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Abstract

The capability of monetary aggregates to generate stable link with fundamental economic indicators verifies the effectiveness of monetary targeting. However, traditional monetary aggregates have become flawed when financial reforms take place. As official monetary aggregates fail to maintain stable link with crucial economic indicators in Malaysia, monetary targeting has been substituted by interest rate targeting. Therefore, Divisia monetary aggregates, which are considered more superior than the simple sum counterparts are used in the investigation for the case of Malaysia. The findings imply that Divisia M2 money demand is stable and is capable to generate appropriate coefficients with correct signs for the variables included. Thus, Divisia money has shed new light on the usefulness of monetary targeting in formulating monetary policy in Malaysia.

***Keywords*:** Divisia money; Money demand; Error-correction model

***JEL Classification Codes*:** C22, C43, E41

1. Introduction

Simple sum or conventional monetary aggregates are employed by monetary authorities in most of the countries as official definitions of money in formulating the monetary policy. Attributable to financial innovation and liberalization, simple sum monetary aggregates have become flawed. According to Anderson *et al.* (1997a), simple sum money approach that assumes monetary assets as perfect substitute is inconsistent with economic theory of consumer decision-making. The emergence of new financial intermediaries has formed varieties of interest-bearing financial assets that are less than perfect substitutes due to financial innovation. The different degree of monetary services that provided by each of the asset should be weighted by its 'moneyness' in obtaining an appropriate monetary aggregate. However, simple sum monetary aggregates assume that all financial assets are given equal and constant weights of unity albeit the financial assets are less than perfect substitutes.

The weaknesses of simple sum monetary aggregates have stimulated the use of weighted-sum monetary aggregate, which is Divisia monetary aggregate. Drake and Fleissig (2004) point out only the monetary aggregates that measure the assets with vary weights over time and assume the financial assets as less than perfect substitutes can predict the economic activity rightfully. Divisia money is constructed by aggregating the expenditure share of the financial assets (see, Barnett, 1980; Belongia, 1996 and Anderson *et al.,* 1997b, 1997c for detail discussion). The aggregated shares are then used to represent the index weights. Financial assets that are frequently used for transactions have higher opportunity costs and are given higher weights. Conversely, financial assets that are used for saving purposes and fewer transactions incurred have lower opportunity costs and thus are given lower weights. Therefore, vary weights are assigned according to the flow of services provided by different asset components.

Barnett and Chang (2005) reveal that the predictive power of the exchange rate in the monetary models is more accurate using Divisia monetary aggregates. Moreover, Binner *et al.* (2005) find that Divisia monetary indexes encompass a stronger relationship with inflation cycle when the composite leading indicators that incorporate Divisia monetary indexes were being used. Divisia monetary aggregates also perform well in the money demand model. Spencer (1997) provides evidence that the velocity of Divisia remains stable over time. la Cour (2006) also discovers that Divisia M2 is superior to simple sum counterpart in the sense that Divisia measure of money can abide the long-run price homogeneity and exhibits stable money demand function.

The innovations in technology advances such as the cash machines and credit cards enhance the easier transferability of money into the substitutes. The impact to the broad and narrow money is the increase in the velocity. In addition, financial liberalization in term of interest rate has caused the change in the velocities of narrow and broad money. Besides the changes in the velocity of money, higher interest rate elasticity also shapes the stability of money demand since the holding of financial assets by financial market participants turns out to be more sensitive to the interest rate fluctuations due to the emergence of the interest-bearing assets. The instability in money demand impinges on the effectiveness of monetary policy when monetary targeting is used as the intermediate indicator.

In Malaysia, M1 has been utilized by the central bank, Bank Negara Malaysia (BNM), as policy target of the monetary policy prior 1987. Nevertheless, due to the financial liberalization and innovation, M1 becomes less reliable as intermediate target in formulating monetary policy. Consequently, BNM replaces M1 by broader monetary aggregate M3, which is highly correlated with inflation in order to achieve price stability. The further evolution in economy and financial system has weakened the effectiveness of M3 as policy target. Thus, BNM has shifted the policy target from monetary targeting to interest rate targeting during the mid-1990s (BNM, 1999).

