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Endogeneity of Money and Non-Conventional Single Monetary Policy in the Context of Ongoing Crisis in three Central European Countries

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Abstract: In this study, we evaluate the relationships between credit creation, bank deposits, and monetary aggregates with a focus on the debate about money endogeneity. For data of Slovakia, Czech Republic, and Germany, we apply the Granger causality test in bivariate VAR models using monthly time series from the period between two large crises (from 02/2009 to 02/2020) to estimate causal relationships between the variables. Our results confirm endogenous money creation with a causal link going from loan growth rate to deposit growth rate in all three countries. In the context of the quantitative easing programme implemented by the national central banks as a response to bland economic recovery we also examine its pass-through into lending stimulation. Our results suggest that the efficiency of implemented quantitative easing might be limited.

Keywords: Granger causality, money creation, quantitative easing, loans, deposits

1 Introduction, theoretical background

The debate on endogeneity vs. exogeneity of money is in its core very closely tied to the theory of money creation and proper theory of bank lending. Examining the relationship between bank lending and the money-making process therefore plays an important role in understanding the impact of the banking sector's activities on economic activity.

Following the outbreak of the financial crisis in 2007-8, the role of banks in the economy has been gaining much more interest once again. According to Werner (2014/16), this was mainly due to the fact that the most widely used macroeconomic models and financing theories until then had largely neglected the sector and thus did not provide an adequate description of the key features of the economy and financial system. However, for the proper implementation of economic policy, it is



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undoubtedly essential to know the basic features of the functioning of these institutions and to further clarify the relationship between the functioning of commercial banks in relation to the central bank.

1.2 Theoretical background

In general, we can find various divisions of banking system. From one of the more recent influential papers, Werner defines three dominant theories of banking prevalent in the last century:

1.2.1 Financial intermediation theory

According to this theory, banks are only intermediaries of funds, which in turn does not distinguish them from other, non-banking, financial institutions. In this system, the bank creates liquidity by borrowing funds from clients (depositors) for a short time and providing loans for a long time. This means that the bank only collects the deposits of clients and then lends them further.

The fact that in this model the distinction between banks and other financial institutions virtually disappears has probably become the reason why even economists did not see a reason for the special position of banks in their macroeconomic models. (Werner 2015, Sgambati 2016)

1.2.2 Fractional reserve theory of banking

Unlike Werner, several authors do not draw a clear line between the model of banks as financial intermediaries and the theory of fractional reserves. According to them, the two systems are interconnected in a way where one is only a subset of the other. (Werner 2015, Angeles 2019, Sgambati 2016)

Ultimately, in characterizing this theory, Werner himself admits that banks also act as intermediaries of loanable funds. However, he goes on to say that the difference from the previous model is that in the fractional reserve theory, the banking sector as a whole generates money through the process of a money multiplier. (Werner 2015)

However, the main shortcoming of this process is the assumption that the lending process in the economy would have to be carried out gradually by banks. The second bank in the process cannot issue a loan before the first, as it needs the funds provided by the first. This, of course, applies to all other banks entering the process. In reality, however, all banks carry out the lending process simultaneously and therefore do not have to wait to receive these funds before granting another loan. (Angeles 2019)



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1.2.3 Credit creation theory of banking

Similarly, as in the previous fractional reserve theory, the credit creation theory admits, that the banking system creates new money. However in this aspect it goes further, arguing that by issuing new loan, individual bank creates money out of thin air. (Werner 2014)

Similarly, Jakab and Kumhof (2015) point to two basic models of banking institutions. In their work, the authors point to two models of perception of banking institutions. The first, currently still dominant view perceives banks as intermediaries of funds (ILF model) - i.e. as institutions dealing with the transfer of existing money from savers to borrowers. An alternative view perceives banks as institutions that finance borrowers through the creation of money (FMC model).

In this work, the authors point to the higher relevance of the FMC model, i.e. the model according to which banks directly generate new money through their lending activity. After taking into account shocks in their model, the FMC model is able to predict changes in lending that are larger, occur faster and have a more significant impact on the economy than the otherwise identical ILF model.

At this point, it is worth adding that the theory of money created through credit is not new in the economic world, as its principles have been discussed since the turn of the 19th and 20th centuries (Werner 2014, Jakab, Kumhof 2015; Gross, Siebenbrunner, 2017).

