STAFF MEMO

Increased growth in broad money after the outbreak of Covid-19

NO. 10 | 2022

RAGNA ALSTADHEIM

NORGES BANK

Staff Memos present reports and documentation written by staff members and affiliates of Norges Bank, the central bank of Norway. Views and conclusions expressed in Staff Memos should not be taken to represent the views of Norges Bank.

© 2022 Norges Bank
The text may be quoted or referred to, provided that due acknowledgement is given to source.

Staff Memo inneholder utredninger og dokumentasjon skrevet av Norges Banks ansatte og andre forfattere tilknyttet Norges Bank. Synspunkter og konklusjoner i arbeidene er ikke nødvendigvis representative for Norges Banks.

© 2022 Norges Bank
Det kan siteres fra eller henvises til dette arbeid, gitt at forfatter og Norges Bank oppgis som kilde.

ISSN 1504-2596 (online only)
ISBN 978-82-8379-254-6 (online only)

INCREASED GROWTH IN BROAD MONEY AFTER THE OUTBREAK OF COVID-19 *

RAGNA ALSTADHEIM†

Norges Bank,
December 2022

Abstract

Growth in deposits and broad money aggregates surged in Norway after the outbreak of the Covid-19 pandemic. Usually, we think of deposit (or money) growth as going hand in hand with bank lending growth, since only banks can create money. But lending did not grow much more than usual in this period. Instead, high money growth was possible because domestic deposits replaced some of banks' net foreign funding. Higher financial savings and portfolio adjustments allowed deposit funding to replace some of the net foreign borrowing by banks, but also other factors contributed to money growth.

*This Staff Memo should not be reported as representing the views of Norges Bank. The views expressed are those of the author and do not necessarily reflect those of Norges Bank. Comments from and discussion with Bjørn Bakke, Tom Bernhardsen, Eirin Ingvaldsen Brynestad, Torbjørn Cock Rønning, Solveig Frøland, Arne Kloster, Jan Tore Klovland, Øyvind Eitrheim, Monique Erard, Karsten Gerdrup, Charlotte Høeg Haugen, Inga-Malene Huse, Torbjørn Hægeland, Plamen Nenov, Ylva Søvik and Eivind Tandberg are highly appreciated. Any remaining errors are the responsibility of the author.

†Correspondence to: Ragna Alstadheim, Financial Stability Department, Norges Bank, P.O. Box 1179 Sentrum, 0107 Oslo, Norway. E-mail address: Ragna.Alstadheim@Norges-Bank.no.

1 INTRODUCTION AND SUMMARY

Broad money growth in Norway and many other countries surged in March 2020.[1] This happened against the backdrop of unprecedented restrictions on activity related to the Covid-19 pandemic and at the same time strong financial and monetary policy support measures.

There is some variation across countries in the likely reasons for higher money growth rates. The causes of high money growth in the US are discussed in Andrew Castro and Michele Cavallo and Rebecca Zarutskie (2022), and the authors point to four explanatory factors: a spike in credit line drawdowns, asset purchases by the Fed, fiscal transfers to such households that are more likely to hold deposits, and finally a higher personal savings rate.[2] Regarding Sweden, Hanna Armelius and Carl Andreas Claussen and David Vestin (2020) indicate that bond purchases by the Riksbank were behind higher money growth after the outbreak of the pandemic. The Reserve Bank of Australia (2020) explains the higher money growth after the outbreak of the Covid-19 pandemic with increased lending, reduced bank bond funding and also purchases of government bonds by the RBA and by the private banks. Also the ECB has referred to asset purchases as the reason for strong growth in broad money, see ECB (2020).

But so far, what caused the upswing in money growth in Norway has been an open question. The higher growth rate in broad money aggregates (mainly consisting of bank deposits) turned out to be quite persistent. Shedding light on the causes of money and deposit growth may help us assess the likely development going forward. This is of relevance both to banks' funding stability, and to the prospects of their net interest income and thus bank profitability going forward.

In this Staff Memo, we show that one flip side of the surge in money growth has been lower net foreign borrowing by banks. As domestic sources of funding became more abundant when savings increased, Norwegian banks may have used the opportunity to build down their net foreign funding. High net financial savings by the private sector thus seem to be behind the increase in money growth. This fits a picture where foreign funding is the banks' marginal source of funding. But other factors also contributed to high money growth, such as continued lending growth, portfolio reallocations and less domestic market funding. Details of balance sheet accounting mechanics are provided, including how higher government expenditure potentially impacts money growth, given the Norwegian "oil fund mechanism".

The rest of this memo proceeds as follows: Section 2 provides a technical background and presents the simple accounting concepts (the counterparts to M3) used in the rest of the paper. Section 3 presents data and discusses plausible driving forces behind money growth, and concluding remarks are provided in Section 4.

[1] See e.g. overview of the initial development across OECD countries in Ane Kathrine Christensen and Alessandro Maravalle and Lukasz Rawadanowicz (2020).

[2] See also Office of the Comptroller of the Currency (2022), Özlem Dursun-de Neef and Schandlbauer (2022) and Levine, Ross and Lin, Chen and Tai, Mingzhu and Xie, Wensi (2021) for a discussion of the high money growth rate in the US. See also Banque de France (2022)

2 THE COUNTERPARTS TO MONEY GROWTH

The consolidated balance sheet for the central bank and private banks, the institutions that have the capacity to create money and deposits (the Monetary Financial Institutions, or MFIs)[3], is shown in Figure 1. We may immediately note that M3 dominates the liability side of the MFIs' balance sheet.[4] In this section we present the other parts of the MFI's balance sheet than M3, that is, the *counterparts* to M3. These counterparts are then used to explain money growth in the rest of this Staff memo.

The first main counterpart to money growth is bank **Lending**[5], placed on the asset side of the stylized balance sheet below. Banks create deposits when they issue loans or purchase assets from the money-holding sector, and therefore - as a first round effect - lending and M3 increase in tandem. But empirically there is not a one-to-one relationship between **Lending** and M3, and in Norway **Lending** is almost twice the size of M3.

It is useful to decompose the consolidated balance sheet somewhat, because the remaining counterparts need to be discussed in some more detail. For this purpose, the same balance sheet as in Figure 1 is repeated in the lower part of Figure 2, but that figure also shows where the counterparts originate.

The balance sheet item **Government** denotes the net government debt of the MFIs owed to the central government, and as shown it consists of deposits from the government in the central bank (GD) minus net ownership of government securities (GB) by the MFIs.

[3]The MFIs in Norway include both banks and mortgage companies (in addition to the central bank) but M3 mostly consists of bank deposits. For simplicity, we use the term banks here to include both banks and mortgage companies, except where the distinction is relevant and we make it clear. See Anne Hege Tangen (ed) (2014) and Anne Hege Tangen (ed) (2019) for a documentation of the statistics. The exact decomposition and presentation of counterparts to money growth, and the exact definition of MFIs may differ slightly across countries and jurisdictions. See ECB (2021) for an example of how developments in monetary counterparts is presented for the euro area. BNP Paribas (2021) presents monetary accounting for the US. See also, for example, Narodowy Bank Polski (2022).

[4]M3 is the main and broadest money aggregate published by Statistics Norway, while M1 and M2 are subsets of M3. Deposits account for 99 percent of M3. Funding instruments of two-year or less maturity and repos with the money-holding sector are also included in M3 as reported by Statistics Norway, while money market fund units are not. Assets both in local and foreign currency, as long as they are owned by the domestic money-holding sector, are included. The money-holding sector consists of all remaining domestic sectors excluding the central government and government lending institutions ("Statsforvaltningen and statlige låneinstitutter"). Money aggregates are published at https://www.ssb.no/statbank/table/10945/.

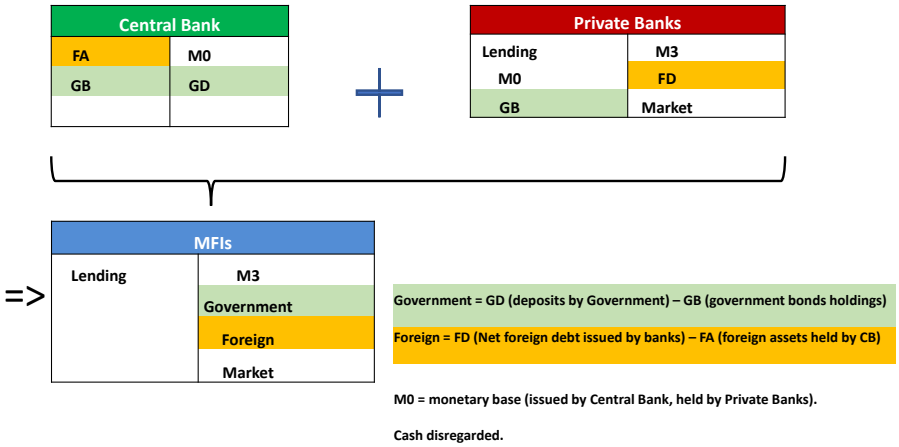
[5]Bold print and a capital letter are used in the following to make clear that we refer to the counterpart concepts as defined in this section. The **Lending** counterpart consists of 96 percent loans, but it also includes banks' ownership of securities issued by the money-holding sector. It is calculated based on Table 10706 from Statistics Norway and consists of total gross claims by banks and mortgage companies (and Norges Bank) on the following domestic sectors: non-financial firms, money market funds, other funds, other financial companies, insurance companies, local governments, households and NGOs. In Appendix D we look into how the non-loan components of what we call **Lending** here contributed to money growth in March 2020 due to the financial stress that month.

