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Divisia monetary aggregates for Russia: Money demand, GDP nowcasting and the price puzzle

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ABSTRACT

The lack of developed financial markets and well-functioning transmission channels assigns monetary aggregates in emerging economies the potential role of nominal anchor, intermediate target, or informational variable for monetary policy. The effectiveness of this approach relies crucially on the correct measurement of money, which is not fulfilled by the conventional index based on the simple sum of financial assets. This paper calculates alternative Divisia monetary aggregates for Russia over the period 1998–2019, which account for the level of liquidity of a given monetary asset by assigning weights according to the usefulness of that asset for transaction services. Divisia is found to follow a markedly different growth pattern from the simple sum, whereby deviations between the two series are even more pronounced when foreign currency accounts are included. We conduct three empirical exercises to demonstrate the advantages of Divisia over the simple sum. Divisia confirms the stability of the money demand function and reflects portfolio shifts in response to changes in the opportunity cost of money. Divisia-based GDP nowcasting performs better in times of financial turmoil than the simple sum. Lastly, Divisia mitigates the price puzzle phenomenon relative to the conventional measure. We conclude that Divisia monetary aggregates would improve the effectiveness of monetary policy in Russia.

1. Introduction

Central banks in emerging economies face some unique obstacles in their pursuit of macroeconomic and financial stability objectives, including government interventions and political pressure, lack of credibility and expertise in controlling inflation, and weak policy transmission, all of which ultimately increase uncertainty about the effectiveness of monetary policy. These challenges are exacerbated by underdeveloped financial markets, volatile exchange rates, and a greater susceptibility to external shocks (Frankel, 2010). Under such circumstances, the choice of an optimal nominal anchor for monetary policy is of great importance. While a nominal exchange rate peg has been very common, inflation targeting has become increasingly popular over the last two decades. By contrast, monetary aggregates have rarely been adopted as a nominal anchor. For instance, among transition economies in Central and Eastern Europe (CEE), only Albania employed full-fledged monetary targeting for more than a decade, while Czechia and Serbia used it over very short periods (Josifidis et al., 2009). China has also made use of M2 as an intermediate target of its monetary policy

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since the late 1990s, but over the past decade shifted to targeting the interest rate.

This pattern can be explained in part by the dismal experience with monetary aggregates as a tool of monetary policy in advanced economies, where money growth targeting became widespread in the 1970s thanks to the growing influence of monetarist ideas and mounting inflation concerns. However, after this approach proved unsuccessful in the United States, the United Kingdom and Canada (Mishkin, 2001), monetary targets were gradually abandoned over the 1980s and early 1990s in favor of interest rates and inflation targeting, although Germany's Bundesbank, and later, to a lesser degree, the European Central Bank, continued to emphasize the prominent role of monetary aggregates in their monetary policy strategy (von Hagen, 1999; Jaeger, 2003).

The usefulness of money as an information variable or monetary policy instrument has been dismissed due to the weak and unstable relationship between monetary aggregates and other key nominal variables in developed countries (Estrella and Mishkin, 1999; Woodford, 2008). Alternatively, monetary aggregates have been viewed as an important source of leading information on future price developments and as an instrument, rather than objective, of policy during a liquidity trap (Masuch et al., 2003). Moreover, monetary targeting has been identified as a major stepstone on the road to an inflation-targeting regime in emerging economies with a weak policy transmission mechanism, institutional deficiencies, shallow financial markets, and a high inflationary environment (Laurens et al., 2015). In fact, Mehrotra and Slacik (2009) and Horvath et al. (2011) show that inflation targeting regimes in CEE countries would benefit from incorporating money into their policy toolbox because it provides useful information about price developments in the medium and long run.

If monetary aggregates are to be employed to inform, guide, or anchor monetary policy in emerging economies, their accurate measurement becomes a crucial precondition for their effectiveness. This paper focuses on monetary aggregates in Russia over the period 1998–2019, arguing that the standard method of quantifying money is severely defective, undermining the effectiveness of monetary policy. At the heart of the problem is the fact that the Central Bank of Russia (CBR), like most other monetary authorities in the world, calculates monetary aggregates as the simple sum of their components, causing significant loss of information. For instance, broad money is the result of adding money in circulation, demand deposits and time deposits with various maturity horizons, which amounts to assuming that they are perfect substitutes. This is clearly erroneous because each of these monetary assets has a different function, with cash or demand deposits being more useful for transaction services, while time deposits are held primarily for the purpose of storing value.

In a series of seminal papers, Barnett (1980, 1981, 1983) derived a new monetary quantity index, which, unlike its simple-sum counterpart, is based on the rigorous application of microeconomic principles and index number theory. The resulting Divisia monetary aggregate takes into account the level of liquidity of a given monetary asset by assigning weights, which depend on how useful that asset is for transaction services, and thus for economic activity in general. The sound theoretical foundations and appealing properties of the new measure attracted interest both from academia and central banks, especially after monetary aggregates returned to the spotlight as policy interest rates reached the zero lower bound following the 2008 global financial crisis. Barnett and Chauvet (2011) showed that the failure to use Divisia monetary aggregates may have misled the Federal Reserve to first fuel asset bubbles through excessive money growth and then to burst them with an excessively contractionary policy just before the crisis. Moreover, large-scale asset purchases by major central banks resulting in a ballooning of their balance sheets triggered calls for the Federal Reserve to start targeting Divisia money growth as a way to preserve systematic, rule-like monetary policy in a zero interest environment (Belongia and Ireland, 2018).

Generating Divisia monetary aggregates for Russia is relevant and important for a number of reasons. Russia is one of the largest emerging economies and its heavy reliance on exports of natural resources makes it prone to external shocks that generate inflationary pressures. In addition, the country experienced a protracted and difficult structural transformation in the 1990s, marked by episodes of hyperinflation, bank failures, and a major financial crisis that ended in debt default and ruble devaluation in 1998. With a few direct monetary instruments initially at its disposal, the CBR was not equipped to deal with the rapid structural changes of economic transition (Balino et al., 1997). The gradual introduction of indirect market-based policy instruments was delayed by the 1998 crisis, with open market operations resuming only in 2003. Similarly, the refinancing rate, which was CBR's key policy rate until 2013, was largely meaningless for monetary policy as it exceeded money market rates and failed to serve as a reference rate for financial markets (Lainela and Ponomarenko, 2012).[1]

As mentioned above, targeting monetary aggregates in an economy marked by underdeveloped financial markets, inadequate policy tools, ineffective policy transmission mechanisms, and high inflation is a sensible approach. Although the exchange rate was chosen as the primary nominal anchor, for years the CBR set an intermediate operational target for M2 growth in an attempt to lower inflation (CBR, 2001, 2002). Over the 2000s, the CBR signaled that money growth targets were becoming more flexible as the link between broad money and prices was weakening but monetary aggregates remained a "key reference point" (CBR, 2004) and a "major leading indicator of inflation" (CBR, 2005). Even after the transition to an inflation-targeting regime in the 2010s, the CBR continued using monetary aggregates as an information variable (CBR, 2011). Further evidence comes from studies showing that over the period 1993–2003 a McCallum rule targeting monetary aggregates provides a better description of the CBR's policy-setting behavior than a Taylor rule (Esanov et al., 2005; Vdovichenko and Voronina, 2006).[2] Similarly, monetary policy had an effect on bank lending in Russia in 1999–2010 only when monetary aggregates (rather than interest rates) were used as a policy instrument

[1] Other institutional deficiencies, such as corruption, have also been shown to impede the transmission channel of monetary policy in Russia (Weill, 2011).

[2] Korhonen and Nuutilainen (2017) detect structural breaks, suggesting that the CBR's monetary policy was characterized by McCallum's rule until 2010, and by Taylor's rule thereafter.

(Deryugina and Ponomarenko, 2011; Juurikkala et al., 2011). Given the crucial function of money in Russia's monetary policy, replacing the simple-sum monetary aggregate with a superior measure is of key essence.

Another reason for the potential of Divisia monetary aggregates to improve the effectiveness of monetary policy in Russia is the central role of foreign currency deposits in the financial system of the country. As in other CEE economies, high inflation, bank failures and devaluations of the domestic currency have led to a partial dollarization of deposits in Russia. The share of these deposits fluctuates over time, generally increasing during times of uncertainty and crises, and declining during periods of stability and economic prosperity. Such transfers of funds between different assets would not be revealed by a simple-sum monetary aggregate as these assets are treated as perfect substitutes. By contrast, weighted averaging enables Divisia monetary aggregates to reflect the substitution effects between monetary assets, which is crucial in the Russian context.[3] However, to the best of our knowledge, Russia is not among the emerging economies for which a Divisia monetary index has been developed (e.g., China (Barnett and Tang, 2016), India (Barnett et al., 2016), Indonesia (Sianturi et al., 2017), Turkey (Polat, 2018)).

