# The Controllability and Reliability of Monetary Policy in Dual Banking System: Evidence from Indonesia

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**ABSTRACT**

*This paper aims to examine the controllability and reliability of monetary policy in dual banking system, namely conventional and Islamic banking systems in the case of Indonesia, where Islamic banking is in operation since 1992. The paper investigates the long run relationship as well as short run dynamic equilibrium for the period 2001 to 2004. Empirical results show that monetary aggregates in Islamic banking system are more controllable than in conventional banking system. In addition, monetary policy in Islamic banking system is less reliable than that of conventional one, as it is not statistically connected to the main goal of monetary policy. It implies that Islamic banking in Indonesia has not been able to significantly respond to the developments in monetary policy nor do they significantly contribute to economic development. This may be explained due to the relatively small size of the Islamic financial sector.*

## I. Introduction

One of the main distinguished features of Islamic financial system is the prohibition of interest payment. In place of fixed interest, Islamic financial system operates under the general principle of profit and loss sharing and other *shari'ah* permissible modes of financing.

For the last two decades, Islamic banking industry has emerged and grown remarkably all over the world. In Indonesia, the establishment of Bank Muamalat Indonesia in 1992 can be considered as the first initiative to introduce the Islamic financial system. Despite the fact that it was quite late in comparison to Iran, Pakistan, and Malaysia, nevertheless, the growth of Islamic banking industry in terms of the amount of assets has increased significantly, particularly, since the introduction of Bank Indonesia Act No 2/1998. It should, however, be noted that the development of Islamic financial system in Indonesia is unique, compared to Iran, Pakistan and Malaysia, as it is *market force driven*, rather than *government initiative driven.*

There have been a number of studies, conducted to measure the relative efficiency and stability of Islamic financial system, compared to its counterpart. But only few of them dealt with the empirical analysis, particularly in the area of monetary policy and its ultimate policy objectives in relation to Islamic banking. Among others, Darrat (1988,2000), Yousefi *et.al.* (1997) Kia (1998), Hassan and Mazumder (2000), Kia and Darrat (2003), Eslamloueyan and Heidari (2003), and recently by Yusoff and Wilson (2005) have already tackled this issue.

Since the development of Islamic banking industry in Indonesia has increased significantly, it is important to present empirically the comparison of monetary policy in dual banking system. This study is, therefore, important as it aims to investigate the reliability and controllability of monetary policy in the dual banking system of Indonesia. In doing so, in section II, a brief review of the literature on the framework of money demand and the studies on the stability of money demand is presented. Section 3 specifies the process of assembling of data.. Section 4 specifies the empirical model used in the analysis and section 5 presents and analyses the estimation results. In section 6, the conclusion of the study is presented.

## II. A Survey of the Literature

Having a stable money demand function is very crucial as it has important implications for how monetary policy should be conducted.

As far as the issue of monetary policy is concerned, the stability of interest elasticity of demand for money becomes relatively more important than the other factors affecting the demand-for-money function. Recently, many studies found a stable money demand in different countries. For example, Stock and Watson (1993) as well as Ball (2001) find a stable long-run demand for U.S.'s M1.

Peytrignet and Stahel (1998) find a stable M2 and M3 demand for Switzerland, and Muscatelli and Spinelli's (2000) results indicate a stable long-run M2 demand in the case of Italy. Buch (2001) finds a stable demand for M1 and M2 for Hungary and a stable M1 demand for Poland. However, many other studies found unstable demand for money. For instance, Lieberman (1980) finds unstable interest elasticity for demand for money for both the U.S and U.K. Ripatti (1998) also finds unstable demand for M1 and M3 for Finland. Bahmani-Oskooee and Bohl's (2000) study yields unstable M1, M2 and M3 demand functions for Germany, and Hamori and Tokihisa (2001) find unstable demand for M2 in Japanese data.

The interest rate may be one of the major factors subject to speculation, if not the only one, of the demand-for-money function. In addition, since money may be demanded as an inventory to smooth differences between income and expenditure streams, and as one among several assets in a portfolio, both actual and expected interest rates may have a strong impact on the economic agents' behavior related to the demand for money. One may, therefore, argue that money demand would be more stable if this major source of instability would be eliminated.

