

**SAMA Working Paper:**

**The Transmission Mechanisms of Endogenous Money  
Supply in the Case of Saudi Arabia**

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By

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# **Endogenous Money Supply in the Case of Saudi Arabia**

By

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## **Abstract**

This paper illustrates and tests the endogenous money hypothesis as well as the role of endogenous money in the Saudi Arabian economy. The paper starts with a description of how various economic schools of thought (Orthodox versus Heterodox) interpret the role of money and its corresponding mechanism on economic factors. Afterwards, this paper uses Granger causality approach to examine whether the endogenous money hypothesis holds true in the case of Saudi Arabia. In context, the most critical piece of information that can be derived from this paper is that there are statistical evidences showing that the classical Modern Money Theory, which says that a country with fixed exchange rate would not have endogenous money mechanisms, does not hold in the case of Saudi Arabia. The empirical findings of this paper indicate that Saudi Arabia defies this theory with a fixed exchange rate, but with an endogenous money supply and an exogenous interest rate over the period 2000Q1 to 2018Q4. In short, these results are clearly compatible with the post-Keynesian hypothesis that rejects the orthodox view of exogenous money supply and concludes that money supply is endogenous. Therefore, the economic growth can be boosted via endogenous money supply hypothesis: that is loans create deposits and deposits create reserves and creditworthiness determines the loans, i.e. banks look for good borrowers not for reserves to grant loans.

**Keywords:** Endogenous money supply hypothesis, co-integration, causality, Saudi Arabia, public expenditures, economic growth.

**JEL classification codes:** B22, C20, C23, C13, D2, D24, E11

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## **Endogenous Money in the Case of Saudi Arabia**

### **1. Introduction**

This paper explores the role of endogenous money in the Saudi Arabian economy. This paper begins with a description of how varied economic schools of thought (Orthodox versus Heterodox) have interpreted the money and its mechanism on economic factors. Part of this paper empirically investigates whether or not the endogenous money hypothesis holds true in the case of Saudi Arabia. The results of this paper are useful to uncover the appropriate policies (coordination between fiscal and monetary policy) that Saudi policy makers can use to implement effective monetary and fiscal policies, which will consequently lead to full employment. Arguably, if Saudi Arabia is experiencing endogenous money, then there should be more coordination between fiscal policy and current robust monetary policy to get full benefit of endogenous money supply, i.e. loans create deposits and deposits create reserves. Therefore, the policy mechanism for solving so many economic issues will be illustrated by understanding the Post- Keynesian solution for unemployment and maintaining and obtaining full employment via using endogenous money approach. In essence, unemployment can be solved through granting more loans to more effective non-oil sectors, which generates a higher productivity and, consequently, a higher job creation.

This paper is organized as follows. The second section provides a theoretical overview and empirical literature review in which the endogenous money supply hypothesis has been tested in several countries. Section 3 presents the methodology and data for testing endogenous supply hypothesis in case of Saudi Arabia. Section 4 consists of the interpretations of main results. Finally, section 5 contains the conclusion.

## **2. Literature review**

### **2.1 Heterodox School's versus Orthodox Views about Role of Money in an Economy**

This section explains the perspectives of the orthodox school of thought versus the heterodox school of thought on money. Theoretically, the two schools of thought consider that money plays an important role, yet certain schools limit the effect of money on nominal variables qua new classical school. This means that money would have virtually no effect on the tangible variables, such as output and employment. In this regard, money is viewed as neutral from this prism. In contrast, some other schools, such as the Post-Keynesian school, view money as creating the “rules the roost” because of its unique properties.<sup>1</sup> However, the role of money is differentiated in terms of its short and long-term impact. These schools consider money differently relative to the time horizon, i.e. money is not

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<sup>1</sup> I) Small elasticity of production: when liquidity preference increases, unemployment increases, price goes down, and investment goes down.

II) Rate of substitution is zero, especially when one wants a liquid asset. There is nothing that satisfies money, and Keynes did not define money, whether in cash or financial assets.

III) Money has the lowest carrying cost

neutral in the short run, yet it is neutral in the long run. To further elucidate the full perspective of these aforementioned schools of thought, this section will discuss how they interpret money and its mechanism on economic variables.

The orthodox economists consider money as neutral, which means that it has no effect on real variables; they also treat it as an exogenous variable. Arguably, according to this school, the main function of money is to play the role of a medium of exchange. Therefore, there is a distinct separation of the real and nominal variables. If there were to be a sudden increase in money supply, then there would be no effect on real output or real employment. From this perspective, the increase of the money supply would lead only to inflation, which means that it is exogenous to central banks. According to the orthodox school, monetary authorities are unable to reduce unemployment, which is one of real variables, by simply increasing the money supply because of its neutral nature and seeing that employment is determined by the labor market. Consequently, the real output would not increase in response to higher money supply; the employment and real output are solely determined by the labor demand market conditions. The full employment occurs as a result of market forces, i.e. market clearing in the labor force. For example, in case of high unemployment rates, wages tend to fall to stimulate demand for labor. Therefore, the unemployment can only be voluntary. Thus, any fluctuation in money supply will not have any significant effect on the real economic sector. In short, orthodox schools of thought view money as a completely neutral variable, which means that it cannot be used as an

endogenous variable to stimulate the economy (Snowdon & Vane 2006; Forstater, 1999, 2006).

