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Monetary Policy Implementation in the Eurozone – the Concept of Endogenous Money

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Abstract

Svatopluk Kapounek: **Monetary Policy Implementation in the Eurozone – the Concept of Endogenous Money**.

The author focuses on the current problems of the common monetary policy implementation in the Eurozone in context of output stabilization function. The author focuses on the money demand function stability and its estimation. The stable money demand function ensures that the money supply would have predictable impact on the macroeconomic variables such as inflation and real economic growth. The instability is described by Poskeynesians´ assumptions of money endogeneity. Although central banks may have certain control over the money supply, they cannot fix the stock of money in a country. According to the Postkeynesians´ assumptions, the enterprises do not need ex ante stock of savings in order to carry out investment decisions. The causality is directed from economic activity to money demand. Interaction between the money demand and supply is arranged by multiplier effect of deposits.

Keywords

monetary transmission mechanism, money endogeneity, European integration process, Post-Keynesian economics

JEL Classification: E5

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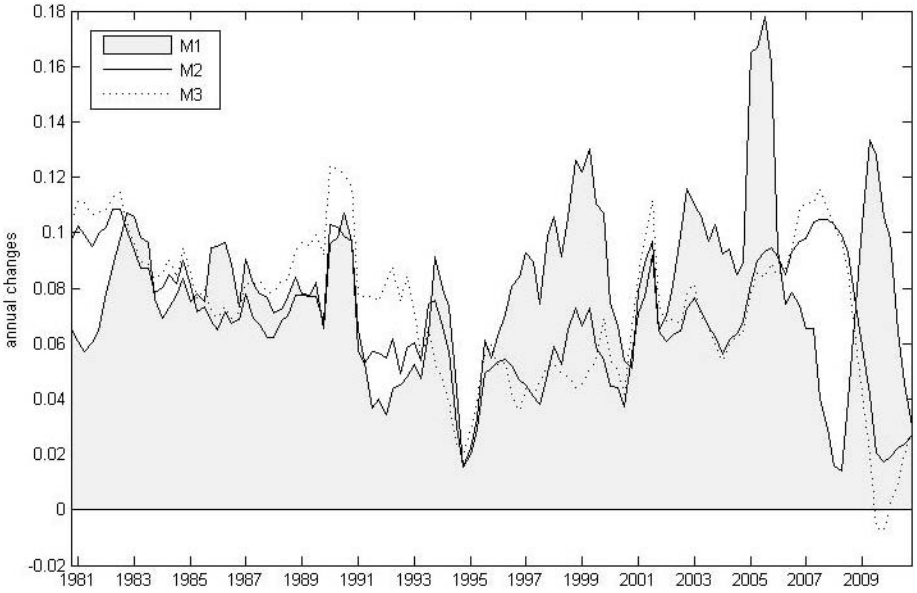
1. Introduction

The primary target of most central banks in developed economies is to maintain price stability, subsequently they support of a sustainable economic growth, full employment and effective utilization of resources in general. The main-stream economic discussions about the monetary policy implementation and its efficiency focus on the central banks' instruments and operative/short-term targets determination (interbank interest rate in most cases) or/and relation between intermediate and final targets in the sense of transmission mechanism. Many academics and researchers around the world are trying to identify monetary policy rules which are robust as a guideline for the conduct of monetary policy. Let us an example the work of Taylor and others, which inspired his interest rate rule. In this field was published variety of econometric models which differ in size, degree of openness or forward looking assumption. Even the most complex model is not able to describe exactly global economic system, just because it is based on past observations. However, the monetary policy efficiency is based on the ability to manipulate significant market distortions which are often caused by unexpected shocks or structural changes in the market.

The period of nineties of the 20th century until the mid-2007 is characterized by stable environment of low inflation and sustainable economic growth in most European countries. How and if any, monetary policy caused the stable development of micro- and macroeconomic environment is discussable. The issue of monetary policy efficiency was actually opened after the financial crisis in 2007. In the years 2007 - 2010, the investment and economic activity significantly decreased across the Eurozone. Broader money aggregates decline together with investment activity. The growth of the money aggregate M3 declined markedly throughout -0.4% in February 2010 (Fig. 1). This development contrasts sharply with the growth of money aggregate M1, that between 2009 and 2010 exceeds the limit of ten percents (up to 12.8% in September 2009).

