An Econometric Appraisal of Monetary Indicators on Malaysian Sectors

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This study examines various measures of monetary indicators in the Malaysian sectoral activity during 1970:1 to 2008:3. It provides with some evidence on the dynamic of the monetary policy variables based on sectoral output data. Some of the variables may response differently across the sector. Failure to examine the sectoral effects can lead to incorrect inferences on the monetary variables particularly when they are the intermediate targets. On how the variables affect the economy has long been debated by economists. This study seeks to investigate the role of the money, interest rate, bank credit and exchange rate in Malaysian economic activity, namely agriculture, construction, manufacturing and services. The econometric appraisal of the monetary indicators is based on the Johansen-Juselius (1992) cointegration techniques, vector error correction model (VECM) and parsimonious error correction model (PECM).

Field of Research: Macroeconomics and Monetary Economics

1. Introduction

The study of the dynamic relationship between the monetary variables and the output level is one of the main concerned in the literature of macroeconomics, particularly in the monetary policy transmission. Money, credit, interest rate and exchange rate are the major monetary policy intermediate targets used by policymakers in their conduct of monetary policy. They are the monetary indicators of economic concern. Although there is broad agreement on the long-run money (or credit) neutrality, there is considerable debate on the role played by the monetary variables in the short-run. Changes in the monetary variables cause fluctuations in the demand that affects the level of output in the short run. In the long-run, output is largely determined by the productive capacity of the

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economy such as the capital stock and the level of technology. As such, the focus of this debate is largely on the relative importance of monetary variables affecting the real economic activity and its greatest role for macroeconomic policy. Despite extensive research, there is no consensus on whether money or credit is more important.

Understanding how the mechanism works can enhance efficient policy making. This paper attempts to examine the relative strength of money and bank credit variables in Malaysia. This is done by analyzing the short-run and the long-run dynamism of the monetary variables and the real output over the period of 1970-2008. It aims to reconcile the disparity of the views. This study presents updated data and offers empirical evidence from sectoral output data. In the past, much of the studies (Bernanke and Blinder, 1988 and 1992; Bernanke and Gertler, 1995; Christiano *et al*., 1996; Romer and Romer, 1990; Azali and Matthews, 1999 and Azali, 2001) on the effects of monetary variables on real output, concentrated much on aggregated output data. Although the approach presents a broader effects on the real output, assessing the relationship from sectoral data may give more accurate assessment of the effects of monetary policy variables on the real output. This is because some sectors may be more sensitive to certain monetary variables (Dale and Haldane, 1995; and Shelley and Wallace, 1998). Failure to examine the relationship can lead to incorrect inferences of the variables and hence, wrong policy implications. The sectoral analyzes are agriculture, construction, manufacturing and services sectors.

The outline of this paper is as follows: Section 2 provides literature review on some of the past and recent empirical studies on the issues. Section 3 discusses the methodology of the study and explains the data set. Section 4 presents the findings of the tests. Finally, Section 5 concludes the study.

2. Literature Review

The traditional theory explains that the quantity of money affects real output through interest rate variable. A reduction in the money stock raises interest rate, which in turn increases cost of capital, discouraging investment and depresses output. The mechanism is referred as ‘money channel’ or `interest rate channel’. The system assumes all non-money assets are lumped into bonds and ignores the credit market (Brunner and Meltzer, 1988). All credit instruments are perfect substitutes and homogenous, therefore bank credit has no special role in the system. In practice, the choice is made between pegging interest rate and monetary aggregates. The emphasis placed on the variables depends largely on the predictability movements in the variables which are closely linked to final objectives, namely output growth and price stability.

However, Bernanke (1986), Brunner and Meltzer (1988) and Bernanke and Blinder (1988, 1992) argue that changes in output may be directly significantly caused by the availability of bank credit. They reject that the entire output response of monetary policy through the money channel. Via credit, monetary policy could affect the economy even if it had little effect on interest rate. Monetary tightening lowers bank reserves, constraints the ability of banks to make new loans to majority of bank dependent borrowers, and hence forcing significant fall in output. In this view, the standard IS-LM model is extended to include three assets, namely money, bonds and bank credit. Bank credit and other credit instruments are imperfect substitutes.

Kashyap *et al*., (1993) observe that a fall in output that coincides with a fall in loans does not indicate that the former was caused by the latter. The fall in loans may simply reflect a decrease in loan demand as output reduced. A distinct bank lending only exists when a monetary tightening reduces loan supply and raises the volume commercial paper issuance when firms substitutes between the two sources of finance. The similar view is also shared by Morris and Sellon (1995). Based on the United States data 1963 to 1989, Kashyap *et al*., (1993) show that when funds rate rises, commercial paper increases and mix variable (the ratio of the bank loans to the sum of bank loans and commercial paper) falls. They suggest that mix variable is a good leading indicator. Responding to the same issue, Gertler and Gilchrist (1993), Oliner and Rudebusch (1993), Kashyap and Stein (1994) and Bernanke and Gertler (1995) argue that if credit is important, a tight monetary policy has a greater impact on small firms, bank dependent than large firms. Small firms with scarce cash reserve facing informational frictions in the financial markets are more dependent on bank loan for investment financing.

In contrast, King (1986), Romer and Romer (1990, 1993), Ramey (1993) and Guender (1998) do not find convincing evidence for the existence of credit channel. Their evidence is consistent with money channel. Moreover, Azali and Matthews (1999) and, Azali (2001) perceive that financial liberalization since 1980s has increased bank competitiveness and made interest rate increasingly important. Deregulated interest rate gives banks more freedom to set their interest rates and assess more funds in the market. Nevertheless, none of the studies reject the importance of credit even though they do not find evidence on the credit-output link.

In a small open economy, exchange rate has considerable effects on the economy. Higher real exchange rate from monetary tightening policy reduces exports and in turn lowers output. Yet, it receives inadequate attention in the studies discussed earlier. Although studies by Duguay (1994), Taylor (1995), Zha and Cushman (1997), Smets and Wouters (1999) Rogers (1999) and Mishkin (2001) establish the exchange rate as a key or important channel of monetary policy, they make no attempt to distinguish the role of money and credit at the same time. For example, Duguay (1994), Taylor (1995) and Rogers (1999) only examine interest rate and exchange rate channels. While Masih and Masih (1996) include money, interest rate and exchange rate channels, the credit channel is not established in the system. To be more realistic and to take account of the increasing globalization of the world’s economies, exchange rate is examined together with money and credit variables in this paper. Therefore, to take account of the highly interdependence of the world's economies, exchange rate is included as one of the important determinant of real output and examine.

3. Econometric Methodology

The analysis is based on cointegration technique and vector error correction model (VECM). Many macroeconomics variables are not stationary in their level form (Harris, 1995 and Dickey *et al*., 1991). Often they seem to be trending upward in a stochastic fashion. This indicates that the variables have no tendency to revert to their mean value. As such, regression involving non-stationary time series is meaningless although the good-of-fit of the model is very high. However, if the non-stationary series are cointegrated the estimates are not dubious.

Cointegration implies that there always exists a linear combination of these variables that is stationary. Provided that the variables have a common trend, if a number of variables are cointegrated, there is a corresponding error correction representation (Engle and Granger, 1987). In short, changes in the dependent variables depend on the level of disequilibrium in the cointegrating relationship and changes in the other explanatory variables. Therefore, it is important to examine first the time series properties of the data to determine the order of integration. Only when each of the series is integrated the same order, cointegration is possible. Unit root test based on Augmented Dickey-Fuller (ADF) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) (1992) are used to test the order of integration of the series.

The cointegration analysis adopted here follows Johansen and Juselius (JJ) (1992) method. It is a multivariate cointegration analysis using a maximum likelihood estimation procedure. The method is different from Johansen and Juselius (JJ) (1990) procedure that commonly being applied in the literature. In JJ (1992), VAR models are estimated with unrestricted intercepts and restricted trends. That is, the cointegrating system equations include a constant term and trend variable. This will ensure linear trends in the series. Generally, the cointegration analysis is based on the model as follows,

$$y_t = A_0 + A_1 y_{t-1} + \cdots + A_k y_{t-k} + \Psi D_t + \varepsilon_t \quad (1)$$

where y_t is a (p x 1) vector of $I(1)$ variables, A_0 is a (p x 1) vector of constant, A_i and Ψ are the estimated parameters, D_t comprises seasonal dummy variables, external shock and policy intervention such that $I(0)$ and ε_t represents unanticipated movement in y_t; $\varepsilon_t \sim N_p(0,\Omega)$. It is a reduced form system equations where all of the variables are assumed jointly endogenous.

Alternatively, a VAR representation in first order differences is,

$$\Delta y_t = A_0 + \Gamma_1 \Delta y_{t-1} + \cdots + \Gamma_{k-1} \Delta y_{t-k+1} + \Pi y_{t-k} + \Psi D_t + \varepsilon_t \tag{2}$$

where $\Gamma_i = -(I - A_1 - \cdots - A_i)$, $\Pi = -(I - A_1 - \cdots - A_k)$ $(i = 1,\ldots,k-1;\ t = 1,\ldots,T)$, $\Delta = 1 - L$ is the first differenced, *L* is the lag operator. The rank of matrix Π determines the linear combinations of y_t that are stationary. The rank of matrix Π, r, is the number of cointegrating vectors. For 1 < rank(Π) = *r* < *p*, there are multiple cointegrating vectors. The JJ procedure measures the number of rank in matrix Π. The JJ procedure is based on trace test and maximal eigenvalues test. The trace test is computed as $\lambda_{trace}(r) = -T \sum_{i=r+1}^{p} \ln(1 - \hat{\lambda}_i)$ and the maximal eigenvalue test is calculated as $\lambda_{\max}(r, r+1)$ = T ln(1 - $\hat{\lambda}_{r+1}$).

