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Ono, Shigeki

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Financial development and economic growth nexus in Russia

Shigeki Ono

Asahikawa University, Asahikawa, Hokkaido, Japan

Abstract

This paper examines the finance-growth nexus in Russia with the vector autoregression model, taking oil prices and foreign exchange rates into account. The analyzed period is from 1999 through 2008 (Subperiod 1) and from 2009 through 2014 (Subperiod 2). The results for Subperiod 1 suggest that there is causality from economic growth to money supply and bank lending, which implies demand-following responses. The results for Subperiod 2 show that economic growth Granger causes bank lending while there is no causality from money supply to economic growth, which could be related to the dramatic decrease in the amount of intervention in foreign exchange markets.

JEL classification: E44, P24.
Keywords: financial development, economic growth, causality, VAR, Russia.

1. Introduction

Does financial development foster economic growth or does economic growth contribute to financial development? The former idea emphasizes the role of funds provided through financial intermediation as a facilitator of economic growth (see, e.g. Schumpeter, 1934 [1912]), and the latter suggests that economic expansion generates the need for more financial services (see, e.g. Robinson, 1952).

Empirical studies regarding the finance-growth nexus show various results, including causality from financial development to economic growth (King and Levine, 1993; Anwar and Nguyen, 2011; Adu et al., 2013; Arestis et al., 2015), causality from economic growth to financial development (Odhiambo, 2005; Lian and Teng, 2006; Odhiambo, 2008), and bidirectional causality between financial

E-mail address: s-ono@live.asahikawa-u.ac.jp
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development and economic growth (Demetriades and Hussein, 1996; Hassan et al., 2011; Kar et al., 2011; Jedidia et al., 2014). These conflicting findings imply that causality between financial development and economic growth could vary, depending on the country, period, and so forth.

This paper examines the finance-growth nexus in Russia, which is one of the world's major oil producing countries. Because affluent natural resources could affect the finance-growth causality, the Russian case is expected to add noteworthy empirical findings to the literature of this field. While Ono (2012) investigates the Russian finance-growth nexus based on cointegration relations, this paper applies a vector autoregression (VAR) model, employing the Granger causality test suggested by Toda and Yamamoto (1995). This approach is applicable regardless of whether a series is $I(0)$, $I(1)$, or $I(2)$, or cointegrated (of any order). Furthermore, this paper compares the finance-growth nexus before the 2008 global economic turmoil with that of the year 2009 and after.

The outline of this paper is as follows. Section 2 reviews the Russian economic situation. Section 3 describes the data sources for the analysis and methodological issues. Section 4 discusses the empirical results. The final section presents the conclusions of this paper.

2. Russian economic situation after the financial crisis in 1998

The real GDP growth rate in the fourth quarter, 1998 and in the first quarter, 1999 was –9.1% and –1.8%, respectively, in comparison with the same period of the previous year due to the Russian financial crisis in 1998. However, it increased to 3.1% in the second quarter, 11.5% in the third quarter and 12.1% in the fourth quarter, 1999.[1]

This rapid economic recovery is attributed to the treble depreciation of the Russian ruble, which provided Russian exporters with price competitiveness and prompted import substitution in domestic industries. Moreover, the low dependence of companies on banks in raising funds prevented them from suffering a liquidity shortage caused by the financial difficulties of the banks (OECD, 2000).

In December 1998, international oil prices bottomed out at USD 10.72 per barrel and reached a record high price of USD 145.29 in July 2008.[2] The high oil prices contributed to the rapid development of the Russian economy, which grew at 7.3% per annum from 2003 through 2007 on average.

However, Russia is said to suffer from "Dutch Disease" because of the increase in energy prices and the appreciation of the Russian ruble (see, e.g., World Bank, 2005; Ollus and Barisitz, 2007).[3] The Central Bank of Russia (CBR) repetitively intervened in the foreign exchange market in attempts to prevent the ruble from appreciating sharply. One of the reasons for the substantial increase in the money supply is the insufficient execution of instruments for sterilized intervention

[1] Data were derived from IMF, *International Financial Statistics*.

[2] Daily futures prices of New York Mercantile Exchange light sweet crude oil at Cushing, Oklahoma, Contract 1 (near month). Data are available at the Energy Information Administration.

