Is inflation always a monetary phenomenon in Malaysia?

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ABSTRACT

The purpose of this study is to empirically re-investigate the money-prices nexus for Malaysia through the cointegration and causality techniques. This study covered the monthly data from 1971:01 to 2008:03. The Johansen cointegration test suggests that the variables are cointegrated. Furthermore, the MWALD test shows a unidirectional causal relationship run from money supply (M2) to aggregate prices, meaning that only the monetarist's view exist in the Malaysian economy. However, the time-varying causality tests indicate that inflation is not always a monetary phenomenon in Malaysia. Therefore, the contractionary monetary policy may not an effective instrument in managing inflationary behaviour in Malaysia.

Keywords: Inflation; Money; MWALD test; Recursive regression; Rolling regression
JEL Classification Codes: C22; E31; E51

1. INTRODUCTION

Over the past decades, there is an increasing interest in examining the empirical question of whether inflation is a monetary phenomenon. This is also refers to the causal relationship between money supply and aggregate prices. The issue of whether inflation is a monetary phenomenon is of concern because it is directly relate to the formulation and implementation of appropriate macroeconomic policies in curbing inflation. Hence, it is of utmost importance for this study to investigate the causal relationship between money supply and aggregate prices or inflation. Theoretically, there are two competing schools of thought (i.e. monetarists and structuralists) have essentially rooted this causal relationship. First, based on the

Quantity Theory of Money (hereafter QTM), the monetarists believe that inflation is purely monetary phenomenon. They claimed that a continuing increase of aggregate prices in an economy is caused by the excessive rate of expansion of the supply of money. This implied that the direction of causality should run from money supply to aggregate prices. Therefore, the monetarists view that the contractionary monetary policy will be an effective anti-inflationary instrument. Second, the structuralists' school of thought has challenged the monetarists' famous dictum – "inflation is purely monetary phenomenon". They argued that the excessive money supply is a consequence rather than cause of inflation, particularly in less developing economies. According to structuralists' school, the root cause of inflation is the structural bottlenecks in the development process (Masih and Masih, 1998). Pinga and Nelson (2001) noted that policymakers and central banks are in interest to expand the money supply by ratifying the inflationary pressures, rather than high unemployment rate or jeopardise the consumption and investment behaviour. Under this view, the causal relationship between money supply and aggregate prices is expected to run from aggregate prices to money supply.

In order to resolve the theoretical controversy between monetarists and structuralists, researchers have spent amount of time to investigate the causal relationship between money supply and aggregate prices in the developed and developing countries. However, the existing empirical studies thus far failed to produce consensus causal link evidence. Turnovsky and Wohar (1984) found that the causality between money supply and aggregate prices in the United States is rather neutral over the analysis period of 1929 to 1979. Hence, they surmised that these variables are not related in the context of the United States. On the contrary, using the United States data from 1953 to 1984, Jones and Uri (1987) found a unidirectional causality runs from money supply to aggregate prices (see also Jones, 1985). In addition to that, Burdekin and Weidenmier (2001) found that a drastic money supply changes will lead to drastic aggregate prices changes in the United States. This positive relationship is consistent with the conventional monetarists' wisdom that inflation is a monetary phenomenon.

As far as Malaysia is concerned, empirical studies on the causal relationship between money supply and aggregate prices or inflation is relatively few and their finding also failed to reach unanimous results. On one hand, Abdullah and Yusop (1996) used quarterly data from 1970:1 to 1992:4 to analyse the causal relationship between growth rate of money supply and inflation rate in Malaysia. They discovered a unidirectional causality runs from money supply to inflation rate regardless of the lag structure. Next, Masih and Masih (1998) employed the Granger causality test, modified Sims causality test and vector error-correction modelling (VECM) approach to examine the causality direction between money supply and aggregate prices in the Southeast Asia economies (i.e. Malaysia, the Philippines, Singapore and Thailand). For Malaysia, they found that all causality tests are consistently implied that money supply (M1 and M2) Granger causes aggregate prices (see also Lee and Li, 1985; Tan and Cheng, 1995). Using monthly data from 1975 to 1995, Tan and Baharumshah (1999) employed the Johansen's cointegration test and vector error-correction modelling approach to investigate the dynamic linkages between money, output, interest rate and prices in Malaysia. An interesting finding emerged from their study is that the causal effect runs from money supply to aggregate prices in the short run, but there is no evidence of reverse causality. Hence, they surmised that monetary policy may be a good choice for price stability in Malaysia. More recently, Tang (2004) employed the relatively new causality testing procedure developed by Toda and Yamamoto (1995) – modified Wald (MWALD) test to re-investigate the causal relationship between money supply and aggregate prices in Malaysia. The sample period covers the quarterly data from 1970 to 1998. The MWALD test result shows that money supply (M2) leads aggregate prices in Malaysia; however aggregate prices do not Granger cause money supply (see also Karim et al., 2001).

