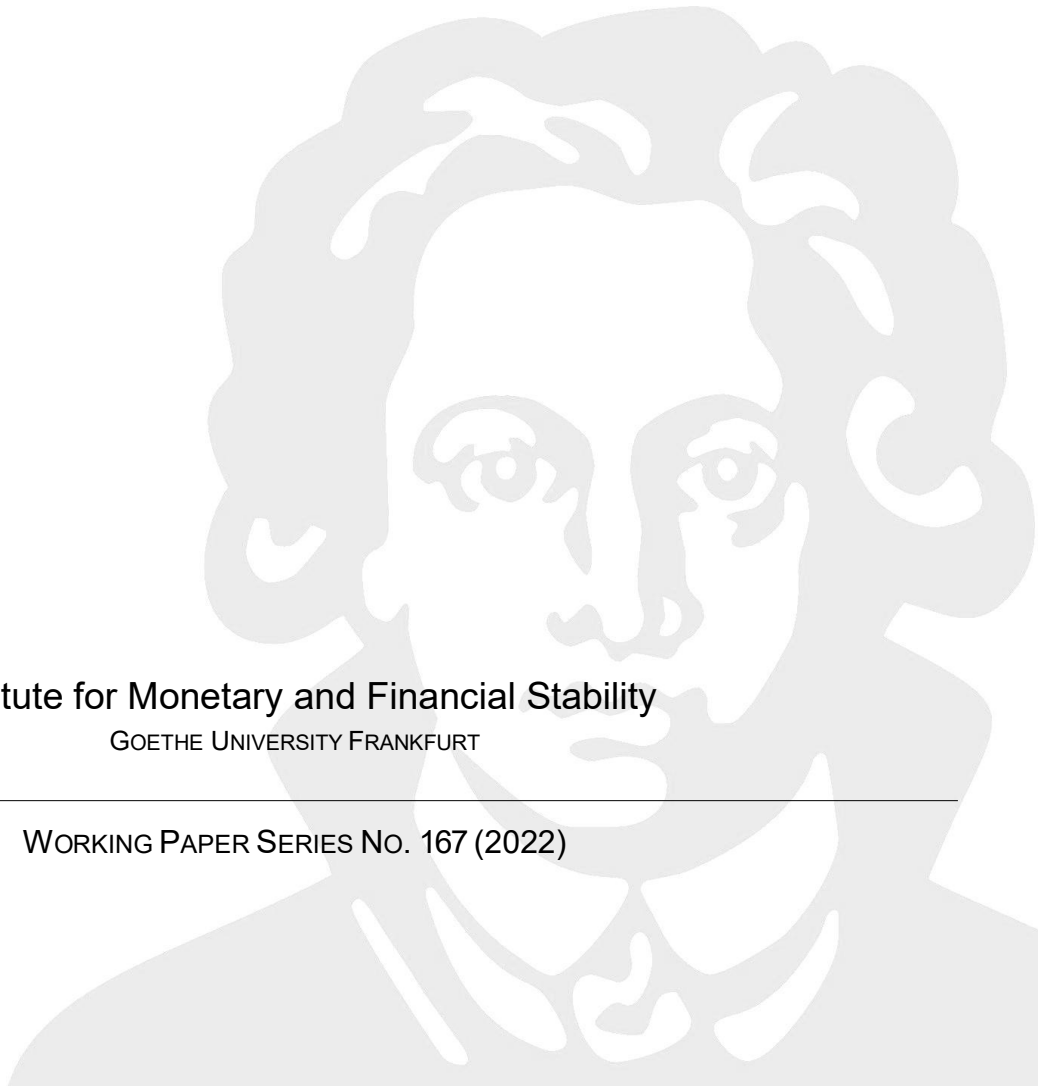
GERHARD RÖSL, FRANZ SEITZ

On the Stabilizing Role of Cash for Societies



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On the Stabilizing Role of Cash for Societies*

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Abstract:
In this paper, we focus on the stabilizing role of cash from a society-wide perspective. Starting with conceptual remarks on the importance of money for the economy in general, special attention is paid to the unique characteristics of cash. As these become apparent especially during crisis periods, a comparison of the Great Depression (1929 – 1933) and the Great Recession 2008/09 shows the devastating effects of a severe monetary contraction and how a fully elastic provision of cash can help to avoid such a situation. We find interesting similarities to both crises in two separate case studies, one on the demonetization in India 2016 and the other on cash supply during various crises in Greece since 2008. The paper concludes that supply-driven cash withdrawals from circulation (either by demonetization or by capital controls) destabilize the economy if electronic payment substitutes are not instantly available. However, as there is no perfect substitute for cash due to its unique properties, from the viewpoint of the society as a whole an efficient payment mix necessarily includes cash: It helps to stabilize the economy not only in times of crises in general, no matter which government is in place. Consequently, it should be the undisputed task of central banks to ensure that cash remains in circulation in normal times and is provided in a fully elastic way in times of crisis.

JEL: E41, E51, E58

Keywords: Cash, banknotes, money, crises, stabilization

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"Money makes the world go 'round" (Liza Minnelli, 1972)

I. Introduction

It is uncontroversial that there should be a sufficient supply of money in the economy without any inflationary or deflationary pressure. However, it is less clear of what components the money stock should consist of: Private money (usually in the form of bank deposits) and/or public money in the form of cash or even Central Bank Digital Currency (CBDC) in the future? In the last decade, there has been an intensive discussion on the role and importance of cash for the economy. This discussion had several facets. Firstly, there are proposals of restricting the use of or even abolishing cash, either in total or the large banknote denominations (see, e. g., Garín et al., 2021, Engert et al., 2018, Krüger & Seitz, 2017, Rogoff, 2016). Secondly, the introduction of negative nominal interest rates made it evident that cash introduces an effective lower bound on the nominal yields of safe assets (Rösl et al., 2019, Krüger & Seitz, 2017, ch. 7.2, Rogoff, 2016, part II). Thirdly, the last decades have shown that in times of crises, cash demand always increased regardless of the type of crisis (Rösl & Seitz, 2022). Fourthly, especially since the financial crisis of 2008, global cash holdings increased drastically, in nominal and real terms, and for the major currencies even relative to GDP indicating a trend increase in cash demand (Rösl & Seitz, 2021, Ashworth & Goodhart, 2020, Arango-Arango & Suáres-Ariza, 2019, Shirai & Sugandi, 2019, Bech et al., 2018, Jobst & Stix, 2017). In addition, the Covid-19 pandemic (Chen et al., 2022, Rösl & Seitz, 2022, Ashworth & Goodhart, 2021, Goodhart & Ashworth, 2020) and the war in Ukraine (ESTA, 2022, Lepecq & Bautista-González, 2022) have reinforced these tendencies. And finally, the discussion about the so-called cash paradox (Zamora-Pérez, 2021, Mitchell, 2020, Ardizzi et al., 2020, Caswell et al., 2020) brought cash into the spotlight once more. It describes the enormous increase in global cash demand despite a continuous and worldwide decline of cash used for day-to-day transactions at the point of sale at the same time (see, e. g., Zamora-Pérez, 2021, Lalouette & Esselink, 2018) .

During crises and turbulences, a sufficient-elastic supply of cash, in total and by denomination, has always stabilized the economic situation (Rösl & Seitz, 2022). This is even more true for less developed countries, as, for instance, the situation of Syria during the war (GOAL, 2021), Afghanistan after the coming into power of the Taliban (Bautista-González, 2022), India in the course of the demonetization (Lahiri, 2020) and Myanmar after the military coup (Lepecq,

2021) have demonstrated. The general population and especially the poor benefit if cash is available. In line with these observations, the present paper's aim is to shed more light on and rationalize the stabilizing properties of cash.

The paper is structured as follows. Section 2 presents the conceptual framework and explains the importance of money for a well-functioning economy. Hereby, we also emphasize the unique selling points (USPs) of cash and illustrate the current trends in cash in circulation together with those of digital alternatives. Chapter 3 draws important lessons from the comparison of the Great Depression of 1929 – 1933 with the Great Recession of 2008/09 with regard to stabilizing the money supply and the specific role of cash in achieving this goal. In Section 4 we extend the analysis on the stabilizing role of cash also to crisis periods which originate outside the banking system. In chapter 5, we exemplify our propositions with two specific examples, namely the demonetization in India in 2016 and the developments during the various crises in Greece since 2008. Finally, section 6 summarizes and concludes.

II. Conceptual framework: The role of money in the economy

II.1. Basic functions and categorization of various types of money

The wealth of nations depends crucially on a stable monetary and financial system. The reason for that is simple: The quality and quantity of products that serve the needs of the citizens can only be increased efficiently if all economic agents can specialize according to their (comparative) advantages or skills. For instance, a dentist should ideally devote all his working time on caring for his patients and not produce other goods and services such as his own food or start teaching. This task is up to other specialized producers (farmers, teachers) which in turn should concentrate on producing food and high-quality lectures and not provide dental services. As this is true for all economic agents in the society, a simple and cheap exchange-scheme is needed to ensure the efficient allocation of goods produced. The most efficient way to do so is using a generally accepted means of exchange or means of payment in the form of money. Money reduces the time and effort to find corresponding trade partners (“shoe leather costs”) and drastically reduces the number of prices to know by referring to a common unit of account (€, $, for instance). In addition, it allows market participants to store value with an utmost degree of liquidity and, hence, increases the payment security for future spending. And finally, a stable and generally accepted money eliminates the "double coincidence of

wants" problem of an exchange (barter) economy.[1] The services money renders are especially important in a world of uncertainty with costly information acquisition. The monetary system implemented should also avoid the 'double spending' problem which is one of the main concerns in the cryptocurrency markets (e. g., Abadi & Brunnermeier, 2022). Whereas in an exchange of physical means of payment like cash, validity and finality of the transaction is easy to verify, a digital transaction makes finality more complicated as it involves only the exchange of messages.

As shown in table 1, several types of monies existed over time, most of them being still in use today.[2]

Table 1: Selected types of money

Type of money	Commodity money	Government money	Central bank money			Commercial bank money	Decentra-lized private digital money
Kind of money	Animals, pearls, shells, cigarettes etc.	Coins	Banknotes	Central bank deposits (reserves)	Central Bank Digital Currency	Commercial bank deposits	Crypto-Currencies
Issuer	Producer of the commodity	Sovereign/ government	Central Bank	Central Bank	Central Bank	Commercial Banks	Mathe-matical protocol (private entities)
Money stock controlled by	Producer of commodity	Government/ Central bank	Central Bank	Central Bank	Central Bank	Central Bank	Mathe-matical algorithm
Significant on a global scale	Not relevant	Relevant only for minor value payments	Relevant	Relevant only for interbank payments	Not (yet) relevant	Relevant	Not relevant

Source: Own figure.

Money can be traced back to ancient times where animals, pearls, shells, and many other goods were used as commodity money. In the course of history, however, state issued money in the form of coins and later banknotes replaced these oldest types of money.[3] Initially, cash

[1] A modern interpretation of this transactions role of money can be found in the search-theoretic literature, see for instance Kiyotaki & Wright (1989). State-of-the-art monetary models include money in the utility function (MIU), see Walsh (2017), ch. 2. Feenstra (1986) proves that a cash-in-advance constraint is a special case of MIU, while Croushore (1993) shows that MIU and shopping-time-models are equivalent. Holman (1998) succeeds in incorporating transaction, precautionary and store-of-value motives in a MIU model.

[2] In addition, there are several other types of money in circulation in some countries such as “regional currencies” or “private barter money”. For an overview of private unofficial currency issuance in Germany see for instance, Rösl (2006).

[3] The first known coins were found in the Eastern Mediterranean and date back to the middle of the seventh century BC. For an excellent overview see Metcalf (2012). The first paper money was issued in China in the 7th century. The first European banknote was issued in 1666 in Sweden.

had still a connection to a commodity since coins (first full-embodied coins, later mostly fractional coins) consisted at least partly of precious metals (e. g., gold, silver) and banknotes were in turn covered by coins or bullions stored in the vault of the money issuer. Of course, it didn't take long before governments' desire for seigniorage led to production of coins from inferior metals and (central) banks reduced their precious metal coverage of banknotes.[4] Remarkably, the following disconnection of cash from its commodity coverage did not lead to a rebirth of commodity money. By contrast, it became more and more clear over time that such a backing is not necessary if the purchasing power of money remains sufficiently stable, i. e., price stability is preserved. In the end, *trust* of money holders in the general acceptance and availability of the money as a means of payment determines whether a specific type of money is successful or not. And this trust finally refers to faith in a stable monetary value which is nowadays a task of central banks. For that very reason the official legal tender status of a currency is not necessary for a money to be widely accepted.[5] In modern times, cash is not the only means of payment supplied by the state. Central banks also issue electronic money (or book money) in the form of sight deposits mostly for interbank payments.[6] In addition, many central banks consider issuing Central Bank Digital Currencies (CBDC) not only for commercial banks ("wholesale CBDC"), but also, and more importantly, for the general public ("retail CBDC"), see, e. g., Kosse & Mattei (2022) and Boar & Wehrli (2021). In October 2020, the Central Bank of The Bahamas introduced the "Sand Dollar", the first CBDC worldwide.[7] Money issued by commercial banks in the form of transferable sight deposits ("commercial bank money") is also widely used especially in developed countries. In the euro area, for instance, cash comprises nowadays (end 2021) only about 10% of the monetary aggregate M3. In addition to state-issued or at least state-controlled money, around 20,000 "cryptocurrencies"[8] currently exist of which the most prominent is Bitcoin.[9] This new type of

[4] The concept of seigniorage in this context refers to the difference between the face value of the coin or banknote – representing the purchasing power of the money – and its production costs.

[5] In the United Kingdom, for instance, banknotes issued by the Bank of England do not have a status of legal tender in Northern Ireland and Scotland. The foreign use of USD and EUR proves this assertion as well.

[6] Indeed, there was an enormous increase of central bank book money, the most secure electronic form of money, following the financial crisis in 2008 and the following years.

[7] Until May 2022, two other currency areas followed, namely the Eastern Caribbean and Nigeria. For more information see https://www.atlanticcouncil.org/cbdctracker/.

[8] Although the term cryptocurrency is widely used in the literature, these types of encrypted assets fulfill the payment function only gradually. For this reason, one should better use the notion "crypto token" or "crypto asset", see https://www.bundesbank.de/en/tasks/topics/jens-weidmann-sceptical-about-central-bank-digital-currency-798326.

[9] In May 2022, see https://coinmarketcap.com/de.

money is created in a decentralized manner based on a mathematical protocol typically using the block-chain technology. Although one must take this development in many regards very seriously, cryptocurrencies play no significant role neither in the world financial system nor in specific countries up to now. In 2021, the market capitalization of all crypto assets in the whole world amounted just to € 1,500 bn (Research & Markets, 2022) being way behind the current value of the money stock M1 in the euro area alone totaling € 11,000 bn.

To sum-up, a well-functioning payment infrastructure is crucial to enhance the efficiency of the financial system and the real economy, boost consumer confidence and facilitate economic interaction and trade in goods and services (ECB, 2010). In contrast, unsafe and inefficient payment systems hamper the efficient transfer of funds among individuals and economic agents.

II.2. Trend towards digital payments

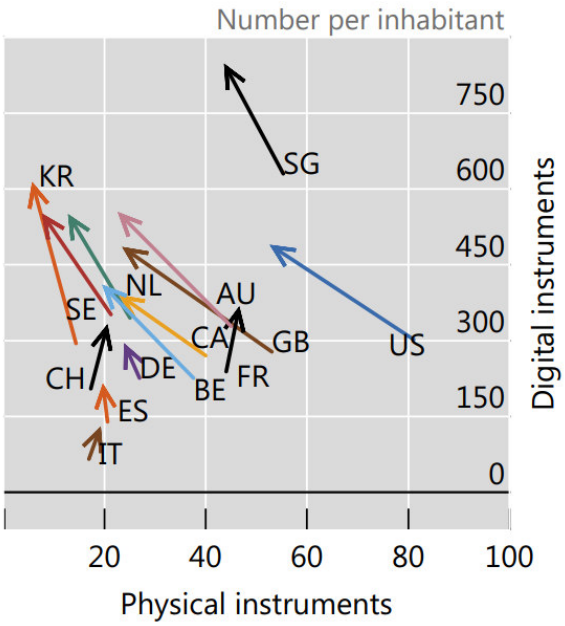
There is undoubtedly an ongoing and intensifying trend towards digitalization of the global economy. And, of course, the monetary system and its payment structure is hereby also heavily influenced. Especially in the developed countries, there was a remarkable shift from payments in paper (e. g., cash or cheques) to cashless payments (e. g., credit and debit cards) in the past decade as shown in figure 1.

Even in Germany, a country known for its preference for cash, card payments overtook payments in banknotes and coins at the point of sale in value terms in 2019 (see figure 2). One can also infer from this figure that the COVID-19 pandemic accelerated the tendency towards cashless payments even more. This observation is in line with the payment behaviour worldwide, including emerging and developing countries.[10] However, at the same time global cash demand increased significantly since the outbreak of Sars-Cov-2 creating the so-called *cash paradox* (Zamora-Pérez, 2021).[11] This implies that other motives for holding cash must have over-compensated the decreasing demand for transaction balances. Due to a severe recession in 2020 and declining criminal activities (see Nivette et al., 2021), this cannot be due to the shadow economy.

[10] See Chen et al., 2022, Rösl & Seitz, 2022, Ashworth & Goodhart, 2021, Yoshizawa et al. 2021, Zamora-Pérez, 2021, Ardizzi et al., 2020, Caswell et al., 2020, and, Mitchell, 2020.

[11] In addition, the recent war in Ukraine also led to a considerable increase in cash demand in some countries, inter alia also in Sweden.

