Marcin Brycz "Keynesian and Monetary Approach to the Liquidity Trap – looking for cointegration evidence from 2008 – Crisis in the United States", *Journal of International Studies*, Vol. 5, No 2, 2012, pp. 18-29.

Journal of International Studies

Keynesian and Monetary Approach to the Liquidity Trap – looking for cointegration evidence from 2008 – Crisis in the United States.

Marcin Brycz
University of Gdansk
Department of Microeconomics
Armii Krajowej 119/121
81-824 Sopot, Poland
marcinbrycz@gmail.com

Abstract. The paper reflects on the phenomenon of the liquidity trap in the U.S. during 2008- financial crisis. The modern history of economics indentyfied strictly only one such a case: Japan since mid – 1990's. The main focus is to collect evidence on the liquidity trap using both: monetary approach and Neo-keynesian. Standard Johansen cointegration anlaysis is used to catch the structural macroeconomic change since the Lehman Bros. collapse. Findings provide the evidence for: a) money demand function change due to zero-bond policy; b) the role of expectations in the liquidity trap condition; c) excessive raise of 'lemon' cost on the financial intermediation market.

Received: March, 2012
1st Revision: July, 2012
Accepted: October, 2012

Keywords: liquidity trap, money demand, cointegration.

JEL: E12, E41, E5.

INTRODUCTION

Liquidity trap is the condition, when central bank increases the money supply with effect on neither prices nor output. The idea was discovered originally by J.M. Keynes and Hicks (1937), as it was said to occur during the great recession of the 1930's for the first time.

Since the 1970's central banks in the developed world was interested in fighting inflation rather to stimulate the economy by increasing money supply, as they follow Milton Friedman (1969, pp. 1-50) rule. In the 1990's and 2000's the main central bank's objective was to ensure the credible monetary policy with inflation target (Svensson, 2010) clearly stated. As economic agents used the same forecasting models as the central banks that time, they were able to predict monetary policy more accurate. This in turn led to decrease in economic aggregates volatility such as: output, inflation etc., which Bernanke (2004) called this period 'The Great Moderation'. Woodford (2003, p.268) shows the path of learning dynamics by economic agents, when the Taylor rule is satisfied much more in recent decade than in previous periods.

In the late 1990's B. Bernanke, L. Svensson, M. Woodford and P. Krugman (Krugman, 2010) researched the Japan's lost decade. Their outcome clearly shows that Japan's economy has been caught into the liquidity trap since mid-1990. Krugman (1998) argue that if liquidity trap has occurred in Japan, it can occur elsewhere anytime now.

Crisis 2008- and the quantitative easing policy in the United States, which was targeted not only to restore liquidity on the financial markets but also to lower right-tail of yield-curve, might cause elements of the liquidity trap. The aim of this paper so, is to find if some aspects of liquidity trap are visible in the United States.

The literature review shows two approaches to assessing liquidity trap. The standard Keynesian view augmented by rational expectation and the monetary, which focus on monetary aggregates cointegration. If evolutions of monetary aggregates become irrelevant to prices and output, economy may be caught into liquidity trap.

The paper is organized as follows: the two sections provide literature survey on Keynesian and monetary approach to liquidity trap. The third one asses some cointegration evidence and the fourth conclude.

LIQUIDITY TRAP – KEYNESIAN APPROACH

Liquidity trap was originally discovered by J.M. Keynes (1936) and Hicks (1937). This phenomena is due to nominal interest rate positive only. When it is no possible to make lower nominal interest rate than zero, further monetary stimulation of aggregate demand is ineffective. Additionally LL curve is sloped upward since an increase of income and further it goes into perfect inelastic (Hicks, 1937). The model has got into standard macroeconomic textbook and was not developed much until famous Krugman's paper (1998). According to Krugman (1998), the lack of economists' interest in this filed was due to the lack of faith that liquidity trap will ever happen.