Since the intensification of the financial crisis in September 2008 and throughout 2009, the European Central Bank (ECB) continued to reduce official interest rates to 1.0 per cent, which corresponds to the lowest level observed among euro area countries in recent history. Despite strong monetary expansion, however, there has been no increase in the intermediate and broad money. A definition of money differs with regard to the degree of liquidity of the Eurozone residents' assets. M1 is the sum of banknotes and coins, as well as balances which can immediately be converted into currency or used for cashless payments (overnight deposits), M2 is the sum of M1, deposits with an agreed maturity of up to two years and deposits redeemable at notice of up to three months and M3 represents the sum of M2, repurchase agreements, money market fund shares/units and debt securities up to two years.

Figure 1: Monetary aggregates in the Eurozone



Source: Eurostat

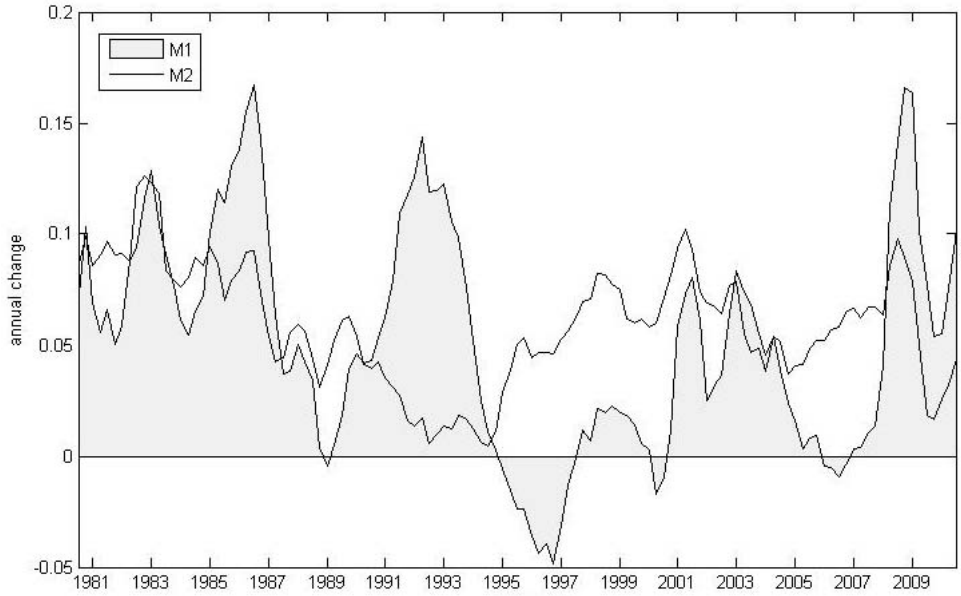
Assume that the monetary aggregates reflect the money demand of individuals and enterprises as well. The development of the monetary aggregates and trends in money-holding are obvious, the economic agents prefer short-term assets against their long-term forms during the financial crisis. Important role in this behaviour play aversion to risk and anticipation of future income. From a Keynesian point of view the transaction motive dominates the speculative. The economists call this situation as a liquidity trap. Demand for money becomes elastic, increases in the money stock will fail to further lower interest rates and, therefore, fail to stimulate investments and economic activity. However, Keynesian economists assumed money exogeneity and endogenous nature of interest rates. The money exogeneity assumption seems to be wrong because the size of euro area banking system and the possibility of deposits multiplication. Endogenous nature of interest rate in the Eurozone is controversial topic. On the one hand, the central bank determines interest rates through its instruments, on the other hand, it responds to the macroeconomic indicators prediction. Even with a high degree of ECB independence is significant its responsibility to achieve its targets.

However, the monetary aggregates do not represent only the money demand but also the supply which is mainly determined by credit multipliers which is directly linked to lending money creation in banking system. This process is limited by economic depression or inflation anticipation, investment decrease, cash transactions or illegal enterprises and share of required minimum reserves. Generally speaking, the creation of money in banking system is determined by amount of cash balances deposited in commercial banks and demand for loans by economic agents (individuals and enterprises).

