

## **MONEY SUPPLY - EXOGENOUS OR ENDOGENOUS? AN EMPIRICAL EVIDENCE FROM EGYPT**

**Emad Omar Elhendawy**

College of Business Administration, Higher Technological Institute Tenth of Ramadan city, Egypt

emad\_elhendawy\_2006@hotmail.com

### **Abstract**

*In this paper, we have attempted to answer the question: is money supply in Egypt exogenous or endogenous in the period 1990-2014? The VECM results clearly indicate the existence of a positive Long run relationship between domestic credit, Inflation and money supply, and there is a negative long run relationship between Deposits and money supply. In particular, if the domestic credit rises by 10 percent, this would trigger an increase in the money supply rate by 4.6 percent, indicating that money supply in Egypt is endogenous. With reference to the Deposits, a 10 percent increase would result in a 0.003 percent decrease in the money supply. The causal relationship results refer to, there is a causal relationship from the domestic credit to deposits, monetary base and the money supply in two lag, Which indicates that the money supply in Egypt is endogenous according to accommodations view. Likewise, we accept the liquidity preference view also because there is a bidirectional causality between domestic credit and money supply in four and five lags, this means that, the central bank influences the money supply through the short-term interest rate which represents an important monetary policy instrument of the central bank of Egypt.*

*Keywords: Money supply, Domestic credit Granger Causality, Error Correction model, variance decomposition, Egypt*

### **INTRODUCTION**

The question as to whether money supply is exogenous or endogenous has long been debated amongst monetary economists. Two schools of thought, originating from Keynesian and monetarist sources, have merged over time, resulting in a consensus that money is exogenous. On the other hand, post-Keynesians (PK) have come to support the idea that money is

endogenous. The idea of the money supply being exogenous stems from the Keynes' liquidity preference theory. There are two views, the money view and the credit view, which, according to the advocates of this old idea explain the monetary transmission mechanism. The PK theorists, though agreed on money endogeneity, also have differences of opinion on how money is considered endogenous. Three views are central to the PK theory of endogenous money: the accommodationist, structuralist and liquidity preference approaches.

Within the exogenous strand, there are two different views on the mechanisms through which monetary policy translates as money supply, which is expected to affect economic activity, these views are money view and credit view which correspond to the old Keynesian stream. The money view can be found in the standard ISLM framework – Investment-Saving-Liquidity preference-Money equilibrium theory – using the Keynes' liquidity preference theory, it shows that, assuming the central bank directly influences the quantity of money by adjusting money supply, a decrease in money supply will increase real interest rates which raise a firm's cost of capital. With a higher cost of capital, there are fewer profitable projects. Thus the end result is a decrease in investment, causing aggregate output to decline. If the contrary happens, economic activity increases. The proponents of the credit view of the monetary transmission mechanism insist that both money supply and bank loans are important in affecting aggregate output. Two different channels exist here: the bank lending channel and the balance sheet channel, the bank lending channel take into account that close substitutes for bank credit are unavailable for households and small firms; hence they rely mainly on bank credit for external financing. By assuming that both bonds and loans are imperfect substitutes, Bernanke and Blinder (1988) modified the ISLM model of the money view by including bank loans that bear an interest rate. A contractionary monetary policy decreases bank reserves or excess reserves (money supply) and hence, bank Deposits. The converse is true under expansionary policy. These views (money and credit views) show the transmission mechanism of changes in money supply to the economy through banks, However, these views take into account that money supply changes are controlled by the central bank (exogenous) through the adjustment of high-powered money (monetary base).

Monetarists oppose the Keynesian view of money with regard to money demand. However, like the original Keynesians, they consider money supply as an exogenous variable, which means that the money supply is perfectly inelastic (vertical), with the interest rate driven by money demand. Its main theoretical claims where the money supply is exogenously determined by the money multiplier and the monetary base. The money supply schedule is therefore vertical in [money supply, nominal income] space, hence the term verticalist. The central bank controls the supply of reserves, and can thereby determine the money supply and

nominal income (monetary base causes money supply, monetary base causes bank lending and money supply causes bank lending), conditional on giving values of the money multiplier and the velocity of money. Nominal income adjusts to equalize money demand with the exogenously determined money supply (money supply causes nominal income). Money is all that matters and fiscal policy is ineffective unless it is money financed. Inflation is caused exclusively by money supply growth. Goods market equilibrium is accomplished by adjustment of the interest rate in the loanable funds market, thereby bringing aggregate demand into alignment with real output. Central banks should adopt a simple money supply growth rule to promote economic stability (Palley, 1993, 2013a, 2014a). The rest of this paper is organized as follows: Section 2 gives the literature review. Section 3 presents the methodology and model estimation. Finally, section 4 and 5 gives the results and conclusion.