In one of the empirical studies, taking Tunisia as a case study, Darrat (1988) shows that demand for money, in the Islamic interest-free system, is relatively more stable, the monetary authority can control more effectively interest-free monetary assets, and only these assets have a reliable link with the ultimate policy objective. Yousefi *et.al.* (1997), following Darrat's (1988) approach, but using Iranian data, confirm Darrat's conclusion on the stability of demand for money, but contradict Darrat's finding on monetary aggregate/price link. Darrat (2000), using the data of Yousefi *et al*. and correcting the misspecification error made by these authors, concludes again that only the interest-free banking system provides a reliable link between money growth and inflation both in the short- and long-run. Hassan and Al-Dayel (1998/9), employing data of 15 Islamic countries, supported Darrat's findings for most of those countries. However, these studies analyze the stability of only short-run interest-bearing and interest-free demand-for-money functions.

Hassan and Mazumder (2000) extend the analysis by investigating short-run stability of the velocity of interest-free money vis-à-vis interest-bearing money as well as long-run policy controllability of these two kinds of money supply for six African countries (Algeria, Egypt, Morocco, Nigeria, Sudan and Tunisia), three Asian countries (Indonesia, Malaysia and Pakistan), four Gulf countries (Bahrain, Kuwait, Qatar and Saudi Arabia) in addition to Iran, Jordan, Syria and Turkey. Their findings support the relative effectiveness of interest-free banking in these countries in terms of stable and smooth velocity of money, controllability of monetary aggregates, and stronger linkage between monetary policy instruments and ultimate policy goals of these countries.

Darrat (2002) further extends the analysis by testing the relative efficiency and policy usefulness of interest-bearing and interest-free monetary systems over the long run for both Iran and Pakistan. The motivation of these papers (Darrat, 1988; Yousefi *et al.* 1997; Darrat, 2000; Hassan and Al-Dayed, 1998/9; Hassan and Mazumber, 2000 and Darrat, 2002) comes from the fact that the Islamic economic system prohibits receipts and payments of pre-determined (fixed) interest on any financial transactions. Namely, the basic premise of Islamic banking lies on the sharing of profit or loss among depositors, investors and banks. However, none of the existing studies directly investigated the stability of long-run demand for interest-free money in contrast to demand for interest-bearing money. Furthermore, since the coefficients of money demand may be constant, but may not be invariant to policy shocks, as mentioned by Lucas (1976), a possible extension of this literature is to investigate whether demand for interest-free money is invariant to policy or other exogenous shocks.

## III. Data and Methodology

This study uses time series data in the analysis. Monthly data, from January 2001 until December 2004, are analysed. One major consideration why this study analyses the data from January 2001 until December 2004 is that the development of Islamic banking system in Indonesia has grown enormously since early 2001.
Data, are mainly collected from the following sources: (1) Monthly Indonesian Financial Statistics (published by Bank Indonesia); (2) Monthly Islamic Banking Statistics (published by Bank Indonesia); (3) Monthly Asean Statistical Indicator (available at www.aseansec.org/macroeconomic).

As to the variables used in the study, they are defined as follows:

***gM0***: High Powered Money in Indonesia contains (1) coins and notes in circulation (cash); plus (2) the reserves of the commercial banks;
***gM1_isl***: M0 plus demand deposits at the Islamic commercial banks;
***gM2_isl:*** M1 plus saving and time deposits at the Islamic commercial banks.
***gM1_conv***: M0 plus non-interest bearing demand deposits at the conventional commercial banks.
***gM2_conv***: M1 plus saving and time deposits at the conventional commercial banks.
***gP:*** Composite Consumer Price Index of 45 Cities which has 2002 as a base year (in growth rate)
***gM2_isl***: M1 plus saving and time deposits at the Islamic commercial banking (in growth rate)
***gM2_conv***: M1 plus saving and time deposits at the conventional commercial banks (in growth rate)

