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Illiquid banks in an overly liquid sector. The impact of liquidity regulation on the deposit policy of listed banks in Poland

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Abstract

Aim: The article aimed to show that banks may face liquidity issues even in a structurally over-liquid sector. The relation between monetary policy and liquidity regulations (liquidity coverage ratio, LCR) was outlined, showing that changes in regulatory liquidity, in the form of the surplus over LCR requirement, impact banks' deposit policy.

Methodology: The author employed qualitative and quantitative data analysis, including dynamic panel data modelling and the calculation of the beta coefficient, presenting the response of deposit policy to changes in the central banks' reference rate.

Results: It was found that the scale of bank interest rate increases in Poland was visibly higher than in the most of EU countries, among others as a result of the decrease in LCR ratios, which in turn was conditioned by the structural features of the Polish banking sector, namely the high exposure to interest rate risk on securities.

Implications and recommendations: The presence of the macroprudential (liquidity) policy channel may reinforce monetary policy transmission via its impact on banks' deposit policy.

Originality/value: The article contributes to the emerging literature on the bank deposit channel of monetary policy transmission. Moreover, it outlines a new (liquidity part of the) macroprudential channel of monetary policy transmission and its operation in Poland during the interest rate tightening cycle.

Keywords: monetary policy, banks, liquidity requirements, transmission, deposits, interest rates

1. Introduction

In their seminal study, McLeay, Radia, and Thomas (2014) showed that from a systemic point of view, the banking sector creates money (in the form of new deposits) by extending loans, however this does not mean that such money creation is unrestricted. Leaving aside the issue of the required reserve in the central bank, at micro level the bank wishing to grant a loan should have adequate capital to cover possible losses resulting from the lack of its full repayment, as well as the amount of liquid funds, in case the borrower would like to withdraw the newly received funds from the cash register or transfer them to another bank. Taking this into account, banks maintain both an appropriate level of equity as well as liquid funds in their assets. The above dependencies are also known to supervisors and regulators who introduce capital and liquidity requirements (usually more restrictive than the internal banking ones) to reduce the financial risk for individual banks and the entire sector. Thus, prudential regulations may affect the scale of credit expansion, as confirmed by empirical research, also in Poland[1].

The impact of prudential regulations on the acquisition of deposits by banks is a much less popular subject for research. This may be due to the fact that the Polish banking sector is characterised by a structural surplus of liquid funds, visible both through the significant predominance of deposits over loans and the related hundreds of billions (PLN 351 billion at the end of August 2024) of Polish currency invested in central bank (NBP) bills. In addition, the sector recorded a very low loan-to-deposit ratio, not exceeding 70% in 2024. At the same time, the newly introduced requirements (e.g. the minimum requirement for own funds and eligible liabilities and the long-term funding ratio) force banks to issue more debt instruments, thus reducing their demand for new deposits.

The structural excess liquidity of the entire sector, understood as a high level of liquid assets, does not necessarily mean that there were no individual institutions struggling with liquidity problems, in particular during (mini) runs, as in the case of the infamous Getin Bank in 2018. On the other hand, one does not hear much about cases where structural excess liquidity (defined above) is accompanied at the same time by a shortage of liquidity, which would be the case for most institutions operating in the sector, at least in terms of share in its assets[2]. Such an event took place in 2022, when the majority of Polish commercial banks struggled with the problem of a shortage of liquid funds and had to actively solicit customer deposits, despite being overly liquid from the monetary policy perspective.

The reason for this paradox was, among others, the growing role of debt securities – in particular treasury bonds and treasury guaranteed bonds – in banks' balance sheets, along with the decreasing role of loans, as well as changes in prudential regulations initiated with the implementation of Basel III in the European Union by the Capital Requirements Regulation (CRR), especially including the introduction of the liquidity coverage ratio (henceforth LCR)[3]. The growing share of debt securities in the structure of banks' assets resulted from the introduction of a banking tax in February 2016, i.e. the tax on banks' assets, from which bonds issued and – later also – guaranteed by the State Treasury were deducted, as well as from rising capital requirements which limited banks' lending capacity and encouraged them to optimise their portfolios, among others by the purchase of Treasury bonds denominated in local currencies, which according to the CRR bear no credit risk). The newly introduced liquidity requirements were also highly important, as they motivated banks to maintain a higher volume of liquid assets in their balance sheets, as well as to take active measures in the event of a loss of liquidity, already at an early stage, i.e. before reaching and falling below the minimum requirements.

The author described how the Polish banks coped with the loss of liquidity, in particular which funds they reached for first, and how they shaped their pricing policy. Hence, the article outlined their active contribution to the monetary policy transmission by pulling free funds from the market and increasing

1 See e.g. Kapuściński (2017 and 2024) and Czaplicki (2022).

2 The analysis does not include cooperative banks operating in associations, which do not have to maintain the LCR requirement.

3 According to the LCR requirement, a bank has to maintain sufficient high-quality liquid assets to cover its 30-day net outflow of funds, as predicted by regulator-specified sensitivity of liabilities.

the opportunity cost for households and corporate spending. It was also revealed that they did this on a larger scale than banks in other European Union countries. Thus, the liquidity side of the macroprudential monetary policy channel was outlined, thereby filling the previously described gap in the literature.

After the introduction to the subject in Section 1, Section 2 summarises the discussion on monetary policy transmission channels, distinguishing between traditional (non-bank) channels and banking channels (credit view), in particular indicating the role of the deposit channel. It also describes the main determinants of banks' deposit policy. Section 3 describes the methodology utilised in the study, explaining the logic of the article. Section 4 presents the empirical results, namely: a) describes the liquidity situation (at macro level) of the Polish banking sector; b) explains the reasons for the decline (at micro level) in the liquidity of Polish banks; c) analyses the impact of the decrease in liquidity in 2022 on the deposit policy of Polish banks, both in macro terms – compared to other banking sectors in the EU, and in micro terms – based the example of the eight largest banks listed on the Warsaw Stock Exchange; d) presents the results of a panel model estimates. Finally, Section 5 sums up the discussion and presents conclusions.

2. Literature review

2.1. Monetary policy transmission channels

The economic literature documents several channels through which a change in interest rates can affect economic activity. Boivin, Kiley, and Mishkin (2010) grouped them into two categories, classifying them as neoclassical and non-neoclassical channels. The first group comprises traditional (non-bank) channels, which focus on the impact of interest rate changes on investments (direct interest rate channel, Tobin's q), consumption (wealth effect, intertemporal substitution effects), as well as international trade (exchange rate). The second group offers a newer view of monetary policy transmission through the impact of economic intervention on credit demand and supply. Within it, one can distinguish banking channels (credit and bank capital channel[4]), as well as the balance sheet channel and borrowers' profitability channel (impact on their creditworthiness). They serve as reinforcing mechanisms rather than a viable alternative to the previously mentioned interest rate and asset price channels.

As demonstrated by Bernanke and Blinder (1988), monetary tightening reduces the volume of deposits, making it more difficult for banks to fund lending – if they cannot find equally cheap debt. Bernanke, Gertler, and Gilchrist (1999) found that credit creation can be slowed (or accelerated) if monetary tightening (easing) affects borrowers' creditworthiness, measured by their net worth, profitability, and the value of collateral. As noted by Bernanke and Lown (1991) and Kashyap and Stein (1995), among others, low levels of banks' equity, equal to or below the regulatory minimum, can limit the effectiveness of banks' credit channels because they cannot expand their lending without additional capital. Van der Heuvel (2002 and 2006) showed that monetary policy has an impact on the level of equity of banks through its influence on their profitability. He also pointed out that monetary tightening reduces bank profits (at least in the US). Since retained earnings are the main source of capital, restrictive monetary policy limits the expansion of banks, thus strengthening the standard interest rate channel. Van der Heuvel (2006) stressed that lending is limited because banks do not have any capital buffers, i.e. they do not hold more capital than required[5], while the issuance of new capital

[4] This list can be supplemented by a risk-taking channel and a bank liquidity or cash flow channel. Beyer et al. (2017) offered a more detailed description of the transmission channels of monetary policy.