## LITERATURE REVIEW

Kaldor, Basil Moore in 1988 developed the post-Keynesian view on money, which asserts that money supply is endogenously determined by the asset and liability management decisions by the commercial banks, the portfolio decisions of the non-bank public and the demand for bank loans (Palley, 1994).

The core of this theory is that causality runs from bank lending to bank Deposits, instead of the traditional notion that Deposits create loans. Although proponents of the PK theory accept the fundamentals of the endogeneity idea, there is still a debate among advocates of the PK theory. That debate is between the accommodationists (horizontalists) and the structuralists. The disagreement mainly revolves around the central bank's role in accommodating the demand for reserves, which ultimately determines the slope of the money supply curve. The central differences concern (1) the factors going into the determination of the complex of interest rates and asset prices, (2) the behavior of financial institutions and whether they are constrained by availability of liquidity (reserves) provided by the central bank, and (3) the supply price of finance to banks (Palley, 2008).

According to the accommodationists, the central bank determines the level of interest rates and the banking sector fully accommodate any demand for credit at any level of interest rate (bank lending cause monetary base, bank lending cause money supply and There are bidirectional causality between money supply and nominal income), while the structuralists insist that full accommodation is not necessary and that interest rates may increase endogenous (Palley, 1997).

Proponents of the structuralist view, such as Wray (1990), Howells (1995) and Rousseas (1998), maintain that banks do not fully accommodate the demand for credit as the

accommodationists propose, because the banks always use a combination of price and quantity rationing in their loan making. For this reason, the structuralists argue that money supply is upward-sloping (There is bidirectional causality between bank lending and monetary base, There is bidirectional causality between bank lending and money multiplier and bank lending cause money supply), as they believe that central banks only partially accommodate the demand for reserves, which will increase interest rates due to market pressures, This makes the supply of reserves a positive function of the central bank rate. The central bank has no control over total reserves, as this is determined by the quantity demanded by banks to support their lending and deposit-taking activities; however, the central bank is still able to alter the mix of borrowed and non-borrowed reserves to achieve its target. Additionally, Pollin (1991) argues that it is the changing structure of the liability side of the balance sheet of banks, rather than the asset side, that is responsible for the upward-sloping curve. Nevertheless, this behavior would lead to the same endogeneity of money supply.

In setting the mark-up over the short-term interest rate, banks may display different degrees of liquidity preference in distinct situations (Minsky, 1975). Dow and Dow (1989) suggest that liquidity preference is a preference for a liquid asset over any illiquid assets. Banks distinguish among potential borrowers by risk category and are likely to have a higher liquidity preference. Thus, for riskier borrowers, banks tend to adopt a very cautious lending behavior. Liquidity preference affects the behavioral functions of households, firms, banks and the central bank and in turn the money supply process (Wray, 1995).

The liquidity preference of the central bank influences the money supply through the short-term interest rate (the interest rate on which market rates are based). Therefore, it represents an important monetary policy instrument of the central bank. The liquidity preference of the central bank may arise as a result of changes in the economy, such as changes in the general level of prices or the exchange rate, or dramatic swings in the financial markets. In such cases, the central bank is less willing to accommodate the bank's demand for reserves. If such is the case, then being less willing to exchange liquid for less liquid assets (that is, to make a change in the composition of its portfolio) means that the central bank would increase the short-term interest rate (Fontana, 2003). This is the feedback rule. This implies that the structuralist and accommodationist views are observationally equivalent.

The empirical hypothesis of the liquidity preference view predicts causality from total bank loans to the broad money supply when the money supply is endogenously determined. If the demand for money and the demand for loans were independent, the supply of Deposits created by the net flow of new bank lending would not need to be willingly held by new deposit owners, who have independent liquidity preferences about the amount of money they wish to

hold. If this were the case, the independent demand for money would place a constraint on the ability of loans to create Deposits. Causality can also be expected from the money supply to bank credit.