Decreases in investment activity and short-term asset holding were significant during the economic crisis during the years 2008 and 2009 or during the Asian financial crisis in 1997. Since 2001, euro appreciated from the reason of political instability and terrorist incidents in the USA. Euro devaluation was not made for political reasons and inflation pressures which influenced interest rates of ECB. (Fig. 1)

The imbalances between the monetary aggregates are significant not only in the Eurozone. The monetary aggregate M2 significantly exceeds narrow money in the USA (2008-2009) as well. Beginning of the nineties was marked by Japan crisis, when the stock index Nikkei-225 lost in one year over 40%. Even today, twenty years after the outbreak of the crisis, the Japanese economy recovered and Japan's financial system continues to burden the bad loans, estimated at 550 billion USD. The investment and economic activity was also affected by war in the Persian Gulf. Significant gap between the monetary aggregates is apparent after the year 1986, after Monday 19 October, when during one day Dow Jones Industrial Average lost nearly 23 percent. Although the slump lasted only two months, it exceeds 30 percent. The markets were at their highs once again after two years. (Fig. 2)

Figure 2: Monetary aggregates in the USA



Source: Federal Reserve System

All the above events were not accompanied only by changes in preferences of economic agents, but also by decreases in investment activity and thus money creation in banking system. This paper deals with monetary policy efficiency in the Eurozone. The author focuses on the money market instability as the result of the investment and economic activity declines.

The first theoretical part of the paper summarizes the main stream economic arguments which help to understand imbalances at the money market. The second, empirical part of the paper, focuses on the (1) money demand stability and (2) money exogeneity as the basic conditions of efficient monetary policy implementation in the eurozone. The conclusions offer several reccommendation to monetary authorities which are supported by empirical analysis results and theoretical arguments.

2. Theoretical background

Keynes distinguishes speculative and motive for money holding which is often linked to uncertainty. However, the uncertainty is just used to mean absence of certainty. The Keynesians' contribution to explain the uncertainty lies in the changing importance of individual motives for holding money of the total demand for money. As will be shown in the empirical analysis, the Keynesian money demand function is not stable over time. However, Keynes accepted equilibrium as an organizing concept and treated the macro economy in terms of marginal efficiency of capital (Johnson et al., 2004, p.224).

The Post-Keynesians on the other hand say that the developed capitalist market economies are inherently unstable. They are convinced that money creation is given by its own market economy and not the result of central bank activity. Post-Keynesian economics provides appropriate theoretical background for the gap in monetary aggregates. The reasons of money endogeneity are explained by Moore (1978, 1879, 1981), Kaldor (1981), Weintraub (1982) or Arestis (1988). Despite of many discussion between the Horizontalists and the Structuralists about the limitations and money properties, assume that money are not invariant over space and time.

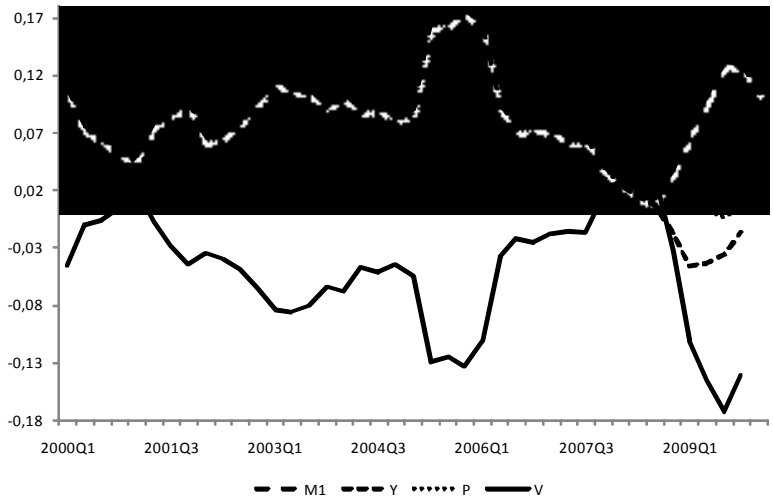
Barker (2010, pp. 215) defines invariance of money over space "that at any given moment large numbers of almost simultaneous, identical transactions can take place over a monetary area." However, the money are used to pay for goods and services at different location, markets and conditions which changes over time. The Single Market of European Union guarantee the free movements of goods, capital, services and people, but these four freedoms do not guarantee full competition and identical transaction over the Eurozone. The differences increase during the periods of economic depressions.

