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International Transmission of Conventional and Unconventional Monetary Policy and Financial Stress Shocks from the Euro Area to Russia¹

Abstract: This paper studies the international transmission of the euro area's monetary policy and financial stress to Russia. The results show that financial stress in the euro area damages Russian economic activity and stock prices, but not its trade balance. The contractionary euro area monetary policy shock decreases Russian GDP, leads to real appreciation of the euro against the Russian rouble, damages Russian stock prices, but does not significantly affect the trade balance between countries. We also found that the Central Bank of the Russian Federation adjusts to monetary policy shocks in the euro area.

Keywords: conventional monetary policy, unconventional monetary policy, financial stress, Russia, international transmission.

JEL classification: E52, F42, G15

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Introduction

It has recently been documented that increasing global trade and financial flows have made economies around the world more susceptible to monetary policy actions in advanced economies (Cushman & Zha, 1997; Koray & McMillin, 1999; Takáts & Vela, 2014; Vespignani, 2015; Rey, 2016; Bluwstein & Canova, 2016) and financial stress (Dovern & van Roye, 2014; Evgenidis & Tsagkanos, 2017; Chen & Semmler, 2018). Some studies have examined in a unified framework the transmission of conventional and unconventional monetary policy and financial stress within the advanced economies of the US and the euro area (Hubrich & Tetlow, 2015; Kremer, 2016). The international transmission of both types of monetary policy and of financial stress shocks from the euro area to Russia in a unified framework has not been studied. We address this question here.

The euro area and Russia are strongly connected via trade.² Moreover, one should bear in mind a possible complexity of international monetary policy transmission of the euro area monetary policy to Russia given the new unconventional monetary policy.³ Therefore, understanding the transmission of monetary policy and financial stress from the euro area to Russia is of great importance for the design of economic policy.

Prior to the introduction of unconventional measures of monetary policy in advanced economies, most studies explained international transmission of monetary policy via trade linkages (Cushman & Zha, 1997; Koray & McMillin, 1999; Kim, 2001a, b). Recently, with the onset of large-scale unconventional monetary policy operations, the focus has shifted away from international trade flows to international financial flows (Berge & Cao, 2014; Falagiarda, McQuade & Tirpák 2015; Chen, Filardo, He & Zhu, 2016; Bluwstein & Canova, 2016; Evgenidis, Philippas & Siriopoulos, 2019). Another strand of the literature has investigated international transmission of financial stress and its detrimental macroeconomic effects (Hakkio & Keeton, 2009; Gilchrist & Zakrajsek, 2012; Dovern & van Roye, 2014; Eickmeier & Ng, 2015; Dajčman, Kavkler, Mikek & Romih, 2020).

² According to Eurostat data (Eurostat, 2019a), in 2018 imports to the euro area from Russia were 123.15 billion euros or 5.9% of total non-euro area imports. Exports from the euro area to Russia amounted to 66.3 billion euros or 2.9% of total exports.

³ From 2008, the ECB has adopted several unconventional tools: direct and indirect credit and quantitative easing and forward guidance (Fiedler, Jannsen, Wolters, Hanisch & Hallett Hughes, 2016). For details see Neri and Siviero (2019).

Only a few studies have investigated international transmission of monetary policy to Russia, focusing mainly on international transmission of US monetary policy (Takáts & Vela, 2014; Chen, Lombardi, Ross & Zhu, 2017; Ono, 2018; Kruglova, Styrin & Ushakova, 2018), while international transmission of euro area monetary policy has attracted little attention (Chen et al., 2017). To fill this gap, we investigate the transmission of euro area (conventional and unconventional) monetary policy to Russia and the relevance of individual channels of transmission.

With respect to international transmission of monetary policy, this paper extends Kremer's (2016) one-country model to a two-country macroeconomic model. The model enables us not only to assess the effects of euro area conventional and unconventional monetary policy shocks, but also the effects of euro area financial stress shocks for a set of Russian economic variables. These variables include economic activity (GDP), price level, monetary policy rate, bilateral trade with the euro area, the bilateral exchange rate, stock prices and government bonds yield.

