RELATIVE PRICE IN THE DEMAND FOR INDONESIAN NARROW MONEY

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Abstract.The present study investigates the behaviour of demand for money. Many determinants of demand for money in Indonesia and classified them into the following : interest rate variable and real income. A conventional money demand specification is then contrasted with a money demand function which contains the relative price as additional regressors. The aim of this paper is to analyse the narrow component of money demand are examined in the following ways : to examine whether a time series has a unit root test, this paper has used Augmented Dickey-Fuller (ADF) unit root test. To find the long-run relationship among the variables, this paper has applied the Engle and Granger Cointegration Test. And finally, to determine that short run dynamic of the system, this paper estimated an Error Correction Model (ECM). Using time series data for Indonesia over the period 1984-2013. The study found the existence of one cointegrating vector, indicating a valid long-run economic relationship among the determinants of demand for money. The study established that there is a valid long-run inverse relationship between demand for money and interest rate variable. The result also reveals that gross domestic product variable has a significant positive effect on demand for money. Similarly the positive effect of relative price. The result in this paper provides very strong evidence that traditional money demand studies may well be misspecified in omitting a role for relative prices.

Keywords: interest rate, real income, relative price, money demand

I. INTRODUCTION

In conventional money demand studies, it is usually assumed that the demand for money as a function of an interest rate and real income. It is very uncommon, however, for relative prices to be included as regressors in estimated money demand function with the implicit assumption that the demand for money is independent of changes in the relatives price of the commodity. This is somewhat surprising, however, given that theoretical work on money demand often stresses the link between money and commodity. Barnett et.all (1992) point out that the establishment of a weakly separable subutility function of monetary assets is a necessary precondition for the construction of valid monetary quantity and price indicates in just the same way as the weak of separability of commodities in the utility function is required for the existence of a valid commodity quantity and price index. It may well be,however, that the utility function is asymmetric in respect of weak separability. That is, the certain group of monetary assets may be weakly separable from other goods, including commodities, in the utility function, but commodity may not be weakly separable from other goods, including monetary assets. If this were the case, a valid monetary aggregate could be established and the role of relative prices examined in the context of a modified money demand function. Drake (1996) establish admissible monetary aggregates and a potential role for relative prices in the money demand function. A conventional money demand specification is then contrasted with a money demand function which contains the relative prices of durables, non-durables and services as additional regressors. Evidence from the long-run cointegrating analysis, short-run error correction model and non-nested testing all confirm a role for relative prices in the UK personal sector money demand function.

Recent advances in the time series analysis have yielded new procedures for estimating long run and the short run econometric relationship between non-stationary variables. One such procedure which has become widespread in the economic literature is the use of dynamic specification with an error correction mechanism (ECM) in the single equation and multi-equation macroeconomic forecasting models. The favourable performances of the ECM model relative to the traditional model have inspired other researchers to use the ECM approach in economic modelling. Granger (1987) who linked the time series properties of economic time series to the concept of cointegrating and ECM modelling approach. If two non-stationary variables are integrated of the same order and are found to be cointegrated, a usual conventional model which includes only dependent and independent variables in their stationary form is subject to misspecification error.

The present study evaluates the determinant of demand for money in the process of economic development of Indonesia, during the period 1984-2013.

The plan of this paper is as follows : section 2 provides the theory of demand for money, section 3 discusses the methodology : description and sources of data used, and error correction model, section 4 presents

discussions on the empirical result, and finally section 5 is the conclusion.

II. THEORY OF DEMAND FOR MONEY

The demand for money has been at the centre of macro economy model debate since Keynes's General Theory set down the initial version of what has to come standard macroeconomic version of the theory. Over the year it has become almost a dictum that a necessary condition for money to exert a predictable influence on the economy is a stable demand function for money, as often emphasised by Milton Friedman. The theoretical literature on money demand does not contain the result that a linear function of a view key variables would be expected to serve as the demand for money. In particular, there exists a large number of potential alternative to money, the price of which might decision to hold money. The studies of demand for money and the many studies of the influence of money on the economy are based on official monetary aggregates, currently M1, M2, M3 and L constructed by a method that does not take advantage of the result either of existing aggregation theory or of recent developments in the application of demand theory to the study of financial institution.

III. THE METHODOLOGY

A. Description and Sources of Data Used

This study used secondary data from Bank of Indonesia and Statistics Indonesia. The period of data is 1984-2013. There are four variables is used in this paper, such as :

1. Narrow Money (M1)
   The common practice among central banks is to construct monetary aggregates from a list of entities by adding together those that are considered to be the likely sources of monetary services.The four popular aggregates of M1, M2, M3, and L.
2. GDP (gross domestic product)
   Consumer holds money because it yields a utility. Their demand for money should be a demand for real balance. This demand for real balance should depend on the level of real income.
3. Interest rate
   The effect of interest rates on demand for money is negative.The higher nominal interest rate reduces the demand for real money balances
4. Relative Price
   The relative prices are included as relevant regressors in the extended relative price money demand specification. This relative price was obtained by deflating the respective price by the GDP deflator

TABLE 1.