## RESEARCH METHODOLOGY

To be able to address the question of Money supply exogenous or endogenous in Egypt, it might be appropriate to start by testing for the stationary of all the variables in our model, namely money supply, domestic credit, Deposits and Inflation. In the event that the variables show non stationary, the next step would naturally be to test for the existence of a long run Co integration relationship linking money supply to the other "explanatory" variables. The existence of such a relationship would presumably warrant the use of an error correction model to carry out the tests in question. However, barring the existence of a long run Co integration relationship, it would not be necessary to apply the Co integration apparatus because of their well- publicized work, Engel and Granger (1987) pose the ECM model as a means of representing Co integration variables. While this method of representation has the advantage of incorporating the dynamics of equilibrium in the short run, it also portrays, whether and how the variables deviate temporarily from their predicted long run equilibrium values. At any rate, and with the Co integration relationship between money supply and domestic credit firmly in place, an ECM equation of the following form might be estimated:

$$\text{Money supply} = \alpha + \delta \text{DCREDIT} + \gamma \text{Deposits} + \psi \text{Inflation} + u_i \quad (1)$$

The variables are defined as follows:

*Money supply: Broad money to total reserves ratio*

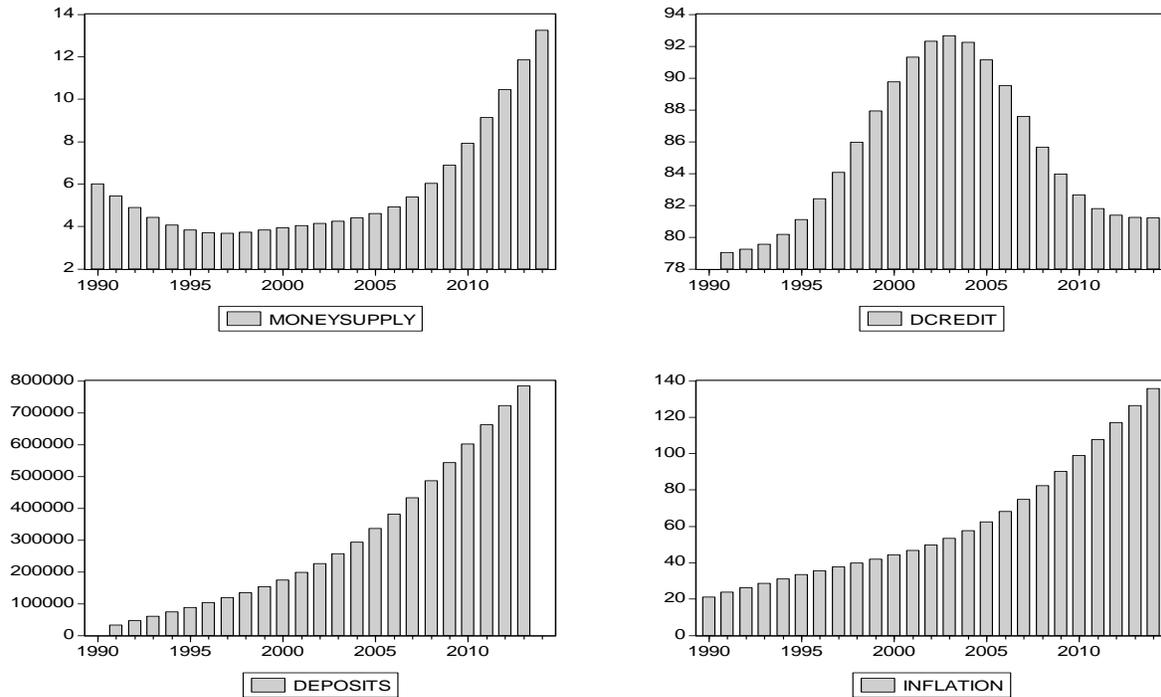
*DCREDIT: Domestic credit provided by the banking sector (% of GDP). World Bank indicator*

*Deposits: Total Deposits in local currency.*

*Inflation: Consumer price index. The value for Consumer price index (2010 = 100%).*

The study uses annual time series data covering the period 1990-2014. The data were obtained mainly from the International Financial Statistics, the World Bank Indicators (WDI) and the Central Bank of Egypt. The Hedrick and Prescott filter (HP) was used to compute the long run or permanent values of the variables. This (HP) filter is a device whereby the cycle effects on a time series are set apart from the raw data, such that only long run changes in a time series are essentially reflected in a variable's movement (Hedrick and Prescott, 1997).

Figure 1. Money supply, Domestic credit, Deposits, and Inflation in Egypt: 1990–2014



Apparently the plot shown in figure 1 indicates that all the variables in question are positively correlated, meaning that they raise or fall together as time passes except domestic credit provided by the financial sector that began a gradual decline from the beginning of 2005 until 2014. Further investigation is needed however to pinpoint the nature of this relationship with the use of a suitable econometric model. The descriptive statistics for the variables are shown in table 1 below (1990 -2014).