Much more comprehensive review of development in economic literature throughout 20th century can be found in the papers mentioned above. From there we can see that credit creation theory was actually more prevalent in the first half of 20th century. This can be observed for example in the work of Schumpeter (1912) where he mentions: "It is much more realistic to say that the banks 'create credit', that is, that they create deposits in their act of lending, than to say that they lend the deposits that have been entrusted to them [...] The theory of 'credit creation' not only recognizes patent facts without obscuring them by artificial constructions; it also brings out the peculiar mechanism of saving and investment that is characteristic of fully-fledged capitalist society and the true role of banks in capitalist evolution." (Gross, Siebenbrunner, 2017)

Keynes's view on this topic from his General Theory of Employment Interest and Money is generally interpreted as leaning towards exogenous interpretation of money creation, where the money supply is fully controlled by the central bank. Post-Keynesians argue however, that this view can be distorted and in fact is only the result of a simplified view of the issue, in given context. Keynes himself admits at the beginning of this book that technical details of monetary sector "fall into background" in the General Theory. Post-Keynesians however mainly provide evidence of the misrepresentation of his views in his previous book A Treatise on



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Money, in which he deals with this issue in more detail and his view in fact resembles more the one of endogenous money creation, when he says “[...] it is apparent that the rate at which a bank passively creates deposits partly depends on the rate at which it is actively creating them” and “[bank...] may itself purchase assets, i.e. add to its investments, and pay for them, in the first instance at least, by establishing a claim against itself. Or the bank may create a claim against itself in favour of a borrower, in return for his promise of subsequent reimbursement; i.e. it may make loans or advances.” (Keynes 1930; Carvalho 2013; Gross, Siebenbruner 2017)

In his work, Schumpeter further mentions that the effort to translate this thinking into the views of economists and politicians was more or less successfully completed by 1930. Unfortunately, the credit creation theory came under pressure after work of Gurley and Shaw (1955, 1956) and then Tobin (1963 in particular). (Werner 2016; Jakab, Kumhof 2015). Gurley and Shaw have smeared an important distinction between banks, as institutions that can generate own funds through the lending process, and non-bank financial intermediaries, which cannot do so. In other words, they saw banks only as another form of intermediary and treated bank liabilities simply as another form of debt. Tobin played a key role in consolidating financial intermediary view of Gurley and Shaw as a new paradigm, explicitly arguing that banks are not money makers in the sense that the credit creation model claims. (Jakab, Kumhof 2015)

Their work was rightly criticized at the time, but this debate did not continue much after the 1960s, when the monetary and macroeconomic function of banks almost completely disappeared from the main macroeconomic theories. As a result, many important lessons from the past that have fallen into the background over time need to be revived today. (Jakab, Kumhof 2015).

On one hand we can see this happening also in the publications and statements of current representatives of major central banks e.g. BoE (McLeay 2014), German Bundesbank (Monthly Report 2017), Swiss National Bank (Jordan 2018) who describe the fact that banks create their own resources through the lending process. On the other hand, as Werner notes, even to this day we can still see that the representatives of the central banks themselves are not united in their views on the functioning and validity of any theory. For example, in the case of the Bank of England, the statements of central bank staff are captured, which simultaneously support each of the three theories (Werner 2014)

1.2 Quantitative easing and the bank lending channel

Since the onset of financial crisis in the euro area and following bankruptcy of Lehman Brothers in September 2008, the ECB has been inflating its balance sheet trying to keep the banking sector functioning by providing liquidity to the bank



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system. Until mid-2012 the balance sheet of the ECB more than doubled. Subsequently as the situation started improving, the balance sheet also started to shrink. However following the period of low inflation, non-standard policies were implemented since 2013 first by forward guidance about keeping the interest rates at low levels for extended period of time and then since summer 2014 several asset purchase programmes were launched, including targeted longer-term refinancing operations (TLTRO) which was aimed at easing credit conditions of banks.

Then, since the beginning of 2015, the ECB launched its so-called quantitative easing (QE) programmes mainly consisting of purchases of government bonds of euro area member countries. The programme is implemented decentralized and when a national central bank purchases government securities, either from a commercial bank or a non-banking institution, it leaves that institution two options regarding the use of the acquired reserves. First, the institution may use these resources to purchase other assets, e.g. corporate bonds, thereby redistributing their portfolio (the so-called portfolio channel). Or, secondly, as excess reserves are currently remunerated at a negative interest rate, a commercial bank can use these reserves to increase lending activity (the so-called bank lending channel). In a small open country with a less efficient capital market - such as Slovakia - the credit channel might become the primary transmission channel for quantitative easing.