Heterodox views stem from Keynes' (1936) approach that maintains that money dictates the rules of the roost (Wray, 2006). Keynes treated money as a real variable, which contradicts the neoclassical views for which money is treated as a nominal variable. In this context, money stands as the main purpose or ultimate goal of production (monetary production function) i.e. the economy agents borrow money to produce commodities and sell the commodities to have more money than be for M (money)—C (commodity)—M'(money) M' has to be greater than M. Arguably, in this system one starts with money, and ultimately aims to accrue larger quantities of money; thus the final output, as money, is neither capital nor physical. In fact, Keynes' theory generally coincides with the theory of output and employment determination as a whole. Thus, money has a very influential role within this school of thought in that it can either implicitly or explicitly determine output and employment (Forstater, 2006).

According to Keynes, unemployment exists when people seek for money (Wray, 2012). Therefore, if money were non-existent, and another asset existed with the three aforementioned properties, unemployment would be reduced or not ever exist in the first place. Keynes would argue that, in a nonmonetary economy, unemployment would not exist. Only in a monetary economy does unemployment exist (M—C—M'); thus, if money were eliminated, it could potentially get rid the world of unemployment as a result (Keynes,

1936 G.T ch 17; Dillard, 1984). Moreover, Post-Keynesian economists, influenced by Keynes's theory, emphasized that insufficient effective (aggregate) demand is the reason behind unemployment and market forces alone cannot do much to stimulate the economy. Thus, it is impossible to ever fully exhaust or expend resources even if a perfectly competitive market were assumed (Keynes 1936; Kregel 1988). Thus, in heterodox economics, government intervention, which can stimulate uncertainty through government spending, becomes necessary as a means to stimulate the economy to achieve full employment. Shortly, avoiding economic issues, such as unemployment can only be accomplished with the help of the government and big banks "Central Banks". In fact, within a heterodox world, there can be no economic sustainability or prosperity without government intervention and role of central bank. Therefore, Post-Keynesian economics typically tackles the economic problems, such as unemployment, through government spending, which would stimulate uncertainty amongst investors thus, create more jobs in economy through supply mechanism (Kaldor & Trevithick, 1998; Moore, 1989; Pollin, 1991, Howells & Hussein, 1998; Vera, 2001; Forstater & Mosler, 2005).

## **2.2 Theoretical Background on Endogenous Money Hypothesis**

This section examines the conclusion of the classical Modern Money Theory stating that, if a country has a floating exchange rate, then, the money supply will be endogenous. This entails that loans create deposits and deposits create reserves. The interest rate is exogenous since it is determined by the central bank. For an economy with a fixed

exchange rate, the money supply is exogenous and the interest rate is endogenous. However, Saudi Arabia defies this rule with a fixed exchange rate, endogenous money supply, and exogenous interest rates. In general terms, the orthodox monetary theory argues that central banks play the crucial role of controlling the growth of money supply. This approach hypothesizes that central banks are able to increase or decrease available monetary supply. This idea is based on the assumption of stability of money multipliers, meaning that money supply is exogenously determined (Friedman , 1995; Shanmugam, Nair & Li, 2003). On the other hand, the essential gist of the endogenous money supply approach is that the demand for bank credit is what determines money supply. In essence, the deposits are destroyed through the repayment of loans. Therefore, the central banks cannot control the money supply (Howells & Hussein, 1998; Vera, 2001). However, the endogenous money supply approach is not unified and can be divided into three distinct viewpoints. Thus, it is necessary to provide an illustration of the theoretical foundation of the following endogenous money supply hypotheses: accommodationist, structuralist, and liquidity preference.

### **2.2.1 Accommodationist Approach**

The accommodationist view insists on the fact that banks can lend indefinitely as long as they have good borrowers without any worries about the reserves since the central bank is supposed to accommodate any demand for reserves and currency. At the same time,



the central bank uses the overnight interest rates to set the costs of short-term liquidity. In this context, the commercial banks add mark-ups to the costs of short-term liquidity in an endeavor to maintain all demands for bank loans; thus, credit demands determine the money supply. In short, loans create deposits and deposits create reserve. In other words, the creditworthy bank borrowers create loans and not the other way around, i.e. reserves are what create loans. According to Moore (1988), working capital finance determines the short-term demands for bank loans. More precisely, banks deposit in borrowers' accounts to meet the demand for loans. On the other hand, the deposits will be destroyed when loans are repaid. It can be clearly seen that the role of money can stem from these procedures wherein the net bank lending stimulates aggregate demand by allowing the borrowers to deficit-spend. Shortly, the difference between the loans and deposits will influence the money growth, which will, in turn, have an impact on the aggregate income.