Table 1. Descriptive statistics for the variables (1990-2014)

	Money supply	DCREDIT	Deposits	Inflation
Mean	5.45	85.31	299639.7	59.82
Median	4.42	84.05	224455.0	49.62
Maximum	11.83	92.64	783460.4	126.30
Minimum	3.67	79.02	32484.67	23.64
Std. Dev.	2.29	4.71	233323.6	30.55
Skewness	1.60	0.25	0.70	0.79
Kurtosis	4.46	1.61	2.22	2.45
Jarque-Bera	11.82	2.10	2.47	2.71
Probability	0.003	0.35	0.29	0.26
Sum	125.37	1962.22	6891714.	1375.90
Sum Sq. Dev.	115.18	488.04	1.20	20527.67
Observations	23	23	23	23

## Unit Root and Counteracted Tests

Our next step is to test for the stationary of the variables. This is a necessary procedure since it is improper to run time series regressions unless stationary is well in place. A stationary time series may be defined as one, whose mean, variance and autocovariance are invariant over the period under consideration. To test for stationary of the time series, we use the Well- publicized Dickey Fuller GLS (ERS) technique to test for the unit roots. The results of this test are reported in table 2 below.

Table 2. Summary of Dickey – Fuller GLS (ERS) Unit Root Test Result

Variable	Level		First-Difference		Second-Difference		Conclusion
	Constant	Trend	Level	Trend	Constant	Trend	
Money supply	-0.72	3.34	3.34	-2.66	-1.62	-3.96**	I (2)
DCREDIT	-2.28	-1.95	-0.66	-3.68***	-3.30**	-12.81*	I (2)
Deposits			-7.43*	-14.04*	-3.30**	-12.81*	I (2)
Inflation	2.98	0.67	2.43	-2.12	-7.01*	-2.12	I (2)

Notes: 1) For ADF and PP tests, \*\*\*, \*\* and \* denote rejection of a unit root hypothesis based on Mackinnon (1991). Critical values at 10%, 5% and 1% respectively.

As can clearly be seen from the results in table 3, all the model variables are integrated of order two, I (2). That is, they are difference stationary. This allows us to go ahead and test for whether there is a long run Co integration relationship between the variables of the model. Once such a relation is established, the next step is to obtain the estimated values of the vector error correction model (VECM) which is a variant of the full information maximum likelihood models. This ensures that the vector estimators are of the highest efficiency possible. The VECM model is advantageous in that it cuts short an otherwise roundabout estimation process into a single step that does not require normalization of the variables concerned. Additionally (VECM) also makes it unnecessary to toil with the usual endogenously or exogeneity assumptions regarding model variables. Thus, with VECM, endogenous variables would gravitate towards their long run or equilibrium values, but any drifts from these long run values would eventually be corrected. In table 4 below, we report the Johansen co-integrated test results for three equations at the 5% and 190 levels for Trace Max-eigenvalue testes.

Table 3. Summary of Johansen Co-integrated Test

## Unrestricted Cointegration Rank Test

Hypothesized No. Of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.99	191.02	47.21	54.46
At most 1 **	0.94	89.06	29.68	35.65
At most 2 **	0.73	29.21	15.41	20.04
At most 3	0.046	1.004	3.76	6.65

Hypothesized No. Of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.99	101.95	27.07	32.24
At most 1 **	0.942	59.84	20.97	25.52
At most 2 **	0.739	28.21	14.07	18.63
At most 3	0.046	1.004	3.76	6.65

Note: \* (\*\*) denotes rejection of the hypothesis at 5 % (1%) level; Trace test indicates 3 co-integrated equation(s) at both 5% and 1% levels; Max-Eigenvalue test indicates 3 co-integrated equation(s) at both 5% and 1% levels

### Granger Causality Tests

To test for causality between Money supply, domestic credit provided by the financial sector, deposits and inflation, we use the familiar Granger causality test with the number of lag lengths not exceeding 5 periods. Results are reported in table (4).

Several conclusions may be drawn from these results, namely that (i) Domestic credit provided by the financial sector cause deposits from three to five lags, but there is a bi-directional causal relationship between domestic credit provided by the financial sector and deposits in two lag, Which indicates that the money supply in Egypt is endogenous not exogenous during the period 1990-2014.

(ii) The hypothesis that domestic credit provided by the financial sector do not Granger cause Money supply is rejected in two lag and the causal link between Domestic credit provided by the financial sector and Money supply is apparently bi-directional and extends in four and five lags.

(iii) There is a bi- directional causal relationship between domestic credit provided by the financial sector and Inflation in four lag and domestic credit provided by the financial sector Granger causes inflation in two, three and five lags.

