The effect of financial deregulation on money demand in Malaysia

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4 June 2008

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ABSTRACT

The study seeks to examine the impact of financial deregulation on the money demand in Malaysia and the implication of altered money demand pattern on the Malaysian monetary conduct. It also attempts to investigate the currency substitution effect as result of the financial market development and integration of domestic market with the rest of the world. The study utilizes Augmented Dickey Fuller (ADF) and Phillips Perron (PP) tests for unit root and stationarity of data, multivariate Johansen cointegration test, and Vector Error Correction model in the analysis of the dynamics of the short run money demand model and adjustment to restore its long run equilibrium. Findings suggest a stable long run relationship of money demand in Malaysia and a greater income elasticity of money demand supported by growing degree of monetization and substantial improvement in banking infrastructure as well as some degree of currency substitution among domestic residents. However, short run dynamic of money demand is found to be instable and correction of its disequilibrium over time was somehow slow, hence shifting monetary targeting by authority from monetary aggregates towards interest rates.

Keyword: *financial deregulation, money demand, vector error correction model*.

INTRODUCTION

Financial deregulation includes measures like freeing the interest rates from any regulatory and/or institutional barriers, promoting development of financial institutions, extending credit and deposit facilities, developing secondary markets for financial instruments, formalizing unorganized financial sectors and encouraging competition among the financial institutions. A major component of financial deregulation program is to allow interest rates to be determined freely by market forces. The move from below equilibrium interest rate under the financial repression to the equilibrium interest rate under a competitive regime would result in increased savings, especially financial savings. Thus, more investment pools made available and consequently low-yielding and inefficient investment project will be rationed off the markets (Hussin, *et al.*, 1993).

Marashdeh (1997) concluded that the deregulation of interest rate has created a more competitive environment in the banking industry. The financial reform programs have brought about substantial improvements in banking infrastructure and technological advances, and this situation has consequently altered the individuals' money demand behavior. Besides, measures to promote financial market development in the reform programs have resulted in the introduction and deepening of market with new and more attractive financial assets and instruments, causing gradual portfolio adjustment away from monetary assets.

As an open economy, the development in Malaysian financial market has invited significant inflows of foreign capital and currency substitution by domestic residents. This has enhanced the role of exchange rate market and subjected Malaysian money demand behavior to foreign factors and Malaysian economy to foreign financial market development and instability. These would eventually reduce the predictability and stability of money demand and would give implication on the conduct of monetary policy by the Malaysian authority. It is interesting to note that in the early development of financial market, the Malaysian authority had put more emphasis on the monetary aggregates, but due to the increased deregulation and therefore predictability of the money demand, it now bases it on a wider set of monetary and real sector indicators of inflationary pressures.

*This paper was presented at National Seminar on Sciences, Technology and Social Sciences 2008, on 3rd-4th June 2008, at MS Garden Hotel, Kuantan, Pahang, Malaysia, and published in the Proceedings of theNational Seminar on STSS 2008, ISBN: 97898326071715.

The primary objective of the study is to examine the impact the Malaysian financial market deregulation brought about to money demand behavior of domestic residents. Besides, it attempts to investigate the currency substitution effect resulted from the financial market development and integration of domestic market with the rest of the world. The altered money demand and its consequence of reduced predictability power and instability in its function are expected to implicate the conduct of policy framework which centered on monetary targets. The paper therefore wishes to empirically ascertain the effect of altered money demand on monetary policy operation in Malaysia.

This paper is organized as the following: the review of related literatures on Malaysia's experience of financial deregulation and its possible impacts on the money demand behavior is discussed in the following section. Afterward, the specification of the model, data sources and econometric methodology are explained, followed by the estimated results and findings, and concluding remarks end it.