The accommodationist view maintains that causality runs from money income to the demand for the bank loans, which has an effect on the monetary growth. In other words, it is the monetary deposits created by bank loans that ultimately finance any increase in aggregate demand (Kaldor & Trevithick, 1981; Shanmugam, Mahendhiran, & Li, 2003). Debatably, the accommodationist view emphasizes that central banks accommodate demand for reserves in order to maintain interest rates at a targeted level; i.e. central banks' main focus is the interest rate and not the money supply. Therefore, the money supply and monetary base are determined endogenously via the measure of bank credit demanded at

the interest rate (Policy rate) setting by the central bank plus the mark-up setting by the commercial banks (Moore, 1988). Shortly, from this perspective central banks control only the interest rate through the accommodation of reserve demands (Moor, 1988; Moore, 1998).

To sum up, the accommodationists' empirical hypothesis is that a unidirectional causality exists from total commercial bank loans (LL) to the monetary base (LB) and the money supply (LM3).

### **2.2.2 The Structuralist View**

This view differs significantly from the accommodationist view. The major difference between the two views lies in the way that structuralists interpret money supply function as an upward-sloping function. However, the accommodationists consider that it has interpreted perfect interest rate elasticity. Therefore, the structuralists argue that the central banks do not fully accommodate the private banks demand for reserves. In essence, the structuralists posit that the reserves would be seen to rise with increases in the bank lending. In other words, they agree that there is some accommodation from central banks, but that it is not full as is assumed by accommodationists. Essentially, the structuralists give the central bank a limited amount of control over the reserves supply (and subsequently, interest rates) while accommodationists argue that central banks has ultimate authority over interest rates. Therefore, structuralists assert that the central banks have the option of targeting *either* the interest rate *or* monetary base (Palley, 1991). Moreover, they

argue that commercial banks can use liability management to partially overcome the reserves constraint,<sup>2</sup> which central banks impose on commercial banks in order to keep funding sources cheaper. However, According to Pollon (1991), liability management may be an insufficient instrument in generating adequate reserves supply to meet the demand of reserves.

To conclude, the structuralist viewpoint is a unique hybrid of orthodox and heterodox hypothesis in terms of explaining control over reserves. Overall, they conclude that causality between total commercial bank loans (LL), the monetary base (LB), and the money multiplier (Lm) is actually bidirectional.

### **2.2.3 The Liquidity Preference View**

The proponents of the liquidity preference view stem their ideas from Keynes' work in general theory, chapter 17 and his financial motive paper. Moreover, they contrast sharply with the accommodationists and structuralist viewpoints. In fact, liquidity preference supporters investigate the accommodationist claim that "credit money can never be in excess supply" (Shanmugam, Mahendhiran, & Li, 2003). Accommodationists argued that demand for money is what determines the money supply; consequently, there would be no money supply without demand for money. Further, there exists no independent function for money; i.e. an identical demand and supply function exists in the

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<sup>2</sup> What Minsky referred to as innovation, 1982.

accommodationist view. Shortly, excess supply is impossible. Howells (1995), a follower of the liquidity preference approach, denies the belief that there exists no independent demand money function because each economic unit has differing preferences of liquidity, i.e. how much money one wishes to hold.

To sum up, the liquidity preference view concludes that there is bidirectional causality from total commercial bank loans (LL) to money supply (LM3).

**Table 1. Summary of Causality Hypotheses on Endogenous Money Supply Based on the Three Views**

Accommodationist (Moore, 1989)	Structuralist (Palley, 1996, 1998; Pollin, 1991)	Liquidity preference (Howells, 1995)
LL $\Rightarrow$ LM3, LB	LL $\Leftrightarrow$ LB, Lm	LL $\Leftrightarrow$ LM3

*Source:* Shanmugam, Mahendhiran, & Li, p. 605, 2003. Notes: Definition of variables: LL stands for log-level of total commercial bank loans; LB denotes log-level of monetary base; LM3 stands for log-level of the money supply M3; Lm represents log-level of the money multiplier.  $\Rightarrow$  stands for unidirectional causality from the left to the right;  $\Leftrightarrow$  stands for bidirectional causality.

### 2.3 Empirical Literature Review

In order for a country to enjoy sustainable prosperity and economic growth, it has to have both financial and human resources. Thus, the latter is beyond our scope in this paper. Whereas, the former will be addressed here. Generally speaking, Saudi Arabia has enjoyed a massive pecuniary surplus in recent decades, yet the nation still needs to continue to develop and invest this surplus towards alleviating current issues of unemployment and dependency on oil. Moreover, the incorporation of both an endogenous money and growth theory, the determination of interest rates, and an articulation of the significance of

endogenous money are all necessary for policy-makers to conduct an appropriate economic policy (Palley, 2008). Thus, this study will use an endogenous money theory to provide a coherent approach to illustrate how banking system and financial sector really work in Saudi Arabia.