Table 4. Results of Granger Causality Tests

Null Hypothesis	Observations	Lags	F-statistics	Probability	Conclusion
DCREDIT does not Granger Cause Money Supply	22	2	854.12***	0.00	DCREDIT → Money supply
Deposits does not Granger Cause Money Supply	21	2	8.99***	0.002	Deposits → Money supply
Deposits does not Granger Cause DCREDIT	21	2	11.08***	0.0009	Deposits ↔ DCREDIT
DCREDIT does not Granger Cause Deposits			3764.34***	0.000	
DCREDIT does not Granger Cause Inflation	22	2	7995.51***	0.00000	DCREDIT → Inflation
DEPOSITS does not Granger Cause Inflation	21	2	1837.76***	0.00000	DEPOSITS → Inflation
The money supply does not Granger Cause DEPOSITS	20	3	4.67585**	0.019	Money supply → Deposits
The money supply does not Granger Cause Inflation	22	3	7.74***	0.002	Money supply → Inflation
DCREDIT does not Granger Cause Deposits	20	3	10.62***	0.0008	DCREDIT → Deposits
DCREDIT does not Granger Cause Inflation	21	3	6.75***	0.004	DCREDIT → Inflation
DCREDIT does not Granger Cause Money Supply	20	4	7.95***	0.002	DCREDIT ↔ Money supply
The money supply does not Granger Cause DCREDIT			4.30**	0.024	
Deposits does not Granger Cause Money Supply	19	4	9.05***	0.002	Deposits ↔ Money supply
The money supply does not Granger Cause Deposits			9.86***	0.001	
Inflation does not Granger Cause Money Supply	21	4	8.19***	0.002	Inflation → Money supply
DCREDIT does not Granger Cause Deposits	19	4	9.37***	0.002	DCREDIT → Deposits
Inflation does not Granger Cause DCREDIT	20	4	4.24387**	0.025	DCREDIT ↔ Inflation
DCREDIT does not Granger Cause Inflation			12.29***	0.0004	
Inflation does not Granger Cause Deposits	19	4	7.18***	0.005	Deposits ↔ Inflation
Deposits does not Granger Cause Inflation			11.08***	0.001	
DCREDIT does not Granger Cause Money Supply	19	5	5.94**	0.013	DCREDIT ↔ Money supply
Deposits does not Granger Cause Money Supply	18	5	17.29***	0.0008	Deposits ↔ Money supply

The money supply does not Granger Cause Deposits			11.37***	0.002		
Inflation does not Granger Cause Money Supply	20	5	6.37***	0.008	Inflation → Money supply	
Deposits does not Granger Cause DCREDIT	18	5	4.49**	0.037	DCREDIT ↔ Deposits	
DCREDIT does not Granger Cause Deposits			12.85***	0.002		
DCREDIT does not Granger Cause Inflation	19	5	11.00***	0.002	DCREDIT → Inflation	
Inflation does not Granger Cause Deposits	18	5	9.80***	0.004	Deposits ↔ Inflation	
DEPOSITS does not Granger Cause Inflation			4.38**	0.039		

Note: \*, \*\*, \*\*\* indicates statistical significance at the 10%, 5% and 1% level respectively.

### VECM Results

In equation 2 below we present estimates of the long run and short run relationship between domestic credit and Money supply.

$$D(\text{Moneysupply}) = -0.07*(\text{Moneysupply}(-1)) + 0.46*\text{DCREDIT}(-1) - 0.0003*\text{Deposits}(-1) + 1.49*\text{Inflation}(-1) - 56.53 + 1.40*D(\text{Moneysupply}(-1)) - 0.90*D(\text{Moneysupply}(-2)) + 0.148*D(\text{DCREDIT}(-1)) - 0.06*D(\text{DCREDIT}(-2)) + 4.096*D(\text{Deposits}(-1)) - 6.46*D(\text{Deposits}(-2)) - 0.156*D(\text{Inflation}(-1)) + 0.11*D(\text{Inflation}(-2)) + 1.05 \quad (2)$$

Table (5) also portrays these same estimates in a tabular form. Deviations by any of the variables from their long run equilibrium values would presumably be corrected through the dynamic long run movement of VECM. It is probably clear from these estimates that there is a significant long run positive relationship between money supply, domestic credit created by commercial banks, and Inflation. But there is a long run negative and significant weak relationship between money supply and Deposits. In particular, if the domestic credit created by commercial banks rises by 10 percent, this would trigger an increase in the money supply rate by 4.6 percent, indicating that money supply in Egypt is endogenous (loans made by banks cause Deposits, and that Deposits in banks, as a component of money supply, thus create more money supply). Likewise, if the Inflation goes up by 10%, the money supply will respond with a 14.9 percent hike. Turning to the Deposits, it can be seen that a 10 percent increase therein would result in a 0.003 percent decrease in the money supply.

In the short run, the explanatory variables, Domestic credit provided by the banking sector and Total Deposits were found to be positive and significant on money supply but Inflation rate was found to be negative and insignificant.