### 3.1 Estimation Methods

Trends in the data can lead to spurious correlations that imply relationships between the variables in a regression equation, when all that is present are correlated time trends. The time trend in a trend stationary variable can either be removed by regressing the variable on time or nullified by including a deterministic trend as one of the regressors in the model. In such circumstances, the standard regression model is operating with stationary series that have constant means and finite variances, and thus statistical inferences, based on t and F-test, are valid.
Regressing a non-stationary variable on a deterministic trend generally does not yield a stationary variable. Therefore, using standard regression techniques with non-stationary data can lead to the problem of spurious regressions involving invalid inferences based on t and F-test.
In order to overcome this, conducting unit root test becomes necessity. This study will employ Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) to check the stationarity of each variable.
The next step is to investigate if cointegration exists among the variables. If there is cointegration (long run relationship between variables), we are justified to go further and estimate not only the cointegrating—or equilibrium—relationship, but also the dynamic relationship which incorporates both the equilibrium and how short run adjustment taking place.
To examine if at least one cointegration relationship exists between each of the monetary aggregates, we will utilise the Johansen and Juselius (1991) efficient test. Unlike the common two-step test of Engle and Granger (1987), the Johansen and

Juselius approach is capable of identifying multiple cointegrating vectors when the model includes three or more variables. However, like most time-series tests, the Johansen Juselius test is sensitive to the presence of serial correlation.

### 3.2 Model Specification

This study utilises growth rate values and employs auto regressive model, namely AR model, and deliberately did not include the contemporaneous values in our model to avoid possible simultaneity biases. More importantly, in analysing the relationship between money supply and price as the policy objective, it is widely understood that money supply can affect prices, while feedbacks from prices to money supply are also possible if monetary authorities consider inflation as a major policy goal.

Discourse on the policy usefulness of alternative monetary aggregates normally involve two main issues; policy controllability of the monetary aggregates and their linkage to ultimate policy goals. There two conditions need to be satisfied, so that monetary aggregates could be useful for policy purposes. First, the aggregate must be effectively under the control of the monetary authorities. Second, there must be a reliable and strong linkage between monetary aggregate on the one hand and the main policy goal on the other hand.

In addition, lacking of such link would result in loosing its policy appeal even if it were under policy control. On the other hand, an aggregate that is strongly linked to a major policy goal would not be useful if policy makers are unable to control it.

Since velocity of money can really affect the effectiveness of monetary policy, this study will also address this issue before investigating the controllability of monetary aggregate and its linkage with ultimate policy goal.

#### 3.2.1 Controllability of the Monetary Aggregates Model

A common way to measure controllability of a monetary aggregate is to examine the statistical association between the aggregate in question and the monetary base, the latter being a major instrument effectively under the direct control of policy makers. Therefore, it is possible to run regression on interest-free money stock against the base and, alternatively, regression interest based-money stock against the base. The monetary aggregate that exhibits a tighter correlation (for example, higher R squared) may be judged more policy controllable.

However, studies conducted by Darrat (1988, 2000) and Kia (1998) compared two different aggregates in the same system, which, according to Suwailem, is like comparing apples to oranges (2000: 252). For this reason, this study attempts to compare different aggregates from different system, i.e. Islamic commercial banking and conventional commercial banking.

Hence, in order to compare the controllability of a monetary aggregate in different banking system, the following models address this issue:

$$gM1\_isl_t = \alpha_1 \pm \beta_1 gM0_t \pm \varepsilon_1 \qquad (1)$$

$$gM1\_conv_t = \alpha_2 \pm \beta_2 gM0_t \pm \varepsilon_2 \qquad (2)$$

Equations (1) and (2) are policy controllability model in Islamic banking system.

$$gM2\_isl_t = \alpha_3 \pm \beta_3 gM0_t \pm \varepsilon_3 \qquad (3)$$

$$gM2\_conv_t = \alpha_3 \pm \beta_4 gM0_t \pm \varepsilon_4 \qquad (4)$$

Equations (3) and (4) are policy controllability model in conventional banking system.

