Study of Association between Monetary Policy and GDP: An Econometric Perspective in Malaysia

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Abstract: This paper aimed to unveil the relationships exists between monetary policy and GDP in Malaysia for quarterly data from 1991 to 2011. The Malaysian economic background, monetary policy concepts and relationship models are discussed in this study. The result of Unit Root test on monetary policy variables namely M1, M2, and M3- and GDP revealed to be stationary only after first difference; yet, stayed level stationary for real interest rate. Co-integration analysis and Vector Error Correction Models (VECM) were also indicated a possibility of merely one long-run equilibrium relationship between real GDP regards to M1, M2, M3, and real interest rate. However, results of trace and maximum Eigenvalue methods suggested two co-integration equations amongst research variables. Altogether, VECM analysis indicates monetary supply variables included in the model (M1, M2, and M3) are statistically significant and have long-term influence on GDP. Findings of this study suggested increasing money supply would eventually increase the real GDP in Malaysian economy.

Key words: GDP, Monetary policy, Money supply, Real Interest rate.

INTRODUCTION

Malaysia is an upcoming emerging market in South East Asia. It is classified as upper-middle-income by the World central Bank (Yusof & Bhattasali, 2008). It is revealed that Malaysians' revenue is centered on exporting of tin and rubber which diversified from palm oil to petroleum. Yet, recently, exporting natural resources has been gradually replaced by manufacturing productions. Industrialization policy adapted by the Malaysian government in late 70's was said to be a pilot for the evolution. Since then, the proportion of agricultural production has been affected Gross Domestic Product(GDP); however, portion of manufacturing productions has balanced the national GDP. In such emerging economy, the policies, especially monetary policy, has become very important for national growth.

While the theoretical arguments of how monetary policies effects are transmitted to the real sector of the economy are fundamentally the same for industrial and developing economies, developing country analyses tend to be specific to the gradually changing economic structure, historical experience, and institutional set-up. The discussions have not bounded to the theoretical debates, yet focused on the correct methodology for empirical studies on its influence on Gross Domestic Product. The difficulties in empirical estimations do not just apply to industrialized countries but also developing or transition economies like in Malaysia. Many differences appear in the empirical studies for developing economies as data constraints may make it impossible to undertake rigorous studies on the various monetary policies' variables. This study attempts to investigate three monetary policy variables- known as M1, M2, and M3- and their impacts on Malaysian GDP. The rest of this paper is structured as follows. Section 2 describes the Malaysian economic background; section 3 involves monetary policy concepts and interest rate; section 4 discusses monetary policy and GDP relationship models; section 5 presents the research results and findings; and section 6 conclude the paper.

Malaysian Economic Background:

Today, industrialization and Foreign Direct Investment (FDI) play vital role in the development of Malaysian economy. There are several economic policies has been conducted in Malaysia which mainly can be classified in three categories. The first category is called New Economic Policy (NEP) that was implemented during 1970 to 1990 in Malaysia. Second is the National Development Policy (NDP) which was executed from 1990 to 2000. Third is the National Vision Policy (NVP) that was launched in 2001, and extended to 2010 (Yusof & Bhattasali, 2008; Ngah, Saini, Habibullah, & Mohamed, 2000). The strategies related to new Economic Policy (1970) mainly focused on free market mechanism. Figure 1 exhibits the effect of NEP on Malaysian economic development. As it illustrated, by implementing NEP, Malaysian Gross Domestic Products (GDP) increased from USD 4.276 billion in 1970, to USD 44.024 billion in 1990.
In 1990, the NEP was replaced by NDP. The economic structures and strategies were enhanced further to several additional aspects in NDP. It addressed the poverty issue and its hardcore strategies including employment of native people in industrial sectors. Although Malaysian economy experienced a financial crisis, its GDP grew from USD 44.024 billion in 1990 to USD 92.783 billion in 2001 by implementing NDP. This economic growth brought down the unemployment level and inflation rate of the country. Figure 2 depicted Malaysian GDP during the mentioned period.