REVIEW OF RELATED LITERATURES

The deregulation of the interest rates, substantial improvements in banking infrastructure, rapid financial innovations, and significant change in monetary policy framework are the significant developments Malaysia has seen in the process of liberalisation of her financial markets. Financial reform in Malaysia has begun since as early as in the 1970s, when a number of steps towards deregulation were taken by the authority. For instance, interest rates on deposits of various maturities in the commercial banks and finance companies and discount rates on the Treasury bills were set to be market-determined during the 1971 to 1973 period. The freeing of interest rates continued in 1978 when Bank Negara Malaysia (BNM) allowed commercial banks to freely determine their deposit and lending rates.

In 1983, the deregulation of interest rates was interrupted with introduction of Base Lending Rates (BLR) where banks were required to peg their lending rates to the BLR determined by BNM. Beside, a new requirement of pegging interest rates of deposits up to 12-month maturities to deposit rate of two leading domestic banks was also introduced. In 1991, however, the BLR was finally freed from administrative control where each commercial bank and finance company was allowed to set its own lending rates based on the cost of funds (Majid, 2004).

Following the liberalization in 1978, nominal and real rates increased markedly especially during the period 1988 and 1993 where domestic money market and LIBOR rates differentials soared to new highs and this had induced significant inflows of foreign capital to Malaysia (Dekle and Pradhan, 1997).

The financial reform programs had also brought about substantial improvements in the banking infrastructure with the increasing number of bank branches and technological advances such as automated teller machines (ATMs) introduced in 1980s, electronic banking and tele-banking in early 1990s, and new attractive financial products such as credit card, deposits-cum-investment facility, cash management account (savings-cum-current account facility), and multi-tiered accelerated interest rates savings deposit. As a result, this has promoted greater competition among commercial banks and eventually reduced transaction costs (Marashdeh, 1997).

Malaysia as an open economy allows currency substitution to take place. The currency substitution effect was the outcome of changes in exchange rates, which may results in positive or negative reaction from domestic residents' demand for money.

The financial market deregulation that begun in 1990s had since induced more inflows of foreign capital. The increasing significant role of exchange rate market had consequently made Malaysian economy more vulnerable to external shocks, as vindicated by excessive capital inflows 1993-94 and financial crisis in 1998. According to Majid (2004), this situation had considerably impacted Malaysian money demand behavior and reduced predictability and stability of money demand (2004).

Developments in money and bond markets followed the deregulation of interest rate, with money markets developed much faster than that of bonds. The interbank money markets started in 1967 with the

establishment of discount houses trading short-dated monetary instruments and this had led to an active discount market. Short-term money markets developed rapidly soon after with the introduction of several instruments such as negotiable certificates of deposits, bankers' acceptance and repurchase agreements.

In ringgit bond market, treasury bills and bonds were introduced by BNM in 1963 and 1969 respectively. The market's development prior to 1990 was somewhat sluggish as it was dominated by Government securities (MGS) only and corporate bond was practically non- existent. Furthermore, the rapid growth in the MGS primary market in 1970s and 1980s was not accompanied by an active secondary market due to its low yields and lack of trading as the bulk of the MGS was held by captive institutions. After 1990, the corporate bond market, known as Private Debt Securities (PDS) market, had changed dramatically. At the end of 1999, the outstanding PDS was estimated about half of total outstanding bonds (Bank Negara Malaysia,
1999).

The financial market development discussed earlier may alter the velocity of money. Reform that increase the number of banks, and spur institutional and technological advances can raise the velocity money as these developments make it easier to convert money into money substitutes. In many developing countries, however, velocity of money could decline over time because of the increasing monetization of the economy or financial deepening.

It is important to note that financial deregulation had reduced the stability of monetary aggregates and the choice of monetary policy targets and variables that are monitored by the Central Bank to gauge monetary conditions would therefore be affected (Dekle and Pradhan, 1997). Dahalan (2004) suggested that increasing globalization of the financial system and interdependent of global economy among countries today may have significant implication towards formulating an effective monetary policy, especially in developing countries like Malaysia.