2 Literature review

Chai, Hahn (2018) test the causal relationship between bank loans and monetary base with regard to change in monetary policy in seven Asia-Pacific countries. The causation in their results mostly runs from bank loans to the monetary base during inflation targeting regime. Their results also do not support the bank lending channel and they suggest that the central bank can hardly increase or decrease the supply of bank lending by controlling the monetary base unless there is a shortage of market liquidity or when the financial markets are underdeveloped. Finally, the authors conclude that “policy makers applying unconventional monetary policy should pay more attention to the asset side of the central bank’s balance sheet rather than to the liability side.”

Albinowski (2020) examines panel data on 20 countries to analyze the links between savings (defined as time deposits and savings accounts) and credit extended by banks. His results suggest that credit growth is not related to prior changes in savings, at least not in the short run.

Regret (2018) brings some evidence on the debate of exogeneity and endogeneity for the case of Zimbabwe. For the period from January 2009 to May 2017, he provides evidence of a long run bi-directional causality between bank credit and



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money supply, bank deposits and monetary base using Johansen Cointegration test and VECM causality tests. His results therefore confirm endogenous nature of money supply.

Koksel (2016) test the nature of money supply for the Turkish economy from 2006 to 2015. This period also marked transition of monetary regime towards inflation targeting. Using Johansen cointegration analysis on the data of bank credits to the private sector and money supply, he finds bidirectional long run relationship between these variables.

Nayan et al. (2013) examined large panel of 177 countries in period from 1970 to 2011 using System GMM. On yearly data they find that real GDP per capita and bank lending are significant determinants of money supply, therefore also supporting the narrative of money supply endogeneity.

For the period from 1990 to 2013 Butt et al. (2014) examine whether quantitative easing implemented by the Bank of England provided a boost to bank lending via the bank lending channel in the United Kingdom. In their model framework with real data and instrumental variables, they find no evidence of Bank lending channel associated with QE. They suggest that the reason behind this finding might be the presence of deposits that are likely to quickly leave the bank - so called flighty deposits, that have emerged in greater extent after the application of QE policy.

Finally, Nazir et al. (2018) study the effects of financial innovation on economic growth in China, India, and Pakistan. Financial innovation is estimated using two proxy variables - domestic credit to private sector and broad to narrow money ratio. Their findings point to the existence of both short- and long-term positive influence of financial innovations on economic growth.

3 Data and Methodology

3.1 Data

The analysis was carried out on the sample of three EU countries – the Czech Republic, where monetary policy falls under jurisdiction of its own independent central bank; Slovakia and Germany where the central banks work in cooperation with the European Central Bank (ECB). Monthly time series span the period from 02/2009 until 02/2020 which covers 133 observation for each country. Data was obtained from databases of national central banks (NCB) (monetary aggregates), the ECB (loans, deposits and central bank balance sheet) and the OECD (industrial production, retail sales and GDP). Data for monthly GDP was obtained using Chow-



Lin interpolation from industrial production and retail sales as reference series, as in Gambacorta, Hofmann, Peersman (2013). Monetary aggregates are represented by M1 and M3 aggregates¹ and central bank balance sheet is the sum of asset side of the balance sheet. Both loans and deposits are represented by the total sum provided or accepted for non-MFIs (Monetary Financial Institutions) and excluding government sector. All the data was transformed to logarithmic form.

3.2 Methodology

To test for endogeneity of money supply we perform Granger causality test in bivariate VAR model which requires time series to be stationary. Therefore, we implement the augmented Dickey-Fuller test which tests null hypothesis that time series are nonstationary against alternative, which states the time series are stationary. Lag selection is based on Bayes information criteria (BIC) and we include intercept in the test regression. We can observe that the level data for all variables are nonstationary, therefore we compute first differences and run the test again. After differencing the data, we can observe that all time series are integrated of order 1.

Next, we construct several bivariate VAR models and calculate Granger causality. Lag length in VAR model is determined using Akaike information criterion (AIC) and Hann-Quinn information criterion (HQ) and as a deterministic regressor we include constant or both constant and trend, depending on their significance in the model.

$$X_t = \sum_{j=1}^p a_j X_{t-j} + \sum_{j=1}^p b_j Y_{t-j} + \varepsilon_t$$

Where X_t, Y_t are two stationary time series, ε_t is white noise and p is the number of lags included in the model.

For Granger causality we set following hypotheses:

H_0 : Y_t does not granger-cause X_t ;

H_1 : Y_t granger-causes X_t

If $b_j \neq 0$ ($i=1, 2, \dots, p$), or in other words, inclusion of Y_t in the model gives us greater precision in predicting X_t then we can say that Y_t affects X_t and we reject the null hypothesis (Granger 1969).