As far as research shows, the endogenous money hypothesis has not yet been tested in Saudi Arabia. Thus, the literature review here will rely on more general descriptions and examples of using the endogenous money approach. In the previous literature, the money supply is endogenous in that central banks cannot control the money supply, while interest rates are exogenous in that the central banks have control over interest rates and banks can influence them (Moore, 1979). Whereas the conventional money approach indicates that the money supply is exogenous because the central banks control the money supply (Choi and Oh, 2000). In literature, Post-Keynesian theory of endogenous money supply can be divided into two approaches: “horizontalist” and “structuralist” (Palley, 2008)

Choi and Oh used quarterly and monthly data from the U.S. to examine the endogenous money supply hypothesis. In their findings, they contended that money supply is, in fact, endogenous. Moreover, Vera (2001) provided empirical evidence that money supply is endogenous by testing the Granger causality within the monetary base, bank lending, and various money multipliers using a Spanish time series from 1986-1998. Vera found Granger causality ran from bank lending to the base and to the money supply.

J. Haghghat (2012) empirically used a co-integration technique to test the long-term equilibrium between the loan demands and deposit, and M1 and M2 with rate of interest. He tested the endogenous money hypothesis in Iran during the period from 1968 to 2007. Haghghat found that the endogenous money supply hypothesis holds for the case of Iran. Moreover, Economists, Shanmugam and Li, tested the endogenous money supply hypothesis in the case of Malaysia from 1985 to 2000. They tested which endogenous money perspective (the accommodationist view, the structuralist view, or the liquidity preference view) holds in the case of Malaysia. Arguably, the results are in-line with the Post-Keynesian hypothesis, which means the money supply in Malaysia was endogenous from 1985 to 2000 (Shanmugam & Li 2003). Other studies also provide empirical evidence of money supply being endogenous (Arestis & Mariscal, 1995; Pollin, 1991 and Howells, 2006).

### **3. Methodology: Econometric Methods and Data**

In this section, there are three models of the endogenous money supply: 1) an Accommodationist model wherein causality runs from commercial bank lending (LL)  $\Rightarrow$  money supply (LM3), monetary base (Lb); 2) Structuralist model,  $LL \Leftrightarrow Lb, Lm$ ; and 3) Liquidity model  $LL \Leftrightarrow LM3$ .<sup>3</sup> The data was collected by SAMA and the sample period is

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<sup>3</sup> LL stands for log-level of total commercial bank loans; LB denotes log-level of monetary base; LM3 stands for log-level of the money supply M3; Lm represents log-level of the money

from 2000 Q1 to 2018 Q4. In context, the time series will be transformed by taking natural logarithms. The econometric procedure is divided into several stages: testing the unit root in the variables by using Augmented Dickey-Fuller test. This test is necessary to ensure whether the variable is stationary or non-stationary— if the variables are non-stationary, then our model would become spurious and results are unreliable. In addition, the stationary condition is a prerequisite for implementing later Granger Causality tests (Granger, 1969). There also will be a test for the short-run relationships by using the Vector Error Correction Model (VECM) proposed by Engle and Granger (1987), if the variables fulfill the VECM conditions. It is worth mentioning that if one would like to start from the first causes for Saudi economy to have endogenous money, one should investigate the causality between the economic growth and government spending, then link it to the commercial bank loans (Alrasheedy & Alrazyeg, 2019).

### **3.1 Augmented Dickey-Fuller Unit Root Tests**

In this sub-section, the unit root test will be conducted in order to be certain whether the variables have unit roots. A variable is said to have a unit root if it does not fluctuate around zero mean and constant variance. In order to search for this, the variables will be tested in their levels and in first differences, with trend and without trend. To do this, the

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multiplier.  $\Rightarrow$  stands for unidirectional causality from the left to the right;  $\Leftrightarrow$  stands for bidirectional causality.

Augmented Dickey-Fuller unit root tests will be utilized. For all four of the time series variables, the tests will be based on two models; one is with constant and the other with constant and trend.

(a) With Constant and without trend

$$1) LL_t = \alpha + \delta LL_{t-1} + \mu_t$$

$$2) LM3_t = \alpha + \delta LM3_{t-1} + \mu_t$$

$$3) Lb_t = \alpha + \delta Lb_{t-1} + \mu_t$$

$$4) Lm_t = \alpha + \delta Lm_{t-1} + \mu_t$$

**The hypotheses are:**

If  $H_0: \delta = 0$ , there is a unit root.

Otherwise,  $H_1: \delta \neq 0$ , there is no unit root.

By using t-test:

If  $t > \text{ADF critical Value}$ ,  $\rightarrow$  fail to reject the null hypothesis, and a unit root exists.

If  $t < \text{ADF critical Value}$   $\rightarrow$  reject null hypothesis, and a unit root does not exist.