However, from the empirical point of view, we can assume that supply and demand for money is still balanced. There are many theoretical arguments that explain the adjustment mechanism of money demand and supply interactions which primarily describe monetary policy transmission mechanism. Basic transmission mechanism was defined by Alfred Marshall. If the money demand drops below the level of money supply, real cash balance and balance on current accounts will be higher than requested. The effort for reduction of redundant money will increase expenditures on goods and

services. Higher expenditures will increase prices which will result in increased demand for money. The so called indirect transmission mechanism based on interest rate changes was defined by David Ricardo. In the case of higher supply of money than the demand, the interest rate decreases. The decrease increases demand for investments, then increase in prices of investment goods and costs of production of consumer's goods follows. The increase of costs of production of consumer's goods stimulates the increase of their price. In the case of the price increase, the demand for money rises until the balance between demand and supply of money is reached.

Generally, from the Post-Keynesian point of view, the endogenous money approach supposes that commercial banks and the central bank are both "passive" players in the money creation process. The central bank can determine money supply indirectly through interest rates which affect economic and investment activity and money demand, to create money supply. Supposing that the causality leads not from the amount of money in the economy to investment and economic activity but the other way round, this leads to balancing demand and supply of money on the money market through multiplication effect of creation noncash money directly connected with providing loans. However, banks do not meet all the demands for loans. The horizontalism is limited by credibility of borrowers and other restrictions on the lending channel of banks that relate to riskiness of their investment environment. Moore (1996) assumes that banks do refuse credit to many borrowers, and central banks may not fully accommodate. Rochon (2006) concludes that "While credit-led and demand-determined, economic activity is limited by the willingness of banks to supply credit. And while microuncertainty can affect an individual firm´s ability to raise proceeds, it is perhaps the macrouncertainty that banks fear most." A very important indicator of instability and uncertainty are changes in velocity of money. If the changes in economic and investment activity reflect in demand for money to which the money supply adapts using creation of noncash money, the changing velocity of money is a mechanism balancing money market. Kapounek (2010).

Figure 3: Variables of Quantity Equation of Money ariables of Quantity Equation of Money



Source: Eurostat

The significant decrease of money velocity in the Eurozone after 2008 is significant at the Fig. 3 (monetary aggregate M1). Money velocity changes, which are developed in the quantity theory, play the crucial role in the adjustment mechanism of money demand and supply balancing. Assume that velocity can be divided into transitory and persistent component, where the inverse of the transitory component is possible to be interpreted as monetary overhang or excess liquidity. Changes in investment or economic activity correspond to changes in velocity of money. Shocks that cause a deviation from the potential output will most likely be attributed to the cyclical components of money velocity. The return of money velocity to its equilibrium is accompanied by the return of the output to its potential. El-Shagi and Giesen (2010) argue that this might incorrectly be interpreted as positive growth effect of excess of liquidity, even though there is no causality between liquidity and investment or economic activity.

However, there are significant differences between the monetary aggregates which correspond to motives for holding money. The preference of economic agents changed during the economic crisis. With increasing uncertainty the economic agents prefer liquid money funds on the demand-side economy. While the narrow money grew in the Eurozone, investment and economic activity declined. The money supply accommodated its demand through money velocity changes (Fig. 3) and credit money creation process.

3. Material and methods

The economic crisis in the Eurozone during the last years points out the instability of money market. The monetary policy efficiency consists precisely in reduction of the uncertainty and instability which is caused by credit money creation process. Money demand stability is a necessary condition to establish direct link between the relevant monetary aggregate and nominal income. Stable money demand function enhances the ability of monetary authorities to reach predetermined monetary growth targets. Stability of this relationship is basic condition of ECB's single monetary policy implementation from the monetary point of view.

