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Abstract

Post Keynesian economics is actually macroeconomics in a world of uncertainty and endogenous money. Post Keynesians posit that money supply in a market oriented production economy is endogenous or endogenously determined (rather than exogenous as claimed by Monetarists). Money supply is said to be endogenous if it is determined within the economic system itself. The present paper investigates this theory using a panel dataset of 177 countries from year 1970-2011 utilising dynamic panel data analysis and has found that money supply is endogenous as proposed by Post Keynesian theorists.

Keywords: **Post-Keynesians; Endogeneity; Panel Data Analysis; System GMM**

1. Introduction

The history of modern monetary economics has witnessed the emergence of two opposing views concerning the role of central bank in managing the supply of money and (indirectly) the level of economic activities in an economy.

The first group of economists known as Monetarists, under the influence of Milton Friedman, contends that money supply in an economy is exogenously determined. This view is based on the premise that money supply equals the money multiplier times the monetary base. Since the central bank can change this base, it can control the supply of money in the economy.

The second group of economists labeled as Post Keynesians, posits that money supply is endogenous rather than exogenous. Money supply is said to be endogenous or endogenously determined if money creation occurs within the monetary system of an economy – rather than being determined by external forces.

What today has come to be known as Post Keynesian economics is actually macroeconomics in a world of uncertainty and endogenous money, inspired by the ideas of the well-known British economist, John Maynard Keynes (Keynes, 1930; 1933; 1936). While the idea of money supply endogeneity has its origin from Lord Keynes (Keynes, 1930) in his *Treatise,* and Le Bourva (1992) provided some insights into this theory, the significant contributions of four early economists must not be ignored. Robinson (1956), Davidson (1978), Kaldor (1982) and Moore (1986, 1988, 1998) were those who actually (directly) responsible for the development of the present day Post Keynesian school of monetary thought

This paper is organized in six sections. After providing a brief review of the theory of endogenous money in Section 2.0, a brief review of previous work is offered in Section 3.0. While the data and methodology to be used in the present empirical study are described in Section 4.0, Section 5.0 presents and discusses the findings of the study. The last Section, Section 6.0, concludes.

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2. Underlying Theory

Endogenous money is a major component of Post Keynesian economics. It refers to the theory that the existence of money in an economy is driven by the requirements of the real economy – that market forces combine with the central bank in establishing the money supply (Pollin, 1991). The banking system reserves then, expand and contract as needed in order to accommodate the demand for credit at prevailing interest rates.

According to Palley (1992:155) the theory of endogenous money "…maintain that money supply is endogenously determined by the joint actions of the monetary authority, the asset and liability management decisions of commercial banks, the portfolio decisions of the non-bank public, and the demand for bank loans". Further, Rochon (2001) underlines that the theory of endogenous money consists of five propositions:

- The causality between money and income in the Quantity Theory of Money is reversed. The supply of money is a function of profit expectation (Wray, 1992). The causality runs from profit expectation (PE) – the expected (or desired) income of firms – to the demand for credit (DC). It is the demand for credit that leads to the creation of money (MC). The creation of money through loans leads to the creation of effective demand (ED). The flow of causality can then be summarised as follows:

$$PE \rightarrow DC \rightarrow MC \rightarrow ED$$

- The causality between reserves (R), deposits (D) and loans (L) is reversed (see also Pollin, 1991: Lavoie, 1992):

$$L \rightarrow D \rightarrow R.$$

Being endogenous, bank reserves have no causal influence on loans. This suggests the rejection of the money multiplier model.

- The causality between savings and investment is reversed (see also Davidson, 1993; Shapiro, 2005). In other words, savings cannot cause investment (Lavoie, 1992). Investment cannot be financed by savings because in a world of endogenous money it is the creation of income resulting from an increase in investment that creates savings.

- The rate of interest is exogenous (see also Lavoie, 1996; Smithin, 1994; Wray,1995). Interest rate is not determined by the market mechanism – it is determined neither by the supply of and the demand for savings nor the supply of and the demand for money. The nominal interest rate is exogenous because it is set by the central bank. Interest rate is exogenously determined according to internal and external economic objectives (Lavoie, 1992; Moore, 1988).