Referring to Malaysia's experience, the monetary authority had initially put greater emphasis on monetary targeting in the conduct of monetary policy, focusing on narrow money (M1) prior to 1980s, and then shifted towards broader monetary aggregates, M2, in early 1980s and subsequently to M3 in late 1980s. Beginning 1990s, with increasing financial deregulation and nnovation of financial markets and instruments, monetary policy framework has notably shifted from monetary aggregates targeting towards interest rate targeting although money and credit aggregates are still monitored (Majid, 2004, Dekle and Pradhan, 1997).

SPECIFICATION OF THE MODEL

The conventional money demand equation expresses the demand for real money balances as a function of scale variable, usually level of real income, and an opportunity cost variable, usually the rate of interest on alternative assets. Studies on Malaysia money demand are, for instance, by Anuar (1986), Habibullah (1987), Habibullah and Ghafar (1989), Marashdeh (1997), Sriram (1999), Majid (2004), and Dahalan (2004).

The scale variable of income can be measured by various ways such as using gross national product (Anuar, 1986, Habibullah, 1987, and Habibullah and Ghafar, 1989), industrial production index (Marashdeh, 1997 and Sriram, 1999), real gross domestic product (Majid, 2004), or household consumption expenditure (Dahalan, 2004). Real gross domestic product is utilized as the measurement of income in this paper.

This paper measured opportunity cost in term of rate of return on alternative assets i.e. treasury bill rate and expected inflation rate. In addition, it includes own-rate of money in term of fixed deposit rate. Anuar (1986) and Majid (2004) used only treasury bill rate, while Habibullah (1987) and Habibullah and Ghaffar (1989) use various measures of short term rates from treasury bills and commercial banks savings and fixed deposits rates. 6-month mode of average deposit rate was used by Marashdeh (1997), while Sriram (1999) used commercial banks deposit rate and treasury bill rate. A number of interest

rates including fixed deposit rates, saving rates, lending rates, money market rates, treasury bill rates, and rate of government securities were used by Dahalan (2004). All of the above studies also included inflation rate/consumer price index as other measure of opportunity cost of holding money.

From the above-cited studies, only Marashdeh (1997), Sriram (1999) and Majid (2004) attempted to determine the impact of exchange rate on money demand behavior. Marashdeh (1997) and Sriram (1999) included nominal exchange rate in their money demand model while real effective exchange rate was utilized by Majid (2004). The nominal exchange rate is therefore included in this paper to capture the effect of currency substitution in the economy.

The long run demand for money can be specified as the following:

$$rm_t = \beta_0 + \beta_1 \ y_t + \beta_2 \ rfd_t + \beta_3 \ rtb_t + \beta_4 \ exc_t + \beta_5 \ \pi^e_t + \varepsilon_t,$$

Where : rm_t = real money balances demanded (RM millions), y_t = real income (RM millions), rfd_t = own rate of return of money, rtb_t = rate on alternative assets, exc_t = nominal exchange rate, π^e_t = expected inflation rate, and ε_t,= error term. All variables except interest rate are in natural logarithms.

According to Majid (2004), factors that supported the inclusion of expected inflation rate as a measurement of opportunity cost are such as poorly developed financial assets, interest rate has a ceiling imposed Bank Negara Malaysia, and real assets are likely to play a significant role in individual's portfolio decision especially in developing countries.

Nominal exchange rate is included in the model to capture the currency substitution effect since Malaysia has moved towards financial deregulation and growing interdependence between domestic economy and other countries. Change in exchange rate is expected to give effect, either positive or negative, on domestic money demand, depending on how public views the change in the rate. If deprecation in exchange rate is unanticipated and leads public to expect further depreciation, then it exerts a negative influence on money demand. On the other hand, if public has anticipated the depreciation, it would then have positive impact since public views this situation as an opportunity to increase wealth by demanding more money for buying assets in foreign denomination whose value expected to rise. Thus, demand for money is expected to increase if inflation rate is anticipated to increase (Arize, *et. al*., 1999).

