Scientific Papers (www.scientificpapers.org)
Journal of Knowledge Management, Economics and Information Technology

Vol. IV, Issue 4
August 2014

The Endogenous Money Hypothesis: An Empirical Study of the Euro Area (1999-2010)

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In this paper I examine the endogenous money supply hypothesis in the Euro Area using data from 1999 to 2010. In doing so, I make extensive use of Vector Auto regression models (VAR) with Granger causality procedure to analyze non-cointegrated series and Vector Error Correction models (VECM) for cointegrated series. The cointegration analyses reveal a bidirectional causality between loans and M1 both in the short and long run whereas loans cause variations in the M2 mainly in the short run. However, according to Granger causality test there is a one-way causality from loans to M3 but not from loans to industrial production index. The results are confirmed by adjusting the loans series for securitization activity in the Euro Area and partially support the accommodations view.

Keywords: *bank channel lending, money supply endogeneity, securitization, long-run cointegrating relationship*

Introduction

According to Post-Keynesian economists' money supply is endogenous and determined by credit-money demand. The use of credit-money originated from debt and credit decisions gives a central role to the banking system ([8]) and the process of money creation becomes independent from the Central Bank actions.

Money endogeneity implies a causality direction from loans to bank deposits. Loans demand is affected by nominal wages: an increase in firms' labor demand leads to higher wages costs resulting in an increase of loans demand.

However, according to Keynesians, monetary policy affects both monetary base and money supply. Changes in money supply cause interest rates fluctuations which in turn affect in-vestments and income.

Post-Keynesian economists argue that global demand (PY) determines the amount of money transactions (MV). In this case, the direction of causality according to the quantity theory of money is reversed. Credit-money is anticipated by the banking system to finance entrepreneurs" requests. Consequently, the quantity of money is determined endogenously by market demand. According to this theory, the high powered money is "a credit result and not the cause of it" ([3]). This inversion of relationship can be represented through the credit multiplier overthrow ([3], [8]). Money base in accordance with Post-Keynesians is a banking process to obtain reserves from Central Banks. Requests to refinance deposits may exceed the capacity of individual banks, which are forced to refund by the Central Bank: through this process additional monetary base is created ([3]). This reversed causal relationship between payments and high powered money implies that Central Banks control money supply through interest rates ([19]).

This vision contrasts the exogenous multiplier approach on the monetary base. According to this theory, Central Banks control monetary base by setting money stock equal to a given tar-get value ([12]).

The debate among Post-Keynesians is about the role played by banks in satisfying loans demand. Accommodation lists argue that Central Banks set the cost of short term liquidity using interest rates (overnight interest rate). In granting loans to credit-worthy borrowers, the banking system - setting a loan rate equal to a fixed mark-up on the overnight interest rate - acts as price setters (sets loan rate) and quantity takers (does not affect loans amount). In-stead, Structuralists argue that Central Banks control reserves ([15]), while the banking system manages liability to increase its own loans/reserves rate ([17]). In accordance with Structuralists, in fact, mark-up changes cyclically and in relation to risk positions ([20]). Supporters of Post-Keynesian theory found the following empirical evidence to confirm this theory ([19]):a)Various econometric results confirm that the

money supply is passive ([14], [19], [20]); b) Money endogeneity can be explained with other economic variables. According to this aspect Cifter and Ozun (2007) analyze the correlation between money, interest, inflation and productivity using VECM models.

In this paper, I analyse money endogeneity in a short term study of the Euro Area during the two main crises: the dot-com bubble burst (1998-1999) and the sub-prime mortgage crisis (2008-2009). I adjust loans series for securitization activity to investigate whether the European banking system – by obtaining additional liquidity independently of the Central Bank re-serve - could shelter its own loans supply from the effect of monetary policy ([2]).

Finally, I extend the evidence of endogenous money hypothesis on other advanced countries. In fact, there is a small amount of empirical evidence available on developed countries ([14] [16], [19]) and a study on Euro Area could fill this gap. I focus my analysis in particular on the aggregate M3. In fact, in the study period the European Central Bank uses M3 money supply as its monetary target.

The paper is organized as follows: Section 2 briefly discusses the literature on passive money hypothesis. Section 3 describes the data and tests stationarity and cointegration. Section 4 implements VAR models applying Granger causality test for non cointegrated series, VECM models based on causality test for cointegrated series and discusses the implications of the results. Section 5 concludes and suggests direction for futures investigations.