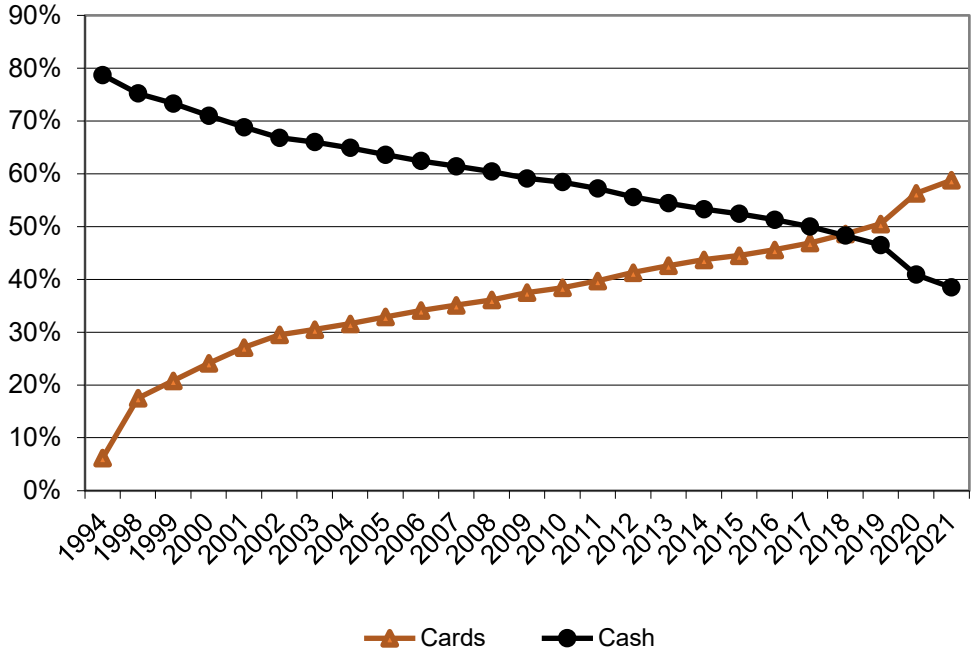
Figure 1: Change in use of digital instruments versus physical instruments for payments from 2012 to 2019



Notes: Graph shows the number of payments per capita in the respective countries comparing the year 2012 (start of arrow) and 2019 (end of arrow). Digital instruments include credit transfers, direct debits, card and e-money payments, and other cashless instruments. Physical instruments include paper-based payment instruments (cheques) and cash withdrawals at ATMs (used as a proxy for cash payments). For CA, latest data for cash withdrawals at ATMs is for 2017. For ES, the start of the arrow represents 2014. For more information see also https://www.bis.org/statistics/payment_stats/commentary2011.htm.

Source: Boar & Wehrli (2021), 16.

Figure 2: Shares of cards and cash payments at the point of sale in Germany (in value terms)

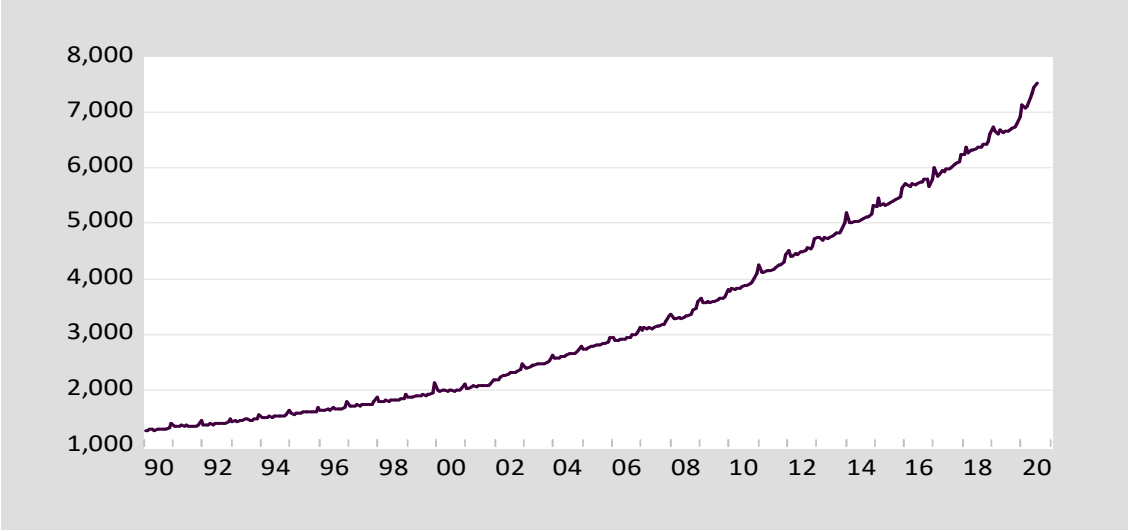


Source: EHI German Retail Institute.

II.3. Cash still heavily in demand worldwide

The following figure 3 shows "global" cash in circulation over the past three decades. It shows unambiguously that this cash metric increased steadily since the 1990ies, and its trend growth became steeper over time.

Figure 3: "Global" cash in circulation (US-Dollar bn)

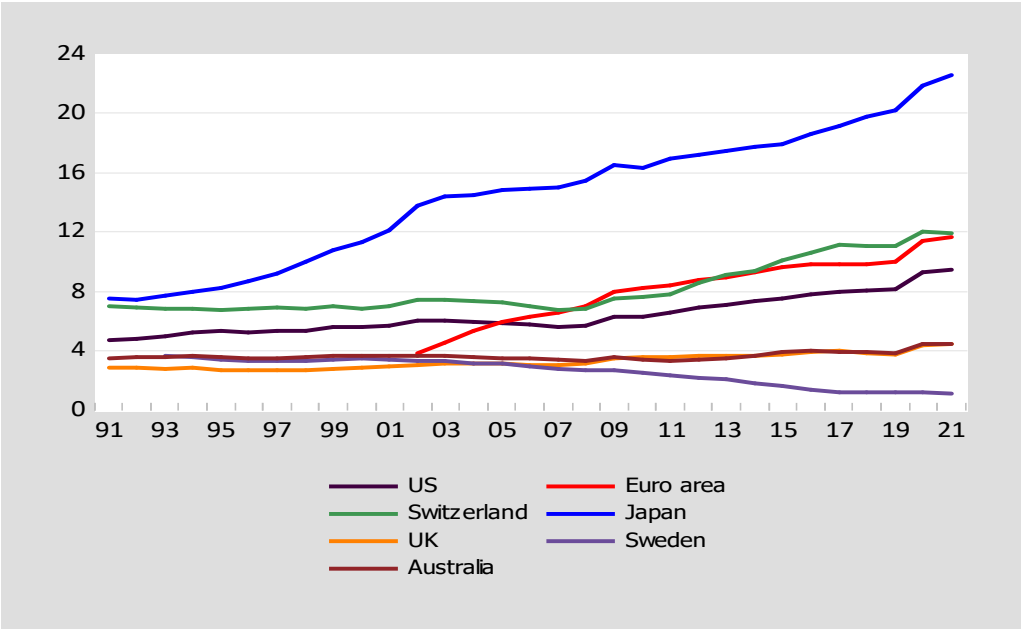


Notes: Data refer to cash or banknotes in circulation. Countries included are Egypt, Australia, Brazil, China (since 2006), Denmark, Germany (until end of 2001), Euro area (since 2002), United Kingdom, India, Japan, Canada, Norway, Russia, Sweden, Switzerland, South Africa, South Korea, USA; sample period: 1990.01-2020.07. National figures converted in US dollar by using the average exchange rate over the data period. The statistical breaks resulting from the inclusion of the Euro area 2002 and China 2006 were smoothed by simple linear interpolation.

Source: Own chart with data from national central banks, IMF.

In most developed countries, except Sweden, cash even grew faster than GDP (see figure 4).

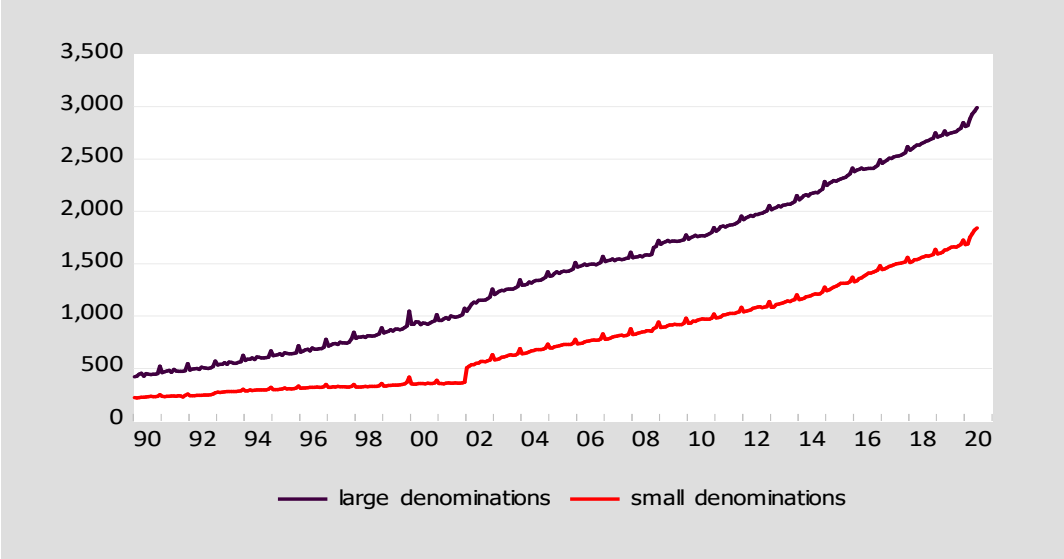
Figure 4: The ratio of cash to GPD internationally (%)



Source: National central banks.

Non-transactional motives – often summarized by the motive of hoarding or store of value – explain why overall cash demand in the world continues to grow quicker than the ongoing decline in cash-based payments at the point of sale. The following figure 5 shows that the value of large banknote denominations for major currency areas, which are typically used for non-transactional purposes, not only increased more than the respective small denominations, but also followed a steeper trend over the past 30 years.

Figure 5: Small and large banknote denominations in circulation international (USD bn.)



Notes: Data refer to the following banknotes in circulation: USD, DEM/EUR, JPY, CHF, GBP, SEK, AUD. Large denominations: USD 100; JPY 10,000; DEM 200, 500, 1,000; EUR 200, 500; CHF 200, 500, 1,000; GBP 50; SEK 10,000; 1,000; 500; AUD 100; small denominations: USD 1 – 50; JPY 500 – 5,000; DEM 5, 10, 20, 50, 100; EUR 5, 10, 20, 50, 100; CHF 5, 10, 20, 50, 100; GBP 5, 10, 20; SEK 5; 10; 20; 50; 100; AUD 5 – 50. National currencies converted into USD by using the average exchange rate of the national currency versus the US dollar over the data period. GBP monthly data for 3/2020 – 6/2020 estimated by multiplying the share of small and large GBP denominations in overall GBP banknotes in circulation in 2/2020 by overall GBP banknotes in circulation.

Source: Own chart with data from national central banks.

II.4. What makes cash so unique?

It is an interesting question what makes cash so resilient as a state-supplied currency despite intensified competition from private cashless payment systems?[12] Cash has special features or even USPs which represent a potentially unreachable benchmark for any electronic or digital substitute. In short, these characteristics are

- anonymity in use,
- cash is central bank money and therefore mostly trustworthy,
- cash does not necessitate the further involvement of service providers,

[12] The benefits of cash in general are intensively discussed in Krüger & Seitz (2017).

- cash is an offline payment medium,
- cash can be used for both small and large payments,
- cash payments are simple, convenient, and quick,
- cash payments are definitive and final,
- cash guarantees financial and payments inclusion,
- cash facilitates overview and control of spending,
- cash is relatively secure against counterfeiting.

Cash has the pivotal characteristic of providing uncompromising anonymity for the money holders. It guarantees privacy and data protection.[13] Admittedly, cryptocurrencies are also often seen as being anonymous. In those schemes existing today, however, the payments themselves are in fact fully transparent for all users, only the payment addresses are encrypted. Once an address is decoded and linked to a certain money holder, all payments ever sent or received will be publicly available for all interested observers (even for non-holders of cryptocurrencies). Therefore, one should better use the notion "pseudonymity" than anonymity.

Once being in circulation, cash also can be used without any electronic infrastructure. Indeed, in times of crises in which the reliability of cashless payment systems is in doubt, demand for cash typically increases rapidly.[14] Additionally, offline functionality is important as a fallback solution when communication networks are down.

A third very important feature of cash is that it can be used without any financial intermediary such as banks, credit card institutions or other service providers. If provided in sufficient quantities by the central bank, cash can also ensure financial inclusion very efficiently as no special knowledge of the cash holders nor any availability of technical devices or authorisation is required. In addition, it can be used indiscriminately for small and large payments and usually without any fees for consumers or producers. Payments in cash are easy, quick, definitive, and comfortable. In payment surveys, cash users also mention a better control and overview of their spending in comparison to cashless payments (e. g., Hall et al., 2022, Deutsche Bundesbank, 2017a, Esselink & Hernández, 2017, Bagnall et al., 2016).[15]

[13] Some researchers even state that cash is privacy, see Kahn (2005).
[14] See Rösl & Seitz (2021) and chapter IV of the present paper.
[15] Budget control can potentially also be reached by noncash payers who use digital applications for that purpose. Ebner et al. (2021) find that both types of watchers differ in important characteristics.

And finally, cash is currently the only state-issued means of payment by which the general population has access to central bank money, the safest form of money which is typically associated with some sort of legal tender function.[16] In times of economic or political turbulences, these elements usually lead to a higher demand for cash because cash holders tend to trust central banks more than private institutions facing potential bankruptcy. Taking all these advantages of cash together, it is unsurprising that banknotes and coins are in circulation since centuries and electronic payment schemes cannot provide a perfect substitute for cash.

III. Consequences of a monetary contraction

III.1. Lessons from the Great Depression (1929 – 1933)

What oil is for an engine, money is for the economy: if there is too little, the system breaks down.[17] This is one of the main conclusions to be drawn from the Great Depression in the US (1929 – 1933). After the stock market crash in October 1929, private households lost savings and commercial banks suffered a severe reduction in equity (see figure 6).

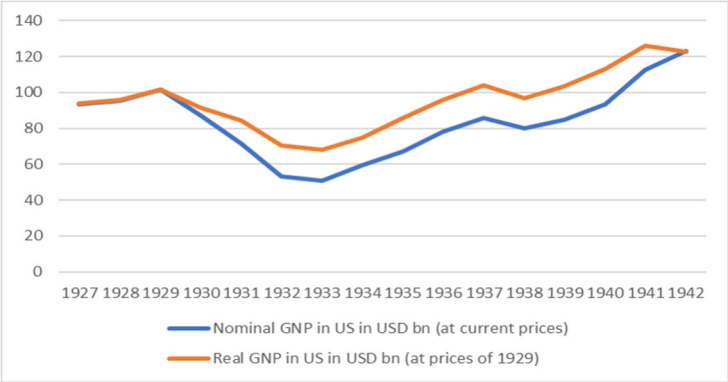
Figure 6: Index of All Common Stock Prices in the USA

Source: National Bureau of Economic Research, Macro History Database.

Consequently, consumption and investment spending plummeted in the early 1930ies leading to an unprecedented downturn of the US economy: nominal Gross National Product (GNP) decreased by 50%, real GNP by 33% (see figure 7) and the unemployment rate went up to 26% in January 1933[18].

[16] In the future, CBDC might be another form of central bank money. Depending upon the chosen CBDC design, money holders could get direct access to central bank accounts.
[17] Of course, the system also breaks down finally if there is too much money in circulation.
[18] See National Bureau of Economic Research, Macro History Database.

Figure 7: Nominal and real Gross National Product (GNP) in the US (1927 - 1942)



Notes: Index with 1929 = 100.

Source: National Bureau of Economic Research, Macro History Database.

As Friedman & Schwartz (1963, 1964) famously pointed out, this economic downturn could have been attenuated enormously if the US Federal Reserve System (FED) would have taken a more aggressive approach in terms of expansionary monetary policy measures. Initially, after the outbreak of the crisis, the FED cut interest rates, but not aggressively enough and even raised the discount rate amidst the freefall of the US economy in 1931 (see figure 8).[19]

Figure 8: Federal Reserve Discount Rates New York (1929 – 1942) in %

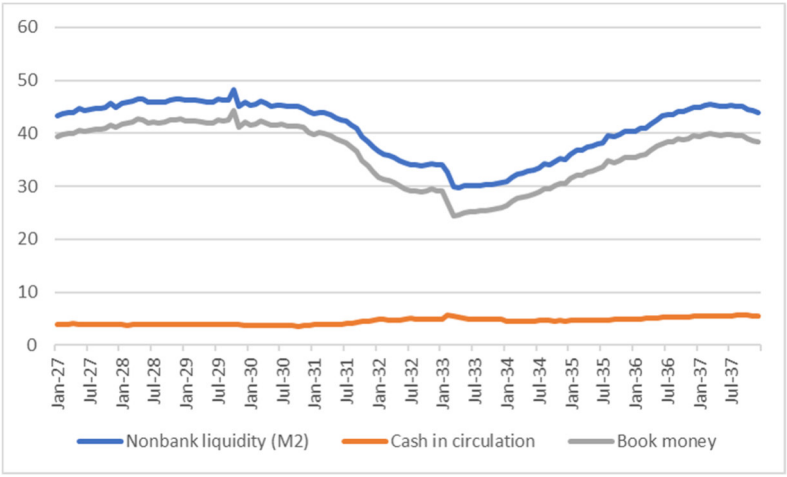
Source: National Bureau of Economic Research, Macro History Database.

