



## Ontologická reflexe monetárních teorií

### The Ontological Reflection of the Monetary Theories

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**Abstrakt:** Cílem práce je prostřednictvím ontologické reflexe vytvořit vlastní model peněžního trhu, který by odpovídal realitě více než dosavadní teoretické modely. Práce dospívá k závěru, že nejméně realistický je vertikalistický model, který je bohužel nejvíce používaný v učebnicích makroekonomie hlavního proudu. Autor má však výhrady i k realitě bližší post keynesovským modelům. Je tak vytvořen alternativní realistický model, který v souladu s realitou pokládá peněžní nabídku za endogenní veličinu a úrokovou míru za exogenní veličinu. Peněžní zásoba je dána nabídkou úvěrů a poptávkou po úvěrech. Centrální banky řídí krátkodobou úrokovou sazbu a nemohou řídit peněžní bázi, nejen pro to, že tyto dva operační cíle jsou v přímém rozporu. Centrální banka může peněžní zásobu za určitých okolností ovlivnit pouze nepřímo. Trh likvidity (rezerv) a trh peněz musí být striktně odděleny.

**Klíčová slova:** peněžní nabídka a úvěr, centrální banka, měnová politika, úroková míra, banky a jiné vkladové instituce

**Abstract:** The aim of the thesis is to create money market model throughout ontological reflection in order to reach the more realistic assumptions than current economic theories may offer. The study concludes that the least realistic is vertical model which is unfortunately the most common in mainstream economic textbooks. The author has some reservations even about the more realistic Post Keynesian models as well and therefore the alternative realistic model which assumes endogenous money supply and exogenous interest rate is created. In this model, money supply is given by credit supply and credit demand. Central banks control the short-term interest rate and cannot control monetary base because these two goals are in direct conflict. Under the certain conditions, central bank is able to influence money supply indirectly. Liquidity market (reserve market) and money market must be strictly separated.

**Keywords:** money supply and credit, central bank, monetary policy, interest rate, banks and other depository institutions

**JEL Classification:** E51, E52, E58, E43, G21

## Prologue

From time to time we may encounter some assumptions within mainstream economic theory from which the consequences are deductively correctly derived. Nonetheless, these theories fail in the face of reality because contained assumptions are not realistic at all. The representative example is the monetary theory.

The important factor is applied methodology. Milton Friedman contributes to the fact that the positivism was one of the domain approaches in economics during the 20th century. According to his theory, there is no way how to test assumptions directly with reality. The only clue of correctness is the predictive ability of given theory (Friedman, 1966). This methodological approach, however, is seemed to be fatally wrong within monetary theory. Friedman's "*good predictive capability*" that the central bank is able to manage money supply throughout monetary base seemed to be correct for many decades until the paths of money supply and monetary base definitely diverged. Until the divergence has occurred the causality between money supply and monetary base could not be obvious from positive empirical testing.

Thus, in order to reach realistic monetary theory it is much better to use Post Keynesian methodological realism which seeks for the total explanation of causal mechanism rather than for the success of prediction. The most important aspect of this methodology is that each research should start with an ontological reflection instead of unrealistic assumptions. This reflection was missing for a decades in economy.

The aim of this thesis is to execute such ontological reflection and perform the much more realistic assumptions of money market.

The first part briefly introduces current monetary theories via excursion of historical development from older theories about money to its current essence – i.e. debt and endogenous.

The second part presents current theories of money market mechanism and money demand and supply explanation. The cardinal models are exogenous-vertical model (so typical for mainstream economy), endogenous-horizontal model and endogenous-structural model.

The third part is devoted to the inherent ontological reflection of monetary theory. The author suggests endogenous-realistic model of money market and liquidity market mechanism on the basis of practician's interpretation, accounting principles and own experience from banking sector. In the next step, endogenous-realistic model is confronted with previous models.

Author performs the empirical testing of endogenous-realistic model in fourth part.

Some notes on natural interest rate are to be found in fifth part.

The study concludes that exogenous-vertical model (unfortunately the most favorite in textbooks) is the most far from reality. Author has some reservations about horizontal and structural models which are, however, much closer to reality. The fundamental basics of the endogenous-realistic model are summarized in epilogue.

## 1. From commodity money to debt money

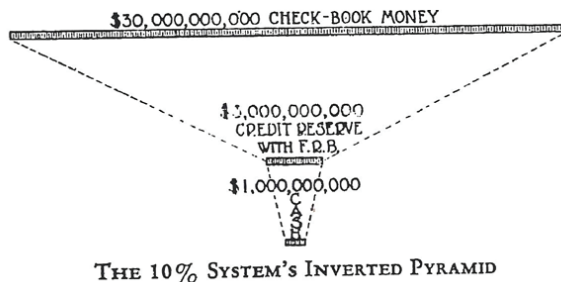
*„Each and every time a bank makes a loan, new bank credit is created – new deposits – brand new money.“*

- Graham F. Towers -

Money as the medium of exchange was the undoubtedly exogenous variable at the beginning of its use. In his famous essay, Carl Menger wrote: *“Money has not been generated by law. In its origin it is a social, and not a state institution. Sanction by the authority of the state is a notion alien to it”* (Menger, 1892, p. 55). He defines money as a special commodity which was chosen by market. It was especially precious metals – their quantity was given exogenously by quantity of mines. In hand to hand with creation of modern banking system the idea of banks as mere financial intermediaries has been developed. Let’s remember Edwin Cannan and his famous cloakroom theory: *“The most abandoned cloakroom attendant cannot lend out more umbrellas or bicycles than have been entrusted to him, and the most reckless banker cannot lend out more money than he has of his own plus what he has of other people’s”* (Cannan, 1921, p. 30).