Literature Review

The theories that support the Post-Keynesian view consider different causal relationships.

According to accommodation lists ([12]) there is full settlement of reserve demand by Central Banks versus banking systems that totally accommodates loans requests. Consequently, there is a one-way causal relationship from loans (L) to monetary base (BM) and from loans (L) to monetary aggregates (M1-M2-M3). Furthermore, debtors establish their own loans demand considering future income expectations. At the same time, deposits created with new loans are used to finance increases in aggregate demand. To sum up, the accommodationist view ([12], [17]) involves a two-

way causality relationship between money revenue (GDP) and money supply (M1-M2-M3).

The structuralist hypothesis ([15],[16],[17]) combines the classical characteristics of monetarism (the Central Bank controls reserves supply) with the accommodationist view. This vision implies bidirectional causality from monetary base (BM) to loans (L), from money supply (M1, M2, M3) to loans (L) and from money multipliers (M1/B, M2/B, M3/B) to loans (L). Structuralists consider the use of alternative financing forms to partially exceed reserves shortage ([16]). Considering the relationship between income (GDP) and money supply (M1, M2, and M3), structuralism is consistent with accommodationalism, which implies bi-directionality between the two variables.

The exponents of the liquidity preference theory ([7]) support the core of accommodationalist that argues a causal relationship from loans (L) to money supply (M1, M2, and M3). However, the economic units involved have independent liquidity preference on how much money they wish to hold, so a supply excess may exist ([7]). In this case, the liquidity preference view implies two-way causality from money supply (M1, M2, and M3) to loans (L).

In Post Keynesian economics the first work on passive money is carried out by Pollin (1991) that obtains results supporting structuralism for USA during 1953-1988. Vera (2001) finds outcomes sustaining accommodationalist and structuralist theories for Spain in the period between 1987-1998 using Granger causality test applied to money multipliers (M1/B, M2/B, M3/B) and loans data. Nell (2000-2001) examines the relationships between money supply, money circulation velocity and loans using VECM models for South Africa during 1966-1997 and confirms all Post-Keynesian approaches (Structuralist, Accommodationalist and liquidity preference theorist). Shanmungan Nair and Li (2003), analyze the relationships between money base, money supply, credit and industrial production index with VECM models and Granger causality test in Malaysia in the period between 1985-2000: their results support the accommodationalist and liquidity preference theorists. Lavoie (2005) tests money endogeneity in Canada and in United States obtaining results that sustain accommodationalist view. Ahmad and Ahmed (2006) apply VAR models for non cointegrated series (short term test) and VECM models (long term test) for cointegrated series on passivity money hypothesis for Pakistan

during 1980-2003. The short term results confirm the structuralist and liquidity preference approaches while the long-run test highlights the active role of Pakistan Central Bank to set money supply. Gunduz (2001), Seyrek, Duman and Sarikaya (2004) analyze the role of Turkish channel lending during 1986-1998 applying VAR models. Their findings support an active role of monetary policy.

Finally, Cifter and Ozun (2007) examine the passive money hypothesis in Turkey for the period between 1997-2006 using money base, money supply, industrial production index, interest rate, inflation rate, and exchange rate through a VECM models. Their results partially support accommodationalist theorists because there is one-way causality relationship from credit to money base and from credit to money supply but there does not exist a causal relationship between money supply and industrial production index.

Data

I employ monthly data drawn from European Central Bank Statistical Data Wharehouse. The variables are: loans (L), M1 money supply (M1t), M2 money supply (M2t), M3 money supply (M3t) and monetary base (BMt) and they are expressed in millions of Euro. Following Vera (2001), I decompose money supply into monetary base (BM) and money multipliers (M1_B, M2_B, M3_B). This helps testing the significance of liability management as a source of loan demand accommodation. The sample examined is the European area. The results are also con-firmed when running the analysis only on the countries which joined monetary policy at the same time: Belgium, Germany, Spain, Ireland, France, Italy, Luxembourg, Netherlands, Austria, Portugal and Finland. I transform data by taking logarithms. The sample period goes from 1999:02 to 2010:12. I choose 1999 as the base year of this study because there is a single monetary policy whereby all banks are subject to one monetary regime. The total amount of observations is 143. A large sample size enhances the power of my estimation. I seasonally adjust the series using Tramo/Seats procedure (to avoid problems related to series seasonality). They exhibit the typical pattern of non-stationary series with increasing trends (Fig. 1, Fig. 3.) except for money multipliers that show stochastic trends (Fig. 2.).