Krugman (1998) sheds new light on liquidity trap, which was proposed by standard IS-LM model. Krugman's model combines interest rate, consumption, money supply and expectations:

$$1+i=\frac{P^*}{DP}(\frac{y^*}{y})^{\rho} \tag{1}$$

Where: i – interest rate, D – discount factor, P* - future price level, P – current price level, y*/y - the relation between future output (expected) and current output, ρ – relative risk aversion. The relation (1) can be viewed as a model, which assumes sticky or flexible futures prices. The risk aversion coefficient comes from agent's utility function, as they are to decide whether they won't to buy bonds at interest rate i or spend money on consumption (which drives output). Therefore if future prices remains fixed (P*), any raise in current prices (P) will produce future deflation, as higher P means lower i and i cannot be negative. If nominal interest rate was negative, agents would hold money instead of bonds. When interest rate is close to zero bonds and money become perfect substitutes and further increase in money supply will not change neither output nor price level.

The Krugman's (1998) model incorporated financial intermediation in the above. The evidence for financial intermediation to liquidity trap is also visible in the evolution of monetary aggregates. In Japan for example monetary base in years 1994-97 rose by 25.6 per cent, while bank credit rose only by .9 per cent (Krugman 1998, table 7). Similar data provided Friedman and Schwartz (1963, table A-1). Between 1930 and 1933 in the United States currency held by public rose by ca. 46 per cent, while commercial bank total deposits fall by ca. 41 per cent[1]. As it was associated with banking crisis that had begun in the early 1930. Krugman's (1998) provides a way to escape the liquidity trap. This is a credible overshoot of inflation target by central bank. In other words central bank should set agent's expectations of the future price level to rise.

[1] Krugman (1998), figure 3, shows that high power money more than doubled this period

Sevensson (2001) sketched an open economy model that analysis the evolution of output gap, domestic inflation, CPI-inflation and real interest rate in a condition of liquidity trap:

Sevensson (2001) sketched an open economy model that analysis the evolution of output gap, domestic inflation, CPI-inflation and real interest rate in a condition of liquidity trap:

$$\pi_{t+1} = \alpha_\pi \pi_t + (1-\alpha_\pi)\pi_{t+2} + \alpha_y y_{t+1} + \alpha_q (q_{t+1} - q) + \epsilon_{t+1} \tag{2a}$$

$$y_t \equiv y_t^d + y_t^n \tag{2b}$$

$$y_{t+1}^n = \gamma_y^n y_t^n + \eta_{t+1}^n \tag{2c}$$

$$y_{t+1} = \beta_y y_t - \beta_\rho \rho_{t+1} + \beta_y^* y_{t+1}^* + \beta_q (q_{t+1} - q) - (\gamma_y^n - \beta_y) y_t^n + \eta_{t+1}^d - \eta_{t+1}^n \tag{2d}$$

$$\rho_t \equiv \sum_{\tau=0}^{\infty} (r_{\tau+1} - r) \tag{2e}$$

$$r_t \equiv i_t - \pi_{t+1} \tag{2f}$$

$$r_t^T = \frac{1}{T} \sum_{\tau=0}^{T} r_{t+\tau} \tag{2g}$$

$$\rho \approx T(r_t^T - r) \tag{2h}$$

Where: $\alpha, \beta, \gamma, \rho$ are parameters to estimate, above relation are in logarithms; asterisk (*) denotes the foreign economic aggregates (eg. y* - rest of the world output).

The relation (2a) is a hybrid-forward-looking Phillips curve in which expected inflation rate π_{t+1} is determined by inflation inertia π_t, expected inflation rate in the future π_{t+2} and α_π parameter denotes rule-of-thumb of the hybrid-forward-looking expectation. In other words agent's expectations of the future price level are based on both past inflation evolution (inflation inertia) and expected future economic trends that will influence on the price level. The current output y_t (2b) is the outcome of the output gap and long term potential output (the model assumes exogenous shock as well - η_{t+1}^n).