On top, the FED accepted a steep decline in the US money stock. The monetary aggregate M2 also known as “broad money” is a measure of liquidity in the hands of private households, firms, and the public sector (nonbanks) and consists conceptually of two components, cash

[19] The cause for the increase in the US discount rate was to prevent the outflow of gold from the US predominantly to Europe after France, the United Kingdom and Germany increased their key interest rates (also during recessions), see Hamilton (1987). On the role of the gold standard during the Great Depression see, for instance, Karau (2020), Eichengreen & Temin (2000) and Eichengreen (1992).

and “book money”.[20] As shown in the following figure 9, nonbank liquidity fell by 33 percent from USD 46 bn in December 1929 to USD 31 bn, comparable to the decline in real Gross National Product at that time. Hereby, the reduction in US money supply from 1929 until 1933 was solely driven by a reduction in book money as banks’ customers withdrew cash from their deposit accounts (see figure 9).

Figure 9: Nonbank liquidity (M2), book money and cash held by nonbanks in the US (USD bn)



Source: National Bureau of Economic Research, Macro History Database Book money held by nonbanks calculated as difference between M2 and cash.

Of course, cash withdrawals pe se do not change the money stock M2. It only alters its components. In other words, getting cash from the bank does not provide money holders with additional liquidity, it only changes the composition of their money stock.[21] If commercial banks, however, go bankrupt due to enormous cash withdrawals by their customers (bank runs), the remaining deposits in the hands of nonbanks will eventually get worthless which leads to a corresponding decline in nonbank liquidity (M2).[22] In fact, of the 24,970 commercial banks that were in existence in the US in 1929, 9,940 suspended operations between 1929 and 1933, reducing the number of commercial banks by 40% (Mitchener, 2004, 37).[23] This banking crash might have been avoided if the FED had provided additional reserves for

[20] “Book money” in turn can be decomposed into demand deposits and other short-term deposits. The European Central Bank even includes short-term marketable instruments in its broadest nonbank liquidity measure M3. The corresponding series for M2 is available at https://data.nber.org/databases/macrohistory/data/14/m14144a.db.

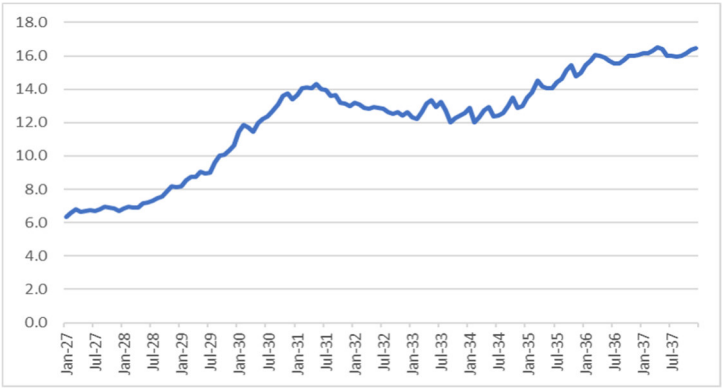
[21] The component “cash” in M2 increases to the extent the other component “book money” decreases.

[22] There was no nation-wide deposit insurance available to US banks’ customers at that time. Note, that M2 declined in the US between 1929 and 1933 not only due to bank insolvencies, but also because solvent banks decreased their net lending to nonbanks.

[23] On the importance of bank failures in prolonging the Great Depression in the US see also Calomiris & Mason (2000), Wicker (1980, 1996), White (1984), Temin (1976), and the ground-breaking work of Friedman & Schwartz (1963, 1964).

commercial banks which in turn could have been used for cash withdrawals to meet the cash demand of their customers.[24] However, the Federal Reserve did – at least by modern standards – not much in this regard: at the outbreak of the stock market crisis in October 1929 commercial banks' reserves stood at USD 10.1 bn and were raised to USD 14.3 bn until May 1931, but as the number of banks declined, so did their reserves (to USD 12.6 bn in March 1933, see figure 10). Finally, during 1930 – 1933, the money multiplier, the ratio of the money stock (M) to reserves, fell sharply (Friedman & Schwartz, 1963).[25]

Figure 10: Reserves of US commercial banks with the FED in USD bn



Source: National Bureau of Economic Research, Macro History Database.

This passive role of the FED during the Great Depression in the US does not only look bizarre from today's perspective, but was also criticized at the time (e. g., Currie, 1934). Since Bagehot (1873) published his analysis of the successful containment of the "Overend-Gurney crisis" by the Bank of England in 1866, the basic principles of fighting a banking crisis were already known: The central bank as a lender of last resort shall then "lend early and freely (i.e., without limit), to solvent firms, against good collateral, and at 'high rates'" (Tucker, 2009, 5).[26] Note, that Bagehot did not restrict his recommendation for quick liquidity provision only to banks, but also to nonbanks such as non-financial enterprises and private households.[27]

[24] Interestingly, during the banking crisis in the US in 1907, a bank run was successfully avoided by ample liquidity provision by private banks organized and led by J. P. Morgan, see Bruner & Carr (2007).

[25] On March 6, 1933, newly elect President Roosevelt declared a nationwide 4-day bank holiday which is nowadays considered to be the beginning of the end of the US banking crisis. For further details see: https://www.federalreservehistory.org/essays/bank-holiday-of-1933. The money multiplier stabilized afterwards.

[26] "High rates" mean, central bank money should be provided in a way that it remains expensive enough to limit subsidized lending to solvent debtors but at the same time is cheap enough to stabilize the re-financing of entities threatened by insolvency. For further discussion of "Bagehot's dictum" see also Goodhart (1999) and Madigan (2009).

[27] See Madigan (2009) who cites Bagehot (1873), 51: "The holders of the cash reserve must be ready not only to keep it for their own liabilities, but to advance it most freely for the liabilities of others. They must lend to merchants, to minor bankers, to 'this man and that man,' whenever the security is good."

Consequently, once a banking crisis is looming, central banks should not only keep an eye on the "liquidity of banks" (vault cash and (reserve) deposits of commercial banks with the central bank), but also on "nonbank liquidity" (cash in circulation in the hands of the public and liquid deposits of nonbanks with the banking system).[28]

In modern monetary systems, however, in which central banks typically administer accounts solely for commercial banks, monetary authorities can influence the money stock in the hands of nonbanks only indirectly.[29] They can – as a first step – lower central bank rates and provide commercial banks with additional reserves in a perfectly elastic way which increases the liquidity of banks and can be used instantly for interbank payments and cash withdrawals from the central bank. However, the volume of nonbank liquidity remains – at least initially – unaffected by these measures.[30] Money in the hands of domestic nonbanks (nonbank liquidity) only increases, if commercial banks a) increase their lending to their domestic nonbank customers, b) increase purchases of net external assets from their domestic nonbank customers and/or c) exchange long-term deposits of their domestic nonbank customers for more liquid ones.

In an environment of flexible exchange rates, of the three principal channels of creating commercial bank book money, the credit channel is typically the most important one. Once a banking crisis translates to a broader economic turmoil, however, the demand for credit from the side of nonbanks might decrease due to various crisis-related uncertainties. This in turn implies that (perfectly liquid) commercial banks that would be willing to provide additional credit to their customers find only subdued demand for it. On the other hand, there might be liquid banks which do not grant credit due to risk and supervisory considerations. In such an environment, the monetary transmission is distorted and there might be a huge increase in bank liquidity but only a moderate increase in nonbank liquidity. This is exactly what happened after the outbreak of the global finical crises in 2008 which quickly turned into the Great Recession (2009) worldwide.

[28] On the importance of closely observing the monetary aggregate M2 (nonbank liquidity) for a successful crisis management see Anderson et al. (2016) who also compare the Great Depression (1929 – 1933) and the Great Recession (2009 – 2011) in the US.

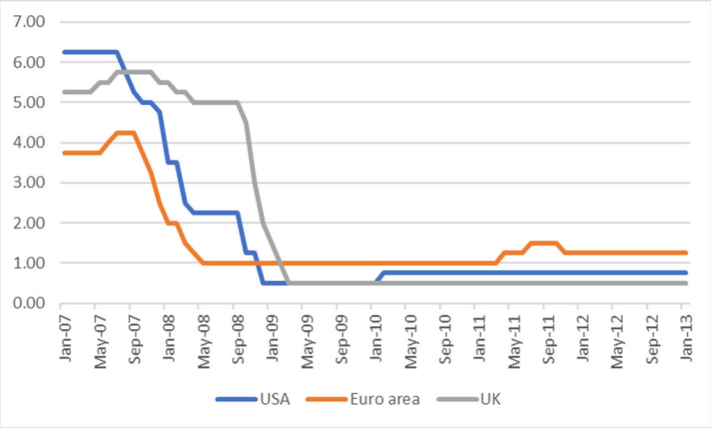
[29] This might change in the future once central banks introduce CBDC for the general public (retail CBDC).

[30] If commercial banks' customers withdraw cash from their banks, book money in the hands of nonbanks declines to the extent cash in the hands of nonbanks increases. On balance, nonbank liquidity remains unchanged.

III.2. The Great Recession of 2008/9 – major mistakes not repeated

After the insolvency of Lehman Brothers in the US in October 2008, panic spread among financial institutions worldwide. This time, however, central banks did not repeat the mistakes of the 1930ies, but immediately started an aggressive expansionary monetary policy by cutting interest rates steeply and increasing bank liquidity (reserves) extraordinary rapidly (see the following figures 11 and 12).[31]

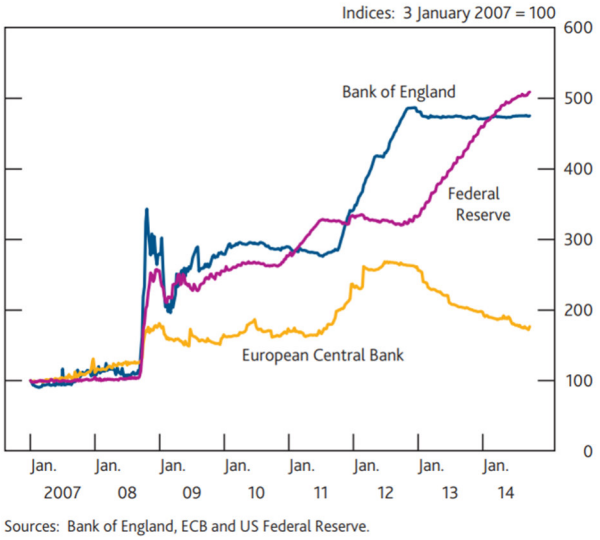
Figure 11: Central bank interest rates (%) in major currency areas (2007 – 2013)



Notes: USA, UK: discount rate; euro area: main refinancing rate.

Source: National central banks.

Figure 12: Growth in central bank balance sheets in the US, Euro area and UK

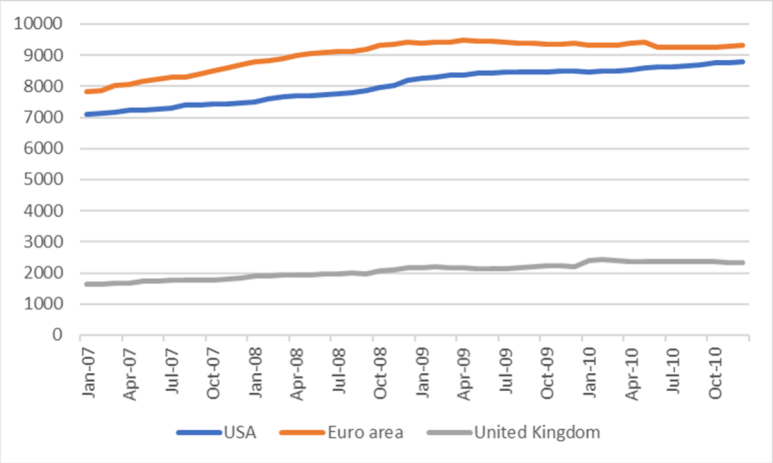


Source: Rule (2015), 7.

[31] The then Chairman of the Federal Reserve, Ben Bernanke, did exactly what he had suggested during his academic career in several papers on the Great Depression, see Bernanke (2000). In a speech given at a conference in honor of Milton Friedman in 2002, he stated: "Regarding the Great Depression, … we did it. We're very sorry. … we won't do it again" (Bernanke (2002), 247. An analysis of the balance sheets of other central banks, also relative to GDP, may be found in Neeley & Karlson (2021).

This stabilized the "money market" (market for liquidity in the hands of commercial banks) and helped also to avoid a decrease in the money stock in the hands of nonbanks (nonbank liquidity), see figure 13.

Figure 13: Nonbank liquidity for different currency areas in national currency bn (2007 – 2010)

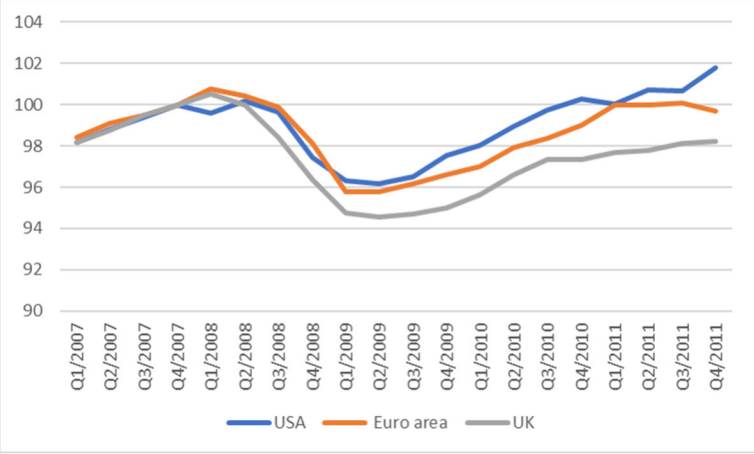


Notes: Broad money for the US, the Euro area and the UK. Broad money (M3) includes currency, overnight deposits, deposits with an agreed maturity of up to two years, deposits redeemable at notice of up to three months and repurchase agreements, money market fund shares/units and debt securities up to two years.

Source: OECD.

These measures also successfully limited the recessionary impact in the US, the Euro area and the UK to roughly -5% in 2008 and accelerated the remarkably quick recovery process afterwards (see figure 14).[32] Indeed, it took only one year for all three major currency areas analysed to grow again after the rapid decline in real GDP in Q4/2008.

Figure 14: Real GDP in major currency areas



Source: Federal Reserve Bank of St. Louis. Index Q4/2007 = 100.

[32] Of course, heavy fiscal policy measures alongside with substantial rescue packages for banks completed the expansionary policy mix.

Comparing the Great Depression 1929 – 1933 and the Great Recession 2008/9 clearly shows what happens if a crisis leads to an environment of monetary contraction in which not only the liquidity of commercial banks, but – for the purpose of this study even more important – also the money stock in the hands of the general public (nonbank liquidity) declines. The latter implies that money is taken out of circulation and nonbanks (especially private households and firms) don't have enough media of exchange. Consequently, production in the economy will be below its potential and a possible downward spiral becomes more likely. Note, that these problems also occur if a monetary authority deliberately starts to demonetize its economy. Recent examples for such a policy were seen in India and in Afghanistan, where the national central bank/government reduced at least temporarily nonbank liquidity by withdrawing cash from circulation without any compensation in form of book money or other means of payments. As will be explicitly shown by the example of India in chapter V.1, the policy of demonetization led indeed to a severe decline in India's real consumption and GDP and to devastating social consequences.

IV. On the stabilizing role of cash

The remarks on the Great Depression (1929 – 1933) above reveal what happens if a central bank remains passive in times of a banking crisis and does not properly act as a lender of last resort for financial institutions and – at the same time – watch the liquidity of nonbanks, the money stock, carefully. By stark contrast, during the Great Recession (2008/9) all major central banks provided commercial banks with an enormous amount of additional reserves (bank liquidity) which they could use for interbank payments and cash withdrawals.

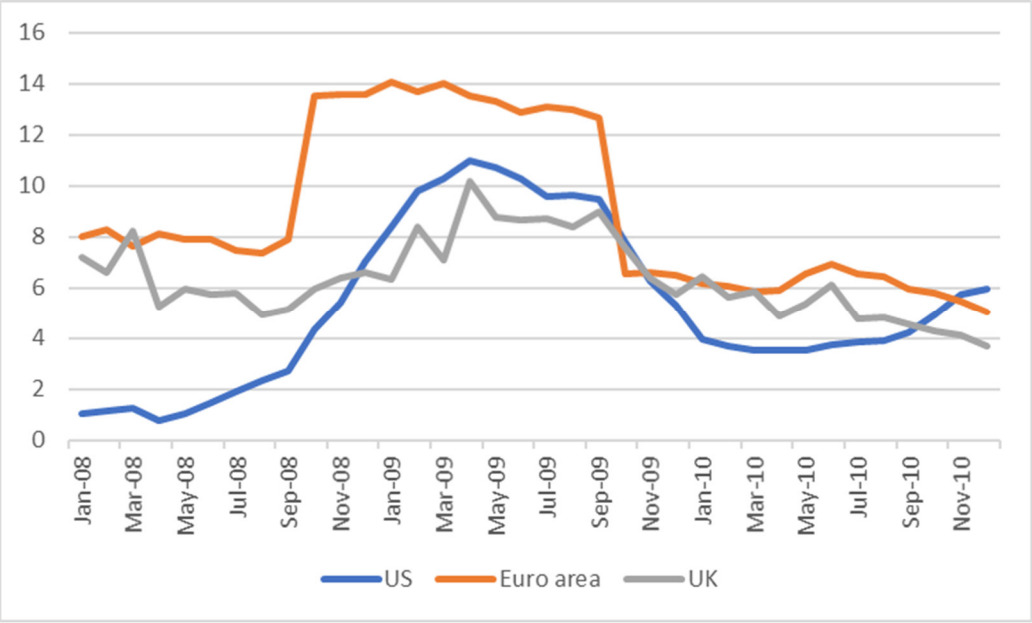
Up to now, however, it seems that bank deposits and cash are perfect substitutes. And this is exactly what simple sum measures of money, like M1 or M3, suggest.[33] As the discussion on the special characteristics of cash in section II.4 has shown, however, the assumption of perfect substitutability is at odds with reality. This implies first that some allocations cannot be reached without cash. And second, there is more to cash than only payments.