This theory was, nonetheless, abandoned by neoclassical economists themselves. The banks evidently lent out more than they own. The frictional reserve system was developed. Nevertheless, neoclassical economists were able to defend their thesis about neutrality of money and logical priority *“savings before loans”* for a long time. In this view, the quantity of money is managed by central monetary authority via monetary base. This imagination was supported by monetarists as well. M. Friedman wrote: *“I have observed that noneconomists find it almost impossible to believe that twelve people out of nineteen—none of whom have been elected by the public—sitting around a table in a magnificent Greek temple on Constitution Avenue in Washington have the awesome legal power to double or to halve the total quantity of money in the country”* (Friedman, 1992, p. 24). So, in the Friedman’s opinion FED has power to change monetary base which causes the proportional shift in money supply throughout multiplier effect. When we get back deep to history we may find the similar statements in Irving Fisher’s work. He, however, had some reservations about FED’s control of the money supply in his book *“100 % Money”*. As a consequence, Fisher suggested 100 % minimum reserve requirements for the banks.

Figure 1 | Fisher's pyramid



Source: Fisher, 1997

Fisher's imagination of money supply is shown in Figure 1. "One billion cash supporting thirty billion checking deposits. This is top-heavy and unstable so that the check-book money can shrink to 3 billions (or theoretically even to 1) and then expand again. Under the 100% system the base would be as broad as the top." (Fisher, 1997)

Such a theory opens a door to the "floating money multiplier". We may find such an idea in works of the "Austrian" economists. This school of economic thought calls credit expansion as the issue of "fiduciary media" – i.e. fiat money (Mises, 1998). In fact, monetary base does not set the money supply but put only certain limit on credit expansion in this theory. Therefore the money multiplier begins to lose its meaning.

We can find the most realistic monetary theory in work of J. A. Schumpeter<sup>4</sup>, Knut Wicksell and Post Keynesians. They have completely abandoned the concept of monetary base, money multiplier and logical priority "deposits create loans". Schumpeter was well aware about the fact that loans create deposits. "It is much more realistic to say that the banks 'create credit,' that is, that they create deposits in of J. A. Schumpeter their act of lending, than to say that they lend the deposits that have been entrusted to them. And the reason for insisting on this is that depositors should not be invested with the insignia of a role which they do not play. The theory to which economists clung so tenaciously makes them out to be savers when they neither save nor intend to do so; it attributes to them an influence on the 'supply of credit' which they do not have." (Schumpeter, 2006, p. 1080) Schumpeter strictly disagrees with the concept of banks as financial intermediaries. In order to start production cycle it is necessary to grant a loan, not to collect deposits. In Schumpeter's view, the natural "neoclassical" causality is reversed – i.e. investments make savings.

This view is shared by Post Keynesians. Paul Davidson criticizes Friedman's monetary conception: "From a Keynesian viewpoint, money does not enter the system like manna from heaven, or dropped from the sky via a helicopter, or from the application of additional resources to the produc-

4) It is necessary to say that Schumpeter was one of the realistic economists and practician. He was minister of finance and the president of Biederman Bank which unfortunately collapsed after four years of his presidency.

tion of the money commodity” (Davidson, 1972, p. 877) Davidson expresses his conviction that money is not supplied “outside” into the circulation by central bank. However, it is necessary to say that even Post Keynesian economists admit the central bank’s influence on money supply. There are a plenty of heterogeneous approaches. For instance, Robert Pollin divides Post Keynesians on horizontalists (central bank plays less important role) and structuralists (central bank plays more important role). (Pollin, 1991)

Franko-italian circulacionistic school (school of monetary circulation) is the most skeptical to the role of central bank. “The main conclusion of the circuit approach in terms of the endogenous nature of money is that money is endogenous because how it enters the economy, i.e., through the normal operations of a capitalist economy of production, due to the credit needs of firms. Money is not endogenous because of the role of central banks or as a result of household portfolio decisions. These two last versions of endogenous money are more akin to Post Keynesian theory.” (Rochon, 1999, p. 16)

Let’s interpret the above stated way from “exogenous” to endogenous money in figure 2.

**Figure 2 | From exogenous to endogenous money**

Exogenous money				→	Endogenous money
Commodity Money	Banks as intermediaries	Fixed money multiplier	Float money multiplier		Endogenous money
Early Austrian School	Neoclassicals	Cambridge School, American Marginalists, Chicago School	Austrian School		Other Economists, Post Keynesians, Circulacionists
Carl Menger	Edwin Cannan	Alfred Marshall, Irwing Fischer, Milton Friedman	Ludwing von Mises, F. A. Hayek		Knut Wicksell, J. A. Schumpeter, J. M. Keynes, N. Kaldor, P. Davidson, A. Graziani, L. Rochon
Neutral money				→	Monetary theory of production