The huge improvement in eliminating poverty by executing NEP and NDP, economists considered Malaysian development model as one of the bests in South East Asia during 1970 to 2000 (Hart, 1994). There are three reasons can be counted to show why Malaysia gets to such economic level. First is the dynamic nature of Malaysian economy in South East Asia due to its multiracial population; second regards to the nation’s poverty reduction and considering economic development as the main part of decision making for planning new strategy; the third is to successfully implementing and directing the NEP and NDP by the local government. Although the successful accomplishment of previous programs, it requires to revise preceding strategies to hold this economic growth. There was a big question that how long local government could maintain its success and keep current economic growth rate and eradicating deficiency in Malaysia. Addressing the issue led to the third economic program known as National Vision Policy (Kurus & Tangau, 2003). NVP was launched in 2001 with the aim of placing Malaysia in a competitive position with a stable society. The aim of NVP can be pointed in different aspects namely; creating adjustable market and society with the external high technology, enhancing equitable society, maintaining economic growth and further accelerating economic growth, strengthening high technology sectors, modernizing the agricultural industry and making it competitive compared with external productions. The records shows that GDP in Malaysia increased from USD 92.783
billion in 2001 to USD 237.803 billion in 2010 as NVP successful implementation. Figure 3 shows the statistics during NVP implementation period.

![GDP of Malaysia (billion $) during 2001 to 2010](image)

Source: World Bank Data Catalog

**Fig. 3:** GDP of Malaysia (billion $) during 2001 to 2010

Malaysian economy has prospered during the period of 1975 to 2010. Successful implementation of NEP, NDP and NVP let Malaysia to become an emerging market in South East Asia. Malaysia is one of the important exporters for electronic devices in high technology sector. The economic success of Malaysia become more clear when national economy of other developing countries is compared during the world economic crisis in 2008 and 2009. Moreover, implementation of an appropriate policy for the economic development of a country like Malaysia is vital for government and the central bank since Malaysia faces stiff competition with other countries in the region such as Brunei, Myanmar, Cambodia, Indonesia, Laos, Philippines, Singapore, Thailand and Vietnam. Therefore, accelerating economic growth by exploring monetary policy should be considered if it is aspired to place Malaysia in a strategic position in the global market.

**Monetary Policy and Interest Rate:**

The short-term rate is an instrument that central banks use in order to make policy. The effectiveness of monetary policy, however, depends heavily on how agents perceive the driving forces of policy decisions and on how market participants use policy announcements to update their expectations about the future state of the economy. In many countries, the central bank policy announcements are accompanied by explicit public commitments related to the desired economic environment. This aims to guide better the market participants and improve their understanding of monetary policy. Although central banks make a general explanatory statement regarding their policy decisions, they do not reveal the actual numerical reasoning behind it. Empirical research however provides evidence that monetary policy authorities set the policy rate according to a specific rule which assigns weights to current and/or past values of the inflation rate and the output growth. In other words, to execute monetary policy, central banks usually determine a desired interest rate upon which open-market operation can be applied to change bank reserves to the target rate. In the expansionary monetary policy, central banks increase the supply of reserve (from S2 to S3), therefore interest rate reduces (from y2 to y1) as depicted in Figure 4. Conversely in the contractionary monetary policy, supply of reserves are decreased (from S2 to S1) which increases the interest rate (from y2 to y3) (Mcconnell, Brue, & Flynn, 2009).

![Relationship between Interest Rate and Quantity of Reserves](image)

**Fig. 4:** Relationship between Interest Rate and Quantity of Reserves
Further, Figure 5 illustrates the money supply as $x_1$, interest rate as $y_3$, with money supply of $x_2$ and interest rate of $y_2$. Figure 6, on the other hand, shows the relationships between interest rate and amount of investment. As Figure 5 illustrated, by implementing expansionary monetary policy, real interest rate decreases from $y_3$ to $y_2$ or $y_1$. In Figure 6, by decreasing real interest rate from $y_3$ to $y_2$, amount of investment increases from $x_{11}$ to $x_{12}$.