With their operations during the Great Recession, the central banks achieved two goals at the same time: Firstly, commercial banks remained liquid even at times when the "money market" dried out after banks with excess liquidity started hoarding of liquidity. Secondly, the money

[33] An alternative would be so-called Divisia aggregates of money which weigh the different components according to their degree of liquidity, see, e. g., Barnett et al. (1992).

stock in the hands of the general public (nonbank liquidity) was prevented from declining (see figure 13). But the latter was only achieved by a fully elastic provision of cash by central banks to satisfy the increased cash demand. Indeed, annual growth rates of cash increased quickly up to 14% in the Euro area, 11% in the US and 10% in the United Kingdom after the insolvency of Lehman Brothers in October 2008 which marks the outbreak of the global financial and economic crisis 2008/09 (see the following figure 15).

Figure 15: Annual growth rates of cash in circulation in major currency areas in %

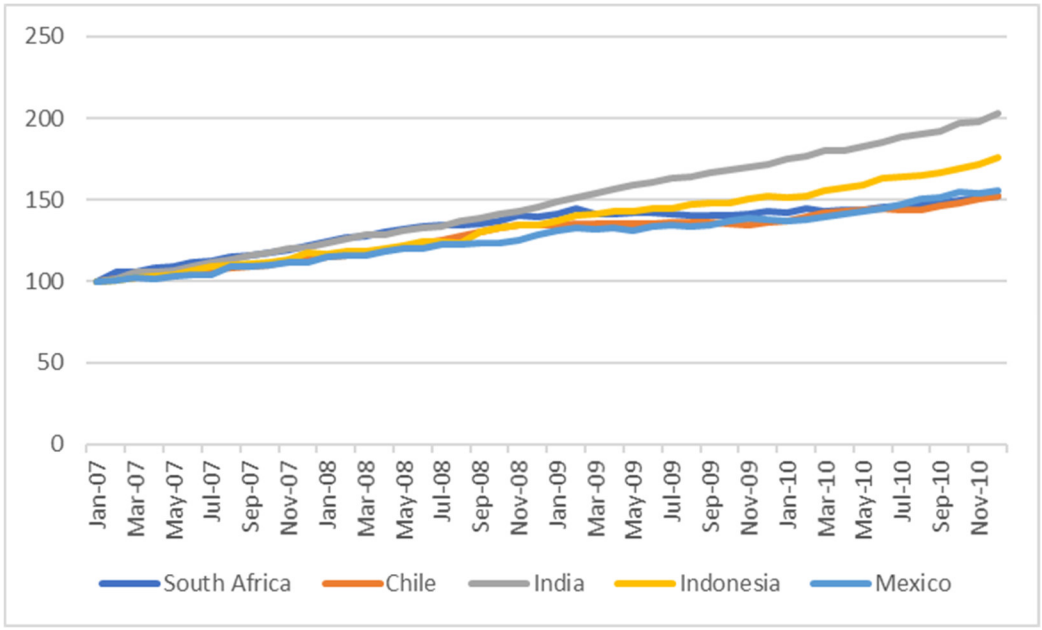


Source: Respective central banks.

This enormous increase in cash demand reflected predominantly the desire of commercial banks' customers to exchange their book money for (especially high value) banknotes.[34] In contrast to the Great Depression, however, this time commercial banks were able to deliver. Consequently, the stock of money in the hands of nonbanks stabilized by the ample provision of cash and the money stock could even continue to increase during the economic downturn. Hence, economic transactions could be financed fully, and the economic recovery was literally not hampered by a lack of money in circulation. This is even more true for countries with a less developed banking sector for which cash is the predominant means of payment and store of value (see figure 16).

[34] Vault cash of banks also increased noticeably at that time, see Rösl & Seitz (2021, 2022).

Figure 16: Money stock M3 for selected developing countries (2007 - 2010)



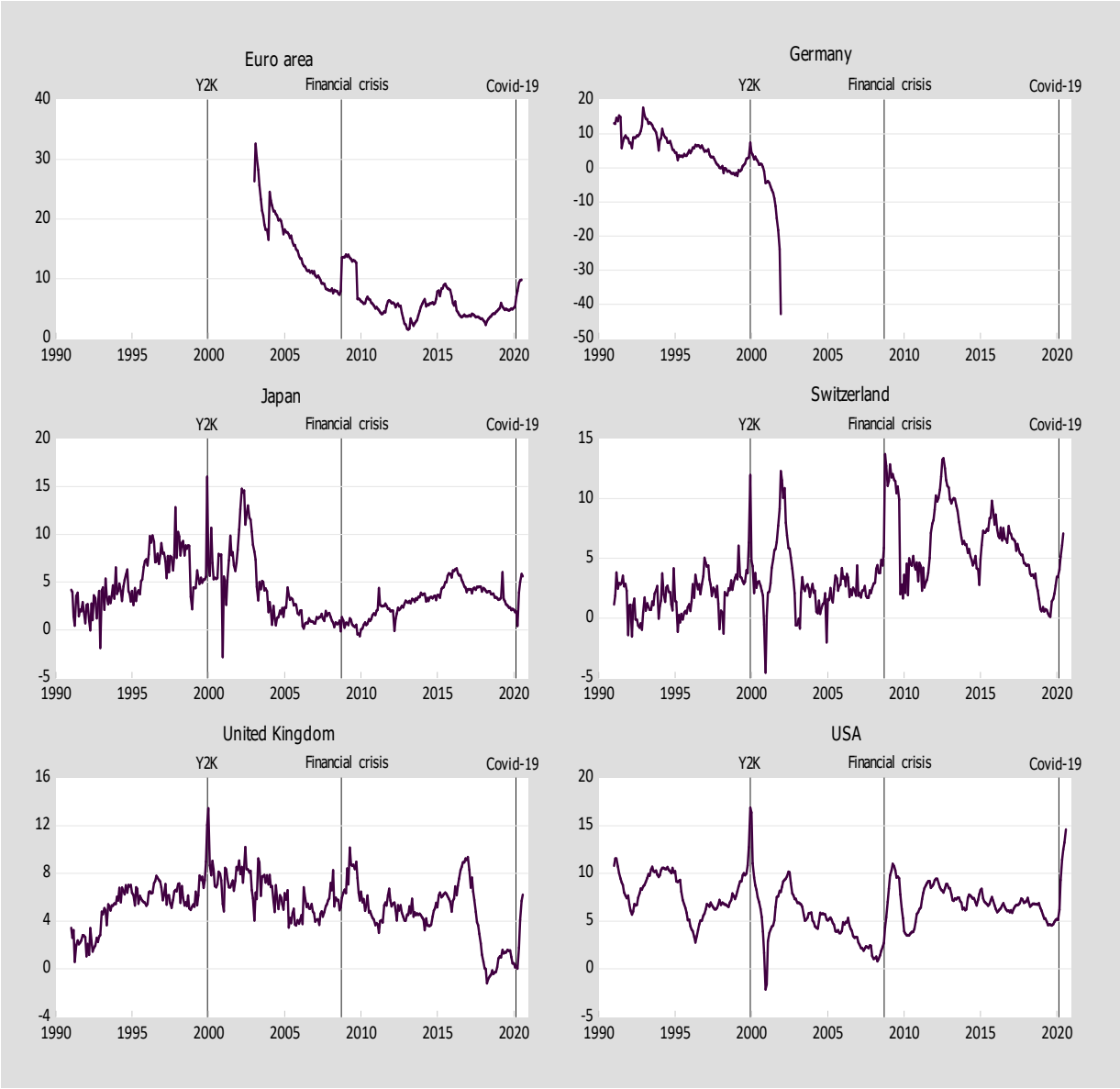
Notes: Index for M3, Jan 2007 = 100.

Source: OECD.

It is important to note that the stabilizing role of cash in times of a (confidence) crisis is more than just preventing the money stock from declining. A perfectly elastic provision of cash can also help to calm down banks' customers, especially the first in line who are typically more risk-averse than other depositors. In other words, by a sheer ample provision of cash at the outbreak of a crisis, the trust in the value of banks' book money can be potentially increased. A good example in this respect is the crisis in Greece from 2010-2015 which was not only a banking crisis in a narrow sense but more of a sovereign debt crisis which quickly scaled up to a confidence crisis of the whole Greek financial system (see chapter V.2).

However, the stabilizing role of cash is not limited only to banking or financial crises alone. Rösl & Seitz (2021, 2022) distinguish three different types of crises (technological crises, financial market crises, natural disasters) and analyse the demand for small and large banknote denominations since the 1990ies in an international perspective. Hereby, three prominent examples for each of the type of a global crisis were selected, namely the time around the turn of the millenium (Y2K) for a technological crisis, the financial crisis 2008 for its own and as an example for a crisis related to a natural disaster, the outbreak of Covid-19.

Figure 17: Annual growth rates of cash in circulation in selected countries in %



Notes: Data refer to cash or banknotes in circulation.

Source: Own chart with data from national central banks.

They find that cash demand always increased in times of crises over the past 30 years, regardless of the nature of the crisis itself (see figure 17). However, the type of crisis determines what kind of banknote denominations are relatively more in demand. Times of payment uncertainties are associated with an increased demand for small denominations, probably reflecting an elevated demand for transaction balances. By contrast, in times of financial crisis or general economic uncertainty, the increased demand for cash is largely the result of consumers taking precautionary actions and building up non-transaction balances; for this reason, there is greater demand for large banknote denominations.

But what makes cash so universal and special as a means of stabilizing the economy in times of economic and political tensions? Firstly, it is a physical means of payment which can still be used if cashless payment systems break down.[35] In the US, for instance, cash demand usually increases during the hurricane season even in regions that are not directly affected by the hurricane itself (Cheney & Rhine, 2006 and Smith, 2014). In that case, fears of a breakdown of power grids endanger the functioning of electronic payment systems. But cash demand can also increase purely due to doubts about the digital infrastructure in the case of computer program bugs (as in Y2K) or cyber-attacks on payment systems.

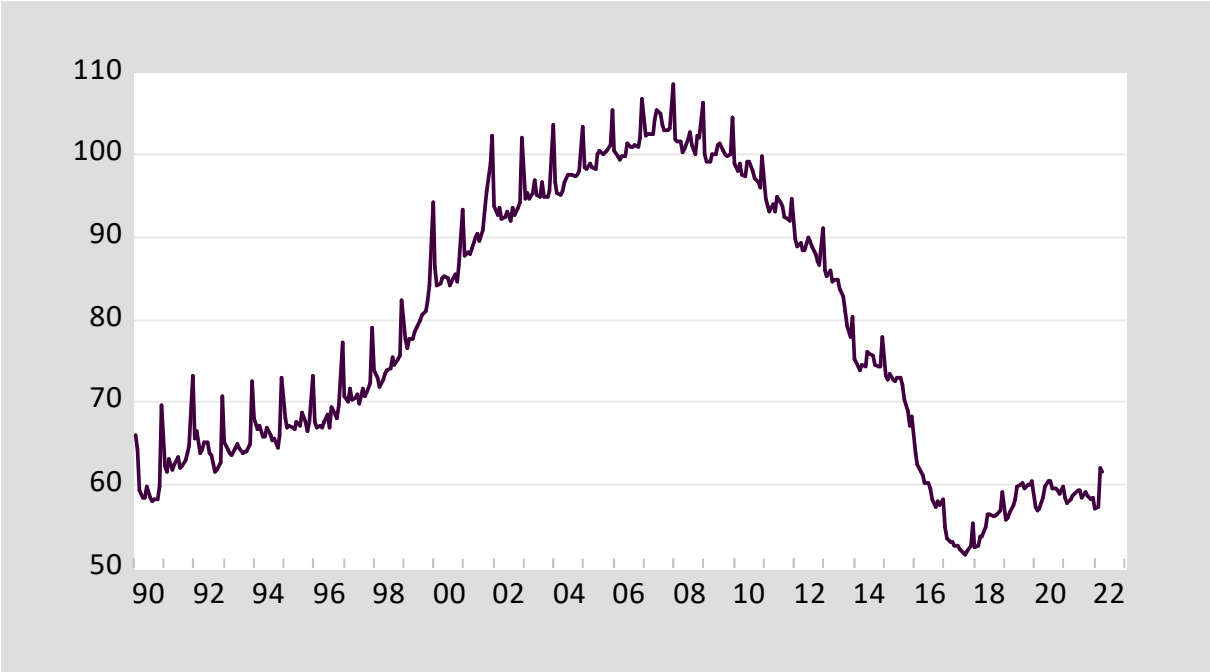
Secondly, cash is the most liquid store of value (Deutsche Bundesbank, 2016). Especially high value banknotes can be viewed as central bank issued interest-free public bonds and thus provide a high level of security with a potential use for payments on top. In addition, the legal tender status contributes to the store of value characteristic of cash as well. It increases the probability of acceptance as a means of payment not only at present but also in the future and, hence, safeguards future purchasing power.

To summarize, cash plays an important part in successful crisis management. It stabilizes the situation, especially for the public. The sheer possibility of having access to cash reduces uncertainty during a crisis on various levels and cash itself can be interpreted as a special kind of public service. In addition, a perfectly elastic provision of cash makes sure that total money supply in times of uncertainty or even turmoil remains stable and helps to avoid a downward spiral (vicious circle) possibly accelerated by a monetary contraction otherwise. However, for cash to fulfil this function in times of crises, a necessary precondition is its proper functioning in normal times. This includes access to and acceptance of cash. The former refers to the role of banks, the latter to the role of retailers. Therefore, one should have a critical view on suggestions and political actions that aim at restricting the use of cash and making cash unattractive.[36] Once payments in cash reach a critical lower level, it becomes less attractive for retailers to accept and for banks to supply and offer the possibility to access cash and deposit banknotes and coins. An alarming example in this direction is Sweden, which came in the years before the outbreak of the Corona pandemic already quite close to this lower threshold (see figures 4 and 18). The latest measures by official authorities (government, central bank) to reverse this trend already gains ground (see, e. g., Ingves, 2020). As shown in

[35] For the advantages of "physical" money see Ruberton et al. (2016).
[36] For a broader discussion on the pros and cons of cash, see Krüger & Seitz (2017), ch. 7.

figure 18 overall cash in circulation started to grow again since 2018. This development was mainly driven by large Swedish Krona (SEK) denominations. Even in Sweden, cash demand increased in 2020 in the course of the pandemic, but not as much as in other countries, also Scandinavian ones, which might be due to supply problems. By contrast, after the start of the war in Ukraine, cash demand rose in Sweden at an exceptional monthly rate of more than 8% in March 2022 (https://www.riksbank.se/en-gb/statistics/statistics-on-payments-banknotes-and-coins/notes-and-coins/).

Figure 18: Banknotes in circulation in Sweden (SEK bn)



Source: Sveriges Riksbank.

V. Case studies

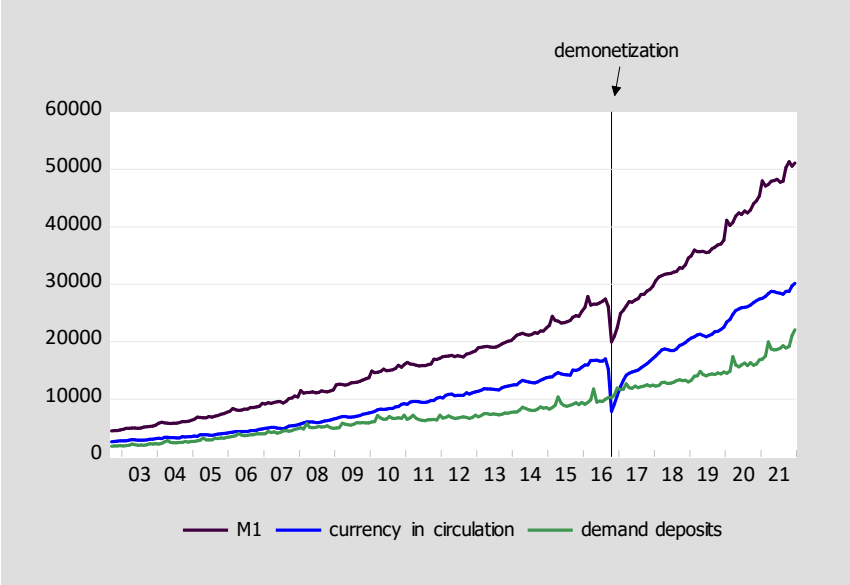
V.1. Demonetization in India

Demonetization can be defined as an act of stripping a currency unit (denomination) of its status as legal tender.[37] In practice, the government declares a certain coin or banknote or a whole series as being invalid from a future point in time.[38] A common motivation for such a step is the exchange of an old money for a new one with enhanced security features to limit counterfeits or to combat inflation by means of a currency reform. Unsurprisingly, such a step must be prepared carefully and communicated to the public in advance if frictions in the monetary system and in the economy in general shall be avoided. At any rate, the higher the intensity of demonetization of the existing money stock, the higher the probability of facing severe economic consequences afterwards. This is because demonetization per se leads to monetary contraction in form of a reduction of the domestic money supply (see chapter III).

V.1.1. Money supply in India

India is a country whose population is used to the advantages of cash payments (see chapter II.4). Since banknotes and coins are easily accessible, cash is currently the most important means of payment in India. As shown in figure 19, cash totaled ₹30,000 bn clearly outweighing demand deposits with just over ₹20,000 bn at the end of 2021.

Figure 19: M1 and its components in rupee (₹) bn



Source: Reserve Bank of India.

[37] See https://www.investopedia.com/terms/d/demonetization.asp.