[3] Oomes and Kalcheva (2007) found evidence of Dutch Disease, that is, real appreciation of the Russian ruble, a declining manufacturing sector, an expanding service sector, and rapid real wage growth. They also claim, however, that more research is needed to determine whether these symptoms are not caused by other factors.

(Tabata, 2009; Granville and Mallick, 2010). Under the repeated interventions in the foreign exchange market, the amount of international reserves increased from USD 12.6 billion at the end of 1999, to USD 569.0 billion at the end of June 2008.[4] The amount of money supply M2 was RUB 554 billion in May 1999 while it increased to RUB 13.5 trillion in October 2008.[5]

In mid-2008, the global financial turmoil put a depreciating pressure on the ruble. The CBR implemented large-scale interventions in the foreign exchange market to prevent ruble's sharp depreciation. Specifically, the amount of the CBR's intervention was USD 43.3 billion in October 2008 and USD 74.5 billion in December 2008.

Until the beginning of 2010, demand for CBR refinancing remained high, giving particular relevance to repo rates. However, as liquidity became abundant due to larger foreign exchange interventions buying USD, demand for refinancing almost evaporated (OECD, 2011).

In 2011, money supply increased dramatically although the amount of the international reserve remained almost unchanged. The higher credit activity of banks became the main factor contributing to broad money growth in 2011. The growth of banking system claims to non-financial organizations and households in 2011 (by RUB 5.3 trillion) was almost twice larger compared to 2010 (CBR, 2012). The banking system claims to non-financial organizations and households continued to rise. Specifically, they increased by RUB 4.5 trillion in 2012, by RUB 5.2 trillion in 2013, by RUB 7.4 trillion in 2014 and by RUB 3.2 trillion in 2015 although they decreased by RUB 800 billion in 2016.[6] In particular, the year 2013 saw a rise in the money supply and bank loans although the ruble exchange rate plunged and the CBR intervened in the foreign exchange market to support the ruble rate to reduce the international reserves.

3. Data and methodology

Financial development is defined as the improvement of the quality and quantity of financial intermediary services. Improvement is reflected in financial indicators through transactions between financial institutions and non-financial economic entities, including the money supply and outstanding bank loans.[7]

In this paper, two indicators are selected as measures of development in the banking sector that are frequently used in papers regarding the finance-growth nexus. The first indicator is the ratio of money supply M2, to nominal GDP (M). The second indicator is the ratio of bank lending to private and non-financial public sectors, to nominal GDP (L). As for the economic growth measure, real per capita GDP is used in the models (Y). International oil prices are also included in the estimation, which are considered one of the major elements affecting Russian economic growth (O). Furthermore, the ruble real effective exchange rate (FX) is added to the models because, as Ono (2014) indicates, oil prices have Granger-caused the ruble rate since 2002 and, as mentioned above, the appreciation of

[4] Data are available at the website of the CBR.

[5] IMF, *International Financial Statistics*, line 59mb.

[6] Calculated on the basis of figures in the banking sector survey.

[7] This paper assumes that the improvement in quality in financial development is reflected in the amount of loans extended to economic entities.

the Russian ruble could be one of the factors causing Dutch Disease in Russia. To sum up, this paper analyzes the following two models: M, Y, O and FX (Model 1); L, Y, O and FX (Model 2).

Data of money supply M2, bank loans and the ruble real effective exchange rate were obtained from the websites of the CBR and the IMF. Figures of the GDP are available on Rosstat's website. Data of oil prices were derived from the website of the Energy Information Administration. This study applies a VAR model with Russian data from the second quarter, 1999 through the third quarter, 2016. In the analysis, M, L, Y, O and FX are expressed in logarithms and are seasonally adjusted except O and FX. The data of O are deflated by the US consumer price index.

This paper applies a modified version of the Granger causality test proposed by Toda and Yamamoto (1995). Their method is applicable regardless of whether the VAR process is stationary, integrated (of an arbitrary order), or cointegrated (of an arbitrary order). After a lag length k is chosen, this paper estimates a $(k + d)$ th-order VAR using the data in their levels where d is the maximal order of integration. The coefficient matrices of the last d lagged vectors in the model are ignored (since these are regarded as zeros), and restrictions on the first k coefficient matrices can be tested.