[5] Subsequent research revealed that banks actually tend to hold additional excess capital greater than the bank capital requirement. A study by the Deutsche Bundesbank (2018) pointed to several reasons for this: a) the desire to take advantage of sudden lucrative investment opportunities, b) the desire to 'insure' against adverse shocks to equity, or c) the desire to signal the bank.s high solvency due to the existing market

is expensive. Disyatat (2011) additionally pointed to the translation of weaker profitability into growing business risk and more expensive cost of financing (through the risk premium), however he added that because financing is readily available in a liberalised financial system, the only limitation to the supply of credit are regulatory capital requirements. Thus, although early monetary transmission studies assumed that monetary policy shocks work through stronger banks, which can easily convert their asset structure from liquid assets to credit – when central banks lower interest rates, the addition of an equity element to the discussion suggests that weaker banks – with limited capital and profitability – may hinder monetary policy transmission and create tensions between monetary and prudential policy (Gambacorta, & Shin, 2018).

Drechsler, Savov and Schnabl (2017) presented a new, deposit channel for the transmission of monetary policy. In contrast to the balance sheet channel, which affects changes in long-term interest rates on the valuation of banks' assets and their equity, the authors described the impact of short-term market rates on the interest rates on bank products. They also pointed out that US banks are expanding the spread between interest rates on loans and deposits as a consequence of the Fed rate hikes, leading to an outflow of deposits and an increase in demand for wholesale funding. Therefore, the study also contributed to the literature describing the deposit policy of banks and the process of determining the interest rate on the funds received.

2.2. Determinants of banks' deposit policy

In the literature, three main groups of factors affecting interest rates on deposits can be distinguished: those related to the economic environment, those specific to banks, and those linked to given products (Bikker, & Gerritsen, 2018). The main determinant of the level of deposit interest rates are market rates, which in turn follow on the central bank's monetary policy decisions. Their volatility is also important and encourages banks to raise funds for a longer period of time – which costs more. Deposit interest rates are also positively affected by inflation, reflecting the opportunity cost for postponing consumption. However, economic growth has a negative impact as the faster it is, the faster the supply of deposits grows, to which banks may respond by reducing interest rates. The same applies to the level of market concentration and the competitive position of banks: the stronger their position in the market, the less they may pay for the funds raised.

Among the factors specific to banks, the level of risk they take plays a key role. The higher it is, the more banks have to pay for the funds raised, however this relation was somewhat weakened by the introduction of deposit guarantees (see Mondschean and Opiela (1999), who analysed the Polish market, and Demirgüç-Kunt and Huizinga, 2004). Liquidity risk is equally important since surplus liquid assets and a lower maturity mismatch between assets and liabilities mean that banks may not be willing to pay more for new funds. The size of the bank itself and the share of deposit financing in its liabilities also play an important role. In both cases, the higher they are, the lower the tendency of these institutions to overpay for new funds. Paradoxically, research points to a positive relationship between bank profitability and deposit interest rates (Banke, & Yitayaw, 2022), which may be due to the fact that profitable institutions have the space to pay more and thus acquire and attach customers by allowing them to earn money from cross-selling of products.

Moreover, the features specific to the products through which banks raise new funds are also important. The longer their maturity, the higher the term premium, and the more expensive the deposit funding. A similar impact was caused by the introduction of a minimum amount that can be deposited, as well as possible fees for early closure of a term deposit. In general, banks pay more on term deposits than on savings accounts.

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pressure. Another reason can also be identified, not mentioned in the above-mentioned study – if a bank expects the regulator to increase the capital requirement, it may simply try to increase its capital faster (frontload), because this will avoid the need to 'fight' for much more expensive funds at a time when it will have to compete for them with other institutions.

Importantly, one issue is the direction of changes of deposit interest rates under the influence of changing market rates, and another is the scale of these changes. Choi and Rocheteau (2023) indicated, at a theoretical level, that as interest rates rise, the spread between interest rates on deposits and loans widens, which leads to an outflow of funds previously deposited by customers. Messer and Niepmann (2023) showed empirically, using the example of banks from the eurozone, that the transition from the refinancing rate to the deposit rate is very slow and depends on the tenor of deposits. At the same time, they suggested that this pace weakened further during the ECB rate increases in 2022-2023, which they justified by the high liquidity of the European banks. Drechsler, Savov and Schnabl (2021) emphasised that thanks to the ability to maintain interest rates on deposits at a relatively stable level, banks in countries where fixed-rate lending dominates, are able to maintain relatively stable profitability. Kho (2024) underlined, in turn, that the rigidity of the deposit interest rate depends on the direction of market rates' changes. This indicates that the transmission of monetary policy to loosening deposit interest rates is faster than in the case of tightening them, in particular in more concentrated banking sectors.

De Graeve, De Jonghe, and Vander Vennet (2007), who analysed the data of Belgian banks, stressed the high heterogeneity of the transmission of interest rate policy to banks. Gambacorta (2008) showed that this variation occurs only in the short term, whilst also stressing the great importance of capitalisation, banks' relations with customers, and their liquidity. In his opinion, the limited issuance capacity of less liquid banks forces them to seek financing from non-financial entities. Pattipeilohy (2013) observed that in countries characterised by a shortage of deposits, banks decide to overpay for them because it is cheaper than obtaining more expensive funds from the wholesale market. The role of liquidity risk, in particular in the context of the volatility of the deposit base, was emphasised by Brunnermeier, Gorton, and Krishnamurthy (2012), as well as Bai, Krishnamurthy, and Weymuller (2018), who provided a measure of that risk in the form of a mismatch ratio between market and funding liquidity (liquidity mismatch index). In this context, Ariefianto et al. (2015) suggested the key role of the bank's Asset and Liability Management Committee as a body running its deposit policy. Finally, Bonner, van Lelyveld, and Zymek (2015) indicated that in the developing regulatory environment – in terms of liquidity – reporting requirements are becoming an important determinant of deposit policy.

Numerous authors have tackled the issue of non-economic determinants of deposit policy and banks' funding costs, such as the COVID-19 pandemic, along with the geopolitical tensions related to, among others, the war in Ukraine. Tran, Nguyen, and Hoang (2024) found that the pandemic significantly reduced funding costs of banks in the USA, driven mainly by the increase in the supply of retail deposits rather than wholesale deposits. Castro, Cavallo, and Zarutskie (2022) stressed the increased savings rate, drawdown of credit lines, along with the Fed and government policies as the main determinants of increased volume of deposits. Contrary results were reported by Gao, Li, and Wen (2023), who showed that the pandemic led to increasing funding costs of Chinese banks due to depositors' flight to liquidity, along with the decreasing quality of banks' assets (greater risk premium required from banks). Dursun-de Neef and Schandlbauer (2022) found that an important factor determining the inflow of core (retail) deposits was the scale of reduction of spending during the pandemic. As the impact of political instability is concerned, Attila (2022), who examined 80 developing countries over the period 1970-2020, stated that it could increase the volatility of bank deposits. Bernardelli et al. (2023) documented the increasing withdrawals of deposits following the outbreak of the full-scale war in Ukraine in early 2022. Lastly, Fascione et al. (2024) pointed out that the turmoil in the banking system, based on the March 2023 crisis, resulted in a significant outflow of deposits from banks, diminishing the liquidity coverage ratios.