On the other hand, Pinga and Nelson (2001) found that money supply and aggregate prices in Malaysia do not Granger cause each other. Then, Cheng and Tan (2002) employed the Johansen's cointegration test and VECM approach to examine the long run equilibrium relationship and the causality direction between inflation and its determinants (i.e. money supply, output, interest rate, exchange rate and trade balance) in Malaysia. They found that the variables are cointegrated, but there is no evidence of direct causal effect runs from money supply to inflation in Malaysia. Their finding suggests that external forces such as the ASEAN[1] inflation rate and exchange rate have significant influences on inflation rate in Malaysia. Recently, Tang and Lean (2007) found that the effect of money supply (M1) on inflation in Malaysia is negative and statistically significant at 1 per cent level. This finding did

[1] ASEAN refers to the Association of Southeast Asian Nations.

not support the monetarists' view that inflation is a result of excessive rate of expansion of money supply.

The goal of this study is to re-investigate the money-prices nexus for Malaysia over the period of 1971:01 to 2008:03. The main motivation for revisiting the Malaysia's money-prices nexus is initiated by the weaknesses in the estimation techniques used in the existing studies. First, a weakness relate to the existing studies in Malaysia is that none of a research effort has considered the implication of structural break(s) in unit root tests. Perron (1989) argued that if the estimated series contained structural break(s), the power of standard unit root test decreases tremendously and lead to spurious rejection of null hypothesis of a unit root when the structural break(s) is ignored. Second, we observed that the Johansen (1988), and Johansen and Juselius (1990) cointegration tests have been widely used to examine the long run equilibrium relationship between aggregate prices and its determinants (e.g. money supply and output) in Malaysia. However, couple studies (e.g. Reimers, 1992; Cheung and Lai, 1993) have conducted Monte Carlo analysis to examine the small sample performance of Johansen cointegration test. These studies found that in small sample Johansen's cointegration test is bias toward rejecting the null hypothesis of no cointegration. Furthermore, Gonzalo and Lee's (1998) simulation results show that Johansen's likelihood ratio (LR) test tends to find spurious cointegration with probability approaching to one if the order of integration of the variables are not purely $I(1)$ process. Hence, the Johansen test results provided by the existing studies (e.g. Masih and Masih, 1998; Tan and Baharumshah, 1999; Cheng and Tan, 2002) may be biased owing to the aforementioned shortcomings.

Third, until now causality testing in most empirical studies were based on VAR and VECM approaches, except Tang (2004). He and Maekawa (2001) pointed out that the use of F-statistics for Granger causality test within the VAR framework often leads to spurious causality result when one or both of the estimated series are non-stationary. Granger (1988) stated that if the first differenced variables are used such as Abdullah and Yusop's (1996) and Pinga and Nelson's (2001) studies, the Granger causality test result may be bias owing to loss of long run causality information. In addition to that, Zapata and Rambaldi (1997) argued that both likelihood ratio test and Wald test are very sensitive to the specification of short run dynamics in the error-correction models (ECMs) even in the large samples. In this context, the uses of VAR or VECM for causality tests seem to be problems.