Literature review

The literature traditionally argues that international transmission of monetary policy works via the impact of exchange rates on trade flows and other macroeconomic variables (Cushman & Zha, 1997; Koray & McMillin, 1999; Kim, 2001a, b; Maćkowiak, 2007; Vespignani, 2015; Shobande & Shodipe, 2021). Mohanty (2014) notes that central bank practitioners identify the adjustment in the exchange rate and the monetary policy rate as the prime channels of monetary policy transmission from advanced to emerging economies: the former is singled out as the main channel in economies with a floating exchange rate regime, the latter with a fixed exchange rate regime. Rey (2016) and Evgenidis et al. (2019) point out that in a floating exchange rate regime, monetary policy impulses can exert influence on the trade balance of domestic and foreign economies in two opposing ways: demand-augmenting effects and expenditure-switching effects. A contractionary domestic monetary policy impulse weakens domestic demand including imports, which improves the domestic trade balance (demand-augmenting effect) and, at the same time, an increase in domestic policy rate may induce a real appreciation of the domestic currency, which in turn worsens the domestic trade balance (expenditure-switching effect) and affects other domestic and foreign macroeconomic variables (*ibidem*). Takáts and Vela (2014) and Rey (2016) show that a floating exchange rate regime cannot insulate domestic economies from monetary spillovers from advanced economies, while Bluwstein and Canova (2016) contend that the exchange rate is the most potent international

transmission channel of conventional ECB's monetary policy for non-euro European countries, irrespective of the exchange rate regime. Takáts and Vela (2014) reason that with fixed exchange rates, the international spillover of policy rates from advanced to emerging economies is direct.

The international transmission of unconventional monetary policy may differ from the conventional monetary policy (see IMF, 2014, and references therein; Bluwstein & Canova, 2016). While the exchange rate channel is still considered as a major channel of transmission (Bluwstein & Canova, 2016; Varghese & Zhang, 2018; Inoue & Rossi, 2018), the literature has identified several other potentially important channels⁴ that work via financial ties between countries, including the wealth channel (stock prices) and the portfolio rebalancing channel (sovereign bond yields)⁵ (see IMF, 2014; Bluwstein & Canova, 2016; Varghese & Zhang, 2018; Inoue & Rossi, 2018). Bluwstein and Canova (2016) argue that unconventional monetary policy affects the cost of capital which in turn may affect stock prices (wealth channel). Unconventional monetary policy may affect bond yields triggering investors' portfolio changes (portfolio rebalancing channel) (Falagiarda et al. 2015; Bluwstein & Canova, 2016; Varghese and Zhang, 2018; Boermans & Keshkov, 2018). In this line of research, Tillmann (2014) and Aizenman, Binici and Hutchinson (2016) find that the Fed's unconventional monetary policy significantly affects the exchange rates and stock prices of emerging markets. Bowman, Londono and Sapriza (2015) argue that unconventional US monetary policy affects the bond yields of emerging market economies. Falagiarda et al. (2015), who investigated international transmission of ECB's monetary policy, note that the impact is mainly on sovereign bond yields. Bluwstein and Canova (2016) find that unconventional ECB policy measures affect nine non-euro European countries via the exchange rate, the wealth channels and the portfolio channels. Varghese and Zhang (2018) investigated the ECB's unconventional monetary policy transmission to four non-euro area European countries. They found that the exchange rate and portfolio rebalancing channels are operational.

MacDonald and Popiel (2017) note two main approaches capturing the stance of unconventional monetary policy: the shadow rate (computed e.g. by Wu & Xia, 2016) and a measure of expansion of the central bank's balance sheet (see

⁴ For a thorough review of different channels of unconventional monetary policy transmission see Mohanty (2014) and Bluwstein and Canova (2016). A recent review of conventional monetary policy transmission channels is provided by Pazardjiev and Vasilev (2021).

⁵ These channels may also be important for the transmission of conventional monetary policy (Ioannidis & Kontonikas, 2008; Bluwstein & Canova, 2016). Ioannidis & Kontonikas (2008) argue that by increasing policy rates, monetary policy can affect stock prices either by increasing the discount rates or worsening expectations of profits on future enterprises.

e.g. Boeckx, Dossche & Peersman, 2017; Kremer, 2016). MacDonald and Popiel (2017) point out that each approach has its own advantages and disadvantages. For instance, the balance sheet cannot capture the central bank's forward guidance, while the shadow rate can (ibidem). However, its weakness stems from the fact that if this rate alone is used to represent the stance of monetary policy, we cannot separate conventional from unconventional monetary policy during the period when the central bank's official policy rate has not yet reached the zero lower bound (ibidem).

The literature on the transmission of unconventional monetary policy to Russia is sparse. Takáts and Vela (2014) have studied repercussions of US unconventional and conventional monetary policy in 24 emerging economies. They find that the Russian policy rate responds positively to shifts in the US policy rate, but not to shifts in the US shadow rate. Further, they find a significant positive relationship between the US and Russian long-term interest rates. Chen et al. (2017) have analysed and compared the impact of the Fed's and the ECB's unconventional monetary policies, proxied by their shadow interest rates, in 24 advanced and emerging economies, including Russia. They find that upon an expansionary Fed policy shock, Russia's GDP growth and inflation rates increase, while upon the ECB's monetary policy shock, only credit growth responds positively and significantly. Ono (2018) concentrates on Fed's conventional and unconventional monetary policy shocks, proxied commonly by the shadow rate and assesses the impact on Russian stock prices, policy rate and bilateral exchange rate. The main finding of the study is that an increase in the shadow rate reduces Russian stock prices and interest rates and depreciates the Russian rouble. Kruglova et al. (2018) apply bank-level data to appraise the impact of the US unconventional monetary policy. They find that monetary tightening is associated with a reduction in bank lending in Russia. Specifically, banks that rely more heavily on international financing cut their loans more heavily. They also note that a structural change occurred in the Russian macroeconomic environment in 2014 and that economic modelling of the Russian economy should take this into account.