3. Methodology

The author employed both quantitative and qualitative research methods. The former serve to introduce the structural overliquidity of the Polish banking sector along with the sources of decreasing (regulatory) liquidity of Polish banks in 2021-2022. Furthermore, the article describes the actions taken

by the banks to counteract this issue. To show the extent of the actions related to deposit pricing policy, the author introduced and utilised the beta coefficient, measuring the relationship between the change in the interest rate on deposits and the change of central banks main policy rate, comparing its development throughout the 2021-2023 monetary policy tightening cycles in each EU country. Finally, the study focused on the Polish banking sector, looking at the top eight listed banks to outline the relation between changes in their liquidity position and the aggressiveness of their deposit pricing policy.

In order to validate the results of the qualitative analysis the author constructed a simple model describing the changes to banks' deposit policy measured by the fluctuations of the offered deposit rate in relation to the market average. Due to the lack of data (as mentioned earlier, only eight Polish banks publish their liquidity coverage ratios on a regular basis), the analysis was not limited to the risk hiking cycle, but used the entire period where the data were available (i.e. 2018-2023). The generalised method of moments (GMM) estimators for panel data were applied for models controlling the impact of the LCR using both macro as well as bank-specific data.

4. Results

4.1. Structural excess liquidity of the Polish banking sector

Maintaining liquidity, i.e. the ability to timely pay liabilities to customers and creditors, is a key aspect in the operations of every bank. The Polish banking sector has been structurally overliquid at least since the first half of the 1990s (see Przybylska-Kapuścińska, 2003). One of the forms of emanating this excess liquidity is the scale of the operations of the National Bank of Poland, which by issuing bills pulls such liquidity out of the market. Figure 1 shows the historical increase in the nominal volume of bills issued by NBP and their share in the banking sector's assets. Note that the scale of excess liquidity has increased significantly since the outbreak of the pandemic, partly as the result of their purchase by Bank Gospodarstwa Krajowego (Polish State Development Bank), which invested the funds (PLN 114 bn at the end of 2023, see Bank Gospodarstwa Krajowego, 2024) from the issuance of COVID bonds intended to fund government projects.

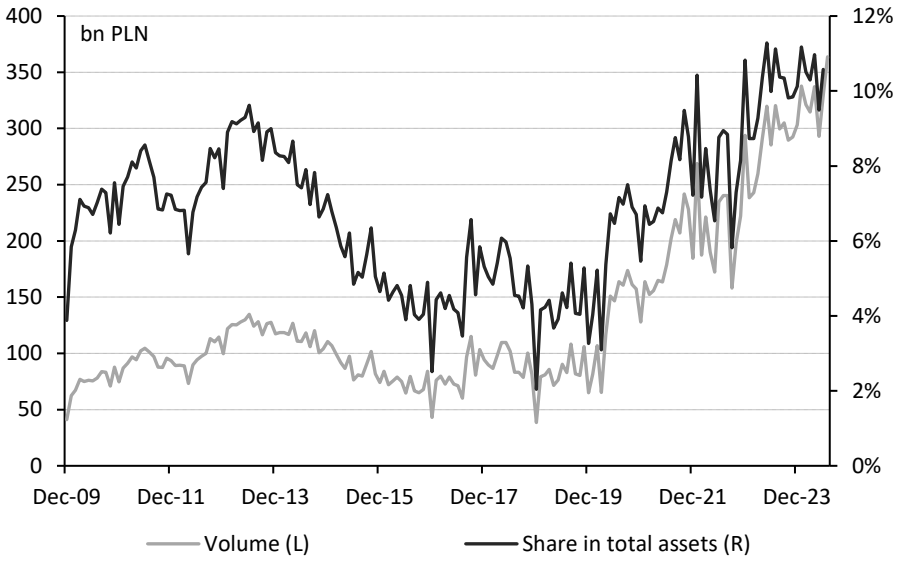


Fig. 1. Nominal value of NBP bills and their share in the banking sector's assets in 2009-2024 (data as at the end of the month)

Source: National Bank of Poland, Polish Financial Supervision Authority, author's own calculations.

Vodová (2013) showed that this excess liquidity can also be observed on the basis of other measures (i.e. liquidity indicators). It is worth noting that Polish banks are increasingly investing their liquidity surpluses in liquid assets other than bills, thus increasing their exposure to interest rate risk. Since the outbreak of the pandemic more than 30% of banks' assets can be classified as liquid as shown in Figure 2.

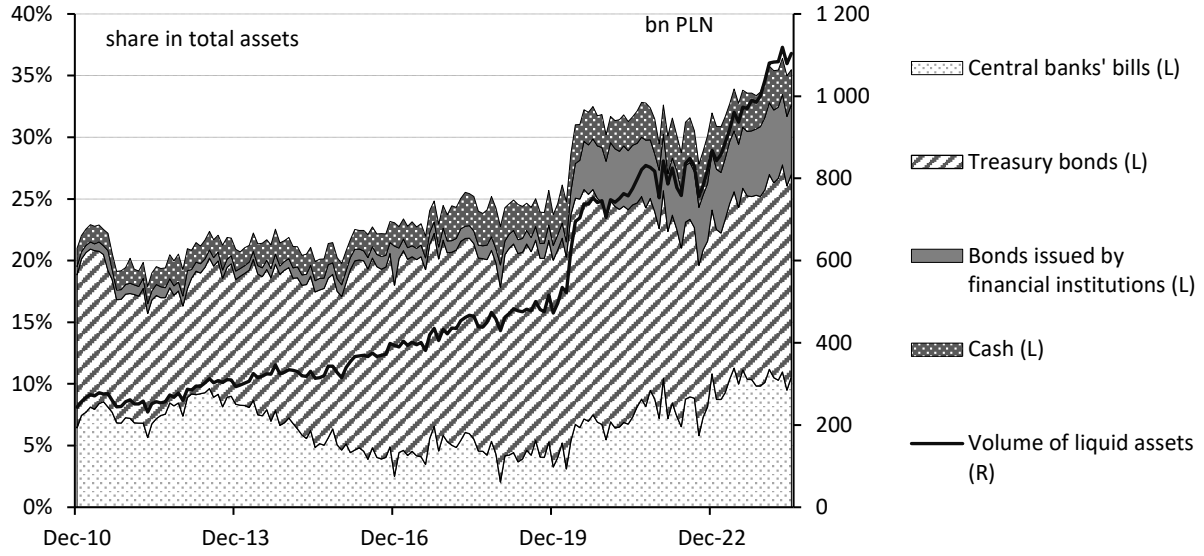


Fig. 2. Size and structure of banks' liquid assets in 2010-2024

Source: National Bank of Poland, Polish Financial Supervision Authority, author's own calculations.

It should be emphasised that achieving such a high level of liquid assets was possible both due to the large inflow of deposits to banks, resulting from, among other things, the great popularity of this type of investment by both households and non-financial enterprises, also as compared to the European Union countries), and the mediocre lending activity of banks reflected in the decreasing loan-to-GDP ratio since 2015. Figure 3 shows the effect of these two opposing trends in the form of a decreasing loan-to-deposit ratio, which in 2024 was at its lowest level since 1997. However, the Polish Financial Supervision Authority (KNF) reporting data indicated that the share of loans in assets in 2024 reached the lowest level in at least 20 years (older data not available) and amounted to 47.3% at the end of June (see Figure 4).