### 3.2.2 Reliability of Monetary Policy Model

Besides controllability, a useful monetary aggregate must also exhibit a reliable link with ultimate policy goals. Monetary authorities in most countries increasingly view price stability as a primary goal. In the absence of strong counter argument, we follow this common presumption and hypothesise that price stability (low inflation) represents a fundamental aspiration of monetary policy. Indeed, such thinking is predicated on the well-established monetarist theory of inflation, which assigns a prominent role for the money supply in the inflationary process. Thus in addition to being important, combating inflation appears to be a realistic and achievable policy goal.

To examine the validity and effectiveness of the Islamic and conventional instruments for maintaining price stability (inflation), the following models are analysed:

$$gP_t = \alpha_5 \pm \beta_5 gM2\_isl_t \pm \varepsilon_5 \qquad (5)$$

$$gP_t = \alpha_6 \pm \beta_6 gM2\_conv_t \pm \varepsilon_6 \qquad (6)$$

## IV. Examining The Behaviour of Money Velocity

The stability of velocity of money (*V*) plays an essential role in the economic analysis. For monetary policy authorities, they need to incorporate velocity considerations into their decisions, especially when the policy goal is to stabilise nominal GNP growth (Thornton: 1983). The hypothesis tested initially is that variance of the velocity of money in Islamic banking system is less than that of conventional banking.

As shown in table 1, the variance of *M1* velocity in Islamic banking is lower that than of conventional one, and statistically significant at 1% level of significance. This finding is not so surprising as it is in line with the findings of previous studies conducted by *Yousefi et al.*(1997), Kia (1998), and Darrat (2000).

**Table 1**
**Test of Variance of Velocity of Money**

| | Variance of M1 | Variance of M2 | F-Test | Number of Observation |
|---|---|---|---|---|
| Islamic Banking | 0.00013212 | 4.04478E-05 | 9.005185767* | 48 |
| Conventional Banking | 1.46715E-05 | 1.10379E-06 | 36.64435307* | 48 |

* Significant at 1% level.

As for *M2* velocity, Islamic banking system has higher volatility than in conventional one. It is quite surprising since we expected that the volatility would be smoother that its counterpart. This result supports the finding of Yusoff and Wilson (2005), but contradicts with those of Darrat (1988) and Hassan (1996).

The results of this comparison analysis, in fact, implies that interest based banking system still plays an important role in maintaining financial stability in Indonesia. Since it apparently, reduces instability in the underlying velocity of money.

## V. Discussing the Empirical Futures and Results

Before examining the empirical results, this section will present the results of unit root tests. Consequently, it will also deal with the issue of cointegration among the variables in the analysed model.

### 5.1 Unit Root Tests

The unit root tests are used in this study to ensure that the time series data are stationary.

The specification for the Dickey Fuller unit root test is:

$$Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_2 \Delta Y_{t-1} + \mu_t$$

in the ADF test, the unit root test can be presented as:

$$\Delta Y_t = \alpha_i Y_{t-1} + \sum_{j=1}^{k} \alpha_j \Delta_{t-j} + \mu_t$$ , where j= 1,2, …. k.

If $\alpha_1$ from the above equation is significantly different from zero then it can be said that $Y_t$ is stationary or does not have unit roots.

However, Phillips and Perron (1988) propose a nonparametric method of controlling for higher-order serial correlation in a series. The test regression for the Phillips-Perron (PP) test is the AR(1) process:

$$\Delta Y_t = \alpha + \beta Y_{t-1} + \varepsilon_t$$

While the ADF test corrects for higher order serial correlation by adding lagged differenced terms on the right-hand side, the PP test makes a correction to the t-statistic of the $\gamma$ coefficient from the AR(1) regression to account for the serial correlation in $\varepsilon$ . The correction is nonparametric since we use an estimate of the spectrum of $\varepsilon$ at frequency zero that is robust to heteroskedasticity and autocorrelation of unknown form. EViews uses the Newey-West heteroskedasticity autocorrelation consistent estimate