Accordingly, our main contribution to the literature is the calculation of two Divisia monetary aggregates for Russia, including one for monetary assets in rubles and one that adds deposits in foreign currency. To illustrate their advantages over the standard measures, we further explore the performance of these Divisia monetary aggregates in three different settings. First, we estimate five money demand specifications and assess the stability of Divisia money demand relative to the simple-sum measure. Next, we nowcast year-on-year growth of nominal GDP for Russia using lagged growth of nominal GDP and contemporaneous growth of money supply, and then compare the forecasts for both Divisia monetary aggregates to their simple-sum counterparts. Lastly, we test whether Divisia monetary aggregates remove or at least mitigate the price puzzle that arises from the sustained increase in the inflation rate following an unexpected tightening of monetary policy.

The rest of the paper is organized as follows. The next section provides an overview of the Russian monetary aggregates and their components. Section 3 describes the Divisia monetary aggregates and their calculation in the case of Russia. Section 4 presents the application of these aggregates to three different settings. Section 5 draws some conclusions.

2. Monetary aggregates in Russia: an overview

Following the dissolution of the Soviet Union at the end of 1991, the CBR became the monetary authority of independent Russia. For the next two decades, the key monetary aggregate reported by the CBR was M2, composed of cash (i.e., currency in circulation outside of the vaults of monetary financial institutions (MFIs) and the CBR) and non-cash funds (i.e., demand and time deposits in rubles held by households, non-financial institutions, and non-MFIs). Fig. 1 shows M2 and its components for the period 1991–2011, revealing the importance of cash in the early years of economic transition when raging inflation, financial instability, and a lack of trust in the banking system were prevalent. A significant decline in deposits can be observed during the Russian financial crisis of 1998, marked by high inflation, a depreciating ruble, and numerous bank failures. The share of deposits in M2 increases significantly over the first decade of the 21st century. The global financial crisis of 2008 led to a dramatic drop in M2, mostly thanks to the contraction of deposits in response to the fall in the value of the ruble.

The CBR's adoption of the IMF's guidelines for reporting monetary and financial statistics in 2011 marked a major step toward the application of international standards in the calculation of monetary aggregates in Russia. The non-cash component of M2 was now replaced by detailed data on deposits for various holders and maturities, allowing the CBR to start reporting M1 as a separate aggregate. Fig. 2 illustrates the three major monetary aggregates in levels and year-on-year growth rates over the period 2012–2019. The growing share of time deposits accounts for the more rapid increase in M2 relative to M1. Moreover, the patterns in Fig. 2 indicate that monetary growth in Russia has not followed a linear process. For instance, during the economic crisis in 2014–2015, all three monetary aggregates collapsed when the dramatic depreciation of the ruble fueled by the CBR's decision to float the national currency caused households and companies to seek the safety of assets denominated in foreign currency.

The substantial share of natural resources in exports, a heavy reliance on imports of foodstuff and consumer goods, and the structural problems of its economy make Russia especially vulnerable to external shocks and foreign exchange fluctuations, which impact the dynamics of monetary aggregates. Natural resources contribute 40–50% of the federal budget and 60–70 % of export revenues, so that any fluctuations in commodity prices on world markets have a major effect on the Russian economy. In particular, the value of the ruble is closely correlated with the price of oil and gas, which typically leads to currency appreciation, a rapid increase in the domestic money supply, and inflationary pressures when global commodity prices surge (Kudrin, 2014). Structural issues are further exacerbated by the subsequent expansion of the mining sector and the decline in manufacturing (Dobrynskaya and Turkisch, 2010; Algieri, 2011). When the ruble depreciates during periods of falling oil prices or Western sanctions, households and companies in Russia have adopted the strategy of holding foreign currency deposits to guard against currency risk, a practice common to all transition economies in Central and Eastern Europe.

Once foreign currency deposits were legalized in Russia in 1995 (Ponomarenko et al., 2014), the CBR created a new monetary aggregate called M2X (broad money), which includes M2 plus foreign currency deposits held by households, firms and non-MFIs. Foreign currency in circulation also played a role, especially during the transition in the 1990s, when many prices were also quoted in dollars. However, M2X does not contain foreign currency in circulation mainly because of the lack of reliable data. Brodsky (1997) estimates the degree of dollarization in Russia for 1994–96, using net sales of foreign currency by commercial banks to physical

[3] Deryugina and Ponomarenko (2011) use deposits instead of standard monetary aggregates in their model specification, arguing that broad money fails to reflect the move from cash holdings to bank deposits, and vice versa. The Divisia monetary index would account for such shifts.

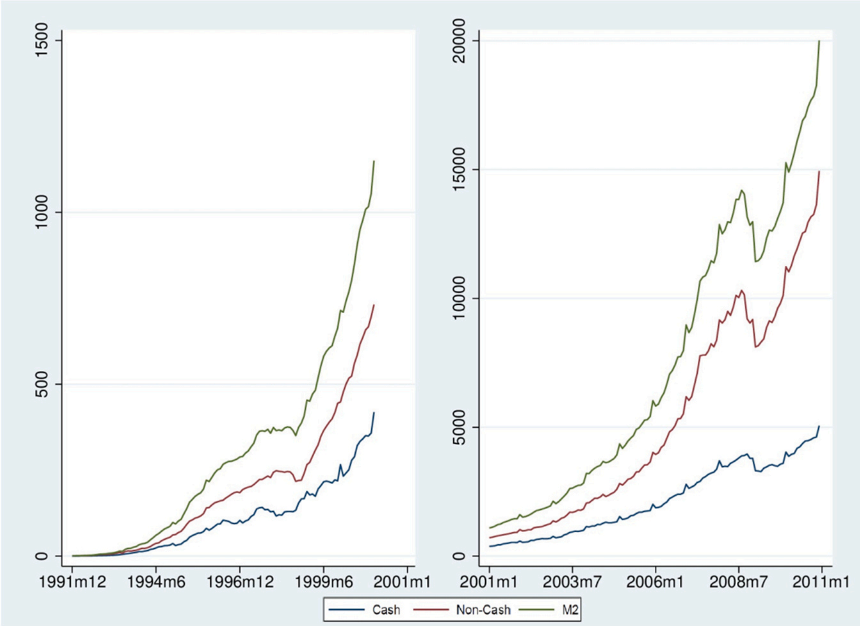


Fig. 1. ***M2*** and its components (billion RUB).
Note: The sample period is split into two subperiods of approximately equal length to better illustrate the evolution of monetary aggregates over time. *Source:* CBR.

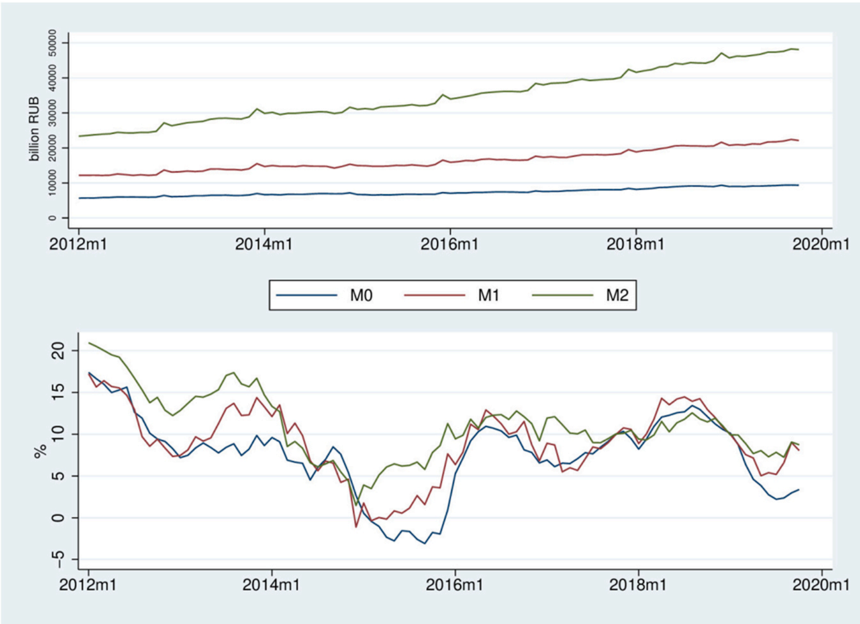


Fig. 2. Levels (in billion RUB) and year-on-year growth (in %) for ***M0***, ***M1***, and ***M2***.
Note: Data on monetary aggregates M0, M1 and M2 is available only since 2012 after the CBR adopted the IMF's guidelines for reporting monetary and financial statistics. *Source:* CBR.

persons as a proxy for foreign cash. More recently, Ponomarenko et al. (2014) create a new monetary aggregate dubbed M2Y, which contains M2X plus foreign currency in circulation. Foreign cash was approximated by data from the balance of payments. M2Y is shown spiking in 1998–99 but its difference to M2X narrows significantly after 2000.