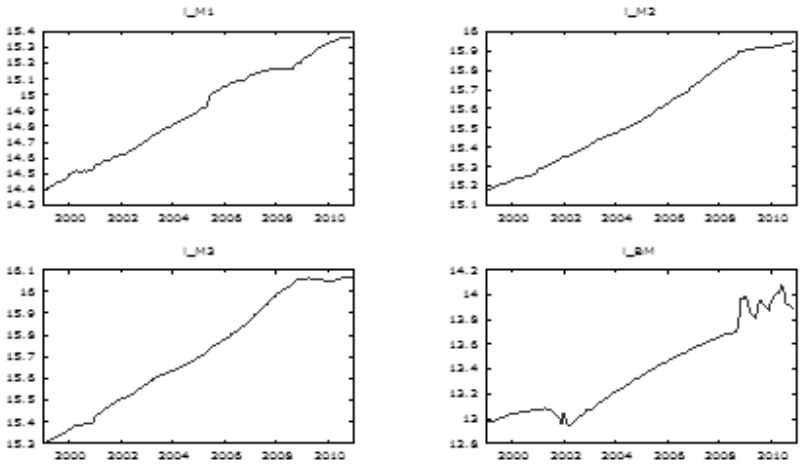

Figure 1: Series in log-levels of base money and monetary aggregates seasonally adjusted

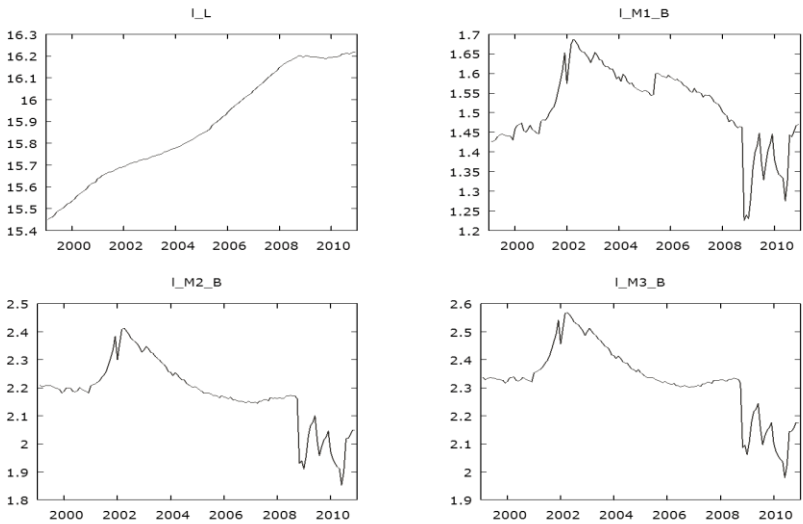

Figure 2: Series in log-levels of loans and money multipliers seasonally adjusted

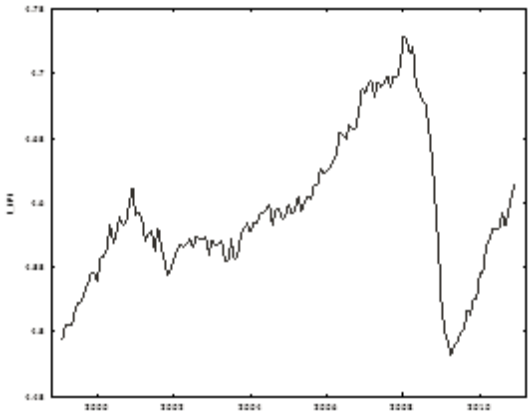

Figure 3: Series in log-levels of industrial production index seasonally adjusted

Unit roots test

From the graphical inspection of the series in log-levels reported in Fig. 1., Fig. 2., and Fig. 3. all variables seem to be I(1), or not stationary and that is jointly confirmed by the Augmented Dickey-Fuller (ADF) test, Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test and Phillips Per-ron (PP) test. Series appear persistent as shown in Table 1. The ADF test and PP test, in fact, never reject at the 5% level of significance the null hypothesis of unit root's presence, while the KPSS test never accept the null hypothesis of unit root's absence.