Table 5. Summary of over parameterized ECM Result

Variable	Coefficient	Std. Error	T-Statistic
DCREDIT (-1)	0.46	0.006	73.98
Deposits (-1)	-0.0003	4.90	52.55
Inflation (-1)	1.49	0.03	51.79
C	-56.54		
Error Correction	-0.07	0.12	-0.59
D (DCREDIT (-1))	0.15	0.08	1.82
D (DCREDIT (-2))	-0.057	0.127	-0.45
D (Deposits (-1))	4.10	2.3	1.81
D (Deposits (-2))	-6.46	4.1	-1.57
D (Inflation (-1))	-0.15	0.18	-0.83
D (Inflation (-2))	0.10	0.10	1.018
R-squared	0.99	Log Likelihood	185.50
Adj. R-squared	0.99	Akaike Information Criteria	-11.37
F-statistic	41354.00	Schwarz Criteria	-9.18
Log likelihood	90.26		

### Variance Decomposition Result

We now examine the variance decomposition which allows us to see the extent to which the variables in the auto regression are affected by each single variable therein. The variance decomposition in fact determines the size of the variation in forecast error which can be attributed to exogenous shocks experienced by the other variables. That is, they show us what portion of the change in all the variables taken together may be attributed to each single variable by itself.

Table 6: Variance Decomposition of Money Supply

Period	S.E	Money supply	DCREDIT	Deposits	Inflation
1	0.003	100.00	0.000	0.000	0.000
2	0.011	96.26	0.074	3.633	0.027
3	0.021	88.47	0.251	11.253	0.022
3	0.021	88.47	0.251	11.253	0.022
4	0.034	78.73	0.981	20.271	0.010
5	0.051	68.40	2.497	29.097	0.004
6	0.071	58.13	4.4000	37.457	0.002
7	0.094	48.46	6.353	45.182	0.001
8	0.118	39.90	8.256	51.839	0.002

Table 7: Variance Decomposition of DCREDIT

Period	S.E	Money supply	DCREDIT	Deposits	Inflation
1	0.010	4.4126	95.587	0.000	0.000
2	0.031	9.8055	86.687	3.465	0.041
3	0.063	15.278	73.145	11.476	0.100
4	0.108	21.369	58.512	19.990	0.127
5	0.160	29.074	45.230	25.569	0.125
6	0.213	38.178	34.701	27.009	0.111
7	0.262	47.223	27.293	25.387	0.095
8	0.301	54.443	22.664	22.808	0.083

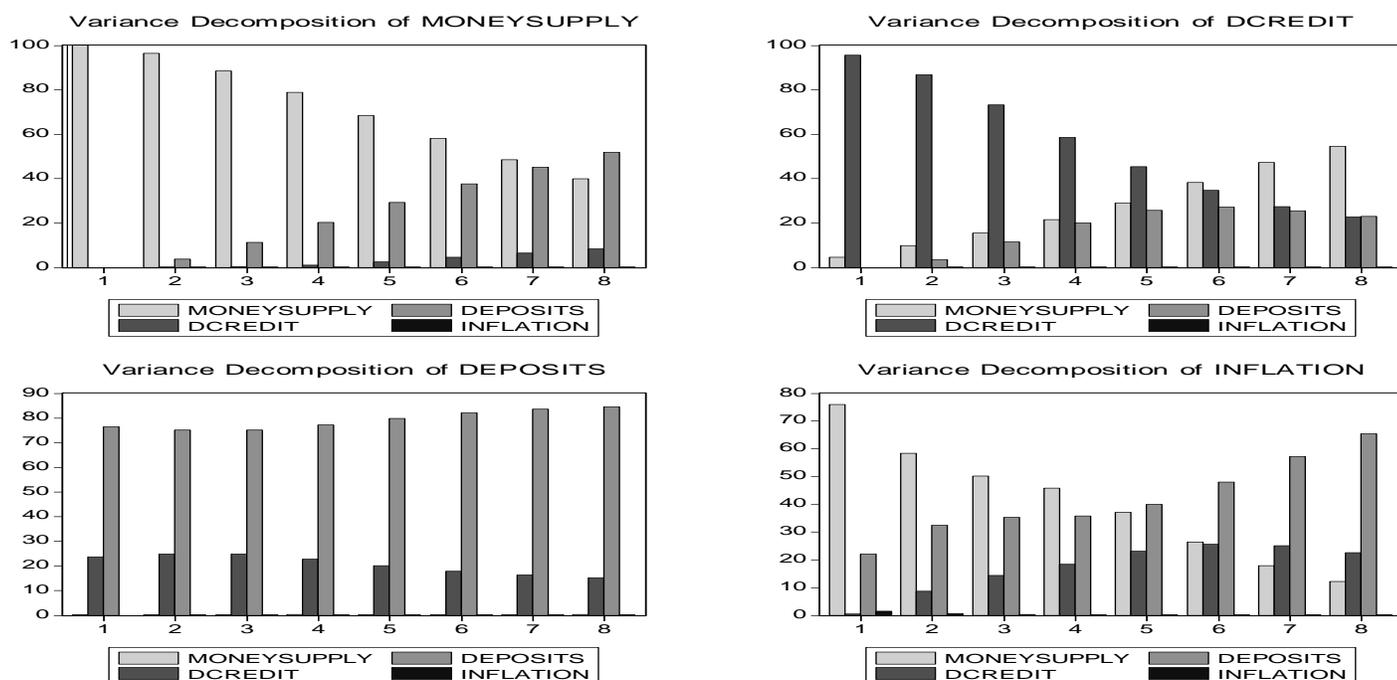
Table 8: Variance Decomposition of Deposits