The 4-variate VAR model of order $k + d$ can be written as:

$$M_t = \alpha_0 + \sum_{i=1}^{k} \alpha_{1i} M_{t-i} + \sum_{j=k+1}^{d} \alpha_{2j} M_{t-j} + \sum_{i=1}^{k} \alpha_{3i} Y_{t-i} + \sum_{j=k+1}^{d} \alpha_{4j} Y_{t-j} + \sum_{i=1}^{k} \alpha_{5i} O_{t-i} + \sum_{j=k+1}^{d} \alpha_{6j} O_{t-j} + \sum_{i=1}^{k} \alpha_{7i} FX_{t-i} + \sum_{j=k+1}^{d} \alpha_{8j} FX_{t-j} + \varepsilon_{1t} \quad (1)$$

$$Y_t = \beta_0 + \sum_{i=1}^{k} \beta_{1i} M_{t-i} + \sum_{j=k+1}^{d} \beta_{2j} M_{t-j} + \sum_{i=1}^{k} \beta_{3i} Y_{t-i} + \sum_{j=k+1}^{d} \beta_{4j} Y_{t-j} + \sum_{i=1}^{k} \beta_{5i} O_{t-i} + \sum_{j=k+1}^{d} \beta_{6j} O_{t-j} + \sum_{i=1}^{k} \beta_{7i} FX_{t-i} + \sum_{j=k+1}^{d} \beta_{8j} FX_{t-j} + \varepsilon_{2t} \quad (2)$$

$$O_t = \gamma_0 + \sum_{i=1}^{k} \gamma_{1i} M_{t-i} + \sum_{j=k+1}^{d} \gamma_{2j} M_{t-j} + \sum_{i=1}^{k} \gamma_{3i} Y_{t-i} + \sum_{j=k+1}^{d} \gamma_{4j} Y_{t-j} + \sum_{i=1}^{k} \gamma_{5i} O_{t-i} + \sum_{j=k+1}^{d} \gamma_{6j} O_{t-j} + \sum_{i=1}^{k} \gamma_{7i} FX_{t-i} + \sum_{j=k+1}^{d} \gamma_{8j} FX_{t-j} + \varepsilon_{3t} \quad (3)$$

$$FX_t = \delta_0 + \sum_{i=1}^{k} \delta_{1i} M_{t-i} + \sum_{j=k+1}^{d} \delta_{2j} M_{t-j} + \sum_{i=1}^{k} \delta_{3i} Y_{t-i} + \sum_{j=k+1}^{d} \delta_{4j} Y_{t-j} + \sum_{i=1}^{k} \delta_{5i} O_{t-i} + \sum_{j=k+1}^{d} \delta_{6j} O_{t-j} + \sum_{i=1}^{k} \delta_{7i} FX_{t-i} + \sum_{j=k+1}^{d} \delta_{8j} FX_{t-j} + \varepsilon_{4t} \quad (4)$$

where M_t is the log of M2-GDP ratio, Y_t is the log of real per capita GDP, O_t is the log of futures oil prices and FX_t is the log of the ruble real effective exchange rate at time t. In Eq. (1) if $\alpha_{3i} \neq 0\ \forall_i$, there is Granger causality from the real GDP to the M2-GDP ratio, and if $\alpha_{5i} \neq 0\ \forall_i$, the oil price Granger causes the M2-GDP ratio, and Granger causality from the ruble exchange rate to the M2-GDP ratio implies $\alpha_{7i} \neq 0\ \forall_i$. Similarly, Granger causality is examined in Eq. (2)–(4).

4. Empirical results

This paper divides the period analysed in the research into three subperiods: before and after the 2008 global financial turmoil, and after the 2014 oil price plunge. In dividing the period into subperiods this paper implements a test for the structural stability of VAR models. The VAR models of this paper are expressed as follows:

$$A(L)X_t = u_t \tag{5}$$

where $A(L) = I - A_1L - ... - A_pL^p$ is a p^{th} order lag polynomial, $LX_t = X_{t-1}$ and u_t is a 4×1 vector of serially uncorrelated disturbances with a mean zero and a covariance matrix $\sum_u$.[8]

When implementing the test for structural stability, this paper applies the procedure used by Christiano (1986), Cecchetti and Karras (1994), and Miyao (2000), which is a test of whether overall parameter values are unchanged between the two periods before and after a given possible break date. Thus the null hypothesis that all the model parameters are the same is tested against the alternative of a structural shift.