In this study, we attempt to re-investigate the money-prices nexus for Malaysia through the multivariate cointegration and causality techniques. This study differs from the extant literature in at least four dimensions. First, we undertake a thorough investigation of the time series properties of the data. Apart from using the conventional unit root test – Augmented Dickey Fuller (ADF), we also employ the Lagrange multiplier (LM) unit root tests with one and two structural breaks developed by Lee and Strazicich (2003, 2004). The advantage of LM unit root tests over the ADF-type endogenous structural break(s) unit root tests (e.g. Zivot and Andrews, 1992; Lumsdaine and Papell, 1997) is that the ADF-type endogenous break tests tend to identify the incorrect break point. Lee and Strazicich (2001) showed that these tests tend to determine the break point at one period before the true break point and thus the frequency of spurious rejection is greater. Apart from that, the ADF-type endogenous structural break unit root tests assumed no break(s) under the null hypothesis of unit root and derived their critical values accordingly. Nunes et al. (1997) indicated that this assumption will lead to size distortions problem in the presence of a unit root with structural break(s). Therefore, when utilising the ADF-type endogenous structural break(s) unit root tests, one tends to conclude that the time series is trend stationary. However, the LM unit root tests are unaffected by the above size distortion problem.

Second, we employ the Johansen cointegration test to examine the potential long run equilibrium relationship.[2] Hooker (1993) and Hu (1996) demonstrated that using high frequency data will increase the power of cointegration tests. Thus, this study uses larger sample size (T = 459) to avoid the small sample bias and size distortion problem associated with Johansen's test. Third, we follow Tang's (2004) study to use the MWALD test to examine the causality direction between money supply and aggregate prices in Malaysia. Finally, this study propose to incorporate the recursive regression and also rolling regression procedures into the MWALD test to examine the persistency of causality test result, particularly on the monetarist view. By doing this, we are able to assess the effectiveness of monetary policy in combating inflation in Malaysia. In other words, if causality result for monetarist view (i.e. money supply Granger causes aggregate prices) is stable, monetary policy will be the

[2] Masih and Masih (1998) documented that the Granger's version of causality tests are actually predictability tests if the variables are not cointegrated. Therefore, they suggest to perform cointegration tests to affirm the presence of causation in at least one direction (see Granger, 1988).

effective price stability instrument. Otherwise, the use of contractionary monetary policy to combat inflation will detrimental the economic development in Malaysia.

The rest of the paper is organised as follows. The next section gives a brief outline of the data, model and econometric techniques used in this study. The empirical results are presented and discussed in Section 3. Finally, Section 4 presents the conclusions that are drawn.

2. DATA, MODEL AND ECONOMETRIC TECHNIQUES

2.1 Data and Model

The data uses in this study are the monthly data from 1971:01 to 2008:03. These data were extracted from International Monetary Funds (IMF) *International Financial Statistics* (IFS) and Bank Negara Malaysia (BNM) *Monthly Statistical Bulletin*. The data for money supply (M2), Consumer Price Index (CPI, 2000), and Industrial Production Index (IPI, 2000) are used in this study. The series IPI is used as a proxy for output due to unavailability of monthly data for Gross Domestic Products (GDP). However, all data are transformed into natural logarithm form.

To examine the money-prices nexus for Malaysia, we apply the trivariate model specification which has been derived from the QTM. In addition, this model has been widely used by the published articles (e.g. Tang, 2004). The model is presented as follow:

$$\ln P_t = \alpha_1 + \alpha_2 \ln M2_t + \alpha_3 \ln Y_t + \varepsilon_t \tag{1}$$

where ln denotes as the natural logarithm. $\ln P_t$ is the aggregate prices, $\ln M2_t$ is the money supply M2 and $\ln Y_t$ represents the transaction output proxy by IPI. The residuals ε_t are assumed to be white noise and spherical distribution.

2.2 Econometric Techniques

2.2.1 Lagrange multiplier unit root tests

To determine the order of integration, we use the Lee and Strazicich (2003, 2004) LM unit root tests with one and two structural breaks. In this study, we use

Model C and Model CC for one and two breaks tests, respectively because they perform better than other models (see Sen, 2003). The LM unit root tests with one and two structural breaks can be obtained by estimate the following regression model.

$$\Delta y_t = \delta' \Delta Z_t + \phi \tilde{S}_{t-1} + \sum_{i=1}^{k} \gamma_i \Delta \tilde{S}_{t-i} + \xi_t \qquad (2)$$