The monetary authority in Malaysia shifts from monetary targeting to interest rate targeting due to the inherent weaknesses of conventional monetary aggregates. However, Barnett (1980) has proposed the use of Divisia monetary aggregates that are consistent with microeconomic aggregation theory. These monetary aggregates are constructed based on monetary services index that encompasses appropriate approximation properties. Should Malaysia adopt Divisia monetary aggregates in order to re-implement the monetary targeting for monetary policy or at least serve as the alternative intermediate policy target? Therefore, this study empirically investigates the performance of Divisia monetary aggregates and compares their performance with simple sum counterparts. The monetary aggregate that generates a stable and correct functional signs of the demand for money can serve as the indicator in monetary targeting for monetary policy purposes in Malaysia.

The rest of this article is structured as follows. Section 2 provides a brief explanation on the theoretical model specification. Section 3 presents the results of the analysis and finally, Section 4 contains the conclusions.

2. Model Specification

2.1 Divisia Monetary Aggregates

The procedures of constructing Divisia monetary aggregate begin with the computation of total expenditure on monetary assets (*Y*). The *Y* at time *t* (see Anderson *et al.*, 1997b) is computed as follows:

$$Y_t = \sum_{i=1}^{n} \pi_{it} \overline{m}_{it} \tag{1}$$

where π_{it} is the user cost of monetary asset *i* at time *t* and $\overline{m}_{it}$ is the optimal stock of monetary asset *i* at time *t*. The π_{it} is the interest rate differentials between the rate of return of a benchmark asset (which is a risk-free asset) and the own rate of return of a monetary asset. User costs also can be defined as the opportunity costs of holding monetary assets. The nominal user cost of the monetary asset (Barnett, 1978) can be measured by:

$$\pi_{it} = \frac{\overline{p}_t (R_t - r_{it})}{(1 + R_t)} \tag{2}$$

with R_t is the benchmark rate and r_{it} is the rate of return of an asset. $\overline{p}_t$ is the consumer price index (CPI). The benchmark rate is the highest rate of return of a risk-free monetary asset that does not provide any monetary services. After computing Y_t, the expenditure share on monetary asset *i* at time *t* can be assessed by:

$$s_{it} = \frac{\pi_{it} \overline{m}_{it}}{Y_t} \tag{3}$$

where the total user cost of the optimal monetary aggregates is divided by the total expenditure. The expenditure share is then utilized to obtain the average expenditure share, which is expressed as:

$$\overline{s}_{it} = \frac{1}{2}(s_{it} + s_{i,t-1}) \tag{4}$$

where $\bar{s}_{it}$ is the average of the sum of s_{it} and s_{it-1}. Finally, $\bar{s}_{it}$ is inserted into the formula to compute growth rate of Divisia monetary aggregate that can be formulated as (see Habibullah, 1999, p.80):

$$G(DM) = \sum_{i=1}^{n} \bar{s}_{it} G(\overline{m}_{it}) \tag{5}$$

2.2 Money Demand Specification

Money demand function relates the quantity of money demanded with a set of fundamental economic variables. In general, money demand function consists of a scale variable (income) and the opportunity cost of holding money (interest rate). Following Marashdeh (1997) and Hueng (1998), we incorporate an exchange rate variable in the money demand function since Malaysia is a small open economy. Besides that, the indicator for financial deepening, which is monetization, also is included in the money demand function as financial reforms are taken place in Malaysia. In addition, we also take into account the financial market indicator in the view that money demand model might be mis-specified if stock activities are not included in the money demand specification (Ibrahim, 2001). In this study, stock capitalization is used to capture the effect of stock market on the demand for money in Malaysia.