In this method, the following system is estimated:

$$A(L)X_t + B(L)X_t d_t = \eta_t \tag{6}$$

where $B(L) = I - B_1L - ... - B_pL^p$, d_t is a dummy variable that is set to be one after a given break date and η_t is a 4×1 vector of serially uncorrelated disturbances with a mean zero and a covariance matrix $\sum_\eta$.

The test statistics are equal to $(T-k)\left[\log|\sum_u| - \log|\sum_\eta|\right]$, where T is the number of observations, and k is the number of coefficients in Eq. (6). The test statistic is asymptotically Chi-squared with degrees of freedom equal to the total number of constraints, which is $(k/2)$ times the number of equations.

We implement the structural break test to verify whether the global financial turmoil in 2008 shows a statistically appropriate break using data from 1999–2016. Table 1 presents results for possible structural breaks related to the 2008 global crisis. According to the test results, this paper set the first subperiod to be from the second quarter, 1999 through the third quarter, 2008, the chi-squared statistics of which have the largest value in the structural stability test.

Data of the fourth quarter, 2008 and the first quarter, 2009 are not used because the global financial turmoil caused a dramatically large market value volatility. The beginning of the second subperiod was set to be 2009Q2. Since the busi-

Table 1
Structural stability test results, 2006Q3–2009Q2.

Possible breaks	2006Q3	2006Q4	2007Q1	2007Q2	2007Q3	2007Q4
Chi-squared statistics	23.67	29.79**	32.76**	33.39**	35.44***	37.25***
Possible breaks	2008Q1	2008Q2	2008Q3	2008Q4	2009Q1	2009Q2
Chi-squared statistics	58.44***	73.39***	78.26***	40.31***	23.06	14.44

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Author's calculations.

[8] In the argument here, constant terms are omitted for simplification.

Table 2
Structural stability test results, 2012Q2–2014Q3.

Possible breaks	2012Q2	2012Q3	2012Q4	2013Q1	2013Q2
Chi-squared statistics	20.43	24.09	17.72	27.46*	52.10***
Possible breaks	2013Q3	2013Q4	2014Q1	2014Q2	2014Q3
Chi-squared statistics	54.51***	58.49***	52.68***	69.70***	85.45***

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Author's calculations.

ness cycle chronology of the Economic Cycle Research Institute indicates that the business cycle peak was in December 2014, this paper implements the structural break test to verify whether the international oil price plunge in 2014 shows a statistically appropriate break using data from the second quarter, 2009 through the third quarter, 2016.[9]

Table 2 presents the results for possible structural breaks related to an oil price plunge in 2014. In accordance with the test results, this paper set the second subperiod to be from the second quarter, 2009 through the third quarter, 2014, the chi-squared statistics of which have the largest value in the structural stability test. The third subperiod was set to be from the first quarter, 2013 through the third quarter, 2016 in order to ensure a longer sample size, considering that the structural stability test results show that the first quarter, 2013 is a possible structural break at the 10 percent level.

4.1. Subperiod 1

Let us test the order of integration of the variables by the Augmented Dickey-Fuller unit root test (Dickey and Fuller, 1979). In the first subperiod *M, L* and *FX* are stationary in their levels because they can reject the null hypothesis of the existence of a unit root (Table 3). On the other hand, *Y* and *O* cannot reject the null hypothesis in their levels, but they are stationary in their first differences. These results suggest that *M, L* and *FX* can be characterized as *I*(0) while *Y* and *O* are integrated of order 1 in the first subperiod. In the estimation of the VAR model, the Schwarz information criterion (SIC) indicates the optimal lag length is one. Since the maximum order of integration of the series is one, a second order of VAR is estimated.

Table 3
Augmented Dickey-Fuller unit root test results for Subperiod 1.

Variables	Constant & trend	
	Log level	1st log difference
M	–3.582 (2)**	–
L	–3.907 (2)**	–
Y	–1.946 (0)	–4.343 (0)***
O	–1.595 (0)	–5.203 (0)***
FX	–3.208 (1)*	–

Note: Figures in parentheses indicate lag length. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Author's calculations.