MONEY DEMAND (M1), GROSS DOMESTIC PRODUCT (GDP), INTEREST RATE (IR), RELATIVE PRICE (RP)

Year	**M1 (billion)**	**GDP (billion)**	**IR (%)**	**RP (%)**
1984	7569	83318,2	14,24	237,19
1985	8581	94517,8	16,99	248,4
1985	10104	99936,1	16,16	262,88
1986	11677	107321,1	16,21	287,27
1987	12685	115110,1	20,59	310,37
1988	20114	122705,1	21,25	330,29
1989	23818	131184,8	15,69	112,48
1990	26342	139707,1	10,03	123,02
1991	28779	354640,8	8,51	132,25
1992	36805	383792,3	13,93	145,07
1993	45374	414418,9	14,92	157,42
1994	52677	434095,5	20,69	172,27
1995	64089	374718,7	39,36	185,96
1996	78343	376902,5	13,19	198,22
1997	101197	389016,9	12,54	168,32
1998	124633	411753,6	15,51	202,63
1999	162186	426943,1	13,65	210,27

2000	177731	444453,5	7,11	234,46
2001	191939	1656517	6,47	262,31
2002	223799	1750815	11,71	279,59
2003	253818	1847293	9,61	113,25
2004	281905	1963974	7,41	125,09
2005	347013	2082456	10,47	141,48
2006	450056	2177742	7,34	150,55
2007	456787	2314459	6,73	160,82
2008	515824	2464566	6,62	115,06
2009	605378	2618938	5,54	120,97
2010	722991	2770345	7,61	127,45
2011	841722	8566271	9,07	132,9
2012	887064	8976932	7,99	142,18
2013	7569	83318,2	14,24	237,19

Source : Statistic Indonesia 1984-2013

B. ERROR CORRECTION MODEL

The model consists of four variables, such as Gross Domestic Product (GDP), Interest Rate (IR), Relative Prices (RP) and Demand for Money (MD). The empirical demand for money function takes the following form :

$$MD_t = b_0 + b_1 GDP_t + b_2 IR_t + b_3 RP_t + E_t$$

In this paper, the effect of determinants on demand for money is examined in the following ways : The first, empirical work based on time series data assumes that underlying time series is stationary. An alternative test of stationarity is known as the unit root test. This paper has used Dickey-Fuller (DF) unit root and Augmented Dickey-Fuller (ADF) unit root test. The second, cointegration means that despite being individually non-stationary, a linear combination of two or more time series can be stationary. The Dickey-Fuller (DF), Augmented Dickey-Fuller (ADF), and Cointegrating Regression Durbin-Watson (CRDW) test can be used to find out if two or more time series are cointegrated.And finally, the Error Correction Mechanism (ECM) developed by Engle and Granger is a means of reconciling the short run behaviour of economic variables with its long run behaviour.

C. HYPOTHESIS TESTING

1. If the null hypothesis is rejected that is a unit root exist and stationary in their difference
2. If the null hypothesis is rejected that there are cointegrated, there is cointegrating relationship involving given of MD, GDP, IR and RP
3. There are positive effects MD on GDP, and MD on IR, there is negative effect MD on RP

IV. DISCUSSIONS ON EMPIRICAL RESULT

A time series is therefore said to be stationary if its means, variance and covariance remain constant over time. A test of stationary is known as the unit root test. If a time series is differenced once and the differenced series is stationary, the original series is integrated of order 1, denoted by I(1). Similarly, if the original series has to be differenced twice (take first difference of the first difference) before it becomes stationary, the original series is integrated of order 2, or I(2). In general, if a time series has to be differenced d times, it is integrated of order d or I(d).

The Dickey-Fuller (1981) test is applied to regression run in the following forms :

$$DX_t = a_0 + a_1 X_{t-1} + \Sigma_{i=1..k} b_i DX_{t-1}$$
$$DX_t = c_0 + c_1 T + c_2 X_{t-1} + \Sigma_{i=1...k} d_i DX_{t-1}$$

Where

$DX_t = X_t - X_{t-1}$

T = times or trend variable

X_t = variable at period of t

k = integrated of order

a_1 and c_2 = DF and ADF value, if DF and ADF values > the critical value of table, the null hypothesis is rejected (see Thomas, 1997 : 406-412), that is a unit root exits and stationary in their difference.

The First difference test is applied to regression run in the following forms : (Insukindro, 1993:131)

$$DDX_t = e_0 + e_1 DX_{t-1} + \Sigma_{i=1..k} f_i DDX_{t-1}$$
$$DX_t = g_0 + g_1 T + g_2 X_{t-1} + \Sigma_{i=1...k} h_i DDX_{t-1}$$

Where

$DDX_t = DX_t - DX_{t-1}$

e_1 and g_2 = DF and ADF value, if the DF and ADF values > the critical value of table, the null hypothesis is rejected (see Thomas, 1997 : 406-412), that is a unit root exits and stationary in their difference.