After identifying the cointegration relationship we proceed to estimating the channels using VECM. This will give more insight into the relationship between the channels and economic activity, particularly on the relative strength of the channels. The cointegrating vectors obtained earlier cannot be interpreted as structural equations simply because they are reduced form equations. The VECM with lag-length *k* and incorporating an error correction term, $\beta' y_{t-1}$ is expressed as follows,

$$\Delta y_t = A_0 + \sum_{i=1}^{k-1} \Gamma_i \Delta y_{t-i} + \alpha(\beta' y_{t-1}) + \Psi D_t + \varepsilon_t \tag{3}$$

$$\alpha\beta' = \Pi = -\left[I - \sum_{i=1}^{k} A_i \right] \quad \text{and} \quad \Gamma_i = -\left[I - \sum_{j=1}^{i} A_j \right].$$

where y_t is a (5x1) vector, $y_t = [Y_i, M_i, r, P, e]$, $Y_i = Yagg,\ Ycon,,$ M_i = *M1, M2, Cre*, Π matrix contains information on the long-run relationship, $\alpha\beta' = \Pi$; α measures the speed of adjustment to disequilibrium, β is a matrix of long-run coefficient, matrix Γ_i represents the short-run dynamics. The estimated models in full are as follows,

$$\Delta Y_t = \alpha_1 + \sum_{i=1}^{k} \beta\, \Delta Y_{t-i} + \sum_{i=1}^{k} \kappa\, \Delta M1_{t-i} + \sum_{i=1}^{k} \tau\, \Delta r_{t-i} + \sum_{i=1}^{k} \pi\, \Delta P_{i=1} + \sum_{i=1}^{k} \rho\, \Delta e_{t-i} + \phi\, CRIS97 + \gamma\, ECT_{t-1} + \varepsilon_t \tag{4a}$$

$$\Delta Y_t = \alpha_1 + \sum_{i=1}^{k} \beta\, \Delta Y_{t-i} + \sum_{i=1}^{k} \kappa\, \Delta M2_{t-i} + \sum_{i=1}^{k} \tau\, \Delta r_{t-i} + \sum_{i=1}^{k} \pi\, \Delta P_{i=1} + \sum_{i=1}^{k} \rho\, \Delta e_{t-i} + \phi\, CRIS97 + \gamma\, ECT_{t-1} + \varepsilon_t \tag{4b}$$

$$\Delta Y_t = \alpha_1 + \sum_{i=1}^{k} \beta \, \Delta Y_{t-i} + \sum_{i=1}^{k} \kappa \, \Delta Cre_{t-i} + \sum_{i=1}^{k} \tau \, \Delta r_{t-i} + \sum_{i=1}^{k} \pi \, \Delta P_{i=1} + \sum_{i=1}^{k} \rho \, \Delta e_{t-i} + \phi \, CRIS97 + \gamma \, ECT_{t-1} + \varepsilon_t \quad (4c)$$

where β, τ, ϕ, $\gamma < 0$ and κ, π, $\rho > 0$. The monetary variables investigate are money supply (*M1* and *M2*), bank credit (Cre) and exchange rate (*e*). The output variable, *Y* is the aggregate output (*Y*) and the sectoral output - agricultural output (*Yagr*), construction output (*Ycon*), manufacturing output (*Ymnf*) and services output (*Ysrv*). To take account of the effect of mid-1997 financial crisis a dummy variable, *CRIS97* is introduced in the model. Several dummies tested on the model are CRIS97Q3 (1997:3=-1), CRIS97 (1997:3-1997:4=-1), CRIS97Q2 (1997:2-1997:4=-1), CRIS97Q398 (1997:3-1998:2=-1) and CRIS978Q1 (1997:3-1998=-1). *ECT* is the error correction term which measures the long-run relationship of the variables. All the series are measured in logarithms and output variables are in real terms. The data are quarterly spanning from period 1970:1 to 2008:3 in constant prices 2000. The 3-month Treasury bill rate was used as a monetary policy interest rate. According to Romer and Romer (1990), the interest rates behavior does not distinguish between money channel and credit channel. This is because both the channels react in a similar way to changes in the interest rates. The monetary aggregate M1 is defined as currency in circulation (holds by the public) plus demand deposits (current accounts). It measures a very liquid form of money for making purchases of goods and services. The monetary aggregate M2 is the sum of monetary aggregate M1, fixed, savings and foreign currency deposits of the residents at the commercial banks. It is also commonly referred to as broad money and is comparatively less-liquid.

Following what has most commonly used in the past (Romer and Romer, 1990; Kashyap et. al., 1993; Agung, 1998; Lown and Morgan, 2002), the total claim of commercial banks on the private sectors served as a proxy for credit variable in the analysis. The Consumer Price Index, a measure of price level is in base year 2000. The exchange rate used is the domestic exchange rate per US dollar at end of period. The estimation period includes a period of fixed exchange rate regime. Under fixed exchange rate regime with perfect capital mobility, monetary policy is powerless. However, in all countries, capital flow was controlled to some extent during the fixed exchange period (Delong, 2002 and Froyen, 2002), therefore, changes in money supply may affect real output.

The data on sectoral GDP of Malaysia was obtained from the Department of Statistics of Malaysia; *Quarterly Bulletin*, Central Bank of Malaysia (BNM); *Monthly Statistical Bulletin Malaysia*, Department of Statistics Malaysia., BNM; and *Monthly Statistical Bulletin Malaysia*, Department of Statistics Malaysia. Data on money, bank credit, price (consumer price index), exchange rate and interest rate were from *International Financial Statistics*, International Monetary Funds.

4. Data and Empirical Findings

The ADF test statistics and KPSS test statistics are reported in Table 1. The ADF statistics are not sufficiently large to reject the null hypothesis of unit root in the level series with trend or without trend. This suggests that the level data contain unit root. The presence of unit root is rejected for all the variables when first-differenced data are used. The ADF statistics, τ_{μ} on almost all the series are very highly statistically significant at 1 per cent level. The similar evidence is found using the KPSS test statistics. The null hypothesis of mean stationarity is rejected in all the level series at a very low level significance. Overall, the first differenced of the series cannot reject hypothesis of mean stationary. This suggests the series are I(0) in first difference. In short, the findings from the unit root tests suggest that all the series are integrated in the same order, I(1). Therefore, cointegration relationships need to be considered appropriately.

Table 1: Unit Root Tests

	Augumented Dickey-Fuller [ADF] H_o: Unit Root						Kwiatkowski-Phillips-Schmidt-Shin [KPSS] H_o: Mean Stationary					
Series	Level				Difference		Level				Difference	
	k	τ_{μ}	k	τ_{τ}	k	τ_{μ}	k	η_{μ}	k	η_{τ}	k	η_{μ}
sample 1970:1- 2008:3												
Y	4	-1.1100	4	-2.9035	3	-4.8556[a]	4	3.1895[a]	4	0.2727[a]	4	0.1688
Yagg	4	-2.1776	4	-2.9763	3	-6.5176[a]	4	3.1174[a]	4	0.6618[a]	4	0.2651
Ycon	4	-1.4316	4	-2.3254	3	-3.9234[b]	4	2.9226[a]	4	0.3287[a]	4	0.2877
Ymnf	4	-1.3979	4	-2.4349	4	-5.6459[a]	4	3.1901[a]	4	0.3430[a]	4	0.2829
Ysrv	2	-1.9209	4	-2.2074	4	-4.3363[a]	4	3.1926[a]	4	0.1927[b]	4	0.2080
Cre	4	-2.0781	4	-1.6463	4	-3.8668[b]	4	3.1373[a]	4	0.6371[a]	4	0.6756[b]
M1	4	-1.2413	4	-2.2708	5	-5.2987[a]	4	3.1546[a]	4	0.3124[a]	4	0.1540
M2	1	-1.6588	1	-2.1166	1	-8.3123[a]	4	3.1550[a]	4	0.3849[a]	4	0.2672
r	6	-2.5765	4	-2.4246	3	-7.0255[a]	1	1.1238[a]	2	0.4873[a]	2	0.0452
P	4	-1.2913	4	-2.8890	4	-4.3086[a]	4	3.0643[a]	4	0.5731[a]	8	0.3439
e	1	-1.2235	1	-2.8064	1	-8.0113[a]	4	1.9738[b]	4	0.4372[a]	4	0.1873

Notes:
1. [a, b] and [c] represents significant level at 1 per cent, 5 per cent and 10 per cent respectively.
2. The Augumented Dickey Fuller test statistics are computed with an intercept, a linear time trend and *k* lagged first-differences of the series to the series in level. The ADF regression in first-differences, exclude a linear time trend. The lag length (k) was selected based on Akaike Information Criteria (AIC). At n=100, the ADF critical values are -3.51 (1 per cent), -2.89 (5 per cent] and -2.58 (10 per cent) for constant (τ_{μ}); -4.04 (1 per cent), -3.45 (5 per cent) and -3.15 (10 per cent) for constant and time trend (τ_{τ}). For n=126, the 95 per cent critical value is -2.8844.
3. The value of the lag truncation parameter used in nonparametric variance correction to account for serial correlation is represented by *k*. After examining the 'lag window' for up to 8 lags, this parameter was set at a level where the test statistics tends to settle down. The KPSS critical values are 0.7390 (1 per cent), 0.4630 (5 per cent), 0.3470 (10 per cent) for constant (η_{μ}) and 0.2160 (1 per cent), 0.1460 (5 per cent), 0.1190 (10 per cent) for constant and time trend (η_{τ}).

In relation to the chosen lag in the cointegration analysis, it is argued that over-estimation of the lag is much less serious than underestimating. However, the chosen lag based on criterion selection of AIC and SBC may not satisfy Gaussian assumptions. Hence, the optimal lag length is selected based on the need of the model to have desirable statistical properties of no serial correlation, normality, homoskedastic variance and correct model specification, rather than using some information theoretic criterion. This may also take into consideration in choosing a higher lag.

The results of cointegration test are reported by λ-max and trace statistics in Table 2. The critical values computed by the Microfit 4 are based on Pesaran *et al.* (2000). Both tests statistics reject the null hypothesis of no cointegration (r = 0) at the 5 per cent significant level in most of the cases. There is at least one cointegrating vector at 5 per cent significant level. This indicates the presence of cointegration among the variables. That is, there exists a unique cointegrating vector in the model that constrains the long-run movements of the variables. However, it is possible that if the series are greater than two (n > 2) there can be more than one cointegrating vectors.

Table 2: Johansen-Juselius Cointegration Test

		λ_{max}					λ_{trace}				
Sectors	k	H_0:r=0	H_0:r=1	H_0:r=2	H_0:r=3	H_0:r=4	H_0:r=0	H_0:r=1	H_0:r=2	H_0:r=3	H_0:r=4
Vector: (Y, M1, r, P, e)											
Y	5	48.9774[a]	15.4863	12.6323	11.760	4.9741	93.8298[a]	44.8524	29.3661	16.7338	4.9741
Yagr	8	33.8943	21.9466	14.1277	8.8302	4.7711	83.5699[b]	49.6756	27.7290	13.6013	4.7711
Ycon	6	44.8818[a]	21.6796	16.3208	9.9715	6.8232	99.6769[a]	54.7951	33.1155	16.7947	6.8232
Ymanf	9	40.5940[a]	18.7033	13.0211	9.0679	2.6074	83.9936[b]	43.3996	24.6963	11.6753	2.6074
Yserv	5	40.3677[a]	16.9510	13.2750	12.503	2.4921	85.5888[b]	45.2211	28.2701	14.9950	2.4921
Vector: (Y, M2, r, P, e)											
Y	13	66.0866[a]	43.0048[a]	24.2738[a]	13.6133	3.9336	150.9120[a]	84.8254[a]	41.8207[a]	17.5469	3.9336
Yagr	7	41.6475[a]	22.9791	12.9520	9.8465	8.5133	95.9384[a]	54.2909	31.3118	18.3598	8.5133
Ycon	9	27.5207	25.2263	20.8540	11.4370	4.8681	89.9061[a]	62.3854[b]	37.1591	16.3051	4.8681
Ymanf	6	28.2957	22.6881	18.3140	13.0807	3.3415	85.7201[b]	57.4244	34.7362	16.4222	3.3415
Yserv	11	34.6547	31.2646	16.9418	9.7308	2.8973	95.4892[a]	60.8345[b]	29.5699	12.6282	2.8973
Vector: (Y, Cre, r, P, e)											
Y	7	31.5857	26.3642	18.9538	11.7413	5.2264	93.8714[a]	62.2857[b]	35.9215	16.9677	5.2264
Yagr	9	52.9013[a]	22.3837	16.1224	8.4730	7.6731	107.5536[a]	54.6522	32.2685	16.1461	7.6731
Ycon	13	99.3141[a]	40.4126[a]	26.2425[a]	10.2035	7.8663	184.0390[a]	84.7249[a]	44.3123[a]	18.0698	7.8663
Ymanf	7	34.9239	23.4215	17.7461	11.9716	2.8997	90.9627[a]	56.0388	32.6173	14.8713	2.8997
Yserv	9	28.2910	22.6891	17.6501	12.0873	10.159	90.8764[a]	62.5854[b]	39.8963[b]	22.2462	10.159
5%		37.860	31.790	25.420	19.220	12.390	87.100	63.000	42.3400	25.770	12.390
10%		35.040	29.1300	23.100	17.180	10.550	82.880	59.160	39.340	23.080	10.550

Notes:
1. Agg: aggregate, agr: agricultural, con: construction, serv: services.
2 a, b denotes significant level of 5 percent and 10 percent respectively.
3. Cointegrating vector includes intercept, time trend, seasonal dummies and dummy for outliers.