Source: McConnell, Brue and Flynn (2009)

**Fig. 5 & 6:** Relationship between Interest Rate, Amount of Money Demanded and Amount of Investment

Effect of three real interest rates ($y_1$, $y_2$, $y_3$) and corresponding levels of investment on aggregated demand (AD) is illustrated in figure 7. AD1, AD2, AD3 are related to the level of investment ($x_{11}$, $x_{12}$, $x_{13}$); Figure 7 also depicts the corresponding price levels of each percentage of interest rate. Therefore, price level of $p_1$, $p_2$, $p_3$ is associated to real interest rate of $y_1$, $y_2$, $y_3$. It is concluded, by decreasing the interest (through expansionary monetary policy) real domestic product increases as result of increasing in aggregated demand and amount of investment, which can inferred from Figure 6 and 7 (Mcconnell, Brue, & Flynn, 2009).

Source: McConnell, Brue and Flynn (2009)

**Fig. 7:** Relationship between Interest Rate and Quantity of Reserves

**Monetary Policy and GDP Relationship Models:**

There are diverse methodologies and approaches have been undertaken to assess the relationship between monetary policy and GDP. According to the study by Fiebig (1980), the relationship between money supply and economic output has significantly affected GDP in Australia. A log-linear relationship was assumed in the research by using quarterly data for nominal growth domestic product GDP and money supply ($M_3$ was a proxy of money supply in the research) during 1960 to 1975 (Fiebig, 1980). On the other hand, Kandil (2001) evaluated the impacts of money supply on GDP and inflation rate in the Middle East countries. Non-linear estimation, 3SLS was applied to analyze the relationship and shows in following equation (Kandil, 2001).
Dyt = \beta_0y + \beta_1yD_{moneyt} + \beta_2yD_{govt} + \beta_3yD_{ext} + \beta_4yD_{oilpt} + \eta_y \tag{1}

Where Dyt is the real output growth, D_{moneyt} is the growth of the money supply at the time t, D_{govt} is the growth of government spending, D_{ext} is the representative of changes in the domestic currency price, D_{oilpt} is the change in oil price and \beta_0y is the constant.

Ajisafe and Folorunso (2002) studied the impacts of fiscal and monetary policy on economy in Nigeria with co-integration and error correction model by using annual series data were extracted from central bank of Nigeria during 1970 to 1998. Their results indicated that monetary policy was more effective than fiscal policy for the stabilization of Nigeria economy. They followed following equation in their research(Ajisafe & Folorunso, 2002).

Y_t = C_0 + m_t M_{t-1} + f_t F_{t-1} + e_t E_{t-1} + u_t \tag{2}

Where Y indicates growth rate of nominal income, M is a proxy of money supply, F represents government expenditure and E is a proxy of exports.

The study by Angeloni (2003) investigated the relationship between monetary policy and output in Euro Area. According to the results, an unexpected increase in the short-term interest rate pulled economic growth down and its maximum effect occurred with a lag of one year. Vector Autoregressive (VAR) model was employed in the research by extracting data during 1971 to 2000(Angeloni & Ehrmann, 2003).

Additionally, Peersman (2004) compared the impact of monetary policy on economic output where implemented on several countries in Euro area. Austria, Belgium, France, Germany, Italy, Netherlands, and Spain were selected in order to analyze the interdependence between monetary policy and output by using structural VAR with quarterly data during 1980 to 1998. According to the findings, there was approximately consistent impact over entire Euro area, yet in some cases, like in Germany stronger effects were observed compared to Netherlands; or stronger effect on prices existed in Italy and Spain compared to Austria and Netherlands. Altogether, impacts of monetary policies on output were somewhat similar across the countries using VAR model(Peersman, 2004).