- The money supply is 'demand-determined and credit driven.' Money which is primarily a flow exists as a result of the demand for credit that allows firms to fulfill their expenditure plans. Being endogenous, the supply of credit is determined by decision of commercial banks.

3. Underlying Theory

Le Bourva, through his two papers published in 1959 and 1962, is actually the one who puts the foundation for the developments of a branch of Post Keynesian economics known as the theory of money supply endogeneity. This theory in its 'organised' form however, started in the late 1970s with the publication of the *Journal of Post Keynesian Economics* in 1979. Among the earliest papers published in this Journal are by Moore (1983; 1988). This suggests that the theory of money supply endogeneity is a relatively new theory, since the empirical works examining money supply endogeneity only started in the early 1980s.

Kaldor (1982) was among the earliest economists who empirically investigated this theory. He analysed the data for the UK for a sample period of 1966 through 1979 by utilising the Ordinary Least Square (OLS) method. His findings suggest that money supply is determined by the demand for bank lending, hence appears to be among the earliest evidence of money supply endogeneity.

Moore (1983) extended this evidence for the U.S economy, using quarterly data spanning from 1964 to 1979, to analyzs the demand for bank loans to commercial and industrial corporations. His finding cited that, in order to finance their working capital, firms increase their demand for loans (particularly for the purpose

of paying wages). Thus, financing for working capital appears to be the most important determinant of bank lending to companies.

Strictly speaking, when monetary authorities (central banks) change interest rates, it because a "refinancing" rate, the rate at which liquidity is made available to the banking sector. It is only in the market for reserves that the bank is the monopoly supplier and only in that market that it can determine price directly. The deputy governor of Bank of England's once noted "...the Bank of England supplies base money on demand at its prevailing interest rate, and broad money is created by the banking system" (King, 1994:264). What happens as broad money is created is determined by behavioural interactions among private sector agents. This includes what happens to market interest rates, the ones that genuinely impinge on real economic activity.

Panagopoulos and Spiliotis (1998) conducted an empirical study of the commercial banks' lending behaviour in Greece and revealed that credit money was primarily determined by the banking system in response to the demand for loans. In their conclusion, Panagopoulos & Spiliotis (1998: 670) underlined that "...evidence verifies the Post Keynesian approach that, in modern economies, the credit-money supply process is an endogenous one".

Vera (2001) provided other evidence that the supply of credit money is endogenous. Using the time series data from Spain (for the period 1987-1998), a Granger causality tests were run between the monetary base, bank lending, and various money multipliers. The evidence is strongly consistent with the hypothesis that the money supply is credit-driven and demand-determined. Granger causality was found to run from bank lending to the base, and to the money supply, and not from the base to the money supply and to loans, as the mainstream view maintains.

Another evidence of money supply endogeneity was from Yulia (2005) using the Russian data. However, different from previous studies (monetarist view), Yulia found that inflation leads to money supply growth. Such findings support the endogenous money supply view.

Lavoie (2005) examined the monetary based endogeneity of the Canadian economy. His findings suggest that asset-based financial system, just like credit in financial systems, rely on a fully endogenous supply of high-powered money, with central bank engaging essentially in "defensive" operations. This is demonstrated through an analysis of the Canadian monetary process with the overnight rate closely gravitating around the target overnight rate. Central bank of Canada knows with perfect certainty both its supply of and the demand for settlement balances (Lavoie, 2005). Thus, money supply in Canada is endogenous.

Ahmad and Ahmed (2006) studied Pakistan monthly data based on a sample period of twenty-four years (i.e., 1980 - 2003) and came up with interesting findings that might have some implications for future research on money supply endogeneity. They found that Pakistan money supply for the period of 1980 – 2003 is endogenously determined in the short run. Different from other studies of money supply endogeneity, in the long-run their findings indicate that it is the base money that determines the total bank advances, versus otherwise. In principle they concluded that the central bank of Pakistan has some considerable on money supply in the long run.