[9] Due to the insufficient sample size, it was impossible to set structural breaks after the fourth quarter, 2014.

Table 4
Toda-Yamamoto non-causality test results for Model 1 (Subperiod 1).

Independent variables	Dependent variables			
	M	*Y*	*O*	*FX*
M	–	5.014**	1.899	1.147
Y	8.606***	–	0.292	2.046
O	2.190	1.936	–	10.338***
FX	1.632	0.980	0.024	–

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Author's calculations.

Table 5
Toda-Yamamoto non-causality test results for Model 2 (Subperiod 1).

Independent variables	Dependent variables			
	L	*Y*	*O*	*FX*
L	–	1.197	0.827	2.161
Y	2.781*	–	0.090	1.562
O	4.183**	0.467	–	2.666
FX	7.982***	0.513	0.016	–

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Author's calculations.

The Toda-Yamamoto non-causality test results shown in Tables 4 and 5 suggest that there is bidirectional causality between *Y* and *M*, whereas *Y* Granger causes *L*. Causality from *Y* to *M* and *L* implies demand-following responses in the finance-growth nexus in Russia although the popular view from the empirical front on the finance-growth nexus has been in favor of the supply-leading response (Odhiambo, 2008). On the other hand, there is causality from *M* to *Y* while there is no causality from *L* to *Y*. This can be interpreted as reflecting the characteristics of the Russian economy. Specifically, the surge in energy prices led to the ruble appreciation through the increase in export revenues. The CBR repetitively intervened in the foreign exchange market in order to prevent the ruble's sharp appreciation. The insufficient execution of instruments for sterilized intervention caused a considerable increase in base money and money supply. This result is almost consistent with Ono (2012), who claims that money supply leads economic growth while economic growth leads loans in Russia.

Furthermore, the results in Table 4 show that there is causality from *O* to *FX*, which is consistent with the findings of Ono (2014), who claims that the international oil price leads the exchange rate from the beginning of 2002 through the end of 2012. The causality from *O* and *FX* to *L*, shown in Table 5, implies that the rise in oil prices and the changes of the ruble exchange rate, which could be affected by oil prices, fostered the increase in bank loans.

4.2. Subperiod 2

This subsection investigates causality between financial development and economic growth from the second quarter, 2009 through the third quarter, 2014. The results of the Augmented Dickey-Fuller unit root test, shown in Table 6, indicate that all the series except *M* cannot reject the null hypothesis of the existence

of a unit root in their levels, but, except *L*, they are stationary in their first difference, and *L* is stationary in its second difference. Therefore *M* is *I*(0), *Y*, *O* and *FX* are *I*(1) and *L* is *I*(2). In the estimation of the VAR model, the SIC indicates that the optimal lag length is one. As the maximum order of integration of the series is one for Model 1 and two for Model 2, a second order of VAR is estimated for Model 1 and a third order of VAR is estimated for Model 2.

The Toda-Yamamoto non-causality test results for Subperiod 2 in Table 8 suggest that *Y* Granger causes *L* as in Subperiod 1, which indicates that the Russian economic growth could stimulate banks to increase loans.

On the other hand, the results in Table 7 show that there is no causality from *M* to *Y*, which is different from the results in Subsection 1. This could be related to the dramatic decrease in the amount of intervention in foreign exchange markets by the CBR as indicated in Fig. 2 because the decline of intervention buying the US dollar would not lead to an increase in base money and money supply (Fig. 1).

The results in Table 7 also indicate that there is no causality from *Y* to *M* although, as indicated above, there is causality from *Y* to *L*. The relations between

Table 6
Augmented Dickey-Fuller unit root test results for Subperiod 2.

Variables	Constant & trend		
	Log level	1st log difference	2nd log difference
M	–3.533 (1) *	–	–
L	–3.001 (2)	–2.560 (2)	–3.464 (4) *
Y	–0.792 (0)	–5.583 (0) ***	–
O	–3.122 (0)	–5.054 (0) ***	–
FX	–2.059 (0)	–5.635 (1) ***	–

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Author's calculations.

Table 7
Toda-Yamamoto non-causality test results for Model 1 (Subperiod 2).

Independent variables	Dependent variables			
	M	*Y*	*O*	*FX*
M	–	0.661	6.023***	6.855***
Y	0.093	–	1.441	0.440
O	1.049	3.436*	–	0.469
FX	6.721***	1.925	0.002	–

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Author's calculations.