Period	S.E.	Money supply	DCREDIT	Deposits	Inflation
1	54.569	0.0216	23.611	76.367	0.000
2	178.96	0.1351	24.790	74.99	0.073
3	401.69	0.0637	24.773	75.064	0.097
4	735.24	0.1919	22.649	77.075	0.082
5	1168.143	0.1757	19.977	79.778	0.067
6	1676.727	0.1283	17.776	82.039	0.056
7	2239.471	0.1307	16.235	83.585	0.047
8	2846.919	0.2494	15.195	84.51488	0.039

Table 9: Variance Decomposition of Inflation

Period	S.E.	Money supply	DCREDIT	Deposits	Inflation
1	0.0057	75.971	0.4904	22.071	1.466
2	0.0137	58.39267	8.5686	32.384	0.654
3	0.0273	50.196	14.368	35.191	0.244
4	0.0483	45.725	18.405	35.729	0.139
5	0.0776	36.990	22.958	39.923	0.127
6	0.1177	26.292	25.602	47.982	0.122
7	0.1714	17.766	24.940	57.181	0.110
8	0.2384	12.108	22.513	65.280	0.097

Figure 2. Variance Decomposition of Money Supply DCREDIT, Deposits and Inflation



Judging from tables 6, 7, 8, 9 and figure 2, it can be seen that the relative importance (contrast ratio prediction error interpreter) of a domestic credit created by commercial banks shock in explaining variations in Money supply is positive, durable and rising. It amounted to 4.41 percent in the first period of the shock, 9.8 in the second period of the shock, 15.28 percent in the third period, 21.37percent in the fourth year and then to as high as 54.4percent after eight years following the shock. This confirms that there is a positive, durable and growing association between domestic credit created by commercial banks and Money Supply in Egypt for the time-period under consideration. Further, considering figure 2 and table 7, it can easily be deduced that there is a direct and continuing relationship between domestic credit created by commercial banks shocks and variations in the Deposits. The importance of such domestic credit created by commercial banks shocks is 3.47 in the second period of the shock, 11.48percent in the third period, 20.00percent in the fourth year and then to as high as 22.80percent after eight years following the shock. While one standard deviation shock in deposits has a positive decreasing effect on domestic credit created by commercial banks, it amounted to 23.6percent in

The first period of the shock, 24.80in the second period of the shock, 24.77 percent in the third period, 22.64 percent in the fourth year and then to as low as 15.19 percent after eight years following the shock. From this it can easily be deduced that there is a direct and continuing relationship between domestic credit created by commercial banks and both deposits and money supply. This means that the money supply is endogenous in Egypt (loans made by

banks cause Deposits, and that Deposits in banks, as a component of money supply, thus create more money supply) for the time period which this study covers.

**Accommodationist, structuralist and liquidity preference approaches**

After the study concluded that money supply in Egypt is endogenous, the question is, endogenous money supply in Egypt is according to the ideas of accommodationist, structuralist or liquidity preference approaches?

To answer this question we will use familiar Granger causality test with the number of lag lengths not exceeding 6 periods between DCREDIT, the monetary base and money multiplier(m1/ monetary base). The results are reported in table (10) below.