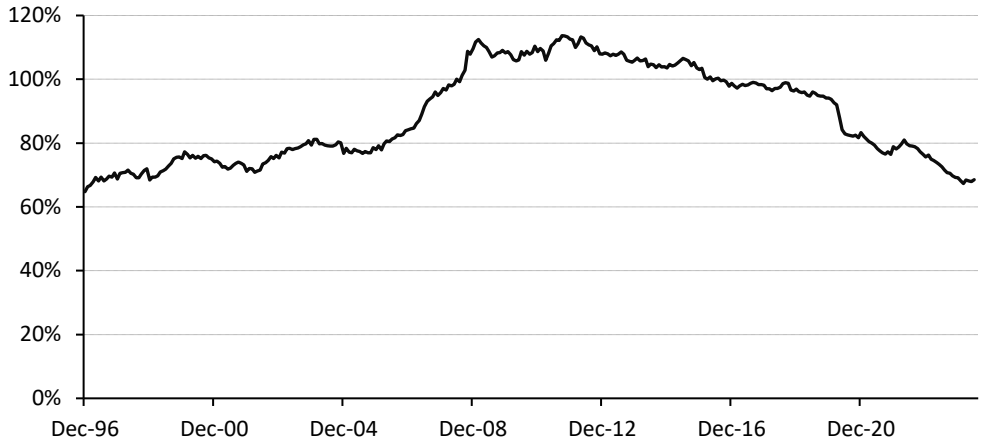


Fig. 3. Loan-to-deposit ratio for Polish banks in 1996-2024

Source: National Bank of Poland, author's own calculations.

4.2. Sources of decreasing liquidity of Polish banks in 2021-2022

Paradoxically, it was the structural excess liquidity of the Polish banking sector that became one of the main sources of the loss of liquidity in 2022. In 2023, the National Bank of Poland (2023) reported a slight (PLN 17.3 bn) year-on-year decrease in funds at the disposal of the banking sector exceeding the required reserve level, which amounted to PLN 236.6 bn at the end of December 2022. This indicated an increase in the required reserve ratio from 2.0% to 3.5% in March 2022, whilst in October 2021 it increased from 0.5% to 2.0%[6], as well as an increase in the level of cash in circulation following Russia's full-scale invasion of Ukraine in February 2022 as the sources of these changes. However, at least four other reasons for the decline in the volume of banks' liquid assets should also be mentioned.

The first were the above-average sales of retail treasury bonds thanks to a very attractive, anti-inflationary offer of the Treasury. According to data from the Ministry of Finance, in 2022 alone, bonds worth PLN 57.1 bn were sold – nearly 32% more than in the previous record year 2021 and 17.4% more than in the following year (2023). A particularly large inflow of funds was observed in the summer period (PLN 30.5 bn from June to August), which additionally prompted banks to accelerate the increase in interest rates on deposits.

Banks were also forced to transfer an increasing amount of funds to deposits in other (foreign) commercial banks, which was due to the margin calls related to the falling value of interest rate swap transactions concluded to secure (fix) cash flows from interest on loans. This was a result of the otherwise correct policy of banks, which, by granting the majority of loans based on a variable rate, wanted to partially hedge the interest rate risk in a situation where – on the liabilities side – they predominantly provide funds with fixed zero-interest rate instruments, i.e. current deposits. In the case of the eight largest listed banks, the increase in receivables from other banks reached PLN 30.2 bn in the period from September 2021 to September 2022; it is worth noting the additional PLN 9.3 bn increase in these receivables from 2021 Q3, when expectations for interest rate hikes began to grow.

Ultimately, the rate hikes caused a sharp devaluation of fixed-coupon treasury bonds. It should be emphasised that Polish banks are characterised by the highest share of Treasury bonds in total assets in the European Union, as well as their highest ratio to GDP. This was due both to the shape of the banking tax, i.e. the exclusion of Treasury bonds and bonds guaranteed by the State Treasury from the tax base and also the structure of capital requirements (exemption for local currency treasury bonds as regards credit risk calculation resulting in a 0% credit risk weight). Their growing role in the assets of Polish banks is shown in Figure 4.

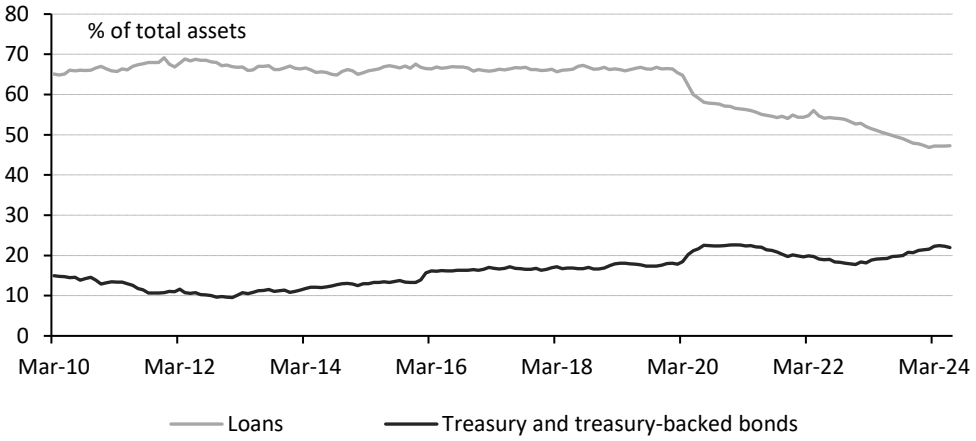


Fig. 4. Share of loans, treasury and treasury-backed bonds in the assets of the Polish banking sector in 2010-2024

Source: National Bank of Poland, author's own calculations.

[6] From September 2021 to September 2022 the value of cash and funds held in the central bank increased by PLN 45.3 bn to PLN 85.9 bn in the eight largest Polish listed banks (PKO BP, Pekao, Santander, ING BSK, mBank, Millennium, BNP Paribas, and Alior).

The decline in the valuation of these securities, along with their rising yields) hit the sector badly. One should mention that Polish banks experienced only about 50% of the effect of this decline, because only about 50% of the treasury bond portfolio was maintained – due to liquidity management – in the so-called liquidity management portfolio (available for sale), which forces them to use the market valuation of these securities and recognise its change in other comprehensive income (the component of equity). The remainder of the bonds were placed (from an accounting point of view) in a portfolio measured at amortised cost on the assumption that the securities would be held by the bank until their maturity. The scale of the decline in the market valuation of bonds from the liquidity portfolio is shown in Figure 5[7].

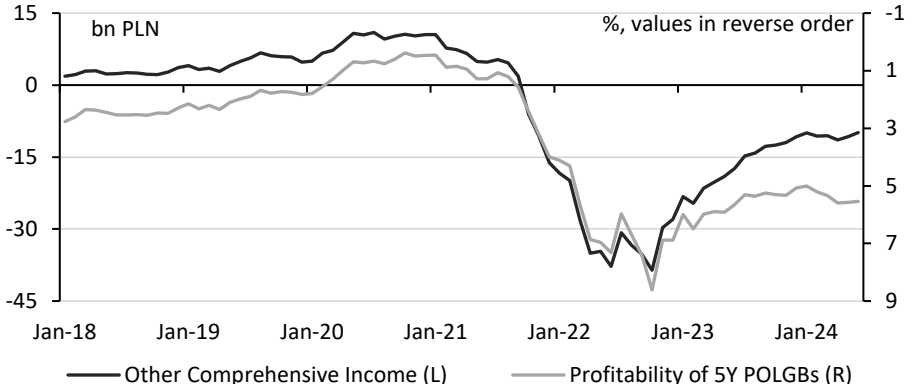


Fig. 5. Other comprehensive income of the Polish banking sector vs. the yield on government bonds

Source: investing.com, Polish Financial Supervision Authority.

Another factor reducing the regulatory liquidity of Polish banks was the structure of the LCR requirement. From the accounting perspective, this indicator is a quotient of the sum of liquid assets and the net outflows from the bank over a period of the next 30 days. The increase in interest rates made households, or at least some of them, increasingly active in managing their funds as shown in the next part of the article. This was also supported by the banks' pricing policy, which increased the conversion of current deposits into term deposits (see Figure 6). From the point of view of the LCR calculation, the advantage of current deposits over term deposits is such that, as the households are concerned, with the former (in the LCR calculation) only 5% of the guaranteed funds per month should be assumed as payable. In the case of term deposits, one does not assume such a withdrawal until the last month of the deposit period, when a 100% outflow has to be locked in for the purposes of LCR. This trend weighed even more heavily on corporate deposits, which were acquired (among others) for very short tenors, mostly of one month.