The result is given in table 2, and show all the variables have a unit root in their levels and stationary in their first difference or I(1). Thus all four variables (MD, GDP, IR, RP) are integrated order one.

TABLE 2.
THE UNIT ROOT TEST

Variables	The Unit Root Test		First Difference	
	DF	ADF	DF	ADF
MD	-1,496	-1,256	-4,411	-4,888
GDP	-0,161	-2,876	3,693	-3,694
IR	-2,092	-3,562	-5,668	-5,550
RP	-2,863	-3,658	-5,380	-5,426

Critical value of DF and ADF, α=5%, N=50 are -2,93 and -3,50

In the next step, the data series are further check for the presence of cointegration. If the series Y is I(1) and another series X is also I(1), they can be cointegrated. In general, if Y is I(d) and X is also I(d), where d is the same value, these two series can be cointegrated. The term I(1) is used in time series analysis. The first step in cointegration analysis is that all the variables must be stationary in the same order and I(1) means that all variables are stationary in their first difference or stationary in the same order.

Using Cointegrating Regression Durbin-Watson (CRDW), Dickey-Fuller (DF), and Augmented Dickey-Fuller (ADF) test for MD, GDP, IR, RP has been estimated and reported in table 3.

The cointegrating test is applied to regression run with Ordinary Least Squares (OLS) in the following forms : (Insukindro, 1993:132)

$$MD_t = b_0 + b_1 GDP_t + b_2 IR_t + b_3 RP_t + E_t$$

Where
CRDW = DW stat
E_t = residual
The DF and ADF test are applied with OLS in the following forms :

$$DE_t = \delta_1 E_{t-1}$$

$$DE_t = \phi_1 E_{t-1} + \Sigma_{i=1...k} w_i DE_{t-1}$$

Where

$$DE_t = E_t - E_{t-1}$$

TABLE 3.
COINTEGRATION TEST

Cointegration Test	MD = f (GDP, IR, RP)
CRDW	0,847
DF	-6,005
ADF	-3,753

Critical value of CDRW, DF and ADF, α=5%, N=100 are 0,386, 3,37 and 3,17

CRDW known as the DW stat is 0,847. DF and ADF are -6,005 and -3,753. If CRDW, DF and ADF value > the critical value of table (see table II in Engle and Granger, 1987) that there are cointegrated. So, there is one cointegration relationship involving given variables of MD, GDP, IR, and RP.

Using Error Correction Model (ECM) to determine the short run dynamics of the system. The coefficient of the Error Correction Term (ECT) has the correct sign (negative) and is statistically significant at 5 per cent. Not only that the ECM is valid but also that there is a significant conservative force tendency to bring the model back into equilibrium whenever it strays too far.

The standard of ECM is following forms : (ECM Wickens and Breusch)

$$DMD_t = \phi_0 + \phi_1 DGDP_t + \phi_2 DIR_t + \phi_3 DRP_t + \phi_4 DGDP_{t-1} + \phi_5 DIR_{t-1} + \phi_6 DRP_{t-1} + \phi_7 ECT_t + U_t$$

Where

$$DX_t = X_t - X_{t-1}$$

$$ECT = GDP_{t-1} + IR_{t-1} + RP_{t-1}$$

Since all the variables are measured in logarithms, the regression coefficients can be directly interpreted as elasticities. Table 4 shows short run and long run estimates of the model of demand for moneyto Indonesia.

TABLE 4.
ERROR CORRECTION MODELl

Dependent Variable MD			
C	-4,8576		
GDP	1,0252	GDP (-1)	0,1805
IR	-0,2052	IR (-1)	-0,0330
RP	0,1818	RP (-1)	0,0090
		ECT (-1)	-0,0858
R^2	0,3328		
DW Stat	0,6658		
F Stat	105,53		

The coefficient for short run and long run Gross Domestic Product (GDP) hasthe positive significant effect on demand for money (MD). The result reveals that GDP have significant positive effect on MD. The long run elasticity from the coefficients GDP suggests that a 1 percent increase in the GDP yield18,5 percent increase in MD respectively.

The result also indicates that real interest rate has exerted the significant negative effect on the demand for money rate. The coefficient for the short run and long run of real interest rate have significant negative effects MD and the long run elasticities are 0,03 respectively.

The effect of the relative price (RP) has a significant positive effect on MD. The long run elasticity of RP indicates that a 1 percent increase in RP will increase MD by0,9 percent.

V. CONCLUSION

According to the findings in this paper, there are three variables are used to determine on demand for money :

1. Gross Domestic Product
2. Interest Rate
3. Relative Price

This paper provides important new evidence concerning the influences of relative prices in the personal sector's demand for narrow money. The use of cointegrating analysis established that conventional money demand specification does appear to bias downwards the long run interest rate coefficient although the income coefficient appears to be invariant (at unity) to the exclusion of relative price term. Dynamic short run, error correction models were estimated for both conventional and relative price money demand specification. The result in this paper provides very strong evidence that traditional money demand studies may well be misspecified in omitting a role for relative prices.

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