Figure 1: *The Monetary Financial Institutions - consolidated balance sheet.*

MFIs aggregate balance (billion NOK, Q3 2022)			
Assets		Liabilities	
Lending	5988	M3	3156
		Government	351
		Foreign	690
		Market	1791
Total	5988	Total	5988

Lending = Gross claims on money-holding sector, including lending.
Government = Net debt to government.
Foreign = Net debt to foreign sector.
Market = Other net debt than M3 to money-holding sector (incl. banks' market funding).

Figure 2: *The MFIs: A consolidation of the central bank and private banks*



Deposits by the government in the central bank (GD) in practice makes up a large part of net **Government** debt, while government bonds owned by the MFIs (GB) are quantitatively less important in Norway.[6] Higher (lower) net **Government** debt is consistent with lower (higher) M3, everything else equal.

The balance sheet item denoted **Foreign**[7] represents the net foreign debt of the MFIs. It includes gross foreign debt issued by banks, as well as deposits in Norwegian banks held by foreigners, minus the banks' claims on the foreign sector. This adds up to net foreign bank debt (FD). The central bank holds foreign reserves (FA), but private banks

[6]Norges Bank is the government's bank, and the central government holds its deposits exclusively in the central bank. See also Figure 10 on page 12. QE has not been used in Norway.

[7]The counterparts to M3 denoted **Government** and **Foreign** here are published monthly by Statistics Norway (see https://www.ssb.no/statbank/table/10993/). The sign convention in Table 10993 is for net assets to have a positive value.

have much larger net foreign debt (FD), which means that in Norway's case the MFIs' total net **Foreign** debt = FD-FA is positive. Higher (lower) net **Foreign** debt is consistent with lower (higher) M3, everything else equal.

The balance sheet item denoted **Market** is a collection of the remaining net domestic funding of banks and the central bank and is calculated as a residual. It includes the value of domestic market (or wholesale) funding and equity owned by the money-holding (domestic, private) sector. Higher (lower) **Market** funding is consistent with lower (higher) M3, all else equal.

The monetary base (M0) mainly includes claims by the private banks on the central bank (central bank reserves)[8], and those disappear from the consolidated MFI balance sheet as shown in Figure 2. Notes and coins held by the money-holding sector are included both in M0 and M3, but that is disregarded in the stylized balance sheet illustration here. The value of circulating cash is relatively low and stable.[9]

3 Money growth in Norway in 2020 and 2021 - contributing factors

Money growth since the outbreak of the Covid-19 pandemic is shown in Figure 3, and an overview of the contributions from the different money counterparts is provided in subsection 3.1 below. There, we show that a substantial part of the increase in M3 may be explained by a fall in the MFIs' net **Foreign** funding. Although we cannot know for sure exactly what drove this, we go on to argue that high net private financial savings probably was a driver (see subsection 3.2). But portfolio reallocations across borders most likely also played a role (see subsection 3.3). Finally, we discuss some details on the contribution from net **Government** debt to money growth (subsection 3.4).

3.1 Contributions to M3 growth from counterparts: an overview

The increase in **Lending** was higher than **M3** growth in absolute values for many years, while other counterparts to money growth - taken together - pulled M3 growth down, see Figure 4. The figure also shows that **Lending** continued to contribute much as before to money growth during 2020 and 2021, while in particular, net **Foreign** funding fell and thus opened up for higher money growth than earlier.[10] Relatively low **Market** funding growth also gave room for the increase in M3.[11]

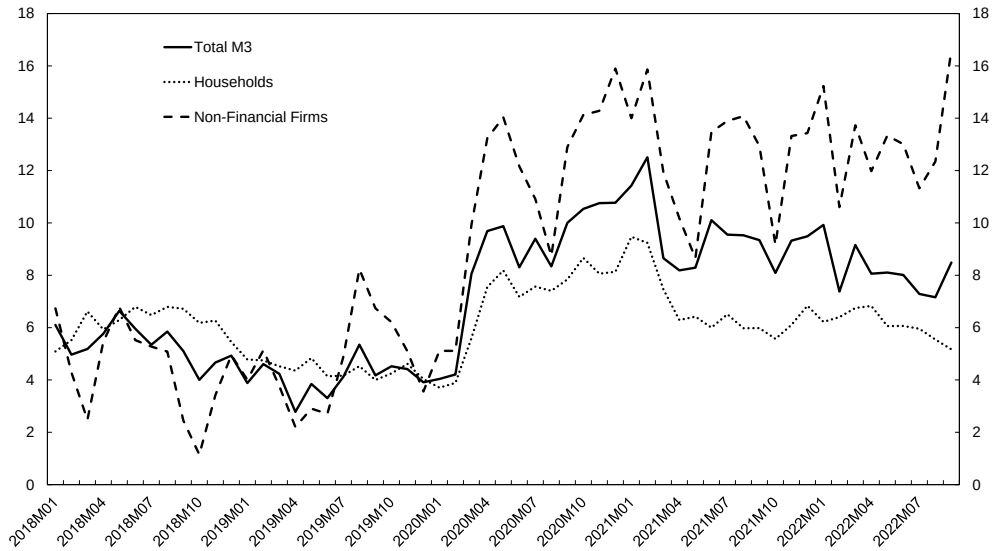
[8] The central bank may also lend to the private banks, and in that case, gross claims by the banks (the reserves) and M0 are larger than net claims. This distinction is not important for our purposes here, where the focus is on the broad money aggregate M3 in which central bank reserves are not included.

[9] All components of M0, which include different types of deposits from banks in Norges Bank as well as notes and coins, are shown in Figure C.2 on page 23.

[10] The quarterly changes in counterparts, along with money growth, are shown in Figure D.2 on page 24.

[11] How market funding may facilitate lending without M3 growth is discussed in Appendix B.

Figure 3: *M3. Twelve-month growth in precent. Total M3 and M3 held by households and non-financial firms. 2018 M1- 2022 M9. Source: Statistics Norway*



Regarding the counterpart **Government**, it on average neither pulled M3 growth up or down in the 2010-2019 period, see Figure 5. In contrast, it increased and contributed to pull down money growth somewhat in 2020 and 2021. Regarding the MFI's net **Foreign** debt, we see that in a typical year until 2019 it increased and thereby pulled M3 growth down, while in 2020 and 2021 it fell and was replaced by higher M3 growth.

Figure 4: *M3 and counterparts. Four-quarter change. Billions of NOK. 2009 Q1 - 2022 Q3. Sources: Statistics Norway, author.*

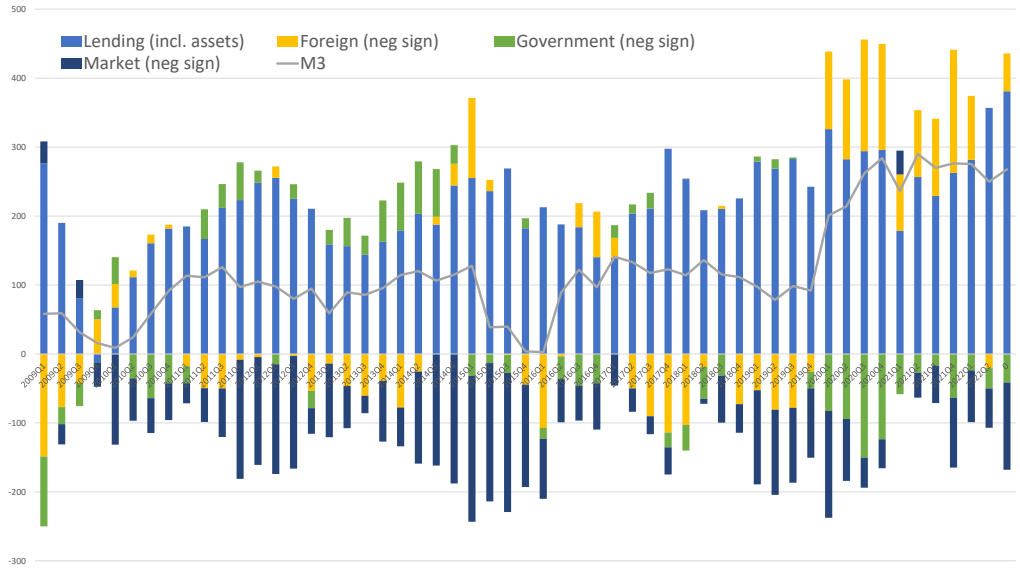


Figure 5: *Annual change in M3 and counterparts. Billions of NOK. Sources: Statistics Norway, author.*

	Nok billions.	Average annual change (2010 – 2019)	Deviation from average annual change: 2020	Deviation from average annual change: 2021
	Lending	211	+85	+52
-	Foreign	25	-179	-204
-	Government	0	+124	+64
-	Market	94	-52	+8
=	M3	92*)	+192**)	+184***)

*) Average contributions to changes in M3 from counterparts during the years 2010-2019; *92 = 211-25-0-94*.
**) The extra increase in M3 in 2020 is accounted for by *192 = 85- (-179) - 124 - (-52).*
***) The extra increase in M3 in 2021 is accounted for by *184 = 52 - (-204) - 64 - 8.*

3.2 High private financial savings and money growth

In this subsection, we argue that higher private net financial savings probably constitute an important explanation for the fall in the MFIs' net **Foreign** funding. High financial savings made it possible for deposits held by the domestic money holding sector to replace some of the net foreign funding of private banks.[12] First, we present how balance sheet mechanics associated with higher net financial savings in a country in principle may materialize as higher M3 and lower net foreign funding of private banks. Next, we argue that high government expenditure contributed to the high private net financial savings rate in Norway after the outbreak of the pandemic, and in that way indirectly also supported M3 growth.