Priori sign of scale variable of income is expected positive since we expect higher income will lead to increased money demand, and similarly for own rate of money since more money will be demanded if it earns more return. Negative sign is expected on both measurements of opportunity cost of holding money i.e. rates on alternative asset and expected inflation rate. This is because when the opportunity cost is higher, individuals will shift away from holding money. The sign of exchange rate coefficient can be positive or negative as discussed earlier.

DATA SOURCES AND ESTIMATION METHODOLOGY

The data sample spans from 1990:3 until 2005:3, purposely selected on the basis that it was during 1990s Malaysia has explicitly moved towards a more liberalized financial markets with the implementation of several reform measures including the deregulation of the interest rates. All data series are in quarterly observations, expressed in natural logarithms except the interest rates. Since the data is quarterly, seasonal dummy variable is included in the model to correct for seasonality.

Money balances are measured by nominal M1, and real money balances are obtained by deflating the series with Consumer Price Index (2000=100). Scale variable of income is measured by nominal Gross Domestic Product, and the series are deflated by CPI (2000=100) to obtain its real values. 3-month fixed deposit rate and 3-month treasury bills rate are used to measure the opportunity cost of holding money. The selection of former is due to the underdeveloped financial markets in Malaysia where number of financial assets as alternative to narrow money are limited. Notwithstanding that, rates of return on 3-month treasury bills is included in measuring the opportunity cost largely due to the availability of the

data for longer time period and the market for the treasury bills as alternative domestic financial asset is sufficiently liquid (Majid, 2004, Sriram, 1999, Deckle and Pradhan, 1999). Another measure of opportunity cost of money holding included in the model is expected inflation rate, measured by Consumer Price Index (2000=100). Perfect foresight model of inflation rate is assumed here as it implies the expected value of rate of inflation in the next period is equal to and exactly is the realized value of the rate in the following period. The nominal exchange rate of ringgit to US dollar is used to represent exchange rate variable in the model.

All series are sourced from Bank Negara Malaysia monthly statistical bulletin of various issues and from International Financial Statistics database compiled by International Monetary Fund. All series are not seasonally adjusted because such pre-filtering may affect short-term dynamics and may exert adverse affect on the power of the unit root and cointegration tests.

Unit root and test for non-stationarity

Since the data are all in time series and the data generating process in unknown, it is crucially important to test for non-stationarity of the series. It is to determine whether or not the series are stationary (no unit root) i.e. they exhibits means reversion in that it fluctuates around a constant long-run mean and has a finite variance that does not vary with time. On the other hand, non- stationary (unit root presents) series have no long-run mean to which the series return and their variance are time-dependent and goes to infinity as time approaches infinity (Enders, 1995).

Most empirical works in classical regression model assumes that the underlying time series is stationary and the errors have zero mean and finite variance. In the presence of unit root, the regression of the series would suffer a problem of "spurious regression" which normally persistent in non-stationary time series. The problem of spurious regression, according to Granger and Newbold, often shows a significant relationship between two or more variables i.e. has very high R^2 and t-statistics that appears to be very significant, though in reality they rarely have specific meaningful economic relationship. Granger and Newbold discovered through simulation that the initial symptom of the problem is when the R^2 of an estimated regression is greater than its Durbin-Watson *d* value (Enders, 1995).

Augmented Dickey-Fuller (ADF) and Phillips Perron (PP) tests are employed to test for the presence of unit root. To models are considered, firstly with constant term only, and second with constant and deterministic trend terms.

$$\Delta y_t = a_0 + \delta y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta y_{t-i} + \varepsilon \qquad \ldots.(1)$$

$$\Delta y_t = a_0 + \delta y_{t-1} + a_2 t + \sum_{i=1}^{p} \beta_i \Delta y_{t-i} + \varepsilon \qquad \ldots.(2)$$

The parameter of interest is δ; if $\delta = 0$, the $\{y_t\}$ sequence has unit root. i.e. non-stationary. The estimated t-statistics is compared against the appropriate critical values in the Dickey-Fuller tables to determine whether the null hypothesis of unit root is valid.