**Table 2 Unit Root Results for Model with Constant and without Trend**

Variable	Test Statistic (lag length)	Results
L (Total commercial loans)	-1.978 p-v 0.295 (1)	
DL (Total commercial loans)	-3.311 p-v 0.017 (0)	I (1)
LB (Monetary base)	-0.736 p-v 0.830 (0)	
DLB (Monetary base)	-8.412 p-v 0.000 (1)	I (1)
LM3 (Money Supply)	-2.382 p-v 0.150 (0)	
DLM3 (Money Supply)	-6.444 p-v 0.000 (0)	I (1)
Lm (Money multiplier)	-3.394 p-v 0.014 (0)	

Source: Author's Computation Note. D stands for the first difference of the variables; I (1) stands for first integrated.



The results in Table 2 reveal that all variables are non-stationary at their levels. Thus, it is clear that the null hypothesis (the variable has a unit root) cannot be rejected at 5 percent. However, all variables became stationary in the case of first difference. Therefore, the test indicates that all variables are integrated of order 1, i.e. I (1). Nevertheless, it is difficult to decide which of the tests should be used, i.e. with constant only or with constant and trend. Since there is currently no test to adequately determine which should be used, and for the sake of thoroughness and accuracy, it is better to use both to determine if they yield the same results. The Augmented Dickey-Fuller unit root test with constant and trend is used for this purpose.

(b). With constant and trend

$$1- LL_t = \alpha + \beta_t + \delta LL_{t-1} + \mu_t$$

$$2- LM3_t = \alpha + \beta_T + \delta LM3_{t-1} + \mu_t$$

$$3- Lb_t = \alpha + \beta_t + Lb_{t-1} + \mu_t$$

$$4- Lmt = \alpha + \beta_t + Lmt_{t-1} + \mu_t$$

**The hypotheses are:**

If  $H_0: \delta = 0$ , there is a unit root.

Otherwise if  $H_1 \neq 0$ , there is no unit root.

By using t-test:

If  $t > \text{ADF critical value} \rightarrow$  fail to reject the null hypothesis, and a unit root exists.

If  $t < \text{ADF critical value} \rightarrow$  reject null hypothesis, and a unit root does not exist.

**Table 3. Unit Root Results For Model With Constant and Trend**

Variable	Test Statistic (lag length)	Results
L (Total commercial loans)	-0.887 p-v 0.951 (1)	
DL (Total commercial loans)	-3.810 p-v 0.021 (0)	I (1)
LB (Monetary base)	-3.006 p-v 0.137 (1)	
DLB (Monetary base)	-8.381 p-v 0.000 (0)	I (1)
LM3 (Money Supply)	-1.512 p-v 1.000 (0)	
DLM3 (Money Supply)	-6.972 p-v 0.000 (0)	I (1)
Lm (Money multiplier)	-3.763 p-v 0.026 (0)	

Sources: Author's Computation; Note. D stands for the first difference of the variables; I (1) stand for first integrated.

The results in Table 3 show that since the null hypothesis cannot be rejected at 5 percent of statistical significance for all variables, then the latter are non-stationary at their level, which means the regression cannot be run for all variables at their level because the results will be spurious. However, the null hypothesis rejected at 5 percent after taking first differences for all variables and they became stationary after taking the first difference. Therefore, the test reveals that all variables are integrated of order 1, i.e. I (1). In short, it can be clear seen that both ADF tests—with constant and trend and with constant and without trend— result in similar outcomes. Therefore, it is now necessary to conduct Granger causality test on the variables at the first difference to ensure accurate results and avoid spurious results.

### 3.2 The Johansen Multivariate Co-integration Tests (Pairwise Maximal Eigenvalue Test and Pairwise Trace Tests)

The results found in the previous sub-section satisfy the conditions required to conduct a Johansen test by showing that all variables are non-stationary at their level, yet stationary at the first difference. Thus, the Johansen test will be conducted for the variables LL, LM3, Lb, and Lm. The purpose of Johansen test is to check whether the variables have long run relationship for the purpose of using the VECM. According to Granger (1988), causality can actually be subdivided into long run and short run causality. Therefore, short-run causality is determined by the vector error correction term, whereby if it is significant, then it indicates a statistic evidence of short-run causality from the explanatory variable to the dependent variable. Therefore, there is a need to test for co-integration as a precondition for the Vector Error Correction Model (VECM) to be conducted.

There are two test statistics produced by the Johansen multivariate Co-integration procedure: trace test and maximal eigenvalue test. Hence, both can be used to determine the number of co-integrating vectors present. Although, there are sometimes discrepancies in the number of co-integrating vectors indicated by both tests.

Shortly, since the condition for running the co-integration test for all variables is met, it will be conducted to test for long run co-integrating vectors between LL and LM3 (Y), LL and Lb, LL and Lm, LM3 and Lb, LM3 and Lm, and Lb and Lm.