Based on the above discussion, the functional relationship of money demand in Malaysia can be specified as follows:

$$\frac{M_t}{P_t} = f(y_t, r_t, q_t, m_t, c_t) \tag{6}$$

where $\frac{M_t}{P_t}$ is the real money balances, y_t is the real income (real GDP), r_t is interest rate, q_t is exchange rate, m_t is monetization and c_t is stock capitalization. When the functional form of Equation 6 is assumed to be in log linearity, the model becomes:

$$\ln \frac{M_t}{P_t} = \beta_0 + \beta_1 \ln y_t + \beta_2 \ln r_t + \beta_3 \ln q_t + \beta_4 \ln m_t + \beta_5 \ln c_t + \varepsilon_t \quad (7)$$

where β_i (i = 1, …, 5) are the coefficients, which indicate the elasticites of money demand with respect to the independent variables.

3. Empirical Analysis

3.1 Data Description

This study utilizes quarterly data that ranges from 1981Q1 to 2004Q4. Financial innovation and liberalization had taken place in Malaysia during late 1970s and early 1980s. Therefore, year 1981 is selected as the starting year to identify the monetary aggregate that can capture the effect of financial reforms. The data series consist of simple sum monetary aggregates M1 and M2 (SSM1 and SSM2), Divisia monetary aggregates M1 and M2 (DM1 and DM2), real GDP, interest rate, real effective exchange rate (REER), monetization and stock capitalization (CAP). The proxies for interest rate are 3-month Treasury bill rate (TBR3M) for simple sum money demand models and dual prices for Divisia M1 and M2 (DUALDM1 and DUALDM2) for Divisia money demand models. Monetization is the ratio of liquidity (M2 minus M1) to GDP. As different measures of money are being used, the monetization is separated into monetization for simple sum monetary aggregates (MONETSSM) and monetization for Divisia monetary aggregates (MONETDM). The data series are extracted from various issues of International Financial Statistics published by International Monetary Fund and Malaysia Quarterly Economic Bulletin published by

BNM. In order to transform SSM1, SSM2, DM1, DM2 and GDP into the real terms, these variables are divided by CPI at 2000 constant price. In addition, all of the data series are in natural logarithms. Graphical comparisons on different monetary aggregates are presented prior to the discussion of empirical results.

3.2 Graphical Comparison for Simple Sum and Divisia Measures of Money

The trends of M1 and M2 for both simple sum and Divisia monetary aggregates from 1981Q1 to 2004Q4 are compared via graphical presentation. It is informative to make comparison among different monetary aggregates since Divisia monetary aggregates are the alternatives to the simple sum counterparts. In order to make comparison, normalizing quarterly simple sum and Divisia monetary aggregates to equal 100 at quarter one of 1981 is performed. The graphical comparisons of the derived simple sum and Divisia monetary indexes for M1 and M2 money are presented in Figures 1 and 2.

M1 money comprises of currency in circulation and demand deposits. Even though demand deposits are non-interest bearing assets, implicit interest rate[1] is paid to demand deposits due to financial reforms. From Figure 1, the indexes of simple sum and Divisia M1 illustrate prominent depart at the end of 1980s owing to the rapid growth rate of demand deposits relative to the growth rate of currency in circulation. The portion of demand deposits is growing larger in the composition of M1 money over time. In other words, the gap of total amount between currency in circulation and demand deposits turns out to be wider over time. Therefore, the growth of demand deposits has the impact on M1 monetary index. Simple sum aggregation assumes currency in circulation and demand deposits to provide same flow of monetary services. As a result, the share weight for demand deposits will not be affected over time. On the other hand, Divisia monetary aggregation assumes demand deposits to provide smaller flow of monetary services as demand deposits earn an implicit rate of return. Thus, the user cost for demand deposits is reduced. The smaller share weight for demand deposits that accounts a larger component in M1 money is the reason behind the slower average growth for Divisia monetary index. Therefore, Divisia M1 always falls bellow simple sum M1.