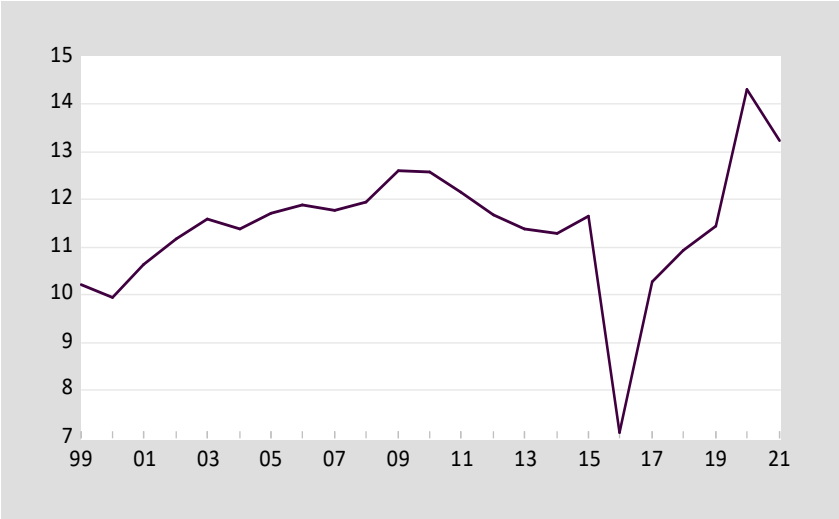
[38] For instance, the replacement of national currencies of the member states of the European Monetary Union by euro cash in 2002 was such an act of demonetization.

Figure 19 also shows that before 2008 both components of the total money stock M1[39] in India were roughly at the same level. Since then, however, cash demand grew at comparatively higher growth rates compared to book money, emphasizing the low relevance of digital payments in India. Pushing India towards a higher level of digitalization was reportedly one motivation behind the demonetization in 2016 although it obviously failed (see figure 19 and the remarks below).

V.1.2. The motivations behind the demonetization in India in 2016

On November 8, 2016, the Prime Minister of India, Narendra Modi, surprisingly announced on a television broadcast at 8:15 pm that his government will demonetize the two largest rupee denominations (₹500 and ₹1,000) of the current "Gandhi banknote series"[40] in circulation effective from midnight of the same day (see Modi, 2016).[41] It was also declared that the current ₹500 banknote was to be replaced by a newly designed one. The ₹1000 banknote, however, was not to be substituted by a note of equal value but a completely new ₹2000 banknote was to be issued by the Reserve Bank of India (RBI) instead. As the two demonetized notes constituted 86% of total currency in circulation (equivalent to around 11% of GDP), many private households suffered immediately severe liquidity constraints (Wadhwa, 2019) and the cash-to-GDP ratio dropped sharply (see figure 20).

Figure 20: Cash-to-GDP ratio in India (%)



Source: Reserve Bank of India.

[39] Monetary aggregate M1 is a measure of nonbank liquidity and comprises cash and demand deposits.
[40] The series was introduced by the Indian Reserve Bank in 1996 and the obverse of these banknotes prominently display the portrait of Mahatma Gandhi.
[41] Note that this was not the first demonetization in India in the 20th century, but that with the largest scope. Three others took place in 1946, 1954 and 1978. For details see https://www.toppr.com/guides/business-economics-cs/overview-of-indian-economy/demonetization/.

The official reasons given for this drastic measure were multifold (Modi, 2016, Lahiri, 2020): Firstly, in its fight against corruption, it would help the government to capture the national wealth accumulated through undeclared income ("black money"). Secondly, it would make huge amounts of counterfeit banknotes ("fake notes") worthless. Thirdly, demonetization was intended to be a means of pushing India toward a modern digitized country, which would be less reliant on cash, as, for instance, Pakistan.[42] This shift was also intended to have a negative influence on the size of the informal economy (Dasgupta, 2017). Fourthly, and related to the last point, forcing people to exchange their old high denomination banknotes into new ones via the banking system, also offers the chance to bring money into the formal tax network, decrease tax evasion and increase tax revenues. Furthermore, demonetization was aimed at fighting terrorism as criminals will be stripped of the purchasing power of their illegal cash balances. And finally, demonetization was intended to reduce prices of goods and services which were believed to be "artificially" high due to the "misuse of cash" (Modi, 2016).

V.1.3. A fatal experiment

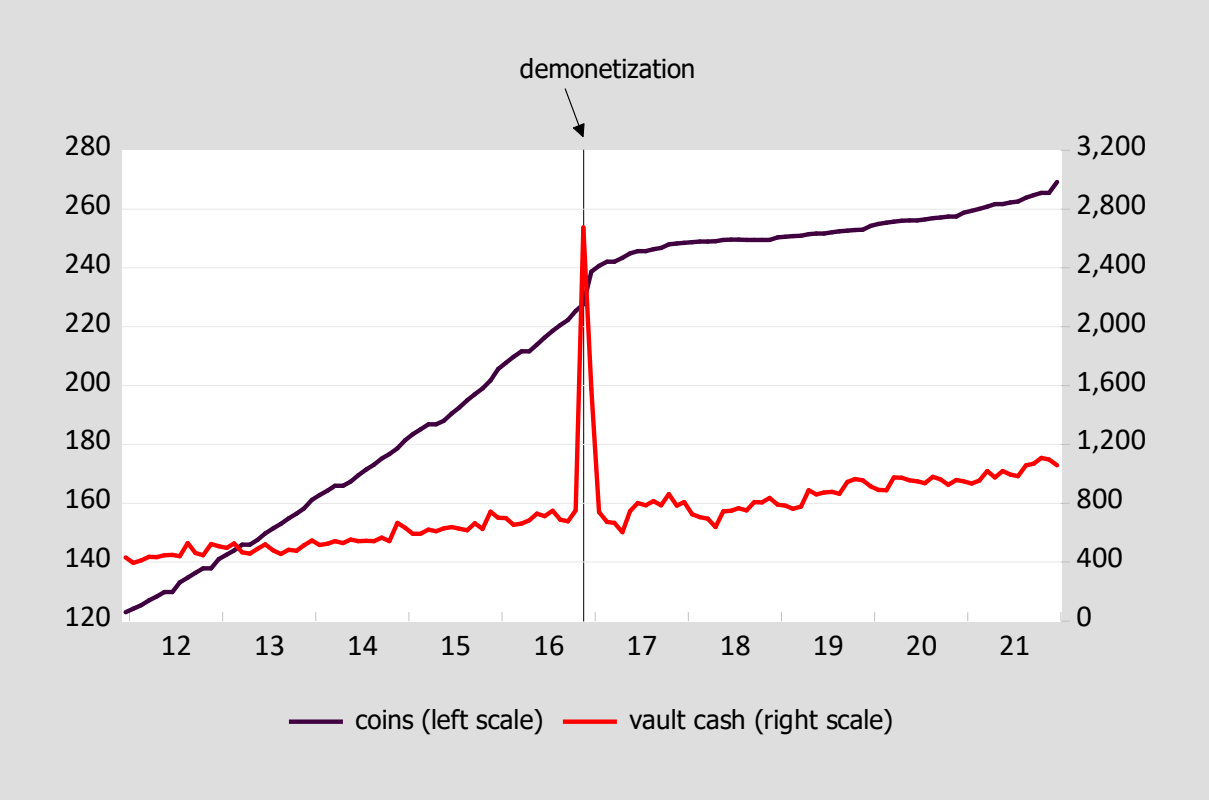
Unfortunately, the demonetization of the ₹500 and the ₹1,000 banknotes in autumn 2016 was ill-prepared. Due to poor communication and bad organization, it took a whole year for total currency in circulation to reach its pre-demonetization level (see figure 19).[43] Not communicating the demonetization, however, was part of the plan of combatting corruption and crime and, therefore, intended. On the logistical side, commercial banks were also surprised by the government decision and therefore closed on November 9, 2016 – the day after the announcement of the demonetization – to give them time to stockpile the newly issued rupee notes (see figure 21).[44]

[42] A critical cost-benefit-analysis of the promotion of digital rather than cash payments for the case of India can be found in Chandrasekhar & Ghosh (2017).

[43] In the course of 2017, the Reserve Bank of India announced that about 99 % of the demonetized banknotes had flown back to it through the commercial banking system (Reserve Bank of India, 2018).

[44] The increase in the liquidity of banks also posed some challenges for the monetary policy operations of the Reserve Bank of India (RBI), see Mohan & Ray (2018), ch. 5. They also show that the RBI's profits declined form 0.5 % of GDP to 0.2 % of GDP and its printing costs increased by a factor of 3.

Figure 21: Vault cash and coins in ₹bn



Source: Reserve Bank of India.

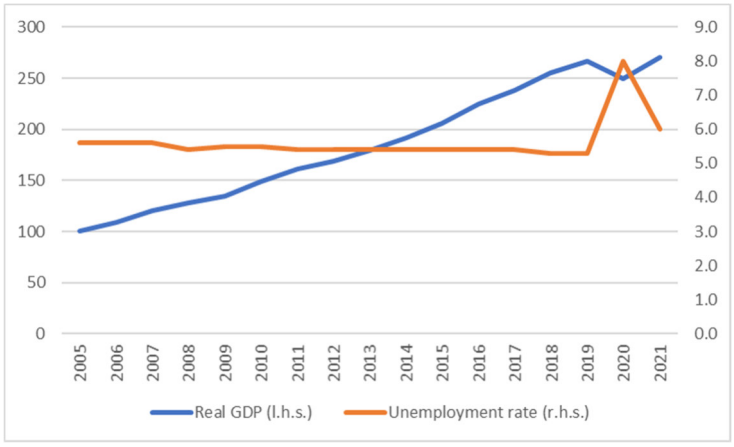
There were two ways for money holders in India to regain the purchasing power of their devalued banknotes. They could either deposit the old notes with banks for book money (if the cash holder was eligible for such a bank account and withdraw new banknotes later if desired) or the demonetized banknotes could be exchanged directly against legal tender banknotes over bank counters, both until December 31, 2016, the latest. However, Indian banks were by far not able to meet the immensely increased demand for cash by their customers as they faced severe problems: There were – amongst other obstacles – logistical problems in delivering the banknotes to rural areas (Vimukt, 2017), technical problems of ATMs supplying the new banknotes (Tharoor, 2016), and daily limits for cash withdrawals set by the Indian government (Banerjee & Kala, 2017).[45] As there was especially a limited supply of the new highly demanded ₹500 note ATMs ran quickly out of cash. Consequently, there were long and lasting queues in front of ATMs and bank counters which were very strenuous for the people waiting and even resulted in deaths.[46] Another repercussion of the frictional

[45] The limit was ₹4,000 per person (around € 50) from November 8 to 13, ₹4,500 from November 14 to 17, and ₹2,000 from November 18 to 25, see various Indian government press releases (Banerjee et al., 2018, appendix A). Contrary to earlier statements, the exchange of banknotes was stopped completely on 25 November.
[46] See for instance, https://timesofindia.indiatimes.com/india/2-die-in-country-wide-rush-to-junk-banned-notes/articleshow/55374158.cms.

cash exchange was that vault cash of banks increased drastically and even coins in circulation rose by an exceptional amount of ₹15 bn due to a lack of other means of payments (see figure 21).

From a macroeconomic perspective, demonetization not only caused cash in circulation to decrease in India at the end of 2016, but also the money stock M1 as the frictions in the exchange process led only to a minor increase in demand deposits with banks (see figure 19).[47] This enormous monetary contraction by 40% even exceeded the rate observed during the Great Depression in the US in 1929 – 1933 (33%, see chapter III.1). Of course, the monetary contraction period of "only" two months in India (November/December 2016) was much shorter as in the US in the 1930ies. But from a theoretical point of view, negative consequences on the Indian economy were still to be expected.[48] Looking at the official figures on unemployment and real GDP in India, however, no such negative effects can be observed: Indian production continued to increase, and unemployment rates decreased as if nothing had happened (see figure 22).

Figure 22: Unemployment rates and real GDP in India



Notes: Unemployment in % of total labor force. Real GDP Index (2005 = 100).

Sources: World Bank and Federal Reserve Bank of St. Louis.

This is, however, in stark contrast to the experience by the Indian public as reported repeatedly by the press.[49] Economic studies on the real effects of the demonetization on the Indian economy also draw a very different picture. Chodorow-Reich et al. (2018, 3) estimate that demonetization induced at least a 2-percentage point decline in GDP in the quarter of

[47] In addition, there was also a slight increase in savings deposits by post offices, see Lahiri (2020), 57.
[48] Note that the RBI was supposedly not in favor of demonetization, see Lahiri (2020), 60
[49] See for instance https://www.financialexpress.com/jobs/now-demonetisation-set-to-cost-400000-jobs/454305/.

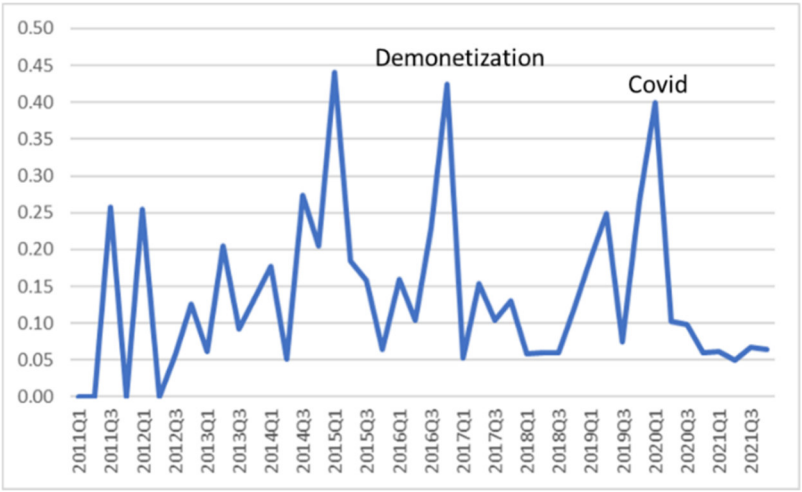
demonetization relative to the counterfactual of no demonetization. Wadhwa (2019, 25) shows that demonetization led to a decline in household consumption shortly after its imposition although the effect was only temporary. However, it was the only case since the turn of the millennium that real private consumption growth decreased in the last quarter of a year and became negative in the first quarter of the following year. Karmakar & Narayanan (2019, 1) find that households without bank accounts experienced a significant decline in income and expenditure in December 2016 compared to households with bank accounts. Lahiri (2020, 70) reports a decline of employment by more than 3 million people and a reduction of the labor force (due to emigration) of around 15 million people from November 2016 to February 2017. The *official* unemployment rate, however, revealed no effect and continued its declining trend (see figure 22). Further empirical evidence shows that the demonetization had drastic negative consequences especially for the poor who worked in the informal sector (Fouillet et al., 2021, Zhu et al., 2017).[50] But the Indian government also failed to achieve the other goals of demonetization. As mentioned above, nearly 100% of the demonetized cash flew back to the RBI indicating that "black money" was indeed washed by demonetization. Moreover, there was only a marginal increase in the tax base after 2016 (Lahiri, 2020, 62ff). Therefore, the direct effect of seizing undeclared wealth tended to zero and the effects via the tax base were also negligible.[51] In addition, the goal of making counterfeit banknotes worthless was quite moderate. This was suspected right from the start as the estimated shares of counterfeit currency in the form of ₹500- and ₹1,000 banknotes were quite low (Lahiri, 2020, 57). Did demonetization bring about a further digitization of India? Indeed, digitization increased since 2016. However, demonetization did not change the trends that prevailed before (Lahiri, 2020, 64ff). Yet, Aggarwal et al. (2020) show that regions more heavily hit by the demonetization shock exhibit a greater increase in digitization and that the effects were less pronounced in districts with more informal workers and rural households. This is in line with the observation that districts with higher deposit growth during the demonetization period recorded higher levels of economic activity in the following year (Chanda & Cook, 2019).

[50] Some argue that demonetization was primarily politically motivated. Ahead of forthcoming elections, it was meant to prevent parties not in government from using banknotes or goods purchased with cash to buy electors' votes (Martin & Picherit, 2020).

[51] Das et al. (2022) find that the forced switch to electronic payments led to an increase of reported sales of firms, but only mixed evidence on total tax payments.

The huge demonetization complicated the day-to-day monetary transactions of the Indian population enormously and it resulted in a rise in uncertainty in India which was even slightly bigger than that during Covid-19 in 2020 (see figure 23). The situation only normalized after cash in circulation returned to pre-demonetization levels and the supply-driven cash shortage problems disappeared at the end of 2017/beginning of 2018 (see figure 19).

Figure 23: Uncertainty index for India and demonetization

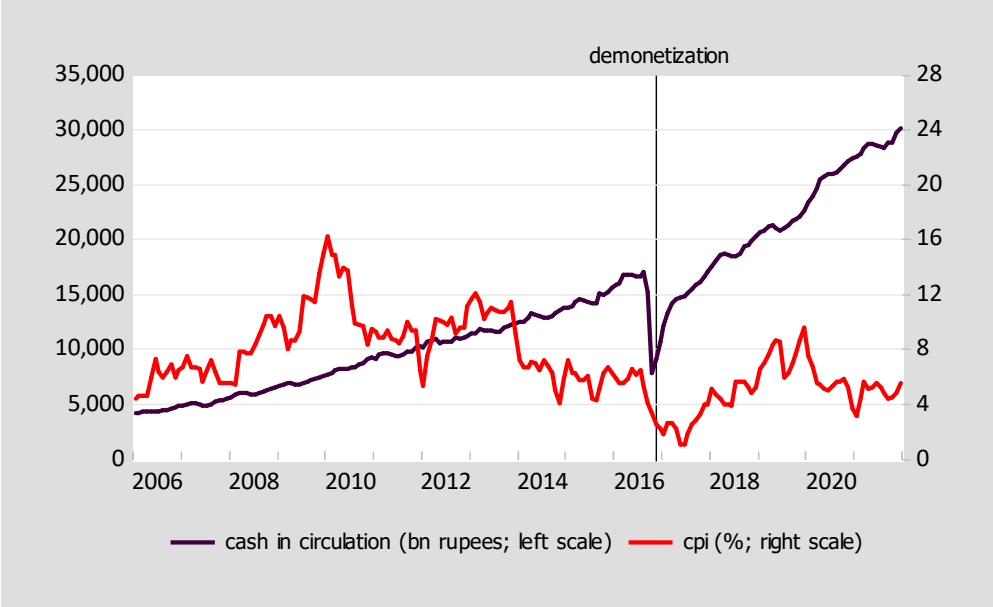


Notes: Uncertainty is measured by the frequency of the word "uncertainty" in the quarterly Economist Intelligence Unit country reports of the IMF for India, see Ahir et al. (2022).