In order to see how a higher current account surplus (and hence higher net financial savings) technically may reduce banks' net foreign funding and at the same time increase M3, two sets of balance sheets are presented in Figure 6. Balance sheet set (1) illustrates the initial situation, where nothing yet has happened to M3, but an exporter earns export income and accumulates a deposit in a foreign bank ($+x$). Next, balance sheet set (2) in the same figure represents a situation where the exporter transfers the income x to an account in a domestic bank. Then M3 (deposits) increase, and the domestic bank receives

[12]The fall in the MFIs' stock of net **Foreign** funding (which covers both private banks and the central bank) is mirrored in increased net claims by private banks on the foreign sector (measured by transactions), see Figure 9 on page 11. The increase measured by the private banks' transactions in Figure 9 is clear regarding the year 2020, and also positive but not as big in 2021. The reported very strong contribution of lower net **Foreign** debt to high money growth in 2021 in Figure 5 is probably not solely due to lower net foreign debt in private banks. Some of it may be due to value change of the central bank reserves measured in NOK. An increased value of central bank foreign exchange reserves measured in NOK serves to reduce the monetary accounting measure of net **Foreign** debt. Any deviation in the measurement of net **Foreign** debt will be absorbed in the counterpart **Market** funding, since **Market** funding is calculated as the residual counterpart. It will not disturb the measure of M3.

a claim on the foreign bank. The domestic bank is here for illustrative purposes assumed to have a loan in the same foreign bank that is paid down when the claim is received (FD falls). Alternatively, the domestic banks' account in its' correspondent bank may be credited by the foreign bank - either way, net **Foreign** MFI debt has fallen and M3 has increased.[13]

Figure 6: *An exporter transfers earned income home to domestic bank*

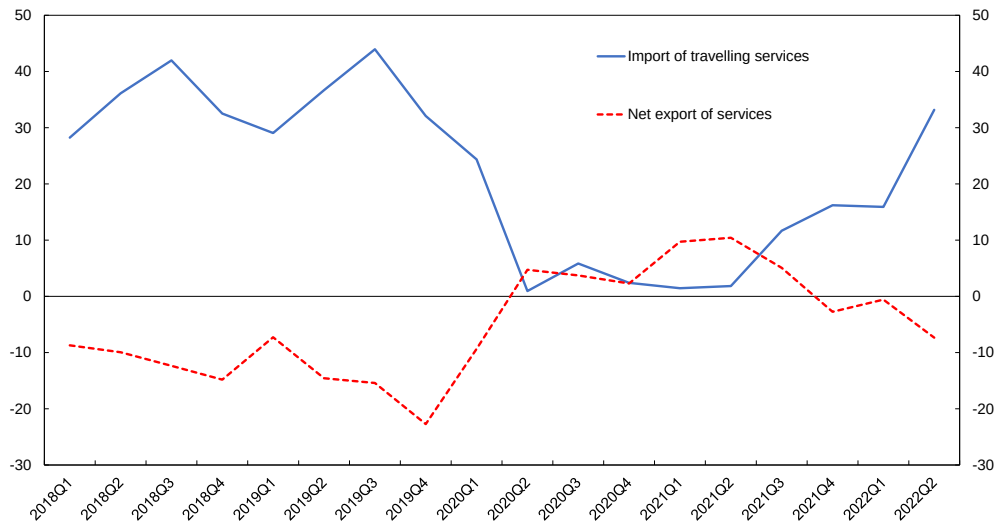
(1) Exporter earns export income and receives payment on account in foreign bank (FB)													
Central Bank					Private Bank					MFI			
FA		M0		+	Lending		M3		=	Lending		M3	
GB		GD			M0		FD					Government	
					GB		Market					Foreign	
												Market	
FB=Foreign Bank					Exporter								
FD		Deposit (FB)	+x		Deposit (FB)	+x							
					M3								
MEMO: Net foreign claims for domestic sectors up by x, directly held by exporter in foreign bank.													
(2) Exporter transfers deposit in FB home to account in domestic bank. Domestic bank pays down on net foreign debt (FD).													
Central Bank					Private Bank					MFI			
FA		M0		+	Lending		M3	+x	=	Lending		M3	+x
GB		Government			M0		FD	-x				Government	
					GB		Market					Foreign	-x
												Market	
FB=Foreign Bank					Exporter								
FD	-x	Deposit (FB)	+x-x		Deposit (FB)	+x-x							
					M3	+x							
MEMO: Net foreign claims for domestic sector still up by x, now showing up as lower net Foreign bank debt.													

We can thus conclude that higher net exports (or reduced net imports) and hence higher net national financial savings may lead to higher money growth. This is the case **if** the increased net exports are invested at home and kept as a deposit in a domestic bank, and the counterpart to money growth is then lower net foreign bank debt. Hence, it is of importance that the sector experiencing higher net exports actually is inclined to keep their extra money in domestic banks.

In Norway, reduced outward travelling in the spring of 2020 contributed to an abrupt decrease in net imports of services, see Figure 7. The same balance sheet mechanics as in Figure 6 now applies, but in this case a *lower* stream *out* from the households' (or the service importers') account in the domestic bank may make M3 increase, rather than a *higher* stream *in* from the exporters account. Thus, this kind of adjustment to a higher surplus in trade in goods or services could be consistent with higher money growth. But in aggregate, the current account surplus (net financial savings) for Norway as a whole was not very high in 2020, see Figure 8. Hence, higher net export revenues are in aggregate not likely to have contributed very much to money growth, although composition effects

[13] We may note here that for monetary accounting purposes, it does not matter whether the money M3 is denominated in NOK or foreign currency. For monetary accounting, the sector that holds the deposit matters, rather than the currency in which it is denominated. We do therefore not need to keep track of the currency denomination. But any movement of assets across the border that includes conversion to a new currency will also involve a consideration of FX risk. In the background of the transaction illustrated in the figure, off-balance sheet hedging operations may occur.

Figure 7: *Net exports of services increased abruptly in the spring of 2020. Billion NOK per quarter. 2018 Q1 - 2022 Q2. Source: Statistics Norway*



most likely have played a role. Distortions of usual trade patterns and slow adjustment of liquidity management may have led to deposits accumulating on bank accounts in some sectors.

However, Figure 8 also shows that although the current account surplus was not very high in 2020, the non-government net financial investments abroad were high in 2020 and 2021.[14] The high non-government net financial savings in Norway in 2020 was made possible by government expenditure funded by transfers from the GPFG. Appendix A.2 on page 16 shows how higher transfers from the GPFG to households and firms via the government budget technically may be associated with higher M3 growth and lower net foreign funding of banks. Such an effect rests on banks' own adjustments of their balance sheets; It plays out **if** banks respond to transfers from the GPFG by increasing their own net claims on the foreign sector (reducing their foreign net debt).[15] In 2020 and 2021, as we have shown, banks in aggregate indeed made the adjustments necessary for M3 to increase and their net foreign funding to decrease, at about the same time as transfers from the GPFG increased. It thus seems plausible that the support that government spending gave to private savings capabilities also enabled banks to build down their net foreign funding.

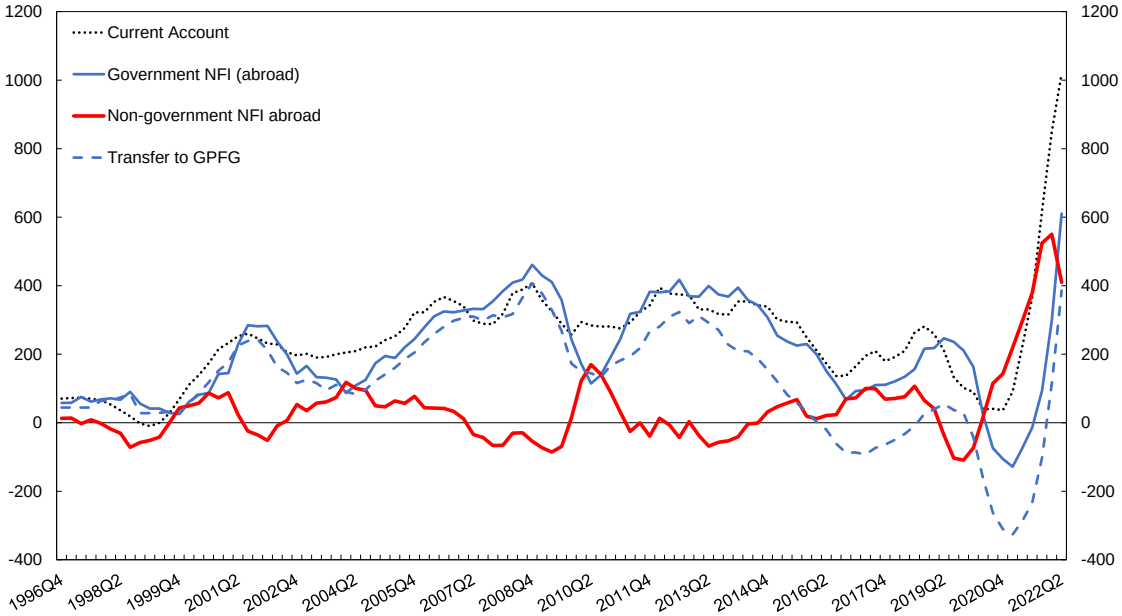
In Alstadheim (2020), it is shown that Non-government (private) net financial investments

[14] Looking at the longer time perspective, Figure 8 shows that the central government's part of the country's net financial savings makes up the lion's share of total savings (strongly affected by petroleum tax revenues, which by law are invested abroad). The residual net financial savings (by the private, or non-government, sector) have fluctuated closer to zero over time. There seems to be a pattern where Non-government net financial investments are relatively high when the government net financial investments are low, reflecting counter-cyclical fiscal policy and cyclical oil revenues.

[15] See appendix A.2, and in particular line (4b) in Figure A.3 on page 17.

Granger-cause banks' net foreign funding, and the variables are negatively correlated.[16] Thus, high net private financial savings historically have predicted a lower foreign funding share for banks going forward. The development in 2020 and 2021 fits such a pattern.