The empirical definition of stability is different from economic interpretation. Thomas (1993) defines stability as the constant relationship between the money demand and only a few variables. Stability was tested for regression parameters in time and low variance of residuals. Common econometric tool is CUSUM test (cumulative sum of the recursive residuals, (Brown, Durbin and Evans (1975)) and Hansen's test (parameter instability in linear models, Hansen (1992)). According to the theoretical background, the author applies the stability test with the keynesian's money demand function assumptions:

$$\frac{M^d}{P} = f(\underset{+}{Y}, \underset{-}{IR}) \qquad (1)$$

where M^d represents nominal stock of the money (M1, M2 and M3), P is aggregate price level (HICP), Y real income (log GDP) and IR represents short-term interest rate (money market short term interest rate).

Concurrently, the Eurozone represents huge monetary union where upper limit of credit money creation disappears. Although the ECB may have certain control over the money supply, it cannot fix the stock of money in the Eurozone. The money supply is not an exogenously set policy variable but is the result of the portfolio decisions of the bank and non-bank private sector. *"Thus, even if a central bank can directly set the value of its own liabilities, the money supply is endogenously determined as a residual of the economic process."* (Fontana and Palacio-Vera, 2003) If money is a residual of economic processes, the rate of change in monetary aggregates is, in fact, a function of the aggregate demand and economy fluctuations. The implied direction of causality would then be from 'changes in nominal income' to 'changes in the stock of the money', which in turn has an impact on the short term interest rates of the interbank market.

Consequently, with the endogenous money assumption, the ECB's monetary policy performance is limited. The determination of money supply is indirect and interest rate transmission mechanism

channel is applicable. The interest rates influence the investment and economic activities which determine money demand. Subsequently, the stock of money (supply) is determined by its demand.

The empirical analysis of the money endogeneity is tested in Granger sense (Granger, 1969 and Sims, 1972). The author identifies direction of the causality between the variables in VAR model, where Akaik, Schwartz and Hannah-Quinn criterion for the lag identification are applied. The model is defined as follows:

$$\begin{aligned} Y_t &= \alpha_{10} + \sum_{j=1}^{k} \alpha_{1j} X_{t-j} + \sum_{j=1}^{k} \beta_{1j} Y_{t-j} + \varepsilon_{1t}, \\ X_t &= \alpha_{20} + \sum_{j=1}^{k} \alpha_{2j} X_{t-j} + \sum_{j=1}^{k} \beta_{2j} Y_{t-j} + \varepsilon_{2t}. \end{aligned}, \qquad (2)$$

where k represents lag order, X_t and Y_t are variables of the VAR model. The types of causality presents Tab 1.

Table 1: Causality type and direction

Causality type	$\{\alpha_{11}, \alpha_{12}, ..., \alpha_{1k}\}$	$\{\beta_{21}, \beta_{22}, ..., \beta_{2k}\}$
Unilateral, $X \rightarrow Y$	$\neq 0$	= 0
Unilateral, $Y \rightarrow X$	= 0	$\neq 0$
Bilateral, $X \leftrightarrow Y$	$\neq 0$	$\neq 0$

To test the causality is applied statistic

$$FW = \frac{(RSS_r - RSS_u)/k}{RSS_u/(n-2k-1)} \sim F(k, n-2k-1), \qquad (3)$$

where RSS_u represents cumulative sum of residuals in unrestricted regression, RSS_r cumulative sum of residuals in restricted regression. (Seddighi etc., 2000) The results of empirical analysis are presented in Tab. 3, Tab. 4 and Tab. 5. Lag order 3 quarters is consistent with the lags of transmission mechanism in the Eurozone (Jílek, 2004 or Poměnková and Kapounek, 2009). The causality of variables itself is possible to interpret as the process memory. The aggregate price level, economic activity and interest rates are significantly affected by its past values.