Source: own

## 2. Money and the role of central bank – current theoretical approaches

„The job of the Central Bank is to worry.“

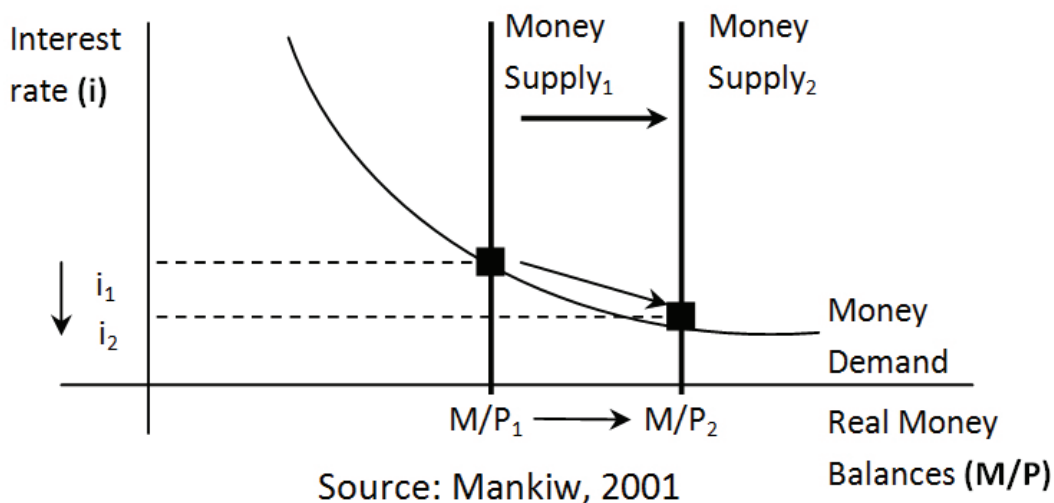
- Alice Rivlin -

In this part I would like to present cardinal money market theories: exogenous-vertical model, endogenous-horizontal model and endogenous-structural model. We focus on the role of central bank.

Mainstream exogenous theory is well represented by the basic economic textbooks such as Gregory Mankiw’s macroeconomics. He defines money supply in this way: “The Fed influences the money supply through open-market operations, reserve requirements, and the discount rate. Open-market operations are the purchases and sales of government bonds by the Fed. If the

Fed buys government bonds, the dollars it pays for the bonds increase the monetary base and, therefore, the money supply.” (Mankiw, 2001, p. 80) And so “The supply curve for real money balances is vertical because the supply does not depend on the interest rate.” (Mankiw, 2001, p. 272) We can observe the mainstream interpretation of money market in figure 3.

**Figure 3 | Money market in vertical approach**



Source: Mankiw, 2001

In general, if the central bank increases monetary base than the increase in money supply through the multiplication process occurs and short-term interest rate goes down.<sup>5</sup> The quantity of money is given exogenously by central monetary authority.

This approach is in direct contradiction with Post Keynesian’s endogenous money market conception. The Radcliffe report has contributed to the formation of modern endogenous theory. Gurley interprets one of its important conclusions in this way: “The money supply has been largely uncontrolled during the postwar period; neither the banks’ cash ratio nor their liquidity ratio has placed an effective upper limit on monetary growth” (Gurley, 1960, p. 673)

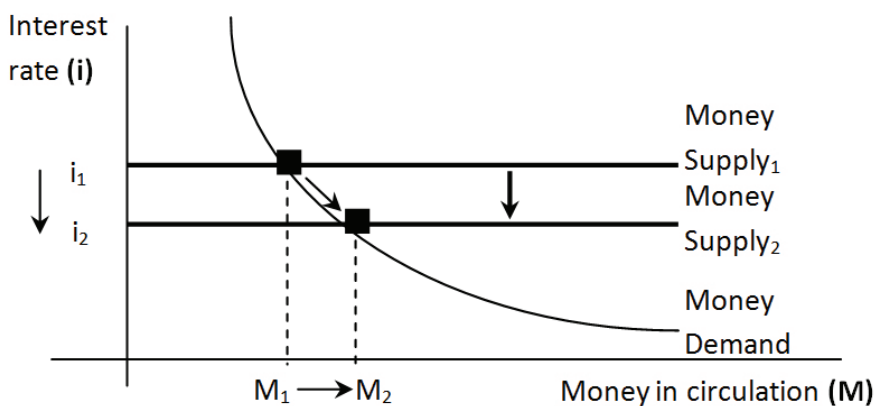
Paul Davidson admits some possibilities of central bank’s money supply control. He asks Friedman for explanation of some of his attitudes: “A fruitful further exchange of ideas will be enhanced, if, in his rejoinder, Friedman devotes some space to indicating why his framework, which assumes a completely exogenous money supply is preferable to a Keynesian analysis which, when the finance motive and elasticity properties of money are included, permits money-supply changes to be endogenous under certain circumstances and exogenous under others.” (Davidson, 1972, p.

<sup>5</sup> It is important to note that the most of macroeconomics is derived from this model (with Keynesian cross). Especially IS-LM model and aggregate demand function.

880) It is interesting that Lord Keynes himself based his theory on exogenous essence of money in his masterpiece *General Theory* (Keynes, 2006) whereas his theory in *Treatise on Money* (Keynes, 1930) was based on endogenous money supply.<sup>6</sup>

In general, Post Keynesian's theory of money is, unfortunately, neglected in economic textbooks. The reason may be its heterodoxy (Lopušník, 2010, p. 1). The main approaches within Post Keynesian endogenous theory are horizontalism and structuralism. In horizontal approach, commercial banks are the price setters and quantity takers (Sojka, 2002) Nikolás Kaldor was one of the main proponent of this approach. Rousseas (1992) constitutes Kaldor's imagination of money supply as horizontal curve and money demand as downward-sloping curve as it is shown in figure 4.