Source: World uncertainty index: Ahir et al. (2022).

Modi (2016) stated in his address to the Indian people on November 8, 2016, that in his believe "the misuse of cash has led to artificial increase in the cost of goods and services like houses, land, higher education, health care and so on." This obviously implied that once the demonetization was successfully completed, prices were expected to fall or at least inflation rates will start to decline. In reality, however, consumer price inflation (cpi) did increase right after the demonetization, from around 2 % at the beginning of 2017 to more than 8 % in mid-2019 (see figure 24). Admittedly, it has to be borne in mind that India introduced a national Good and Services Tax (GST) in the second half of 2017 which replaced a multitude of disparate regional indirect taxes. This complicates the assessment of the effects of demonetization alone. At any rate, the decline in inflation which was hoped for didn't happen.

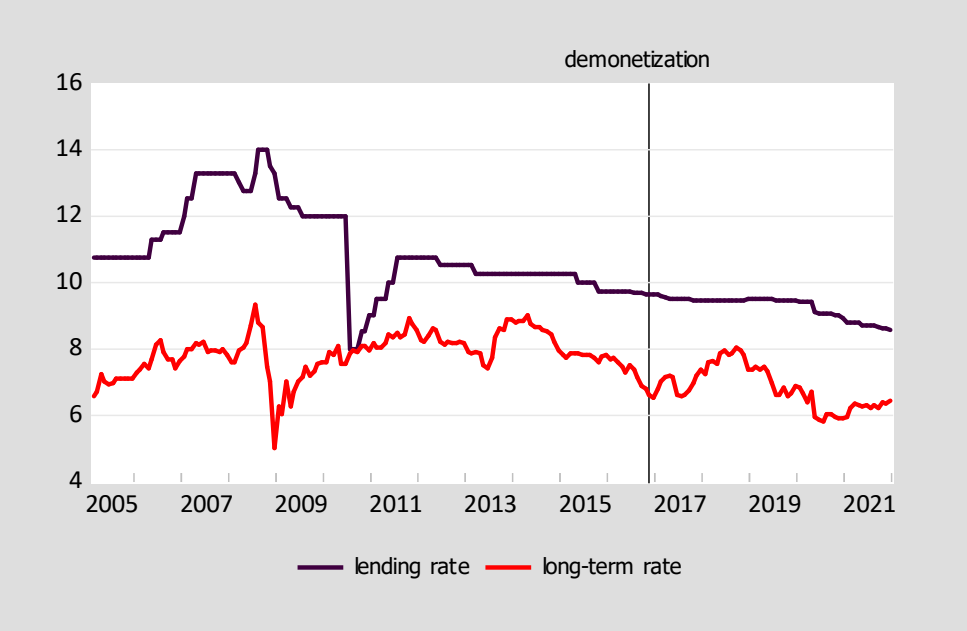
Figure 24: Cash in circulation and inflation in India (%)



Source: Reserve Bank of India.

Lahiri (2020, 69) pointed out that a possible favorable side effect of the demonetization could have been a decrease in bank lending rates if larger parts of cash would have been permanently deposited with banks. Despite some increase in deposits with banks during the demonetization period (see figure 19), bank interest rates did not show a sharp downward movement after the demonetization took place (see figure 25), nor did bank credit. In contrast, long-term interest rates even went up.

Figure 25: Interest rates in India (%)



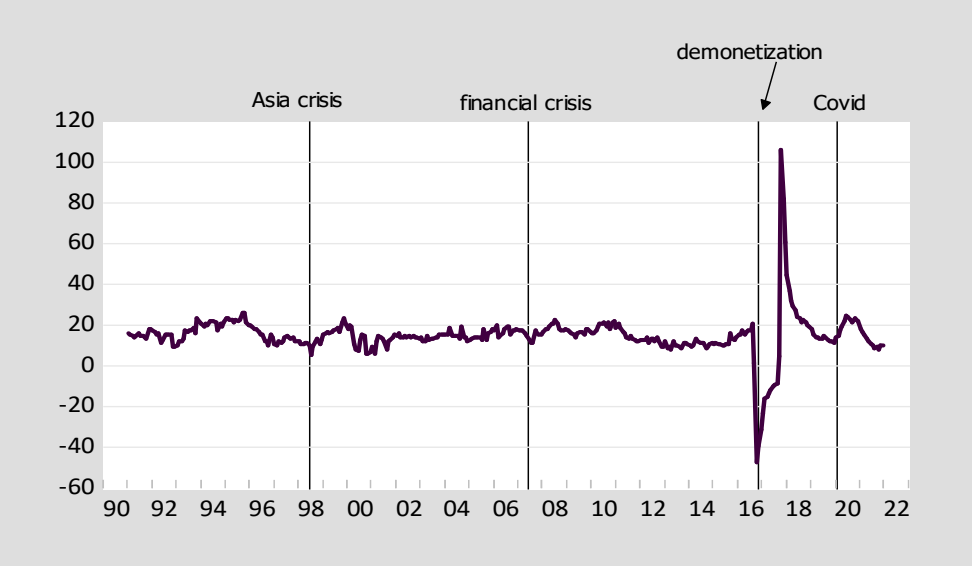
Notes: long-term rate: 10-year government bond yield; lending rate: bank lending rate.

Source: Reserve Bank of India.

V.1.4. Cash demand in India in times of crisis

Demonetization was not the only crisis India was exposed to in the last decades, but it was the only one that was caused by cash shortages. Als already demonstrated in chapter IV, cash is an ideal means to combat crises if provided by the central bank in a perfectly elastic way. And this is exactly what the Indian Reserve Bank did when its country faced the Asian crisis of 1998 (see Carson & Clark, 2013), the financial crisis which already started in India in 2007 (see chapter III.2, Joseph, 2009, and Kumar & Vashisht, 2009) and the Covid-19 crisis (see Dhingra & Ghatak, 2022, Rösl & Seitz, 2022). Figure 26 shows cash in circulation and different crises in India.

Figure 26: Cash in circulation and different crises in India (annual growth rates, %)



Source: Reserve Bank of India.

The Asian crisis had its origin in South-east Asia but was transmitted to India via trade channels, repercussions on capital flows and domestic policy responses. As might be expected, increased uncertainty at that time boosted cash demand for the next two years as shown in figure 26. By contrast, however, the great financial crisis of 2007/08 had an only modest direct effect on Indian cash demand as its financial sector was not narrowly integrated with the global financial system. Covid-19 caused the worst recession in India since its independence. In 2020, private consumption decreased even more than GDP and especially rural poverty and unemployment increased drastically. Cash demand, however, increased sharply in India after the outbreak of the SarsCov-2 virus. As other central banks around the world (see chapter IV), also the RBI met this demand for banknotes and coins quickly and in a fully elastic way. And

this – together with fiscal and other monetary policy support programs – stabilized the situation and calmed the population.

In sum, the government-led demonetization in India forced the Indian central bank to implement the policy without being adequately prepared. The process of remonetizing the country with the new banknotes proved to be slow and severely disruptive for regular commercial transactions and the population. The situation only stabilized after currency in circulation was back to its pre-demonetization level, with newly issued notes and the RBI again supplying cash in a perfectly elastic way. And although demonetization was officially intended as a measure against the relatively wealthy with undeclared wealth, it seems that it may instead have disproportionately affected the relatively poorer people working in the informal sector (Lahiri, 2020, 73).

V.2. Crises in Greece – from ample cash provision to cash restrictions

V.2.1. The Greek Tragedy: over a decade full of crises

This section intends to give a short overview of the economic developments in Greece over the past 25 years and provide useful background information for the following analysis of cash demand and cash supply by the Greek central bank during various crises. Hereby, we separate five periods which are characterized by:

1. interest rate convergence before the introduction of euro cash in Greece (6/1995 – 12/2001),
2. lasting upswing and real appreciation of the Greek economy after joining the euro area (1/2002 – 9/2008),
3. first Greek banking/sovereign debt crisis (10/2008 – 9/2014),[52]
4. second banking/sovereign debt crisis (10/2014 – 12/2019),
5. Covid crisis (1/2020 – 3/2022).

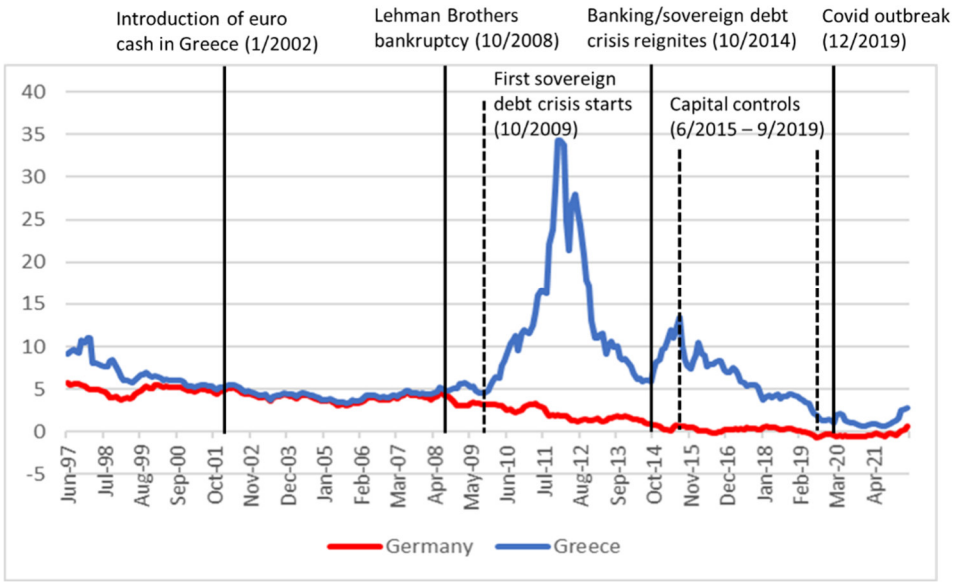
As shown in figure 27, four years before Greece introduced the euro in 2001 capital market interest rates were roughly double as high as in Germany.[53] However, as a possible Greek admission to the European Monetary Union (EMU) became more likely over the years, interest

[52] For a more comprehensive analysis of the first sovereign debt crisis in Greece see Sinn (2014) and Mink (2018). A timeline of the Greek financial crisis can also be found at https://www.esm.europa.eu/publications/safeguarding-euro/runaway-train-greece-sounds-alarm.

[53] Greece was not allowed to join the euro area from its start on 1 January 1999 since it didn't pass the convergence criteria of the EU treaty (Maastricht-Treaty), see European Monetary Institute (1998, 16). In addition, two years after entry it became apparent that the data on government debt and deficit reported by the Greek government were false, see EUROSTAT (2004).

rates converged to the German benchmark rates in phase 1 (6/1995 – 12/2001). Market participants obviously believed at that time that the euro will be more stable than the national Greek Drachma and the risk of default of public debt in Greece was low either due to future sound public finances and/or possible bailouts by other euro area countries in case of state insolvency (Dolls et.al (2018), 16).

Figure 27: 10-year Government bond yields in Greece and Germany in %

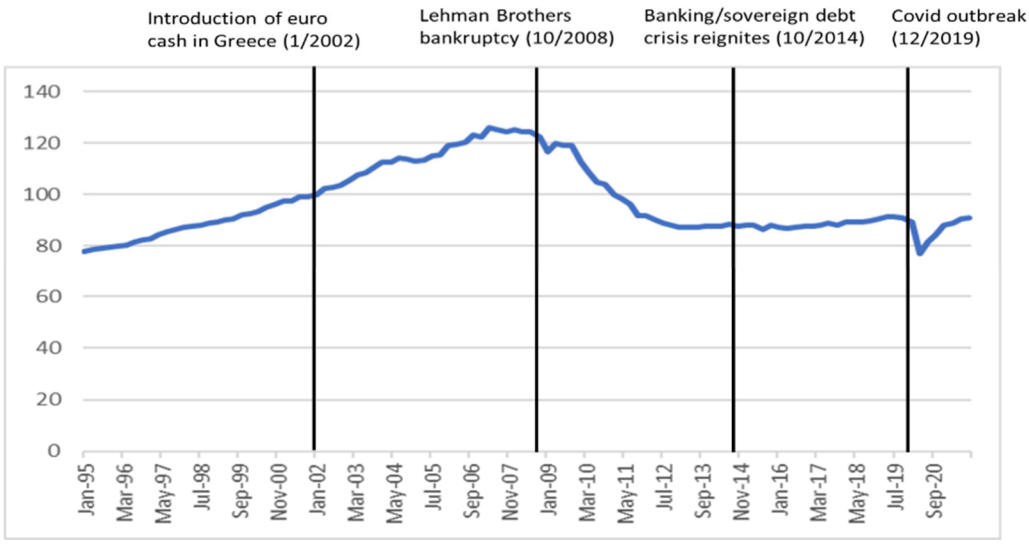


Notes: Monthly data.

Source: Deutsche Bundesbank and Federal Reserve Bank of Saint Louis.

The historically low capital market rates prolonged the already existing credit-driven boom in the Greek economy (see figure 28) in phase 2 (1/2002 – 9/2008).

Figure 28: Real GDP in Greece

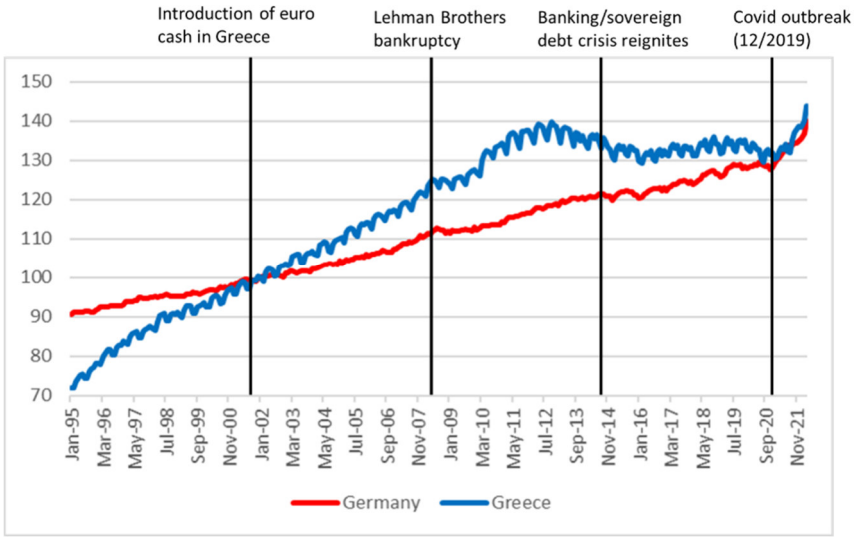


Note: Quarterly data. Index Q1/2002 = 100.

Source: Federal Reserve Bank of Saint Louis.

This led to comparatively high inflation rates and a corresponding real appreciation with a steady loss of international competitiveness of the Greek economy (see figure 29 in which Germany was again chosen as a benchmark country).[54]

Figure 29: Consumer Price Index for Greece and Germany



Note: Data not seasonally adjusted. Index: 1/2002 = 100.

Source: Federal Reserve Bank of St. Louis.

The steep economic upswing in Greece came finally to a halt at the end of 2006 followed by two years of stagnation. Unfortunately, the comparatively low interest rates in an environment of a booming economy with high inflation rates were not used by the Greek government at that time to reduce its high sovereign debt levels which stood around 100 percent of GDP for years, see figure 30.[55]

After the outbreak of the global financial crisis in October 2008, Greece went into steep recession (see phase 3, 10/2008 – 9/2014, in figure 28). Greek banks needed capital injections, firms and private households asked for financial assistance from the Greek government which could initially be financed by financial markets. In October 2009, however, the newly elected Greek government made an official confirmation that the past data reported on its sovereign debt and deficit were again not accurate.[56] This led Greek government bond yields to rise

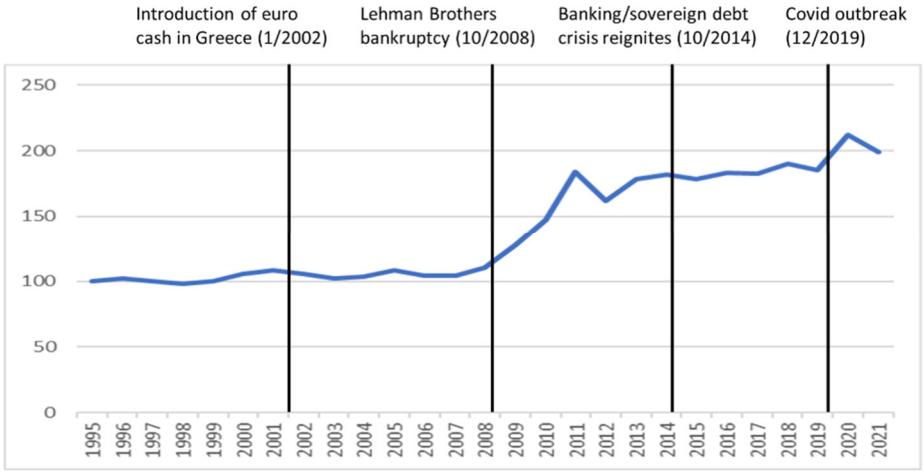
[54] Germany is one of Greece's largest trade partners, see https://wits.worldbank.org/.