[Insert Figure 1]

Figure 2 demonstrates trends of simple sum and Divisia M2 monetary indexes. M2 money is derived by adding saving deposits, time deposits and negotiable certificates of deposits to M1 money. The quasi money (saving deposits, time deposits and negotiable certificates of deposits) comprises of interest bearing assets that emerges due to financial innovation. The diverged gap between simple sum and Divisia M2 monetary indexes is greater than the gap of M1 measure of money when comparison is assembled across different levels of money. Furthermore, the impact of interest bearing assets on different method of aggregations of M2 is more prominent as divergence between simple sum M2 and Divisia M2 begins earlier, which is at the mid of 1980s. This is because a larger component of M2 money are the interest bearing assets that serve as store of value function rather than medium of exchange function. Therefore, those components are saving-type deposits that provide higher rates of return. Equal weights are assigned to both interest and non-interest bearing assets via simple sum method of aggregation. However, for Divisia method of aggregation, the share weights are lower for less liquid (interest bearing) assets that earn higher rates of return. This means that higher return assets will have lower share weight. Since the components of interest bearing assets are larger than non-interest bearing assets in M2 money, the growth rate of Divisia M2 is smaller than simple sum counterpart. Thus, the average growth rate for Divisia M2 is slower compared to simple sum M2.

[Insert Figure 2]

The descriptive statistics for the growth rates of different monetary indexes are reported in Table 1, which can provide further evidence on the divergence between simple sum and Divisia monetary indexes. The descriptive statistics consist of mean and standard deviation values statistics for both M1 and M2 money levels. Based on Table 1, the mean value statistics imply that the average growth rates of Divisia monetary indexes are lower compare to simple sum monetary indexes at both M1 and M2 levels. The average growth rate for Divisia M1 is 1.93% while the average growth rate for simple sum M1 is 2.68%. For M2 money, the average growth rate for Divisia M2 (2.14%) is also lower than simple sum counterpart (3.16%).

The volatility of the growth rates is indicated by standard deviation values. The volatility of growth rates for simple sum and Divisia M1 monetary indexes are identical as the values of standard deviation are the same. However, there is difference in the standard deviation values for simple sum M2 and Divisia counterpart. The volatility of growth rate is 3.30% for Divisia M2. On the other hand, the volatility of growth rate only accounts for 2.62% for simple sum M2. Higher volatility in Divisia M2 is attributable to the dual user cost of using the flow of monetary services that has taken into account the spontaneous variations in aggregate price level (Yu and Tsui, 1992).

[Insert Table 1]

3.3 Unit Root Test Results

The Augmented Dickey-Fuller (ADF) test that developed by Dickey and Fuller (1981) is utilized to examine the stationarity properties of the data. All of the variables under estimation are non-stationary in levels and stationary in first differences. The results that are not presented here are made available upon request. Therefore, all of the variables possess the same order of integration, which is $I(1)$. This requisition permits Johansen and Juselius cointegration test to proceed.

3.4 Cointegration Test Results

If cointegration exists, the variables are bound together in the long run with a common stochastic trend although each variable has the individual stochastic trend. Johansen (1988) and Johansen and Juselius (1990) had developed Maximum-Likelihood (ML) procedure to assess the cointegrating relationship. Johansen's ML procedure comprises of trace and maximal-eigenvalue tests. The null hypothesis of trace test that the number of cointegrating vectors is less than or equal to r is tested against a general alternative hypothesis. However, the null hypothesis of maximal-eigenvalue test that the number of cointegrating vectors is r is checked against a specific alternative hypothesis of r+1 cointegrating vectors.