¹ Only M3 for Germany



4 Results

In the tables below we present results of Granger causality tests for the three countries. Here we include all the results which were statistically or economically significant.

In the case of Slovakia, we can state that the growth rate of loans affects both monetary aggregates with one-month lag. We can also see that growth of monetary base helps to predict GDP growth rate with three-month lead. When we look at the financial sector, we can see that the Granger causality between loans and deposits goes only in one direction, from loans to deposits, with one-month lag.

Table 1: p-values for Slovakia

	p-value	lag
Loan growth -> M3 growth	0,008	1
M3 growth -> Loan growth	0,095	1
Loan growth -> M1 growth	< 0,001	1
M1 growth -> Loan growth	0,13	1
Loan growth -> Deposit growth	0,006	1
Deposit growth -> Loan growth	0,899	1
GDP growth -> M3 growth	0,811	3
M3 growth -> GDP growth	0,04	3

Source: own calculations

In the case of Germany, we can observe the same relationship between growth rate of loans and growth rate of deposits as for Slovakia, when the direction of Granger causality runs from loans to deposits. Similarly, M3 aggregate can predict changes in GDP with four-month lead. On the other hand, there is no visible link between growth rate of loans and monetary base, even when we consider longer lag length.



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Table 2: *p-values for Germany*

	p-value	lag
Loan growth -> M3 growth	0,0476	3
M3 growth -> Loan growth	0,0127	3
Loan growth -> Deposit growth	0,0187	1
Deposit growth -> Loan growth	0,7455	1
GDP growth -> M3 growth	0,2383	4
M3 growth -> GDP growth	0,0182	4

Source: own calculations

Results for Czech Republic again confirm endogeneity of money hypothesis since we can also see that loans growth rate Granger causes growth rate in deposits. Similarly, as in Slovakia, we can observe that loans can help to predict growth rate of both monetary aggregates one month in advance. On the other hand, there is no clear relationship between monetary development and GDP growth rate

Table 3: *p-values for Czech Republic*

	p-value	lag
Loan growth -> M3 growth	0,0013	1
M3 growth -> Loan growth	0,8538	1
Loan growth -> M1 growth	0,001	1
M1 growth -> Loan growth	0,3668	1
Loan growth -> Deposit growth	0,0002	1
Deposit growth -> Loan growth	0,0763	1
GDP growth -> M3 growth	0,4349	1
M3 growth -> GDP growth	0,9313	1

Source: own calculations

One of the proclaimed effects of the quantitative easing programmes of the ECB is also the stimulation of lending which should work either by more direct stimulation through TLTRO programme or via the bank lending channel of monetary policy.



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However, in our results we find no evidence for effectiveness of this policy, even when we considered longer lag length.

Table 4: *p-values for central bank balance sheets*

	p-value	Lags
NBS bal growth -> Loan growth	0,14	1
Bundesbank bal growth -> Loan growth	0,433	1
CNB bal growth-> Loan growth	0,343	1

Source: own calculations

5 Conclusion

Although the fact, that at the present basically all central banks in developed countries target inflation by controlling interest rates and not money supply is widely accepted among central banks and academics, the implications of this are arguably still not entirely mirrored into academic thinking. Therefore, in this paper we try to contribute to the debate of money endogeneity by looking at the causal links between development in banking sector and broad economy.

Namely we employ Granger causality tests for the data of bank loans, bank deposits, M1 and M3 monetary aggregates, central bank balance sheet and GDP for the period between two large crises, from February 2009 to February 2020. Our results show that growth rate of loans Granger causes growth rate of deposits in all three economies and there is no causality running in the opposite direction (i.e. from deposits to loans). We have also found evidence for causality from loans to both monetary aggregates, for Slovakia and the Czech Republic. And while the Czech Republic still has its own independent national central bank, Slovak National Bank (and German Bundesbank) falls under the supervision of the ECB so potential central bank independence issue does not seem to be the likely explanation for this difference. We also confirm that developments in monetary sector play role in predicting changes in GDP, at least in Slovakia and Germany, where money (M3) aggregate Granger causes GDP with three and four moth lag respectively. Based on these results we can state that money supply should be considered endogenous in all three economies.

There is also no clear causal link between the assets of central bank and demand for loans, which would render one aspect of quantitative easing policy (the so-called bank lending channel) as ineffective. On the other hand, we are aware that this could be a result of limitations of relatively simplistic Granger causality model and



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perhaps a more sophisticated method in our further research would shed more light into this problem.

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