The relation (2d) shows how liquidity trap condition enters the expected output. The expectation is the central issue in assessing liquidity trap in the Keynesian model. The future output (y_{t+1}) is caught into liquidity trap by ρ_{t+1}, the expected deviation of the real interest rate from the steady-state real interest rate (natural interest rate in Kunt Wicksell's sense). When agents expect the real interest rate not to fall, they will expect no raise in current output in the future; assuming everything equal domestic demand will not raise, until monetary authority lower the real interest rate in the future. The latter one is sensitive to the monetary policy credibility. (2f) explain real interest rate as the (log) difference between nominal interest rate and in-

flation. (2g and 2h) are the yield curve – relation between interest rate and instrument's maturity. Eggertson and Woodford (2003) concludes that in a condition of zero-interest bond, different maturity assets turn to be perfect substitutes

In the Keynesian approach liquidity trap condition can be seen through market friction in the financial intermediation sector. Bernanke and Gertler (1995) introduce the term 'external finance premium'. The premium comes from the 'lemons problem' directly. Financial intermediation assesses the borrowers' credit-worthiness, which cost is incorporated to the 'external finance premium'. The level of an average 'premium' is varying over the business cycle. Usually during the economic downturn 'premium' raises, which in turn makes the interest rate that entrepreneurs and consumers faces higher; even though central bank's short-term interest rate is very low. The raise in cost of 'lemons' in some circumstances can sharply decrease the transaction volume, as suggested by Akerlof (1970). Kacperczyk and Schnabl (2010) shows that financial market in the United States was blocked by the problem of 'lemons'. Liquidity trap in that sense should occur, when financial sector is reluctant to lend money to private sector in spite of high banks reserves. This condition is somehow similar to the mentioned above problem of natural interest rate, as the 'premium' raises the nominal interest rate. Martens and Raven (2011) evidence shows, that credit channel in the United States depressed the expectations and hence caused the liquidity trap recession recently.

LIQUIDITY TRAP – MONETARY APPROACH

Friedman's 'helicopter drop' in some way excluded the existence of liquidity trap. If there is an additional and unanticipated increase in money stocks that inhabitance holding, there will be an increase in spending due to change in relation between marginal utility of holding money and marginal utility of possession of goods and services which was in equilibrium before. In other words people will spend additional money, which is provided by eg. central bank, because the new money changes the marginal-utility relation and finally economy reaches its equilibrium with higher prices (Stein, 1970).

Among small number of publications, which were published in pre-Kurgman (1998) times, we can find an interesting example of Grandmont and Laroque (1976). They consider the statement: "the demand for money may tend to infinity when the rate of interest goes to zero" (Grandmont and Laroque, 1976, p. 132). They conclude that liquidity trap arises in the condition of trade-off between the short run demand for long-terms bonds and short run money stock. The model can be sketched briefly as follows:

In the closed economy are: central bank, which issues *fiat* money by open market bond purchase; there is the spot market for: goods, money and bonds; there are assets prices and good prices; on the spot market agents expect future prices of assets and goods

When central bank open market purchases tend to infinity, assets prices tend to infinity too; eventually the money value is rising as long as agents expect goods prices not to rise.

When agents expect rise in goods prices, the value of money tends to zero.

Eventually there is a short run trade-off between long-term bonds and money stock, which is depended on expectation of future goods prices or assets prices.

Bank accounting identity:

$$M = -(b^j - \sum_i b_i(t-1)) / r + \sum_i b_i(t-1) \tag{3}$$

Where M denotes money demand, b^j – amount of bonds outstanding held by central bank, b_i are bonds hold by investors, r – the interest rate set by central bank and t is time. The model assumes that M tends to infinity when r tends to zero under liquidity trap condition.