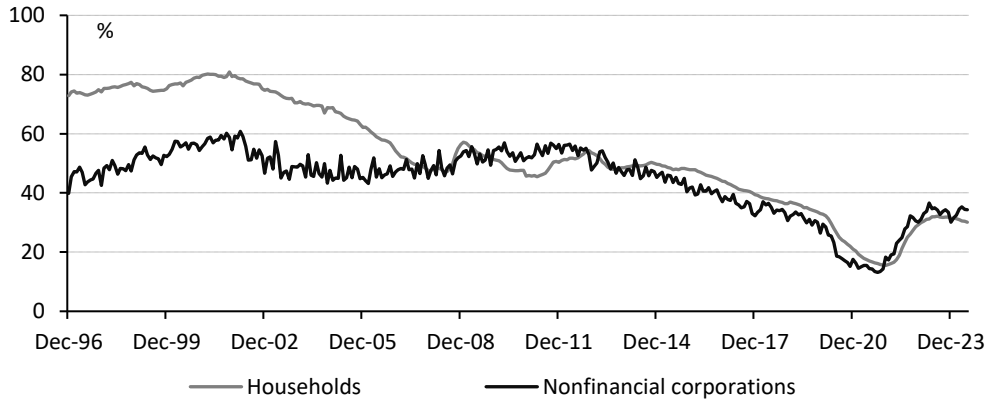


Fig. 6. Share of term deposits in deposits of households and non-financial corporations in 1996-2024

Source: National Bank of Poland, author's own calculations.

[7] Other comprehensive income includes additionally the effect of changing valuation of cash flow hedges.

To sum up, within a year since the first interest rate hike in October 2021, Polish banks lost for a variety of reasons nearly PLN 150 bn of liquid funds, i.e. over 10% of assets, mostly due to a change in the valuation of financial instruments. An important element was also the conversion from current to term deposits, as well as the replacement of retail with corporate deposits – regarded as less stable from the regulatory perspective. As a result, banks recorded a sharp decline in LCRs, as shown in Figure 7.

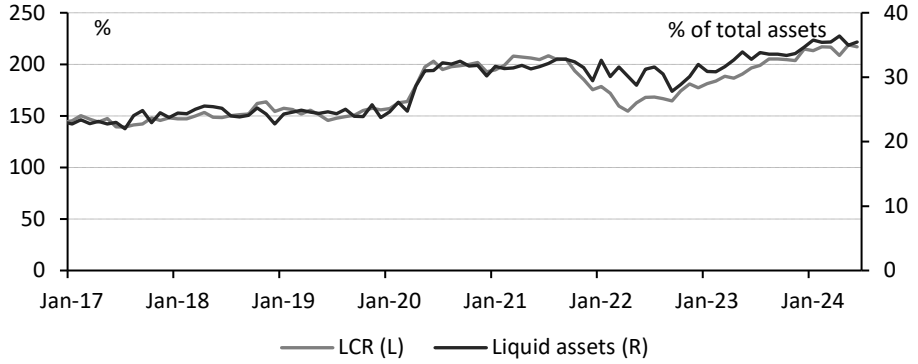


Fig. 7. LCR ratio of Polish banks and the ratio of liquid assets to total assets in 2017-2024

Source: investing.com, Polish Financial Supervision Authority, author's own calculations.

It should be emphasised that the decrease in LCR was also related to the construction of this indicator. Hence, while the LCR itself (for the entire sector) fell to 2019 levels (and even lower for individual banks), the decline in the case of liquid assets was not as drastic, if at all.

Finally, another important factor contributed to the (temporary) outflow of funds (and liquidity) from the Polish banks, namely the outbreak of the war in Ukraine and the related short-term bank run. According to the NBP's data on money supply, the volume of cash in circulation increased by PLN 15.7 bn in February, PLN 18.3 bn in March, and PLN 3.6 bn in April 2022 (PLN 37.5 bn in total). However, as the mood stabilised it decreased by PLN 27.6 bn by January 2023, resulting in a net PLN 10.0 bn increase, whereas the increase between February 2021 and January 2022 totalled PLN 29.0 bn. Yet, the 'mini' run was a vital, but only temporary factor, affecting the Polish banking sector.

4.3. Deposit policy of Polish banks in 2021-2023: an empirical analysis

The limited scale of the decline in the share of liquid assets in total resulted from the fact that Polish banks actively tried to counteract the decreasing regulatory liquidity at the turn of 2021 and 2022. Figure 8 shows that as early as in October 2021, they started rapidly increasing interest rates on newly acquired deposits from non-financial corporations. This was aimed at quickly raising new funds in order to cover the gap created by the decline in the valuation of fixed-coupon assets.

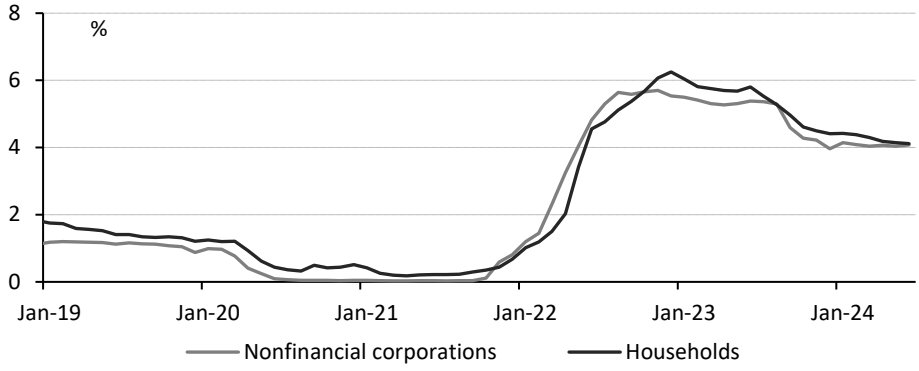


Fig. 8. Interest rates on newly acquired term deposits of Polish banks in 2018-2024

Source: National Bank of Poland.

Figure 9 shows that as a result of the aforementioned rate increases, the volume of funds raised also grew sharply. It should be emphasised that the structure of the LCR requirement meant that banks needed to raise disproportionately more new corporate deposits compared to the decreasing volume of liquid assets, due to the construction of LCR favouring retail over wholesale funding[8].

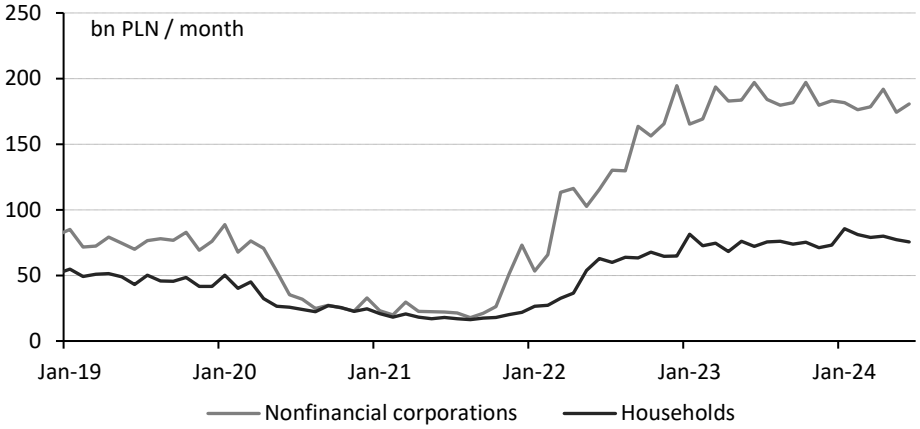


Fig. 9. New sales of deposits of Polish banks in 2018-2024

Source: National Bank of Poland.