[Insert Table 2]

Table 2 reports the results for both trace and maximal eigenvalue tests. Trace and maximal eigenvalue tests statistics mutually indicate that one cointegrating vector exists in each of the models. The only exception is in DM1 model since no cointegrating vector is being identified in the trace test. Johansen and Juselius (1990) point out that maximal eigenvalue test is more powerful than trace test by providing more definite results as intercept terms have been included in the test. As such, we consider the maximal eigenvalue test results that a single cointegrating vector exists in DM1 model. With the presence of cointegration in DM1, then all of the measures of money possess long run equilibrium relationship with real GDP, interest rate, exchange rate, monetization and stock capitalization. Yet, in order to generate a well-defined money demand function, credible coefficients with the signs of coefficients that are consistent with the *a priori* hypothesis of money demand need to be obtained. Therefore, by normalizing the coefficients of real money balance to one in each model, the appropriate long run money demand functions can be identified. The coefficients of the variables imply the elasticities of the variables since all of the variables are in logarithms. Table 3 presents the restricted cointegration relationships with the implied long run elasticities of four different models.

[Insert Table 3]

Even though all of the variables are statistically significant (except LRGDP in SSM1), we find that in SSM1, SSM2 and DM1 models, the negative signs of LRGDP and LMONETSSM coefficients are inconsistent with the *a priori* hypothesis of money demand. On the other hand, DM2 model yields excellent results compare to the other models. With the consistency of the sign of coefficients with theoretical concept of money and the appropriateness of the size of coefficients, a well-defined money demand function can only be derived from DM2 model. The DM2 money demand function is as below:

LRDM2 = 0.768LRGDP – 0.127LDUALDM2 – 0.458LREER + 1.057LMONETDM + 0.073LCAP

An increase in real GDP causes money demand to increase since purchasing power has risen to enable the economic agents to buy more goods and services. Conversely, an increase in the interest rate reduces the demand for money as the demand for the financial assets increases when interest rate is high. Same as interest rate, the relationship between exchange rate and money demand is also negative. When there is an appreciation[2] in Ringgit, the products from Malaysia become relatively expensive to its trading partner countries. Consequently, they will demand less Malaysian products and subsequently reduce the demand for Ringgit. Therefore, the wealth effect is prominent in the case of Malaysia. The findings are in line with the study of Arize *et al.* (2005), who find that interest rate and exchange rate have negative effects on money demand for Malaysian case. However, positive relationship is demonstrated by monetization and money demand. This is because higher demand for money is needed to acquire interest-bearing assets in a more monetizes financial market. A study by Ahmad (2001) also reveals that the increase in monetization has increased the money demand. For stock capitalization, when there is an increase in the total capital in stock market, it will help to promote a well-established stock market for risk diversification and capital mobilization. As a result, the financial transactions will increase in the stock market and more money is demanded to facilitate the increased financial transactions. Wu *et al.* (2005) and Caruso (2006) report that stock market is positively associated to money demand although different stock market indicators are being employed by them.

3.5 Error-Correction Model (ECM) and Granger-Causality Tests

Short run dynamics of money demand model is examined using ECM. As single cointegrating vector can be identified in each model, the corresponding error-correction representation will exist in each model (Engle and Granger, 1987). ECM incorporates an error correction term (ECT) to capture the short-run changes of the cointegrated variables and subsequently transmit those adjustments to correct the disequilibrium in the long-run money demand. Thus, ECT also contains long run information of the variables. Parsimonious ECM is derived using Hendry and Ericsson's (1991) general-to-specific approach. Therefore, insignificant coefficients will be eliminated gradually.

The results of Granger-causality tests based on ECM are reported in Tables 4A and 4B. From the models estimated, all of the lagged ECTs are statistically significant and thus supporting the results of cointegration test. The signs of ECTs also have to be in negative (Arize *et al.*, 2005). The significance and correct sign of ECT enable the estimation of short run Granger-causality of the variables. Table 4A shows that real GDP and stock capitalization can Granger cause SSM1. When proceed to the SSM2 model, monetization also exerts short-run effect on SSM2 besides real GDP and stock capitalization. At a broader level of monetary aggregation, as illustrated by Table 4B, we find that real GDP and monetization Granger cause DM1 and DM2 in the short-run. In addition, the exchange rate and stock capitalization also can affect DM2 in the short run. Therefore, the impact of financial reforms is more prominent in

DM2 model. The monetization and stock capitalization variables that indicate the phenomena of financial liberalization show short run impact on DM2.