Fig. 3 displays M2 and M2X over the period 1998–2019 in levels and year-on-year growth rates. It is obvious that the share of foreign currency deposits has increased over time. More importantly, the growth graph shows that M2X is smoother than M2 thanks to the foreign currency component that caused M2X to grow by less than M2 during economic expansions (such as in the 2000s) and to exhibit smaller drops than M2 during crises and recessions (such as in 1998 and 2008). This smoothing reflects the role of foreign currency deposits as an insurance against uncertainty and swings in the value of the ruble. Furthermore, it appears that hedging via a

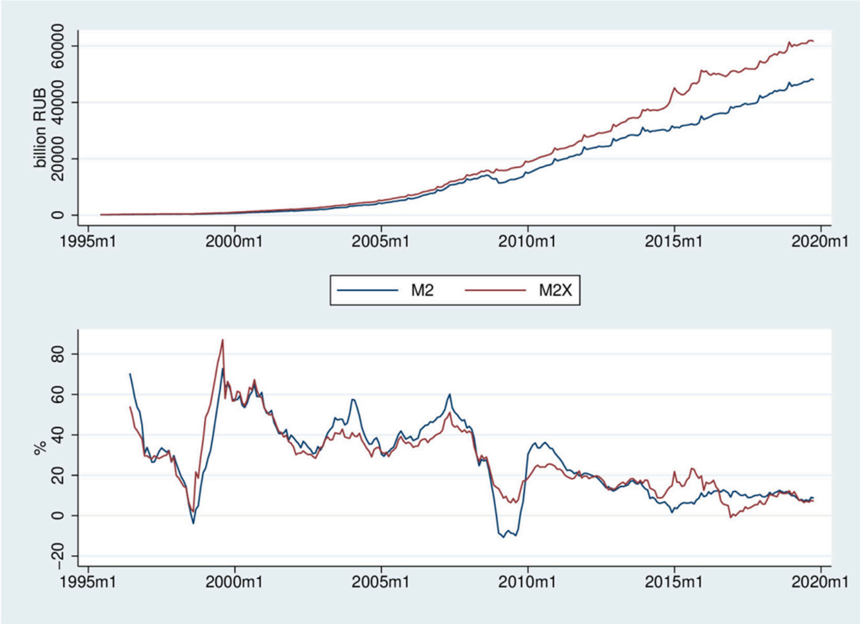


Fig. 3. Levels (in billion RUB) and year-on-year growth (in %) for ***M2*** and ***M2X***. *Source:* CBR.

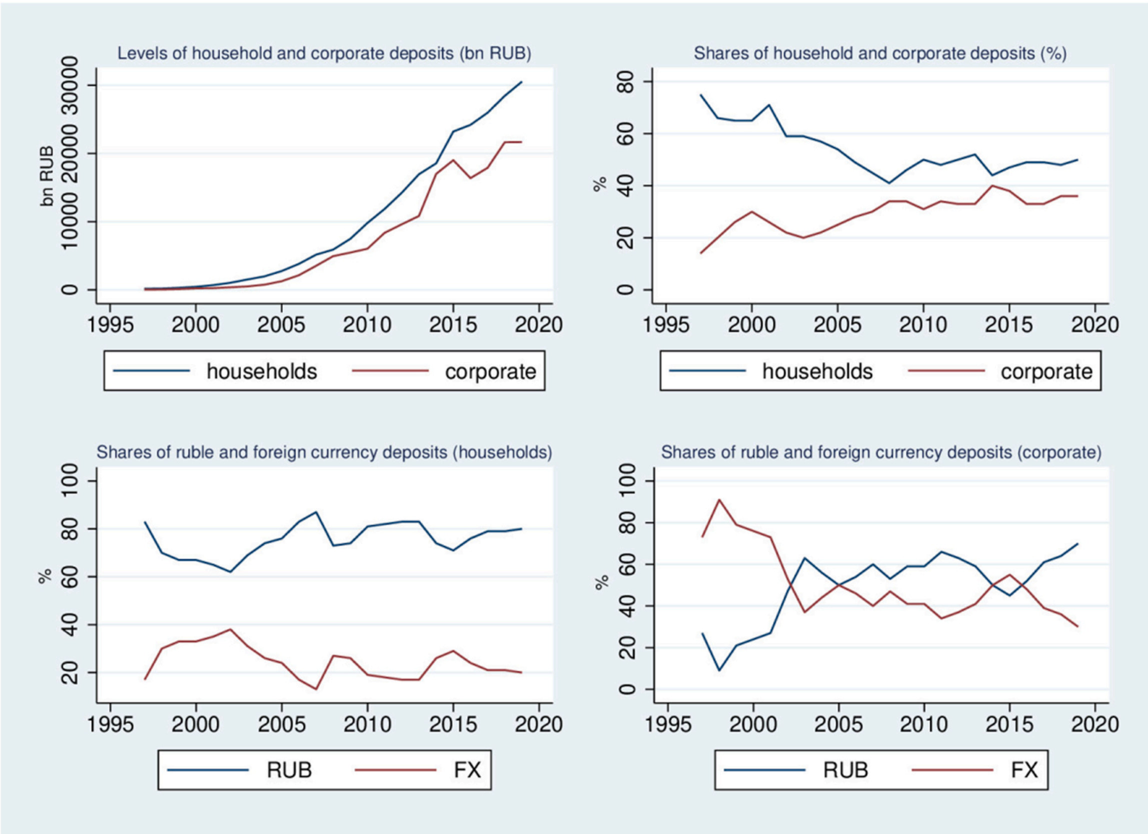


Fig. 4. Levels and shares of household and corporate deposits in domestic and foreign currency. *Source:* CBR.

dollarization of deposits has intensified over time. During the 1998 financial crisis, the difference in the decline of M2 and M2X is relatively small, while in 2008 it widens dramatically. In 2014–15, the two monetary aggregates diverge, with M2 diminishing and M2X surging.

Exploring the breakdown of broad money by sector in Fig. 4, we note that despite the rapid growth of both household and corporate deposits since the mid-2000s, the latter are lower in levels and have experienced more volatile dynamics than the former. In the late 1990s, household deposits constituted more than three quarters of all deposits in the country at a time when corporate Russia was still struggling through the economic transition. But the share of corporate deposits rose gradually to reach near parity on the eve of the crises in 2008 and 2014 before regressing again. The differences between the two sectors regarding the composition of domestic vs. foreign currency are evident from the lower part of Fig. 4. Foreign currency deposits average around 25% for households and increase above this level only in the aftermath of the crises in 1998, 2008 and 2014, when Russians rushed to protect their savings from a depreciating ruble. By contrast, enterprises appear much more sensitive. At the height of the 1998 crisis, less than 10% of corporate deposits were held in rubles. Only in 2003 did ruble deposits exceed foreign currency ones, but the difference remained relatively small, and in 2015 foreign currency again ruled supreme with a share of 55% as the CBR floated the ruble. The general decline in foreign currency deposits in recent years can be attributed to the strengthening of the ruble and the sharp drop in the interest rates on such deposits caused by the monetary easing in the US and the Euro area.

In terms of maturity, Fig. 5 reveals variation across sectors and currencies. For households, demand deposits and time deposits for 3–6 months dominated in the late 1990s and early 2000s with a combined share of between 66% and 82%. However, these categories experienced a gradual decline in favor of deposits with longer maturities, especially time deposits for 6 months to a year, which saw their share increase from 6 % in 2000 to 52 % in 2016. The picture for deposits in foreign currency is very similar, with maturities above 6 months commanding an average share of 84 % over the past decade. In comparison, demand deposits are a miniscule fraction of the total for companies, regardless of the currency. Corporate deposits in rubles are spread almost evenly across various maturities, with time deposits of up to 30 days claiming a larger share in recent years. In terms of foreign currency, a major shift occurred in 2007–2008 when deposits with maturities above 1 year doubled their share from around 34% to more than 77 %, retaining their dominance over the last decade. The strong preference for time deposits with long maturities held by households and companies in Euros and US dollars again underlines the role of foreign currencies as a major means to store value in the face of a volatile ruble.

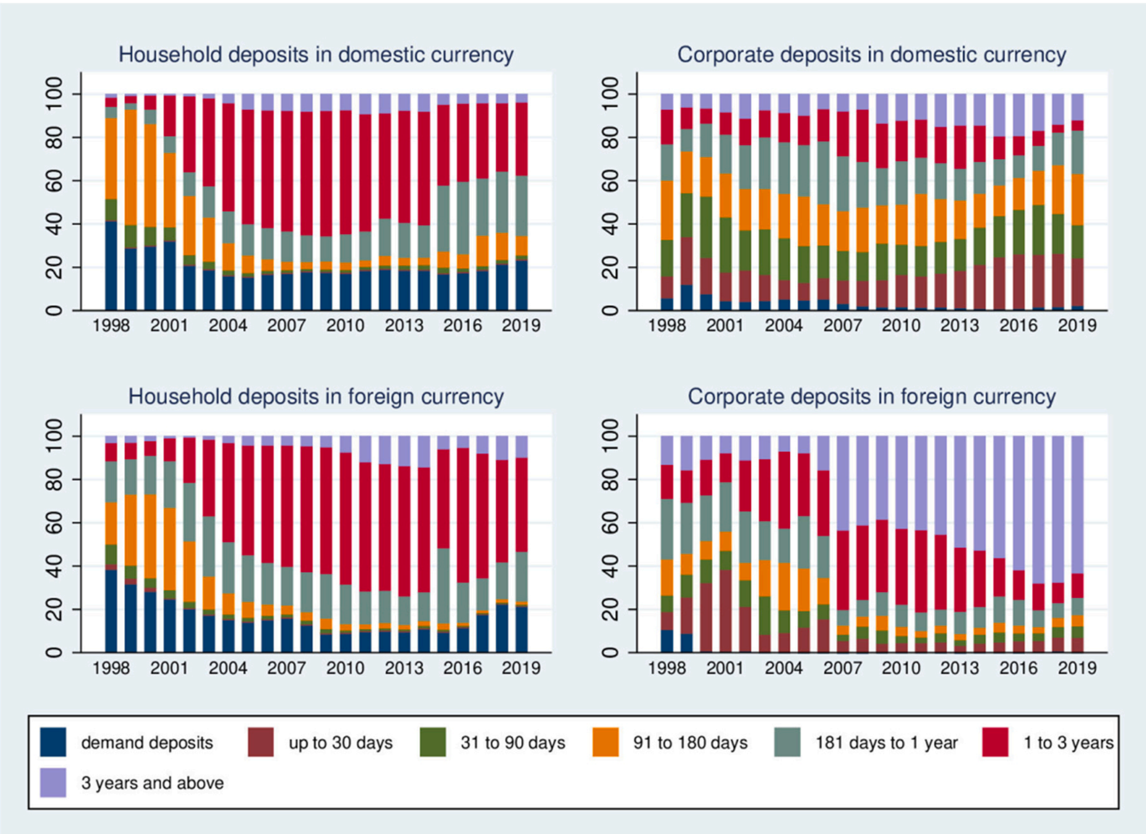


Fig. 5. Maturities of household and corporate deposits in domestic and foreign currency. *Source:* CBR.