Table 8
Toda-Yamamoto non-causality test results for Model 2 (Subperiod 2).

Independent variables	Dependent variables			
	L	*Y*	*O*	*FX*
L	–	0.041	23.255***	27.467***
Y	6.095**	–	6.974***	1.959
O	0.176	0.056	–	1.957
FX	23.983***	0.311	0.399	–

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Author's calculations.

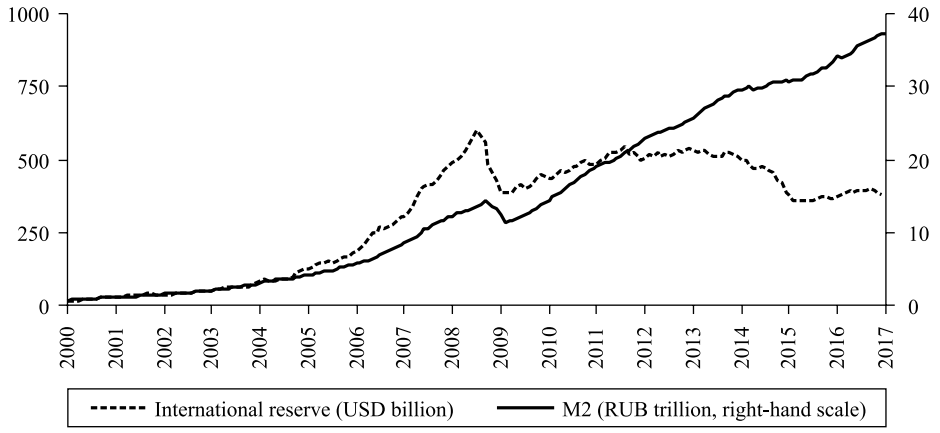

Fig. 1. International reserve and money supply M2.

Source: Website of the CBR.

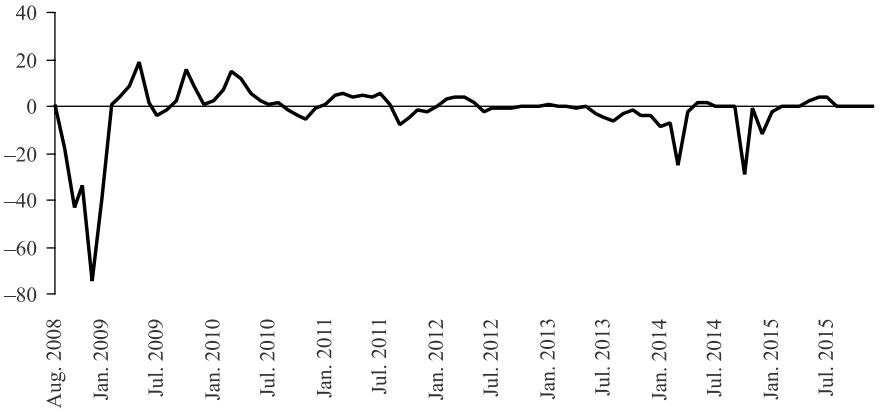

Fig. 2. Foreign exchange interventions by the CBR (USD billion).

Source: Website of the CBR.

bank lending and money supply can be extracted from the monetary survey of the CBR. Because assets equal liabilities in the banking system survey, broad money equals the sum of net foreign assets, domestic claims (including bank lending) and other items. Therefore, an increase in the liabilities of the banking system to the government causes a decrease in broad money. The liabilities of the banking system to the government increased by RUB 2.4 trillion in 2007 and by RUB 2.1 trillion in 2008, which was caused by liquidity absorption through the Stabilization Fund.[10] This contributed to the decrease in money supply. However, the liabilities of the banking system to the government decreased by RUB 2.1 trillion in 2009 and by RUB 1.6 trillion in 2010 mainly because of the decrease in the amount of the Reserve Fund.[11] It contributed to the increase in

[10] The Stabilization Fund was established in January 2004 and was accumulated from the export duties of crude oil and other sources in order to balance the federal budget at a time when the oil price falls below a cut-off price. It was divided into the Reserve Fund and the National Wealth Fund on January 30, 2008.