Where $\tilde{S}_{t-1} = y_t - \tilde{\psi}_x - Z_t \tilde{\delta}$, $t = 2, \ldots, T$; $\tilde{\delta}$ are coefficients estimated in the regression of Δy_t on ΔZ_t; The lagged augmented terms $\Delta \tilde{S}_{t-i}$ are included into the model to remove the serial correlation problem; $\tilde{\psi}_x$ is given by $y_1 - Z_1 \tilde{\delta}$; y_1 and Z_1 are the first observations of y_t and Z_t, respectively. Z_t is a vector of exogenous variables. In the case of the Model C, one structural break unit root test, $Z_t = \left[1, t, D_{1t}, DT_{1t}\right]'$ while in the case of the Model CC, two structural breaks unit root test, $Z_t = \left[1, t, D_{1t}, D_{2t}, DT_{1t}, DT_{2t}\right]'$, where $D_{jt} = 1$, $DT_{jt} = t - T_{Bj}$ for $t \geq T_{Bj} + 1$, $j = 1, 2$ and zero otherwise. T_{Bj} is the time period of the structural break(s) and $\delta' = \left(\delta_1, \delta_2, \delta_3\right)$. The LM unit root tests statistics is given by: $\tau =$ t-statistics for testing the null hypothesis of a unit root $\left(\phi = 0\right)$. The location of the structural break(s) $\left(T_{Bj}\right)$ is determined by selecting all plausible break point(s) for the minimum statistic as follow:

$$\mathrm{Inf}\, \tilde{\tau}\left(\tilde{\lambda}_i\right) = \underset{\lambda}{\mathrm{Inf}}\ \tilde{\tau}\left(\lambda\right), \text{ where } \lambda = \frac{T_B}{T}$$

The break points search is carried out over the 80 per cents trimming region (0.10*T*, 0.90*T*), where *T* is the total numbers of observations. Critical values for LM unit root test with one structural break case are tabulated in Lee and Strazicich (2004), while the critical values for two structural breaks case are tabulated in Lee and Strazicich (2003). Finally, the RATS programming codes will be used to compute both LM tests for unit root.

2.2.2 *Cointegration test*

In this section, we will briefly discuss the Johansen test. To implement the Johansen's cointegration test, the following VECM is estimated.

$$\Delta X_t = \Phi D_t + \sum_{i=1}^{k-1} \Gamma_i \Delta X_{t-i} + \Pi X_{t-1} + \varepsilon_t \tag{3}$$

where Δ is the first difference operator. X_t is a vector of endogenous variables ($\ln P_t$, $\ln M2_t$ and $\ln Y_t$). D_t is the deterministic vector (constant and trend, etc); Φ is a matrix of parameters D_t. The matrix Π contains information about the long run relationship between X_t variables in the vector. If all the variables in X_t are integrated of order one, the cointegrating rank, *r*, is given by the rank of $\Pi = \alpha\beta'$ where α is the matrix of parameters denoting the speed of convergence to the long run equilibrium and β is the matrix of parameters of cointegrating vector. To determine the number of cointegrating rank, we use the likelihood ratio (LR) trace test statistic $LR(\lambda_{\text{trace}}) = -T\sum_{i=r+1}^{k} \ln(1-\lambda_i)$, where λ_i are the eigenvalues $(\lambda_1 \geq \lambda_2 \ldots \geq \lambda_k)$ and *T* is the numbers of observations (see Johansen, 1991).

2.2.3 *Causality test*

To ascertain the direction of causality between money supply (M2) and aggregate prices in Malaysia, this study employs the MWALD test developed by Toda and Yamamoto (1995). To implement the MWALD test, we estimate the augmented VAR model as presented in equation (4).