[55] Note that the Stability and Growth Pact would have called for measures to reduce the government debt ratio to 60% but was not implemented by Greece. See Article 1 of Protocol 12 on the Excessive Deficit Procedure and Council Regulation (EC) 1466/97 on the strengthening of the surveillance of budgetary positions and the surveillance and coordination of economic policies (the preventive arm of the Stability and Growth Pact).

[56] It announced on October 21, 2009, that the country's budget deficit was much higher than initially reported (7.7% instead of 5% of GDP) and the Greek deficit ratio for 2010 was projected to be around 12.5% of GDP instead

promptly and marked the beginning of the first sovereign debt crisis (see figure 27). In addition, it caused some bitterness among European partner countries who demanded from Greece structural reforms and a strict austerity policy.[57]

Figure 30: Government debt in Greece as percentage of GDP



Notes: Annual data.

Source: Federal Reserve Bank of St. Louis.

In May 2010, the first of ultimately three rescue packages for Greece were provided by EU countries (including bilateral credits) and the IMF.[58] Although some success was achieved, the overall assessment of the Greek reform by the Troika were regarded as not being sufficient.[59] It concluded in October 2011 that Greece will not be able to return to financial markets the next year and an additional massive bailout will be needed soon. This led to further increases in Greek government bond yields eventually reaching its peak of 34.3% pa (monthly average) in December 2011 (see figure 27). Although a second European rescue package and a substantial haircut[60] of Greek government debt in spring 2012 (see figure 30) helped to

of 3.7% of GDP previously announced. See https://www.esm.europa.eu/publications/safeguarding-euro/runaway-train-greece-sounds-alarm.

[57] The European Commission already started an Excessive Deficit Procedure in February 2009, see European Commission (2009).

[58] It was agreed in a "Memorandum of Understanding" that the payouts will by partially and in succession dependent on successful structural reforms in Greece. For a comprehensive overview on the financial assistance to Greece, see https://ec.europa.eu/info/business-economy-euro/economic-and-fiscal-policy-coordination/financial-assistance-eu/which-eu-countries-have-received-assistance/financial-assistance-greece_en. Payments to Greece from the European Stability Mechanism (ESM) can be found here: https://www.esm.europa.eu/assistance/greece.

[59] The Troika consisted of experts from the European Central Bank, the European Commission and the International Monetary Fund.

[60] The first haircut of Greek sovereign debt in March 2012 had a volume of €107 bn and was solely financed by private investors which had to write off 53.5% of their claims. However, taking also into account additional cuts in interest rates and credit prolonging, private write-offs increased de facto to 75% of original claims. In November 2012, a second (indirect) haircut took place versus public creditors totaling further €47 – 59 bn. For details see Meyer (2018).

somewhat reduce the risk premia on Greek bonds for a short period of time, yields went up again in May 2012 until ECB's President Mario Draghi promised to do "whatever it takes to preserve the euro" in a speech in London on July 26, 2012. On top, the following decision of the Governing Council of ECB on the Outright Monetary Transactions (OMT) program in September 2012 implying unlimited purchases of sovereign bonds at the secondary market if needed[61] calmed markets and Greek bond yields continued to decrease to pre-crisis levels in September 2014 (see figure 27). In October 2014, however, the Greek banking/sovereign debt crisis reignited again, marking the beginning of phase 4 (10/2014 – 12/2019) in our analysis. Rumours about a need for a third international rescue package for Greece and a newly elected Greek Government which expressively refused structural reforms demanded by its international creditors resulted in an increase in bond yields again up to unsustainable levels of 13.5% pa in mid-2015 (see figure 27). At this time, the Greek government was forced to introduce comprehensive capital controls and agreed finally to the demanded reforms which led to a third rescue package for Greece and relaxed the tensions on the financial markets in the years to come. In August 2018, Greece successfully completed its third economic adjustment program and just over one year later the last capital controls were abolished. In December 2019, however, the SarsCoV-2-virus broke out in Wuhan (China) marking the beginning of a new global crisis period (phase 5). Consequently, real GDP in Greece went down but recovered relatively quickly to the pre-crisis level in line with global developments (see figure 28). However, government debt increased again, but this time government bond yields remained largely unaffected hereby (see figures 27 and 30).

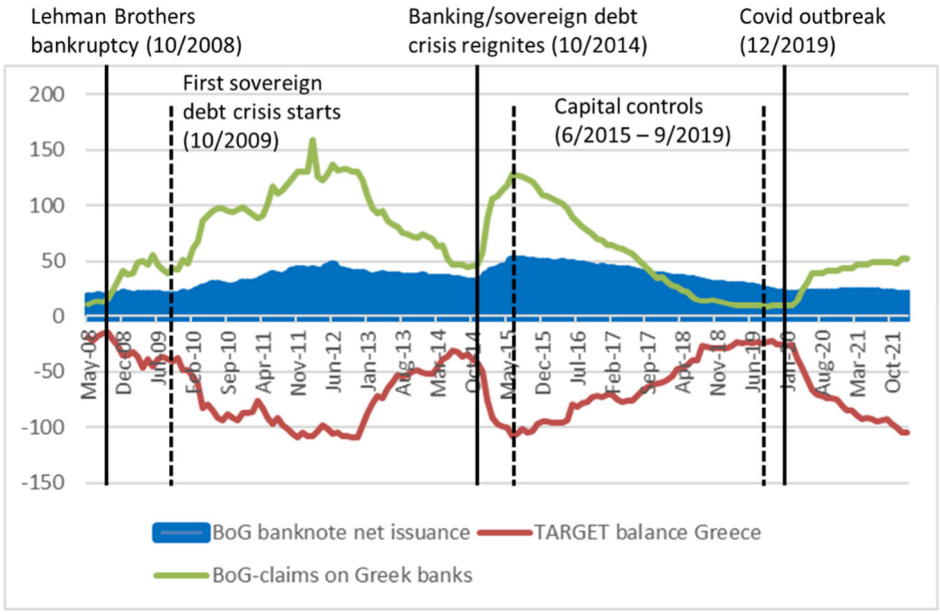
Regarding monetary policy, the ECB cut interest rates quickly after the outbreak of the global financial crisis in October 2008 and provided European banks with additional reserves (see chapter III.2, figures 11 and 12) by fully allotted fixed rate tender operations.[62] On a country level,[63] the Bank of Greece (BoG) acquired by this means respective claims on the domestic banking system which rapidly went up from €16.2 bn in September 2008 to €55.3 bn in June 2009 (see figure 31).

[61] See press release of the ECB on 6 September 2012, https://www.ecb.europa.eu/press/pressconf/2012/html/is120906.en.html

[62] Later, also substantial purchases of securities were conducted by the Eurosystem. See several ECB Monthly/Economic Bulletins since October 2008, https://www.ecb.europa.eu/pub/economic-bulletin/mb/html/index.en.html.

[63] Note that the monetary policy of the ECB is implemented by the national central banks of the Eurosystem. For details see https://www.ecb.europa.eu/mopo/implement/html/index.en.html.

Figure 31: Claims of BoG on Greek banks, net banknote issuance by BoG and Greek TARGET balance in € bn.



Source: Bank of Greece and ECB.

Greek banks, in turn, took the additional liquidity to finance cross border payments as indicated by the negative Greek TARGET balance.[64] This was possible because the BoG provided extraordinary reserves to the domestic banking system via the "emergency liquidity assistance" (ELA).[65] At times, this source of central bank money outside the normal channels of the ECB/Eurosystem was even the main refinancing tool used by Greek banks after effectively being cut-off from the European money market in 2012 (see figure 32). Somewhat surprisingly, however, cash demand in Greece didn't react at all in the first year since the outbreak of the global financial crisis (see figure 31). This is in stark contrast to total net issuance of euro banknotes by the Eurosystem of which other National Central Banks like the Deutsche Bundesbank showed an enormous increase.[66] Obviously, the Greek population didn't question the solvency of the domestic banking system at that time. This changed, however, drastically after the outbreak of the first sovereign debt crisis in autumn 2009. Net

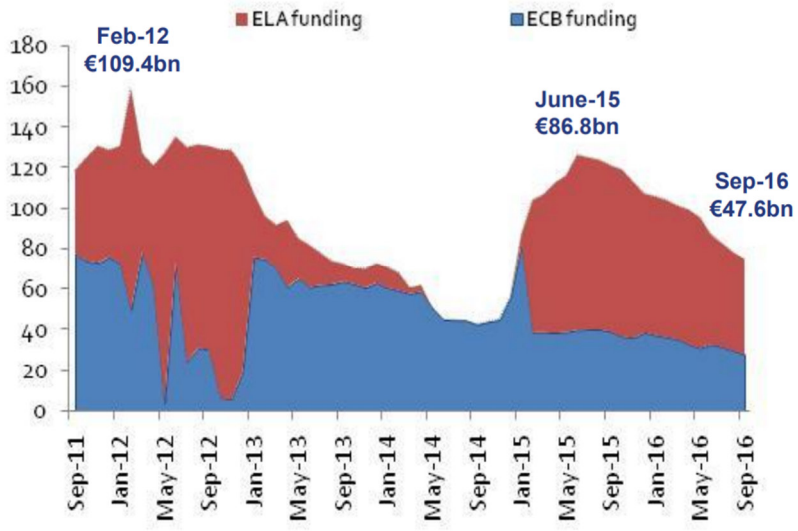
[64] TARGET and later its successor TARGET2 is an acronym for (the second generation of) the **T**rans-European **A**utomated **R**eal-time **G**ross settlement **E**xpress **T**ransfer system and is the payment system used by Eurosystem central banks for the quick settlement of euro payments in real time. For more details see https://www.bundesbank.de/en/tasks/payment-systems/target2. On the discussion of TARGET balances see for instance Sinn & Wollmershäuser (2012), Fuest & Sinn (2018), Deutsche Bundesbank (2017b), Hellwig & Schnabel (2019).

[65] For the latest information on the ELA-Agreement see ECB (2020b). On the discussion of providing liquidity to the domestic banking system by the NCBs in parallel to the monetary policy operations of the ECB see for instance Hansen & Meyer (2020).

[66] Annual growth rates of total banknotes in circulation by the Eurosystem went up from 7.3% in October 2008 to 13.7% in January 2009. See also figures 17 and 33.

issuance of banknotes by the BoG more than doubled from €18.4 bn in October 2009 to €45.4 bn in June 2012.

Figure 32: Refinancing structure of Greek banks during sovereign debt crises in € bn.



Source: Eurobank (2016), 39.

This process changed once the first sovereign debt crisis calmed down. Greek banks got access to the European money markets again and with inflow of funds from abroad they were able to pay back large parts of their central bank credit. But at the outbreak of the second sovereign debt crisis in 2015, history repeated itself. The BoG again provided ample liquidity (mostly by means of ELA) which was used to finance capital flight and cash withdrawals by the population (see figures 31 and 32).[67] After the imposition of capital controls by the Greek government in June 2015 both came to a sudden halt. Cash withdrawals were limited to €60 per individual per day and bank transfers from Greek banks to foreign banks were restricted and needed approval by Greek authorities.[68] After huge political tensions in Greece even resulting in a referendum on the internationally demanded structural reforms and ongoing heated arguments with the "Eurogroup",[69] the Greek government finally declared its commitment to continue with the implementation of the memorandum of understanding. The latter enabled payouts from a third European rescue package and calmed the situation: Greek bond yields

[67] On 6 July 2015, however, the ECB decided not to allow a requested enlargement of ELA credits by the BoG over the already existing limit of €86.8 bn. See https://www.ecb.europa.eu/press/pr/date/2015/html/pr150706.en.html.

[68] For more details see Eurobank (2016b, 2) and Bank of Greece (2017).

[69] The Eurogroup is an informal body where the ministers of the euro area member states discuss matters relating to their shared responsibilities related to the euro. For more details see https://www.consilium.europa.eu/en/eurogroup/.

went steadily down over the following years (see figure 27), Greek banks got access to the European money market again resulting in inflow of funds from abroad, and Greek citizens reduced their cash holdings to a level before the first sovereign debt crisis in 2010 (see figure 31) even when capital restrictions were gradually lifted over time and were finally abolished in 2019.[70]

After the outbreak of the Corona crisis, the ECB again provided the European banking system with ample liquidity. In addition to long-term fixed rate tender operations additional reserves were provided by the Eurosystem in terms of purchases of private and public sector securities.[71] This so-called Pandemic Emergency Purchase Program (PEPP) totaling €1,850 bn was initiated in March 2020 and is mostly implemented by the national central banks of the Eurosystem.[72] This implied, however, that purchases of securities by the BoG from holders outside Greece eventually led to an increase in its (already) negative TARGET balance.[73] Hence, the crisis related increase in Greeks' (negative) TARGET balance shown in figure 31 was this time not associated with capital flight.[74] Although cash demand increased at the beginning of the Covid crisis to some extent, a lasting effect on net issuance of banknotes by the BoG was not observed (see figure 31).

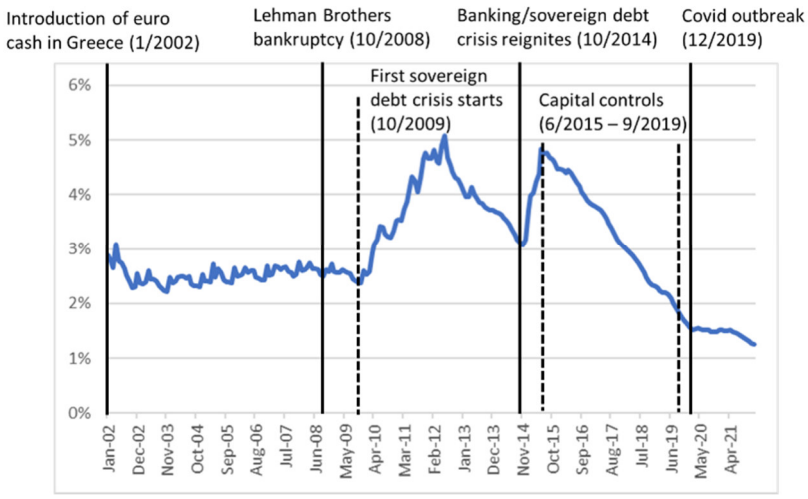
V.2.2. Euro-cash supply in Greece

In the European Monetary Union, euro banknotes are put into circulation only by the national central banks (NCBs) of the Eurosystem.[75] At the end of 2021, total banknotes in circulation amounted to €1,544 bn of which only €20 bn were issued by Greek monetary authority. Figure

[70] Restrictions on cash withdrawals were terminated on 1 August 2018 and on cross-border bank transfers on 1 September 2015.
[71] See https://sdw.ecb.europa.eu/reports.do?node=10000027.
[72] For details see https://www.ecb.europa.eu/mopo/implement/pepp/html/index.en.html.
[73] If the counterparty is located in the euro area, the BoG gets the bond as an additional asset and a corresponding TARGET liability against the central bank of the country in which the seller of the bond is located. If the seller resides outside the euro area and the bond is brought to the euro area by selling it first to a bank outside Greece but inside the euro area (for instance to a German bank in Frankfurt) then the BoG also gets a TARGET liability versus a Eurosystem-NCB (in this case against the Deutsche Bundesbank).
[74] A further indication for this is the fact that the spread between Greek and German government bond yields also hardly widened after the beginning of the Covid crisis (see figure 27).
[75] The Eurosystem consists of the European Central Bank (ECB) and currently 19 national central banks (NCBs) of all member states of the European Monetary Union. The ECB as an institution has also the right the issue banknotes but refrains from doing it. The item "banknotes in circulation" in the ECB's balance sheet does not reflect the actual net issuance of banknotes by the ECB. For details see European Central Bank (2022, 28ff.) and the Decision of the European Central Bank on 13 December 2010 on the issue of euro banknotes (ECB/2010/29; 2011/67/EU). The right to issue euro coins, however, lies within the competence of the national governments of the euro area. For further details see https://ec.europa.eu/info/business-economy-euro/euro-area/euro-coins-and-notes/euro-coins_en.

33 shows the share of banknote net issuance by the BoG in total banknotes in circulation of the Eurosystem since the introduction of the euro in 2002.

Figure 33: Share of banknote net issuance by the Bank of Greece in total banknotes in circulation of the Eurosystem



Source: ECB and BoG, own calculations.