Peersman and Smets (2005) analyzed the impact of monetary policy on output growth rate in seven countries within Euro Union during 1980 to 1998. Linear regression equation was used for this research. Based on their findings, due to tight monetary policy during the recession, negative impacts were evolved by increasing interest rate(Peersman & Smets, 2005).

Bodman (2006) also studied asymmetric impacts of monetary policy on economic activities in Australia. The study applied the method introduced by Cover (1992) and several simple threshold models to analyze economic growth in expansionary and contractionary monetary policy in Australia. The model is illustrated as follows(Bodman, 2006).

Y_t = \beta_0 + \beta_1 Y_{t-1} + \Delta TOT_{t-1} + \delta \Delta U_{t-1} + \eta \Pi_{t-1} + \Pi_{POS_{t-1}} + \Pi_{NEG_{t-1}} \tag{3}

Where Y_{t-1} is output growth (change in the log of real GDP); \Delta TOT represents trade changes (a proxy of supply shock); \Delta U is the proxy of unemployment rate; \Pi represents inflation; POS reflects Max [res, 0]; and NEG reflects Min [res, 0].

The study by Uhlig (2005) analyzed the effect of monetary policy shocks which revealed not significant impacts of contractionary monetary policy on GDP; yet price level of goods and services may affect gradually as result of monetary policy. He applied VAR model to analyze the relation between monetary policy shock and GDP, continuous monthly data were extracted from January 1965 to December 2003. According to his research, response of GDP to contractionary monetary policy was found ambiguous. On the other words, implementation of tough policy changed GDP by \pm 0.2 percent with a probability of 2/3, as GDP price deflator faced with reduction less than commodity price index(Uhlig, 2005).

Hooi, Habibullah and Smith (2008) have also assessed the effectiveness of monetary policy on the state of economy. They used Hamilton Markov switching model with quarterly data which were extracted during 1978 to 2003 for Indonesia, Philippines, Thailand and Malaysia during 1974 to 2003. According to their findings, monetary policy had further influence on the economy downward rather than upward.

Assenmacher and Gerlach (2009) studied thereaction of economic activities and properties as result of monetary policy shocks. In this research, the VAR model was used in order to analyze interdependency exist between Consumer Price Index (CPI), real GDP, property prices and interest rate in 18 members of Organization for Economic Co-operation and Development (OECD) during 1986 to 2008 Quarterly. The study employed following equation model for its purpose(Assenmacher-Wesche & Gerlach, 2009).

\begin{align*}
A^n_0 Y^n_t = \mu^n + A^n(L)Y^n_{t-1} + \epsilon^n_t
\end{align*}

(4)
\( Y_t = (p_t, y_t, i_t, cr_t) \) is a \( N \times 1 \) vector including CPI\( (p) \), real GDP\( (y) \), three-month interest rate\( (i) \) and real credit\( (cr) \) for \( N \) countries; \( \mu_n \) is a country-specific intercept; \( A(L) \) is a log polynomial with the VAR coefficients and \( n_t \) is the residual.

Ridhwana, Groot, Nijkamp, and Rietveld (2010) have studied specific models which indicated how contractionary monetary policy influence on GDP through the impacts on aggregate demand. VAR model was applied to investigate the mentioned relationship (Ridhwana, Groot, Nijkamp, & Rietveld, 2010). For sake of this study, following section describes both tests and results conducted to discover the relationship between the monetary policy and GDP in Malaysia.

**RESULTS AND DISCUSSIONS**

This study was conducted in multiple-stage basis. In each stage, a set of analysis was applied and the findings of that pace determined the next operating stage. Upon data collection which basically extracted during 1991 to 2011 quarterly, stationary analysis was required in first place. Hence, Augmented Dickey Fuller (ADF) Test and Phillip-Perron (PP) Test were conducted on data to test the existence of unit root. The non-stationary data were treated in a way to become stationary for further analysis. In the next step, co-integration test was applied before conducting Vector Error Correction Model (Khin, Eddie, Zainalabidin, & Nasir, 2010). Results of unit root tests presented in Table 1. The results indicated that monetary supply variables (M1, M2, and M3) were stationary only after first difference. Real GDP, in this context, revealed similar characteristics. Real interest rate is also found level stationary. Results of ADF and PP tests confirmed each other.