$$\begin{bmatrix} \ln P_t \\ \ln M2_t \\ \ln Y_t \end{bmatrix} = \begin{bmatrix} \beta_1 \\ \beta_2 \\ \beta_3 \end{bmatrix} + \begin{bmatrix} B_{11,1} & B_{12,1} & B_{13,1} \\ B_{21,1} & B_{22,1} & B_{23,1} \\ B_{31,1} & B_{32,1} & B_{33,1} \end{bmatrix} \times \begin{bmatrix} \ln P_{t-1} \\ \ln M2_{t-1} \\ \ln Y_{t-1} \end{bmatrix} + \cdots + \begin{bmatrix} B_{11,k} & B_{12,k} & B_{13,k} \\ B_{21,k} & B_{22,k} & B_{23,k} \\ B_{31,k} & B_{32,k} & B_{33,k} \end{bmatrix}$$

$$\times \begin{bmatrix} \ln P_{t-k} \\ \ln M2_{t-k} \\ \ln Y_{t-k} \end{bmatrix} + \begin{bmatrix} B_{11,p} & B_{12,p} & B_{13,p} \\ B_{21,p} & B_{22,p} & B_{23,p} \\ B_{31,p} & B_{32,p} & B_{33,p} \end{bmatrix} \times \begin{bmatrix} \ln P_{t-p} \\ \ln M2_{t-p} \\ \ln Y_{t-p} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \end{bmatrix} \tag{4}$$

where k is the optimal lag orders and p represents $k+1$ lag orders. From equation (4), $B_{12,k} \neq 0 \forall_k$ implies that money supply (M2) Granger causes aggregate prices; whereas if $B_{21,k} \neq 0 \forall_k$ means aggregate prices Granger cause money supply (M2). However, it should be pointed out here that the parameters for the extra lag, i.e. $d_{\max} = 1$, in equation (4) are unrestricted because the inclusion of extra lag is to ensure that the asymptotic χ^2 distribution critical value can be applied when the test for causality between the integrated variables are conducted. The $d_{\max} = 1$ is chosen because it performs better than other maximal order of integration (see Dolado and Lütkepohl, 1996).

3. EMPRICIAL RESULTS

3.1 Unit root test results

Prior to Johansen cointegration and also causality tests, it is necessary for this study to conduct unit root tests to determine the time properties for each series. In order to ascertain the order of integration, we begin by applying the ADF unit root test. The testing results suggest that the variables $\left[\ln P_t,\ \ln M2,\ \ln Y_t\right]$ are each integrated of order one, *I*(1). To conserve space, the ADF test results are not reported here. Nevertheless, as we discussed in Section 1, the conventional ADF unit root test is low power when the series contained structural break(s). To circumvent this, we performed the LM unit root tests with one and two structural break(s) to affirm the order of integration and the results are presented in Table 1.

From Panel A, Table 1, the LM unit root test with one structural break indicates that there is no additional evidence against the null hypothesis of unit root compared to the ADF test result, except $\ln Y_t$. The result shows that the variable output $\left(\ln Y_t\right)$ is stationary at level. However, we have to perform the LM test with two breaks to affirm the result because the one structural break test may lose power when confronted with two or more structural breaks. The results for LM unit root test with two structural breaks are reported in Panel B, Table 1. An interesting finding emerges from this study is that the LM unit root test statistics could not reject the null hypothesis of unit roots for all the series. Therefore, we surmise that the variables belong to *I*(1) process. This result is consistent to the Nelson and Plosser's (1982) assertion that most of the macroeconomics series are non-stationary at level, but it is stationary after first differencing.

Table 1: The results of unit root tests with structural breaks(s)

Panel A: Univariate LM test for unit root with one structural break

	$\ln P_t$	$\ln M2_t$	$\ln Y_t$
TB1	1985:08	1981:10	1988:02
S_{t-1}	–3.894	–2.076	–4.644**
Lag length	6	1	1
Critical values			
1%	–5.05	–5.15	–5.11
5%	–4.50	–4.45	–4.51

Panel B: Univariate LM test for unit root with two structural breaks

	$\ln P_t$	$\ln M2_t$	$\ln Y_t$
TB1	1985:08	1984:12	1987:02
TB2	1998:12	1996:01	1988:05
S_{t-1}	–4.614	–2.550	–5.602
Lag length	6	1	1
Critical values			
1%	–6.42	–6.45	–6.45
5%	–5.65	–5.67	–5.67

Note: The asterisks ** denotes statistical significance at the 5 per cents level, respectively. The RATS programme codes provided by Prof. Dr. Junsoo Lee have been used to perform the above LM tests for unit root with one and two structural breaks, respectively.