$$\omega^2 = \gamma_0 + 2\sum_{j=1}^{q}\left(1 - \frac{j}{q+1}\right)\gamma_j , \gamma_j = \frac{1}{T}\sum_{t=j+1}^{T}\tilde{\varepsilon}_t \tilde{\varepsilon}_{t-j}$$

where q is the truncation lag. The PP *t*-statistic is computed as:

$$t_{PP} = \frac{\gamma_0^{1/2_{t_\delta}}}{\omega} - \frac{(\omega^2 - \gamma_0) T\delta_b}{2\omega\tilde{\sigma}}$$

where $t_{\delta_b}, \delta_b$ are the *t*-statistic and standard error of $\beta$ and $\tilde{\sigma}$ is the standard error of the test regression.

In order test the stationarity of each variable; both methods Dickey Fuller and Philip Peron tests are operated with E-Views. As shown in the table 2, most of the variables are stationary in the first difference.

**Table 2**
**Summary of Augmented Dickey-Fuller (ADF) and Philip-Perron (PP) Statistics**

| | Unit Root Test | |
|---|---|---|
| **Level** | **ADF** | **PP** |
| | K=1 | k=3 |
| *gM0* | -3.091 | -3.287** |
| | K=1 | k=3 |
| *gM1_isl* | -2.313 | -2.648 |
| | K=2 | k=3 |
| *gM1_conv* | -2.677 | -7.425* |
| | K=1 | k=3 |
| *gM2_isl* | -3.014 | -3.540** |
| | K=1 | k=3 |
| *gM2_conv* | -2.820 | -3.050 |
| | K=1 | k=3 |
| *gP* | -4.219* | -4.289* |
| | K=1 | k=3 |
| *gM2_isl* | -4.362* | -6.054* |
| | K=1 | k=3 |
| *gM_conv* | -4.100** | -5.529* |
| **1st Difference** | **ADF** | **PP** |
| | K=1 | k=3 |
| *gM0* | -5.852* | -7.619* |
| | K=1 | k=3 |
| *gM1_isl* | -5.258* | -7.679* |
| | K=1 | k=3 |
| *gM1_conv* | -12.117* | -16.707* |
| | K=1 | k=3 |
| *gM2_isl* | -4.431* | -6.096* |
| | K=1 | k=3 |
| *gM2_conv* | -5.153* | -7.514* |

Note: The ADF and PP statistics were generated by model with constant and trend. k is the lag length and was determined by Akaike info criterion and Schwarz criterion for the ADF test. The PP test use the automatic lag length that suggested by Newey-West. All variables were tested in log form.
* denotes rejection of the null at 1% level ; ** denotes rejection of the null at 5% level

### 5.2 Cointegration Test

Johansen test is sensitive to the particular lag order selected for the underlying VARs, and also sensitive to the presence of residual autocorrelation (Gonzalo, 1994). Therefore, we determine the proper lag oerder in the Johansen tests based on the AIC procedure, provided that the AIC-based model also produces white-noise errors (otherwise, we expand the chosen lag until the errors prove white noise processes).

**Table 3**
**Johansen Cointegration Test Results for *gM0, gM1* and *gM2***
**in Islamic Banking System**

| Eigenvalue | Trace Statistics | 5 percent CV | 1 percent CV | Hypothesized No. of CE(s) |
|---|---|---|---|---|
| 0.602060 | 83.50531 | 29.68 | 35.65 | None* |
| 0.434728 | 42.96128 | 15.41 | 20.04 | At most 1* |
| 0.333653 | 17.86159 | 3.76 | 6.65 | At most 2 * |

***** Denotes rejection of the hypothesis at 1% significance level

As depicted in table 3, the results from the Johansen test (likelihood ratio) suggest that there is a very significant long run relationship between variables in the model at the one percent level. Evidence for cointegration between *gM0*, *gM1* and *gM2* in Islamic banking system implies that there is a long run relationship between three variables. This finding supports the long run controllability of the interest-free monetary aggregate.