Having obtained the long-run cointegration relations, it is possible now to estimate the real output using the error correction model (ECM) framework. The number of lags is similar to that used in the cointegration test. The primary interest of the analysis is to examine the significant role of money, bank credit and exchange rate in affecting the real output. The results are robust based on the expected sign of the variables, significant *t* test, goodness-of-fit and satisfactory diagnostic tests perform on the equations, like errors are normally distributed, serially uncorrelated errors, homoskedastic error variances and well is specified functional forms.

The outstanding finding of the estimates is a negatively significant error correction term in most all the estimated models. Although in some sectors there are more than one error correction term entering the regression, only one is significant and has negative sign. This implies all the monetary variables are important, resolving the conflicting empirical findings from the previous studies. Some parts of the current variation and dynamics of the real output are explained by the error correction term. The coefficient measures the speed of short-run responses of real output toward restoring the long-run equilibrium in the system. The negative coefficient implies that lagged excess output supply induces a smaller expansion of current real output. This indicates the system is stable.

All the dummies crisis tested in the model are not significant and therefore were dropped from the model. On average, the fluctuations were average out over the years. The robustness of the results is justified by the overall satisfactory diagnostic tests. The residuals have normal distribution and the insignificant serial correlation test indicates the residuals are white noise. Most of the RESET test supports that the models are correctly specified. To examine the channels of monetary transmission, we estimate a parsimonious VECM (PVECM) by dropping the insignificant variables from the VECM. The findings are reported in Table 3 and Table 4.

Table 3: Summary of Parsimonious Error Correction Model

	ΔM1 (ΔM2, ΔCre)	Δr	ΔP	Δe	$ECT1_{t-1}$	$ECT2_{t-1}$ Coefficients of Adjustments (α)	$ECT3_{t-1}$
ΔY (M1)				---	-.073199***		
ΔY (M2)	++		+	+++	.027906***	-.054324***	
ΔY (Cre)	+		+	-	-.028802***	.015859	
Agricultural Sector							
ΔYagr(M1)		-		+ -	-.12391***		
ΔYagr(M2)	+	-		-	-.15652***		
ΔYagr(Cre)			+	+ -	-.14982***		
Construction Sector							
ΔYcon(M1)			+	---	-.20213***		
ΔYcon(M2)			+	-+	0090337	-.098159***	
ΔYcon(Cre)		-	+++	+++	-.15374***	.10701***	.0084724
Manufacturing Sector							
ΔYmnf(M1)	+		+	+ -	-.062471***		
ΔYmnf(M2)		-		-	.011711		
ΔYmnf(Cre)				+ -	-.085663***		
Services Sector							
ΔYsvr(M1)		-	+	---	-.069006***		
ΔYsvr(M2)			+	+ -	.014955	-.025083***	
ΔYsvr(Cre)		-		-	-.010208	.010455	-.036431***

Notes:
1. ++ or --- refers to continuous effects.
2 *, **, *** denotes significant level of 1 per cent, 5 per cent and 10 per cent respectively.

The estimates provide remarkable results. All the variables are important monetary policy indicators. Money, credit and exchange rate have significant impacts on economic activity. Finding from the aggregate data shows that economic activity or real output responds greater to broad money (M2) in the long-run relationship. Real output expands by 0.15 per cent when broad money is heightened by 1 per cent. Real output reacts to the deviations in the long-run disequilibrium by closing 7 per cent of the gap. However, highly liquid money (M1) is neutral in the short-run. The estimated coefficient is neither positively significant nor significantly bears the correct sign. Although output is strongly linked to credit variable, the short-run effect of credit variable is much shorter than M2. The finding suggests that both broad money and credit have greater role in the economic activity. Generally, rapid innovation in the financial market has made broad money and bank credit becoming more important in the economy. Holding of less-liquid money close substitutes to highly liquid money allows economy to grow larger. While bank credit extended to the various sectors helps to expand the economy. Meanwhile, exchange rate provides mixed results. The evidence suggests that weaker ringgit exchange expands real output as exports become more competitive in the global market. Likewise, exchange rate appreciation lowers inflation reduces production costs and thus, increase production.

Findings from the sectoral output offer some interesting evidence. Both highly liquid money and credit are neutral in the short-run in the agricultural sector. The coefficients have wrong sign and not statistically significant. This is not surprising because the sector is less sensitive to the variables. For many small rural farmers, livestock breeders and fishermen, bank credit is not the main source of financing. Loans and credit facilities extended to the smallholders are always small and limited. This is because the profit from agricultural sector takes a long time to become visible and moreover they are vulnerable to weather as well as subject to uncertain world demand. Therefore, banks identify them as less worthy firms than the larger competitive businesses. In the recent decades, agricultural sector has becoming more commercialized. The development of agro-biotechnology, growing population, increasing retail food business, rising hypermarkets and development in infrastructure has increased the demand for agricultural product. In a more modern financial system, a large number of the transactions are made by electronics payments such as internet banking, automated teller machines (ATMs) and credit cards which served well by broader money definition. Therefore broad more has more role than narrow money definition (M1). For other variables, interest rate is significantly linked to agricultural real output. Exchange rate has positive and negative impacts on real agricultural output.

In the construction activity, all the indicators are neutral in the short-run. However evidence from the long-run relationship suggests that the real construction output responds larger to the disequilibrium in the long-run relationship in the present of highly liquid money (M1). Construction activity changes by 20 per cent to the disequilibrium in the system. In fact, the sector adjusts more than any other sectors in the economy. This implies that the sector is more dynamic although its contribution in the GDP is small. The construction of buildings and new houses is not immediate but with some delays about one to two years. Contractors incur some expenses before the building project is completed. Hence, they need financing over the construction period to sustain the activities. Although contractors frequently obtain bank financing to source the needed funds the finding suggests that the availability of highly liquid money is also important to the construction activity. Highly liquid money can be use immediately, conveniently and cheaply for making payments. This is particularly important when placing down payment for the building property purchasing.

Only highly liquid money is affecting manufacturing activity in the short-run. This indicates that M1 has greater role in the manufacturing sector. Manufacturing output increases 0.24 per cent when highly liquid money is lifted by 1 per cent. From the error correction coefficient, manufacturing output adjusts by .06 per cent to the disequilibrium in the model. Interest rate and exchange are significant but not price. No evidence is traced from the short-run and long-run relationship for broad money. This is true as companies in the manufacturing sector comprise a large number of small and medium firms. Holding large highly liquid money is crucial to safeguard from uncertainties of payments and receipts. In 2007, small and medium manufacturing businesses represented more than 80 per cent total manufacturing establishments. Mainly involved producing manufactured goods such as food and beverages (20 per cent), fabricated metal products (18 per cent), wood and wood products (17 per cent) and basic metal (4 per cent) (Domaç). Only a small number of manufacturing firms is multinational corporations which rely on their own sources of financing. As such, neither credit nor broad money is important in the short-run. Instead, the output is more sensitive to highly liquid money. On the role of exchange rate, appreciation and depreciation of ringgit expands manufacturing activity.

Services output is not responsive to all the monetary indicators in the short-run. There is reasonably strong evidence to accept services output react more in the presence of highly liquid money. The services output adjusts by .06 per cent to the long-run disequilibrium in the system. The sector expands in line with the rapidly growing financial intermediation. The rapid expansion of wholesale and retail trade, hotels and restaurants, transportations, storage, communication, banking, and business services activities is more integrated to the financial system. The sector is the largest contributor of the GDP (58 per cent in 2002). The rapid intermediation and financial liberalization have much impact on services sectors as they facilitate the services activities. Obviously, the innovations in the payment system integrate more highly liquid money with services sector. Interest rate, price and exchange rate variables have expected sign and significant.

Table 4: Parsimonious Error Correction Model

Dependent Variable: *Y*

Inpt	2.2769^a	-.42107^a	0.29342
ΔY_{-1}	.13476^b	-.18622^b	
ΔY_{-2}		-.29988^a	
ΔY_{-3}		-.46529^a	-.22419^a
ΔY_{-4}	.29651^a	.18635^b	.27474^a
ΔY_{-5}		-.21246^a	-.091037
ΔY_{-6}		-.088155	-.083970
$\Delta M1_{-2}$	-.052761		
$\Delta M1_{-3}$	.049941		
$\Delta M2_{-3}$		.14919^a	
$\Delta M2_{-5}$		.084345^c	
$\Delta M2_{-6}$		-.066615	
$\Delta M2_{-7}$		.056996	
ΔCre_{-1}			-.099778
ΔCre_{-2}			.086572
ΔCre_{-3}			.13029^b
ΔCre_{-4}			-.21829^a
Δr_{-2}	-.004594		-.0054150
Δr_{-3}		0.008643^a	
Δr_{-4}	.005838^b	0.006776^b	.0075856^b
Δr_{-5}			-.0033928
Δr_{-6}			-.0037209
Δr_{-7}		0.003360	
Δr_{-10}		0.043273	
ΔP_{-2}	-.27451		-.23811
ΔP_{-3}	.049941		.40441^b
ΔP_{-6}		0.41973^b	.37279^b
ΔP_{-9}		-0.41671^b	
ΔP_{-10}		0.35811	
ΔP_{-11}		0.42341^b	
Δe_{-1}	-.23539^a		-.11046^a
Δe_{-2}	-.10273^b		-.072526^b
Δe_{-3}	-.14414^a		-.091726^b
Δe_{-4}	-.10198^b		
Δe_{-7}		.13110^a	
Δe_{-9}		.14031^a	
Δe_{-10}		.11390^a	
Δe_{-12}		.078424^b	
SR1	-.03712^a	-.012789	-.023406^b
SR2	.00437	.030321^a	.020793^b
SR3	.01118^c	.016648^b	.029275^a
Y75Q1	.098579^a	.11543^a	.13605^a
ECT_{-1}	-.07320^a	.0279^a	-.028802^b
ECT_{-2}		-.0543^a	.015859
$\bar{R}^2$	.85394	.85318	.83700
$\chi^2_{SC}[4]$	.143	.520	.137
$\chi^2_{N}[2]$	.785	.071	.306
$\chi^2_{FF}[1]$	.535	.391	.847
$\chi^2_{H}[1]$	.513	.271	.620