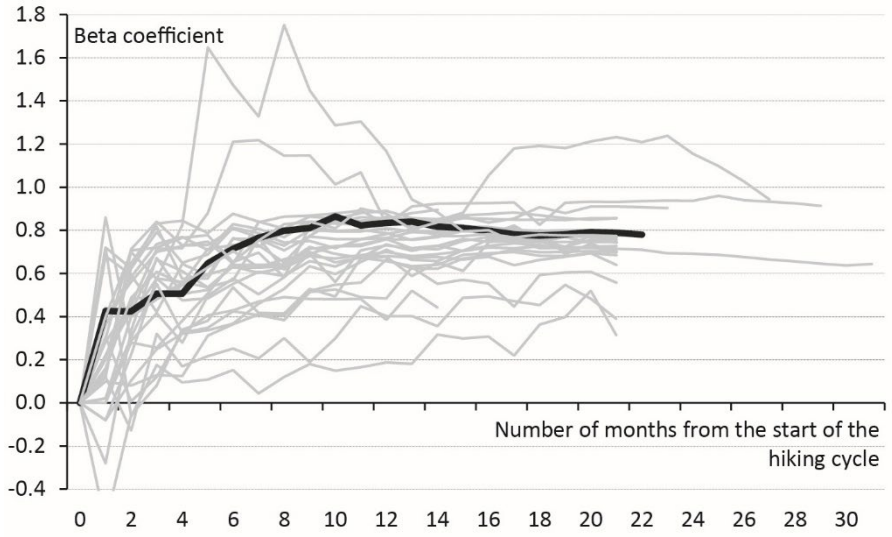


Fig. 10. Aggregated beta coefficients for interest rates on deposits of non-financial corporations in the EU during the 2021-2023 interest rate hiking cycles[9]

Source: European Central Bank (data on banks' interest rates), central banks (data on reference rates), author's own calculations.

[8] LCR is calculated as the quotient of liquid assets and the difference between outflows and inflows of funds from/to the bank over the next 30 days. Note that the majority of deposits of non-financial enterprises placed in banks had a very short, monthly tenor. Although these deposits were usually renewed, or funds were reinvested, as shown by the scale of monthly inflows reaching PLN 150 bn with the portfolio of deposits of non-financial enterprises at the level of approx. PLN 450 bn in mid-2022, nevertheless, in accordance with the LCR regulation, the bank had to assume a full outflow of funds in the period. In the case of ordinary current deposits, the bank had to assume a 20% or 40% outflow of funds – depending on whether they were covered by the deposit guarantee – while in the case of natural persons this was 5%.

[9] For each sector, the beta coefficient from the month with the first rate hike in the cycle to the month with the first reduction is presented, where the rate cutting cycle had not yet started in Romania as of the end of August 2024.

The deposit rate hikes themselves were of key importance and also distinguished Polish banks from their EU peers, as shown in Figures 10 and 11, which present the beta coefficients for interest rates on new term deposits. These indicators reflect the scale to which changes in interest rates on deposits mirrored interest rate hikes by central banks. Therefore, the lower they are, the less sensitive banks' deposit policy is to interest rate increases, whereas in the opposite case higher (and faster growing) rates imply greater sensitivity.

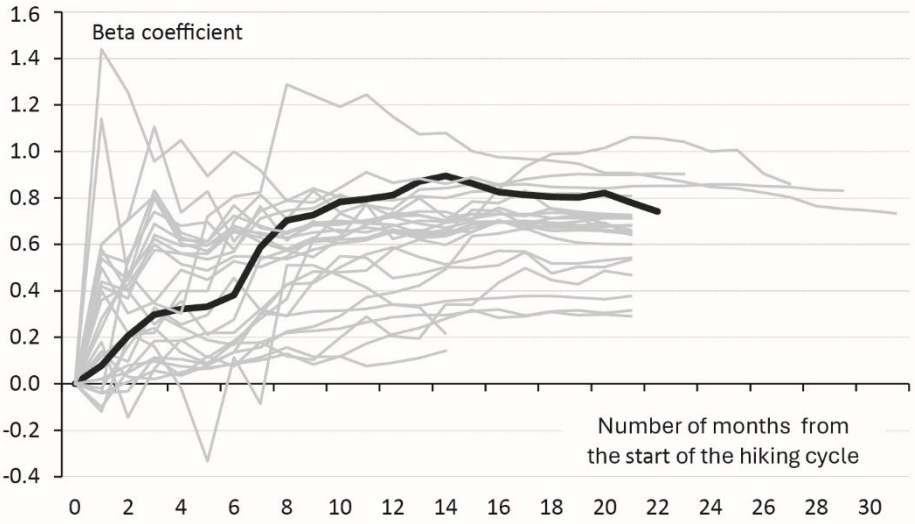


Fig. 11. Aggregated beta coefficients for EU household deposit rates during the 2021-2023 interest rate hiking cycles

Source: European Central Bank (data on banks' interest rates), central banks (data on reference rates), author's own calculations.

An analysis of Figures 10 and 11 confirmed the conclusions drawn from Figure 8. In the initial phase, Polish banks were much more vigorous in raising interest rates on term deposits of non-financial enterprises than for households. At the same time, it can be noted that Poland did not stand out from other EU countries as far as the pace of adjusting interest rates is concerned, at least not in the case of retail deposits, yet the peak values of the beta factors placed its banking sector in one of the leading positions in terms of the transmission of interest rate policy through the deposit channel.

As mentioned earlier, one of the most important factors affecting the pace of transmission of interest rate policy might have been the loss of regulatory liquidity in the form of a decrease in the LCR ratio. To demonstrate this, the data of the eight largest Polish listed banks (PKO BP, Pekao, Santander, ING BSK, mBank, Millennium, BNP Paribas and Alior), in the period 2017-2023 were analysed. The choice was determined by the fact that they were the only ones to publish the LCR ratios on a quarterly basis throughout the full period under study, and accounted for over 60% of the assets of the banking sector throughout the entire sample period.

The analysis was based on data from consolidated financial statements. In contrast to the ECB's data on the average level of deposit rates in EU countries, there was no source of standardised data for these banks, therefore the author relied on manually collected data, where for each period the maximum value of the interest rate offered for deposits opened at the bank was adopted, regardless of whether they concerned new or old funds or in which channel they were accepted. This method is not free from drawbacks, related in particular to the failure to take into account the time structure of the funds received, as well as the fact that some banks could have increased interest rates on selected products in order to attract customers operating, e.g. in mobile channels.

The analysis of banks originating from the same banking system and affected by similar shocks, both in terms of monetary policy, government debt issuance policy and geopolitics, allowed to capture

the impact of changes in the restrictiveness of macroprudential policy. Figure 12 shows the changes in the beta coefficients calculated according to the previously indicated method for the eight banks, comparing them with the change in the surplus over the LCR requirement in the previous quarter (quotient of the difference between LCR_t and LCR_{t-1}, and the surplus of LCR_{t-1} over the 100% requirement).

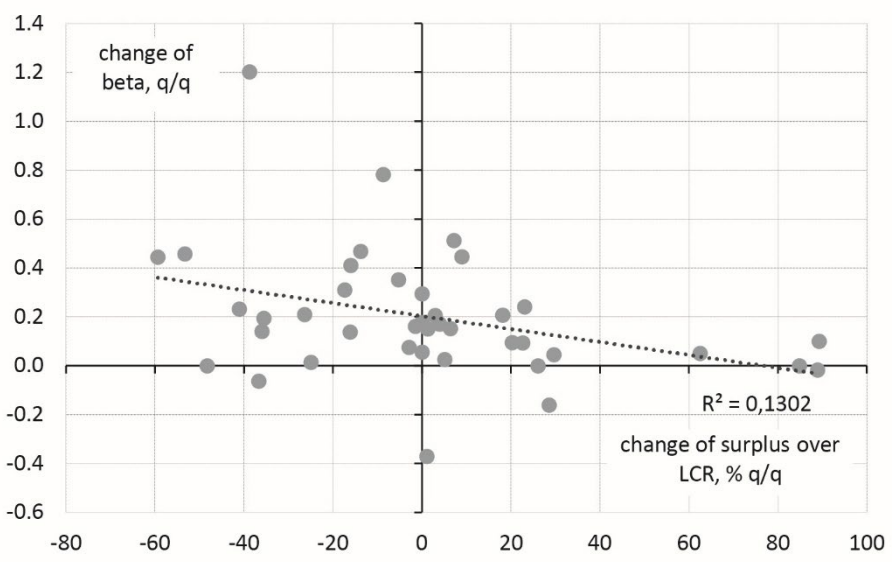


Fig. 12. Changes in the beta coefficient for interest rates on term deposits of individual clients vs. changes in the surplus over the LCR requirement of Polish banks during the 2021-2022 rate hiking cycle

Source: banks' websites and quarterly results' presentations, author's own calculations.