Similar to Ahmad and Ahmed (2006), Cifter and Ozun (2007) also utilised Granger Causality and Vector Error Correction (VECM) methodology to examine money endogeneity in a developing country. Aimed at testing monetary transmission mechanism and passive money (or money supply endogeneity) hypothesis, they used seven types of variables: money base, money supply, credit capacity, industrial production index (i.e., the proxy for the GDP), interest rates, inflation and real exchange rate. They used quarterly data for the sample periods of ten years, ranging from 1997 to 2006. One of the major outcomes of the study is that the endogeneity of money supply hypothesis of the Post Keynesian economics is supported in part by Accommodationists view but differ from those of Structuralist and Liquidity Preference theories.

4. Data and Empirical Method

The panel dataset used in this paper runs across 42 years timespan from 1970-2011 for 177 countries. All data are obtained from World Development Indicators (World Bank, 2012). Money supply variable is represented by money and quasi money (M2) as percentage of GDP, while real GDP per capita is measured in constant US dollars year 2000. Whereas data on domestic credit provided by the banking sector including

the monetary authorities and deposit money banks as well as other banking institutions and taken as percentage of GDP is used to reflect bank lending. Finally, the inflation is taken by the year-on-year change of the consumer price index (base year 2000).

To provide a preliminary empirical assessment on the monetary endogeneity, the following money supply model is used:

$$MS_{it} = \alpha MS_{it-1} + \beta_1 GDP_{it} + \beta_2 LENDING_{it} + \beta_3 INFLATION_{it} + v_i + \varepsilon_{it} \qquad (1)$$

where money supply (MS_{it}) is estimated against real GDP per capita (GDP_{it}), bank lending ($LENDING_{it}$) and inflation ($INFLATION_{it}$). We aim to investigate whether the variables have significant explanatory power on the money supply. As previously discussed in the literature review, the explanatory variables have been shown to significantly influence money supply nothwithstanding the monetarist argument that the direction of causality running from money supply to those variables. v_i is included in the model to capture the unobserved heterogeneity factor normally present in panel data and ε_{it} is the i.i.d. error term.

We employ a relatively new and advanced estimation method known as System GMM to estimate the money supply model as in Equation (1). System GMM is developed by Arellano and Bover (1995) and Blundell and Bond (1998) and the method is considered more superior than difference GMM. Bond *et al*. (2001) argue that this method is able to correct unobserved country heterogeneity, omitted variable bias, measurement error, and potential endogeneity that frequently affect growth estimation.

This technique combines in a system the relevant regressions expressed in first-differences and in levels. First-differencing checks for unobserved heterogeneity and omitted variable bias, as well as for time-invariant component of the measurement error. It also corrects endogeneity bias (time-varying component) via instrumenting the explanatory variables. Instruments for differenced equations are obtained from values (levels) of explanatory variables lagged at least twice, and instruments for levels equations are lagged differences of the variable. Estimating two equations in a system GMM reduced potential bias and imprecision associated with a simple first-difference GMM estimator (Arrellano and Bover, (1995), Blundell and Bond (1998))[†]. Alonso-Borrego and Arellano (1999), and Blundell and Bond (1998) point out that when explanatory variables are persistent over time, lagged levels of these variables make weak instruments for regression in differences, and instrument weakness in turn influences the asymptotic and the small-sample performance of the difference estimator. Asymptotically, variance of the coefficients will rise, and in small sample, Monte Carlo experiments show that weak instruments can produce biased coefficients.

Consistency of the GMM estimator depends on the validity of the instruments. As suggested by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998), two specification tests are used. Firstly, Sargan/Hansen test of over-identifying restrictions which tests for overall validity of the instruments and the null hypothesis is that all instruments as a group are exogenous. The second test examines the null hypothesis that error term ε_{it} of the differenced equation is not serially correlated particularly at the second order (AR2)[‡] Ones should not reject the null hypothesis of both tests.

For additional robustness check, as far as the results are concerned, we also estimate Equation (1) using cross sectional (Pooled Ordinary Least Square- Pooled OLS) and panel fixed effect methods.