Our work is also related to studies of the transmission of financial stress in otherwise standard monetary Vector Autoregressive (VAR) models (Hubrich & Tetlow, 2015; Kremer, 2016). To analyse euro area stress and monetary policy transmission to Russia, we extended the model of Kremer (2016) who studied the macroeconomic effects of conventional and unconventional ECB's monetary policy and financial stress (proxied by the Composite Indicator of Systemic Stress) and found that financial stress significantly affects output and inflation.

Methodology

The impact of euro area conventional and unconventional monetary policy and financial stress shocks on the Russian economy is assessed by fitting a two-country VAR model and computing impulse responses. The estimated VAR can be written as (see e.g. Christiano, Eichenbaum & Evans, 1996, 1999; Luetkepohl, 2011; Kremer, 2016)⁶:

$$x_t = a + \sum_{l=1}^p A_l x_{t-l} + \varepsilon_t, \quad (1)$$

where x_t is $n \times 1$ vector of endogenous variables partitioned into 3 blocks $x_t = [x_t^{EA} \ x_t^{RU} \ x_t^{FTR}]'$, A_l is $n \times n$ matrix of regression coefficients, l denotes the lag ($1, \dots, p$), a is $n \times 1$ vector of regression constants and ε_t is a vector of errors.

The first block of endogenous variables consists of euro area variables $x_t^{EA} = [gdp_t^{EA} \ cpi_t^{EA} \ CISS_t^{EA} \ i_t^{EA} \ ECBsheet_t]'$, the Russian variables are contained in the vector $x_t^{RU} = [gdp_t^{RU} \ cpi_t^{RU} \ i_t^{RU} \ SP_t \ YD_t]'$, and the variables related to foreign trade in the vector $x_t^{FTR} = [exc_r_t \ tb_r_t]$. gdp_t is the real GDP for the euro area (Russia, respectively), cpi_t is consumer price index, $CISS_t^{EA}$ is the Composite Indicator of Systemic Stress in the euro area, i_t is monetary policy rate, capturing the stance of conventional monetary policy in the euro area and in Russia respectively, $ECBsheet_t$ is the Eurosystem's balance sheet capturing the stance of unconventional monetary policy in the euro area, SP_t is stock prices index for Russia, YD_t is the yield on long-term Russian government bonds, exc_r_t is the real exchange rate between the rouble (RUB) and the euro (EUR), i.e., the price of one euro in roubles, and tb_r_t is the bilateral trade balance of the euro area with Russia in real terms. SP_t and YD_t are included in the Russian block variables to identify whether ECB's monetary policy is transmitted to the Russian economy via the wealth and the portfolio rebalancing channels. The block of variables related to foreign trade helps to identify whether the international transmission of ECB's monetary policy via trade linkages between the economies is operational. To control for a possible structural change in the Russian economy after 2014⁷, an

⁶ Compare also to Cushman and Zha's (1997) model.

⁷ In 2014, at least three important factors may have contributed to this change (Kruglova et al., 2018; Central Bank of the Russian Federation, 2014): i) new monetary policy regime (managed exchange rate regime was substituted by formal inflation targeting), ii) a large fall in the price of oil, the main Russian export commodity and iii) the imposition of economic sanctions amongst others by the euro area countries.

exogenous dummy variable was added⁸ in model (1) VAR equations for the x_t^{RU} and x_t^{FTR} blocks of variables. In addition, the world oil price (oil_t) was added as an exogenous variable⁹, entering all equations in VAR model (1). All variables, except $CISS_t^{EA}$, i_t , and YD_t enter equation (1) in natural logarithm of levels¹⁰. The lag, p , is determined by information criteria.

In equation (1), unconventional monetary policy of ECB is proxied by the volume of the Eurosystem's balance sheet ($ECBsheet_t$). By taking this proxy instead of the shadow rate, we can disentangle unconventional from conventional monetary policy of ECB at a time when its policy rate has not yet reached the zero lower bound (see MacDonald & Popiel, 2017)¹¹. The total consolidated balance sheet of the Eurosystem is considered (Kremer, 2016; Boeckx et al., 2017).