Figure 8: *Norway's net financial investments (NFI). Transactions. Four quarter cumulative total. Billion NOK. Source: Statistics Norway.*



The structural behaviour of Norwegian banks' foreign funding in response to global macroeconomic shocks is analyzed in Alstadheim and Blandhol (2018). The study shows that banks' foreign funding share typically falls in response to negative global macroeconomic shocks. It is argued there that the effect goes via a negative impact from low foreign activity to domestic activity which pulls down domestic credit demand, rather than via more costly access for domestic banks to foreign funding (credit supply). Hence, also that study suggests that low domestic activity (and high savings) may contribute to lower bank foreign funding demand.

3.3 Portfolio allocations across borders and money growth

Some nuance is appropriate regarding the picture that higher net financial savings is behind the lower net foreign funding of banks and increased money growth. Figure 9 zooms in on the increase in non-government net foreign financial investments since 2018, and shows how banks', asset managers' and non-financial firms' net foreign financial claims developed, respectively. These three sectors are behind most of total non-government net financial investments abroad, since households have very little direct financial claims on the foreign sector. In 2020, banks net foreign financial claims increased *more* than total net non-government financial investments, while the financial claims of non-financial

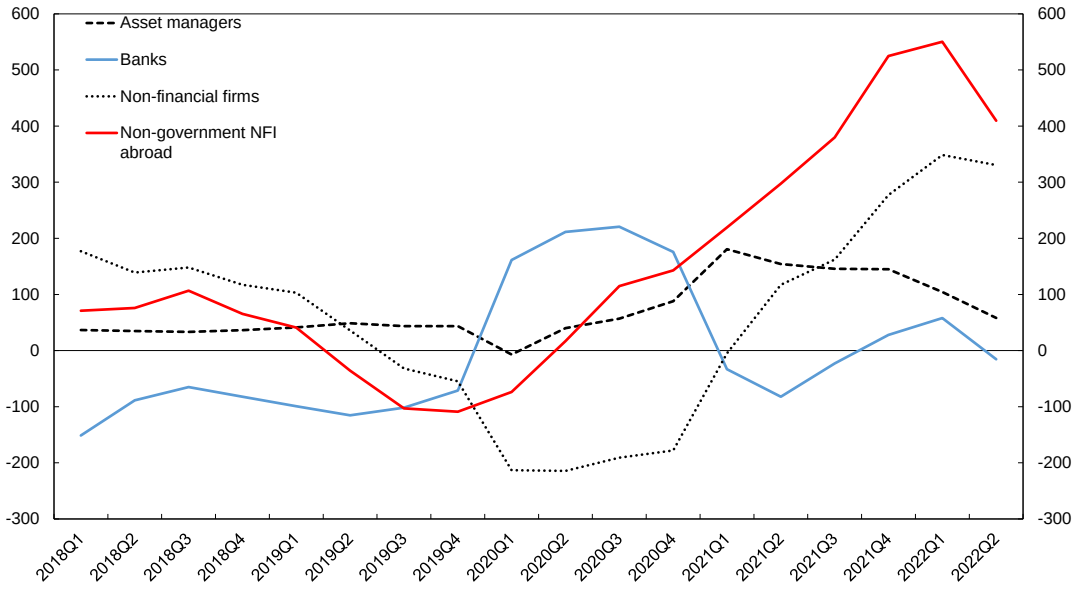
[16] See Table 3 on page 14, and also Figure 6 on page 11 in Alstadheim (2020).

firms on the foreign sector fell.

Such a simultaneous fall in non-financial firms' net claims on the foreign sector, and an increase in banks' net foreign claims may happen when - for example - the exporter in Figure 6 decides to transfer deposits from the foreign account to the account in the domestic bank without having earned higher export income first. In that case it is just a portfolio reallocation across borders that reduces banks' net foreign funding, while it at the same time reduces the non-financial firms' net foreign financial claims, resulting in higher money growth in the process.

Figure 9, and also longer data series, indicate that there indeed is a negative relationship between banks' accumulation of net foreign assets, and non-financial firms accumulation of net foreign assets. This suggests that some of the fall in banks' net foreign debt (and increase in money growth) in 2020 was due to firms bringing net financial assets home, and not only due to higher net financial savings.

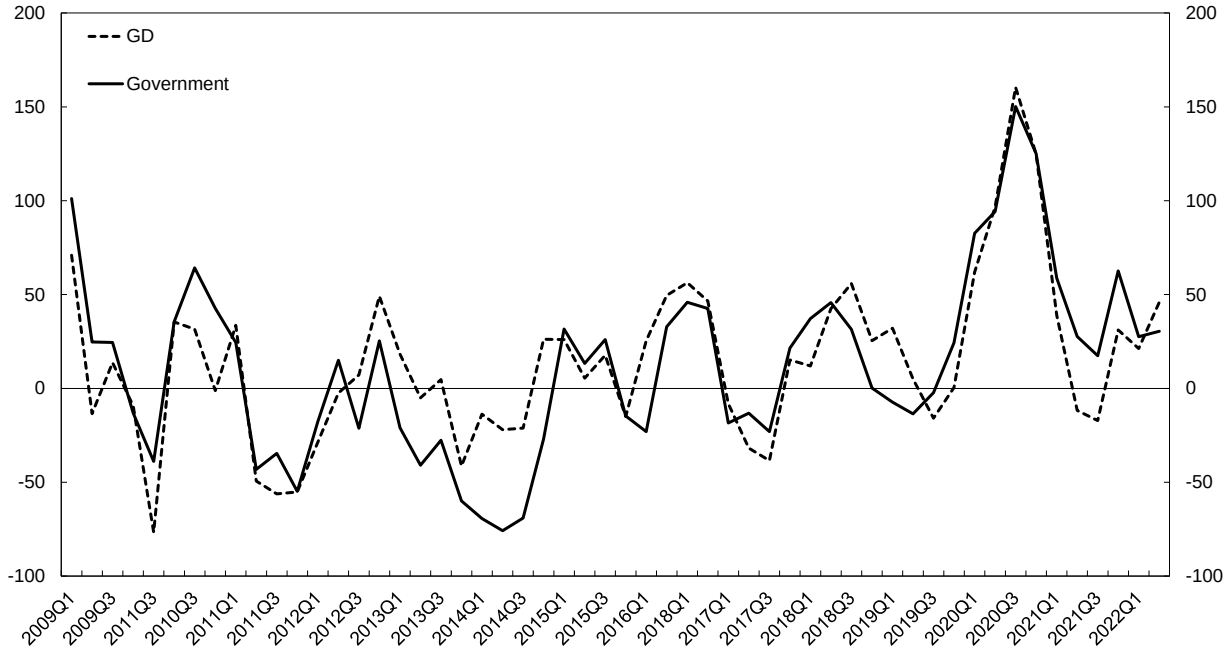
Figure 9: *Change in net foreign financial claims, selected sectors. Transactions. Four quarter cumulative total. 2018 Q1-2022 Q2. Billions of NOK. Source: Statistics Norway.*



3.4 Government expenditure and money growth

Government expenditure increased during the Covid-19 pandemic. A larger government deficit is in principle a potential direct source of higher money growth (see Appendix A.1). But the counterpart accounting in Figure 5 on page 7 shows that in fact net MFI debt to the **Government** *increased* and thus contributed to *lower* M3 growth in 2020 and 2021. In this section we show that the negative contribution to M3 growth was probably partly due to the slightly positive government budget surpluses after transfers from the Government Pension Fund Global (GPFG) in 2020 and 2021.

Figure 10: *Government deposits in the central bank (GD) and the balance sheet item net* ***Goverment*** *debt. Billions of NOK. Four-quarter change. Source: Statistics Norway*



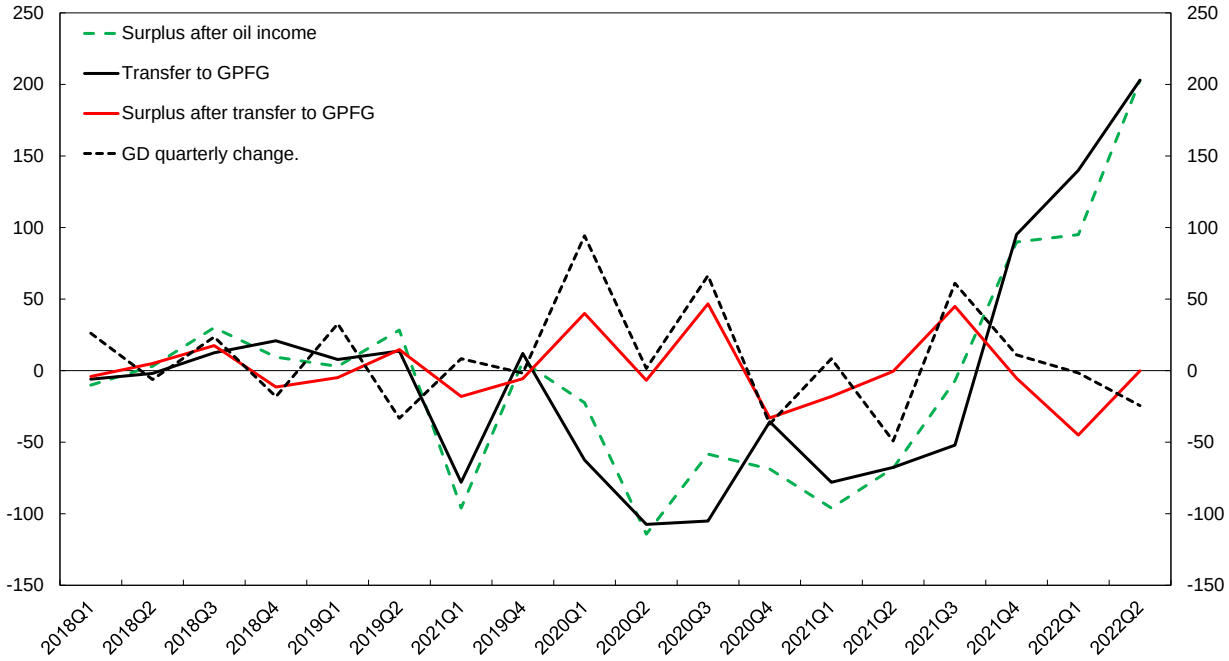
Changes in the MFI's net debt to the Norwegian **Government** are almost exclusively driven by changes in government deposits in the central bank (GD), as shown in Figure 10. Thus we may focus here on how a government budget surplus or deficit affects the government deposits in the central bank (GD).[17] The series for government deposits in the Central Bank (GD) is again shown in Figure 11, but now in a quarter-to-quarter change format. The figure illustrates that the quarterly change in government deposits (GD) has a pattern that is similar to the quarterly government budget surplus after transfers to the Government Pension Fund Global (GPFG). That is, in accordance with the example in Appendix A.1, a high (low) government budget surplus in the data goes with higher (lower) government deposits (GD).[18]