An important assumption of the ADF test of unit root is that the error terms are independently and identically distributed and have constant variance. Thus, to cater for problem of serial correlation and heterogeneity of the error terms, PP test of unit root is used, where the test allows the disturbances to be weakly dependent and heterogeneously distributed. In other words, the test is valid in the situation where error term is serially correlated and heterogeneous. The test statistics of PP are the modification of the t-statistics employed by the ADF tests but the critical values of PP tests are exactly those given by the ADF tests (Enders, 1995). If the variables are found to be non-stationary, Johansen test for cointegration is then conducted.

Cointegration and Johansen cointegration test

Introduced by Engle and Granger (1987), cointegration implies that between a number of non- stationary variables, there exists a linear combination among them that is stationary. This situation necessitates the time path of the non-stationary variables be linked which illustrates the crucial insight for the equilibrium theories found so much in the macroeconomic literatures of recent years. Within the equilibrium framework, the deviation from the equilibrium is said to be temporary in nature, and in the long run it will correct to its equilibrium level.

As in the case of money demand, if the real money balances (rm_t), real income (y_t), 3-month fixed deposit rate (rfd_t), 3-month treasury bills rate (rtb_t), exchange rate (exc_t) and expected inflation rate (π^e) as in the Equation (1) are all non-stationary and integrated of order one, I(1), and if the linear combination of them, i.e. $rm_t - \beta 0 - \beta 1\ y_t - \beta 2\ rfd_t - \beta 3\ rtb_t - \beta 4\ exc_t - \beta 5 = \varepsilon_t$, is stationary, the variables are said to be cointegrated of order one, CI(1,1). The vector x_t are (rm_t, y_t, rfd_t, rtb_t, exc_t, π^e_t) and the cointegrating vector β are (1, $-\beta_0$, $-\beta_1$, $-\beta_2$, $-\beta_3$, $-\beta_4$, $-\beta_5$). The deviation from the long run money demand equilibrium is ε_t, and since $\{\varepsilon_t\}$ is stationary, this deviation is temporary in nature and in the long run the money demand will return to its equilibrium level.

Johansen cointegration test is employed as the testing methodology for the cointegration. Johansen (1988) maximum likelihood estimation can estimate and test for the presence of multiple cointegrating vectors. Moreover, these tests allow testing of restricted version of cointegrating vector(s) and speed of adjustment parameters. Johansen's procedure relies heavily on the relationship between the rank of a matrix and its characteristics root and considered as a multivariate generalization of the Dickey Fuller test (Enders, 1995).

Test on number of cointegrating vectors is conducted using the following two test statistics:

$$\text{Trace statistics } (\lambda_{\text{trace}}) = -T \sum_{i=1}^{n} \ln (1-\lambda_i)$$

$$\text{Maximum eigenvalue statistics } (\lambda_{\max}) = -T \ln (1-\lambda_{r+1})$$

where λ_i = the estimated value of characteristics root (also called eigenvalues) obtained from the estimated Π matrix

T = the number of usable observations

Trace statistics tests the null hypothesis of number of distinct cointegrating vectors is at most equal to r against a general alternative, while Maximum eigenvalue statistics tests the null hypothesis of number of cointegrating vectors is r against alternative of $r + 1$ cointegrating vectors. The critical values for both test statistics are provided Osterwald-Lenum (1992). If the null hypothesis is rejected at any given r in both tests, they will be repeated until we fail to reject the null hypothesis.

ESTIMATED RESULTS

Table 1 below shows that null hypothesis of unit root is overwhelmingly rejected in first difference but not in level, thus ADF test concludes that all series are non-stationary in level but stationary in first difference. In PP test, except expected inflation rate (π^e), all series are stationary in first difference but not in level. Expected inflation rate is tested as stationary in level at 5% critical value in model with constant only, but it is found to be non-stationary in model with constant and deterministic trend at 1% critical value. Since all data are stationary in first difference based on both tests, it can be concluded they are integrated of order one, I(1).