**Table 4**
**Johansen Cointegration Test Results for *gM0, gM1* and *gM2***
**in Conventional Banking System**

| Eigenvalue | Trace Statistics | 5 percent CV | 1 percent CV | Hypothesized No. of CE(s) |
|---|---|---|---|---|
| 0.541293 | 56.06568 | 29.68 | 35.65 | None* |
| 0.334703 | 27.99681 | 15.41 | 20.04 | At most 1* |
| 0.013920 | 9.609043 | 3.76 | 6.65 | At most 2* |

* Denotes rejection of the hypothesis at 1% significance level

Evidence for cointegration between *gM0*, *gM1* and *gM2* in conventional banking system, as depicted in table 4, demonstrates a strong result as well, since it rejects the null hypothesis at one percent level. Comparing the trace statistics results in in table 3 and 4, we may have a presumption that monetary money demand in Islamic banking is likely more controllable than in the conventional banking system.

**5.3 Policy Controllability**
The following table provides the comparison of the results of these two models:

$$gM1\_isl_t = \alpha_1 \pm \beta_1 gM0_t \pm \varepsilon_1 \quad \text{: for Islamic banking system} \quad (1$$
$$gM1\_conv_t = \alpha_2 \pm \beta_2 gM0_t \pm \varepsilon_2 \quad \text{: for conventional banking system} \quad (2)$$

**Table 5**
**Regression Results of the Relationship between *gM0* and *gM1***

| **Model 1 (Islamic Banking System)** | **Estimated Values** | **Model 2 (Conventional Banking System)** | **Estimated Values** |
|---|---|---|---|
| **Dependent Variable** | ***gM1_isl*** | **Dependent Variable** | ***gM1_conv*** |
| *C* | .000612<br>(.226847) | *C* | 0.006604<br>(3.675712) |
| *GM0* | .906632<br>(14.3207) | *gM0* | . 395230<br>(9.11916) |
| *AR(1)* | -.4305<br>(-3.126605) | *AR(1)* | -.0512935<br>(-3.99330) |
| $R^2$ | .814623 | $R^2$ | .617789 |
| *R Bar Square* | .806000 | *R Bar Square* | .600012 |
| *F-Statistic* | 94.47958 | *F-Statistic* | 34.75168 |
| *DW-Statistics* | 1.986335 | *DW-Statistics* | 2.000022 |

*Note*: Figures in parentheses are t-statistics

As can be seen, in the regression results (see table 5), the slope coefficient indicate that for every 1 unit change in *gM0*, *gM1_isl* increases by .000612 million rupiah, which is very small. There is a positive correlation and significant between the two variables. However, the influence of *AR(1)* on *gM1_isl* is negative and also significant.

The models have been modified into the autoregressive model in order not only to remove the autocorrelation problem, but also to imply that the value of variable at time *t* is effected by its value at time *t-1*. More importantly, it will give the good effect to the value of DW.

As regard to the issue of policy controllability, the value of $R^2$ has a very important implication. Reflected by the table, it is very obvious that the result in the model 1 is more robust that in the model 2 (conventional banking system).

**Table 6**
**Estimation of Error Correction Model for Policy Controllability of M1 Model**

| **Model 1 (Islamic Banking System)** | **Estimated Values** | **Model 2 (Conventional Banking System)** | **Estimated Values** |
|---|---|---|---|
| **Dependent Variable** | ***gM1_isl*** | **Dependent Variable** | ***gM1_conv*** |
| *C* | .000591 (.250753) | *C* | .007112 (3.80206) |
| *GM0* | .899380 (13.77762) | *gM0* | .354168 (7.387) |
| *AR(1)* | -.743981 (-5.5058) | *AR(1)* | -.458425 (-1.6644) |
| *ECM(-1)* | .329521 (2.181646) | *ecm(-1)* | .030149 (.145559) |
| $R^2$ | .826365 | $R^2$ | .657818 |
| *R Bar Square* | .808556 | *R Bar Square* | .622722 |
| *F-Statistic* | 46.40228 | *F-Statistic* | 18.74361 |
| *DW-Statistics* | 2.1226 | *DW-Statistics* | 1.9616 |

In the model 1, growth in the base money explains about 91% variations in the *gM1_isl*. On the other hand, in model 2, growth in the base money explains only around 40% of total variatios in the *gM1_conv*.