[11] According to CBR (2010; 2011), the Reserve Fund decreased by RUB 2.2 trillion in 2009 and RUB 1.1 trillion in 2010.

money supply in 2009 and 2010, whereas the bank lending decreased in the same years. These money supply changes through the Russian sovereign wealth fund could partly cause the difference in causality from *Y* to *L* and *M*.

As for other causality relations, *FX* Granger causes *M* and *L*, which implies that exchange rates have a significant influence on Russian money markets. Table 7 shows that *O* Granger causes *Y* while Table 8 indicates that *Y* Granger causes *O*. This suggests that the global economic conditions could affect Russian economic growth, which, in turn, could have an impact on international oil prices. At the same time oil price increases could stimulate Russian economic growth. Table 7 also shows that there is Granger causality from *O* to *FX*, which is consistent with the findings of Ono (2014). Furthermore, *M* and *L* Granger cause *O*. This implies that global and Russian economic growth induces an increase in loan and money supply, and then pushes up oil prices.

4.3. Subperiod 3

This subsection investigates finance-growth nexus from the first quarter, 2013 through the third quarter, 2016. The results of the Augmented Dickey-Fuller unit root test, shown in Table 9, indicate that *M* and *L* cannot reject the null hypothesis of the existence of a unit root even in their second difference. This means that at least a fourth order of VAR must be estimated. However, the sample size is not sufficient to estimate the VAR model. Therefore, causality between financial development and economic growth in Subperiod 3 is not examined.

5. Conclusions

This paper examines the finance-growth nexus in Russia, taking oil prices and foreign exchange rates into account. The analyzed period is from the second quarter of 1999 till the third quarter, 2008 (Subperiod 1) and from the second quarter, 2009 till the third quarter, 2014 (Subperiod 2). Subperiod 3, which is set to be from the first quarter, 2013 through the third quarter, 2016, is not analyzed due to the insufficient sample size. Two sets of 4-variate VAR models are estimated in this paper, that is, *M, Y, O* and *FX* and *L, Y, O* and *FX*.

The Toda-Yamamoto non-causality test results for Subperiod 1 suggest that there is bidirectional causality between *Y* and *M* whereas *Y* Granger causes *L*. Causality from *Y* to *M* and *L* implies demand-following responses in the finance-growth nexus in Russia although the popular view from the empirical front on

Table 9
Augmented Dickey-Fuller unit root test results for Subperiod 3.

Variables	Constant & trend		
	Log level	1st log difference	2nd log difference
M	–1.007 (0)	–2.443 (1)	–2.733 (1)
L	–0.590 (1)	–1.526 (0)	–2.467 (2)
Y	–2.119 (0)	–3.134 (0)	–5.255 (0)***
O	–2.214 (0)	–3.648 (0)*	–
FX	–2.817 (0)	–4.479 (0)**	–

Note: Figures in parentheses indicate lag length. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Author's calculations.

the finance-growth nexus has been in favor of the supply-leading response. On the other hand, there is causality from *M* to *Y* while there is no causality from *L* to *Y*. This could reflect the increase in base money and money supply caused by insufficient sterilized intervention.

The Toda-Yamamoto non-causality test results for Subperiod 2 show that *Y* Granger causes *L*, which indicates that the Russian economic growth could stimulate banks to increase loans. On the other hand, there is no causality from *M* to *Y*, which could be related to the dramatic decrease in the amounts of interventions in foreign exchange markets by the CBR. Furthermore, there is no causality from *Y* to *M* although there is causality from *Y* to *L*. The relations between bank lending and money supply can be extracted from the monetary survey of the CBR. The decrease in the amount of the Reserve Fund contributed to the increase in money supply in 2009 and 2010 whereas bank lending decreased in the same years. These money supply changes through the Russian sovereign wealth fund could partly cause the difference in causality from *Y* to *L* and *M*.

This paper empirically supports the claim that Russian banks do not play the role of leading economic growth. Russia needs to establish a financial system to stimulate sustainable economic growth with less dependency on natural resources.

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References

Adu, G., Marbuah, G., & Mensah, J. T. (2013). Financial development and economic growth in Ghana: Does the measure of financial development matter?. *Review of Development Finance, 3* (4), 192–203.

Anwar, S., & Nguyen, L. P. (2011). Financial development and economic growth in Vietnam. *Journal of Economics and Finance, 35* (3), 348–360.