5. Results and Discussion

The following Table 1 outlines the results of four regression methods, namely Pooled OLS, Fixed Effects, Difference GMM and System GMM, on the Equation 1 above. A quick glance of the results reveals that real GDP per capita and bank lending are indeed signifcant determinants of money supply, hence

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[†] See Arellano and Bover (1995) and Blundell and Bond (1998) for more detailed explanation of the dynamic panel system GMM, its moment conditions and stationarity assumptions which shown to outperform difference GMM and static panel model such as Fixed effect and Pooled OLS.

[‡] By construction, the differenced error term is probably serially correlated at first-order even if the original error is not. While most studies that employ GMM dynamic estimation report the test for first order serial correlation, some do not.

supporting the earlier arguments of money supply endogeneity as proposed by Post-Keynesian economists. Inflation is however not, and this is not uncommon since it is in line with fundamental theory of inflation according to monetarist perspective. Our finding therefore contradicts the endogeneity of money supply as found by Yulia (2005) that shows inflation determines money supply. The strength of dynamic difference and system GMM relies on the instruments validity and reliability. They are indicated by the serial correlation tests (AR(1) and AR(2)) and the Hansen test.

The p-values of AR(1) and AR(2) tests indicate the presence of serial correlation, but this is however not unexpected since the dataset used is 40 years series and the variables have been shown to be persistent over time. The objective of this empirical analysis is simply to assess the relationship between money supply and a number of explanatory variables previously proposed in the money supply endogeneity theory, and not to investigate the long run relationship between the variables which would prompt us to take care of the serial correlation issue via panel unit root tests and panel cointegration technique. Meanwhile, the Hansen test shows that we are unable to reject the null of overall exogeneity of the instruments used in the estimation of dynamic difference and system GMM since the p-values are 0.33 and 0.40, respectively.

Table 1: Money supply estimation

Explanatory variables	Methods	Pooled OLS	Fixed Effects	Difference GMM	System GMM
Constant		-20.188***	-115.356***		-116.229***
		(3.381)	(5.169)		(35.806)
Lagged Money Supply		0.084	0.011***	0.006	0.003
		(0.079)	(0.002)	(0.005)	(0.004)
Real GDP per capita		**5.117***	**18.635***	**22.235***	**18.983***
		(0.607)	(0.696)	(7.309)	(5.081)
Bank Lending		**0.548***	**0.474***	**0.639***	**0.448***
		(0.048)	(0.008)	(0.123)	(0.104)
Inflation		-0.001	0.000	-0.000	0.000
		(0.001)	(0.000)	(0.000)	(0.000)
Observations		4,914	4,914	4,722	4,914
R-squared		0.567	0.590		
Adj. R-squared		0.567	0.575		
Number of country			177	177	177
No. of instruments				163.000	168.000
AR1 p-value				0.430	0.919
AR2 p-value				0.870	0.980
Hansen p-value				0.330	0.402

Note: Dependent variable is money supply. All variables are in natural log form. Robust standard errors in parentheses.***, **, * indicate significant at 1%, 5% and 10% respectively.

6. Conclusions

The question of whether money supply in an economy is endogenously or exogenously determined is crucial for a proper formulation of macroeconomic theory and policy. While this issue still seems to be unsettled, our review of the empirical literature indicates that evidence supporting the proposition of money supply endogeneity in several countries is increasing.

Further, in recent years, monetary authorities in several countries – Malaysia is included – have employed interest rate targeting approach in managing their economies towards facing internal as well as external changes. In facing the effect of the 2007/2008 world financial crisis for example, monetary authorities in the United States of America (U.S.), the United Kingdom (U.K.) and Japan have introduced zero interest rate policies in addition to their stimulus packages. The U.S., European Union, Germany, France, Japan, China, South Korea, Indonesia, the Phillipines, Vietnam, Singapore, Thailand and Malaysia are among the countries that introduced billions of dollars stimulus packages to 'save' their economies from the adverse effects of the current global financial crisis.

The aforementioned scenario of policy decisions and actions suggest that monetary authorities in major economies of the world have considered money supply as endogenous and hence, interest rates are treated to be exogenous. If the supplies of money in these economies are actually endogenous, then interest rate

targeting approach in managing the economy (as highlighted above) would be the appropriate and effective policy.

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