Transactions not related to the government budget surplus or deficit may also affect government deposits in the central bank (GD) and thereby also net MFI **Government** debt and M3. For example, issuance of new government debt, purchased by the money holding sector, will as a first round effect lead to higher GD and lower M3. On average, in Nor-

[17]We may recall that net **Government** debt is defined as government deposits in the central bank (GD) minus the holdings of government bonds (GB) by the central bank and the private banks. The effects of central bank purchases and sales of government bonds (GB) on M3 and M0 are very important in many countries and discussed extensively in the literature on Quantitative Easing (QE) and Quantitative Tightening (QT). But this is of less practical relevance for Norway, as Figure 10 shows. For balance sheet mechanics on QE/QT, see for example e.g. Daniel Bolduc and Brad Howell and Grahame Johnson (2022), and see also Alstadheim (2011).

[18]The surplus was NOK 47 billion in 2020 and 21 billion in 2021 (see annual numbers in Figure A.4 on page 19).

Figure 11: *Quarterly transfer to the GPFG (level) and GD (quarter-to-quarter change). Billion NOK. Source: Statistics Norway*



way, the MFI balance sheet item **Government** including (GD) has typically not affected M3 one way or the other, as was shown in Figure 5.

4 Concluding remarks

The money accounting framework shows that a counterpart to high money growth in Norway since the outbreak of the Covid-19 pandemic is higher net claims by banks on foreign agents (lower net foreign bank debt). This reflects both higher net private financial savings and portfolio adjustments by households and firms. But also the fact that lending proceeded as before contributed to holding up money growth, as did the fact that domestic market funding grew moderately.

We have not discussed interest rate responses to the deposit surge in this Staff Memo. Banks may have hesitated to lower their deposit rates further in a low interest-rate environment, and they may have willingly received the surging deposit volume even if their deposit margins were low. Firms and households may have been slow to optimize their liquidity management to new cash-flow patterns, and demand for precautionary liquidity buffers may also have increased. An econometric approach would be required to shed more light on the underlying driving forces.

Going forward, both slower credit growth, lower net private financial savings and higher interest rates on alternatives to deposits might contribute to lower deposit growth.

REFERENCES

Alstadheim, R. (2011). Om nye virkemidler i pengepolitikken. Avgrensning mellom pengepolitikken og finanspolitikken. Aktuell kommentar 1, Norges Bank.

Alstadheim, R. (2020). Banks' wholesale funding share as an indicator of financial vulnerability. Staff Memo 7, Norges Bank.

Alstadheim, R. and C. Blandhol (2018). The global financial cycle, bank capital flows and monetary policy. Evidence from Norway. Working Paper 2, Norges Bank.

Alstadheim, R., K. B. Nordal, O. Syrstad, S. T. Ellen, and M.-I. W. Wassås (2021). Bond market fire sales and turbulence in the Norwegian FX market in March 2020. Staff Memo 2, Norges Bank.

Andrew Castro and Michele Cavallo and Rebecca Zarutskie (2022). Understanding Bank Deposit Growth during the Covid-19 Pandemic. https://www.federalreserve.gov/econres/notes/feds-notes/understanding-bank-deposit-growth-during-the-covid-19-pandemic-20220603.html, Board of Governors of the Federal Reserve System.

Ane Kathrine Christensen and Alessandro Maravalle and Lukasz Rawadanowicz (2020). The increase in bank deposits during the COVID-19 crisis: Possible drivers and implications. https://oecdecoscope.blog/2020/12/10/the-increase-in-bank-deposits-during-the-covid-19-crisis-possible-drivers-and-implications/?print=pdf, OECD.

Anne Hege Tangen (ed) (2014). Pengemengdestatistikken. Documents 34, Statistics Norway.

Anne Hege Tangen (ed) (2019). Omlegging av indikatorene for penger og kreditt. Documents 9, Statistics Norway.

Banque de France (2022). The increase in the money supply during the Covid crisis: analysis and implications. Bulletin 239/2, de la Banque de France.

BNP Paribas (2021). Inside the Money Creation in the United States. Eco Conjoncture 5, BNP Paribas.

Daniel Bolduc and Brad Howell and Grahame Johnson (2022). How does the Bank of Canada's balance sheet impact the banking system? Staff Analytical Note 2022-12, Bank of Canada.

ECB (2020). Account of the monetary policy meeting of the Governing Council of the European Central Bank. https://www.ecb.europa.eu/press/accounts/2021/html/ecb.mg210114 14ef04b8bd.en.html.

ECB (2021). Monetary developments in the euro area: November 2021. Press release, 29 December.

Hanna Armelius and Carl Andreas Claussen and David Vestin (2020). Money and monetary policy in times of crisis. Economic Commentaries 4, Riksbanken.

Lerbak, M. N., K. Tafjord, and M. Øwre-Johnsen (2016). The petroleum fund mechanism and Norges Bank's foreign exchange transactions. Economic Commentaries 1, Norges Bank.

Levine, Ross and Lin, Chen and Tai, Mingzhu and Xie, Wensi (2021). How Did Depositors Respond to COVID-19? *The Review of Financial Studies 34*(11), 5438–5473.

Narodowy Bank Polski (2022). M3 and its counterparts. Balance sheet format. https://www.nbp.pl/homen.aspx?f=/en/statystyka/m3/m3.html.

Norges Bank (2021). Norges Bank's liquidity policy: principles and design. Norges Bank Papers 3.

Office of the Comptroller of the Currency (2022). Deposti Growth Likely Slowing but Abundance of Low-Cost Funding Could Endure Through 2022. https://www.occ.treas.gov/publications-and-resources/publications/economics/on-point/pub-on-point-deposit-growth-slowing-low-cost-funding-endure.pdf, OCC.

Reserve Bank of Australia (2020). Box D: Recent Growth in the Money Supply and Deposits. https://www.rba.gov.au/publications/smp/2020/aug/box-d-recent-growth-in-the-money-

supply-and-deposits.html.
Özlem Dursun-de Neef, H. and A. Schandlbauer (2022). Covid-19, bank deposits, and lending. *Journal of Empirical Finance 68*, 20–33.

A Government expenditure. Some balance sheet mechanics

In this Appendix, we describe stylized balance sheet changes that take place when the government increases expenditure. First we describe a case where the government finances spending by using its deposit in the central bank (GD). Next we describe accounting mechanics related to government expenditure and the Government Pension Fund Global (GPFG), and how M3 might potentially be affected.

A.1 Government expenditure funded by existing government deposits in the central bank

We may consider an initial situation as described in the upper three balance sheets in Figure A.1 (row (0)). Next, we assume that the government decides to increase its deficit by x. Now, the balance sheets change as described in the row denoted (1); The government first instructs the central bank to move money over to private banks' accounts in the central bank. M0 then increases while GD decreases. At the same time, the private banks' credit the households and firms' accounts increase according to what the government has decided, and M3 increases.

If the central bank wants to hold M0 constant, it may sell government bonds to the private banks. This is shown in the bottom row in the same figure (row denoted (2)). If this is the case, M0 ends up like it started, while M3 (still) has increased.[19] It may also sell government bonds to households and firms (the money holding sector). If so, both M0 and M3 then falls back and balance sheets are back to the initial position (0).

[19] In Norway, Norges Bank seeks to calibrate the amount of M0 that is *liquid* (overnight deposits, or folio deposits) and not M0 itself. Norges Bank controls the volume of banks' overnight deposits by auctioning fixed-rate F-loans and F-deposits. This auctioning is tightly coordinated with the effect on M0 of the governments' transfers to and from of its account in the central bank. More F-deposits will for example be auctioned when M0 is high (for example due to transfers from the government), in order to target the volume of overnight deposits and to secure a smooth implementation of the central bank's interest rate policy (see https://www.norges-bank.no/en/topics/liquidity-and-markets/The-liquidity-management-system/ and Norges Bank (2021).)

Figure A.1: *Effect of increased government spending on M3, simple case.*

(0) Starting point, balances.

Central Bank			
FA		M0	
GB		GD	

Private Bank			
Lending		M3	
M0		FD	
GB		Market	

MFI			
Lending		M3	
		Government	
		Foreign	
		Market	

Government = GD-GB
Foreign = FD-FA
M0= monetary base

(1) Government spends more.