With these findings, we can proceed with the Johansen's cointegration test to investigate the presence of long run equilibrium relationship between aggregate prices, money supply (M2) and output in Malaysia.

3.2 Cointegration test result

A common practice in Johansen's test is that we have to decide the optimal lag order in the VAR model. In this study, the choice of the optimal lag order (k) of the

VAR model employed in the Johansen's cointegration technique was determined by Schwarz Bayesian Criterion (SBC) due to its superior properties (see Lütkepohl, 2005). The SBC statistic suggests two lags for our VAR model and the results for cointegration test are reported in Panel A, Table 2.

Table 2: The results of cointegration analysis

Panel A: Cointegration test			
Eigenvalues	0.0508	0.0221	0.0010
Null hypothesis, H_0	$r = 0$	$r \leq 1$	$r \leq 2$
$LR(\lambda_{\text{trace}})$	33.499	10.347	0.431
Asymptotic p-value	0.0179**	0.2250	0.5116

Panel B: Normalised cointegrating vectors

Variables	$\ln P_t$	$\ln M2_t$	$\ln Y_t$	*Constant*
Cointegration coefficients	–1.000	0.189***	0.038	1.968

Panel C: Short run coefficients – VECM
Dependent variable: $\Delta \ln P_t$

Variables	$\Delta \ln M2_t$	$\Delta \ln Y_t$	*Constant*	ECT_{t-1}
Coefficients	0.025**	0.008**	–0.001	–1.176***

Diagnostic Tests:

LM-test [2]	0.336
Ramsey RESET [1]	0.002
ARCH	0.043

Dependent variable: $\Delta \ln M2_t$

Variables	$\Delta \ln P_t$	$\Delta \ln Y_t$	*Constant*	ECT_{t-1}
Coefficients	0.552***	–0.013	–0.0004	–1.143**

Diagnostic Tests:

LM-test [2]	0.719
Ramsey RESET [1]	1.100
ARCH [1]	46.387***

Note: The asterisks ***, ** and * denotes statistically significant at 1, 5 and 10 per cents level, respectively. The optimal lag orders 6 for VECMs were determined by using Likelihood Ratio (LR) test. The parentheses [ ] represents the order of diagnostic tests.

As shown in Panel A, Table 2, at the 5 per cents significant level the trace statistics suggest that only one cointegrating vector exists among the three variables.

This implies that these three variables would not move too far apart from each other, hence displaying a co-movement phenomenon for aggregate prices, money supply (M2) and output in Malaysia over the analysis period. As the variables are cointegrated and the interest of this study is to evaluate the responses of aggregate prices to money supply (M2) and output the cointegrating vectors are normalised by aggregate prices, $(\ln P_t)$. The normalised coefficients in Panel B, Table 2 show that the long run effect of money supply on aggregate prices is positive and statistically significant at the 1 per cent level. However, although the output is positively related to aggregate prices, this variable is not significant at the 10 per cents level. Clearly, our finding consistent to the monetarists' view that in the long run output (Y) is constant; hence only change of money supply will lead to prices change. However, this is contrary to the finding of Tang and Lean (2007) who found that money supply and inflation is negative relation in Malaysia.

Turning to the short run relationship, we estimate the VECM with the aggregate prices and money supply (M2) as the dependent variables. The estimation results are reported in Panel C, Table 2. The diagnostic tests indicate that the trivariate models are well specified, except the VECM for money supply (M2) with evidence of Autoregressive Conditional Heteroskedasticity (ARCH) problem. According to econometric literature, ARCH is just a particular form of heteroskedasticity, hence it will not affect the unbiasedness and consistency of the ordinary least squares regression estimators, but it does affect their efficiency, thus the standard error is no longer valid (see Pindyck and Rubinfeld, 1998; Wooldridge, 2003). In this respect, the usual heteroskedasticity-robust standard errors procedure is applied to correct the standard error. Lee at el. (1993) noted that this is the appropriate approach to remove the ARCH effect. As shown in Panel C, Table 2, the estimated lagged error-correction terms (ECT_{t-1}) are negative and statistically significant at the 5 per cents level. These imply that the finding from Johansen's test that a long run relationship exists is valid (see Kremers et al*.,* 1992). In addition to that, this trivariate model is also correctly specified (see Perman, 1991). Conceivably, the estimated models can thus be accepted as a tentatively adequate representation of the data generating process and can be used to explain the inflationary phenomenon in Malaysia. The coefficients size for the lagged error-correction terms are relatively large which means that the speed of convergence to the long run equilibrium is rapid once the system is exposed to a shock. Both VECM results also indicate that aggregate price and money supply (M2) are positively related and statistically significant at the 5 per cents level. These results are corroborating to our prior expectation and also the monetarist views.