Table 1: Unit root test of series in log-levels[a]

Variables	Lags	ADF Test (p-value)	KPSS Test (test statistic)	PP Test (test statistic)	Results
l_L	13	0.72	1.12[b]	-1.73[c]	**I(1)**
l_BM	8	0.96	1.63	-1.46	**I(1)**
l_M1	13	0.88	1.12	-1.89	**I(1)**
l_M2	6	0.77	2.13	-1.36	**I(1)**

l_M3	3	0.63	3.63	-1.83	**I(1)**
l_M1_B	8	0.51	1.66	-1.4	**I(1)**
l_M2_B	8	0.76	1.11	-2.14	**I(1)**
l_M3_B	8	0.76	0.8	-1.79	**I(1)**
l_IPI	13	0.39	1.85	-1.93	**I(1)**

Notes: [a] The results confirm graphical intuition. [b] The critical value at 5% level of significance is equal to 0.46 and the critical value at 1% level of significance is equal to 0.73 so the null hypothesis Ho: no unit roots is rejected. [c] The critical value at 5% level of significance is equal to -2.88 and the critical value at 1% level of significance is equal to -3.47 so the null hypothesis Ho: presence of unit roots is not rejected.

I apply the ADF test, PP test and KPSS test to the variables in log-levels transformed into first-order differences. The results are reported in Table 2:

Table 2: Unit roots test of series in log first-order differences

Variables	**Lags**	**ADF Test (p-value)**	**KPSS Test (test statistic)**	**PP Test (test statistic)**	**Results**
Δl_L[a]	12	0	0.25[b]	-18.78[c]	**I(0)**
Δl_BM	13	0.08	0.14	-10.46	**I(0)**
Δl_M1	12	0.02	0.12	-11.32	**I(0)**
Δl_M2	12	0	0.17	-12.36	**I(0)**
Δl_M3	2	0.003	0.58	-9.83	**I(0)**
Δl_M1_B	13	0.048	0.10	-10.98	**I(0)**
Δl_M2_B	13	0.048	0.11	-10.90	**I(0)**
Δl_M3_B	13	0.007	0.10	-10.79	**I(0)**

Δl_IPI	10	0.004	0.09	-24.08	**I(0)**

[a] I apply the Hodrick- Prescott filter to loans series. [b] The critical value at 5% level of significance is equal to 0.46, the critical value at 1% level of significance is equal to 0.73. In this case the statistic test results accept the null hypothesis Ho: no unit root presence. [c] The critical value at 5% level of significance is equal to -2.88, the critical value at 1% level of significance is equal to -3.47. In this case the statistic test results reject the null hypothesis Ho: unit root presence.

The PP, ADF and KPSS test jointly confirm stationarity of the series, so I can confirm that they do not contain more than one unit root and are integrated of order 1 in log-levels.

Cointegration Analysis

Contrarily to Shanmugam, Nair and Li (2003), where residuals based on cointegration analysis of Engle-Granger (1991) are used, I apply the Johansen procedure on bivariate VAR models to consider multiple cointegration relationships, as in Cifter and Ozun (2007).

Since the variables individually follow non stationary I(1) processes in levels and they become I(0) in their first-order differences, I can apply Johansen cointegration test. I run the test inserting the lags order that minimizes the three information criteria (AIC, BIC, HQC) and the option "unrestricted constant". I insert dummies to capture the effects of Central Bank interventions and business cycle effects. The trace test and the maximal eigenvalue test reveal one cointegrating vector at 5% level of significance among loans-M1 and loans-M2 (Table 3).

A nonzero cointegrating vector represents the influence from a long-term force. The cointegrating vector specifies a long term relation among the levels of loans, M1, and M2. Any deviation from this relation will cause loans to change and the impact of this deviation will last for a long period of time because it is the levels of the variables that cause the loans change. Since a nonzero cointegrating vector has enduring effect, it represents the influence in the long run. The results are shown in Table 3.

Table 3: The maximal Eigenvalue Test and the Trace Test of Johansen

Variables	**Lags**	H_0	λ_{trace} **Stat.**	λ_{max} **Stat.**	**Results**
l_L and l_BM	**3**	**r=0**	10.95 [0.21][a]	7.75 [0.21]	**Not Cointegrated**
l_L and l_M1[b]	**2**	**r=0**	13.60 [0.079]	13.051 [0.07]	**Cointegrated**
		r=1	0.55 [0.48]	0.45 [0.48]	
l_L and l_M2[c]	**2**	**r=0**	20.31 [0.007]	17.43 [0.02]	**Cointegrated**
		r=1	2.87 [0.59]	2.87 [0.59]	
l_L and l_M3	**2**	**r=0**	13.28 [0.10]	8.20 [0.36]	**Not Cointegrated**
l_L and l_M1_B	**3**	**r=0**	11.86 [0.16]	6.75 [0.52]	**Not Cointegrated**
l_L and l_M2_B	**3**	**r=0**	10.9 [0.21]	7.55 [0.43]	**Not Cointegrated**
l_L and l_M3_B	**3**	**r=0**	10.14 [0.27]	6.95 [0.50]	**Not Cointegrated**
l_L and l_IPI	**4**	**r=0**	13.69 [0.29]	10.24 [0.2]	**Not Cointegrated**