Dependent Variable: *Yagr*

Inpt	1.9188^a	3.0233^a	3.1196^a
$\Delta Yagr_{-1}$	-.32146^a	-.17174^a	-.21926^a
$\Delta Yagr_{-2}$	-.34573^a	-.25397^a	-.28096^a
$\Delta Yagr_{-3}$	-.27285^a	-.23116^a	-.25399^a
$\Delta Yagr_{-4}$		.18666^b	
$\Delta Yagr_{-5}$	-.21921^a	-.097629	-.21132^a
$\Delta Yagr_{-6}$	-.24472^a		-.22607^a
$\Delta Yagr_{-7}$	-.30501^a		-.30813^a
$\Delta M1_{-1}$	.12600		
$\Delta M1_{-5}$	.11565		
$\Delta M1_{-6}$	-.13000		
$\Delta M2_{-1}$		-.074656	
$\Delta M2_{-2}$		.042565	
$\Delta M2_{-4}$		-.19687^b	
$\Delta M2_{-5}$		.20708^b	
$\Delta M2_{-6}$		-.26281^a	
ΔCre_{-4}			-.18136
ΔCre_{-5}			-.077514
ΔCre_{-6}			.12789
ΔCre_{-8}			-.54475
Δr_{-2}		-.0040199	
Δr_{-3}	.012366^c		.012289^b
Δr_{-4}		-.0022064	
Δr_{-5}	.009238	.012055^b	.010976^c
Δr_{-6}	-.01056^c	-.018267^a	-.008549
Δr_{-7}			.0077162
ΔP_{-1}			-.29226
ΔP_{-2}		-.56946	-.58972
ΔP_{-3}	.33177	.60331	.77874^c
ΔP_{-4}	-1.1384^a	-.67400	-.45144
ΔP_{-5}		-.42686	-.47638
ΔP_{-6}	-.73765^b	-.74449^c	-.67278^c
ΔP_{-7}			.61796
Δe_{-1}	-.056056	-.075560	
Δe_{-2}	.10448		
Δe_{-3}	-.12666	-.15639^b	-.10566
Δe_{-4}	.15952^c	.10771	.11174
Δe_{-5}	-.17323^b	-.19074^b	-.18917^b
Δe_{-7}	.13619		.15910^c
SR1	-.03227^b	-.047582^a	-.021568
SR2	.007450	-.014281	.0094658
SR3	.017248	.015137	.032444^b
ECT_{-1}	-.12391^a	-.15652^a	-.14982^a
$\bar{R}^2$	.80460	.79632	.81336
$\chi^2_{SC}[4]$	.199	.309	.392
$\chi^2_{N}[2]$	.002	.011	.001
$\chi^2_{FF}[1]$	.905	.737	.650
$\chi^2_{H}[1]$	.028	.002	.127

Dependent Variable: *Ycon*

Inpt	-2.1849^a	.41951	1.7351^a
$\Delta Ycon_{-1}$	-.12165^b		-.10803
$\Delta Ycon_{-2}$	-.21476^a	-.073049	-.17316^c
$\Delta Ycon_{-3}$	-.20767^a	.090573	.095949
$\Delta Ycon_{-4}$	.47783^a	.51652^a	.67510^a
$\Delta Ycon_{-5}$			.36847^a
$\Delta Ycon_{-6}$			.39961^a
$\Delta Ycon_{-7}$		-.10963	.38221^a
$\Delta Ycon_{-8}$		.22196^a	.55630^a
$\Delta Ycon_{-9}$			.34102^a
$\Delta Ycon_{-10}$			.23537^a
$\Delta M1_{-1}$	.11396		
$\Delta M1_{-3}$	-.054310		
$\Delta M1_{-5}$	-.061820		
$\Delta M2_{-1}$		.060903	
$\Delta M2_{-3}$		-.083188	
$\Delta M2_{-4}$		.14849	
ΔCre_{-3}			-.092604
ΔCre_{-4}			-.39146^b
ΔCre_{-5}			-.47863^b
ΔCre_{-7}			.26803
ΔCre_{-8}			-.51333^b
ΔCre_{-9}			-.032551
ΔCre_{-10}			-.08647
ΔCre_{-11}			.24850
ΔCre_{-12}			-.053795
Δr_{-1}		-.0081071	-.012390
Δr_{-2}	0.00829	.019380	.012956
Δr_{-3}	.011071		
Δr_{-5}	.013725^b		
Δr_{-7}			-.0059946
Δr_{-8}		-.00633	
Δr_{-9}			-.013204
Δr_{-10}			-.0057064
Δr_{-11}			-.011277
Δr_{-12}			-.018386^b
ΔP_{-1}	-1.0086^b	-.81151	-1.2916^b
ΔP_{-2}		.47072	1.6776^b
ΔP_{-3}	.93142^b		.96844
ΔP_{-4}		1.4353^b	1.4310^c
ΔP_{-5}	-.061820	-.92071^b	
ΔP_{-6}			-1.3144^b
ΔP_{-8}		.59822	
ΔP_{-10}			1.7125^a
ΔP_{-12}			1.2562^b
Δe_{-1}	-.51050^a	-.076481	.24291^c
Δe_{-2}	-.29236^b	-.20680^b	
Δe_{-3}	-.40487^a		
Δe_{-4}	-.39664^a	-.23042^b	-.13042
Δe_{-5}	-.32175^b		
Δe_{-6}		.33917^a	.37799^a
Δe_{-7}		.14885	.46204^a
Δe_{-8}		.15669	.47228^a
Δe_{-9}			.34208^b
Δe_{-10}			.33118^b
Δe_{-11}			.17368
Δe_{-12}			.30250^b
SR1	-.025008^b	-.024636^b	-.029367^c
SR2	-.2828E-3	.014624	-.002200
SR3	.7318E-3	-.0020996	-.011545
Y75Q1	.22249^a		
Y7580		.22711^a	
ECT_{-1}	-.20213^a	.0090337	-.15374
ECT_{-2}		.098159	.10701
ECT_{-3}			.0084724
$\bar{R}^2$	.72035	.76240	.71499
$\chi^2_{SC}[4]$	.146	.157	.780
$\chi^2_{N}[2]$	.372	.364	.046
$\chi^2_{FF}[1]$	.234	.774	.746
$\chi^2_{H}[1]$	.643	.626	.110

Dependent Variable: *Ymanf*

Inpt	.40112^b	.083760	.50876^b
$\Delta Ymanf_{-2}$	-.057007		-.066029
$\Delta Ymanf_{-3}$	-.29136^a	-.17972^b	-.18186^b
$\Delta Ymanf_{-4}$	.29146^a	.26782^a	.24166^a
$\Delta Ymanf_{-5}$	-.28601^a	-.23567^a	-.26285^a
$\Delta M1_{-1}$	.062043		
$\Delta M1_{-2}$	.23663^a		
$\Delta M1_{-3}$	.10782		
$\Delta M1_{-5}$	.10907		
$\Delta M1_{-8}$	-.15174^b		
$\Delta M2_{-4}$		.081053	
ΔCre_{-1}			-.12515
ΔCre_{-3}			.10402
ΔCre_{-6}			-.36904^a
Δr_{-1}	-.0077001	-.0072585	-.010731^c
Δr_{-2}		-.0097457	
Δr_{-3}	.013505^b	.0070884	-.0074921
Δr_{-4}	-.0047885		
Δr_{-5}	-.0054509	-.0055268	
ΔP_{-1}	-.47938		
ΔP_{-3}			.27586
ΔP_{-4}		-.48400	-.49855
ΔP_{-5}		.27459	.52248
ΔP_{-7}	-.68284^c		
ΔP_{-8}	.78989^a		
Δe_{-1}	-.089356	-.16815^b	
Δe_{-2}	-.15162^c	-.11055	-.13711
Δe_{-3}		-.14661^c	
Δe_{-4}		-.092284	-.12372
Δe_{-6}	.15498^c		.16659^b
Δe_{-7}	.20143^b		
SR1	-.041201^a	-.016971	-.015086
SR2	.023299	.042313^a	.035069^b
SR3	.031296^b	.054166^a	.050104^a
ECT_{-1}	-.062471^b	.011711	-.085663^a
$\bar{R}^2$	.70624	.66806	.68957
$\chi^2_{SC}[4]$	.480	.840	.493
$\chi^2_{N}[2]$	.217	.568	.107
$\chi^2_{FF}[1]$	.705	.467	.185
$\chi^2_{H}[1]$	.574	.179	.164

Dependent Variable: *Ysrv*

Inpt	1.0018	.36514^c	.23019
$\Delta Ysrv_{-1}$		-.15586	-.27234^a
$\Delta Ysrv_{-2}$	-.073327	-.18772^b	-.10786
$\Delta Ysrv_{-3}$		-.066760	
$\Delta Ysrv_{-4}$	.35827^a	.32359^a	.27291^a
$\Delta Ysrv_{-5}$		.16976^c	.10138
$\Delta Ysrv_{-6}$		.14181^b	
$\Delta Ysrv_{-7}$			-.11764^b
$\Delta Ysrv_{-8}$			.17100^b
$\Delta Ysrv_{-9}$		-.057548	
$\Delta Ysrv_{-10}$		-.071360	
$\Delta M1_{-1}$	-.028119		
$\Delta M1_{-2}$	-.070102^c		
$\Delta M1_{-3}$	.035311		
$\Delta M1_{-4}$	-.047034		
$\Delta M2_{-1}$		.056418	
$\Delta M2_{-2}$		.019915	
$\Delta M2_{-3}$		.037270	
$\Delta M2_{-9}$		.030291	
ΔCre_{-1}			.079732
ΔCre_{-2}			.10336
ΔCre_{-}			-.12419^c
Δr_{-1}		.003527	
Δr_{-2}		.001671	-.0026482
Δr_{-3}	-.005699^b	-.0015406	-.007698^b
Δr_{-4}	.0029285	.0040869	.0057322^b
Δr_{-5}		.0089966^b	.0025608
Δr_{-6}			-.0046865
Δr_{-7}		.0019781	
Δr_{-8}		-.0011814	
Δr_{-9}		.0064804^b	
ΔP_{-1}	-.22716	-.20106	-.30881
ΔP_{-2}	.34589^b	.27106	.26059
ΔP_{-3}		.076160	.23503
ΔP_{-5}		-.22127	
ΔP_{-6}		.17377	
ΔP_{-7}		-.16247	-.22447
ΔP_{-8}			.18927
ΔP_{-9}		-.19201	
ΔP_{-10}		.33595^c	
Δe_{-1}	-.13175^a	-.033415	-.065421
Δe_{-2}	-.13472^a	-.071297	-.091682^b
Δe_{-3}	-.082708	-.018133	
Δe_{-4}	-.10570^b	-.082053^c	-.14568^a
Δe_{-5}		-.029599	-.055862
Δe_{-6}		.047184	
Δe_{-7}		.083024^c	
Δe_{-9}		.022349	
Δe_{-10}		.11676^b	
SR1	-.026919^a	-.025940^a	-.023259^a
SR2	-.016474^a	-.0098251	-.0090476
SR3	-.010895^b	-.0095187	
Y93551	.060404^a		
Y935		.079660^a	
ECT_{-1}	-.069006^a	.014955	-.010208
ECT_{-2}		-.025083^c	.010455
ECT_{-3}			-.036431^b
$\bar{R}^2$	.76003	.71816	.64710
$\chi^2_{SC}[4]$	.644	.942	.966
$\chi^2_{N}[2]$	.671	.084	.466
$\chi^2_{FF}[1]$	.749	.868	.196
$\chi^2_{H}[1]$	.358	.686	.257