Central Bank			
FA		M0	+ x
GB		GD	- x

Private Bank			
Lending		M3	+ x
M0	+ x	FD	
GB		Market	

MFI			
Lending		M3	+ x
		Government	-x
		Foreign	
		Market	

(2) Central banks sterilizes effect on M0

Central Bank			
FA		M0	+ x-x
GB	- x	GD	- x

Private Bank			
Lending		M3	+ x
M0	+ x-x	FD	
GB	+x	Market	

MFI			
Lending		M3	+ x
		Government	-x
		Foreign	
		Market	

A.2 Government expenditure and Norway's oil income - the balance sheet mechanics

In this stylized example, the starting point is again increased expenditure x funded by transfers from the government's account GD, see lines denoted (1) in both Figures A.2 and A.3 below. M3 increases.

Lines (2) in the same figures illustrate that next, the government receives oil tax income (a) and revenues from the State's Direct Financial Interest (SDFI) in petroleum activities (b) (see discussion in Lerbak, Tafjord, and Øwre-Johnsen (2016)).[20] These two types of government oil income are credited the government's account GD in line (2). The oil tax payments (a) are paid by private companies in terms of NOK. These payments increase GD directly and reduce M0 and M3 correspondingly. [21]

[20] The sequence of transactions described in the present example is stylized and for expositional purposes only. As an illustration, the deficit $-x$ here may be taken to represent the government deficit before oil income, which was NOK 371 billion in 2020 (see first line in Figure A.4).

[21] The size of the government budget surplus (+) or deficit (-) after oil income is equal to $-x + a + b$. In order to make the example here easier to follow, we will describe $-x+a+b$ as being of positive value. In years with high oil income, this will be the case. In this case there will be positive transfers to the GPFG. We will discuss the implications for M3 of high government expenditure combined with low oil income, which was the case in 2020 and 2021 (with $-x + a + b$ being negative) at the end of this section. In 2020 $-x + a + b$ was NOK -264 billion, see Figure A.4.

Figure A.2: *Government spending, oil income and transfers to the GPFG I*

(1) Government increases spending by x, GD falls by x

Central Bank					Private Bank					MFI			
FA		M0	+x	+	Lending		M3	+x		Lending		M3	+x
GB		GD	-x		M0	+x	FD		=			Government	-x
					GB		Other					Foreign	
												Market	

(2) Government receives oil tax income in NOK (a) and other oil income in foreign currency (b) => After this, net increase in GD is equal to surplus after oil income = -x+a+b.

Central Bank					Private Bank					MFI			
FA	+b	M0	+x-a		Lending		M3	+ x-a		Lending		M3	+ x-a
GB		GD	-x+a+b	+	M0	+ x-a	FD		=			Government	-x+a+b
MEMO	*+b*		*+b*		GB		Other					Foreign	-b
												Market	

(3) Government transfers excess income minus a small amount (e) to oil fund => transfer is (a+b-e-x)

Central Bank					Private Bank					MFI			
FA	b-(a+b-e-x)	M0	+x-a		Lending		M3	+x-a		Lending		M3	+x-a
GB		GD	-x+a+b-(a+b-e-x)	+	M0	+x-a	FD		=			Government	e
MEMO	*-(a-e-x)*		*-(a-e-x)*		GB		Other					Foreign	+(a-e-x)
												Market	
										MEMO	*0*		*0*

(4) Central bank sterilizes effects on FA by buying FX equal to (a-e-x) from private bank => FA back to 0, but consolidated MFI's "Foreign" still up by a-e-x

Central Bank					Private Bank					MFI			
FA	-(a-e-x)+(a-e-x)	M0	+(x-a)+(a-e-x)		Lending		M3	+ x-a		Lending		M3	+x-a
GB		GD	e	+	M0	+(x-a)+(a-e-x)	FD	+(a-e-x)	=			Government	+e
MEMO	*0*		*0*		GB		Other					Foreign	+(a-e-x)
					MEMO	*-e*		*-e*				Market	
										MEMO	*0*		*0*

(5) Private bank sold FX to central bank on behalf of customer, now gets FX=a-e-x from customer. Net foreign debt (FD) and "Foreign" back to zero. M3 changes.

Central Bank					Private Bank					MFI			
FA		M0	-e		Lending		M3	+ (x-a)+(a-e-x)		Lending		M3	- e
GB		GD	+e		M0	-e	FD	+(a-e-x)-(a-e-x)	=>			Government	+e
MEMO	0		0		GB		Other					Foreign	
Bank customer					*MEMO*	*-e*		*-e*				Market	
Deposit	+(a-e-x)									*MEMO*	*0*		*0*
FX asset	-(a-e-x)												

Figure A.3: *Government spending, oil income and transfers to the GPFG II*

			GD	M3	FA	M0	FD
	(1)	Government surplus (+) /deficit (-) before oil income	-x	+x		+x	
+	(2)	Government net income from oil	+a+b	-a	+b	-a	
=		Surplus after oil income	a+b-x	+x-a	+b	+x-a	
+	(3)	Transfer to GPFG	-(a+b-e-x)		-(a+b-e-x)		
+	(4)	Sterilizing			+(a-e-x)*	+(a-e-x)*	+(a-e-x)*
=	(4b)	net before transaction w/bank customer	+e	+x-a	0	-e	+(a-e-x)
+	(5)	Transaction with bank customer		+(a-e-x)**			-(a-e-x)
=	(6)	**=> net change**)**	+e	-e	0	-e	0

*) (a-e-x) corresponds to FX purchases in the market by central bank, and (b) corresponds to FX purchases from the SDFI, see https://www.norges-bank.no/en/topics/liquidity-and-markets/Foreign-exchange-purchases-for-GPFG/. The amount **e** allows for a (typically small) deviation between the transfer needs due to budgeting, and actual transfers.

**) Change in M3 in step (5) rests on assumption that Norges Banks' counterparts do their FX-trades with Norges Bank on behalf of their non-bank customers, and final customer delivers FX. Without step (5), the effect on M3 would be (x-a), and effect on FD (a-e-x).

The SDFI income (b) is received in foreign currency by the government. The government sells these foreign claims to the central bank, and the central bank then credits the government on the liability side of its balance sheet with the amount (b), and receives the

foreign claims (b) in return. FA increases correspondingly as shown in the balance sheet example, line (2).

After step (1) and (2), M3 and M0 have changed by $x - a$ and hence falls if (a) is large, see sum of lines (1) and (2) in Figure A.3, while the central bank foreign assets now are up by b.

Next, in line (3) of Figures A.2 and A.3, the balance sheets describe a transfer from the government's account GD to the Government Pension Fund Global (GPFG). The transfer is assumed to be equal to the budget surplus after oil income, $a + b - x$, minus an "error term" equal to e, in total $a + b - e - x$. At this step, only the central bank balance sheet items FA and GD are affected.

In Norway, the central bank is obliged to sterilize (or undo) the reduction in its foreign reserves (FA) that takes place when it transfers foreign assets FA from the central bank to the GPFG. This is described in line (4). Here, the central bank purchases foreign assets FA from market participants (banks) equal to $a - e - x$ in order to build back FA. It does not need to buy foreign assets equal to (b) at this step, because that was already done in step (2).[22]

When the central bank sterilizes and purchases foreign asset, it trades with private banks. Hence, at least in the first round of events, private banks' foreign assets fall by $a - e - x$ (their net foreign debt (FD) increases) in step (4), and M0 increases by $a - e - x$.[23] Accordingly, line (4) in Figure A.2 shows that for the aggregate MFI, the size of net Foreign debt of MFIs does not fall in this step, because private banks now have more net foreign debt (FD) than before. The change in M3 (x-a) that happened as a result of increased expenditure is also still in place. It is positive or negative, depending on the sign of (x-a).

Now we have reached line (5) in the balance sheet setup. If banks purchase or sell foreign assets in the market on behalf of customers, and no further balance sheet adjustments take place, the effect on both M3 and **Foreign** so far will be eliminated in step (5) of events.

Hence, when it is the case that banks mainly trade FX with the central bank on behalf of customers, the net effect of the whole government budget funding process on M3 is as given in line (6) in Figure A.3.

But now reconsider line (4b) in figure A.3, and imagine a marginal increase in x. With a higher x, M3 will be higher than otherwise, all else equal. Also, a higher x will correspond to *lower* net **Foreign** debt for the MFI than otherwise. It is not implausible that at

[22]The petroleum fund mechanism and the central bank's FX transactions are explained at: https://www.norges-bank.no/en/topics/liquidity-and-markets/Foreign-exchange-purchases-for-GPFG/

[23]In practice, the central bank purchases the foreign assets from either domestic or foreign banks. The private bank sector in the figure denotes the aggregate of Norwegian institutions only. If the assets are purchased from domestic bank, the bank receives a compensation for the transfer and its deposit in the central bank M0 increases correspondingly by $a-e-x$. If the purchase is from a foreign bank, this bank's payment from Norges Bank is first deposited on its' Norwegian correspondent banks' account in Norges Bank. Next, the Norwegian correspondent bank pays the seller. Either way, M0 changes by $a - e - x$.

the macro level, high government expenditure may have contributed to higher M3 growth and a fall in net Foreign debt due to this balance sheet mechanics during 2020 and 2021. Even though banks typically trade FX on behalf of customers (as in line (5)), the overall strategy in some banks may at the same time have been to reduce net foreign debt. This may have happened via less rolling over of foreign debt.

Both line (4b) and line (6) capture any change in government deposits GD in the central bank as the result of the whole process. The budget numbers for 2020 and 2021 are shown in line (4b)/(6) of Figure A.4.

Figure A.4: *Government spending, oil income and transfers to the GPFG III*

		Billion NOK	2020	2021
	(1)	Government surplus (+) /deficit (-) before oil income*) = -x	-371	-369
+	(2)	Government net income from oil**) = a+b	107	288
=		Surplus after oil income***) = a+b-x	-264	-81
+	(3)	Transfer to GPFG***) = -(a+b-e-x)	-(- 311)	-(- 103)
=	(4b)/(6)	Surplus after transfer to GPFG***) = **e** «overskudd før lånetransaksjoner» (=> Contribution to increased (+)/reduced (-) GD)	+ 47	+ 21

*) See e.g. *Nasjonalbudsjettet 2023*, table 1.1 in attachment 1, column (A).
**) Source: Statistics Norway, table 11012.
***) Source: Statistics Norway, table 10486.