Japan is now the most vital example of liquidity trap since the middle of 1990's, as there is a vast of papers exploring this case from monetary approach. Fujiki and Watanabe (2004) assumed the existence of liquidity trap "as a nonlinear M1 demand function with respect to the short-term nominal interest rate". Cointegration between real M1, real cash, demand deposits and Indices of Industrial Production, call rate failed to reject the null hypothesis of no cointegration. Bae, Kakkar, Ogaki (2006) have also test the liquidity trap conditions in case when money demand is infinitely elastic as the consequence of zero-interests bond. They estimated the following money-demand equations:

$$\frac{M_t}{P_t Y_t} = \beta_0 + \beta_1 i_t + u_t \tag{4a}$$

$$\frac{M_t}{P_t Y_t} = \beta_0 + \beta_1 ln \frac{1+|i_t|}{|i_t|} + u_t \tag{4b}$$

Where: i – is the short-term interest rate, P is a price level, Y is the output and M is the money supply measure; all in logarithms. The test for liquidity trap was to check whether functional better fits the data. They conclude that non-linear money demand function fits better to the Japanese data and it is an evidence for liquidity trap

LIQUIDITY TRAP – LOOKING FOR THE U.S. EVIDENCE IN THE 2008- CRISIS

The aim of the study is to find evidence on liquidity trap in the United States during the unconventional monetary policy introduced by Ben Bernanke in period after Lehman Bros. collapse in september 2008. This example is somewhat different from Japanese case.

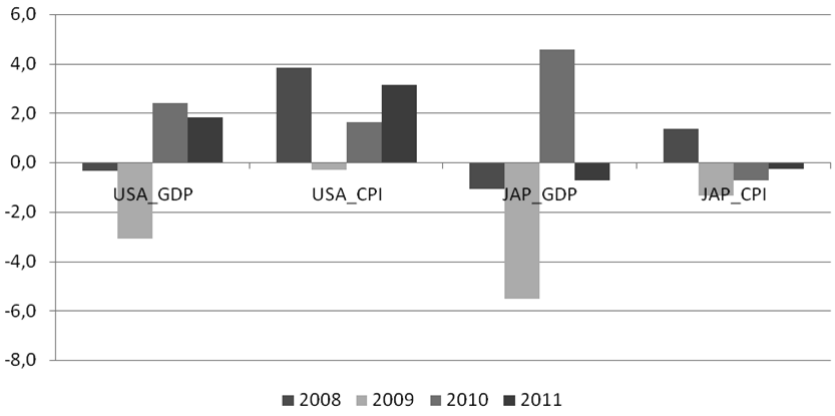

Figure 1. Real output growth and CPI (yoy) in the USA and Japan
Source: data FRED.

Figure 1 shows the evolution of the main economics aggregate in the USA and Japan. The Japan case, as stressed in the literature is the classical liquidity trap. In the USA overall inflation rate is positive and output rose in the 2010 and 2011.

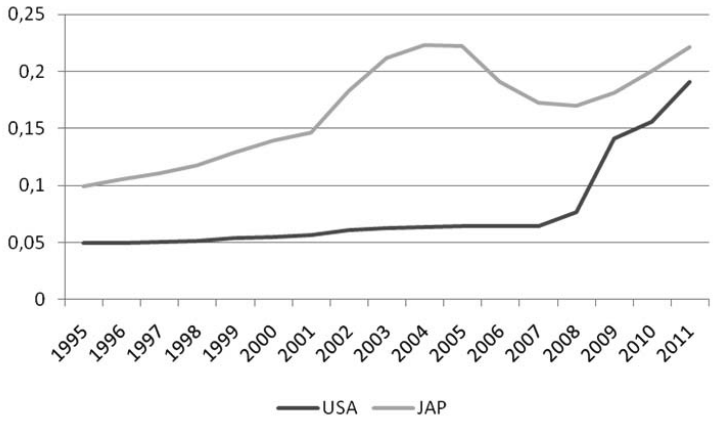

Figure 2. Monetary base as the share of real GDP in the U.S. and Japan
Source: data FRED and Bank of Japan.