There are six models:

$$1) LL_t = \alpha_0 + \alpha_1 LM_t + \mu_t \quad \mu_t \approx \text{i.i.d. } (0, \Omega)$$

- 2)  $LL_t = \alpha_0 + \alpha_1 Lb_t + \mu_t$   $\mu_t \approx \text{i.i.d. } (0, \Omega)$   
3)  $LL_t = \alpha_0 + \alpha_1 Lm_t + \mu_t$   $\mu_t \approx \text{i.i.d. } (0, \Omega)$   
4)  $LM3_t = \alpha_0 + \alpha_1 Lb_t + \mu_t$   $\mu_t \approx \text{i.i.d. } (0, \Omega)$   
5)  $LM3_t = \alpha_0 + \alpha_1 Lm_t + \mu_t$   $\mu_t \approx \text{i.i.d. } (0, \Omega)$   
6)  $Lb_t = \alpha_0 + \alpha_1 Lm_t + \mu_t$   $\mu_t \approx \text{i.i.d. } (0, \Omega)$

Where:

i.i.d- independent and identically distributed

$\Omega$  - variance-covariance matrix, indicating no heteroskedasticity

**Table 4. Co-Integration Test Results**

Dependent Variable	Independent Variable	Trace Statistic	Max-Eigen Statistic	Results
L(L)	M3	11.224 (15.494) p-v 0.198	6.412(14.264) p-v0.560	Not cointegrated
M3	L(L)	11.224 (15.494) p-v 0.198	6.412(14.264) p-v0.560	Not cointegrated
L(L)	L(B )	9.719 (15.494) p-v 0.303	5.264 (15.494) p-v0.738	Not cointegrated
L(B )	L(L)	9.719 (15.494) p-v 0.303	5.264 (15.494) p-v0.738	Not cointegrated
L(L)	L(m)	12.100 (15.494) p-v 0.152	7.264 (15.494) p-v0.489	Not cointegrated
L(m)	L(L)	12.100 (15.494) p-v 0.152	7.264 (15.494) p-v0.489	Not cointegrated
L(M3)	L(B)	17.191(15.494) p-v 0.027	12.589(14.264)p-v0.090	Not cointegrated
L(B)	L(M3)	17.191 (15.494) p-v 0.027	12.589(14.264)p-v0.090	Not cointegrated
L(M3)	L(m)	17.453 (15.494) p-v 0.025	12.819(14.264)p-v0.083	Not cointegrated
L(m)	L(M3)	17.453 (15.494) p-v 0.025	12.819 (14.264) 0.083	Not co-integrated
L(B)	L(m)	17.254 (15.494) p-v 0.026	12.612 (14.264) 0.089	Not co-integrated
L(m)	L(B)	17.254 (15.494) p-v 0.026	12.612 (14.264) 0.089	Not co-integrated

*Source:* Author's Computation; the decision has been taken based on the Max-Eigen.

Based on Max-Eigen test, the above results indicate that the null hypothesis cannot be rejected for all variables at 5 percent, which means that not a single pair of variables is co-integrated. Thereby, the Vector Error Correction Model (VECM) cannot be

implemented to investigate the short-term relationship between variables. Consequently, the standard Granger causality will be employed to detect the direction of causality in the case of Saudi Arabian money supply.

### 3.4.1 Standard Granger Causality Test

After showing that the variables are stationary, i.e. integrated of order 1, but not co-integrated (no long run relationship, thus the Vector Error Correction Model cannot be conducted), then the standard Augmented Granger causality test can be conducted to ascertain the direction of causality between variables. Moreover, the results will provide a clear view about the Post-Keynesian approaches to endogenous money supply that match better the case of Saudi Arabia.

**Table 5 .Standard Granger Causality Test Results**

Direction	Direction of causality	Optimal lag	Test statistic
Null DLL does not cause DLM3	LL $\Leftrightarrow$ LM3	2	6.917 p-v 0.001
Null DLM3 does not cause DLL		2	6.188 4 p-v 0.003
Null DLB does not cause DLL	LL $\Rightarrow$ LB	2	0.248 p-v 0.780
Null DLL does not cause DLB		2	5.379 p-v 0.006
Null DLL does not cause Lm	Lm $\Rightarrow$ LL	2	3.107 p-v 0.012
Null Lm does not cause DLL		2	3.207 p-v 0.595
Null DLM3 does not cause DLB	LM3 $\Rightarrow$ LB	2	1.801 p-v 0.000
Null DLB does not cause DLM3		2	2.898 p-v 0.061

Sources: Author's Computation. Note: Using AIC to indicate optimal lag length. All decisions are taken based on  $\alpha = 0.05$ .

The results support the fact that the liquidity preference view is most accurate in the case of Saudi Arabia. The paper shows that there is a bi-directional Granger causality running from the total commercial bank loans to the money supply and vice versa. Moreover, the tests show that there is a Granger causality running from the total commercial bank loans to the monetary base because the null hypothesis that says the monetary base does not cause the total commercial bank loans cannot be rejected, which supports the Accommodationist's view. In contrast, the additional null hypothesis postulating that the total commercial bank loans do not cause the monetary base can be rejected; thus, there is a Granger causality running from total commercial bank loans to the monetary base. Finally, it is clear that there is a Granger causality running from the money multiplier to the total commercial bank loans because the null hypothesis, which is that the total commercial bank loans do not cause the money multiplier, cannot be rejected. On the other hand, the other null hypothesis, which is that the money multiplier does not cause the total commercial bank loans, can be rejected. In short, the Granger causality holds correct in only one direction. To sum up, there is a mixture of results that reveals that the Saudi economy has endogenous money supply according to the Accommodationist's and Liquidity preference views.