Table 1: ADF and PP tests of unit root

Model		Constant		Constant with deterministic trend	
Test variables		Level	First difference	Level	First difference
rm_t	ADF test	-0.75 (0)	-7.31* (0)	-2.00 (0)	-7.26* (0)
	PP test	-0.76 [1]	-7.32* [2]	-2.09 [1]	-7.27* [2]
y_t	ADF test	-1.13 (5)	-4.32* (4)	-2.32 (5)	-4.33* (4)
	PP test	-0.59 [42]	-10.49* [31]	-2.80 [8]	-10.38* [30]
rfd_t	ADF test	-1.10 (0)	-6.51* (0)	-2.57 (0)	-6.48* (0)
	PP test	-1.38 [3]	-6.50* [1]	-2.80 [3]	-6.48* [1]
rtb_t	ADF test	-1.71 (0)	-10.20* (0)	-3.30 (0)	-10.11* (0)
	PP test	-1.67 [4]	-10.03* [3]	-3.46 [4]	-9.95* [3]
exc_t	ADF test	-0.97 (0)	-7.78* (0)	-1.84 (0)	-7.72* (0)
	PP test	-1.07 [3]	-7.82* [3]	-2.07 [3]	-7.76* [3]
$\pi^e t$	ADF test	-2.76 (0)	-7.14* (0)	-1.31 (0)	-7.89* (0)
	PP test	-2.99** [8]	-7.14* [1]	-1.29 [7]	-7.90* [7]
Critical values^		1%: -3.53 5%: -2.90		1%: -4.11 5%: -3.48	

* (**) indicates significant at 1% (5%) level. ^The critical values are given by Dickey and Fuller (1976). Optimal lag lengths for ADF test is in bracket, automatically set by Schwarz Information Criterion.
Optimal bandwith for PP test is in parenthesis, automatically set by Newey-West using Bartlett kernel.

Table 2 below presents the result of Johansen maximum likelihood estimation for number of cointegrating vectors on the money demand model.

Table 2: Johansen maximum likelihood estimation for number of cointegrating vectors on the interest rates model

H_0	H_1	Statistics	Critical values^ 95%	99%	Results
λ_{trace} test	$r \geq 1$	145.22	94.15	103.18	Reject null hypothesis*
$r \leq 1$	$r \geq 2$	60.01	68.52	76.07	Do not reject null hypothesis
$r \leq 2$	$r \geq 3$	34.05	47.21	54.46	Do not reject null hypothesis
λ_{max} test	$r = 1$	85.21	39.37	45.10	Reject null hypothesis*
$r = 1$	$r = 2$	25.96	33.46	38.77	Do not reject null hypothesis
$r = 2$	$r = 3$	15.04	27.07	32.24	Do not reject null hypothesis

* (**) denotes rejection of null hypothesis at 1% (5%) level.
^Eviews uses the (nonstandard) critical values taken from Osterwald-Lenum (1992).

Both Trace and Maximum-eigenvalue statistics strongly rejected that there is no cointegrating relationship between the variables i.e. r=0, and they concluded that there is one cointegrating equation at 1% level.

The Johansen maximum likelihood test is conducted to test for cointegration between non- stationary variables in the money demand model. Except seasonal dummy variable that is considered to be exogenous, all other non-stationary variables are considered to be integrated of the same order, i.e. I(1), and the optimal number of lags, which are selected based on SIC and AIC criteria, is set to 3 periods. Next, we specify the deterministic terms in VAR and we choose only intercept to appear in cointegrating equation with the assumption of no deterministic trend.