On the other hand the share of the monetary base in GDP rose sharply in the US since quantitative easing policy was introduced (2008-2009), similar to the Japan's case. In the beginning of the 2000's National Bank of Japan introduced large-scale asset purchase, which caused the raise of the share of monetary base in real GDP (figure 2)

The monetary approach in the assessing the liquidity trap will be based on money demand equation. The theory of money assumes that real cash balance should be relevant to the real economic activities. As stated above liquidity trap can be assessed by transactional money demand function. Estimating long-run relation is limited by data availability – quarterly sample is too short. Kruszka (2004) estimated money demand using monthly data. This model measures income elasticity of money with respect to income a_1, which should be positive and a_2 is money demand elasticity with respect to interest rate, which should be negative.

$$\left(m-p\right)_t = a_1 y_t + a_2 i_t + \epsilon_t \tag{5}$$

Where: (m – p) is the real cash balance, y – measure of output, i – interest rate, π – inflation; all in logarithms. The first step in assessing the liquidity trap in the U.S. during 2008- crisis is to proof that long-run relation of money-demand equation changed or there is no cointegration between the money balance and interest rate or output measure (as Japan's evidence suggests). Periods 1992m1 – 2008m8 and 2008m9 – 2012m11 will be compared. Standard Johansen test of contiegration applies for (5). The procedure need integrated time trends, so the first step is to run unit root test. The data used are: $(m-p)$ – monetary aggregate divided by price level. Monetary Base, M1, M2 and CPI; y – is the measure of economic activity, which provide transactional money demand – Industrial Production Index (INDPRO) and Real Retail and

Food Service Sales (RRSFS) are used; finally *i* is the interest rate 3-Month Treasury Constant Maturity Rate (DGS3MO).

The accounting procedure for U.S. monetary aggregates indicates that Monetary Base is the currency in circulation plus deposits held by all depository institutions. M1 on the other hand is currency in circulation without bank vaults. The raise in the Monetary Base was associated with the raise in bank reserves, which means that banks are reluctant to lend money to other banks and public and set aside excessive reserves. For this reason *bank reserves* (WRESBAL) will be in the analysis included.

Table 1

The KPSS Unit root test for data used in (5) in levels

Subsample	Monetary base in (m – p)	M1 in (m – p)	M2 in (m – p)	*y* - retail sales	*y* industrial production	*i*	*Bank reserves*
1992m1 – 2008m8	1,7134	0,5411	1,7108	1,7092	1,6039	0,4400	0,9950
2008m9 – 2012m11	0,8818	0,9421	0,9026	0,8714	0,7536	0,4523	0,8886
1992m1 – 2012m11	1,6173	0,6084	1,9948	1,7230	1,5348	1,2028	0,9140

Source: own calculations.

The critical value at the 5% level of significance is 0,463. All the variables in the table 1 are integrated processes. A questionable is the interest rate as the process is integrated in the period 1992m1 – 2012m11 and is not integrated in the subsamples.

Table 2

Johansen test of cointegration rank in (5)

Subsample	H_0: r = 0			H_0: r = 1
	monetary base in (m – p)			
	Eigenvalue	Trace Test	Eigenvalue	Trace Test
1992m1 – 2008m8	0,1262	55,46*	0,0999	29,15
2008m9 – 2012m11	0,5739	75,68*	0,3746	32,18*
	M1 in (m – p)			
1992m1 – 2008m8	0,1208	56,95*	0,0799	31,85*
2008m9 – 2012m11	0,4627	67,16*	0,3785	35,48*
	M2 in (m – p)			
1992m1 – 2008m8	0,1452	63,41*	0,0827	32,81*
2008m9 – 2012m11	0,4447	65,21*	0,3761	35,21*

Source: own calculations. Data: FRED (*) denotes rejection of the null hypothesis at 5% significance.