[Insert Table 4A]

The statistical properties of each model are investigated using diagnostic tests. Table 4A indicates that SSM1 model encounters with the problems of model mis-specification and parameter instability. On the other hand, SSM2 model is suffered from the normality problem. In Table 4B, CUSUM of squares test implies that parameter instability exists in DM1 model. Only DM2 model is considered the best as it is stable and passes all the diagnostic checking. Based on the empirical results, DM2 exhibits superior performance in the money demand estimation. The superior performance of DM2 in money demand specification is consistent with the findings of Dahalan *et al.*, (2005) and la Cour (2006).

[Insert Table 4B]

4. Conclusion

By comparing the performance of both the simple sum and Divisia types of M1 and M2 monetary aggregates in this study, the usefulness of monetary targeting can be attained employing Divisia M2 monetary aggregate. Divisia M2 is superior and can produce accurate and stable money demand function. This means that monetary targeting can still be useful in promoting the effectiveness of monetary policy in Malaysia. Monetary targeting has been abandoned by BNM due to the acceleration of financial reforms. Since Divisia M2 is capable to maintain stable relationship with economic and financial indicators, monetary targeting can serve as the alternative policy target for BNM in conducting the monetary policy. In addition, BNM can consider constructing Divisia monetary aggregates together with official monetary aggregates in order to provide policymakers with additional information regarding the economic circumstance in Malaysia.

Notes

1. Implicit rate of return on demand deposits is computed by using Klein's (1974) method. The formula is Demand Deposit Rate (DDR) = r*(1-RRDD), where r is commercial bank's base lending rate, and RRDD is reserve requirement on demand deposits.

2. The reversed property of real effective exchange rate with nominal exchange rate indicates that an increase in currency represents an appreciation.

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Table 1: Descriptive statistics for the growth rates of monetary indexes

Monetary Indexes		Mean	Standard Deviation
M1 Level	SSM1	2.68	4.50
	DM1	1.93	4.50
M2 Level	SSM2	3.16	2.62
	DM2	2.14	3.30

Notes: SSM1 and SSM2 designate simple sum monetary indexes M1 and M2, respectively. DM1 and DM2 are Divisia monetary indexes M1 and M2, respectively.