**Figure 4 | Money market in pure horizontal approach**



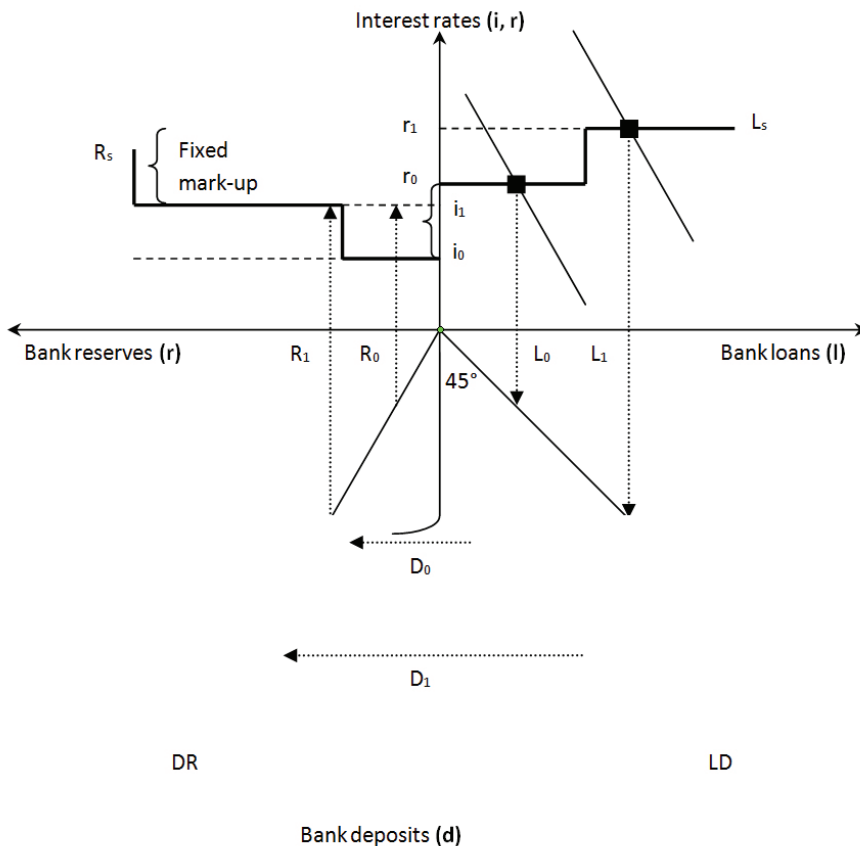
In Kaldor's opinion, central bank can influence money supply via shifts in short-term interest rate: *"Of course, within limits, the ultimate monetary authority can and does exercise control over the volume of borrowing, because it can control interest rates, particularly at the short end, through open market operations, far more powerfully than other operators."* (Kaldor, 1970, p. 7) Thus, in opposite to the vertical approach, the interest rate is exogenously given by monetary authority.

In advanced form, both the horizontalism as well as structuralism distinguish credit market and reserve market within money market. The accommodative [horizontal] position ... maintains that no effective quantity constraints exist on bank reserves. Individual banks can always obtain additional reserves, at the market price, so long as lender confidence in their solvency (ability to repay) is preserved. (Moore, 1991, p. 404) In contrast, *"The structural position ... makes less of a break with the mainstream view that central banks control monetary aggregates exogenously by varying the supply of reserves. It maintains that*

<sup>6</sup> Keynes himself never used the term "endogenous money". "Keynes did not clearly spell out the proper sequence of events leading to the creation of money. He never really argued in terms of reversed causalities between deposits and loans." (Rochon, 1999, p. 4)

even though central banks are able to restrict the supply of bank reserves quantitatively, this will be more or less, but not perfectly, offset through innovative bank liability management practices.” (Moore, 1991, p. 404)

**Figure 5 | Credit Market and Reserve Market in Post Keynesian Approach**



Source: Fontana, 2004, own

Giuseppe Fontana accents the common denominators of both approaches. One of them is an idea that “loans make deposits” and “deposits make reserves”. Moreover, he endeavors to constructive interpretation of the debate. The individual controversial arguments are shown as issues that can “be explained rigorously once a single-period–continuation framework is adopted.” (Fontana, 2004, p. 367)

Figure 5 shows the Fontana’s Post Keynesian money market interpretation. We move on



in relevant causal order (from right upper quadrant) so that we can explain the graph correctly. Money supply is given by intersect of credit supply (commercial banks) and credit demand (non-bank subjects as firms, households, government). The amount of bank credit determines the amount of bank deposits and therefore the entire money supply.<sup>7</sup>

In the horizontalist point of view, only horizontal part of curve is relevant and money supply is determined exclusively by credit demand. According to verticalists, credit supply is imperfectly elastic. *“Horizontalists look at the credit market with the assumption that during the money supply process banks are not affected by changes, if any, in their own liquidity ratios and the liquidity ratios of their customers. Structuralists allow for the possibility that over the business cycle banks revise their non-price and price terms of credit.”* (Fontana, 2004, p. 375) In the both approaches, the banks rises up their mark-up (credit supply curve goes up) during the recession and vice versa.