Table 4: Parsimonious Error Correction Model

PECM with Highly Liquid Money (M1) for Aggregate Output

Dependent variable is DLGDP
150 observations used for estimation from 1971Q2 to 2008Q3

Regressor	Coefficient	Standard Error	T-Ratio [Prob]
INPT	2.2769	.41228	5.5226[.000]
ΔY(-1)	.13476	.072368	1.8622[.065]
ΔY(-4)	.29651	.066501	4.4587[.000]
ΔM1(-2)	-.052761	.043680	-1.2079[.229]
ΔM1(-3)	.049941	.043719	1.1423[.255]
ΔP(-2)	-.27451	.18943	-1.4491[.150]
ΔP(-3)	.29966	.18775	1.5960[.113]
Δr(-2)	-.0045941	.0029058	-1.5810[.116]
Δr(-4)	.0058380	.0027754	2.1035[.037]
Δe(-1)	-.23539	.041509	-5.6708[.000]
Δe(-2)	-.10273	.041042	-2.5030[.014]
Δe(-3)	-.14414	.043247	-3.3331[.001]
Δe(-4)	-.10198	.044811	-2.2757[.024]
SC1	-.037116	.0066144	-5.6115[.000]
SC2	.0043658	.0079278	.55070[.583]
SC3	.011184	.0057233	1.9542[.053]
Y75Q1	.098579	.017737	5.5577[.000]
ECT(-1)	-.073199	.013322	-5.4946[.000]

R-Squared	.87060	R-Bar-Squared	.85394
S.E. of Regression	.016674	F-stat. F(17, 132)	52.2426[.000]
Mean of Dependent Variable	.016447	S.D. of Dependent Variable	.043628
Residual Sum of Squares	.036698	Equation Log-likelihood	410.8342
Akaike Info. Criterion	392.8342	Schwarz Bayesian Criterion	365.7385
DW-statistic	2.0742		

Diagnostic Tests
Serial Correlation χ^2(4)= 6.8669[.143]; F(4, 128)= 1.5352[.196]
Functional Form χ^2 (1)= .074501[.785]; F(1, 131)= .065096[.799]
Normality χ^2 (2)= 1.2497[.535]
Heteroscedasticity χ^2 (1)= .42828[.513]; F (1, 148)= .42378[.516]

PECM with Broad Money (M2) for Aggregate Output

Dependent variable is DLGDP
142 observations used for estimation from 1973Q2 to 2008Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
INPT	-.42107	.10802	-3.8979[.000]
ΔY(-1)	-.18622	.077936	-2.3894[.019]
ΔY(-2)	-.29988	.080770	-3.7127[.000]
ΔY(-3)	-.46529	.077744	-5.9849[.000]
ΔY(-4)	.18635	.073722	2.5277[.013]
ΔY-5)	-.21246	.076188	-2.7886[.006]
ΔY(-6)	-.088155	.079146	-1.1138[.268]
ΔM2(-3)	.14919	.053277	2.8003[.006]
ΔM2(-5)	.084345	.049487	1.7044[.091]
ΔM2(-6)	-.066615	.049893	-1.3352[.185]
ΔM2(-7)	.056996	.050277	1.1336[.259]
ΔP(-6)	.41973	.17993	2.3327[.021]
ΔP(-9)	-.41671	.20153	-2.0678[.041]
ΔP(-10)	.35811	.21970	1.6300[.106]
ΔP(-11)	.42341	.19716	2.1476[.034]
Δr(-3)	.0086432	.0031939	2.7061[.008]
Δr(-4)	.0067762	.0029181	2.3221[.022]
Δr(-7)	.0033600	.0030047	1.1182[.266]
Δr(-10)	.0043273	.0029664	1.4588[.147]
Δe(-7)	.13110	.048300	2.7143[.008]
Δe(-9)	.14031	.044066	3.1840[.002]
Δe(-10)	.11390	.042443	2.6835[.008]
Δe(-12)	.078424	.041849	1.8739[.064]
SC1	-.012789	.0085138	-1.5021[.136]
SC2	.030321	.010434	2.9059[.004]
SC3	.016648	.0087812	1.8958[.061]
Y75Q1	.11543	.019034	6.0646[.000]
ECT(-1)	.027906	.010013	2.7869[.006]
ECT(-2)	-.054324	.0079754	-6.8114[.000]

R-Squared	.88234	R-Bar-Squared	.85318
S.E. of Regression	.016535	F-stat. F(28, 113)	30.2636[.000]
Mean of Dependent Variable	.015962	S.D. of Dependent Variable	.043153
Residual Sum of Squares	.030895	Equation Log-likelihood	397.2536
Akaike Info. Criterion	368.2536	Schwarz Bayesian Criterion	325.3941
DW-statistic	2.0447		

Diagnostic Tests
Serial Correlation χ^2(4)= 3.2298[.520]; F(4. 109)= .63424[.639]
Functional Form χ^2(1)= 3.2550[.071]; F(1, 112)= 2.6275[.108]
Normality χ^2(2)= 1.8801[.391]
Heteroscedasticity χ^2(1)= 1.2137[.271]; F(1, 140)= 1.2069[.274]

PECM with Bank Credit (Cre) for Aggregate Output

Dependent variable is DLGDP
148 observations used for estimation from 1971Q4 to 2008Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
INPT	.29342	.29278	1.0022[.318]
ΔY(-3)	-.22419	.073038	-3.0695[.003]
ΔY(-4)	.27474	.070955	3.8720[.000]
ΔY(-5)	-.091037	.072605	-1.2539[.212]
ΔY(-6)	-.083970	.072879	-1.1522[.251]
ΔCre(-1)	-.099778	.071572	-1.3941[.166]
ΔCre(-2)	.086572	.070119	1.2347[.219]
ΔCre(-3)	.13029	.073091	1.7826[.077]
ΔCre(-4)	-.21829	.073597	-2.9661[.004]
ΔP(-2)	-.23811	.21693	-1.0976[.275]
ΔP(-3)	.40441	.21705	1.8632[.065]
ΔP(-6)	.37279	.18943	1.9680[.051]
Δr(-2)	-.0054150	.0034336	-1.5770[.117]
Δr(-4)	.0075856	.0030619	2.4774[.015]
Δr(-5)	-.0033928	.0030680	-1.1059[.271]
Δr(-6)	-.0037209	.0030869	-1.2054[.230]
Δe(-1)	-.11046	.041734	-2.6467[.009]
Δe(-2)	-.072526	.043330	-1.6738[.097]
Δe(-4)	-.091726	.045131	-2.0325[.044]
SC1	-.023402	.0081599	-2.8679[.005]
SC2	.020793	.0098340	2.1144[.036]
SC3	.029275	.0082881	3.5322[.001]
Y75Q1	.13605	.020502	6.6361[.000]
ECT(-1)	-.028802	.016015	-1.7984[.075]
ECT(-2)	.015859	.015187	1.0443[.298]

R-Squared	.86362	R-Bar-Squared	.83700
S.E. of Regression	.017610	F-stat. F(24, 123)	32.4527[.000]
Mean of Dependent Variable	.015853	S.D. of Dependent Variable	.043618
Residual Sum of Squares	.038143	Equation Log-likelihood	401.5047
Akaike Info. Criterion	376.5047	Schwarz Bayesian Criterion	339.0395
DW-statistic	2.0683		

Diagnostic Tests
Serial Correlation χ^2(4)= 6.9768[.137]; F(4, 119)= 1.4718[.215]
Functional Form χ^2(1)= 1.0484[.306]; F(1, 122)= .87039[.353]
Normality χ^2(2)= .33302[.847]
Heteroscedasticity χ^2(1)= .24599[.620]; F(1, 146)= .24307[.623]

PECM with Highly Liquid Money (M1) For Agricultural Output

Dependent variable is DLAGR
147 observations used for estimation from 1972Q1 to 2008Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
INPT	1.9188	.41150	4.6629[.000]
ΔYagr(-1)	-.32146	.078448	-4.0977[.000]
ΔYagr(-2)	-.34573	.077708	-4.4491[.000]
ΔYagr(-3)	-.27285	.074091	-3.6826[.000]
ΔYagr(-5)	-.21921	.072303	-3.0318[.003]
ΔYagr(-6)	-.24472	.074753	-3.2737[.001]
ΔYagr(-7)	-.30501	.071604	-4.2597[.000]
ΔM1(-1)	.12600	.088220	1.4283[.156]
ΔM1(-5)	.11565	.079925	1.4470[.150]
ΔM1(-6)	-.13000	.082439	-1.5770[.117]
ΔP(-3)	.33177	.37810	.87746[.382]
ΔP(-4)	-1.1384	.39594	-2.8751[.005]
ΔP(-6)	-.73765	.34736	-2.1235[.036]
Δr(-3)	.012366	.0063758	1.9395[.055]
Δr(-5)	.0092375	.0056243	1.6424[.103]
Δr(-6)	-.010558	.0055401	-1.9057[.059]
Δe(-1)	-.056056	.072630	-.77179[.442]
Δe(-2)	.10448	.083515	1.2511[.213]
Δe(-3)	-.12666	.077057	-1.6438[.103]
Δe(-4)	.15952	.081191	1.9648[.052]
Δe(-5)	-.17323	.080591	-2.1495[.034]
Δe(-7)	.13619	.087028	1.5649[.120]
SC1	-.032270	.014516	-2.2230[.028]
SC2	.0074500	.018028	.41326[.680]
SC3	.017248	.013555	1.2724[.206]
ECT(-1)	-.12391	.026928	-4.6015[.000]

R-Squared	.83806	R-Bar-Squared	.80460
S.E. of Regression	.032111	F-stat. F(25, 121)	25.0478[.000]
Mean of Dependent Variable	.0081108	S.D. of Dependent Variable	.072644
Residual Sum of Squares	.12477	Equation Log-likelihood	311.1884
Akaike Info. Criterion	285.1884	Schwarz Bayesian Criterion	246.3128
DW-statistic	1.8897		

Diagnostic Tests:
Serial Correlation χ^2(4)= 6.0041[.199]; F(4, 117)= 1.2456[.296]
Functional Form χ^2(1)= 10.0738[.002]; F(1, 120)= 8.8285[.004]
Normality χ^2(2)= .20031[.905]
Heteroscedasticity χ^2(1)= 4.8007[.028]: F(1, 145)= 4.8953[.028]