Identification of shocks is achieved by (Cholesky decomposition) assuming that variables in block x_t^{EA} are not contemporaneously affected by shocks in variables in blocks x_t^{RU} and x_t^{FTR} , while variables in block x_t^{RU} are not contemporaneously affected by shocks in variables in block x_t^{FTR} . All computations are made with standard Stata VAR and impulse responses (estimation and drawing) procedures.

Following the standard VARs of monetary policy transmission (Christiano et al., 1996; Christiano et al., 1999) and VARs which study transmission of conventional and unconventional monetary policy (Kremer, 2016; Boeckx et al., 2017; Dajcman & Tica, 2017) the specific order of the euro area variables implies that the shock in conventional ECB's monetary policy is identified by assuming that the ECB sets its policy rate by considering contemporaneously information on economic activity, price dynamics and financial stability in the euro area, whereas all other determinants considered in the model affect policy rate decisions with a lag.

⁸ We follow Kruglova et al. (2018) and determine that a regime change could have happened in 2014. We set March 2014 as the regime-shift date, since after that time factors outlined in footnote 6 started to realize (see also e.g. Gurvich and Prilepskiy (2015) for analysis on the impact of sanctions). The dummy variable thus takes value 1 (and 0 otherwise) for the period from March 2014 until the end of the sample. We allow the regime change in the Russian economy to impact only x_t^{RU} and x_t^{FTR} blocks of variables.

⁹ Although oil is an important Russian export commodity (according to the Central Bank of the Russian Federation (2014), more than 50% of Russian exports is attributed to oil export) we assume that the world price of this commodity is exogenous to the modelled variables (for such treatment of this variable see e.g. Ono, 2018).

¹⁰ This is also common practice in the referenced literature (Cushman & Zha, 1997; Koray & McMillin, 1999; Vespignani, 2015; MacDonald & Popiel, 2017; Boeckx et al., 2017).

¹¹ ECB's key policy rate (the rate used in its ordinary main refinancing operations) reached zero level in 2016, whereas an expansion of the Eurosystem's (consolidated) balance sheet due to its unconventional measures started sooner (see e.g. Fiedler et al., 2016; Boeckx et al., 2017).

An ECB's unconventional monetary policy shock is identified by assuming that, in a particular month, the central bank evaluates that month's indicators of the euro area economic activity, price dynamics, financial stability and the current level of its policy rate before taking any action that will have an impact on the size of Eurosystem's balance sheet, $ecbsheet_t$, while other variables impact Eurosystem's balance sheet with a lag. We identify the Central Bank of the Russian Federation monetary policy shock by assuming that it considers contemporaneously all euro area economic and financial sector variables included in the model (1). This reasoning is standard in the previous studies on the international transmission of monetary policy from large, advanced, to small, open or emerging economies (Cushman & Zha, 1997; MacDonald & Popiel, 2017). The ordering implies that the balance of bilateral trade and the RUB/EUR exchange rate dynamics are contemporaneously affected by all euro area and Russian variables shocks.

Data and empirical results

Model (1) is estimated on monthly data. Although for some variables data availability started in 1999M1, the availability of data for some others was shorter and given the estimated model characteristics the actual period of VAR model (1) estimation was 2000M10-2018M6. A detailed specification of variables is presented in Table 1.