B Market funding and money growth

This section presents stylized examples of how market funding may increase and lead to a reduction in the volume of money.

When banks sell bank bonds to the money-holding sector (e.g. a household), M3 will fall, as illustrated in Figure B.1. The household pays from its deposit account and receives bonds. The "Market" item on the MFI balance sheet will increase in this case.

Figure B.1: *Bank sells bank bonds to money-holding sector.*

Central Bank					Private Bank					MFI			
FA		M0		+	Lending		M3	-x	=	Lending		M3	-x
GB		GD			M0		FD					Government	
					GB		Market	+X				Foreign	
												Market	+x
					Household								
					Market	+x							
					M3	-x							

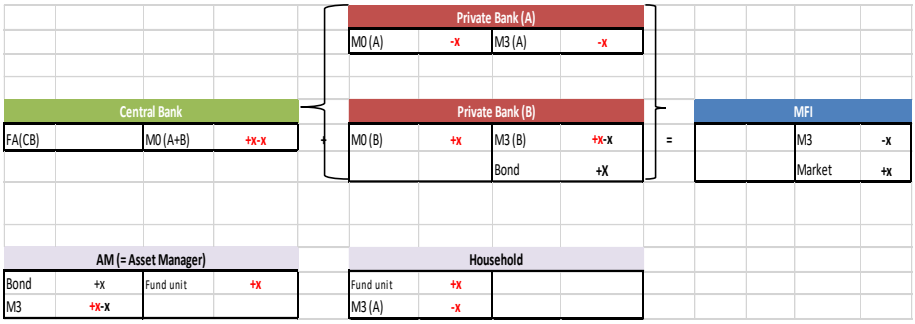
Figure B.2 explains the same story as Figure B.1, but with some (still stylized) details on the interaction between banks and the central bank, as well as between the household and an asset manager. The "destruction" of money when a bank bond is sold to the money-holding sector may in practice take place through, for example, the following sequence of events: Deposits in a bank (say bank A in Figure B.2, shown as M3(A) on the banks' balance sheet) are used by a household (see lower row of balance sheets in the figure) to pay for a bond issued by bank B, and the household makes the purchase through an asset manager by purchasesing a fund unit. For simplicity, we may assume that the asset manager has an account in bank B for transaction purposes, M3(B).

The asset mamangers account is credited when the household purchases the fund unit, and the household account M3(A) is debited. M3 on the MFI balance sheet includes both the deposit held both by the household, M3(A) and the asset manager M3(B). When the fund unit is paid for by the household, the corresponding amount is transferred from bank A's account in the central bank M0(A) to bank B's account in the central bank M0(B). First, the allocation of M0 across banks changes (A has less and B has more), and the allocation of M3 changes (the household has a lower claim on bank A and the fund manager has a larger claim on bank B), but volumes have not changed.

Next, bank B issues the bond and the asset manager receives the bond claim. The asset manager's payment to bank B for the bond is considered complete and taken from the asset managers account in bank B, and M3(B) falls.[24]

[24]The monetary base M0 on the CB balance sheet includes both the M0 held by bank A and by bank B. The issuance of the bank bonds only reallocates M0 across banks. The bank that lost the deposit has lower reserves (M0(A)), while the bank that issues the bond has higher reserves M0(B)).

Figure B.2: *Bank sells bank bonds to money-holding sector: Details.*



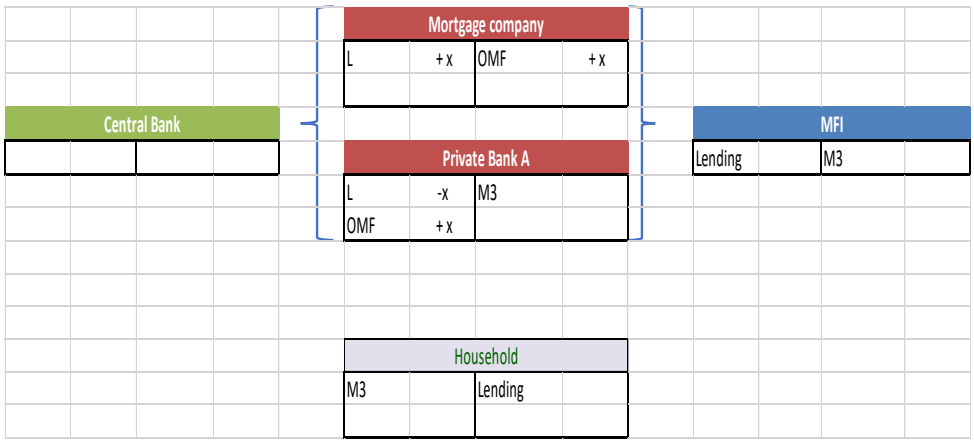
The two above examples show that when banks issue new bonds that are purchased by the money-holding sector, money is destroyed. This means that if banks first create money by lending, but then issue a corresponding amount of bonds, no net money creation takes place. Banks may prefer to reduce liquidity risk by this type of operation.

Next, consider lending from a mortgage company. We may assume that in order to fill up its deposit account with a bank (so that it has money available for lending in the first place), the mortgage company first issues a bond (a covered bond called OMF in Norway). When this is done and the buyer of the OMF is a household or firm, money is "destroyed"; The household or firm pays for the OMF by transferring a deposit (part of M3) to the mortgage company's account in (say) bank A, and - notably - deposits held by mortgage companies are not part of M3. Next, the mortgage company lends money and transfers the deposit to the borrower who is part of the money-holding sector. The net result is that any lending which is funded by a bond this way does not create money: Money is first destroyed, and then created when the loan is given and the money is transferred from the mortgage company's bank account to the loan customer.[25]

Only market funding purchased by the money holding sector contributes to lower M3. To see this, consider the following: bank A starts out with a certain loan portfolio L on its balance sheet (see Figure B.3) and a corresponding volume of deposits M3. Now, Bank A sells the loan portfolio L to (its own) mortgage company, and the mortgage company issues covered bonds (OMF) that bank A receives as payment, as shown in the figure. Money is here not destroyed, even though the bank sells the loan portfolio, as shown on

[25]The same end result would apply also if the mortgage company was not defined to be part of the MFI. In that case, there would be no money creation when the mortgage company issued a loan, because the deposit transferred to the borrower in exchange for the loan would already belong to M3. On the other hand, there would then be no money destruction when the mortgage company issued a bond either, because the money that the household paid for the bond to the mortgage company would still belong to M3.

Figure B.3: *Mortgage company issues OMF to bank and receives loan portfolio (L). MFI balance sheet and M3 is unaffected.*



the balance sheets of the household sector and the MFIs in the figure.

C Money aggregates

C.1 Broad money

Figure C.1: *M3 in billions of NOK. Held by Households, Non-Financial firms and Other (non-bank) financial firms. 2008 M1 - 2022 M9. Source: Statistics Norway.*

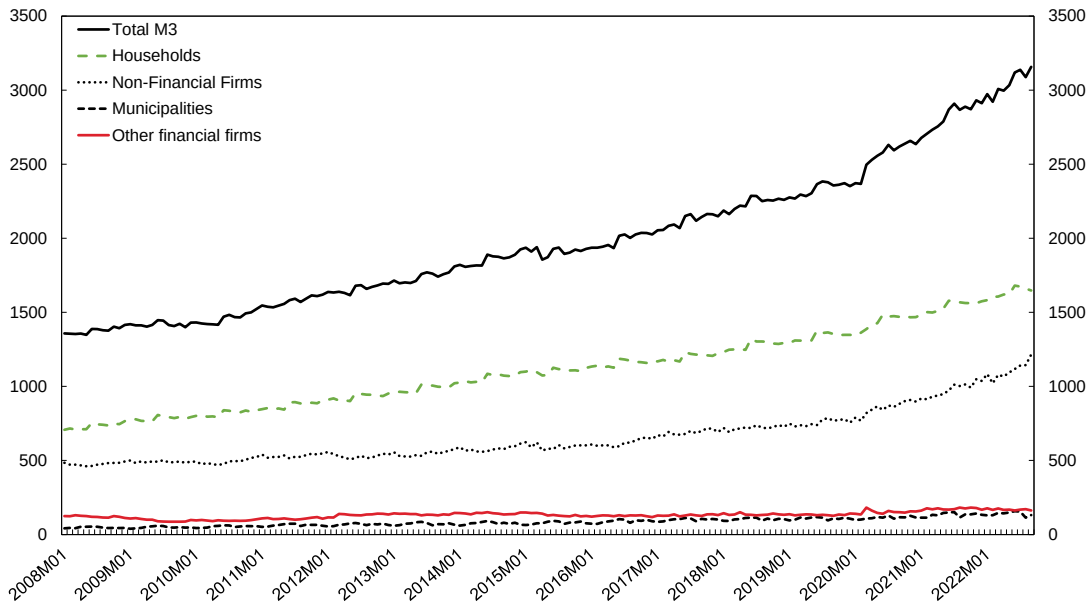
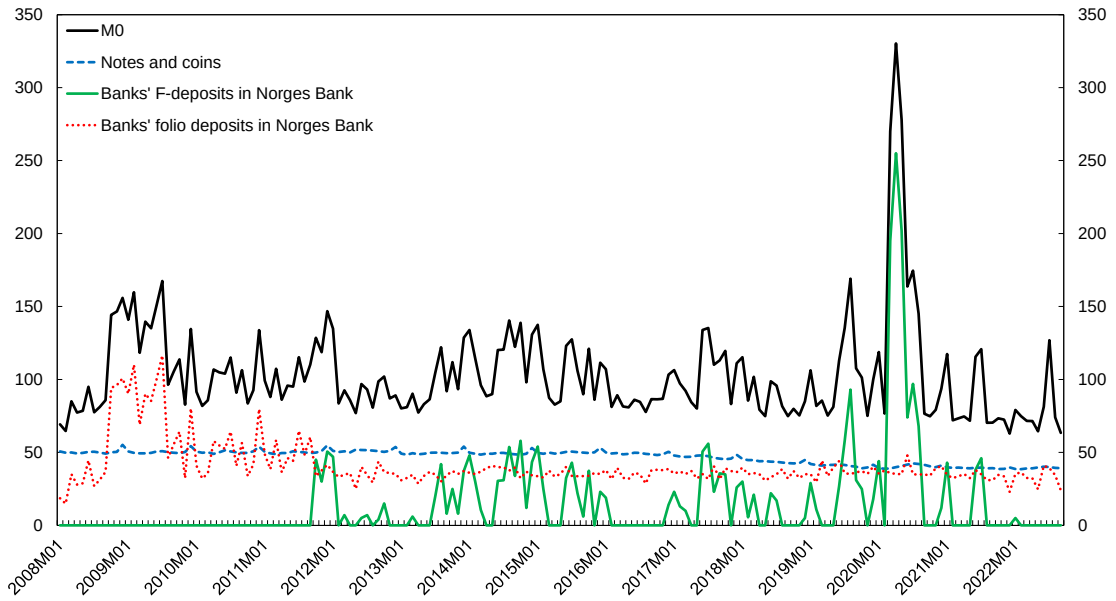