Table 6 presents the results of ECM model (short run dynamics), which evidence that the coefficient of ECM is significant in Islamic banking system, not in conventional one. Hence, about 33% of disequilibrium is corrected each period. Again, the result of $R^2$ in Islamic banking system is higher than its counterpart.

The next table is the results of the following model :

$$gM2\_isl_t = \alpha_3 \pm \beta_3 gM0_t \pm \varepsilon_3 \quad \text{: for Islamic banking system} \quad (3)$$

$$gM2\_conv_t = \alpha_4 \pm \beta_4 gM0_t \pm \varepsilon_4 \quad \text{: for conventional banking system} \quad (4)$$

**Table 7**
**Regression Results of the Relationship between *gM0* and *gM2***

| **Model 3 (Islamic Banking System)** | **Estimated Values** | **Model 4 (Conventional Banking System)** | **Estimated Values** |
|---|---|---|---|
| **Dependent Variable** | ***gM2_isl*** | **Dependent Variable** | ***gM2_conv*** |
| *C* | -.000432<br>(-.067987) | *C* | 0.006465<br>(5.23425) |
| *GM0* | .301111<br>(3.709242) | *gM0* | 0.119536<br>(4.37326) |
| *AR(1)* | .235662<br>(1.80438) | *AR(1)* | -.301645<br>(-1.90065) |
| $R^2$ | .268615 | $R^2$ | .258723 |
| *R Bar Square* | .234597 | *R Bar Square* | .224245 |
| *F-Statistic* | 7.89628 | *F-Statistic* | 7.503990 |
| *DW-Statistics* | 2.195947 | *DW-Statistics* | 1.668710 |

*Note*: Figures in parentheses are t-statistics

A comparison between the two models shows a very similar finding to the previous analysis when we discuss the relationship between base money and *M1*. In table 7, the model of Islamic banking system shows more robust results than in the conventional banking system. This is reflected by the value of $R^2$ (27% in Islamic banking system), which is slightly higher than in the conventional banking system (26%).

The results of the dynamic model in table 8 show that the impact of the growth rate of monetary base on the growth rate of *M2* is getting higher in Islamic banking system, while it is getting lower in conventional banking. As for the value of $R^2$ , again, Islamic banking system gives higher result that the conventional system. In addition, the ECM result in Islamic banking system is also significant and the adjustment coefficient is quite rapid, around 47%.

**Table 8**
**Estimation of Error Correction Model for Policy Controllability of *M2* Model**

| **Model 3 (Islamic Banking System)** | **Estimated Values** | **Model 4 (Conventional Banking System)** | **Estimated Values** |
|---|---|---|---|
| **Dependent Variable** | ***gM2_isl*** | **Dependent Variable** | ***gM2_conv*** |
| *C* | -.001545<br>(-.507589) | *C* | .006993<br>(4.9347) |
| *GM0* | .306198<br>(4.0188) | *gM0* | .101989<br>(3.6269) |
| *AR(1)* | -.506195<br>(-3.79695) | *AR(1)* | -.155701<br>(-.60921) |
| *ECM(-1)* | .474758<br>(3.66209) | *ecm(-1)* | -.03984<br>(-.24809) |
| $R^2$ | .34885 | $R^2$ | .31578 |
| *R Bar Square* | .28207 | *R Bar Square* | .2456 |
| *F-Statistic* | 5.2236 | *F-Statistic* | 4.4999 |
| *DW-Statistics* | 1.98009 | *DW-Statistics* | 1.666041 |

From the results above, we may conclude that *M1* and *M2* in Islamic banking system in Indonesia is more controllable that that of the conventional system. This result also implies that monetary authority has more control over Islamic banks' deposit.