3. Divisia

3.1. A brief introduction to Divisia monetary aggregates

Divisia monetary aggregates aim to overcome a major problem in the design of standard measures of money. Narrow monetary aggregates ignore assets used partly as money, while broad monetary aggregates contain assets that provide some liquidity but are primarily an investment. Almost risk-free assets as are typically included in monetary aggregates deliver two benefits: liquidity and yield. If markets are efficient (and for this type of asset there is little reason to believe they are not), all assets have to generate the same marginal utility. Therefore, the lacking yield on some assets is the price agents pay for the liquidity services derived from holding those assets; which – essentially building on the theory of revealed preferences – allows us to infer the degree of liquidity from those opportunity costs and use this degree of liquidity to generate a weighted monetary aggregate. More precisely, Divisia monetary aggregates are chain-weighted indices measuring the monetary service flow derived from the monetary portfolio held within an economy.

The log difference (i.e. approximately the growth rate) of the monetary service flow is a weighted average of the individual monetary assets' log difference:

$$\Delta m_t = \sum_{k=1}^{K} \Delta m_{k,t} \widetilde{s}_{k,t}, \tag{1}$$

where m_t is the log of (Divisia) money at time t, $m_{k,t}$ is the log of monetay asset k at time t, K is the number of assets, and $\widetilde{s}_{k,t}$ is the corresponding expenditure share that is used as weight. For a Divisia index, or more precisely its discrete time approximation, the Theil-Tornqvist index, the expenditure share used for weighting, is simply the average of the expenditure shares in the first and second period, i.e. $\widetilde{s}_{k,t} = (s_{k,t} + s_{k,t-1}/2)$.

The most controversial part of applying Divisia aggregation (or any proper, theoretically founded aggregation method) in the case of money is measuring the cost of holding money, which is necessary to compute expenditure (and, in turn, expenditure shares). While the theoretical idea of looking at opportunity costs is extremely straightforward, the practical implementation is less so, because the natural reference point would be a risk-free asset that provides a yield only but no liquidity service at all, i.e. that is completely illiquid. Based on this reference point, defined as the *benchmark rate* R, the present value of the opportunity cost of holding an asset or *user cost uc* is then given by:

$$uc_{k,t} = \frac{R_t - r_{k,t}}{1 + R}, \tag{2}$$

allowing us to define expenditure shares through:

$$s_{k,t} = \frac{uc_{k,t} q_{k,t}}{\sum_{k=1}^{K} uc_{k,t} q_{k,t}}, \tag{3}$$

where q refers to the quantity of the individual asset and r to the corresponding interest rate.

Since the benchmark rate is unobservable, it is replaced by a proxy, most commonly either the interest rate of an asset with extremely long maturity that yields higher interest rates than any monetary asset (e.g., a long-term treasury bond), or an upper envelope curve (i.e. the maximum of yield on monetary assets at each point in time) plus a fixed liquidity premium. The latter option guarantees that even the least liquid monetary asset is always assumed to provide at least some liquidity.

3.2. Creating Divisia for Russia

The CBR officially reports four monetary aggregates. M0 contains domestic currency in circulation outside banks. M1 is defined as M0 plus balances in domestic currency on current and other demand deposits held by households, nonfinancial institutions and non-MFIs. M2 (national definition) includes M1 and balances in domestic currency on time deposits, while M2X (broad money) consists of M2 and deposits in foreign currencies held by the aforementioned three sectors. M1, M2 and M2X are generated by simple sum aggregation of their respective components, which, as pointed out in Section 3.1, is the key problem at hand.

Given the importance of foreign currency deposits in Russia, we calculate two Divisia monetary aggregates, namely Divisia M2 (DM2) and Divisia M2X (DM2X) using Eq. (1). This exercise requires data on monetary quantities and their corresponding interest rates by sector, maturity and currency, which were collected from official CBR publications. Due to limitations in the statistical reporting on differentiated interest rates, our sample period ranges from April 1998 to October 2019 and covers two sectors (households and nonfinancial institutions) holding deposits in two currencies (rubles and foreign currency) over five maturity horizons (demand deposits bundled with time deposits of up to 30 days, and time deposits with maturities of 31–90 days, 91–180 days, 181 days to 1 year, and above 1 year). The descriptive statistics of the interest rates we use in our calculation are shown in Table 1. As expected, longer maturities of time deposits are associated with higher interest rates. Nonfinancial institutions enjoy slightly lower average interest rates than households across all maturity horizons, with the exception of demand deposits. Foreign currency denominated deposits offer lower interest rates than ruble deposits thanks to their status as safe havens during crises. Furthermore, the evolution of various interest rates over the sample period is presented in Fig. 6.

Table 1
Interest rates by sector, maturity and currency, 1998–2019.

	Households		Nonfinancial inst.	
Maturity	RUB	USD	RUB	USD
demand deposits + up to 30 days	3.03	0.99	6.09	1.84
31–90 days	9.45	3.62	9.24	3.32
91–180 days	10.87	4.51	10.56	4.55
181 days to 1 year	13.86	5.70	12.59	5.24
over 1 year	15.13	5.28	14.10	5.58

Source: CBR.

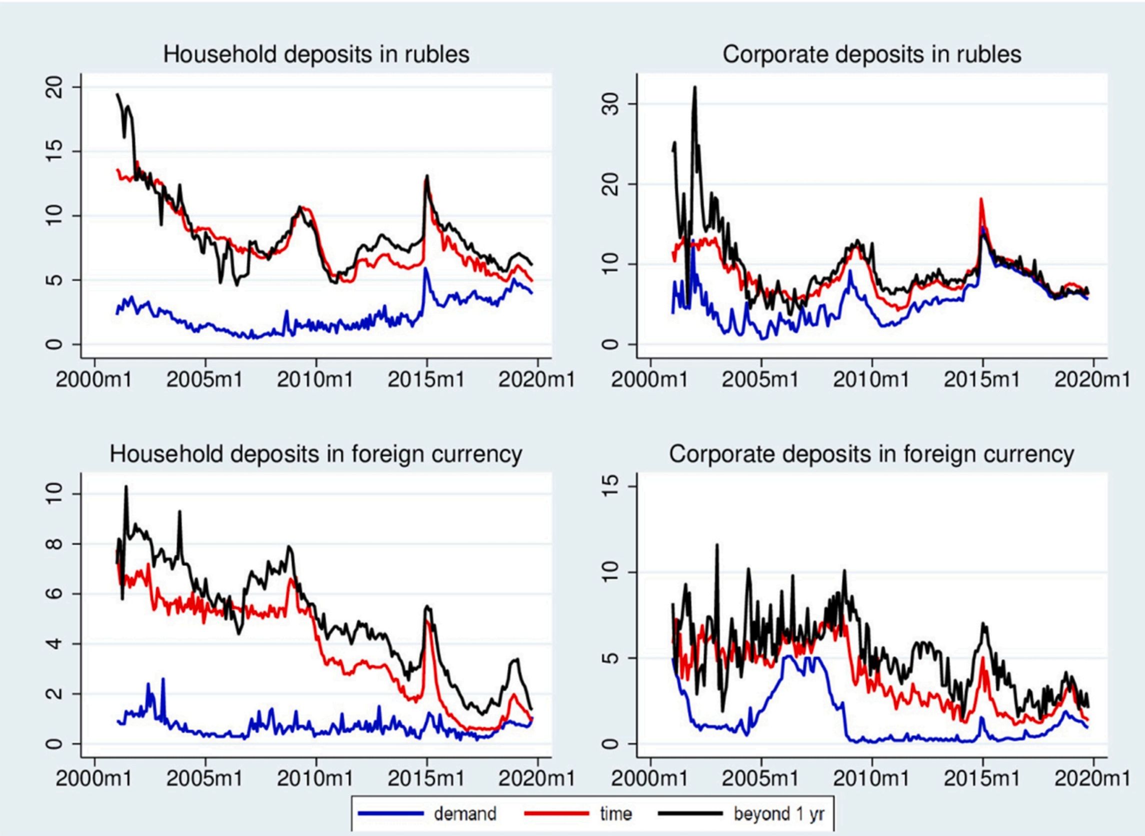


Fig. 6. Interest rates by sector, maturity and currency.
Note: The interest rates shown are for demand deposits, time deposits with maturities up to 1 year, and time deposits with maturities exceeding 1 year. *Source:* CBR.