During the first 7 years, the Greek share in total banknote net issuance stood at roughly 2.5% and even declined slightly after the bankruptcy of Lehman Brothers in October 2008 as the Greek banking system was hardly affected in the beginning of global financial crisis. With the outbreak of the first sovereign debt crisis in Greece in October 2009, however, cash demand in Greece increased considerably leading to a relative share in banknote net issuance within the Eurosystem of 5.1% in June 2012. After a remarkable decline over the two following years, the Greek share went up again to almost 5% but after the imposition of capital controls by the Greek government including cash withdrawal restrictions in June 2015, the Greek share in euro banknote net issuance went down sharply once more until these measures were abolished in autumn 2019 – this time even below its former ratio of 2.5%. This can be attributed to restrictions of cash usage at the POS[76] and incentives for cashless payments such as tax deductions, rewards from bank loyalty programs and also to a quite popular lottery which pays out €1,000 each for 1,000 persons per month who use electronic payments at the POS (Panagiotidis, 2019).[77] Nonetheless, cash is still the primary means of payment in Greece. According to a recent study by the European Central Bank (2020a), the share of cash usage at

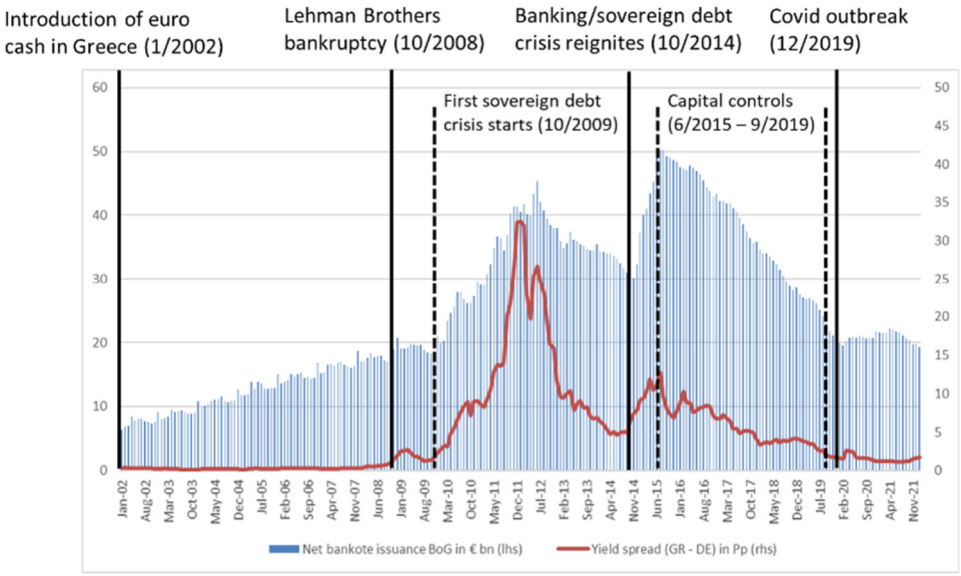
[76] Greece has currently the hardest cash payment restrictions in the EU limiting the amount to €500 per transaction, see Ecorys (2017, 26).
[77] On the use of cashless payments in Greece see https://sdw.ecb.europa.eu/reports.do?node=100000845.

the POS[78] and person-to-person (P2P) in 2020 is still 80% in volume terms and 62% in value terms compared to the average in the euro area of 73% and 48%, respectively (ECB 2020a, 115), although the Greek figures were somewhat lower than in 2017 with 88% and 75%, respectively (ECB, 2017, 20).

V.2.3. Cash demand in Greece in times of crisis

Figure 34 shows the spread between Greek sovereign bond yields and the respective German benchmark rates as a measure of uncertainty on capital markets for Greek Government finances which explains the wave-like behavior in cash demand in Greece during the two sovereign debt crises (2009 – 2019).

Figure 34: Net issuance of euro banknotes by the Bank of Greece and bond yield spread between Greece and Germany



Notes: Monthly data, 10-year government bonds yields.

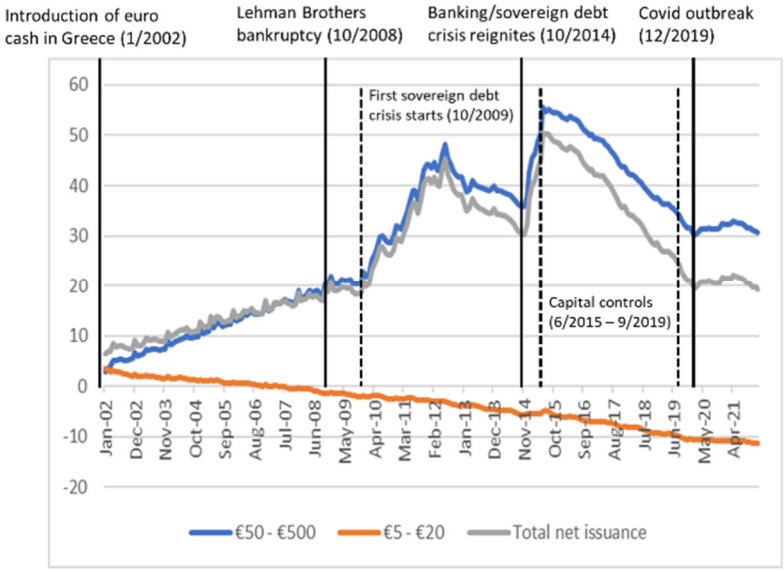
Source: Deutsche Bundesbank.

From the point of view of Greek cash holders, euro banknotes can be seen as a cross-border insurance against domestic risks as they cannot only be used to buy domestic products but potentially also to purchase products from other euro area countries (Whittaker, 2011, 6). Hence, it comes with little surprise that during the two sovereign debt crises (and to some extent also during the Covid crisis), the increase in cash demand in Greece was solely driven

[78] POS (Point of Sale) is the place in which goods and services are sold and paid for, such as shops and restaurants as well as services outside the home. P2P (Person-to-person) includes all the payments made from a private individual to another private individual without intermediaries, see ECB (2020a, 115).

by the larger denominations (€50 - €500) emphasizing the relevance of the store-of-value function of banknotes (see figure 35).

Figure 35: Net issuance of euro banknotes by the Bank of Greece (BoG) by denominations



Source: Bank of Greece, own calculations.

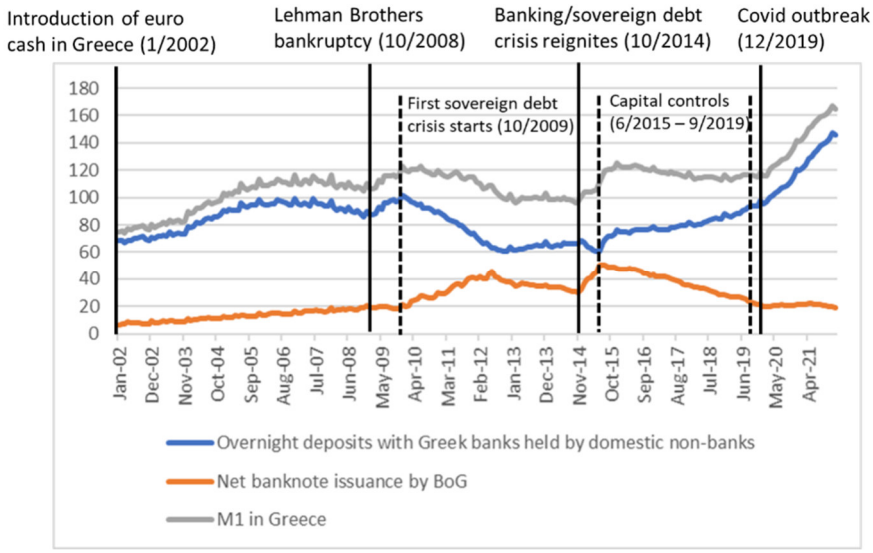
By stark contrast, net issuance (difference between the banknotes put into circulation by the BoG and the withdrawals of banknotes from circulation by the BoG) of small denominations (€5 - €20) by the BoG showed a steady, almost linear decline and became even negative since July 2007. The latter is due to "imports" of banknotes issued from other central banks of the Eurosystem and brought into Greece by tourism.[79]

V.2.3. On the stabilizing properties of cash supply in Greece

The analysis in chapter III.1 showed that countries run a severe risk of amplifying a crisis if the money stock in the economy isn't prevented from declining (at least relative to the goods produced). Consequently, the Greek central bank should not be blamed in principle for providing additional reserves for domestic banks via the emergency liquidity assistance when the two sovereign debt crises broke out.[80] Of course, it enabled enormous capital flight (until the introduction of capital controls in June 2015) but, at the same time, it also helped to stabilize the domestic money stock by providing reserves to domestic banks which, in turn, were used to provide additional cash to the Greek citizens (see figure 36).

[79] The biggest net provider of euro banknotes to other EMU countries is the Deutsche Bundesbank, see Deutsche Bundesbank (2020) and Bartzsch et al. (2011a, 2011b, 2013a, 2013b).
[80] For a critical view see for instance Sinn & Wollmershäuser (2012).

Figure 36: Monetary aggregate M1 and its components in Greece in € bn.



Notes: M1 calculated as the sum of overnight deposits with Greek banks held by domestic residents and net banknote issuance by the BoG.

Source: Bank of Greece, own calculations.

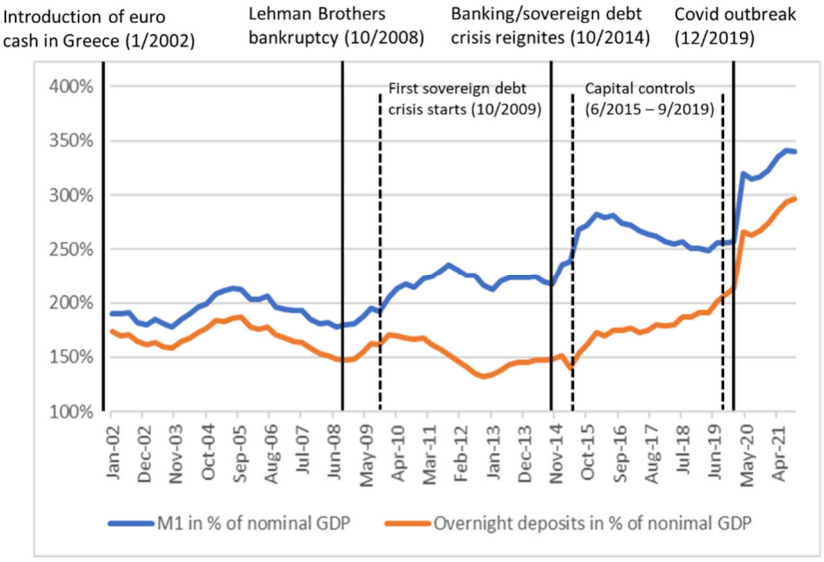
At the start of the first sovereign debt crisis in October 2009, nonbank liquidity measured by M1 stood at €115 bn and declined steadily over the next three years until it levelled at around €100 bn during 2013/14. At the same time, overnight deposits (current account holdings) of Greek nonbanks with their domestic banking systems declined steeply by 40%, mostly due to capital flight but also because Greek citizens withdrew cash from their domestic banks (see figure 31). The latter, however, stabilized domestic money supply because cash gave Greek residents the possibility to safeguard a part of their liquid assets without transferring it to other countries. It was only thanks to cash that there was always enough money available in Greece during the first sovereign debt crisis (2009 – 2014) to fully finance domestic transactions (see figure 37).[81]

Indeed, money in the hands of Greek nonbanks (M1) as percentage of nominal GDP even increased from 192% in Q3/2009 to 217% in Q3/2014. In a cashless society, however, this would have been very different. If money in Greece would have consisted only of overnight deposits, the Greek money stock would have decreased by 40% (see figure 36) or relative to nominal GDP by 30 percentage points (see figure 37).[82] This would have exacerbated the already devastating economic situation in Greece even more (see figure 28).

[81] See also Ongan & Gocer (2022) who analyze the Greek money demand for M2.

[82] At the beginning of the first sovereign debt crisis in Q3/2009, Greek overnight deposits stood at 162% of nominal GDP and fell to 132% of nominal GDP in Q3/2012.

Figure 37: M1 and overnight deposits as percentage of nominal GDP in Greece



Note: Nominal GDP seasonally adjusted.

Source: Bank of Greece, Federal Reserve Bank of St. Louis, own calculations.

At the beginning of the second government debt crisis in October 2014, additional credit by the Bank of Greece allowed capital flight again and – this time – even bigger cash withdrawals. Consequently, the Greek money stock increased to just over €111 bn in June 2015 (see figure 36). But when the Greek government introduced capital controls on June 28, 2015, cash withdrawal restrictions quickly induced a reduction of banknotes in circulation in Greece. In addition, capital flight was prevented implying that additional money provided by Greek banks to their domestic customers based on credit remained within Greece and contributed to the slow but steady recovery of the Greek economy in the years to come (see figure 28). By looking at the decline of M1 in the period of capital controls (6/2015 – 9/2019) in nominal terms (see figure 36) and in real terms (relative to GDP, see figure 37), however, one could argue that the "money belt" for the Greek economy was too tight at that time. In other words, Greece could have probably recovered more quickly if the provision of cash by the BoG would have been less restrictive.

During the Covid crisis, M1 increased considerably in Greece but the demand for cash remained comparatively subdued (see figures 31 and 36). This might be attributed to the ongoing "war on cash" by the Greek government. Over the past decade, it intended to address tax fraud by various means including limits to cash payments. In 2017, the cash payment limit in Greece was still €1,500 per transaction but was subsequently lowered to the current level

of €500.[83] In addition, in 2019 the ECB received a request from the Greek Ministry of Finance of further reducing the upper limit for cash usage to €300 per transaction. The ECB, however, considered this as being "disproportionate" (European Central Bank, 2019, 6). According to a report, Greeks are forced to spend a third of their income electronically.[84] If Greeks do not meet their electronic spending target, they must pay a 22% tax on the shortfall. To conclude, the considerable and ongoing decline in the usage of cash in Greece even after the end of capital controls in September 2019 is mainly driven by external factors (see chapter V.2.2). Therefore, it is no surprise that additional cash demand in Greece due to Covid was comparatively subdued. But in its fight against cash, the Greek government should keep in mind that it was exactly this old-fashioned means of payment that stabilized the domestic money supply during the sovereign debt crisis!

VI. Summary and conclusions

The aim of the present paper was to shed light on the stabilizing role of cash for societies. In section II, we discussed the conceptual framework for the later analysis by addressing the role of money for a well-functioning economy and highlighted the reasons why cash is still heavily in demand worldwide. Banknotes and coins have their own unique characteristics which can't be substituted perfectly by any electronic or digital means of payment. These features gain importance for the money holders especially in times of turmoil. In chapter III, the economic consequences of a severe monetary contraction were analysed by comparing the Great Depression (1929 – 1933) and the Great Recession 2008/09, both of which were initially caused by financial market crises. Hereby, it became clear that a fully elastic provision of cash in times of a confidence crisis can help to stabilize total money supply and therefore also assist to contain a possible economic downward spiral and vicious circle. In chapter IV, the analysis of the stabilizing role of cash was extended to other types of crises such as technological crisis and natural disasters. It turned out that cash is like a universal medicine to attenuate the economic effects of crises regardless of the type of crisis. Therefore, cash can be seen as a public insurance the central banks deliver if the overall situation becomes dire. But this also means that from the general viewpoint of the society an efficient payment mix necessarily

[83] See Europäische Verbraucherzentrum Deutschland (2017, 2022), https://www.evz.de/.
[84] Daily Telegraph (2019), https://www.telegraph.co.uk/business/2019/12/08/new-greek-government-forces-public-spend-electronically-despite/.

includes cash. Consequently, it should be the undisputed task of central banks to ensure that cash remains in circulation and functions properly also in normal times.

This central claim of the paper is strengthened by two case studies on the demonetization in India 2016 and on cash provision during several crises in Greece since 2008. The sub-chapter on India concludes that unnecessary and supply-driven cash withdrawals from circulation in an unbanked economy will quickly affect the real economy in a devastating way. Essentially, none of the goals promoted by the Indian government were achieved by this fatal experiment of an ill-prepared demonetization. The results of the analysis on Greece regarding the cash supply of the Bank of Greece during various crises is mixed. As long as no capital controls were in place, the Bank of Greece successfully helped to stabilize the Greek economy during the first national banking/sovereign debt crisis (10/2008 – 10/2014) and also during the Covid crisis by a perfectly elastic provision of cash. But during the phase of capital restrictions imposed by the Greek government right in the middle of the second banking/sovereign debt crisis in Greece, the Greek central bank was not able to avoid a monetary contraction due to limitations on cash withdrawals set by the government. Consequently, the money supply in Greece decreased not only in nominal but also in real terms indicating that the "monetary belt" for the Greek economy was too tight at that time. This might have hindered the gradual recovering process of the Greek economy.

The conclusions to be drawn and lessons learned from our analysis are manifold: Firstly, private electronic money (in the form of bank deposits) is no perfect substitute for cash. The special USPs of cash make this (nearly by definition) impossible. Secondly, an efficient payment mix necessarily includes cash. This is true for psychological as well as economic reasons. Thirdly, cash is still important for societies due to its stabilizing role. This is independent of the government in place. The general population as well as business always profit from having cash available. It stabilizes non-bank liquidity in times of turmoil and consequently economic development if cash is provided in a perfectly elastic way by central banks, both in total and by denomination. Fourthly, cash is part of successful crisis management as it is the physical form of the safest asset in a currency area. Fifthly, in order to fulfil its stabilizing functions in times of crisis, cash has to function properly also in normal times. This implies that it should be the task of central banks to guarantee the cash infrastructure even if cash used for daily transactions is more and more declining. And finally,

supply-side driven problems for the cash circle should be avoided, as the experiences of the demonetization in India and cash withdrawal restrictions in Greece have clearly shown.

Our case studies concentrated on two more or less “transformation” countries, albeit at different levels of transformation. However, our analysis is even more relevant for developing and unbanked countries in (political) crisis periods. Examples are Myanmar, Afghanistan, Syria, Rwanda, or Libya. Here, cash and its stabilizing role for the population is even more essential. Therefore, a future paper should focus more closely on these countries.

Currently, only cash enables private nonbanks to access central bank money. However, central banks all over the world are thinking about also offering a Central Bank Digital Currency, CBDC (see section II.1). The reasoning of the present paper implies that such a CBDC should mirror the characteristics of cash as closely as possible. Due to its digital form and the regulatory framework, this might, however, be difficult to attain completely (see, e. g., the offline functioning, easiness of use, and anonymity). Consequently, a co-circulation of cash and CBDC might be the preferred solution. If cash, however, might be out of circulation for whatever reasons in the future, CBDC should be introduced by the central banks as a close substitute, and if there is an increasing demand for it in times of crises, the central bank should provide it in a perfectly elastic way again. Four essential questions arise in this respect: How does the concrete CBDC look like? Related to that, will there be a demand for it? Can the non-transactional demand for cash be fully transferred to a CBDC? Can a CBDC also stabilize in times of turmoil, or does it introduce new problems, e. g. for financial institutions and financial market stability?

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