l_M1 and l_IPI	**4**	**r=0**	12.48 [0.13]	10.43 [0.18]	**Not Cointegrated**
l_M2 and l_IPI	**4**	**r=0**	3.58 [0.9]	3.24 [0.9]	**Not Cointegrated**
l_M3 and l_IPI	**4**	**r=0**	5.31 [0.77]	3.21 [0.92]	**Not Cointegrated**
l_BM and l_IPI	**4**	**r=0**	3.3 [0.94]	3.3 [0.91]	**Not Cointegrated**

Notes: [a] The values in parentheses are the respective *p-values*. [b] I accept for this relationship the cointegration relationship at 10% level of significance to analyze the long-run effect. [c]For an anomalous series behavior in 2001:01 I add a dummy variable that results statistically significant.

Using Johansen procedure I obtain zero cointegrating vector among loans-monetary base, loans-M3, loans-money multipliers, loans-IPI and IPI-M1, M2, M3, BM. So, according to Vera (2001) and Shanmugam, Nair and Li (2003) rather than levels, I use in my analysis variables first-order differences in order to estimate stationary VAR models. I test also, for each relationship, the absence of autocorrelation and conditional eteroschedasticity (ARCH effects) in the residual. Supplementary appendices including these results are available from the author upon request.

A VAR model to test the hypothesis of money endogeneity in the Euro Zone

I estimate bivariate VAR models for not-cointegrated stationary series. I select the optimal lags order for each VAR model considering the

information criteria of Akaike (AIC), Hannan-Quinn (HQC) and Schwartz (SIC). I use 2 lags for the relationship loans-monetary base (BM) and loans-money multipliers (M1/B, M2/B, M3/B) while 1 lag for the relationship loans-M3.For each VAR model I apply Wald test to analyze the endogenous money hypothesis. The results are reported in Table 4, 5, 6, 7. Supplementary tests do not show evidence of autocorrelation nor ARCH effect on the residuals. For brevity, I do not report here the results.

Table 4: Wald test for the lags' significance of money multipliers, base money and M3 in the loans regression

	$\Delta l_{M1\_B_t}$	$\Delta l_{M2\_B_t}$	$\Delta l_{M3\_B_t}$	Δl_{BM_t}	Δl_{M3_t}
Lag 1	0.84 [0.35] [a]	1.19 [0.27]	1.13 [0.28]	1.34 [0.24]	0.12 [0.72]
Lag 2	18.20 [0]	11.62 [0]	10.10 [0.001]	11.80 [0]	-

Notes: [a] The values in parentheses are the respective *p-values*.

Table 5: Wald test for the lags' significance of loans in the money multipliers, base money and M3 regression

	$\Delta l_{M1\_B_t}$	$\Delta l_{M2\_B_t}$	$\Delta l_{M3\_B_t}$	Δl_{BM_t}	Δl_{M3_t}
Lag 1 Δl_{L_t}	2.24 [0.13] [a]	0.3 [0.58]	0.22 [0.63]	1.34 [0.24]	5.51 [0.02]

Lag 2 Δl_{L_t}	0.07 [0.93]	0.08 [0.77]	0.11 [0.74]	11.80 [0.78]	-

Notes:[a] The values in parentheses are the respective *p-values*.

Table 6: Wald test for the jointly lags' significance of money multipliers, base money and M3 in the loans regression

	$\Delta l_{M1\_B_t}$	$\Delta l_{M2\_B_t}$	$\Delta l_{M3\_B_t}$	Δl_{BM_t}
Δl_{L_t}	10.66 [0] [a]	6.56 [0.001]	5.64 [0.004]	6.57 [0.001]

Notes:[a] The values in parentheses are the respective *p-values*.

Table 7: Wald test for the jointly lags' significance of loans in the money multipliers, base money and M3 regression

Dependent Variable	Δl_{L_t}
$\Delta l_{M1\_B_t}$	1.94 [0.14]
$\Delta l_{M2\_B_t}$	0.15 [0.85]
$\Delta l_{M3\_B_t}$	0.11 [0.89]
Δl_{BM_t}	0.11 [0.89]

Notes: [a] The values in parentheses are the respective *p-values*.