Figure 12 suggests that the contraction of the surplus over the LCR requirement in a given quarter resulted in a more aggressive increase in the deposit rates offered. Similar conclusions can be drawn from the analysis of Figure 13, which additionally shows that the relationship between changes in LCR and deposit policy also holds in the long term. Given the longer time horizon (2017-2023), Figure 13 also includes periods of rate stabilisation, as well as cuts. Observations from the period presented in Figure 12 are highlighted in a darker colour.

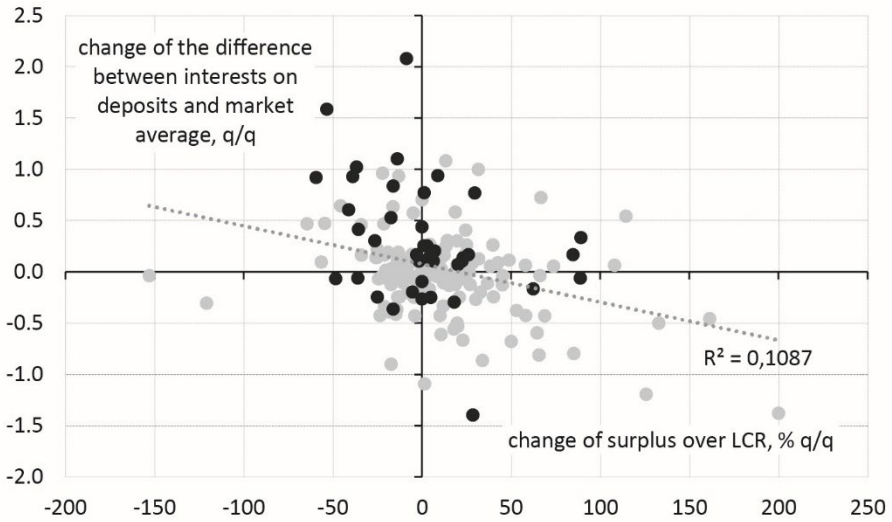


Fig. 13. Changes in the difference between the interest rate offered and the market average in Polish banks vs. changes in the surplus over the LCR requirement of Polish banks in 2017-2023

Source: banks' websites and quarterly results' presentations, author's own calculations.

4.4. Modelling the drivers of banks' deposit policy

To prove the outlined relation, panel data models were introduced. Identifying common drivers of bank deposit (pricing) policy proves that banks' regulatory liquidity is a crucial factor impacting its aggressiveness. Several dependent variables were introduced to test the drivers presented in the relevant economic literature (introduced in Section 2.2). The author also introduced a variable representing the changes of the LCR surplus over the regulatory minimum. Unfortunately, the study was limited by the small size of the research sample resulting from the availability of the data on the LCR ratio. Table 1 contains the description of the variables utilised in the models, along with their sources.

Table 1. Variables and their sources

Variable	Source
Change of the difference between the offered deposit rate and the market average (pp. q/q)	Banks' websites, National Bank of Poland
Change of LCR surplus (%)	Banks' quarterly presentations
Change of NIM (%) measured as the quotient of interest income and the average volume of working assets	Banks' consolidated financial statements
Change of loan to deposit ratio (%)	Banks' consolidated financial statements
Change of capital adequacy ratio (%)	Banks' consolidated financial statements
Change of M3 money supply (% q/q)	National Bank of Poland
Change of cash in circulation (% q/q)	National Bank of Poland
Change of nominal GDP growth y/y (pp. q/q)	Statistics Poland
Change of CPI inflation y/y (pp. q/q)	Statistics Poland
Change of deposit market concentration level (pp. q/q) measured as a share of the five biggest banks' deposit holdings in total	Banks' consolidated financial statements, Polish Financial Services Authority

Source: author's own elaboration.

The descriptive statistics for the variables used in the estimations are presented in Table 2. For each variable, the measures of central tendency and the total number of observations are shown. All the variables are stationary and follow a normal distribution, except for the quarterly change in the inflation dynamics.

Table 2. Descriptive statistics

	Mean	Median	Max.	Min.	Std. Dev.	Jarque-Bera (prob.)	ADF* (prob.)	Obs.
Change of the difference between the offered deposit rate and the market average (pp. q/q)	0.0423	0.0317	2.0800	-1.3967	0.4529	0.0000	0.0000	192
Change of LCR surplus (%)	8.8963	3.8462	200.0000	-153.0000	41.7260	0.0000	0.0000	177
Change of NIM (%) measured as the quotient of interest income and the average volume of working assets	-0.0107	-0.0083	0.0917	-0.1970	0.0354	0.0000	0.0000	208
Change of loan to deposit ratio (%)	0.0192	0.0070	0.3652	-0.2263	0.0766	0.0000	0.0000	208
Change of capital adequacy ratio (%)	-0.0016	-0.0026	0.1811	-1.0000	0.0885	0.0000	0.0000	207
Change of deposit market concentration level (pp. q/q)	-0.0044	0.0000	0.0100	-0.0500	0.0136	0.0000	0.0000	25
Change of M3 money supply (% q/q)	0.0230	0.0195	0.0723	-0.0053	0.0170	0.1005	0.0000	26
Change of cash in circulation (% q/q)	0.0274	0.0228	0.1284	-0.0267	0.0358	0.0113	0.0000	26
Change of nominal GDP growth y/y (pp. q/q)	0.0004	-0.0006	0.1096	-0.1063	0.0387	0.0055	0.0000	26
Change of CPI inflation y/y (pp. q/q)	0.0018	0.0015	0.0420	-0.0390	0.0181	0.5918	0.0000	26

Note: * Cross section independent for panel variables.

Source: author's own calculations.

The dynamic model specification is presented below:

$$\Delta deposit\_policy_{i,t} = \alpha \times \Delta deposit\_policy_{i,t-1} + \beta \times \Delta LCR_{i,\,t} \times + \gamma \times X_{i,t-n} + \mu_i + \varepsilon_{i,t} \qquad (1)$$

where the subscripts of *i* and *t* denote bank and time period, respectively. Δ*deposit_policy* is the quarterly change of the difference between offered deposit rate and the market average, Δ*LCR* is the quarterly change in LCR surplus over capital requirement (see Figure 13), whilst *X* is the vector of explanatory variables, whereas μ is the bank specific effect, and ε is the error term.

The GMM panel estimators are designed to control for time series and cross-sectional variation in data, moreover this method eliminates the bank-specific effect problem by differentiating the regression equation:

$$\begin{aligned} &\Delta deposit\_policy_{i,t} - \Delta deposit\_policy_{i,t-1} \\ &\qquad = \alpha \times \left(\Delta deposit\_policy_{i,t-1} - \Delta deposit\_policy_{i,t-2}\right) + \ldots \\ &+\beta \times \left(\Delta LCR_{i,\,t-1} - \Delta LCR_{i,\,t-2}\right) + \gamma \times \left(X_{i,t-n} - X_{i,t-n-1}\right) + \left(\varepsilon_{i,t} - \varepsilon_{i,t-1}\right). \end{aligned} \qquad (2)$$

As Equation 2 introduces a correlation between the new error term and the lagged dependent variable, the study employed the two-step Arellano and Bond (1991) first difference GMM estimator with lagged values of the explanatory variables as instruments. The results of the baseline estimations are presented in Table 3 (*qq* stands for the quarterly change of the variable).