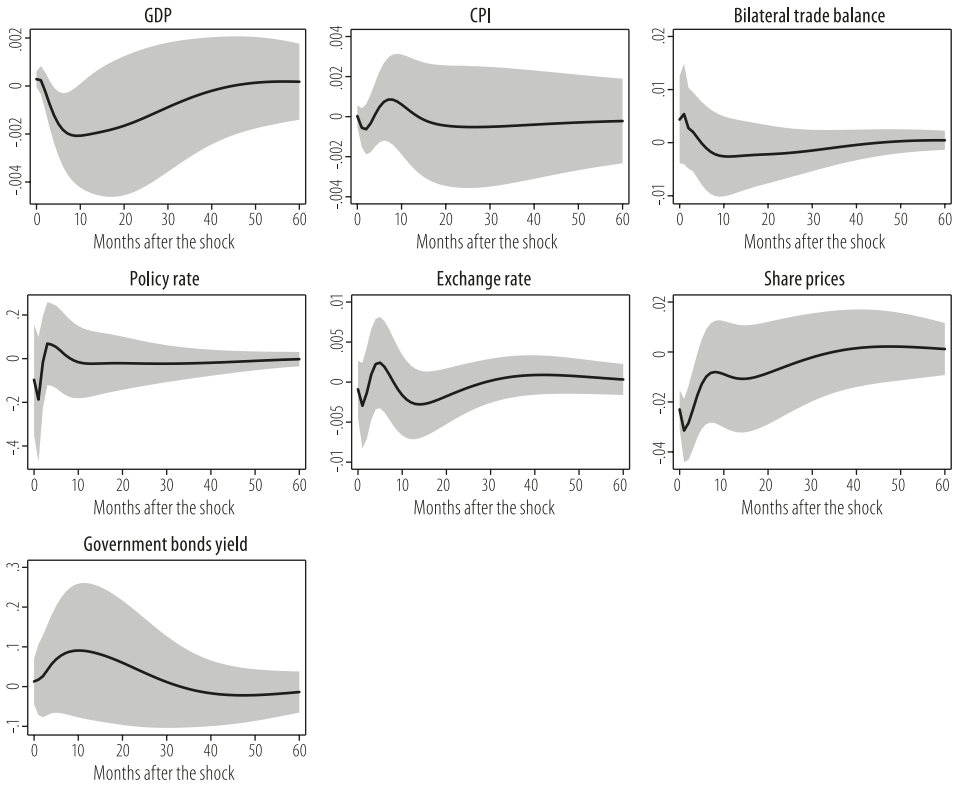
Table 1: Description of the variables

Variable notation	Description
gdp_t^{EA}, gdp_t^{RU}	Monthly index of seasonally adjusted real GDP for euro area and Russia. Monthly time series was estimated from monthly seasonally adjusted industrial production index for euro area and Russia (total industry, excluding construction; OECD (2019a) data was used) and quarterly (seasonally adjusted) GDP index series for Russia (OECD (2019b) data) and euro area (seasonally and calendar adjusted) (Eurostat (2019b) data) by temporal disaggregation method of Chow-Lin (1971) ^a . Computation is based on the sum method (index for each month was obtained by summing the estimates obtained by the method for the current and past two months) and as a robustness test the time series was estimated with the average method (see Quilis, 2019). The natural logarithm of the time series enters model (1).
cpi_t^{EA}, cpi_t^{RUS}	Consumer price index for the euro area and Russia. For euro area the seasonally and working day harmonized index of consumer prices (HICP) is used (European Central Bank – ECB (2019a) data), while for Russia the consumer price index (OECD (2019a) data). In robustness test we also seasonally adjusted the series for Russia by using the X-13ARIMA-SEATS method ^b . The natural logarithm of the time series enters model (1).

$CISS_t^{EA}$	The monthly level (index) of the Composite Indicator of Systemic Stress (CISS) for the euro area. The indicator is a fundamental indicator of the level of financial stress in five segments of euro area's financial system: bond, equity, money and foreign exchange market, and the stress experienced by financial intermediaries. It is used by ECB as one of the main indicators of systemic stress in the euro area and is measured on the interval (0,1] (Hollo, Kremer & Lo Duca, 2012; Kremer, 2016). The data was obtained from European Central Bank – ECB (2019b).
i_t^{EA}, i_t^{RU}	The monthly rate measuring the stance of conventional monetary policy. Following, e.g., Boeckx et al. (2017) and Kremer (2016), for the euro area this is the rate applied in the ordinary open market refinancing operations (MRO) of the ECB. The data is from the Reserve Bank of Australia (2019) statistical database. For Russian monetary policy stance, we apply the Moscow InterBank Actual Credit Rate (MIACR), as advocated by recent research on monetary policy transmission in Russia (Borzykh, 2016). Monthly level of the rate for Russia is defined as monthly average of the daily rate on one day loans and was obtained from the Central Bank of the Russian Federation (2019).
$ECBsheet_t$	Monthly indicator of unconventional monetary policy stance of ECB, proxied by the natural logarithm of total assets of Eurosystem's consolidated balance sheet (data is from European Central Bank – ECB, 2019c).
SP_t	The Russian share prices index. Data was retrieved from OECD (2019a). The natural logarithm of the time series enters model (1).
YD_t	Yield on the Russian 10-year government bonds. Data source was OECD (2019a).
exc_r_t	The average monthly real exchange rate, calculated from average monthly nominal exchange rate, defined as the number of RUB to buy one EUR. The source of data was European Central Bank – ECB (2019d). The usual formula for computation of the real exchange rate was then applied (consumer price indices time series of OECD (2019a) were used). The natural logarithm of the time series enters model (1).
tb_r_t	The euro area's trade balance (of goods) with Russia in real terms, monthly frequency. The trade balance is expressed as a ratio (as used also in Koray and McMillin, 1999) of seasonally and calendar day adjusted volume indices of exports to imports of the euro area with Russia. The source of data was Eurostat (2019a). The natural logarithm of the time series enters model (1).
oil_t	The average monthly price (in EUR) of crude oil, calculated from spot prices of Dated Brent, West Texas Intermediate and the Dubai Fateh oil. Data source was IMF (2019). USD/EUR rate is from European Central Bank – ECB (2019e). The natural logarithm of the time series enters model (1).