According to Wald test I find that money multipliers and base money are statistically significant in explaining the short term loans dynamic while the explanatory power of loans is relatively weak in the short run (Table 4, 6, 7). I find that the first loans lag (Table 5) influences monetary aggregate M3 and this result partially supports money endogeneity in the European area. To improve the economical interpretation of my results, I apply Granger causality test (Table 8).There is Granger-causality between loans and monetary base (also considered the optimal lag order) with a direction of causality from monetary base (BM) to loans (L), from money multipliers (M1/B, M2/B, M3/B) to loans (L), from industrial production index (IPI) to loans (L), money supply (M1, M2, M3) and money base (BM). In general, Granger-causality test underlines that the hypothesis of money endogeneity is weakly confirmed in the Euro area. In fact, considering the optimal lag loans Granger-Cause money supply M3 at 10% level of significance but do not Granger-Cause industrial production index. This result partially supports the accommodationalist view. Repeating the analysis for lag length, varying from optimal lag order to 12 does not affect the results. This confirms the robustness of the test.

Table 8: Granger causality test[a]

Variables		Optimal lags[b] (p.value)	6 Lags (p.value)	8 Lags (p.value)	12 Lags (p.value)
$\Delta l_{L\,t}$ $\Delta l_{M1\_B_t}$	->	0.52	0.44	0.6	0.5
$\Delta l_{M1\_B_t}$ $>\Delta l_{PR\,t}$	-	0.03**	0.05**	0.01***	0.01***
Δl_{L_t} $\Delta l_{M2_{B_t}}$	->	0.89	0.61	0.78	0.8
$\Delta l_{M2_{B_t}}$ $>\Delta l_{L\,t}$	-	0.01***	0.04**	0.04**	0.16

Δl_{L_t} -> $\Delta l_{M3_{B_t}}$	0.9	0.58	0.72	0.6
$\Delta l_{M3\_B_t}$ ->$\Delta l_{L\ t}$	0.01***	0.06*	0.06*	0.021**
Δl_{L_t} -> Δl_{BM_t}	0.7	0.6	0.7	0.5
Δl_{BM_t}->$\Delta l_{L\ t}$	0.01***	0.03**	0.03**	0.012**
Δl_{L_t} -> Δl_{M3_t}	0.001***	0.077*	0.085*	0.079*
Δl_{M3_t}->$\Delta l_{L\ t}$	0.86	0.19	0.27	0.51
$\Delta l_{L\ t}$ -> Δl_{IPI_t}	0.7	0.8	0.7	0.8
Δl_{IPI_t}->$\Delta l_{L\ t}$	0.01***	0.03**	0.07*	0.04***
Δl_{IPI_t} -> Δl_{M1_t}	0.02**	0.008***	0.001***	0.03**
Δl_{M1_t} ->$\Delta l_{IPI\ t}$	0.28	0.22	0.9	0.1
Δl_{IPI_t} -> Δl_{M2_t}	0.02**	0.05**	0.0005***	0.003***
Δl_{M2_t} ->$\Delta l_{IPI\ t}$	0.6	0.5	0.9	0.3
Δl_{IPI_t} -> Δl_{M3_t}	0.09*	0.008***	0.01***	0.002***

Δl_{M3_t} >$\Delta l_{IPI\ t}$	-	0.9	0.6	0.7	0.9
Δl_{IPI_t} Δl_{BM_t}	->	0.0098***	0.009***	0.008***	0.009***
Δl_{BM_t} >$\Delta l_{IPI\ t}$	-	0.31	0.4	0.5	0.5

Notes: [a] Ho: No *Granger-causality*. [b] For the lag selection I use the three informative criterions. The optimal lags is equal to 2 for all relationships except Loans-M3 whose optimal lag is equal to 1.[c] Considering the optimal lag, loans *Granger-Cause* M3 at 10% level of significance supporting the accommodationalist view. (*), (**), (***) indicate statistical significance at 10%, 5% and 1% percent level.