The empirical results show statistical evidence supporting the fact that the classical Modern Money Theory does not hold in the case of Saudi Arabia. This theory maintains that if a country has a floating exchange rate, the money supply in this country will be

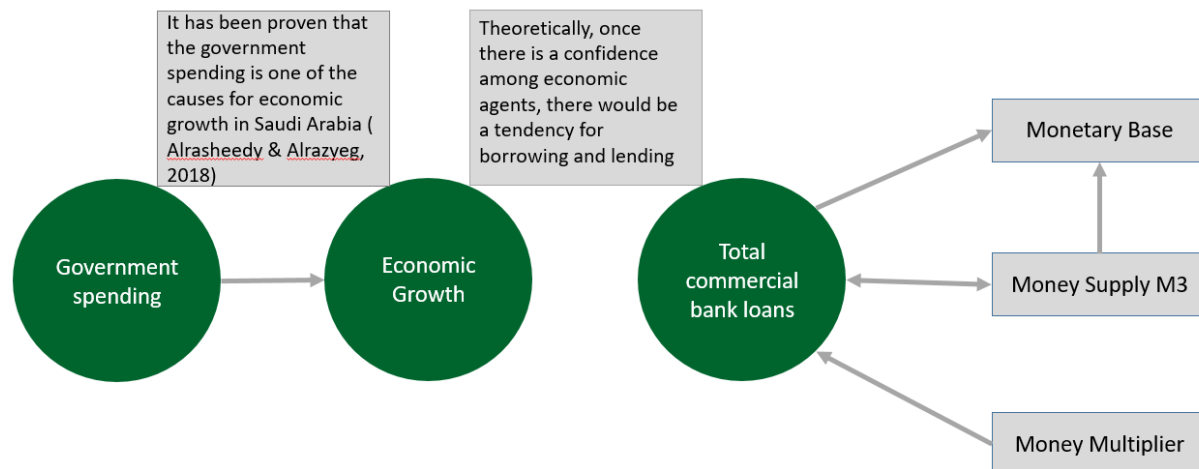
endogenous and the interest rate will be exogenous. Furthermore, the classical version of Modern Monetary Theory claims that if a country has a fixed exchange rate, then the money supply will be exogenous, and the interest rate will be endogenous. Empirically, Saudi Arabia defies the claim of this theory with a fixed exchange rate, but with an endogenous money supply and an exogenous interest rate over the period 2000Q1 to 2018Q4. In short, these results are clearly compatible with the post-Keynesian hypothesis, which rejects the orthodox view of exogenous money supply and concludes that the money supply is endogenous. The endogenous money supply hypothesis conjectures that loans create deposits and deposits create reserves and creditworthiness determines the loans, i.e. banks look for good borrowers not for reserves to grant loans.

## **4. Interpretations of Results**

### **4.1. Saudi Money Supply Mechanism:**

The endogenous money transmission mechanisms start from the positive expectation about the future of the economy. In fact, the certainty among economic agents can clearly increase the money supply through increasing demand for credits and, in turn, increase deposits. Arguably, the endogenous money starts with government spending, which is the main driver of positive insight of good future for the economic agents.