The user cost of each component is calculated according to Eq. (2) and represents the present value of the difference between the benchmark rate and the individual asset's interest rate. The benchmark rate is obtained using an upper envelope curve plus a fixed liquidity premium in the amount of 100 bps, which is a standard assumption in the literature.[4] Currency in circulation (M0) is assigned an interest rate of zero, which means that the user cost of this component is the highest. By contrast, the most illiquid asset (time deposits for more than 1 year) is given the lowest user cost due to the high interest rates (and low liquidity services) it offers. Once the user cost of each asset is calculated, they are used to obtain the expenditure shares according to Eq. (3).

A lack of data prevents us from decomposing foreign currency deposits into US dollars and Euros, which dominate the Russian market. As a result, foreign currency deposits in M2X and DM2X are differentiated by sector and maturity but not by currency, and the corresponding interest rates are for deposits in US dollars for which much longer time series are available. This specification is

[4] As a robustness check, we calculated Divisia series using 50 bps and 200 bps as alternative levels. Although a higher (lower) liquidity premium produces a larger (smaller) monetary aggregate relative to the standard, the difference between the three series is minimal. These results are available from the authors upon request.

unlikely to have any major effect on our analysis, given that the maturity structure of deposits in US dollars and Euro is very similar, with Russian households holding 70% of the former and 77% of the latter for between 180 days and 3 years over the period 2014–2019. Moreover, the correlation between the interest rates on deposits in the two foreign currencies held by households ranges between 0.80 and 0.95, depending on the maturity horizon.[5]

For comparison purposes, we calculate simple sum monetary aggregates (M2 and M2X) and their Divisia counterparts (DM2 and DM2X). The results in Fig. 7 illustrate the significant differences between the two series in levels and growth rates. M2 dramatically overstates the true rate of money growth in the first half of the 2000s, when it fails to properly take into account the effects of the shift out of deposits offering low interests and short maturities, and into less liquid accounts with higher returns and longer maturities. Since the mid-2000s, the differences between the simple sum and Divisia have narrowed as monetary growth rates have gradually gone down to more normal levels. However, it is obvious that during the periods 2006–07 and 2011–12, DM2 was growing at a faster pace than M2 as lower interest rates on deposits and a boom in household consumption spending made liquid assets more desirable. Moreover, since the economic crisis of 2014, the series exhibit three episodes of the Divisia aggregate growth (or decline) substantially exceeding that of the simple sum. This again underscores the importance of Divisia as providing a more accurate signal of monetary changes to policymakers than the traditional measure.

The deviations of the Divisia monetary aggregate from the simple sum are also present when foreign currency accounts are added in the right panel of Fig. 7. In fact, the gap between the two series seems even more pronounced over the past decade than for the monetary aggregates limited to domestic currency accounts. This is not surprising given the potential portfolio changes of households and firms with respect to movements in the foreign exchange rate. In fact, there are significant differences between M2X and DM2X for the majority of observations, with the simple sum aggregate consistently overstating growth rates during monetary tightening and understating them in times of monetary easing. For instance, in January 2014, DM2X increased by almost 50% relative to the previous year, while M2X grew by only 36%, suggesting that the latter did not properly internalize the shift to foreign currency deposits in the aftermath of the free float of the ruble. Similarly, when the ruble appreciated again in 2016 and Russians shifted to accounts denominated in domestic currency, M2X recorded a drop that profoundly overstated the actual degree of monetary tightening as a result of this portfolio change.

4. Three applications of Divisia

4.1. Money demand

4.1.1. Model specification and estimation strategy

Estimating money demand functions and assessing their stability is one of the key exercises in empirical monetary macroeconomics. Given Divisia's claim of superiority over the simple sum measure, exploring how our view on money demand changes when replacing the standard monetary aggregate by Divisia is an obvious initial step, with the first papers already appearing in the 1980s (Ishida, 1984). More recent publications on the topic include Drake and Chrystal (1997), Serletis and Gogas (2014), Dahalan et al. (2005), and Belongia and Ireland (2019). Furthermore, the existing research on money demand in Russia is limited to the simple sum monetary aggregates, creating space for improvement (Korhonen and Mehrotra, 2010; Mehrotra and Ponomarenko, 2010; Sosunov, 2013; Krupkina and Ponomarenko, 2013; Gilenko, 2018).

We estimate five different money demand specifications, one closed economy specification and four versions of the standard open economy model, that aim to account for the impact of European and US financial markets on Russia. All five models are estimated for each of the four monetary aggregates (M2, DM2, M2X and DM2X) from August 2000 to October 2019.[6]

The closed economy money demand specification is given by:

$$m_t - p_t = \beta_0 + \beta_1 y_t + \beta_2 i_t + \varepsilon_t, \tag{4}$$

where m_t is the monetary aggregate, p is the price level as measured by the consumer price index (CPI), y is monthly real GDP, and i is the three-month interbank rate.[7] The Russian statistical agency does not report official monthly GDP figures, compelling us to rely on estimates made by the Ministry of Finance, which are available for the entire sample period. When aggregated to quarterly frequency, these estimates exhibit a correlation with the official quarterly GDP numbers of 0.96. We favor GDP over industrial production because the secondary sector constitutes less than a third of aggregate output in Russia.[8]

[5] The correlation would be even higher were it not for a spike in interest rates on time deposits in US dollars in 2018–19 in response to the increase in the US federal funds rate. While these interest rates surged beyond 3%, the ones on Euro deposits continued their slide towards zero.

[6] Our sample for this exercise is slightly shorter than the period for which we construct Divisia because data on the domestic interest rate are available only since 2000. At the same time, the years 1998 and 1999 are often dropped from the sample anyway because the financial crisis in Russia at the time has caused estimation problems in earlier studies (Vymyatnina, 2005; Granville and Mallick, 2006).

[7] We also conducted alternative estimations using the overnight interbank interest rate and the average weighted rate on personal deposits. The results, which are available upon request, are largely robust across the different specifications.

[8] With regard to the opportunity cost of holding money, previous studies have sometimes opted for the inflation rate instead of interest rates because of the underdeveloped financial markets in Russia (Bahmani and Kutan, 2010; Korhonen and Mehrotra, 2010). Replacing the three-month interbank rate with inflation did not affect our findings regarding the stability of the money demand function. However, the coefficient for inflation was insignificant. The results of this estimation are available from the authors upon request.

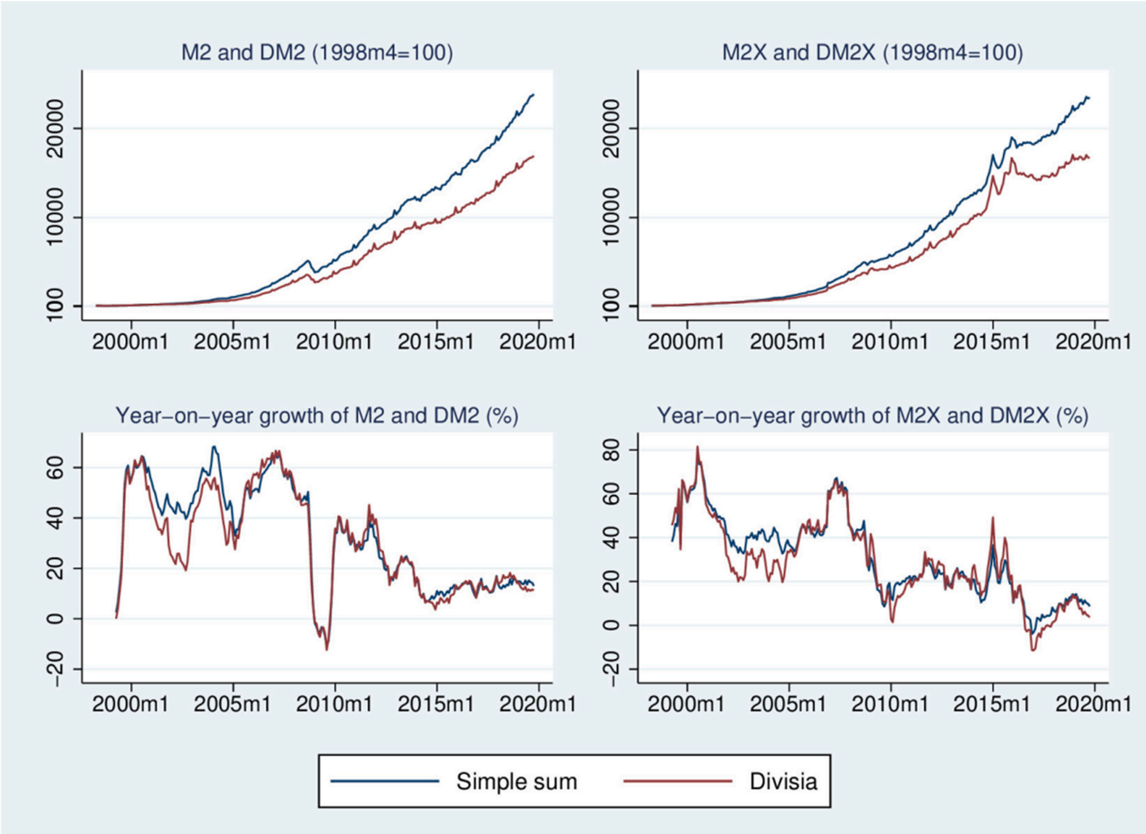


Fig. 7. Simple sum M2/M2X vs. Divisia (DM2/DM2X) (in levels and growth rates).