Notes: ^aFor this intention, the Matlab code of Quilis (2019) was applied. ^bWe utilized the JDemetra+ software (see Grundowska, 2016), available at: https://ec.europa.eu/eurostat/cros/content/software-jdemetra_en.

Next, we present the impulse responses computed from the results of model (1). Figure 1 presents the orthogonal impulse responses of Russian variables to a one standard deviation shock to CISS for the euro area. The plots in the first row convey the response of GDP, CPI and bilateral trade balance in real terms. Evidently, the financial stress shock harms Russian economic activity: GDP drops almost by impact and 10 months from the shock contracts by approximately 0.2%, while recovery is gradual. The response of CPI and the trade balance is rather muted and non-significant. These results corroborate the empirical literature on detrimental domestic effects (Hakkio & Keeton, 2009; Kremer, 2016) and international effects of financial stress on economic activity and non-significant effect on price dynamics (Dovern & van Roye, 2014).

Figure 1: The response of the Russian economy to euro area financial stress (CISS) shock

Source: Own calculations

Notes: Model (1) with two lags (indicated by HQIC information criteria) was estimated. The mean (orthogonal) impulse response of the variables to a positive one standard deviation shock to CISS for euro area and 95% confidence intervals (shaded area) are drawn. We used Stata degrees-of-freedom adjustment. The responses are changes in logarithm values of variables with the exception of policy rates and government bonds yield, which are in percentage points.

Graphs in the second and the third rows display the response of Russian financial variables. Only the impulse response for the share prices index is significant and conveys that Russian stock prices tumble upon a financial stress shock in the euro area. Response to a shock is immediate and culminates within a month from the shock when stock prices decline by approximately 3%. Whilst ECB responds¹² to

¹² We do not present the impulse responses for the euro area variables but note that the euro area response to the domestic financial stress shock is almost identical to Kremer (2016): GDP and ECB policy rate drop, while the Eurosystem's balance sheet expands.

counter the negative impact of the shock for the euro area's economy by reducing its policy rate, the response of policy rate in Russia is not significant. The euro in real terms depreciates against the rouble on impact, but also this response is not significant¹³, possibly reflecting the exchange rate stabilizing efforts of the Russian central bank in the observed time period (see e.g. Central Bank of the Russian Federation, 2013, 2014). The impulse response of yield on Russian government bonds is not significant.

Possibly due to sanctions against Russian financial institutions, which drastically reduced borrowing from abroad (see e.g. Gurvich & Prilepskiy, 2015), the transmission channel of financial stress to the Russian financial market was rather muted.

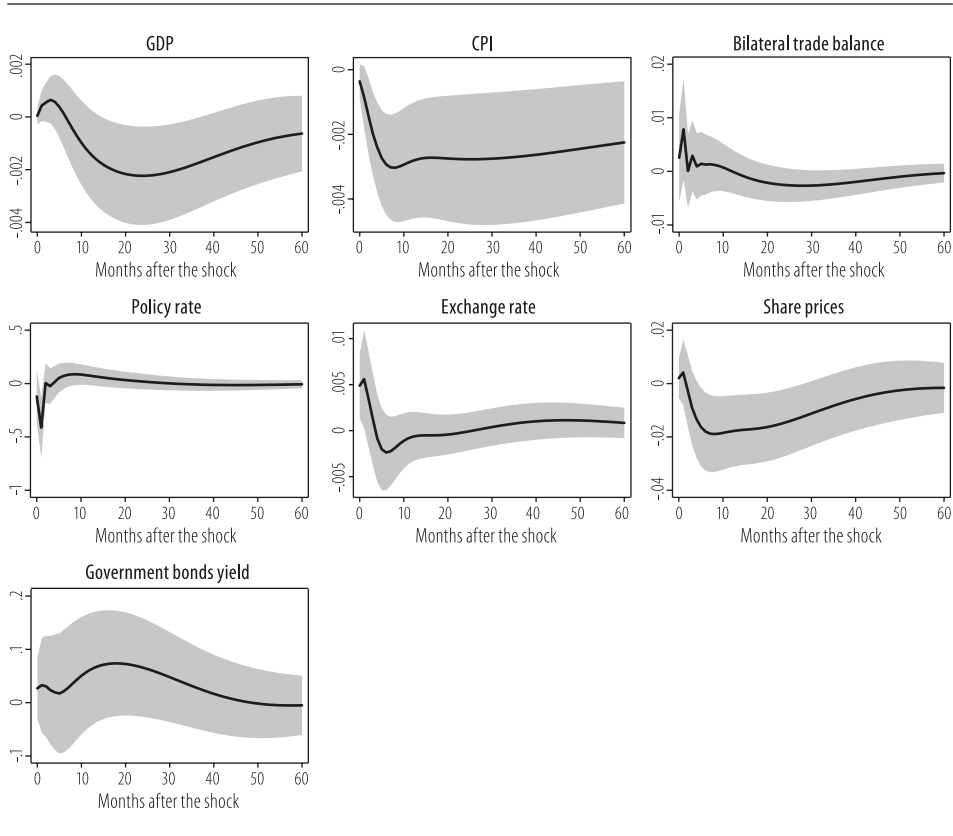
Figure 2 plots the impulse responses of Russian variables to the shocks in the ECB's monetary policy rate (i.e., conventional monetary policy shocks). A contractionary monetary policy impulse of ECB decreases Russian GDP with a few months lag. The maximum effect is a reduction of approximately 0.2% about 25 months from the shock. CPI drops by approximately 0.3% eight months from the shock. These findings corroborate the finding of Takáts and Vela (2014), Chen et al. (2017), Ono (2018) and Kruglova et al. (2018), that Russian real economy is susceptible to monetary policy shocks originating in large advanced economies.