**Figure 1. Endogenous Money Transmission Mechanisms**

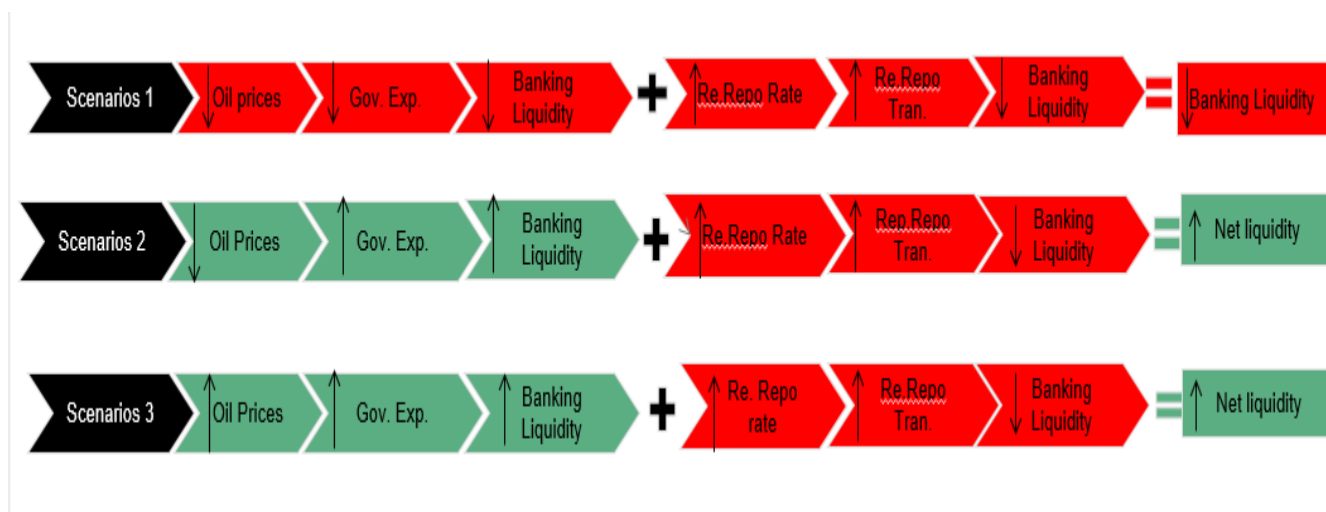


From a theoretical perspective, the main driver of money supply is government spending through stimulating certainty amongst economic agents (borrowers and lenders). Thus, if there is a significant government spending, there would be a positive future expectation amongst agents, in turn, agents would seek more loans, regardless of the purposes of borrowing i.e. for investment or consumptions, which eventually would lead to more economic activity. In context, if the purposes of loan were to invest, then there would be creation of new jobs. As a result, higher purchase power in society tends to increase consumption. In short, endogenous money view holds true in the case of the Saudi economy because of certain factors, including government spending and current Saudi monetary policy. In this context, the current Saudi monetary policy, which is a fixed exchange regime, has helped the government smooth its consumption during oil reduction. The theory of foreign reserves as a *de facto* sovereign wealth fund can illustrate how the current Saudi monetary policy has helped the government smooth its expenditure during a



period wherein oil prices were low. The theory postulates that the ability of a country (which is commodity-based economy with fixed exchange rate regime in the case of Saudi Arabia) to accumulate more foreign reserves during periods of high oil prices, and smooth government spending during periods of low oil prices by withdrawing from reserves. However, the foreign reserves theory is not an ultimate source to smooth expenditures forever because it would put pressure on the exchange rate regime. Therefore, coordination between fiscal and monetary policies is necessary.

**Figure 2. Impact of the Fiscal and Monetary Policies on the Banking Liquidity**



*Source: SAMA internal Presentation used for another purpose, done by SAMA Staff*

Figure 2 shows the indirect mechanism of oil sector to the money supply in the Saudi banking system. This Figure contains three scenarios of which the first one shows that lower oil prices cause a drop in government expenditures, leading to a contraction in the banking liquidity. As a consequence, the reverse repo rate would go up, the reverse repo

transactions would increase, and the banking liquidity would decrease. On the contrary, the second scenario shows the impact of government expenditures on the Saudi banking system even in case of lower oil prices. The second scenario also elucidates that if there is an increase in government expenditures, there would be an increase in the banking liquidity, even in the case of lower oil prices. However, in this scenario, the reverse repo increases which would cause an increase in reverse repo transactions, the net liquidity in the system would increase because of government expenditure. Finally, the third scenario illustrates the normal status in which oil prices are high. High oil prices would increase government spending and the liquidity in the banking system would increase despite the increase in reverse repo rate, which causes an increase in the reverse repo transactions which reduces the liquidity in banking system that would be offset the government spending.

## **5. Conclusion**

This paper examined whether the endogenous money approach, for which loans create deposits and deposits create reserves, holds true in the case of Saudi economy. The results show statistical evidence confirming that the classical Modern Money Theory (MMT) does not hold in the case of Saudi Arabia. This theory maintains that, if a country has a floating exchange rate, the money supply in this country will be endogenous (loans create deposits and deposits create reserves; the central bank has no control over the money supply) and the interest rate will be exogenous; that is, the central bank determines the

interest rate. Further, the classical version of MMT claims that if a nation has a fixed exchange rate, then the money supply will be exogenous, and the interest rate would be endogenous. Empirically, Saudi Arabia defies this theory with a fixed exchange rate, but with an endogenous money supply and an exogenous interest rate over the period (2000 Q1 to 2018Q4) In short, these results are clearly compatible with the post-Keynesian hypothesis, which rejects the orthodox view of exogenous money supply and concludes that the money supply is endogenous. Endogenous money supply hypothesis conjectures that loans create deposits and deposits create reserves and creditworthiness determines the loans, i.e. banks look for good borrowers not for reserves to grant loans. Moreover, this paper starts from the fact that government spending is the main cause of economic growth, which, in turn, increases the certainty amongst economic agents (borrowers and lenders). In essence, government spending increases confidence among economic agents and, thus, banks would lend as long as they have creditworthy client, eventually credit could be the second driver of economic growth. In context, the growth of credit would cause economic growth through stimulating economic activities.

For future research, one could have this approach and apply it on decomposition of the economic sectors, to further investigate the impact of the endogenous money on specific sector and economic activities. Moreover, one can further illustrate the role of the fiscal under the endogenous money hypotheses.

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