The first normalized cointegrating equation for money demand is as the following:

$$\begin{array}{lccccc} rm_t = & + 3.69\, y_t & + 2.30\, rfd_t & - 1.86\, rtb_t & + 8.98\, exc_t & - 17.81\, \pi^e_t \\ & (2.03)^{**} & (11.07)^{*} & (-9.13)^{*} & (9.19)^{*} & (-3.80)^{*} \end{array}$$

t-statistic is in bracket.
* (**) indicates significant at 1% (5%) level.

The long run relationship between money demand as estimated in the normalized cointegrating equation by the Johansen maximum likelihood test variables showed that all variables are significantly differently from zero. Furthermore, all variables have correct signs as anticipated which implies a positive long run relationship between money demand and income, own rate of return and exchange rate, and negative with short term interest rate and expected inflation rate.

The long run elasticity of income is estimated at 3.69% which is significantly larger than unity. This possibly reflects the growing degree of monetization in Malaysia, and continuous improvement in the banking infrastructures. Moreover, Dekle and Pradhan (1997), Majid (2004), and Dahalan (2004) also reported income elasticity of money demand higher than unity and, therefore, such finding is not uncommon for developing countries.

The positive coefficients of own rate of money, measured by 3-month fixed deposit rates unsurprisingly explains individuals are considering short term fixed deposits as their mode of savings which earn them rate of returns, at the same time favoring the short term nature of the deposits as the money is part of their disposable income.

For domestic rate of interest measured by 3-month Treasury bill rate and expected inflation rate, they have negative long run elasticity to money demand which confirmed theoretical explanation of their relationships. It is also obvious that the elasticity coefficient for expected inflation rate is relatively larger than that of domestic interest rate and own-rate of money, as it strongly indicates that individuals, in anticipation of increased inflation rate, has more incentive to shift away from money holdings into real assets than other financial instruments.

Long run relationship of money demand with exchange rate is positive, indicating the presence of currency substitution in Malaysia, and depreciation in exchange rate is somehow already anticipated by the public. When public has anticipated ringgit is going to depreciate in the future, they view this as an opportunity to increase wealth as higher money holdings will be converted to buying more assets in foreign denomination. This is clearly a favorable situation as suggested by the relatively large coefficient of exchange rate variable in the estimated long run money demand function.

The vector error correction model is represented as the following:

$$\Delta rm_t = \alpha_0 + \alpha_1\, EC_{t-1} + \sum_{i=1}^{2} \beta_i\, \Delta rm_{t-i} + \sum_{i=1}^{2} \eta_i\, \Delta y_{t-i} + \sum_{i=1}^{2} \gamma_i\, \Delta rfd_{t-i}$$

$$+ \sum_{i=1}^{2} \delta_i\, \Delta rtb_{t-i} + \sum_{i=1}^{2} \theta_i\, \Delta exc_{t-i} + \sum_{i=1}^{2} \lambda_i\, \Delta_i \pi^e_t$$

where EC_{t-1} is equal to the error correction term of the model i.e. $\varepsilon t\text{-}1 = rm_{t-1} - \beta 1\ y_{t-1} - \beta 2\ rfd_{t-1} - \beta 3 rtb_{t-1} - \beta 4 exc_{t-1} - \beta 5\ \pi^{e}_{t-1}$. The results of the vector error correction estimates are presented in Table 3 below:

Table 3: Short run money demand model

Dependent Variable = $\Delta\ rm_t$		
Variables	Estimated coefficients	t-ratio
α_0	**0.03**	**2.48***
α_1 ECM_{t-1}	**-0.01**	**-2.39***
β_1 $\Delta\ rm_{t-1}$	**-0.29**	**-2.12***
β_2 $\Delta\ rm_{t-2}$	-0.02	-0.15
η_1 $\Delta\ y_{t-1}$	0.19	1.26
η_2 $\Delta\ y_{t-2}$	0.00	0.01
γ_1 $\Delta\ rfd_{t-1}$	-0.00	-0.21
γ_2 $\Delta\ rfd_{t-2}$	**0.04**	**3.20***
δ_1 $\Delta\ rtb_{t-1}$	**-0.03**	**-2.54***
δ_2 $\Delta\ rtb_{t-2}$	**-0.04**	**-3.86***
θ_1 $\Delta\ exc_{t-1}$	-0.06	-0.42
θ_2 $\Delta\ exc_{t-2}$	-0.12	-0.71
λ_i $\Delta\ \pi^{e}_{t-1}$	**-1.75**	**-1.93****
λ_i $\Delta\ \pi^{e}_{t-2}$	0.96	0.90
α_2 Dummy	**0.06**	**4.42***
R^2=0.63, F-statistics=5.46, SSR=0.05, SEE=0.03.		