**Table 1: Results of Unit Root Test**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Augmented Dickey Fuller Test</th>
<th>Phillip-Perron Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level</td>
<td>1st Difference</td>
</tr>
<tr>
<td>M1</td>
<td>3.920</td>
<td>-4.626***</td>
</tr>
<tr>
<td>M2</td>
<td>3.468</td>
<td>-5.309***</td>
</tr>
<tr>
<td>Real GDP</td>
<td>-0.584</td>
<td>-11.938***</td>
</tr>
</tbody>
</table>

*, **, ***: statistically significant at respectively 0.10, 0.05, and 0.01 acceptance levels

**Effect of Money Supply on Real GDP:**

To test the research model, long-term relationship between real GDP, money supply variables (M1, M2, and M3) and real interest rate were identified by means of co-integration tests. Results of Johansson co-integration test on the model (co-integration rank) is presented in Table 2. Table 2 provides Johansson co-integration results obtained from both methods of Trace and Maximum Eigenvalue. Results of trace method suggest existence of two co-integration equations as well as what proposed in maximum Eigenvalue method. In other words, there are two long-run equilibrium equations between real GDP, M1, M2, M3, and real interest rate exists within a multivariate framework which indicated the confirmatory of both.

As illustrated in Table 3, the long run relation (co-integration equation 1 and can be found at the horizontal equation in first row) suggests that long-term relationship between money supply variables of M1, M2, and M3 with GDP are statistically significant. This is reflected by respective t-statistics value of 3.54, 3.99, and 4.17, which suggested a strong relationship between M1, M2, and M3 and real GDP at 0.01 acceptance level. On the other hand, t-statistic of 0.128 fails to support any form of relation between real interest rate and real GDP in Malaysia. The sign of coefficients for money supply variables are similar to the sign of coefficient for real GDP. Hence, one may infer a direct relationship between money supply and real GDP.

The results from VECM model provide information about the short-term relationship of the variables tested in this study. First column on the left (Table 3) reveals the short-term relationship between real GDP and its own one period lagged term, one period lagged money supply variables (M1, M2, and M3) and one period lagged real interest rate. In other words, it shows the forecasting power of real GDP, money supply, and real interest rate variable on one period ahead in time. Results are significant at 0.01 acceptance levels as the F-statistic is 34.07. R-Square value of 0.742 indicates that up to 74.2 per cent of variation in short term changes of real GDP in Malaysia were explained by variation in the lagged money supply variables as well as real interest rate. Therefore, this is a concrete model in predicting and explaining short term movement of real GDP of Malaysia.
As discussed above, existence of relationships between research variables were statistically supported. T-statistic value of 6.56 indicates that the real GDP for last quarter was positively affecting real GDP of current quarter at significant level of 0.01. Moreover, t-statistics of -5.86 and -2.51 suggest that the one quarter lagged M1 and M2 were statistically significant at 0.01 acceptance level. For real interest rate, the significance of the relationship is acceptable at 0.05 levels due to t-statistics value of -1.98. Coefficients of -0.41, -0.50 and -0.004 indicate that one period lagged M1, M2 and real interest rate have negative relation with current real GDP. Results do not support any short-term relationship between M3 and real GDP.

Current time M1 has short-term relationship with one period lagged changes in real GDP, M1, M2, M3, and real interest rate. This is acceptable at 0.01 levels, as it supported by F-statistic value of 12.15. Moreover, R-square of 0.50 suggests that up to 50 per cent of variation in changes of M1 can be explained by changes in independent variables. However, as t-statistics of -5.15 shows, current M1 only has a 0.01 acceptance level relationship with one period lagged M1. Results fail to support any short-term relationship between present M1 and other variables.