While the existing literature does not analyse the impact of international monetary policy shocks on the bilateral trade balance between Russia and the euro area, our results indicate that conventional monetary policy does not significantly affect the bilateral trade balance. An increase in ECB's policy rate results in real appreciation of the euro against the rouble. This is in line with theoretical predictions and is an indicator of the operational exchange rate channel. Russian policy rate falls in response to a contractionary ECB policy shock, implying that the policy rate channel is important. This is in line with the findings of Ono (2018) and in contrast to Takáts and Vela (2014) who find that Russian policy rate co-moves with the US monetary policy rate. The results also indicate that stock prices in Russia tumble when the policy rate in the euro area increases, corroborating the finding of Ono (2018). A significant response in stock prices indicates the strength of the international wealth channel (see Bluwstein & Canova, 2016). In contrast, a non-significant response in the yield of Russian government bonds

¹³ Literature documents that some currencies are regarded as a "safe haven" in times of globally elevated uncertainty, financial stress or risk aversion (Ranaldo & Söderlind, 2010; Adam, Benecká & Matějů, 2018) and are likely to appreciate against the others in these periods. However, Adam et al. (2018) point out that currencies without such status also may appreciate in response to a foreign financial stress owing to diversification.

is observed, indicating (following e.g. Falagiarda et al. (2015) and Varghese & Zhang (2018)) that the portfolio rebalancing channel is not an operational channel of ECB’s conventional monetary policy transmission to Russian economy.

Figure 2: The response of the Russian economy to ECB’s policy rate (conventional monetary policy) shocks