Table 2: Johansen and Juselius cointegration tests results

LRSSM1, LRGDP, LTBR3M, LREER, LMONETSSM, LCAP (k = 4, r = 1)							
H_0	**H_1**	**λ-trace**	**95% CV**	**H_0**	**H_1**	**λ-max**	**95% CV**
r = 0	r ≥ 1	97.037*	94.15	r = 0	r = 1	42.043*	39.37
r ≤ 1	r ≥ 2	54.994	68.52	r ≤ 1	r = 2	27.920	33.46
r ≤ 2	r ≥ 3	27.074	47.21	r ≤ 2	r = 3	12.667	27.07
r ≤ 3	r ≥ 4	14.407	29.68	r ≤ 3	r = 4	9.834	20.97
r ≤ 4	r ≥ 5	4.573	15.41	r ≤ 4	r = 5	4.562	14.07
r ≤ 5	r = 6	0.011	3.76	r ≤ 5	r = 6	0.011	3.76
LRSSM2, LRGDP, LTBR3M, LREER, LMONETSSM, LCAP (k = 4, r = 1)							
H_0	**H_1**	**λ-trace**	**95% CV**	**H_0**	**H_1**	**λ-max**	**95% CV**
r = 0	r ≥ 1	105.196*	94.15	r = 0	r = 1	46.755*	39.37
r ≤ 1	r ≥ 2	58.440	68.52	r ≤ 1	r = 2	30.646	33.46
r ≤ 2	r ≥ 3	27.794	47.21	r ≤ 2	r = 3	12.301	27.07
r ≤ 3	r ≥ 4	15.493	29.68	r ≤ 3	r = 4	9.840	20.97
r ≤ 4	r ≥ 5	5.653	15.41	r ≤ 4	r = 5	5.555	14.07
r ≤ 5	r = 6	0.097	3.76	r ≤ 5	r = 6	0.097	3.76
LRDM1, LRGDP, LDUALDM1, LREER, LMONETDM, LCAP (k = 4, r = 1)							
H_0	**H_1**	**λ-trace**	**95% CV**	**H_0**	**H_1**	**λ-max**	**95% CV**
r = 0	r ≥ 1	85.685	94.15	r = 0	r = 1	40.465*	39.37
r ≤ 1	r ≥ 2	45.220	68.52	r ≤ 1	r = 2	19.728	33.46
r ≤ 2	r ≥ 3	25.492	47.21	r ≤ 2	r = 3	11.881	27.07
r ≤ 3	r ≥ 4	13.611	29.68	r ≤ 3	r = 4	8.352	20.97
r ≤ 4	r ≥ 5	5.259	15.41	r ≤ 4	r = 5	5.259	14.07
r ≤ 5	r = 6	0.001	3.76	r ≤ 5	r = 6	0.001	3.76
LRDM2, LRGDP, LDUALDM2, LREER, LMONETDM, LCAP (k = 4, r = 1)							
H_0	**H_1**	**λ-trace**	**95% CV**	**H_0**	**H_1**	**λ-max**	**95% CV**
r = 0	r ≥ 1	105.820*	94.15	r = 0	r = 1	40.265*	39.37
r ≤ 1	r ≥ 2	65.555	68.52	r ≤ 1	r = 2	32.862	33.46
r ≤ 2	r ≥ 3	32.693	47.21	r ≤ 2	r = 3	14.507	27.07
r ≤ 3	r ≥ 4	18.186	29.68	r ≤ 3	r = 4	12.811	20.97
r ≤ 4	r ≥ 5	5.375	15.41	r ≤ 4	r = 5	5.372	14.07
r ≤ 5	r = 6	0.003	3.76	r ≤ 5	r = 6	0.003	3.76

Notes: The following notation applies: LRSSM1 and LRSSM2 are natural log of real simple sum money M1 and M2; LRDM1 and LRDM2 are natural log of real Divisia money M1 and M2; LRGDP is natural log of real GDP; LTBR3M is the natural log of 3-month Treasury bills rate; LDUALDM1 and LDUALDM2 are the natural log of dual prices for Divisia money M1 and M2; LREER is the natural log of real effective exchange rate; LMONETSSM and LMONETDM are the natural log of monetization for simple sum and Divisia money and LCAP is natural log of stock capitalization. Asterisks (*) denote significant at 5% level, k is the number of lag and r is the number of cointegration vector(s).

Table 3: Long run elasticities of normalized cointegrating vectors

LRSSM1	**Constant**	**LRGDP**	**LTBR3M**	**LREER**	**LMONETSSM**	**LCAP**
-1.000	28.544	-0.753 [-0.851]	-1.042 [-4.677]*	-4.146 [-5.155]*	-3.342 [-3.452]*	1.209 [4.443]*
LRSSM2	**Constant**	**LRGDP**	**LTBR3M**	**LREER**	**LMONETSSM**	**LCAP**
-1.000	218.014	-13.437 [-2.477]*	-5.888 [-4.462]*	-29.641 [-5.908]*	-18.275 [-3.105]*	7.492 [4.426]*
LRDM1	**Constant**	**LRGDP**	**LDUALDM1**	**LREER**	**LMONETDM**	**LCAP**
-1.000	155.902	-13.897 [-4.443]*	-4.749 [-3.149]*	-19.196 [-5.542]*	17.276 [3.486]*	4.993 [3.822]*
LRDM2	**Constant**	**LRGDP**	**LDUALDM2**	**LREER**	**LMONETDM**	**LCAP**
-1.000	3.763	0.768 [19.992]*	-0.127 [-6.080]*	-0.458 [-6.873]*	1.057 [13.461]*	0.073 [5.084]*

Notes: Asterisks (*) indicate significant at 5% level.