The right lower quadrant represents 45° curve of equality between loans and deposits (LD line). The slope of the curve in left lower quadrant is given by reserve ratio and expresses required amount of bank reserves. The amount of bank reserves is derived from credit market and not vice versa as it is in verticalist approach. The disagreement between horizontalists and structuralists exists in behavior of the central bank. Horizontalists insist that central bank must satisfy every demand for additional reserves because it plays the role of lender of last resort. On the other hand, verticalists advocate that central bank can defend itself by changes in interest rate for given amount. Contrary, theories are correspondent in opinion that central bank can influence money supply by shifts in target rate. *“Central banks have a very active role in the money supply process. By adjusting the short-term nominal interest rate, they may be able to affect lending conditions in the credit market. This power of central banks is in general recognized by both horizontalists ...and structuralists.”* (Fontana, 2004, p. 372)

The different aspects of endogenous money theory are highlighted by a circuit dynamic approach (circulacionists). *“Money is therefore endogenous, as in Post Keynesian theory, but the analysis rests neither on the accommodative role of the central bank nor on the nature of contracts, uncertainty, and portfolio analysis. Production is what money gives its endogenous nature.”* (Rochon, 1999, p. 9) So the circulacionists describe money as endogenous in the way how it enters into the economy. They have strong doubts about the use of standard analysis of money market through the supply and demand curve. Rochon translated DiRuzza (1984) from French: *“It appears to me that the use of supply and demand analysis with respect to money gives rise to more inconveniences than advantages. If we assume that the supply of money is endogenous, and determined by demand, the notion of a supply itself loses all its significance. The only quantity of money foreseeable, possible and normal, would be the desired quantity, i.e. that arising from the internal economic needs of the system. A money supply function is unthinkable because apart from the precise intersection with the demand function, all other points on supply curve represent something which is not money”* (Rochon, 1999, p. 14)

<sup>7</sup>) The assumption that bank deposits are the entire money supply is applied in this model. (currency is excluded)

### 3. Money and the role of central bank – ontological reflection

*„If the central bank tried to run a system of monetary base control, it would fail.“*

- Charles Goodhart -

This part of the study undertakes the analysis of financial system reality and subsequently implants it into the theoretical economic framework.

Within his positive methodology, Profesor Friedman denies the possibility of comparison assumption directly with reality. He did not see any meaningful way how to do it. The only way how to verify the assumptions is to test the predictive ability of given theory. (Friedman, 1966) That methodology is the subject to criticism from the Post Keynesian lines. Their theory is much more based on the methodological realism – i.e. they search for the realistic assumptions. The Post Keynesian cognitive starting point is an ontological reflection (Jespersen, 2011). Simply said, all the assumptions should correspond with reality. For instance, reality can be assured through higher level of communication between academicians and practitioners. The author hereby tries to detect the money market reality on the basis of practitioners' interpretation, own banking sector experience and international accounting rules.

First of all, the great confusion about *“what the money is”* exists. Debates are may be older than economics itself. For instance, Lin Lin argues with Dr. Currie about what financial instruments meet the definition of money: *“Dr. Currie would argue that no „money“ is created if the check is redeposited with the savings bank. This is, however, not correct. To say that time deposits are not money is the same as saying that Mr. D can at his own free will destroy money simply by depositing his check with the savings bank.”* (Lin, 1937, p. 80) As the time goes by (and maybe because these disagreements) the relatively clear definitions of monetary aggregates have been developed in practice. Unfortunately, the most of the economic theories do not worry about such definitions. For Example, in spite of the fact that the reserve account balances (liquidity) of banking sector are not the part of monetary aggregates in all countries over the world the most of economic textbooks and papers call them money.<sup>8</sup>

It is very common to read in magazines, newspaper or even professional publications that central banks *“print”* money. In reality, however, central banks do not have any direct influence on money supply in common. If the central bank grants a loan to the commercial bank, no money is created. Only liquidity is created. The central banks even do not manage the money creation via monetary base. As Alan Holmes<sup>9</sup> confirms, the causality is directly opposit: *“The idea of a regular injection of reserves-in some approaches at least-also suffers from a naive assumption that the banking system only expands loans after the Sys-*

8) Until 2006 the liquidity on bank's clearing account was the part of monetary aggregates in Great Britain. That was only exception.

9) Alan Holmes worked for 33 years in the Federal Reserve Bank of New York, where he manages Federal Reserve account for open market from 1965 to 1979.

tem (or market factors) have put reserves in the banking system. In the real world, banks extend credit, creating deposits in the process, and look for the reserves later.” (Holmes, 1969, p. 73)

The fact is that the liquidity management (the managing of reserves) and loans management are independent even within individual bank. The liquidity is influenced by many bank’s departments. Reserve requirements recalculation is the one but not the only aspect of the liquidity management. If the bank is solvent the department of liquidity management never asks the department of loans management if the bank has enough reserves to grant a loan. The lending bank clerks do not care about reserve ratio but the client’s creditworthiness. In other words, lender does not care about the reserves for granting a loan. Contrary, he cares about the client’s ability to repay the debt because in case of default the bank is obliged to increase expense account balance of nominal value of the entire loan which bears the negative effect on its own capital.

**Figure 6 | The money creation and liquidity creation**

Central Bank (CB)			
Loans granted to B1		Clearing account B1	
2) 25			PS) 0
			2) 25
		Clearing account B2	
			PS) 100
Commercial Bank 1 (B1)		Commercial Bank 2 (B2)	
Clearing account CB	Current accounts	Clearing account CB	Current accounts
SB) 0	SB) 0	SB) 100	SB) 700
2) 25	1) 250		