PECM with Broad Money (M2) For Agricultural Output

Dependent variable is DLAGR
148 observations used for estimation from 1971Q4 to 2008Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
INPT	3.0233	.61287	4.9330[.000]
ΔYagr(-1)	-.17174	.088990	-1.9299[.056]
ΔYagr(-2)	-.25397	.084338	-3.0114[.003]
ΔYagr(-3)	-.23116	.080507	-2.8713[.005]
ΔYagr(-4)	.18666	.080867	2.3082[.023]
ΔYagr(-5)	-.097629	.076414	-1.2776[.204]
ΔM2(-1)	-.074656	.094617	-.78903[.432]
ΔM2(-2)	.042565	.096460	.44127[.660]
ΔM2(-4)	-.19687	.095822	-2.0545[.042]
ΔM2(-5)	.20708	.099208	2.0874[.039]
ΔM2(-6)	-.26281	.097247	-2.7025[.008]
ΔP(-2)	-.56946	.39058	-1.4580[.147]
ΔP(-3)	.60331	.42301	1.4262[.156]
ΔP(-4)	-.67400	.42342	-1.5918[.114]
ΔP(-5)	-.42686	.43343	-.98484[.327]
ΔP(-6)	-.74449	.40838	-1.8230[.071]
Δr(-2)	-.0040199	.0057744	-.69615[.488]
Δr(-4)	-.0022064	.0058596	-.37655[.707]
Δr(-5)	.012055	.0059216	2.0358[.044]
Δr(-6)	-.018267	.0055932	-3.2660[.001]
Δe(-1)	-.075560	.074124	-1.0194[.310]
Δe(-3)	-.15639	.077429	-2.0198[.046]
Δe(-4)	.10771	.083996	1.2823[.202]
Δe(-5)	-.19074	.081799	-2.3318[.021]
SC1	-.047582	.014502	-3.2811[.001]
SC2	-.014281	.017152	-.83258[.407]
SC3	.015137	.013793	1.0974[.275]
ECT (-1)	-.15652	.032057	-4.8824[.000]

R-Squared	.83373	R-Bar-Squared	.79632
S.E. of Regression	.032696	F-stat. F(27, 120)	22.2861[.000]
Mean of Dependent Variable	.0083316	S.D. of Dependent Variable	.072446
Residual Sum of Squares	.12828	Equation Log-likelihood	311.7528
Akaike Info. Criterion	283.7528	Schwarz Bayesian Criterion	241.7918
DW-statistic	1.9099		

Diagnostic Tests:
Serial Correlation χ^2(4)= 4.7939[.309]; F(4, 116) = .97079[.426]
Functional Form χ^2(1)= 6.4263[.011]; F(1, 119) = 5.4016[.022]
Normality χ^2(2)= .61144[.737]
Heteroscedasticity χ^2(1)= 9.2403[.002], F(1, 146) = 9.7224[.002]

PECM with Bank Credit (Cre) for Agricultural Output

Dependent variable is DLAGR
146 observations used for estimation from 1972Q2 to 2008Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
INPT	3.1196	.54690	5.7041[.000]
ΔYagr(-1)	-.21926	.082073	-2.6716[.009]
ΔYagr(-2)	-.28096	.077302	-3.6345[.000]
ΔYagr(-3)	-.25399	.072529	-3.5020[.001]
ΔYagr(-5)	-.21132	.070420	-3.0008[.003]
ΔYagr(-6)	-.22607	.074027	-3.0538[.003]
ΔYagr(-7)	-.30813	.070989	-4.3406[.000]
ΔCre(-4)	-.18136	.13224	-1.3714[.173]
ΔCre(-5)	-.077514	.12730	-.60893[.544]
ΔCre(-6)	.12789	.13709	.93287[.353]
ΔCre(-8)	-.54475	.12873	-4.2317[.000]
ΔP(-1)	-.29226	.39628	-.73751[.462]
ΔP(-2)	-.58972	.43298	-1.3620[.176]
ΔP(-3)	.77874	.45213	1.7224[.088]
ΔP(-4)	-.45144	.42580	-1.0602[.291]
ΔP(-5)	-.47638	.41963	-1.1353[.259]
ΔP(-6)	-.67278	.40488	-1.6617[.099]
ΔP(-7)	.61796	.38422	1.6084[.110]
Δr(-3)	.012289	.0060372	2.0356[.044]
Δr(-5)	.010976	.0055764	1.9683[.051]
Δr(-6)	-.0085486	.0054177	-1.5779[.117]
Δr(-7)	.0077162	.0054207	1.4235[.157]
Δe(-3)	-.10566	.073928	-1.4292[.156]
Δe(-4)	.11174	.075934	1.4716[.144]
Δe(-5)	-.18917	.079460	-2.3807[.019]
Δe(-7)	.15910	.081218	1.9589[.053]
SC1	-.021568	.013880	-1.5539[.123]
SC2	.0094658	.016993	.55703[.579]
SC3	.032444	.013934	2.3284[.022]
ECT(-1)	-.14982	.026549	-5.6432[.000]

R-Squared	.85069	R-Bar-Squared	.81336
S.E. of Regression	.030892	F-stat. F(29, 116)	22.7895[.000]
Mean of Dependent Variable	.0092740	S.D. of Dependent Variable	.071507
Residual Sum of Squares	.11070	Equation Log-likelihood	317.3038
Akaike Info. Criterion	287.3038	Schwarz Bayesian Criterion	242.5497
DW-statistic	1.9426		

Diagnostic Tests:
Serial Correlation χ^2(4)= 4.1025[.392]; F(4, 112)= .80953[.522]
Functional Form χ^2(1)= 10.6175[.001]; F(1, 115)= 9.0190[.003]
Normality χ^2(2)= .86015[.650]
Heteroscedasticity χ^2(1)= 2.3309[.127]; F(1, 144)= 2.3363[.129]

PECM with Highly Liquid Money (M1) for Construction Output

Dependent variable is DLCON
149 observations used for estimation from 1971Q3 to 2008Q3

Regressor	Coefficient	Standard Error	T-Ratio [Prob]
INPT	-2.1849	.46659	-4.6827[.000]
ΔYcon(-1)	-.12165	.060983	-1.9948[.048]
ΔYcon(-2)	-.21476	.061623	-3.4851[.001]
ΔYcon(-3)	-.20767	.060480	-3.4336[.001]
ΔYcon(-4)	.47783	.059939	7.9719[.000]
ΔM1(-1)	.11396	.13589	.83863[.403]
ΔM1(-3)	-.054310	.13212	-.41106[.682]
ΔM1(-5)	-.061820	.12150	-.50880[.612]
ΔP(-1)	-1.0086	.47844	-2.1082[.037]
ΔP(-3)	.93142	.52436	1.7763[.078]
ΔP(-5)	-.66812	.50727	-1.3171[.190]
Δr(-2)	.0082904	.0088285	.93905[.350]
Δr(-3)	.011071	.0083616	1.3241[.188]
Δr(-5)	.013725	.0078142	1.7565[.081]
Δe(-1)	-.51050	.11948	-4.2726[.000]
Δe(-2)	-.29236	.13378	-2.1853[.031]
Δe(-3)	-.40487	.12339	-3.2812[.001]
Δe(-4)	-.39664	.13403	-2.9593[.004]
Δe(-5)	-.32175	.12725	-2.5284[.013]
SC1	-.025008	.014335	-1.7446[.084]
SC2	-.2828E-3	.014736	-.019189[.985]
SC3	.7318E-3	.014472	.050570[.960]
Y75Q1	.22249	.053248	4.1784[.000]
ECT(-1)	-.20213	.043074	-4.6927[.000]

R-Squared	.76381	R-Bar-Squared	.72035
S.E. of Regression	.046381	F-stat. F(23, 125)	17.5755[.000]
Mean of Dependent Variable	.013176	S.D. of Dependent Variable	.087707
Residual Sum of Squares	.26890	Equation Log-likelihood	259.2220
Akaike Info. Criterion	235.2220	Schwarz Bayesian Criterion	199.1746
DW-statistic	2.0879		

Diagnostic Tests

Serial Correlation	$X^2(4)$=	6.8173[.146];	F(4, 121)=	1.4504[.222]
Functional Form	$X^2(1)$=	.79547[.372];	F(1, 124)=	.66556[.416]
Normality	$X^2(2)$=	2.9012[.234];		
Heteroscedasticity	$X^2(1)$=	.21458[.643];	F(1, 147)=	.21201[.646]

PECM with Broad Money (M2) for Construction Output

Dependent variable is DLCON
146 observations used for estimation from 1972Q2 to 2008Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
INPT	.41951	.27544	1.5231[.130]
ΔYcon(-2)	-.073049	.054191	-1.3480[.180]
ΔYcon(-3)	.090573	.067791	1.3361[.184]
ΔYcon(-4)	.51652	.066468	7.7710[.000]
ΔYcon(-7)	-.10963	.068155	-1.6086[.110]
ΔYcon(-8)	.22196	.067244	3.3008[.001]
ΔM2(-1)	.060903	.12439	.48959[.625]
ΔM2(-3)	-.083188	.12590	-.66076[.510]
ΔM2(-4)	.14849	.12178	1.2194[.225]
ΔP(-1)	-.81151	.51699	-1.5697[.119]
ΔP(-2)	.47072	.55302	.85117[.396]
ΔP(-4)	1.4353	.55086	2.6056[.010]
ΔP(-5)	-.92071	.49361	-1.8653[.065]
ΔP(-8)	.59822	.40702	1.4698[.144]
Δr(-1)	-.0081071	.0076099	-1.0653[.289]
Δr(-2)	.019380	.0080680	2.4021[.018]
Δr(-8)	-.0063307	.0070501	-.89796[.371]
Δe(-1)	-.076481	.10640	-.71883[.474]
Δe(-2)	-.20680	.10618	-1.9476[.054]
Δe(-4)	-.23042	.10531	-2.1881[.031]
Δe(-6)	.33917	.11113	3.0520[.003]
Δe(-7)	.14885	.10394	1.4321[.155]
Δe(-8)	.15669	.10677	1.4676[.145]
SC1	-.024636	.013189	-1.8679[.064]
SC2	.014624	.012967	1.1278[.262]
SC3	-.0020996	.013045	-.16095[.872]
Y7580	.22711	.033858	6.7076[.000]
ECT(-1)	.0090337	.034667	.26058[.795]
ECT(-2)	-.098159	.033353	-2.9430[.004]

R-Squared	.80828	R-Bar-Squared	.76240
S.E. of Regression	.041692	F-stat. F (28, 117)	17.6166[.000]
Mean of Dependent Variable	.012902	S.D. of Dependent Variable	.085531
Residual Sum of Squares	.20337	Equation Log-likelihood	272.9083
Akaike Info. Criterion	243.9083	Schwarz Bayesian Criterion	200.6460
DW-statistic	1.9942		

Diagnostic Tests:

Serial Correlation	$X^2(4)$=	6.6272[.157];	(4, 113)=	1.3433[.258]
Functional Form	$X^2(1)$=	.82367[.364];	(1, 116)=	.65814[.419]
Normality	$X^2(2)$=	.51222[.774]		
Heteroscedasticity	$X^2(1)$=	.23710[.626];	(1, 144)=	.23423[.629]