Table 10. Results of Granger Causality Tests between DCREDIT, monetary base and money multiplier

Null Hypothesis	Observations	Lags	F-statistics	Probability	Conclusion
MMF does not Granger Cause monetary base	21	2	922.091***	0.000	Money multiplier → monetary base
DCREDIT does not Granger Cause monetary base	21	2	1429.36***	0.000	DCREDIT ↔ monetary base
Monetary base does not Granger Cause DCREDIT			8.69***	0.002	
Money multiplier does not Granger Cause DCREDIT	21	2	1231.89***	0.000	Money multiplier → DCREDIT
Money multiplier does not Granger Cause monetary base	20	3	4.619**	0.020	Money multiplier → monetary base
DCREDIT does not Granger Cause monetary base	20	3	8.52**	0.002	DCREDIT → monetary base
Money multiplier does not Granger Cause MONETARYBASEF	19	4	11.55***	0.0009	Money multiplier → monetary base
DCREDIT does not Granger Cause monetary base	19	4	14.26***	0.0003	DCREDIT → monetary base
Money multiplier does not Granger Cause DCREDIT	19	4	8.936**	0.002	Money multiplier → DCREDIT
DCREDIT does not Granger Cause monetary base	18	5	7.07**	0.011	DCREDIT → monetary base
Money multiplier does not Granger Cause DCREDIT	18	5	12.42**	0.002	Money multiplier → DCREDIT
DCREDIT does not Granger Cause monetary base	17	6	12.15**	0.015	DCREDIT → monetary base
Money multiplier does not Granger Cause DCREDIT	17	6	23.40***	0.004	Money multiplier → DCREDIT

Note: \*, \*\*, \*\*\* indicates statistical significance at the 10%, 5% and 1% level respectively

Judging from tables 4, 10 above, it can be seen that (i) domestic credit created by commercial banks causes monetary base. (ii) Money multiplier causes domestic credit created by commercial banks (iii) domestic credit provided by the financial sector cause Money supply in two lags. This implies that the money supply in Egypt is endogenous according to accommodationists view after two lags because domestic credit created by commercial banks cause monetary base and the money supply. (iiii) We reject the structuralists view because there is no bidirectional causality between domestic credit created by commercial banks, monetary base and money multiplier. But there is a bidirectional causality between domestic credit created by commercial banks and money supply in four and five lags. (iiiii) we accept the liquidity preference view also which argue that there is a bidirectional causality between domestic credit created by commercial banks and money supply, This means that, the central bank influences the money supply through the short-term interest rate which represents an important monetary policy instrument of the central bank of Egypt.

## CONCLUSION

In this paper, we have attempted to answer the question: Does money supply Exogenous or Endogenous in Egypt in the period 1990-2014. The causal relationship between money supply, credit, deposits, inflation, monetary base and money multiplier Inflation refer to Domestic credit provided by the financial sector cause deposits from three to five lags, but there is a bi-directional causal relationship between domestic credit provided by the financial sector and deposits in two lag, Which indicates that the money supply in Egypt is endogenous not exogenous during the period 1990-2014. The hypothesis that domestic credit provided by the financial sector do not Granger cause Money supply is rejected in two lag and the causal link between Domestic credit provided by the financial sector and Money supply is apparently bi-directional and extends in four and five lags. There is a bi-directional causal relationship between domestic credit provided by the financial sector and Inflation in four lag and domestic credit provided by the financial sector Granger causes inflation in two, three and five lags. Domestic credit created by commercial banks causes monetary base and Money supply This implies that the money supply in Egypt is endogenous according to accommodations view. Likewise, we accept the liquidity preference view also which argue that there is a bidirectional causality between domestic credit created by commercial banks and money supply, this means that, the central bank influences the money supply through the short-term interest rate which represents an important monetary policy instrument of the central bank of Egypt. The VECM results clearly indicate the existence of a Long run positive relationship between money supply, domestic credit created by commercial banks, and Inflation. But there is a long run negative and

significant weak relationship between money supply and Deposits. In particular, if the domestic credit created by commercial banks rises by 10 percent, this would trigger an increase in the money supply rate by 4.6 percent, indicating that money supply in Egypt is endogenous (loans made by banks cause Deposits, and that Deposits in banks, as a component of money supply, thus create more money supply). Likewise, if the Inflation goes up by 10%, the money supply will respond with a 14.9 percent hike. Turning to the Deposits, it can be seen that a 10 percent increase would result in a 0.003 percent decrease in the money supply.

## FURTHER RESEARCH

Possible further study is that one could use semi-annual, quarterly or monthly data if one take into account the seasonal effect of data. The study could also include with more or less coverage of time horizon controlled with structural break, to get a more general picture or some specification of certain policy period to be investigated. Studies could also interested into other group of countries. Further study could also take in more variables into investigation. For example, to be related more on Daily Interbank Rates, real economy and interest rate. One could also include factors of fiscal policy, government spending and government borrowing. In this paper, the credit and deposit variables are limited to domestic and non-public, but as the globalization and opening-up of the developing world, potential angles for study could include the international factor movements, income and price effects of foreign trade, and international coordination of policies.

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