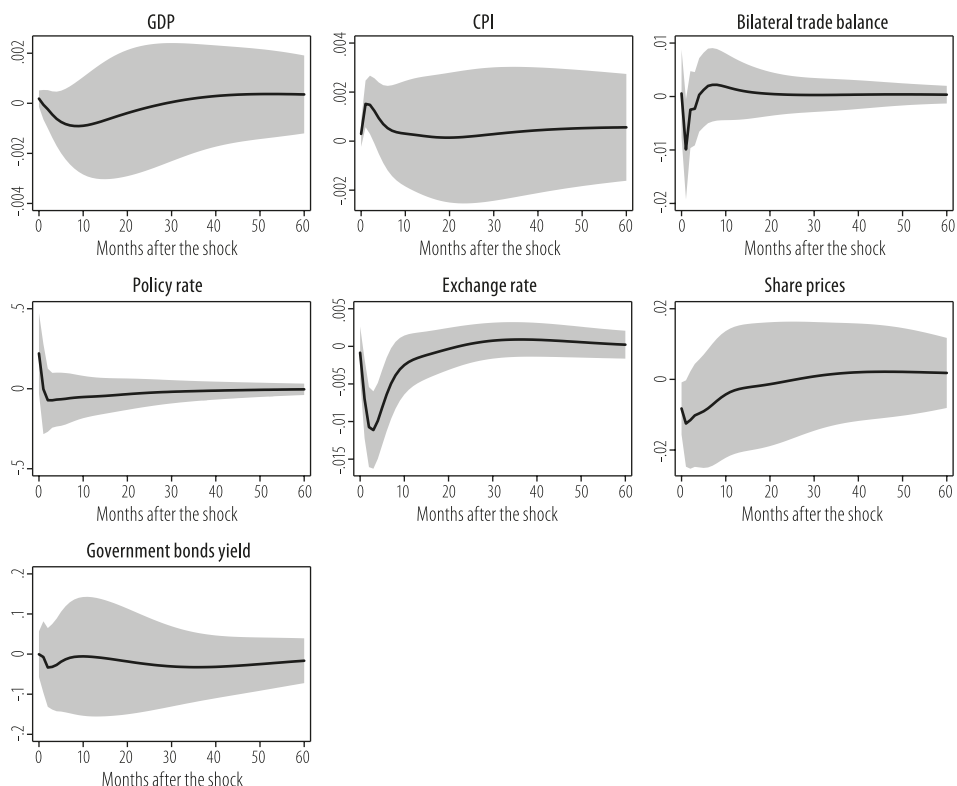


Source: Own calculations

Notes: Model (1) with two lags was estimated. The shock relates to ECB’s monetary (MRO) policy rate. Other notes from Figure 1 apply.

Figure 3 shows the response of the Russian economy to a positive ECB unconventional monetary policy shock that expands the volume of the Eurosystem’s balance sheet.

Figure 3: The response of the Russian economy to Eurosystem's balance sheet (ECB unconventional monetary policy) shocks



Source: Own calculations

Notes: Model (1) with two lags was estimated. The shock relates to Eurosystem's balance sheet (unconventional) monetary policy. Other notes from Figure 1 apply.

An expansionary unconventional monetary policy shock is transmitted to Russia's CPI, stock prices and the bilateral exchange rate. Following a one standard deviation increase in the Eurosystem's balance sheet, CPI in Russia increases by approximately 0.15% two months from the shock. Compared to the conventional monetary policy shock (Figure 2), the effect is relatively small and shorter in duration. The response of the Russian stock market follows within a month of the shock when stock prices fall by approximately 1.2 % and then recover approximately one year from the shock. It implies that the wealth effect is operational. However, the result of the transmission of unconventional monetary policy shock through this channel differs from the conventional monetary policy transmission. Whereas a reduction in the ECB's policy rate is beneficial

(note that Figure 2 shows the response to an increase in ECB's policy rate), an expansion of the Eurosystem's balance sheet is detrimental to the Russian stock market. Negative impact of the ECB's expansionary unconventional (balance sheet) policy on domestic and foreign stock prices is reported in the literature (Bluwstein & Canova, 2016). In contrast, Ono (2018), who studied the impact of the Fed's shadow rate shocks, found that contractionary policy shock of the latter results in a reduction in Russian stock prices. A significant response in the real bilateral exchange rate is notable. In line with theoretical predictions, a Eurosystem's balance sheet shock leads to real depreciation of the euro against the rouble by a maximum of approximately 1% 3 months from the shock. The trade balance is significantly impacted by nonconventional monetary policy shock one month from impact only, worsening the bilateral trade balance ratio of the euro area with Russia.

Comparing the responses of Russian variables to monetary policy shocks in the euro area (Figures 2 and 3), we assert that conventional monetary policy has a larger impact on the Russian economy than unconventional monetary policy. In this regard, two observations are relevant. First, the euro area conventional monetary policy is transmitted to Russia via policy rate, exchange rate and wealth channels, while unconventional monetary policy is transmitted via exchange rate and wealth channels. Second, the former type of monetary policy affects Russian GDP and CPI, whereas the latter only affects CPI.

As a robustness test, an alternative ordering of share prices index, government bonds yield and exchange rate was tried, and we found that the above presented results are robust. Next, we estimated model (1) with alternative estimate of GDP series (see Table 1 for explanation) and found that the above presented results are not impacted, except the bilateral trade balance response to unconventional monetary policy shock that becomes non-significant. Using seasonally adjusted CPI time series for Russia instead of CPI (see Table 1 above) makes the responses of Russian GDP, CPI, and share prices to ECB's policy rate shock and the CPI to ECB's unconventional policy shock non-significant while other findings presented above are not impacted.

Conclusion

The scope of international trade and financial links between Russia and the euro area countries implies a potential importance of international transmission of monetary policy and financial stress to Russia. This paper fills the gap in quantitative analysis of these issues. Some of our results are in line with the reviewed literature. The reaction of Russian GDP and CPI to a euro area financial stress and conventional and unconventional monetary policy shocks qualitatively corresponds to the evidence in other countries. However, the reactions of stock prices, bilateral exchange rate, policy rate of the Central Bank of the Russian Federation and Russian government bonds yield show some specific dissimilarities. In particular, government bonds yield does not significantly react to a euro area shocks. The real exchange rate significantly responds to conventional and unconventional ECB's policy shocks, but not to a euro area financial stress. This reassesses the role of financial linkages. Among other findings, we also confirm the importance of the policy rate channel for the transmission of shocks to Russia and show the crucial difference between the impact of conventional and unconventional euro area monetary policy on the Russian stock market.

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