3.3 MWALD causality test results

According to Granger Representation Theorem, if the variables are cointegrated, there must be at least one direction of causal relationship to hold the existence of long run equilibrium relationship. Therefore, we proceed with the augmented VAR model to investigate the causality direction between money supply and aggregate prices in Malaysia. As the VAR model is sensitive to the choice of lag structure measures such as Akaike's Information Criterion (AIC) is used to select the appropriate lag structure. The AIC measure shows that VAR(17) is the best, and the selected maximal order of integration $(d_{\max})$ is one, thus we estimate the VAR(18) as an augmented model for MWALD tests.

Table 3: The results of causality tests (MWALD)

Null Hypothesis:-	M2 does not cause P (Monetarist, $M2 \nrightarrow P$)	P does not cause M2 (Structuralist, $P \nrightarrow M2$)
Panel A: Toda and Yamamoto (1995) Causality test – Augmented VAR(18)		
MWALD test statistics (χ^2)	29.153	17.672
p-value	0.0331**	0.4098

Note: The asterisks *, ** and *** denotes statistically significant at 1, 5 and 10 per cents level, respectively. The optimal lag order is determined by using AIC.

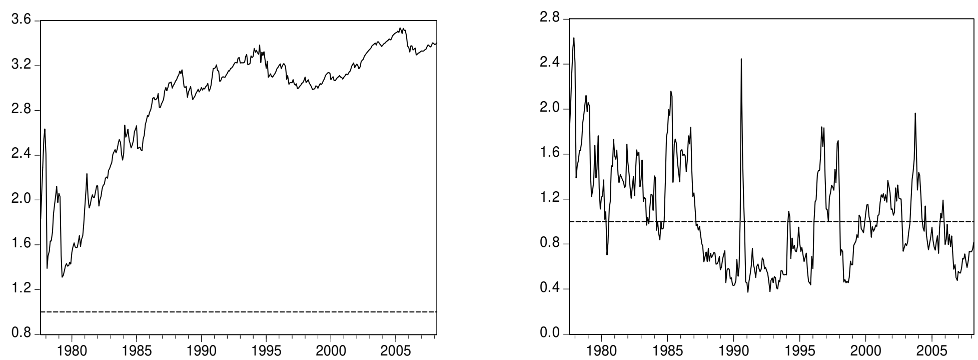
We report the result of MWALD test in Table 3. The MWALD test statistics suggest that money supply is significant at the 5 per cents level in the aggregate prices equation, but the aggregate prices is not statistically significant in money supply (M2) equation at the 10 per cents level. This implies that there is unidirectional causality run from money supply to aggregate prices, but there is no evidence of reverse causality. Therefore, only the monetarists' view is supports by the Malaysian data over the period of 1971:01 to 2008:03. This result is corroborated to the findings of Tang (2004) that structuralists' may not exist in the context of Malaysian economy. With this evidence we support that inflation is a monetary phenomenon. Apart from that, another issue emerge from this study is the question that how long is this monetarists' view can hold in Malaysia? In other words, is inflation always a monetary phenomenon in Malaysia? The causal relationship may change over time owing to the change of economic and political environments (Tang, 2008). In this case, the MWALD test for the presence of causality over the entire sample period would not be a good guidance in assessing the effectiveness of monetary policy in curbing inflation. To deal with this possibility of time-varying causality, we employ recursive and also rolling causality, a method that explicitly allows for changes in the causal relationship between money supply and aggregate prices. To the best of our knowledge, none of a research effort has considered this issue for the case of Malaysia. Therefore, it is interesting for this study to examine the stability or persistency of monetarists' view in explaining inflationary behaviour in Malaysia through the time-varying causality tests.