PECM with Bank Credit (Cre) for Construction Output

Dependent variable is DLCON
142 observations used for estimation from 1973Q2 to 2008Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
INPT	1.7351	.35808	4.8457[.000]
ΔYCon(-1)	-.10803	.090394	-1.1951[.235]
ΔYCon(-2)	-.17316	.094441	-1.8335[.070]
ΔYCon(-3)	.095949	.092407	1.0383[.302]
ΔYCon(-4)	.67510	.094335	7.1564[.000]
ΔYCon(-5)	.36847	.11125	3.3121[.001]
ΔYCon(-6)	.39961	.11462	3.4864[.001]
ΔYCon(-7)	.38221	.11463	3.3343[.001]
ΔYCon(-8)	.55630	.10610	5.2429[.000]
ΔYCon(-9)	.34102	.10128	3.3671[.001]
ΔYCon(-10)	.23537	.086661	2.7160[.008]
ΔCre(-3)	-.092604	.21862	-.42358[.673]
ΔCre(-4)	-.39146	.21823	-1.7938[.076]
ΔCre(-5)	-.47863	.22718	-2.1068[.038]
ΔCre(-7)	.26803	.23811	1.1257[.263]
ΔCre(-8)	-.51333	.20849	-2.4622[.016]
ΔCre(-9)	-.032551	.21510	-.15133[.880]
ΔCre(-10)	-.086465	.21216	-.40755[.685]
ΔCre(-11)	.24850	.21532	1.1541[.251]
ΔCre(-12)	-.053795	.19992	-.26908[.788]
ΔP(-1)	-1.2916	.64179	-2.0125[.047]
ΔP(-2)	1.6776	.74040	2.2659[.026]
ΔP(-3)	.96844	.74363	1.3023[.196]
ΔP(-4)	1.4310	.74753	1.9143[.059]
ΔP(-6)	-1.3144	.65093	-2.0193[.046]
ΔP(-10)	1.7125	.59467	2.8798[.005]
ΔP(-12)	1.2562	.60217	2.0861[.040]
Δr(-1)	-.012390	.0091710	-1.3510[.180]
Δr(-2)	.012956	.0095777	1.3527[.179]
Δr(-7)	-.0059946	.010752	-.55753[.579]
Δr(-9)	-.013204	.0097994	-1.3474[.181]
Δr(-10)	-.0057064	.0091530	-.62345[.535]
Δr(-11)	-.011277	.0093313	-1.2085[.230]
Δr(-12)	-.018386	.0084564	-2.1742[.032]
Δe(-1)	.24291	.13941	1.7424[.085]
Δe(-4)	-.13042	.13739	-.94927[.345]
Δe(-6)	.37799	.13823	2.7344[.007]
Δe(-7)	.46204	.13150	3.5137[.001]
Δe(-8)	.47228	.13499	3.4986[.001]
Δe(-9)	.34208	.14412	2.3735[.020]
Δe(-10)	.33118	.14602	2.2680[.026]
Δe(-11)	.17368	.15733	1.1039[.272]
Δe(-12)	.30250	.14135	2.1401[.035]
SC1	-.029367	.016142	-1.8193[.072]
SC2	-.0022004	.016378	-.13435[.893]
SC3	-.011545	.016585	-.69614[.488]
ECT(-1)	-.15374	.026471	-5.8079[.000]
ECT(-2)	.10701	.032240	3.3191[.001]
ECT(-3)	.0084724	.036447	.23246[.817]

R-Squared	.81201	R-Bar-Squared	.71499
S.E. of Regression	.045106	F-stat. F (48, 93)	8.3691[.000]
Mean of Dependent Variable	.012346	S.D. of Dependent Variable	.084490
Residual Sum of Squares	.18922	Equation Log-likelihood	268.5802
Akaike Info. Criterion	219.5802	Schwarz Bayesian Criterion	147.1624
DW-statistic	2.0154		

Diagnostic Tests

Serial Correlation	X^2 (4)=	1.7599[.780];	F(4, 89)=	.27922[.891]
Functional Form	X^2 (1)=	3.9813[.046];	F(1, 92)=	2.6538[.107]
Normality	X^2 (2)=	.58506[.746]		
Heteroscedasticity	X^2 (1)=	2.5594[.110];	F (1, 140) =	2.5697[.111]

PECM with Highly Liquid Money (M1) for Manufacturing Output

Dependent variable is DLMNF
146 observations used for estimation from 1972Q2 to 2008Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
INPT	.40112	.16640	2.4106[.017]
ΔYmanf(-2)	-.057007	.080349	-.70950[.479]
ΔYmanf(-3)	-.29136	.082851	-3.5167[.001]
ΔYmanf(-4)	.29146	.080936	3.6012[.000]
ΔYmanf(-5)	-.28601	.077821	-3.6752[.000]
ΔM1(-1)	.062043	.085672	.72419[.470]
ΔM1(-2)	.23663	.082931	2.8533[.005]
ΔM1(-3)	.10782	.084496	1.2760[.204]
ΔM1(-5)	.10907	.084003	1.2985[.197]
ΔM1(-8)	-.15174	.079809	-1.9013[.060]
Δr(-1)	-.0077001	.0056635	-1.3596[.176]
Δr(-3)	.013505	.0065208	2.0710[.040]
Δr(-4)	-.0047885	.0054799	-.87382[.384]
Δr(-5)	-.0054509	.0057499	-.94799[.345]
ΔP(-1)	-.47938	.32303	-1.4840[.140]
ΔP(-7)	-.68284	.37223	-1.8345[.069]
ΔP(-8)	.78989	.36976	2.1362[.035]
Δe(-1)	-.089356	.073575	-1.2145[.227]
Δe(-2)	-.15162	.081142	-1.8686[.064]
Δe(-6)	.15498	.088242	1.7563[.082]
Δe(-7)	.20143	.089950	2.2394[.027]
SC1	-.041201	.013480	-3.0565[.003]
SC2	.023299	.015711	1.4830[.141]
SC3	.031296	.013030	2.4019[.018]
ECT(-1)	-.062471	.027019	-2.3121[.022]

R-Squared	.75486	R-Bar-Squared	.70624
S.E. of Regression	.030972	F-stat. F(24, 121)	15.5251[.000]
Mean of Dependent Variable	.022039	S.D. of Dependent Variable	.057145
Residual Sum of Squares	.11607	Equation Log-likelihood	313.8454
Akaike Info. Criterion	288.8454	Schwarz Bayesian Criterion	251.5503
DW-statistic	1.8975		

Diagnostic Tests:

Serial Correlation	$X^2(4)$=	3.4835[.480];	F(4, 117)=	.71495[.583]
Functional Form	$X^2(1)$=	1.5249[.217];	F(1, 120)=	1.2666[.263]
Normality	$X^2(2)$=	.69981[.705]		
Heteroscedasticity	$X^2(1)$=	.31571[.574];	F(1, 144)=	.31206[.577]

PECM with Broad Money (M2) for Manufacturing Output

Dependent variable is DLMNF
149 observations used for estimation from 1971Q3 to 2008Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
INPT	.083760	.16124	.51949[.604]
ΔYmanf(-3)	-.17972	.078126	-2.3004[.023]
ΔYmanf(-4)	.26782	.077393	3.4606[.001]
ΔYmanf(-5)	-.23567	.077705	-3.0329[.003]
ΔM2(-4)	.081053	.090511	.89550[.372]
Δr(-1)	-.0072585	.0059861	-1.2126[.228]
Δr(-2)	-.0097457	.0060388	-1.6139[.109]
Δr(-3)	.0070884	.0057994	1.2223[.224]
Δr(-5)	-.0055268	.0055793	-.99059[.324]
ΔP(-4)	-.48400	.38246	-1.2655[.208]
ΔP(-5)	.27459	.37570	.73087[.466]
Δe(-1)	-.16815	.079705	-2.1096[.037]
Δe(-2)	-.11055	.082095	-1.3466[.180]
Δe(-3)	-.14661	.083619	-1.7533[.082]
Δe(-4)	-.092284	.080172	-1.1511[.252]
SC1	-.016971	.012789	-1.3270[.187]
SC2	.042313	.014436	2.9311[.004]
SC3	.054166	.0099598	5.4385[.000]
ECT(-1)	.011711	.031326	.37384[.709]

-R-Squared	.70843	R-Bar-Squared	.66806
S.E. of Regression	.032955	F-stat. F(18, 130)	17.5482[.000]
Mean of Dependent Variable	.021550	S.D. of Dependent Variable	.057200
Residual Sum of Squares	.14119	Equation Log-likelihood	307.2182
Akaike Info. Criterion	288.2182	Schwarz Bayesian Criterion	259.6807
DW-statistic	1.8909		

Diagnostic Tests:

Serial Correlation	X^2 (4)=	1.4230[.840];	F(4, 126)=	.30374[.875]
Functional Form	$X^2(1)$=	.32538[.568];	F(1, 129)=	.28232[.596]
Normality	$X^2(2)$=	1.5223[.467]		
Heteroscedasticity	$X^2(1)$=	1.8067[.179];	F(1, 147)=	1.8043[.181]

PECM with Bank Credit (Cre) for Manufacturing Output

Dependent variable is DLMNF
148 observations used for estimation from 1971Q4 to 2008Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
INPT	.50876	.15824	3.2151[.002]
ΔYmanf(-2)	-.066029	.078122	-.84520[.400]
ΔYmanf(-3)	-.18186	.080158	-2.2688[.025]
ΔYmanf(-4)	.24166	.078208	3.0900[.002]
ΔYmanf(-5)	-.26285	.078126	-3.3644[.001]
Δcre(-1)	-.12515	.12069	-1.0370[.302]
Δcre(-3)	.10402	.12261	.84840[.398]
Δcre(-6)	-.36904	.11899	-3.1016[.002]
Δr(-1)	-.010731	.0055829	-1.9222[.057]
Δr(-5)	-.0074921	.0055437	-1.3515[.179]
ΔP(-3)	.27586	.38437	.71770[.474]
ΔP(-4)	-.49855	.41640	-1.1973[.233]
ΔP(-5)	.52248	.38750	1.3483[.180]
Δe(-2)	-.13711	.074206	-1.8477[.067]
Δe(-4)	-.12372	.078904	-1.5680[.119]
Δe(-6)	.16659	.079419	2.0976[.038]
SC1	-.015086	.012541	-1.2030[.231]
SC2	.035069	.015605	2.2473[.026]
SC3	.050104	.012410	4.0374[.000]
ECT(-1)	-.085663	.028143	-3.0439[.003]

R-Squared	.72969	R-Bar-Squared	.68957
S.E. of Regression	.031961	F-stat. F(19, 128)	18.1860[.000]
Mean of Dependent Variable	.021395	S.D. of Dependent Variable	.057363
Residual Sum of Squares	.13075	Equation Log-likelihood	310.3411
Akaike Info. Criterion	290.3411	Schwarz Bayesian Criterion	260.3690
DW-statistic	1.9347		

Diagnostic Tests

Serial Correlation	$X^2(4)$=	3.4011[.493];	F(4, 124)=	.72915[.574]
Functional Form	$X^2(1)$=	2.6041[.107];	F(1, 127)=	2.2746[.134]
Normality	$X^2(2)$=	3.3744[.185]		
Heteroscedasticity	$X^2(1)$=	1.9347[.164];	F(1, 146)=	1.9338[.166]