The empirical analysis uses seasonally adjusted data set of Eurostat in the period 1999/Q1 – 2010/Q2. The stationarity of data set is generally required, but its meeting is not always necessary. As Enders (2003) wrote, VAR models are used for identification and revealing relations between variables. Non-stationary time series contain a variety of information which may be, with the aim of stationarity, eliminated in transformation process. From the stated reason, the author uses absolute

values of money stock, harmonised index of consumer prices, short-term interbanking market interest rates and natural log of GDP.

4. Results

The estimated models presented in Tab. rI identify causality between interest rate, economic activity and money demand (money aggregates) at 10% significance level. All models meet theoretical assumptions about the money demand instability as well. Significant lags were not identified. Fig. 4 presents CUSUM and recursive residuals test results. First indications of instability are significant in the year 2005 and year 2008-2009 when financial crisis culminated. The recursive residuals correspond with time periods when money velocity significantly decreased (Fig. 3).

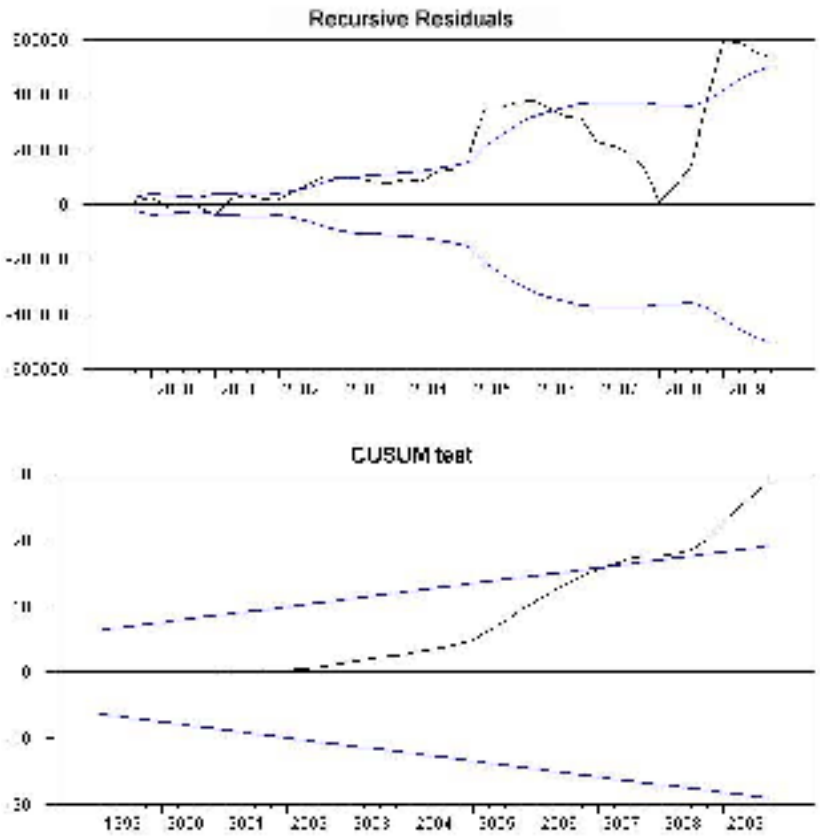
Table 2: OLS estimation and Hansen instability test

		OLS estimation			**Hansen test**	
Variable	Parameter	Std. chyba	T-Stat	P-value	T-stat	P-value
			Monetary aggregate M1			
Constant	-176222704,90	9047743,40	-19,477	0,0000	1,0934	0,0000
Y	12489023,10	628808,50	19,8614	0,0000	1,0980	0,0000
IR	-165945,80	33537,1000	-4,9481	0,0000	0,8104	0,0000
Joint					3,7208	0,0000
Variance					0,3415	0,1100
			Monetary aggregate M2			
Constant	-293170548,40	19119841,6	-15,3333	0,0000		0,0000
Y	20817013,60	1328808,50	15,6659	0,0000	1,1305	0,0000
IR	-198430,40	70871,10	-2,7999	0,0078	0,8322	0,0000
Joint					3,1783	0,0000
Variance					0,9894	0,0000