Findings in table 2 provide that there is at least one cointegrating vector among analyzed variables.

Table 3

Normalized cointegrating vectors for (5)

Subsample	$m - p$	y_1 *(retail sales)*	y_2 *(industrial prod.)*	i
	monetary base in $(m - p)$			
1992m1 – 2008m8	1,000 1,000	-1,4405 (0,1383) 0,000	0,1282 (0,1147) -0,7889 (0,0786)	0,0492 (0,006) 0,0827 (0,018)
2008m9 – 2012m11	1,000 1,000	-0,5163 (2,2606) 0,000	-2,0299 (1,9548) -2,4740 (0,4832)	-0,0025 (0,0276) 0,0004 (0,0270)
	M1 in $(m - p)$			
1992m1 – 2008m8	1,000 1,000	-0,9038 (0,2614) 0,0000	1,1555 (0,2175) 0,6787 (0,108)	0,0402 (0,014) 0,0983 (0,0281)
2008m9 – 2012m11	1,000 1,000	17,73 (4,1) 0,000	-18,97 (3,6) -2,4800 (0,4078)	-0,0399 (0,0559) -0,0460 (0,0223)
	M2 in $(m - p)$			
1992m1 – 2008m8	1,000 1,000	-0,8428 (0,5448) 0,0000	-0,6526 (0,4841) -1,4568 (0,1267)	0,0283 (0,0232) 0,0320 (0,0265)
2008m9 – 2012m11	1,000 1,000	72,77 (14,0) 0,000	-69,47 (12,42) -1,099 (0,2900)	-0,0794 (0,1827) -0,0500 (0,0158)

Source: own calculations; data: FRED. Standard errors are in parentheses.

Outcomes in the table 3 show the structural change between periods 1992-2008 and 2008-2012. The period 1992-2008 indicate a stable relation as suggested by (5). The elasticity of demand for money with respect to interest rate seems to be stable and is ca. 0,03 – 0,04, which means that raise in the interest rate by one pp. decrease the demand for legal tender by 0,03 – 0,04 percent. Kruszka (2004) for example found similar elasticity in the Eastern Europe. In the period 2008 – 2012 the mentioned elasticity turns to be negative or insignificant. On the other hand income elasticity of demand for money increases, which indicate that money demand, tends to infinity, when the interest rate approaches to zero, as monetary approach to the liquidity trap suggests.

Table 4

Johansen test of cointegration rank between real money balance and bank reserves

Subsample	H_0: r = 0			H_0: r = 1
	monetary base in (m – p) and bank reserves			
	Eigenvalue	Trace Test	Eigenvalue	Trace Test
1992m1 – 2008m8	0,0373	9,8197	0,0122	2,3964
2008m9 – 2012m11	0,9736	187,97*	0,0500	2,6192

Source: own calculations. Data: FRED (*) denotes rejection of the null hypothesis at 5% significance.

Table 5

Normalized cointegrating vectors for real money balance and bank reserves

Subsample	*m – p*	*bank reserves*
monetary base in (m – p) and bank reserves		
1992m1 – 2008m8	1,000	9,6436 (2,9873)
2008m9 – 2012m11	1,000	-0,5176 (0,0556)

Source: own calculations; data: FRED. Standard errors are in parentheses.

Findings in the table 4 and 5 assess the cointegration between real money balance and bank reserves. According to the credit channel theory, cost of 'lemons' catch the economy into liquidity trap. Raise in money supply will be not transmitted to the price level or output gap, as excessive money supply is set aside as a reserves in the central bank.

The cointegration between real money, when using Monetary Base as monetary aggregate is insignificant in the period 1992-2008.[2] In the period 2008 – 2012 the significance of cointegration is very high, which indicate that raising Monetary Base was strictly associated with the raise in bank reserves.