The vector error correction models

For the analysis of cointegrated series I apply VECM models using Wald test to analyze short term relationships ([4],[11],[19]). I use cointegration modeling to separate the potential long term relationship between money supply M1 and loans, money supply M2 and loans from their short term adjustment mechanisms. Johansen describes cointegrated variables (loans, M1, M2) as being in equilibrium when the stationary linear combination of their levels is at its unconditional mean that is usually assumed to be zero. The system is out of equilibrium when this combination of levels (loans, M1 and M2) is not zero. However, since the combination is stationary, there is always a tendency for the system to return to equilibrium. The non-zero stationary cointegration vector is defined "equilibrium error" (EC). I make the analysis of long run relationship considering EC parameter ([4],[19]). The results are reported in the Table 9. The error correction models imply a situation in which a long-term relationship exists among the variables (loans, M1, M2) in the economy and in which the equilibrium error induces change in the dependent variable. I estimate a vector error correction model of order 1 with rank one for the relationships loans-M1, and loans-M2. For both series, I added dummy variables in 2001:01 as dot-com bubble effect (DC). Since VECM order is one and the rank is one it is not necessary to impose other constraints for a correct interpretation ([11]).

Table 9: Causality test for the money endogeneity hypothesis based on vector Error Correction Model

	Short term Effect	**Long term Effect**	**VECM**	
	Wald Test	**EC_{t-1}**	**Short term**	**Long Term**
Dependent Variable: ΔlM1				
	2.98 (0.03)	-0.02 (0.09)	**lL=>lM1**	**lL=>lM1**
Dependent Variable: ΔlL				
	7.37 (0)	-0.02 (0)	**lM1=>lL**	**lM1=>lL**
Dependent Variable: ΔlM2				
	8.85 (0)	-0.009 (0.94)	**lL=>lM2**	**lL≠>lM2**
Dependent Variable: ΔlL				
	0.38 (0.67)	0.05 (0)	**lM2≠>lL**	**lM2=>lL**

Table 9 reveals that M2 influences loans in the long run because the cointegrating vector involve M2 (influence factor 0.05) but this relationship does not exist in the short term in which loans condition M2 money supply (influence factor 8.85). The earlier results of Granger causality test (Table 8) show a short term one-way causality from M2 money multiplier (M2_B) to loans, from monetary base to loans and from industrial production index to

loans. This implies that the Post-Keynesian view may not hold true in the case of Euro Area's M2 money supply. In the case of monetary aggregate M1 there is both, in the long and in the short run, a bidirectional causality between M1 and loans that may support the theoretical foundations of liquidity preference. However, in the short term I obtain that Granger causality runs from base money, M1 money multiplier (M1_B) and industrial production index (IPI) to the bank lending and not vice versa. In this case the absence of causality from total bank loans to the M1 money multiplier (M1_B) do not sustain the structuralist view, showing lack of evidence to support the use of liability management among European banks.

Robustness check: The securitization effect

In this section I test the robustness of my results by adjusting loans for securitization to analyze whether banks can insulate from monetary policy negative shocks through securitization. I estimate VAR models of order 2 for stationary series testing the endogenous money hypothesis with Granger Causality Test. The results are reported in Table 10.

Table 10: Granger Causality test

Variables[a]	**Optimal Lags**	**4 Lags (p.value)**	**8 Lags (p.value)**	**12 Lags (p.value)**
$\Delta l_{L\,sec_t}$ –> Δl_{IPI_t}	0.7	0.8	0.7	0.8
Δl_{IPI_t}->$\Delta l_{L\,sec_t}$	0.01***	0.05**	0.04**	0.1
$\Delta l_{L\,sec_t}$-> Δl_{M1_t}	0.61	0.76	0.61	0.11
Δl_{M1_t}->$\Delta l_{L\,sec_t}$	0.09*	0.06*	0.05**	0.81
$\Delta l_{L\,sec_t}$ ->$\Delta l_{M2\_B_t}$	0.85	0.75	0.76	0.71
$\Delta l_{M2_{B_t}}$ ->$\Delta l_{L\,sec\ t}$	0.02**	0.07*	0.06*	0.35

$\Delta l_{L\,sec_t}$ -> Δl_{M3_t}	0.01***	0.04**	0.04**	0.055*
$\Delta l_{M3\ t}$ –>$\Delta l_{L\,sec\ t}$	0.84	0.81	0.2	0.44
$\Delta l_{L\,sec_t}$ -> Δl_{BM_t}	0.33	0.66	0.61	0.59
Δl_{BM_t} ->$\Delta l_{L\,sec\ t}$	0.02**	0.05**	0.04**	0.36
$\Delta l_{L\,sec_t}$ ->$\Delta l_{M1\_B_t}$	0.64	0.65	0.83	0.71
$\Delta l_{M1\_B_t}$->$\Delta l_{L\,sec\ t}$	0.04**	0.06*	0.07*	0.21
$\Delta l_{L\,sec_t}$ ->$\Delta l_{M3\_B_t}$	0.82	0.71	0.67	0.70
$\Delta l_{M3\_B_t}$->$\Delta l_{L\,sec\ t}$	0.02**	0.06*	0.19	0.38

Notes: [a] The ARCH test and the autocorrelation test confirm the absence of eteroschedasticity and autocorrelation (here not reported). (*), (**), (***) indicate statistical significance at 10%, 5% and 1% percent level.