Monetary aggregate M3

Constant	-349559287,80	20937364,80	-16,6955	0,0000	1,1019	0,0000
Y	24804510,00	1455124,40	17,0463	0,0000	1,1053	0,0000
IR	-211857,20	77608,00	-2,7298	0,0093	0,8143	0,0000
Joint					3,1018	0,0000
Variance					0,9839	0,0000

Figure 4: CUSUM test for monetary aggregate M1 in the Eurozone



Tab. 3 presents bilateral causality between economic activity and aggregate price level, which corresponds with business cycle phases and inflation pressures at the peak. Unilateral causality was identified between aggregate price level, money stock and interest rate. The interest rate is exogenous variable in the above model. The money endogeneity is not significant because there is bilateral causality between the monetary aggregate M1 and economic activity.

Table 3: Granger causality for M1 and VAR(3)

Independent variable (lag variables)	Causality type	Dependent variable
IR	→	IR
Y	no causality	
P	→	
M1	→	
IR	no causality	Y
Y	→	
P	↔	
M1	↔	
IR	no causality	P
Y	↔	
P	→	
M1	no causality	
IR	no causality	M1
Y	↔	
P	→	
M1	no causality	

Estimated models in Tab. 4 and Tab. 5 present causality between all variables, thus any variable is not significantly exogenous. Opposed to the M1 monetary aggregate, aggregates M2 and M3 imply causality in direction from economic activity to liquid money. Consequently, the money supply is caused by interest rate and economic activity. This causality indicates the possible existence of money endogeneity.

Table 4: Granger causality for M2 and VAR(3)

Independent variable (lag variables)	Causality type	Dependent variable
IR	→	IR
Y	→	
P	↔	
M2	↔	
IR	no causality	Y
Y	→	
P	no causality	
M2	no causality	
IR	↔	P
Y	→	
P	↔	
M2	no causality	
IR	↔	M2
Y	→	
P	no causality	
M2	→	

Absolute money endogeneity theory assumes infinitely elastic money supply. However, banking sector has some limitations in lending process. The economic agents (or enterprises) have different credibility at various levels of interest rates. From the specific point the money supply is not infinitely elastic but increasing. This approach is known as relative version of money endogeneity theory. The liquidity of commercial banks has also impact on the credits which are offered by banking sector (Wray, 1990). The tendency to offer more credits with lower interest rates increases with economic expansion too.

The impact of banking system money creation on the stock of the money in the economy is determined by financial market size and share of small and medium enterprises, which are dependent on the credit financing of commercial banks. The money endogeneity is limited also by liquidity sources of commercial banks. Small regional commercial banks are directly dependent on the interbank market and central bank - their money supply is exogenously determined.

Table 5: Granger causality for M3 and VAR(3)

Independent variable (lag variables)	Causality type	Dependent variable
IR	→	IR
Y	→	
P	no causality	
M3	↔	
IR	no causality	Y
Y	→	
P	↔	
M3	no causality	
IR	→	P
Y	↔	
P	→	
M3	→	
IR	↔	M3
Y	→	
P	no causality	
M3	→	

5. Discussion

The monetary policy implementation in the Eurozone was based on two pillars. The first one was economic analysis, consisting in short-term to medium-term targeting of macroeconomic indicators. The second, monetary analysis is based on the fact that monetary growth and inflation are closely related in the medium to long run. The monetary aggregate M3 was used by the ECB as the 'reference value'. This ECB´s reference value for M3 growth was set at 4,5% p.a. by the Governing Council in December 1998 (ECB, 2004, pp.64).

The money growth targeting is the basic principle of the classical monetary theory. Beginning late 80s, several countries began introducing inflation target regimes with explicit quantitative inflation targets. The collapse of the previously stable relationship between the money growth and inflation caused the impact of exogenous factors. (Issing, 1997, pp.78) The theory argues that the change in inflation is directly proportional to the changes in money supply under assumption of constant level

of final production and velocity of money. The assumption of constant velocity of money or at least its easy predictability became unrealistic. The reason was particularly the openness of the economies and development of financial innovations. The monetary authorities extended monetary aggregates, but the money supply is influenced by endogeneity as well. Therefore, the ECB changed the both of pillars (in May 2003) and focused only on the inflation targeting which can currently be described as mainstream of modern monetary economics. Although this strategy is applied by more than 24 central banks, the major disadvantage is the significant reduction of inflation in emerging economies which is accompanied by the local economic growth decreasing.