Source: Jílek – Svobodová, 2013, own

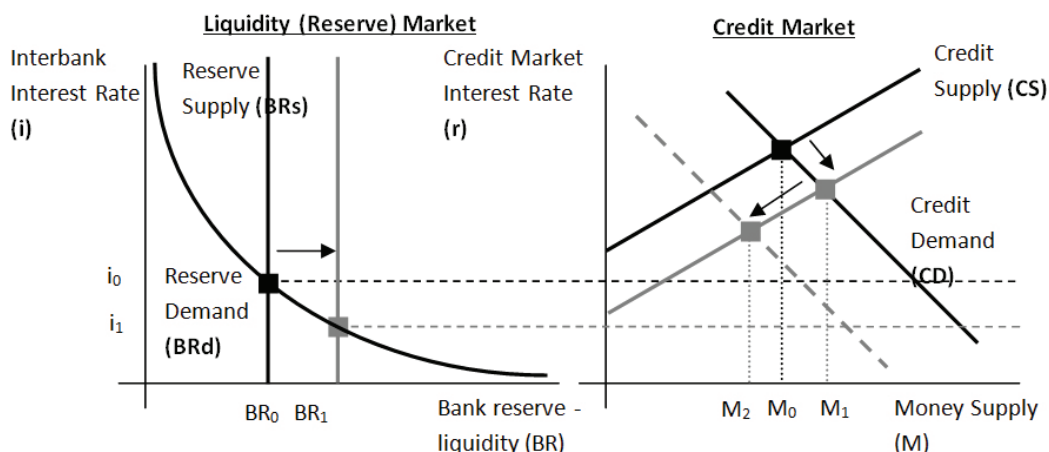
We can explain the process on the basis of international accounting rules (Figure 6). Commercial bank 1 grants a loan to the non-bank subject and thereby the money supply increases (Operation 1). If we suppose that there is 10 % reserve requirement, the bank needs to obtain the liquidity in amount of 10 % out of granted loan (i.e. 25) at the interbank market. Assume that bank 1 wants to borrow liquidity from bank 2 and bank 2 is willing to lend liquidity only at higher rate than the interbank rate targeted by central bank. If operating target of a central bank is a short-term interest rate then central bank must provide additional liquidity (reserves) to the banking sector (for instance, through the granting a loan to B1), otherwise the interbank short-term interest rate would go up above desired level of this rate (Operation 2). That is the case of banking sector with deficit of liquidity.<sup>10</sup>

10) If it was the banking sector with systematic surplus of liquidity than the central bank would have to absorb the excess liquidity, otherwise the effective interbank interest rate could go down below targeted level.

From above mentioned example it is clear that “Bank reserves market is the special kind of market. Central bank operates on both demand and supply side of it. It determines the demand by setting reserve requirements and by setting conditions for the interbank clearing system. At the same time it determines supply by means of open market operations. Open market operations are used to achieve the desired level of interest rates.” (Jilek, 2009, p. 151)

This fact means not less and not more than the operating targets short-term interest rate and monetary base are in direct conflict. If the central bank started to manage the monetary base<sup>11</sup> it would not be able to harmonize reserve requirements of the commercial banks with their lending activity. This scenario would lead to very high volatility of the interbank interest rate and therefore the very high volatility of the all interest rates in the economy.<sup>12</sup> Both the low volatility of interest rates and explicitly announced desired level of the target rate are the evidences of the fact that all the central banks over the world use the short-term interest rate as an operating target.

**Figure 7 | Liquidity Market and Credit Market in Realistic approach**



Source: own

In order to formulate alternative model it is necessary to distinguish credit market and liquidity market because they are two separate circuits.

Figure 7 shows the realistic idea of credit and liquidity markets. Whereas demand for reserves and reserve supply are set exclusively by central bank the credit market (which determines money supply) is outside the direct control of the central bank. The credit supply is an upward-sloping curve which starts above the interbank interest rate (set by central bank).

11) It is technically impossible anyway – central bank can't control the volume of currency.

12) It happened in history during the “great monetary experiment” at the late seventies when the FED was trying to target monetary aggregates via monetary base.

Commercial banks are willing to provide additional amount of credit at the higher interest level insomuch as borrowers credit risk growth in hand to hand with the amount of provided loans. Credit demand is the downward-sloping function because the borrowers are willing to accept additional amount of loans at the lower interest rate. The intersect of credit supply and credit demand determines money supply. So, the money supply is not set by central bank (just reserves) but it can be influenced (under the certain conditions) through short-term interest rate which is set by central bank.

If the central bank decides to decrease short-term interbank interest rate (through providing additional liquidity) then the final decision about money supply lies at the credit market. For instance, if the economic crisis shifts credit demand function to the left (or makes credit supply curve less elastic) then the money supply may shrink despite the decline in the short-term interest rate.

It does matter how this model correspond with previously stated theoretical models. It is quite clear that vertical model fails in confrontation with reality. Central banks have no direct influence on monetary aggregates and therefore cannot set money supply exogenously (it may set the supply of the bank reserves). Accordingly, central banks set the short-term interest rates exogenously and this rate cannot be determined by money demand. Short-term interest rate is clearly exogenous variable whereas money supply is clearly endogenous variable in realistic model and wherefore the horizontal position is the closest to our model. Nonetheless, the horizontal explanation of providing liquidity due to the central bank's "*lender of last resort*" role is not entirely accurate. In reality, the central bank must provide liquidity in order to reach given interest rate and not because of its role. This fact is even accepted by some circulationists: "*In fact, a central bank's accommodation is instrumental in avoiding interest rate hikes that a non-accommodating behaviour would lead to in the interbank market.*" (Rochon, Rossi, 1997, p. 9)

#### 4. Money and the role of central bank – empirical testing

Our methodology requires the empirical test after the ontological reflection (Jespersen, 2011). The subjects to such a test are the two crucial conclusions – exogeneity of interest rate<sup>13</sup> and endogeneity of money.<sup>14</sup>