Figure C.1 shows that in Norway, households hold about half of all money (mostly consisting of bank deposits).

C.2 Narrow money

Figure C.2 below shows that notes and coins are a very stable but gradually falling component of M0. The liquidity management system of Norges Bank implies that banks' sight deposits (folio deposits) in Norges Bank are kept stable. This is done by withdrawing liquidity by auctioning fixed-term F-deposits, and also by supplying liqudity by auctioning F-loans (see Norges Bank (2021)).

Figure C.2: *M0 and its components. Level. Billion NOK. 2008 M01-2022 M09. Source: Statistics Norway*



D The liquidity stress in Norwegian markets in March 2020

Figure D.1 shows that there was a jump in money growth in March 2020, and that particular month was characterized especially by other (non-bank) financial firms' demand for liquidity. The total value of M3 increased by NOK 129 billion NOK that month, including the other (non-bank) financial firms' deposits increase of NOK 47 billion. Given the very small share that these other financial firms have of total M3 (see Figure C.1), that amounted to a huge relative increase, see Figure D.1.

Figure D.1: *M3. Monthly growth in percent. Total M3 and selected sectors. 2018M01-2022M09. Source: Statistics Norway.*

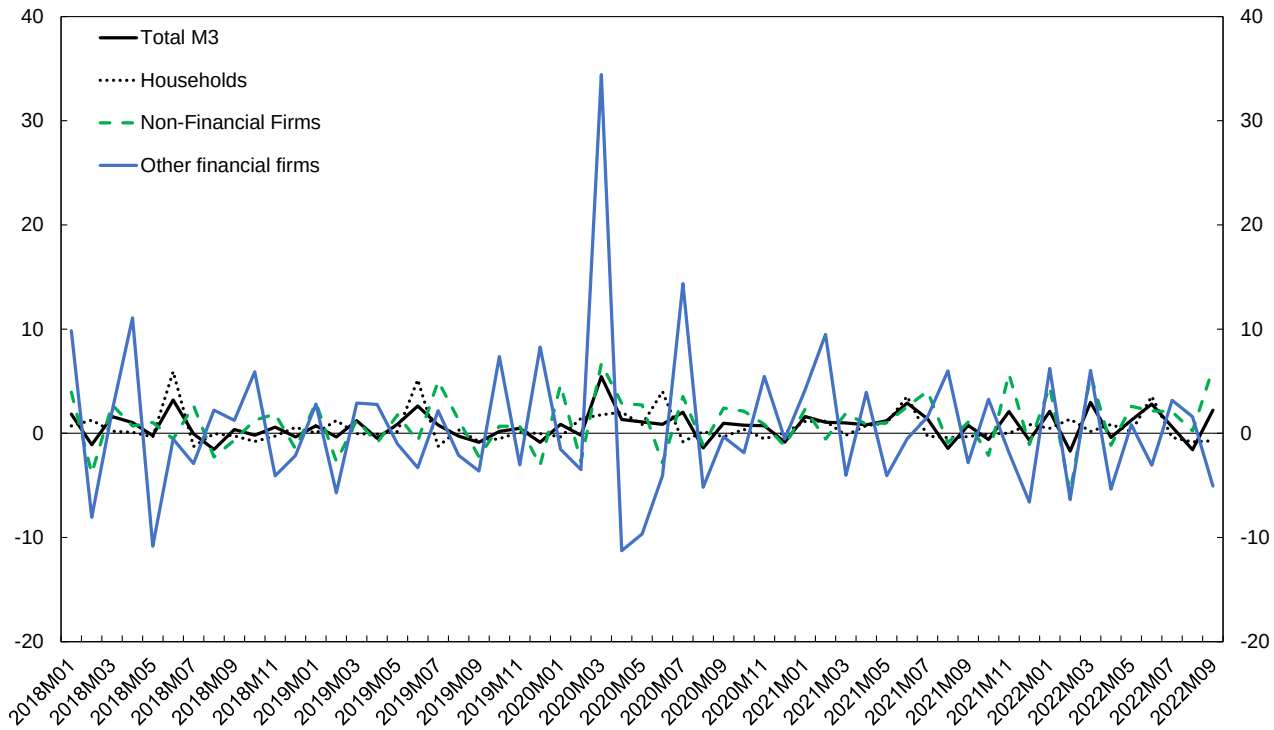


Figure D.2: *Quarterly change in M3 and counterparts. Lending and other gross claims shown separately. Billions of NOK. 2018 Q1- 2022 Q1. Source: Statistics Norway and author.*

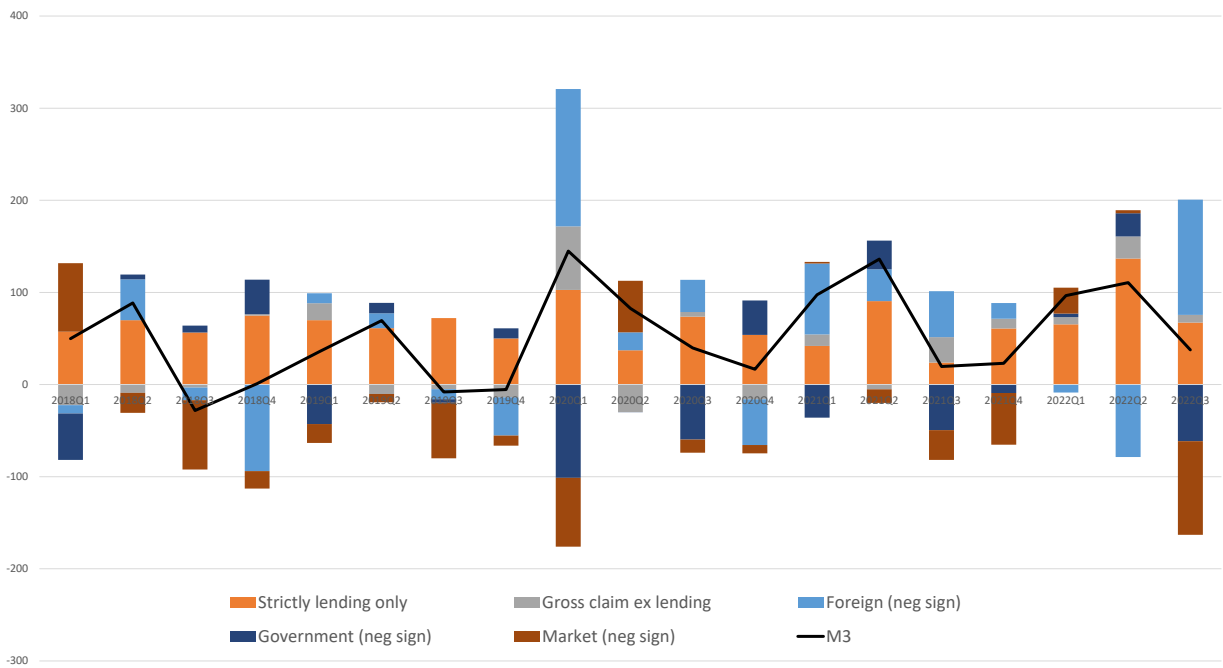


Figure D.2 shows quarter to quarter changes in M3 in billions of NOK, with counterparts. The **Lending**-counterpart is split into contribution from *Lending only* and *Gross claims excluding lending*. The figure illustrates that M3 growth was higher than *Strictly lending only* growth in the first quarter of 2020. There was a significant contribution to increased M3 from banks' *Gross claims excluding lending*, which includes securities. This is consistent with the fact that Norwegian fund managers sold assets to banks in order to satisfy margin calls during the market turbulence in March 2020.[26]

The increase in MFIs' holdings of gross claims excluding lending reversed somewhat in the following quarters, and deposits by other (non-bank) financial firms also reversed. Looking at the aggregate increase in M3 over the two-year period 2019 Q4 to 2021 Q4, which was NOK 560 billion, other (non-bank) financial firms including fund managers accounted for slightly less than NOK 25 billion, or only around 4 percent.

[26] See Alstadheim, Nordal, Syrstad, Ellen, and Wassås (2021).