In running the recursive and rolling regression procedures, we have to pre-specify the observations to start and rolling window size, respectively. To the best of our knowledge, there is no formal statistical procedure to select the optimal sample for recursive and rolling regressions, thus the choice of initial sample seem arbitrary. For this reason, we set the initial sample as 80 for monthly data (i.e. 6 years). In addition, the χ^2- statistics for MWALD causality tests will be normalised by the 10 per cents critical values. If the ratio is above one then the null hypothesis of money supply does not Granger causes aggregate prices is rejected. In other words, if inflation always a monetary phenomenon in Malaysia, then a large number of significant statistics should be observed when the sample is forwards.

The time-varying causality tests results are reported in Figure 1. From the graphs, we observed that as the sample size increases the causality test statistics for the recursive regression tend to reject the null hypothesis of money supply (M2) does not Granger causes aggregate prices. This increasing trend of causality test statistics is due to the power of the test increases. Therefore, the conclusion from the causality test result based on entire sample (e.g. Table 3) may not be a good guidance. In order to disentangle this effect, the power of the causality test needs to be maintained fixed. Therefore, the rolling regression with a constant sample size will be a good remedy. From the rolling regression, we observed that the causality test statistics is varied over the sample period of analysis. Thus, the causal relationship is not stable. Furthermore, most of the test statistics failed to reject the null hypothesis of money supply does not

Granger aggregate prices. With this evidence, we may surmise that inflation is a monetary phenomenon in Malaysia as shown by the causality tests (e.g. Table 3), but this is not always the case because time-varying causality shows that the causal relationship is not stable.

Figure 1: The results of time-varying causality tests



Recursive regression | Rolling regression

Note: The above is the time-varying causality tests for the null hypothesis of "Inflation is not always a monetary phenomenon".

Therefore, the implementation of contractionary monetary policy in combating inflation may not be a wise strategy. In addition, Tang (2004) has also noted that although the empirical evidence shows that money caused the prices to change, it does not mean that money supply is an effective monetary instrument to address inflation pressures.

4. CONCLUSION AND POLICY IMPLICATIONS

This paper has re-examined the money-prices nexus for Malaysia through the Johansen's cointegration and MWALD causality tests. In particular, we are interested to know whether inflation is always a monetary phenomenon in Malaysia. There are some remarkable findings discovered by this study. First, the results of unit root tests with one and two structural breaks indicate that all series are $I(1)$ process. This implies that shock(s) on aggregate prices, money supply or output in Malaysia will have a permanent effect. Second, the evidence from Johansen's cointegration test suggests that the aggregate prices and its determinants (i.e. money supply and output) are cointegrated. This implies that the variables are moving together in the long run. The normalised cointegrating coefficients show that the effect of money supply (M2) on aggregate prices is positive and statistically significant at the 1 per cent level. Third, we performed the MWALD causality test to affirm the causality direction. The result of MWALD test suggests a unidirectional causality run from money supply to aggregate prices. This implies that the monetarist's views exist in Malaysian economy, while we failed to obtain an evidence to support the presence of structuralists' view. Nevertheless, using time-varying causality tests (i.e. recursive and rolling regressions), we have found that the causal relationship is not stable over the analysis period. Hence, we surmise that inflation is not always a monetary phenomenon in Malaysia even the causality test within the entire sample supports the monetarists' view.

The findings of this study may shed some light to the policymakers and the Central Bank of Malaysia (i.e. Bank Negara Malaysia, BNM) that the implementation of contractionary monetary policy alone may not be an effective anti-inflationary instrument because the evidence indicates that inflation is not always a result of monetary policy in Malaysia. Strictly speaking, the used of money supply M2 as monetary instrument for price stability in Malaysia may detrimental to economic growth. Therefore, other policies such as fiscal and also supply-sides economy may be appropriate to incorporate into the management of inflationary behaviour in Malaysia. Specifically, the supply-sides economy may simultaneously decrease macroeconomics evils, inflation and unemployment rates, meanwhile this strategy may also increase the Malaysia's output level. In sums, the supply-sides economy may lead to low inflation and unemployment rates and also sustainable economic growth.

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