Arestis, P., Chortareas, G., & Magkonis, G. (2015). The financial development and growth nexus: A meta-analysis. *Journal of Economic Surveys, 29* (3), 549–565.

Cecchetti, S. G., & Karras, G. (1992). Sources of output fluctuations during the interwar period: Further evidence on the causes of the Great Depression. *Review of Economics and Statistics, 76* (1), 80–102.

CBR (2010). *Bank of Russia annual report 2009.* Moscow: Central Bank of the Russian Federation.

CBR (2011). *Bank of Russia annual report 2010.* Moscow: Central Bank of the Russian Federation.

CBR (2012). *Bank of Russia annual report 2011.* Moscow: Central Bank of the Russian Federation.

Christiano, L. J. (1986). Money and the US economy in the 1980s: A break from the past?. *Federal Reserve Bank of Minneapolis Quarterly Review, 10*, 2–13.

Demetriades, P. O., & Hussein, K. A. (1996). Does financial development cause economic growth? Time-series evidence from 16 countries. *Journal of Development Economics, 51* (2), 387–411.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association, 74* (366a), 427–431.

Granville, B., & Mallick, S. (2010). Monetary policy in Russia: Identifying exchange rate shocks. *Economic Modelling, 27* (1), 432–444.

Hassan, M. K., Sanchez, B., & Yu, J. S. (2011). Financial development and economic growth: New evidence from panel data. *Quarterly Review of Economics and Finance, 51* (1), 88–104.

Jedidia, K. B., Boujelbène, T., & Helali, K. (2014). Financial development and economic growth: New evidence from Tunisia. *Journal of Policy Modeling, 36* (5), 883–898.

Kar, M., Nazlıoğlu, Ş., & Ağır, H. (2011). Financial development and economic growth nexus in the MENA countries: Bootstrap panel granger causality analysis. *Economic Modelling, 28* (1), 685–693.

King, R. G., & Levine, R. (1993). Finance and growth: Schumpeter might be right. *Quarterly Journal of Economics, 108* (3), 717–737.

Lian, Q., & Teng, J. Z. (2006). Financial development and economic growth: Evidence from China. *China Economic Review, 17*, 395–411

Miyao, R. (2000). The role of monetary policy in Japan: A break in the 1990s?. *Journal of the Japanese and International Economies, 14* (4), 366–384.

Odhiambo, N. M. (2005). Financial development and economic growth in Tanzania: A dynamic causality tests. *African Finance Journal, 7* (1), 1—17.

Odhiambo, N. M. (2008). Financial depth, savings and economic growth in Kenya: A dynamic causal linkage. *Economic Modelling, 25* (4), 704–713.

Ollus, S. & Barisitz, S. (2007). The Russian non-fuel sector: Signs of Dutch disease?: Evidence from EU-25 import competition. *BOFIT Online, 2/2007*. Helsinki: Bank of Finland.

Oomes, N. & Kalcheva, K. (2007). Diagnosing Dutch disease: Does Russia have the symptoms?. *IMF Working Paper*, No. 07/102. Washington: IMF.

OECD (2000). *OECD economic surveys: Russian Federation*. Paris: OECD Publishing.

OECD (2011). *OECD economic surveys: Russian Federation.* Paris: OECD Publishing.

Ono, S. (2012). Financial development and economic growth: Evidence from Russia. *Europe-Asia Studies, 64* (2), 247–256.

Ono, S. (2014). Causality relationship among oil price, stock index and exchange rate: Evidence from Russia. *Acta Slavica Iaponica, 35*, 87–107.

Robinson, J. (1952). The generalisation of the general theory. In *The rate of interest and other essays*. London: McMillian.

Schumpeter, J. A. (1934 [1912]). *The theory of economic development.* Cambridge, MA: Harvard University Press.

Tabata, S. (2009). The impact of global financial crisis on the mechanism of economic growth in Russia. *Eurasian Geography and Economics, 50* (6), 682–698.

Toda, H. Y. & Yamamoto, T. (1995). Statistical inference in vector autoregressions with possible integrated processes. *Journal of Econometrics, 66* (1–2), 225–250.

World Bank (2005). *Russian economic report* (No. 11). Washington, DC: World Bank.