M2 for present quarter has a short-term relationship with one period lagged change in real GDP, M1, M2, M3, and real interest rate. F-statistic value of 7.98 indicates that the model fit is acceptable at 0.01 acceptance levels. Moreover, R-square of 0.40 suggests that the model can explain up to 40 per cent of variation in dependent variables using independent variables. In the next step, t-statistic of 3.40 for changes in real interest rate indicates significant positive effect on present changes in M2 at 0.01 acceptance level. T-statistic value of -2.26 for one period lagged change in M2 shows significant negative impact on changes in present time M2 at 0.05 acceptance levels. And finally, t-statistics value of -1.81 for lagged change in real GDP suggests a negative relationship with present changes in M2 only at 0.10 acceptance levels. Results fail to support any other significant relationships between variables.

Regarding current M3, short-term relationship exist with one quarter lagged changes in real GDP, M1, M2, M3, and real interest rate. F-statistics of 7.80 shows a model fit at 0.01 acceptance level. R-square value of 0.39 suggests that up to 39 per cent of variation in dependent variable might be explained by the variation in independent variables. Moreover, t-statistics values of 3.06 and -3.05 for lagged real interest rate and lagged change (respectively) in M3 indicate a positive and negative effect on current changes in M3. Further, t-
statistics value of -2.49 for lagged changes in real GDP shows a significant negative relation at 0.05 acceptance levels. Finally, t-static of 1.97 for lagged changes of M1 suggests a positive relationship only at 0.10 acceptance levels. Results fail to support any statistically significant relationship between current M3 and lagged changes of M2 in Malaysia.

Table 3: Results of VECM Test

<table>
<thead>
<tr>
<th>Error Correction</th>
<th>D(LNREAL)</th>
<th>D(LN1)</th>
<th>D(LN2)</th>
<th>D(LN3)</th>
<th>D(LNREAL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CointEq1</td>
<td>-1.410073</td>
<td>0.753956</td>
<td>0.457601</td>
<td>0.343313</td>
<td>0.791044</td>
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<td></td>
<td>(0.13894)</td>
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<td>(0.11447)</td>
<td>(0.08226)</td>
<td>(0.14796)</td>
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<tr>
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<td>[-10.149]</td>
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<td>[3.99752]</td>
<td>[4.17125]</td>
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<tr>
<td></td>
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<td>[-0.00814]</td>
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<td>[-0.01333]</td>
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</table>

Real interest rate at present time has a short-term relationship with lagged variables of real GDP, M1, M2, M3, and real interest rate. F-statistics of 5.76 indicates that the model fit is acceptable at 0.01 acceptance level. R-square value of 0.327 suggests the model has ability to explain up to 32.7 per cent of variation in dependent variable. T-statistics value of -5.27 for lagged real interest rate shows that real interest rate is negatively affected by its own value lagged a period. The relationship is statistically significant at 0.01 acceptance levels. Accordingly, t-statistic value of -2.57 for lagged changes in M2 shows a statistically significant negative relation at 0.05 acceptance level. Results fail to support statistical relationship between other variables.

**Conclusion:**
To conclude, this paper attempts to unveil the relationships exist between monetary policy and GDP in Malaysia. The Malaysian economic background, monetary policy concepts and relationship models are discussed in this study. The results of Johansson cointegration test indicate two long-term equations among real GDP, money supply variables of M1, M2, and M3 and real interest rate. The VECM test was also conducted over the dataset and the results suggested a long run relationship between real GDP and monetary supply variables of M1, M2 and M3. However, results did not support any long run relationship between real GDP and real interest rate. The study also found a positive relationship between money supply variables (M1, M2, and
M3) and real GDP. This implies that by increasing money supply in Malaysia, a positive impact can be expected on the overall long-term production (in terms of gross domestic production) in the country. Therefore, Bank Negara Malaysia may choose the expansionary monetary policy to boost the real GDP of the country as a long-term plan. The result of this study is also supported by the experience of loose money supply policy undergone in the last decades.

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