Neo-Keynesian approach to the liquidity trap comes from economic expectations strictly. Since expectations to the future economic growth are absent, aggregate demand will not raise, as stated in the relation (1) and (2). The data used to asses this approach are: the difference between the expected retail sales (University of Michigan Sentiment Index – y^*) and actual real retail sales (RRSFS) - y; the interest rate: 3-Month Treasury Constant Maturity Rate (DGS3MO) – i. The data are prepared as follows:

$$\frac{y^*}{y} = 1000 * \frac{Sentiment\ Index}{Real\ Retail\ Sales}.$$

[2] Note that in the Monetary Base reserves held by credit institutions are inculded.

Table 6

The KPSS and PP Unit root test for in levels for *y*/y*

Subsample	KPSS	PP
1992m1 – 2008m8	1,4397	-0,4804
2008m9 – 2012m6	0,1338	-2,8817
1992m1 – 2012m6	1,7541	-1,0170

Source: own calculations.

In the table 6 all the subsample are integrated according to PP unit root test at 5% significance level, but KPSS indicate that in the period 2008m9 – 2012m6 *y*/y* is not integrated.

Table 7

Johansen test of cointegration rank between *i* and *y*/y*

Subsample	H_0: r = 0			H_0: r = 1
	Eigenvalue	Trace Test	Eigenvalue	Trace Test
1992m1 – 2008m8	0,0297	5,8927	0,000	3,8417
2008m9 – 2012m11	0,2393	19,22*	0,1344	6,6421*

Source: own calculations. Data: FRED (*) denotes rejection of the null hypothesis at 5% significance.

Table 8

Normalized cointegrating vectors for *i* and *y*/y*

Subsample	*i*	*y*/y*
monetary base in (m – p) and bank reserves		
1992m1 – 2008m8	1,000	-4,2459
2008m9 – 2012m11	1,000	-20,881

Source: own calculations. Data: FRED (*) denotes rejection of the null hypothesis at 5% significance.

Outcomes from cointegration shows that there is no cointegration in the period 1992 – 2008 between interest rate and the *y*/y*. In the period 2008 – 2012 cointegration is significant at 5% level. The sign of normalized vector is consistent with the theory suggested in (1). In case of fixed future expectations (y*), any raise in retail sales creates expected decrease in current sales, as real interest rate raises (higher *y* means higher *i*). Hence economy delivers equilibrium interest rate no matter the nominal production, as suggested by Krugman (1998).

CONCLUSIONS

Liquidity trap occurs, when violent monetary stimulation is not transformed by economy to rise in prices and output. Usually central bank enlarges monetary aggregates by bonds purchase. The aim of such a monetary policy is to: a) lower interest rates, as excessive demand raise bond's price, hence lower the interest rate, b) provide economy with more cash holding instead of holding longer-maturity assets. As monetary theory predicts larger cash holding and low interest rate should deter economy from deflation and depression as Friedman suggests that great depression of the 1930's was caused by decrease of money supply in the economy.

On the other hand Keynesian approach suggests that when demand is reluctant to grow, excessive money supply will not raise prices and output, as bonds and money turns to be perfect substitutes, when interest rate tends to zero. An expectations seems to be crucial in monetary transmission channel. Unsuccessful monetary policy can caused by monetary intermediation frictions and associated cost of 'lemons'. Additional money supply will therefore be stored in banks' vaults instead of providing economy with the credit.

The aim of conintegration analysis is to confirm long-term relation between economic aggregate. The 2008- crisis has last only for four years, but using monthly data is possible to find some persistent economic relation. The analysis is based on comparison between 2008- crisis relation and those which was observed during the 1990's and 2000's. The outcome provides at least a structural change in the U.S. economy since Lehman Bros. collapse. The analysis provide an evidence of structural economy change suggesting the liquidity trap condition in following aspects: a) money demand elasticity with respect to the interest rate; b) money demand elasticity with respect to the income; c) raise a cost of 'lemons' in the financial intermediation sector; d) increased sensitivity of output expectations with respect to the interest rate.