Table 4A: Granger causality based on ECM for simple sum money demand

	LRSSM1	**LRSSM2**
	F-statistics (*p*-value)	F-statistics (*p*-value)
LRGDP	6.514(0.000)*	175.780(0.000)*
LTBR3M	0.901(0.445)	1.009(0.394)
LREER	1.931(0.132)	1.526(0.215)
LMONETDM	0.870(0.461)	174.813(0.000)*
LCAP	8.952(0.000)*	5.556(0.001)*
	Coefficients [T-statistics]	Coefficients [T-statistics]
ECT	-0.216[-3.006]***	-0.173[-2.823]**
Diagnostics Test:		
JB	4.249(0.120)	11.072(0.004)*
AR [4]	0.708(0.589)	0.785(0.539)
ARCH [4]	1.594(0.184)	0.524(0.718)
RESET [2]	2.446(0.094)	0.902(0.411)
CUSUM	Stable	Stable
$CUSUM^2$	Unstable	Stable

Notes: JB is Jarque-Bera normality test of the residuals, AR[4] is a 4th order Breusch-Godfrey serial correlation Lagrange Multiplier test, ARCH[4] is a 4th order autoregressive conditional heteroskedasticity test, RESET[2] is a 2nd order Ramsey's RESET test, CUSUM is cumulative sum of recursive residual stability test and $CUSUM^2$ is cumulative sum of squares of recursive residual stability test. Asterisks (*) denote significant at 5% level.

Table 4B: Granger causality based on ECM for Divisia money demand

	LRDM1	LRDM2
	F-statistics (*p*-value)	F-statistics (*p*-value)
LRGDP	3.852(0.013)*	255.479(0.000)*
LDUALDM1	0.193(0.941)	-
LDUALDM2	-	0.957(0.418)
LREER	1.614(0.194)	3.649(0.017)*
LMONETDM	5.179(0.003)*	319.594(0.000)*
LCAP	1.793(0.140)	2.647(0.055)*
	Coefficients [T-statistics]	Coefficients [T-statistics]
ECT	-0.142[-2.064]*	-0.133[-2.040]*
Diagnostics Tests:		
JB	3.010(0.222)	4.600(0.100)
AR [4]	0.240(0.914)	1.446(0.228)
ARCH [4]	1.256(0.294)	0.768(0.549)
RESET [2]	1.404(0.253)	1.227(0.299)
CUSUM	Stable	Stable
$CUSUM^2$	Unstable	Stable

Notes: See Table 4A.

Figure 1: Simple Sum and Divisia M1 Monetary Indexes, 1981Q1 to 2004Q4

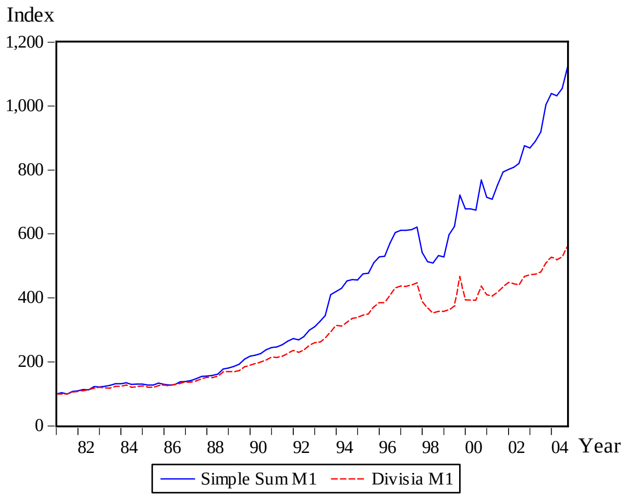

Figure 2: Simple Sum and Divisia M2 Monetary Indexes, 1981Q1 to 2004Q4