Table 3. The drivers of quarterly changes in bank deposit policy (2018-2023, TOP eight Polish listed banks)

Dataset	Time lag	Dependent variable: deposit policy $(qq)_t$								
Dependent variable(qq)$_t$	-1	-0.5622 (0.3824)	-0.5384* (0.3231)	-0.3900*** (0.1364)	-0.4000** (0.1931)	-0.6915* (0.3293)	-0.7531*** (0.1522)	-0.6737*** (0.0546)	-0.7169*** (0.0757)	-0.6346*** (0.0341)
ΔLCR(qq)$_t$	-1	-1.6414*** (0.5948)	-1.5415* (0.9218)	-1.7843*** (0.5815)	-1.7187* (0.8897)	-1.5364** (0.5763)	-2.0696* (1.1634)	-1.2259*** (0.4093)	-1.5023** (0.7094)	-0.8732** (0.3682)
ΔLTD(qq)$_t$	-1	-7.4335** (3.6708)	-7.7125 (4.7808)	-9.2677* (5.2917)	-8.1528 (5.1106)	-9.0751** (2.9409)	-7.1222 (4.3113)	-8.3054* (4.8480)	-5.3569 (4.6374)	-10.2897* (5.9466)
ΔNIM(qq)$_t$	-1	38.6473 (26.985)	41.1719 (34.1816)	57.2382* (31.3616)	48.9856 (29.6421)	43.7175* (22.5338)	43.2756* (24.4883)	38.4499 (25.7048)	34.0284* (20.3062)	40.3864 (26.3534)
ΔCAR(qq)$_t$	-1	1.5764 (4.3064)	1.9652 (3.1320)	2.4571 (1.8989)	3.4014 (2.2500)	-1.0264 (2.3455)	-3.9241 (5.7586)	-0.3416 (1.8714)	-3.4067 (5.9782)	2.3615 (2.2837)
Δdeposit_concentration(qq)$_t$	0	3.2284 (8.6230)	-27.5058 (61.0437)	-49.9607** (20.2734)	-48.7361 (34.9401)					
ΔM3(qq)$_t$	-1	-25.2908 (62.5276)				7.0057 (4.5655)	14.0153 (13.3941)			
ΔCash(qq)$_t$	-1		2.9945 (7.0056)					5.8298** (2.2745)	10.7418 (7.4485)	
ΔnominalGDP(qq)$_t$	0			6.6981 (13.1328)		7.8777 (11.5639)		8.6224 (14.5780)		16.1455 (15.956)
ΔInflation(qq)$_t$	-1				4.3573 (42.2503)		-41.5609 (64.0182)		-48.7408 (71.8402)	44.1198* (26.6156)
Cross-sections fixed (first differences)										
No. of observations		159	159	159	159	159	159	159	159	159
Serial correlation test (1)		0.7007	0.3367	0.4607	0.6077	0.3651	0.5946	0.3229	0.4251	0.4024
Hansen test (2)		0.5308	0.6086	0.6605	0.5738	0.7214	0.8946	0.6985	0.9556	0.4178

Source: author's own calculations. ***, **, * denote significance at 1%, 5%, and 10% test levels, respectively; standard errors are in parentheses. All the explanatory variables were included as instrument variables with two lags. White period instrument weighting matrix. White period standard errors & covariance (no d.f. correction). Constant added to the instrument list. (1) Reports p-values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. (2) Reports p-values for the null hypothesis that the instruments used are not correlated with the residuals.

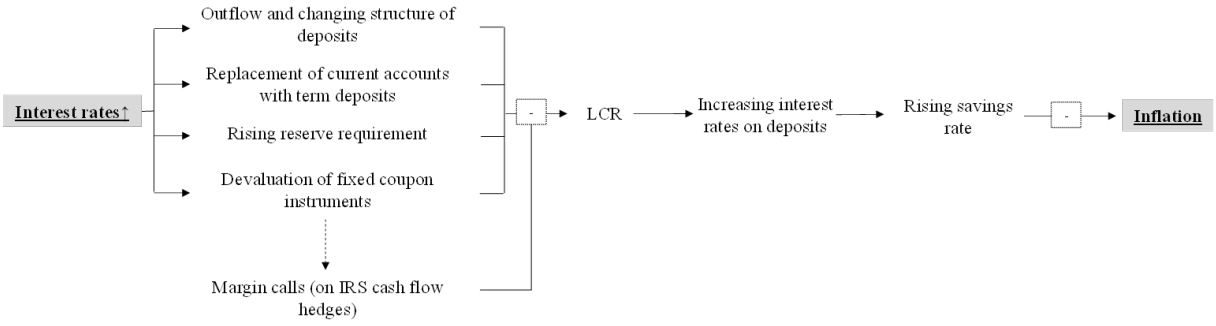
The results seem convincing. In all the models, the change of LCR surplus significantly affected the banks' deposit rate policy for individual clients, with the desired sign, i.e. falling LCR surplus implies that a bank needs to attract more deposits, hence it increases the offered rate in relation to the market average. This supports the author's previous conclusions drawn from the qualitative analysis, pointing at an important determinant of banks' deposit policy in the form of their liquidity stance vs. the regulatory requirement. Importantly, these conclusions are binding throughout the entire monetary policy cycle, i.e. when the central bank cuts and hikes rates.

Interestingly, in some models the rising net interest margin has led to increases in interest rates offered for new deposits, which may indicate that rising income from banks' assets induces these institutions to attract new deposits in order to profit from the favourable economic environment. Finally, the capital position of banks did not seem to have a significant impact on their deposit policy. As far as the changes in loan-to-deposit ratio are concerned, banks seem to increase interest paid on deposits despite weak lending, meaning that there may be other reasons why they attract new funds (e.g. attractive interest on sovereign debt). Unfortunately, the size of the panel did limit the number of controlled variables in this model, thus the addition of other banks would have been valuable.

5. Discussion and conclusions

When analysing the channels of monetary policy transmission through banks as financial intermediaries, the focus is placed on the credit side, whilst the deposit side is also important as it allows to take excess savings out of the economy during a period of rising rates, thus increasing the opportunity costs of consumption or investment, and freeing them during a period of falling rates. One of the reasons for 'skipping' this channel is that it does not work evenly in both directions: during the periods of monetary policy easing, a bank – motivated by its own profits – quickly cuts interest rates on deposits, yet when it is tightened – it is reluctant to raise them, unless it is forced to do so.

A factor that 'forces' banks to adopt a more active pricing policy during a monetary policy tightening cycle is the loss of liquidity. In the Polish banking sector, characterised by structural excess liquidity, it is not easy to achieve this effect. However, the article shows, using the example of banks' reactions to the tightening of NBP's monetary policy in 2021-2022, that regulatory factors may force banks to adjust their pricing policy faster, thus supporting the transmission of monetary policy to the economy. This transmission channel constitutes a liquidity part of a broader macroprudential channel, in which the liquidity side is supplemented with the lending side determined by the restrictiveness of capital requirements. Graph 1 shows the liquidity channel as outlined in this article.



Graph 1. The liquidity arm of the macroprudential monetary policy transmission channel

Source: author's own elaboration.

This study is not free of issues and questions which are mainly related to the parallel impact of external shocks, namely the outflow of deposits due to the outbreak of the war and the issuance of anti-inflation bonds by the Polish government, without which the liquidity transmission channel could have turned out to be weaker. The study also excluded the period of monetary easing, and this type of analysis may be an interesting subject of further research.

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