Further research can assess the relation between different maturity interest rate, economic expectation and monetary aggregates.

REFERENCES

Akerlof, G.A. (1970). "The Market for 'Lemons': Quality Uncertainty and the Market Mechanism". *Quarterly Journal of Economics* (The MIT Press) 84.

Bae, Y., Kakkar, V., Ogaki, M. (2012), Money Demand in Japan and Nonlinear Cointegration, *Journal of Money, Credit and Banking*, Vol. 38, No. 6 (Sep., 2006), pp. 1659-1667.

Bernanke, B. (1983), Nonmonetary Effects of the Financial Crisis in the Propagation of the Great Depression, *The American Economic Review*, Vol. 73, No. 3 (Jun., 1983), pp. 257-276.

Bernanke, B. (2004), *The Great Moderation*, *At the meetings of the Eastern Economic Association*, Washington, DC February 20, 2004.

Bernanke, B., Gertler, M. (1995), *Inside the Black Box: The Credit Channel of Monetary Policy Transmission* in: *Journal of Economic Perspectives*, vol. 9:4 pp. 27-48.

Friedman, M. Schwartz, A.J. (1963), *A Monetary History of the United States 1867-1960*, Princeton University Press

Friedman, M. (1969), *The Optimum Quantity of Money* in Milton Friedman ed. *The Optimum Quantity of Money and Other Essays*, Aldine Publishing Company, Chicago, 1-50.

Fujiki, H., Watanabe, K. (2004), *Japanese Demand for M1 and Demand Deposits: Cross-Sectional and Time-Series Evidence from Japan*, Bank of Japan Discussion Paper No. 2004-E-12.

Grandmont, J.M., Laroque, G. (1976), *The Liquidity Trap* in *Econometrica*, Vol. 44, No. 1 (Jan., 1976), pp. 129-135

Hicks, J.R. (1937), *Mr. Keynes and the 'Classics'*, Econometrica 5(2): 147-59.

Jeanne, O., Svensson, L.E.O. (2007) Credible Commitment to Optimal Escape from a Liquidity Trap: The Role of the Balance Sheet of an Independent Central Bank, *The American Economic Review*, Vol. 97, No. 1 (Mar., 2007), pp. 474-490.

Kacperczyk, M. and Schnabl, Ph. (2010) When Safe Proved Risky: Commercial Paper during the Financial Crisis of 2007–2009 *Journal of Economic Perspectives*—Volume 24, Number 1—Winter 2010—Pages 29–50.

Keynes, J.M. (1936), The General Theory of Employment, Interest, and Money.

Krugman (1998) It's Baaack: Japan's Slump and the Return of the Liquidity Trap, *Brookings Papers on Economic Activity*, 2:1998.

Krugman, P. (2010), An Economy Under Siege, Lecture at Yale University, 21.12.2010.

Kruszka, M. (2004), The Monthly Transactional Demand for Money in Countries under Transition: Evidenence from Cointegration Test, University of Crete Conference Proceeding: International Conference on Macroeconomic Analysis and International Finance.

Martens, K., Raven, M. (2011), Credit Channels in a Liquidity Trap, CEPR Discission Paper 8332.

Stein, J.L., (1970) The Optimum Quantity of Money by Milton Friedman Review by: Jerome L. Stein, *Journal of Money, Credit and Banking* , Vol. 2, No. 4 (Nov., 1970), pp. 397-419.

Svensson, L. O. (2001) "The Zero Bound in an Open Economy: A Foolproof Way of Escaping from a Liquidity Trap," Monetary and Economic Studies, February 2001, 19 (S1), 277–312.

Svensson, L.O. (2010), Inflation Targeting, NBER Working Paper 16654.

Woodford, M. (2003), Interests and Prices, Foundationes of a Theory of Monetary Policy, Princeton University Press.