For the open economy specification, we augment the model using foreign interest rates and the exchange rate. We account for the international effects by estimating two separate models with the Euro area and the US as Russia's respective counterparts, a third model that includes both, and finally a model with weighted exchange rates and interest rates, where the weights represent the shares of EUR and USD in the currency basket used as the operational indicator of CBR's exchange rate policy. Since the introduction of the dual currency basket in 2005, the share of USD decreased from 90% to 55% (see Table 1 in Mehrotra and Ponomarenko, 2010). For the time before 2005, we use the 90% weight for USD, reflecting the key function of the US currency in implementing Russia's managed floating exchange rate regime.

The open economy money demand specification is given by:

$$m_t - p_t = \beta_0 + \beta_1 y_t + \beta_2 i_t + BX_t + \varepsilon_t, \tag{5}$$

where X can be $[e_{eur,rub}, i_{ecb}]$, $[e_{usd,rub}, i_{fed}]$, $[e_{eur,rub}, i_{ecb}, e_{usd,rub}, i_{fed}]$ or $[e_w, i_w]$. Foreign interest rates are represented by the 3-month Euribor (i_{ecb}) and the 3-month US Treasury bill rate (i_{fed}), while $e_{eur,rub}$ and $e_{usd,rub}$ stand for the RUB/EUR and RUB/USD exchange rates, respectively. The weighted interest rates and exchange rates are denoted by i_w and e_w, respectively.

We estimate the resulting 20 equations (4 monetary aggregates × 5 models) using the autoregressive distributed lag model (ARDL) specification that can be employed to estimate cointegrated models introduced by Pesaran and Shin (1998).[9]

For each specification, we test stability using both the CUSUM test (which is widespread in the literature), and the linear version of the test originally developed by Nyblom (1989) and proposed by Hansen (1992). In the sample size available to us, the latter is far more robust, while the former tends to be extremely sensitive to minor data problems, ranging from outliers to heteroskedasticity (El-Shagi and Giesen, 2013). Therefore, while we report both results for easier comparison to the literature, our preference lies with the Nyblom-Hansen test.

4.1.2. Results

Table 2 summarizes our results. In the upper half of the table focusing on broad money in domestic currency, most variables exhibit the expected signs for both M2 and DM2. Income has a positive effect on money demand, while domestic interest rates have a

[9] Vector autoregressive approaches as they were used in the early literature tend to produce extremely uncertain estimates, while dynamic OLS as proposed by Stock and Watson (1993) tends to be highly sensitive with respect to structural break tests (see, for instance, El-Shagi and Zheng, 2020).

Table 2
Estimated money demand functions.

	*M*2	*DivisiaM*2	*M*2	*DivisiaM*2	*M*2	*DivisiaM*2	*M*2	*DivisiaM*2	*M*2	*DivisiaM*2
Dependent Variable: Broad money (in real terms) including domestic currency deposits										
y	2.365***	0.98	2.338***	1.2284**	2.2616***	1.386***	1.9976***	1.164***	2.215***	1.31***
	(0.147)	(0.990)	(0.141)	(0.608)	(0.137)	(0.397)	(0.1318)	(0.340)	(0.13)	(0.487)
i	-0.017	-0.27***	-0.023**	-0.2040***	-0.0275**	-0.101***	-0.0074	-0.063***	-0.034***	-0.18***
	(0.012)	(0.055)	(0.011)	(0.033)	(0.011)	(0.019)	(0.0093)	(0.014)	(0.01)	(0.026)
i_{fed}			0.025	-0.0088			0.0498*	0.010		
			(0.032)	(0.068)			(0.0272)	(0.038)		
$e_{usd,rub}$			0.088	0.6011*			-0.6035***	-1.131***		
			(0.161)	(0.315)			(0.1581)	(0.245)		
i_{ecb}					-0.0062	-0.042	-0.0541*	-0.068		
					(0.037)	(0.056)	(0.0300)	(0.042)		
$e_{eur,rub}$					0.1266	0.466	0.8172***	1.735***		
					(0.229)	(0.320)	(0.1575)	(0.174)		
i_w									-0.040	-0.12
									(0.06)	(0.113)
e_w									0.111	0.57*
									(0.17)	(0.296)
NybHan	0.68	0.40	0.60	0.40	0.55	0.21	0.63	0.41	0.66	0.29
CUSUM	0.85	0.91	0.48	0.24	0.78	0.46	0.39	0.11	0.52	0.046**
Dependent Variable: Broad money (in real terms) including domestic and foreign currency deposits										
y	2.421***	2.34***	2.4200***	2.22472***	2.3859***	2.099***	2.222***	1.844***	2.2476***	2.149***
	(0.136)	(0.271)	(0.130)	(0.226)	(0.126)	(0.189)	(0.1201)	(0.203)	(0.1164)	(0.204)
i	0.015	-0.12***	0.0076	-0.10865***	0.0015	-0.061***	0.013	-0.044***	-0.0085	-0.099***
	(0.011)	(0.023)	(0.011)	(0.018)	(0.010)	(0.013)	(0.0097)	(0.012)	(0.0095)	(0.015)
i_{fed}			0.0344	-0.00024			0.060**	0.028		
			(0.030)	(0.044)			(0.0288)	(0.033)		
$e_{usd,rub}$			-0.0141	0.37367*			-0.336**	-0.768***		
			(0.159)	(0.213)			(0.1605)	(0.202)		
i_{ecb}					-0.0183	-0.035	-0.067**	-0.071*		
					(0.035)	(0.041)	(0.0304)	(0.036)		
$e_{eur,rub}$					-0.0331	0.312	0.296	1.117***		
					(0.238)	(0.241)	(0.1999)	(0.176)		
i_w									-0.0448	-0.083
									(0.0560)	(0.078)
e_w									0.0814	0.373*
									(0.1600)	(0.210)
NybHan	0.58	0.39	0.45	0.27	0.37	0.17	0.51	0.24	0.47	0.12
CUSUM	0.29	0.96	0.18	0.67	0.78	0.46	0.089*	0.32	0.30	0.86

Notes: Standard errors are given in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively. The rows labeled NybHan and CUSUM show the p-values of the Nyblom-Hansen and CUSUM test, respectively.

negative effect. The impact of foreign interest rates is not significant, while exchange rates matter only when all variables under consideration are included in the model. The major difference between the simple sum and Divisia is to be found in the magnitude of the coefficients. Divisia consistently provides estimates of the income elasticity that are much closer to the theoretically expected value of 1, while those for the simple sum are at or above 2.

Moreover, the size of the coefficient for the interest rate is considerably higher for DM2 relative to M2. In fact, the coefficient for the domestic interest rate in the case of M2 is no longer significant when all variables are included. This is not surprising because portfolio substitutions in response to changes in the opportunity cost of money do not affect the simple sum monetary aggregate but are reflected in the Divisia measure by design. Previous studies on money demand in Russia have tried to address this shortcoming of the simple sum index by including the weighted average of interest rates on deposits with different maturities (Oomes and Ohnsorge, 2005) or the spread between the yield on domestic currency deposits and foreign currency deposits (Krupkina and Ponomarenko, 2013) as a separate variable in the money demand function.

With regard to the stability of money demand, the Nyblom-Hansen test does not indicate the presence of structural breaks for either of the two monetary aggregates. In the case of the simple sum measure, this concurs with earlier studies on Russia like Korhonen and Mehrotra (2010), who find a stable relationship between real money balances on the one hand and income, inflation and exchange rates on the other. More importantly for our purposes, the Divisia specifications uphold the stability of the money demand function in Russia, while having the advantage of reflecting shifts among the components of the monetary aggregate in response to changes in the opportunity cost of money.

This advantage is also evident from the results for M2X in the lower part of Table 2. When foreign currency deposits are incorporated in the monetary aggregate, the coefficient for the domestic interest rate is negative and significant across all Divisia models, while it is not significant in the case of the simple sum. Income elasticity for Divisia is still lower than for the simple sum, although the overall magnitude of the corresponding coefficient now exceeds 2 in most cases. While implausibly high from a theoretical viewpoint, such a result is common in the literature on Russia and is usually explained by monetization marked by declining barter transactions, a maturing financial system, and a return of confidence in the ruble. The absence of structural breaks in the money demand relationship is again confirmed for all specifications.