As shown in Table 10 the results of the previous sections are confirmed. I find one-way Granger Causality from money multipliers (M1_B, M2_B, M3_B), monetary base (BM), M2 money aggregate and industrial production index (IPI) to loans. In the case of money supply M3 there is an inversion of Granger causality direction that runs from loans to M3 in part supporting the accommodationist view. Finally, the same earlier results are confirmed applying the VECM model for cointegrating relationships. The results are reported in Table 11.

Table 11: Causality test based on Vector Error Correction Model to test endogeneity of money

	Short Term Effect	**Long term Effect**	**VECM**		
	Wald Test	**EC_{t-1}**	**Short Term**		**Long Term**
Dependent Variable: ΔlM2					
	16.50 (0)	-0.01 (0.15)	**lL_SEC=>lM2**		**lL_SEC ≠>lM2**
Dependent Variable: ΔlL_SEC					
	0.29 (0.74)	0.06 =((0)	**lM2≠>lL_SEC**		**lM2=>lL_SEC**

I find that M2 money supply affects loans in the long run (influence factor 0.06) whereas loans causes variations of money supply M2 in the short run. So, I can conclude that the relationship among European banking system and monetary policy does not change with securitization activity.

Conclusions

I focus the analysis on the relationship between European banking system and monetary policy conducted by the European Central Bank during the years 1999-2010. In this work I consider money supply, monetary base, money multipliers, credit capacity and industrial production index to test the passive money hypothesis. I implement two types of models according or not to the presence of cointegration with a double objective: to test the

endogenous money hypothesis and to analyze the effect of securitization on monetary transmission mechanism.

The main results consist in: a) two-way elasticity both in the long period and in the short term between loans and M1 money supply; b) elasticity in the short period of M2 money supply to the loans and inelasticity in the long period; c) Granger causality from monetary base to loans and from money multipliers (M1_B, M2_B, M3_B) to loans; d) Granger causality from loans to M3 money supply; d) Granger causality from industrial production index to M1, M2, M3, loans and monetary base but not vice versa. To sum up, loans influences M2 in the short run but this relationship does not exist in the long term. From the Granger causality test there is a one-way direction causality from M2 money multiplier (M2_B) to loans, from monetary base to loans and from industrial production index to loans. This implies that the Post-Keynesian view may not hold true in the case of Euro Area's M2 money supply. In the case of monetary aggregate M1 there is, both in the long and in the short period, a bidirectional causality be-tween M1 and loans that may support the liquidity preference view.

However, in the short term I find that Granger causality runs from base money, M1 money multiplier (M1_B) and industrial production index (IPI) to bank's lending but not vice versa. In this case, the absence of causality from total bank loans to M1 money multiplier (M1_B) does not sustain the structuralist view showing lack of evidence to support the use of liability management among European banks.

Finally, there is a short run one-way causality from loans to M3 but not from loans to industrial production index. This result shows that in the Euro Area money supply is endogenous in nature partially supported by the accommodatist view but the results do not confirm the structuralist vision and the theory of liquidity preference.

I replicate the analysis considering loans adjusted for securitization to investigate whether the banking system, by obtaining additional liquidity through securitization, has an active role in the monetary mechanism transmission. The analysis confirms the results of the previous sections. This is not surprising: the scarce use of securitization in the Euro Area during 1999-2010 could have only a minor impact on monetary policy of the European Central Bank. However, there still remains the question whether securitization may play a significative role for banking systems. I am currently investigating this issue by means of a comparative analysis

between the Euro Area and the United States, where the volume of securitization is large enough to influence the monetary mechanism transmission. Also, securitization could show cyclic patterns that the models implemented in this paper are not able to capture. The use of more sophisticated tools, such as Regime Switching variants, could be needed to discriminate among the theories that support the Post-Keynesian view.

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