Hagen and Hofmann (2009) summarize that last decade is characteristic not only by low inflation rate but also weak relationship between inflation and economic growth gap. Traditional signals of the inflation pressures in tems of monetary or economic growth gap is not possible to apply. The central bank should turn away from stabilization of high-frequency movements in prices and focuse primarily on the long-term trend.

In times of instability at the market of interbank deposits due to various demand and supply shocks, the short-term interest rates are optimal monetary policy operational target with low volatility. (Bindseil, 2004) This recommendation is fully consistent with the money endogeneity and Post-Keynesians´ assumptions, that central bank determines money supply indirectly, through economic and investment activity which affect money demand.

Chatelain et al. (2003) argues that the traditional interest rate channel has a lot of noises. An alternative is the "broader interest rate channel" defined by the net cash flow in individual companies through microeconomic data. Consequently, monetary policy implementation is dependent on debt of enterprises and capital sources. The debt of enterprises fluctuates from 48% in Germany to 71% in Italy and Spain. The interest rate channel is heterogeneous across the whole Eurozone.

6. Conclusions

The author argues that the money stock is influenced by investment and economic activity. Concurrently, the credit money creation is source of economic system instability, where money supply is balanced by velocity of money and determined by money demand. The Eurozone is huge monetary union with large financial system where the upper limit of money creation vanishes. For that reason, the Eurozone is appropriate model of the economy for money endogeneity assumptions application.

The empirical analysis identified money demand instability during the financial crisis when investment activity rapidly decreased. The author identified causality in direction from economic

activity to monetary aggregates M2 and M3. The bilateral causality was identified between economic activity and monetary aggregate M1. These results indicate possible existence of money endogeneity in Eurozone. While central bank increased liquidity at the market, broader money aggregates decline together with investment activity.

This conclusion is very important for monetary policy implementation in the Eurozone. The central bank is able to determine the money stock in the economy indirectly, through the interest rates and its impact on the investment and economic activity. According to the Post-Keynesians assumptions administrative instruments are very important. The target of central bank is not only maintaining price stability but also financial system stabilization and sufficient liquidity arrangement.

The passive role of central bank in the process of monetary policy implementation in the Eurozone is recommendable. The optimal ECB´s target is maintaining low and stable interest rates to support sustainable economic growth in the Eurozone. Price stability is recommended field of national governments excluding situation of symmetric and significant inflation shock in the all member states.

Summary

The author discusses the monetary policy efficiency during the financial crisis in the years 2007-2010. Since the ECB continuously reduced official interest rates, there has been no increase in the intermediate and broad money. The author argues that the reason is significant decrease of money velocity in the Eruozone after 2008. Money velocity changes play the crucial role in adjustment mechanism of demand and supply. If the changes in economic and investment activity reflect in demand for money to which the money supply adapts using creation of noncash money, the changing velocity of money is a mechanism balancing money market. Concurrently, the instability of money demand function was identified by CUSUM and Hansen test. The preferences of ecoonomic agents changed during the economic crisis.

Another part of the paper focuses on the causality identification between the monetary aggregates, economic activity, prices and short-term interest rates. The results point out the possibility of money endogeneity in the Eurozone.

The author concludes that the Eurozone represents huge monetary union where upper limit of credit money creation disappears. Although the ECB may have certain control over the money supply, it cannot fix the stock of money in the Eurozone. The money supply is not an exogenously set policy variable but is the result of the portfolio decisions of the bank and non-bank private sector. Finally, the central bank plays the passive role and cannot fix the stock of money in a country. The central bank is able to determine the money stock in the economy indirectly, through the interest rates and its impact on the investment and economic activity.

Finally, the author provides a few recommendations for monetary authorities which are based in Post-Keynesian economy – (1) low and stable interest rates to support sustainable economic growth, (2) financial system stabilization by administrative instruments.

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