4.2. Nominal GDP nowcasting

4.2.1. Method

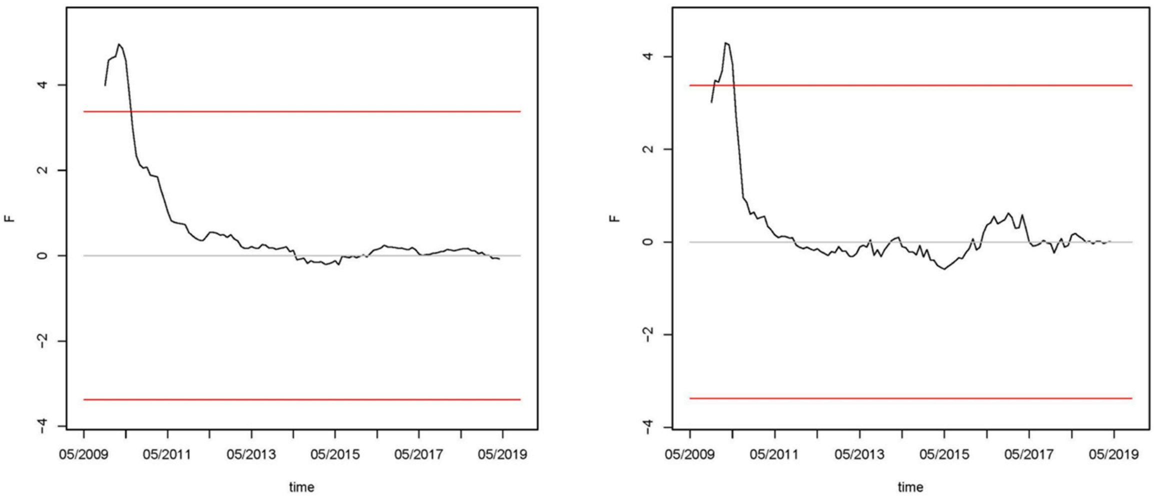
4.2.1.1. Nowcasting. A large fraction of the current Divisia literature is concerned with demonstrating the informational content of Divisia monetary aggregates, particularly compared to simple sum money. For example, Binner et al. (2004, 2005) and Gogas et al. (2013) use Divisia for forecasting based on machine learning techniques, while Barnett and Chauvet (2011) and El-Shagi and Kelly (2019) show that Divisia would have been useful in signaling the 2008 global financial crisis. In recent years, one of the main applications has been nominal GDP nowcasting (Barnett et al., 2016; Barnett et al., 2016). In the case of Russia, the relevant literature has been expanding in the last several years (Dahlhaus et al., 2017; Makinen, 2016; Mikosch and Solanko, 2019; Porshakov et al., 2016).

Since our objective is not to provide the best possible nowcast but to highlight the differences between Divisia money and conventional simple sum monetary aggregates, we use a very parsimonious specification. In Russia, official quarterly GDP figures are released with a delay of around 10 weeks, while monetary statistics for a given month are available within 4 weeks. However, using quarterly GDP data would reduce the number of observations, compromising the accuracy and certainty of our forecasts. Instead, we rely on monthly GDP forecasts by the Ministry of Finance. We then nowcast year-over-year growth of nominal GDP using lagged (year-over-year) growth of nominal GDP and *contemporaneous* year-over-year growth of money supply. That is, we estimate:

$$y_t - y_{t-12} = \beta_0 + \beta_1(y_{t-1} - y_{t-13}) + \beta_2(m_t - m_{t-12}) + \varepsilon_t, \tag{6}$$

where y is the log (monthly) nominal GDP and m is the log of money supply. We produce four series of forecasts, one for each of our monetary aggregates (M2, DM2, M2X and DM2X). These are (pseudo) out-of-sample forecasts based on a rolling window of 120 months of observations each. Our Divisia time series start in April 1998, allowing us to produce a nowcast series ranging from May 2009 to October 2019.

4.2.1.2. Forecast evaluation. For our forecast evaluation, we conduct a pairwise comparison of M2 vs. DM2 and M2X vs. DM2X. Under stable economic conditions, Divisia (growth) is typically highly correlated to simple sum aggregates. It is mostly during times of turmoil that the dynamics of Divisia and simple sum differ sharply (El-Shagi, 2021) because interest rates move quickly and strong portfolio restructuring takes place (i.e., the individual monetary assets grow at a heterogeneous pace). Therefore, Divisia does not necessarily outperform simple sum continuously, but has the potential to do so in volatile times. Rather than doing a full sample forecast comparison through a conventional Diebold and Mariano (1995) test (DM), we thus employ the Giacomini and Rossi (2010) test for forecast comparison in instable environments. Instead of assessing the average (relative) performance, this *fluctuation test* looks at forecast performance in a rolling window and focuses on the extreme value of the individual test. The null hypothesis is that the models under consideration always predict equally well, with the alternative hypothesis that they differ in performance at least



(a) Forecasting with M2 (b) Forecasting with M2X

Fig. 8. Results of the fluctuation test.
Notes: The black line shows the relative forecast performance (based on squared forecasts errors) of simple sum vs. Divisia. High values indicate higher forecast errors (lower performance) for the simple sum. The red line reflects the critical values at the 5% significance level.

once. This is not unlike running individual DM tests for different subsamples. Since this creates multiple testing problems, the critical values then have to be adjusted depending on the ratio of the size of the rolling window and the total sample of available forecasts. For a ratio of 1 the test is equivalent to a DM test (and has the same critical values). With a decreasing ratio, the critical values increase. Rather than just reporting the test statistic and/or p-value, the Giacomini and Rossi (2010) test is often interpreted graphically, allowing a look at the dynamics of relative forecast performance.

4.2.2. Results

While a simple DM test does not reject the null hypothesis (i.e., does not indicate that the performance differs substantially), we find strong evidence that Divisia-based nowcasting performs better in times of financial turmoil. The results of the Giacomini and Rossi (2010) tests in Fig. 8 show that the null hypothesis of identical performance at all times is clearly rejected for both comparisons (M2 vs. DM2 and M2X vs. DM2X). In both cases, the rejection is driven by our earliest forecasts, which still coincide with the turmoil triggered by the global financial crisis in 2008.

4.3. A simple monetary SVAR for a resource-rich economy

In recent years, several papers found that using Divisia in a monetary VAR can remove or at least mitigate the infamous *price puzzle*, i.e. the finding that inflation initially increases after a contractionary policy shock, before eventually dropping. Given that this phenomenon exists in Russia (Ito, 2008), we assess the potential role of Divisia using an extremely simple five variable structural VAR with a recursive identification scheme. Due to the importance of natural resources for the Russian economy, we augment the traditional small-scale monetary VAR (consisting of production, prices, interest rates and money) by adding oil prices, more specifically the price of Russian Urals oil.[10]

For our baseline specification (Model A), we estimate:

$$\begin{bmatrix} p^{oil} \\ y \\ i \\ p \\ m \end{bmatrix}_t = B_0 + B_1 \begin{bmatrix} p^{oil} \\ y \\ i \\ p \\ m \end{bmatrix}_{t-1} + A\varepsilon_t, \tag{7}$$

where p^{oil} is the Urals oil price in USD per barrel, y is real monthly GDP, i is the three-month interbank rate, p is the price level measured by the CPI, and m is a given monetary aggregate. We are only interested in the monetary policy shock identified through the interest rate. That is, the order of the variables within the "blocks" before and after the interest rate is irrelevant (Christiano et al., 1999). Keating (1996) shows that this still holds if there is no "order" at all within the blocks, as long as the sequence (and assumptions regarding causality) between the blocks remain unchanged.

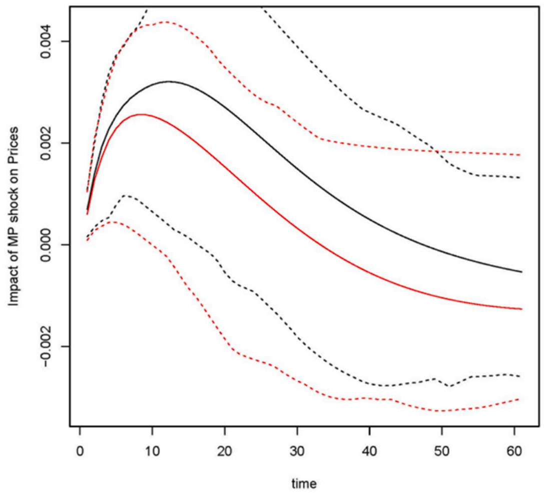
[10] Ono (2013) estimates a similar model for Russia over the period 1999–2011 but uses only M0 as a measure of money.