The central banks manage the short-term interest rate in order to influence all the interest rates in the economy – i.e. in order to shift the entire yield curve. If there is a strong positive correlation between the target rate and the other interest rates in the economy then the interest rate is exogenous variable. The standard linear-regression model is sufficient with respect to the fact that we examine simple correlation and not the causality.<sup>15</sup>

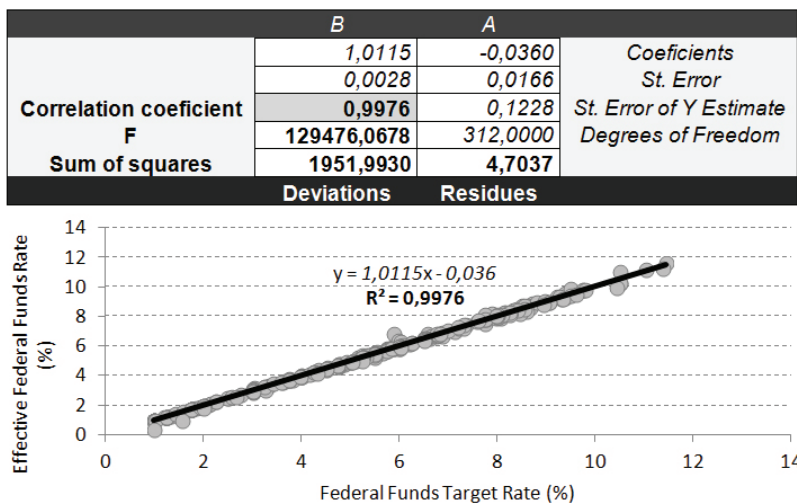
13) The subject of the test will be the correlation between target interest rates and other rates in economy.

14) The subject of the test will be the causality between money supply and monetary base.

15) To said that the market interest rate determines the target interest rate is somewhat absurd.

The specific test will be based on monthly US data. We suppose that the basic relationship between Federal Funds Target Rate and Effective Federal Funds Rate is strongly positive. We used the monthly data from October 1982<sup>16</sup> to November 2008.<sup>17</sup> The result is performed in Figure 8.

**Figure 8 | Correlation between target and effective fund rate (1982-2008)**



Source: FRED (2013), own

The almost perfect correlation can be represented by value 0.9976. As we can see in the graph, the target and effective rate are almost the same. So, for the further examination of the influence on the other interest rates, we may use the effective rate as an approximation of the target rate. Firstly, we will judge the influence of the effective rate on the entire yield curve which we constructed out of the interbank market rates and government bonds yields. The result is to be found in Figure 9.

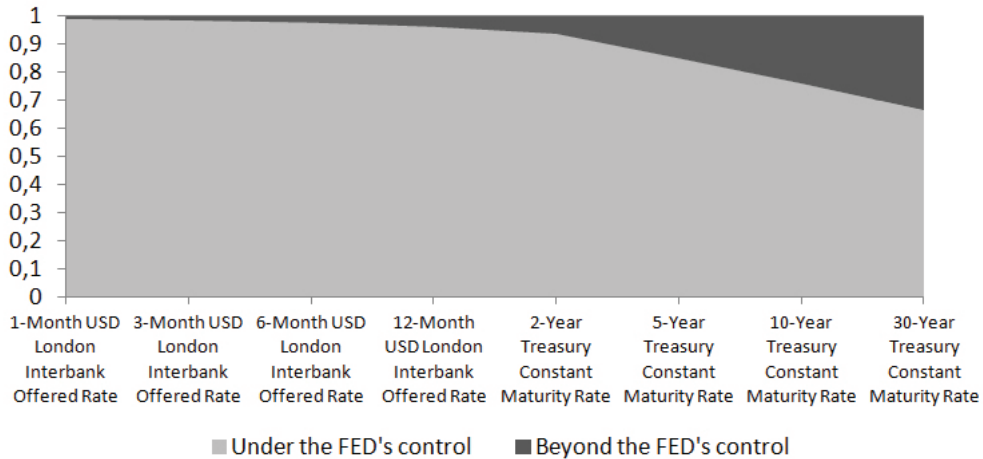
**Figure 9 | Correlation between effective rate and yield curve rates (1986-2013)**

Interest Rate	Correlation Coefficients of the FED
1-Month USD London Interbank Offered Rate	0,9918
3-Month USD London Interbank Offered Rate	0,9860
6-Month USD London Interbank Offered Rate	0,9782
12-Month USD London Interbank Offered Rate	0,9632
2-Year Treasury Constant Maturity Rate	0,9380
5-Year Treasury Constant Maturity Rate	0,8502
10-Year Treasury Constant Maturity Rate	0,7598
30-Year Treasury Constant Maturity Rate	0,6639

Source: FRED (2013), own

16) FED has left the monetary experiment.  
 17) FED causes the liquidity "floods" at the interbank market.

**Figure 10 | Fed influence on yield curve rates**



Source: FRED (2013), own

When we plot the values from table to the graph (Figure 10), we may observe that the yield curve interest rates are almost under the FED's control. The power of control slightly weakens with the distance of maturity. We can analyze some other interest rates outside the yield curve to support the conclusion (Figure 11).