PECM with Highly Liquid Money (M1) for Services Output

Dependent variable is DLSRV
150 observations used for estimation from 1971Q2 to 2008Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
INPT	1.0018	.18297	5.4752[.000]
ΔYsrv(-2)	-.073327	.051768	-1.4165[.159]
ΔYsrv(-4)	.35827	.049345	7.2606[.000]
ΔM1(-1)	-.028119	.040009	-.70280[.483]
ΔM1(-2)	-.070102	.039672	-1.7671[.080]
ΔM1(-3)	.035311	.038850	.90893[.365]
ΔM1(-4)	-.047034	.033937	-1.3859[.168]
Δr(-3)	-.0056991	.0024680	-2.3092[.023]
Δr(-4)	.0029285	.0024594	1.1907[.236]
ΔP(-1)	-.22716	.16347	-1.3896[.167]
ΔP(-2)	.34589	.15952	2.1684[.032]
Δe(-1)	-.13175	.034725	-3.7940[.000]
Δe(-2)	-.13472	.038329	-3.5147[.001]
Δe(-3)	-.082708	.038236	-2.1631[.032]
Δe(-4)	-.10570	.039795	-2.6561[.009]
SC1	-.026919	.0044496	-6.0496[.000]
SC2	-.016474	.0044827	-3.6751[.000]
SC3	-.010895	.0046205	-2.3580[.020]
Y93551	.060404	.0076203	7.9268[.000]
ECT(-1)	-.069006	.012744	-5.4149[.000]

R-Squared	.79063	R-Bar-Squared	.76003
S.E. of Regression	.013950	F-stat. F(19, 130)	25.8371[.000]
Mean of Dependent Variable	.018197	S.D. of Dependent Variable	.028476
Residual Sum of Squares	.025297	Equation Log-likelihood	438.7383
Akaike Info. Criterion	418.7383	Schwarz Bayesian Criterion	388.6320
DW-statistic	2.0549		

Diagnostic Tests:
Serial Correlation $\chi^2(4)$= 2.5013[.644]; F(4, 126)= .53417[.711]
Functional Form $\chi^2(1)$= .18080[.671]; F(1, 129)= .15567[.694]
Normality $\chi^2(2)$= .57773[.749]
Heteroscedasticity $\chi^2(1)$= .84501[.358]; F(1, 148)= .83846[.361]

PECM with Bank Credit (Cre) for Services Output

Dependent variable is DLSRV
146 observations used for estimation from 1972Q2 to 2008Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
INPT	.23019	.17547	1.3118[.192]
ΔYsrv(-1)	-.27234	.088455	-3.0789[.003]
ΔYsrv(-2)	-.10786	.076122	-1.4169[.159]
ΔYsrv(-4)	.27291	.078319	3.4846[.001]
ΔYsrv(-5)	.10138	.071613	1.4157[.160]
ΔYsrv(-7)	-.11764	.065487	-1.7964[.075]
ΔYsrv(-8)	.17100	.074320	2.3009[.023]
ΔCre(-1)	.079732	.066262	1.2033[.231]
ΔCre(-2)	.10336	.070850	1.4589[.147]
ΔCre(-4)	-.12419	.070978	-1.7497[.083]
Δr(-2)	-.0026482	.0034458	-.76851[.444]
Δr(-3)	-.0076979	.0031084	-2.4765[.015]
Δr(-4)	.0057322	.0030476	1.8809[.062]
Δr(-5)	.0025608	.0031449	.81429[.417]
Δr(-6)	-.0046865	.0032444	-1.4445[.151]
ΔP(-1)	-.30881	.21944	-1.4073[.162]
ΔP(-2)	.26059	.21378	1.2190[.225]
ΔP(-3)	.23503	.22672	1.0367[.302]
ΔP(-7)	-.22447	.21214	-1.0581[.292]
ΔP(-8)	.18927	.21232	.89145[.375]
Δe(-1)	-.065421	.042258	-1.5481[.124]
Δe(-2)	-.091682	.042921	-2.1361[.035]
Δe(-4)	-.14568	.046878	-3.1075[.002]
Δe(-5)	-.055862	.045840	-1.2186[.225]
SC1	-.023259	.0059497	-3.9093[.000]
SC2	-.0090476	.0055075	-1.6428[.103]
ECT(-1)	-.010208	.013465	-.75812[.450]
ECT(-2)	.010455	.014533	.71941[.473]
ECT(-2)	-.036431	.014793	-2.4627[.015]

R-Squared	.71525	R-Bar-Squared	.64710
S.E. of Regression	.017066	F-stat. F(28, 117)	10.4958[.000]
Mean of Dependent Variable	.018042	S.D. of Dependent Variable	.028727
Residual Sum of Squares	.034075	Equation Log-likelihood	403.3199
Akaike Info. Criterion	374.3199	Schwarz Bayesian Criterion	331.0576
DW-statistic:	2.0314		

Diagnostic Tests
Serial Correlation $\chi^2(4)$=.57752[.966]; F(4, 113)= .11219[.978]
Functional Form $\chi^2(1)$=.53263[.466]; F(1, 116)= .42474[.516]
Normality $\chi^2(2)$=3.2584[.196]
Heteroscedasticity $\chi^2(1)$=1.2843[.257]; F(1, 144)= 1.2780[.260]

PECM with Broad Money (M2) for Services Output

Dependent variable is DLSRV
144 observations used for estimation from 1972Q4 to 2008Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
INPT	.36514	.19665	1.8568[.066]
ΔYsrv(-1)	-.15586	.088121	-1.7688[.080]
ΔYsrv(-2)	-.18772	.087954	-2.1343[.035]
ΔYsrv(-3)	-.066760	.083855	-.79614[.428]
ΔYsrv(-4)	.32359	.083379	3.8809[.000]
ΔYsrv(-5)	.16976	.089281	1.9014[.060]
ΔYsrv(-6)	.14181	.081209	1.7463[.084]
ΔYsrv(-8)	.15640	.070420	2.2210[.029]
ΔYsrv(-9)	-.057548	.075253	-.76472[.446]
ΔYsrv(-10)	-.071360	.072907	-.97879[.330]
ΔM2(-1)	.056418	.049274	1.1450[.255]
ΔM2(-2)	.019915	.050812	.39194[.696]
ΔM2(-3)	.037270	.049874	.74729[.457]
ΔM2(-9)	.030291	.047092	.64322[.522]
Δr(-1)	.0035272	.0035219	1.0015[.319]
Δr(-2)	.0016705	.0034957	.47787[.634]
Δr(-3)	-.0015406	.0035795	-.43039[.668]
Δr(-4)	.0040869	.0033656	1.2143[.228]
Δr(-5)	.0089966	.0035118	2.5618[.012]
Δr(-7)	.0019781	.0030390	.65090[.517]
Δr(-8)	-.0011814	.0030871	-.38269[.703]
Δr(-9)	.0064804	.0031315	2.0694[.041]
ΔP(-1)	-.20106	.20768	-.96812[.335]
ΔP(-2)	.27106	.23328	1.1620[.248]
ΔP(-3)	.076160	.23417	.32523[.746]
ΔP(-5)	-.22127	.22005	-1.0056[.317]
ΔP(-6)	.17377	.21746	.79909[.426]
ΔP(-7)	-.16247	.20407	-.79615[.428]
ΔP(-9)	-.19201	.20164	-.95226[.343]
ΔP(-10)	.33595	.19211	1.7487[.083]
Δe(-1)	-.033415	.043343	-.77094[.443]
Δe(-2)	-.071297	.044564	-1.5999[.113]
Δe(-3)	-.018133	.045005	-.40291[.688]
Δe(-4)	-.082053	.049118	-1.6705[.098]
Δe(-5)	-.029599	.049131	-.60245[.548]
Δe(-6)	.047184	.048980	.96334[.338]
Δe(-7)	.083024	.048233	1.7213[.088]
Δe(-9)	.022349	.045369	.49260[.623]
ΔP(-10)	.33595	.19211	1.7487[.083]
Δe(-1)	-.033415	.043343	-.77094[.443]
Δe(-2)	-.071297	.044564	-1.5999[.113]
Δe(-3)	-.018133	.045005	-.40291[.688]
Δe(-4)	-.082053	.049118	-1.6705[.098]
Δe(-5)	-.029599	.049131	-.60245[.548]
Δe(-6)	.047184	.048980	.96334[.338]
Δe(-7)	.083024	.048233	1.7213[.088]
Δe(-9)	.022349	.045369	.49260[.623]
Δe(-10)	.11676	.040560	2.8788[.005]
SC1	-.025940	.0063999	-4.0532[.000]
SC2	-.0098251	.0070316	-1.3973[.165]
SC3	-.0095187	.0071016	-1.3403[.183]
Y935	.079660	.013910	5.7268[.000]
ECT(-1)	.014955	.013107	1.1410[.257]
ECT(-2)	-.025083	.014483	-1.7319[.086]

R-Squared	.80488	R-Bar-Squared	.71816
S.E. of Regression	.015315	F-stat. F(44, 99)	9.2816[.000]
Mean of Dependent Variable	.018031	S.D. of Dependent Variable	.028848
Residual Sum of Squares	.023220	Equation Log-likelihood	424.4160
Akaike Info. Criterion	379.4160	Schwarz Bayesian Criterion	312.5952
DW-statistic	1.9561		

Diagnostic Tests:
Serial Correlation $\chi^2(4)$= .77179[.942]; F(4, 95)= .12798[.972]
Functional Form $\chi^2(1)$= 2.9852[.084]; F(1, 98)= 2.0746[.153]
Normality $\chi^2(2)$= .28263[.868]
Heteroscedasticity $\chi^2(1)$= .16337[.686]; F(1, 142)= .16128[.689]

5. Conclusions

The model combines the short-run dynamics as well as the long-run equilibrium adjustments between real output and various monetary indicators using an error correction modeling. In the error correction model, the information contained in the undifferenced data is reintroduced to the first differenced VAR system via the error correction term. Significant negative error correction term offers extra explanation on the causality of the variables. The model examines the relative strength of the monetary indicators in the economy as well as in several key economic sectors. The findings resolved conflicting evidence in the past on the importance of money and credit. Money, credit, exchange rate, interest rate and price are cointegrated and hence, significantly affect real output. The findings highlight the differences in the response of real output from aggregated output and sectoral output. Consistent with previous studies, aggregate economic activity is predominantly determined by broad money (M2). Interestingly, agricultural sector is more responsive to broad money. Rising population, increasing trade, development in agro-biotechnology, increasing purchasing power, rapid urbanization and mushrooming hypermarket in Malaysian economy are making agricultural product more commercialized and demands greater role of broad money in the system. Deposits which pay interest rate, used for electronic transactions are highly substitutable for currency (Schreft and Smith, 2000 and Marimon, *et al*., 2003). Another remarkable finding is the growing importance of highly liquid money in construction, manufacturing and services sectors. Rapid technological and communications development in banking facilities has led fundamental change in M1 over the period 1970-2008. Increased demand on internet banking, telephone banking, automated teller machines (ATMs), debit cards and credit cards allows greater assess to highly liquid money in the market. The empirical of this study suggests that highly liquid money should not be neglected rather need to be monitored closely together with other indicators. Studies by Atta-Mensah (2001), Hassapis (2003) and Chan et al., (2005) also favor highly liquid money as the leading indicator of economic activity. On the exchange rate, depreciation and appreciation of the ringgit expands economic activity. Weaker ringgit increases exports while stronger exchange rate lower imported material costs, reduces production costs and expands output, especially in the construction sector.

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