Accordingly, we assume:

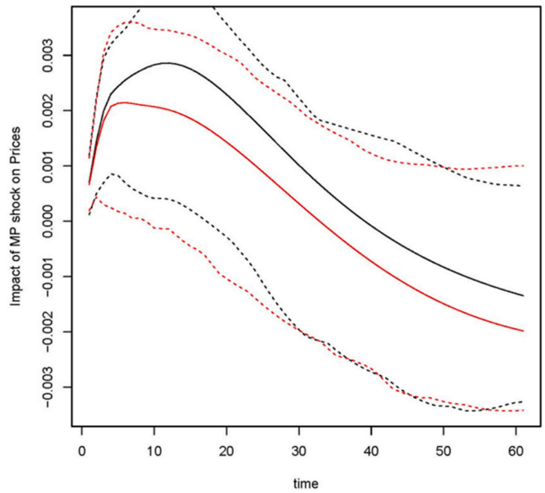
$$A = \begin{bmatrix} a_{11} & a_{12} & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 & 0 \\ a_{31} & a_{32} & \boldsymbol{a_{33}} & 0 & 0 \\ a_{41} & a_{42} & \boldsymbol{a_{43}} & a_{44} & a_{45} \\ a_{51} & a_{52} & \boldsymbol{a_{53}} & a_{54} & a_{55} \end{bmatrix} \tag{8}$$

As a robustness test, we run an alternative specification (Model B), where we do not allow prices to react to monetary policy contemporaneously. This setup is probably more widespread in the literature, but since we mostly want to talk about the price puzzle, we prefer allowing for a contemporaneous effect of prices rather than ruling it out by construction. This yields the following restrictions on A:

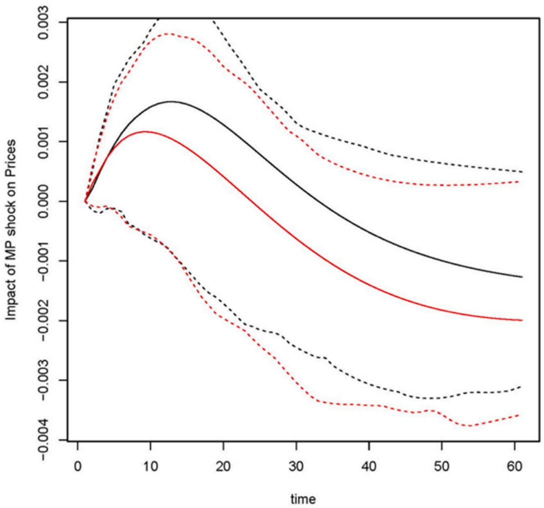
$$A = \begin{bmatrix} a_{11} & a_{12} & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 & 0 \\ a_{31} & a_{32} & 0 & a_{34} & 0 \\ a_{41} & a_{42} & \boldsymbol{a_{43}} & a_{44} & 0 \\ a_{51} & a_{52} & \boldsymbol{a_{53}} & a_{54} & a_{55} \end{bmatrix} \tag{9}$$



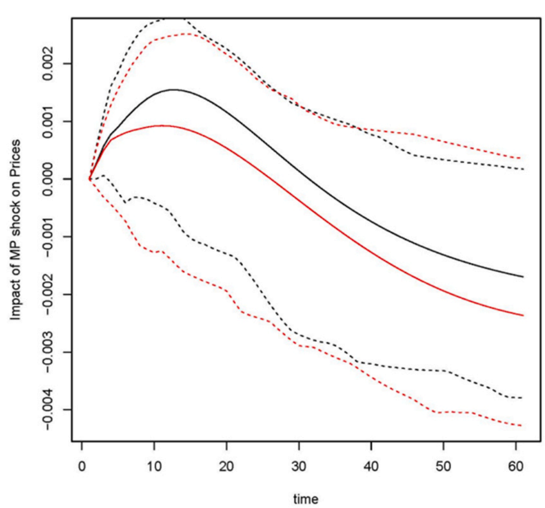
(a) M2 vs DM2, Model A



(b) M2X vs DM2X, Model A



(c) M2 vs DM2, Model B



(d) M2X vs DM2X, Model B

Fig. 9. Impulse response function of prices after a monetary policy shock.
Notes: Simple sum is denoted in black, Divisia is in red. Dotted lines represent the 95% confidence bounds. Model A allows for prices to respond contemporaneously. Model B precludes a contemporaneous effect on prices.

For both cases, we are only interested in the third column of this identification matrix (highlighted in bold), i.e. the contemporaneous effect of the monetary policy shock, and the dynamics following thereafter. As before, we report a pairwise comparison of M2 vs. DM2 and M2X vs. DM2X for both specifications of the SVAR.

4.3.1. Results

Fig. 9 shows the impulse response of prices to a contractionary monetary policy shock. The baseline specification (Model A) in the top row confirms the existence of the price puzzle over the sample period with prices rising for a number of months following the shock. When the monetary aggregate including domestic and foreign currency deposits is used, the magnitude of the price surge is higher, but the reversal also occurs earlier. More importantly, there is a significant difference between the simple sum and Divisia measures, whereby Divisia clearly and consistently mitigates the extent of the price puzzle. Although prices do still rise right after a contractionary shock before settling at a lower level, the initial increase is less pronounced when using Divisia. For DM2, prices begin decreasing around 9 months after the shock, while in the case of M2 this occurs after more than a year. When we employ DM2X, the price-puzzle effect starts dying off after only 5 months, whereas for M2X it takes more than twice as long. The alternative specification (Model B) in the lower part of Fig. 9 presents a very similar picture, suggesting that our results remain robust even if we preclude a contemporaneous effect on prices.

5. Conclusions

Money as a macroeconomic variable serves a number of important functions for monetary policy in emerging economies. In the absence of developed financial markets and well-functioning transmission channels, the growth of monetary aggregates can be adopted as a nominal anchor, which has, for instance, been a popular choice among transition economies in CEE. As markets mature, money can become an intermediate target of the monetary regime. Even in countries that switch to inflation targeting and rely on interest rates alone, the informational content of monetary aggregates can still assist in conducting an effective monetary policy. As the recent experience of developed countries has shown, money garners renewed attention in the aftermath of financial crises when zero-bound interest rates render monetary policy ineffective. Money can serve productively as a nominal anchor, intermediate target, or informational variable only if it is measured correctly. Unfortunately, central banks and statistical agencies have for decades relied on a flawed measure of monetary aggregates based on the simple sum of financial assets.

Starting with the seminal work of Barnett (1980, 1981, 1983), an alternative measure has been gaining traction that has strong foundations in microeconomic theory and addresses one of the key shortcomings of simple sum indices, namely treating all financial assets as perfect substitutes. This Divisia index takes into account the level of liquidity of a given monetary asset by assigning weights, which depend on how useful that asset is for transaction services. A large body of literature has offered evidence of the superiority of Divisia over simple sum indices in the context of monetary policy, compelling a number of major central banks (e.g., Federal Reserve, Bank of England, Bank of Japan) to start reporting Divisia series (some publicly, others for internal use) alongside their conventional measures. Russia is notably absent from the growing list of important emerging economies for which Divisia aggregates have been produced.

The main goal of our study was to calculate Divisia indices for the two measures of broad money reported by the CBR (M2 and M2X) over the period 1998–2019 using data on currency in circulation, as well as demand and time deposits of households and firms with various maturities and denominated in various currencies. Analyzing the conventional and alternative measures in a comparative setting reveals that Divisia follows a pattern of growth that is markedly different from the simple sum, whereby the latter generally overstates growth rates during monetary tightening and understates them in times of monetary easing. The deviations between the two series are even more pronounced when foreign currency accounts are included.

Furthermore, we conducted three empirical exercises that demonstrate the advantages of Divisia over the simple sum. First, we estimated five specifications of the money demand function and assessed its stability. While our results do not indicate the presence of structural breaks for either of the two competing monetary aggregates, Divisia consistently provides estimates of income elasticity that are closer to the theoretically expected value of 1. More importantly, portfolio shifts in response to changes in the opportunity cost of money do not affect the simple sum but are strongly reflected in the corresponding coefficients for Divisia. The second exercise involved nowcasting the growth of nominal GDP using its lagged values and contemporaneous growth of money supply. We found strong evidence that Divisia-based nowcasting performs better in times of financial turmoil than the simple sum. Lastly, we employed a structural VAR to test the notion that Divisia has the potential to mitigate the price puzzle phenomenon. Prices rise following a contractionary monetary shock, but the initial increase is less pronounced for Divisia than for the simple sum.

Given the fairly short sample and the simple approximation of Divisia (based on the asset granularity that is publicly available), the results of our analysis are encouraging, offering high hopes for a Divisia series constructed by the CBR using more detailed microeconomic data. Replacing the simple sum measure with Divisia could have a number of beneficial implications for monetary stability in Russia. Existing research shows that monetary aggregates have been playing an important role in the CBR's monetary policy, even after the shift to inflation targeting. Adopting Divisia would improve the effectiveness of monetary policy, given that the new measure is based on a stable money demand function, produces better forecasts, and mitigates the price puzzle. In addition, Divisia performs better than the conventional measure in times of financial turmoil, which is particularly relevant for a resource-based economy prone to external shocks, inflation and exchange rate volatility. Last but not least, financial assets denominated in foreign currency are still an important factor in Russia. Portfolio shifts triggered by interest rate changes or exchange rate movements are detected by the Divisia index, allowing the CBR to gain a better picture of the monetary situation than by relying on the simple sum.

The National Bank of Poland has become the first monetary authority of an emerging economy to publish Divisia monetary aggregates on a regular basis. Based on our findings, we are convinced that the CBR would benefit from following Poland's example by incorporating Divisia M2 and M2X aggregates into its official statistics and monetary policy deliberations.

Declarations of interest

None.

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