**Figure 11 | Correlation between effective rate and other rates (1986-2013)**

Interest Rate	Correlation Coefficients of the FED
Bank Prime Loan Rate	0,9699
30-Year Conventional Mortgage Rate	0,8490
24 Month Finance Rate on Personal Loans at Commercial Banks	0,7439
Moody's Seasoned Aaa Corporate Bond Yield (AAA)	0,6639

Source: FRED (2013), own

The second, and the more arduous, quest is the test of the causality between monetary base and monetary aggregates. Naturally, the question of causality is not only the significant methodological problem but specifically also the problem of econometrics. (Korda, 2007) When we use the simple linear-regression model we get no more than almost perfect correlation until the end of 2008. This would say nothing about the causal question (whether deposits make reserves or reserves make deposits).

One of the controversial ways how to test the causality is the "Granger's causality". The essence of this econometric instrument is the testing of causality in terms of time sequence – i.e. testing whether changes in one variable systematically precede the changes in another variable. So, besides the monetary base and monetary aggregate M2, the additional input in our testing is the time lag (2 months).

Figure 12 shows that we can reject null hypothesis that monetary base (MB) does not cause the changes in monetary aggregate (M2) but we cannot reject null hypothesis that M2 does not cause the changes in MB at the 5 % significance level ( $0.0044 < 0.05$ ).

**Figure 12 | Granger's causality between MB and M2 (2M lag) (1984-2008)**

Pairwise Granger Causality Tests

Date: 06/09/13 Time: 12:36

Sample: 1984M02 2008M09

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
MB does not Granger Cause M2	294	1.73436	0.1783
<del>M2 does not Granger Cause MB</del>		<del>5.53089</del>	<del>0.0044</del>

Source: FRED (2013), EViews, own

This kind of test must be, however, inevitably the subject of self-critics. Granger causality is very sensitive to so-called spurious causalities. (Eichler, 2007) Moreover, there are a plenty of reservations about the ability of this econometrical apparatus to decide what is cause and what is consequence. (Hušek, 1999) Nor the author himself concludes anything through the granger's test. This is the confirmation of our methodological argumentation that causality cannot be tested – it must be explained. It must be observed in a practice.

## 5. Some notes on natural interest rate

A couple of lines ago, we concluded that the interest rate is an exogenous variable. Nevertheless, in both the mainstream and Austrian economic theory exists the idea that decline in rate of interest is the immediate consequence of the credit expansion. It means that the real rate of interest can fall below the “*natural rate of interest*”. This natural rate is defined in 8th Chapter of Wicksell's book: „*There is a certain rate of interest on loans which is neutral in respect to commodity prices, and tends neither to raise nor to lower them. This is necessarily the same as the rate of interest which would be determined by supply and demand if no use were made of money and all lending were effected in the form of real capital goods. It comes to much the same thing to describe it as the current value of the natural rate of interest on capital.*“ (Wicksell, 1962, p. 102).

Real rate of interest is set exogenously and therefore its natural level can be just estimated (natural rate is not observable). The natural rate of interest is commonly the subject of interest of the central banks as well: „*We show that time variation of the natural rate has important implications for the design and implementation of monetary policy. Adjustment to changes in the natural rate is crucial for the achievement of long-run inflation and short-run stabilization goals.*“ (Laubach, Williams, 2001, p. 21).<sup>18</sup>

18) For example, it is possible to find some methods of estimating the natural rate in Williams' paper (2003).



The criticism of these efforts is directed to the inability of estimating the accurate natural rate by central monetary authority on time. Potužák characterizes that in the eyes of the Austrian school of thought and under assumption of endogenous money: „*[T]he output gap and higher inflation are rather the outcome of the entire process. They both come into existence especially due to the inability of the central bank to keep track with the natural rate of interest. In other words, by increasing the policy rates after the positive output and inflationary gaps have occurred, it is too late for the central bank to avoid the business cycle. ... Hence, it is quite reasonable to assume that under the current banking and monetary system the market interest rate does not respond sufficiently to the increase in the natural rate of interest, either due to the accommodative behaviour of the commercial banks or due to the lag in the monetary policy response.*” (Potužák, 2012, p. 127)

The stability and “*idol*” of natural rate of interest are, nonetheless, surely at least very disputable. The business cycles would certainly not be excluded even if the central bank were reaching natural interest rate permanently and accurately. Moreover, with respect to the practical point of view it could not be suitable to let natural rate of interest free market interaction. It could lead to the extremely high volatility of interest rate and therefore the interest rate risk management would become impossible. Central banks anchor the expectations via setting of interest rates.

Discussions may be various but the reality shows that real interest rate is under control of the central bank which just strives to estimate and subsequently reach the natural rate of interest.

## Epilogue

The main aim of this paper was to highlight unrealistic assumptions of the mainstream money market model. The study searches for the reality in the models of alternative heterogeneous approaches and subsequently formulates new model which should be based on the realistic assumptions. The crucial aspects of the reality neglected by the mainstream are:

- a) Money supply is an endogenous variable, whereas interest rate is an exogenous variable.
- b) Commercial banks stand on side of credit supply which, in interaction with credit demand, determines the money supply.
- c) Central bank is able to influence the money supply only indirectly throughout the control of the short-term interest rate.
- d) Steering the monetary base is not the subject of central banks' interest because it is in direct contradiction with the real operating target – short-term interest rate.

*Credit market and liquidity (reserve) market are the two different circuits. Liquidity (reserves) is not the part of monetary aggregates and hence it is not money. Money supply is determined exclusively by the credit market.*

The above stated conclusions may surely have significant impacts on the entire mainstream economic framework. The author is aware that the money market is just shard of the mosaic of the whole macroeconomic science. Thus, following research should be focused on the impacts of above examined conclusions on the other areas of macroeconomic theories.

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