* (**) indicates significant at 1% (5%) level.

The above result explains the dynamics of short run money demand and its adjustment to restore the long run equilibrium via error correction term. The error correction term is significant at 1% critical values but with somewhat small coefficient. The negative sign implies that in current period, a portion of disequilibrium from previous period will be corrected by the individuals. Small coefficient 0.01% indicates that correction of shocks from previous period to its long run equilibrium is somewhat slow. The reason behind this could be the smaller time period covered in this study hence preventing its capability of capturing the whole magnitude of the correction.

Of all lagged difference terms of the variables, first lagged difference of money balances, second lagged difference of own rate of money, and both lagged differences of rate on alternative asset, and first lagged difference of expected inflation rate are significantly differently from zero.

Surprisingly that none of lagged differences of income and exchange rates are significant to short run money demand. For exchange rate, this may reflect the exchange rate depreciation is perceived as fundamental and long term phenomenon by public which does not give any effect to their short run demand for money. For income, this is possibly due to small time period in the sample or due to measurement of the scale variable used in this study i.e. gross domestic product. Other possible measurement of income i.e. either industrial production index, household consumption expenditure, or gross national income could perhaps yield a more robust estimation.

CONCLUSION

This paper examines money demand relationship with several explanatory variables namely income, domestic interest rate, opportunity cost of holding money, and exchange rate throughout the period 1990-2005 by employing cointegration technique and error correction model.

The period under study has seen significant development in financial markets such as the

deregulation of interest rates, substantial improvement in banking infrastructure and technological advances, and significant change in monetary policy framework by Malaysian monetary authority as well as greater integration of domestic financial market to the rest of the world. These developments clearly have given considerable effects on the money demand behavior in Malaysia.

The estimation result is robust and supports a stable long run relationship of money demand in Malaysia. It indicates a greater than unity of income elasticity of money demand which supports the growing degree of monetization and substantial improvement of banking infrastructure. In addition, the result also yields significantly higher inflation elasticity of money demand than that of interest rates and own-rate of money which indicates that in anticipation of increased inflation rate, individuals have more incentive to shift away from money holdings to real assets than other financial instruments. Moreover, this is supported by nature of the financial markets in Malaysia perceived by public as underdeveloped with illiquid and small number of financial instruments.

The findings also recognize the presence of currency substitution effect where domestic residents have somehow anticipated the depreciation of interest rates, and responded positively to the change i.e. they view it as opportunity to increase wealth by holding more assets in foreign denomination. Moreover, they regard the depreciation of exchange rate as fundamental and a long term phenomenon and ignore the effect in short term. This finding has substantiated the effect of increased deregulation and globalization of the Malaysian financial market and interdependence of domestic market to the rest of the world.

We however found that the short run dynamic of money demand is somehow unstable with neither income nor exchange rate appear to affect money holdings decision in short run. The correction of disequilibrium over time is also found to be somewhat slow. Thus, it can be concluded that in short run the instability and unpredictability of money demand behavior would persist, and would therefore give an implication on the conduct of monetary policy in Malaysia. It is suggested that monetary policies need to be guided by wider set of monetary and real sector indicators of inflationary pressures. The shift by monetary authority of Malaysia from a policy that centered on monetary aggregates towards interest rates targeting is therefore rightly justified.

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