**5.4 Reliability of Monetary Policy**

In this section, the following models were estimated to examine the reliabiloity of monetary policy:

$$gP_t = \alpha_5 \pm \beta_5 gM2\_isl_t \pm \varepsilon_5$$ ; for Islamic banking system (5)

$$gP_t = \alpha_6 \pm \beta_6 gM2\_conv_t \pm \varepsilon_6$$ ; for conventional banking system (6

**Table 9**
**Regression results of the relationship between *gM2* and *gP***

| **Model 5 (Islamic Banking System)** | **Estimated Values** | **Model 6 (Conventional Banking System)** | **Estimated Values** |
|---|---|---|---|
| **Dependent Variable** | ***gP*** | **Dependent Variable** | ***gP*** |
| *C* | .005408 (3.000949) | *C* | 0.003667 (1.459115) |
| *GM2_ISL* | .014898 (.258500) | *gM2_conv* | 0.226168 (1.056701) |
| *AR(1)* | -.340358 (-2.133173) | *AR(1)* | -.282473 (-1.650253) |
| $R^2$ | .096932 | $R^2$ | .120036 |
| *R Bar Square* | .054929 | *R Bar Square* | .079108 |
| *F-Statistic* | 2.307743 | *F-Statistic* | 2.93282 |
| *DW-Statistics* | 1.922238 | *DW-Statistics* | 1.922162 |

The results in table 9 show the robustness of the model in the conventional banking system. Since the $R^2$ in the conventional model gives higher value than in the Islamic one. This finding is not in line with the previous studies, which always support the strong linkage between the monetary aggregate and ultimate policy goals (see Darrat and Kia, 2003).

Despite the fact that none of the variable is significant, the result shows that in Indonesia, interest based system is still superior than Islamic banking system in running its role to set the policy objectives.

The results of the dynamic model justify the effectiveness of monetary policy in conventional banking system over its target, as can be seen in table 10. Comparing the value of ECM from both system, we know that, in conventional banking system, the adjustment towards disequilibrium is more rapid (around 64%) than in Islamic banking system (only 58%). More importantly, it might explain why the volatility of *M2* velocity in Islamic banking system is higher than that of conventional system.

**Table 10**
**Estimation of Error Correction Model for Policy Reliability**

| **Model 5 (Islamic Banking System)** | **Estimated Values** | **Model 6 (Conventional Banking System)** | **Estimated Values** |
|---|---|---|---|
| Dependent Variable | *gP* | Dependent Variable | *gP* |
| *C* | .00433<br>(1.3648) | *C* | .001151<br>(.2578) |
| *GM2_ISL* | .011779<br>(.15445) | *gM2_conv* | .32685<br>(1.4474) |
| *AR(1)* | .19763<br>(.6972) | *AR(1)* | .343163<br>(1.2759) |
| *ECM(-1)* | -.581819<br>(-2.0646) | *Ecm(-1)* | -.6408<br>(-2.6007) |
| $R^2$ | .157500 | $R^2$ | .198764 |
| *R Bar Square* | .071089 | *R Bar Square* | .116586 |
| *F-Statistic* | 1.8226 | *F-Statistic* | 2.418698 |
| *DW-Statistics* | 1.98086 | *DW-Statistics* | 1.9927 |

## VI. Concluding Remarks

Researchers have expanded enormous efforts exploring the essence of interest free banks and their efficiency relative to the more conventional interest-based banks. However, much of the evidence brought to bear on the subject has been theoretical in nature. In this study, we focus attention on empirically testing the behaviour of monetary aggregate in dual banking system. With time series data spanning the period 2001-2004, the money velocity behaviour has also been analysed in the study.

Even though a coherent picture seems to emerge from a whole range of empirical models and tests in support of interest-free monetary system in the previous studies, in this study we find the opposed results.

Of course, the empirical results in this paper are only suggestive and certainly do not provide definitive conclusion on the issue of the relative merits of interest-based versus interest free banking systems. The findings in this study show that Islamic banking system in Indonesia is less effective in controlling the monetary authority goal (price stability) than in conventional banking system. This is may be due to the small fraction of Islamic banking assets, as compared to the total assets of the whole banking system in Indonesia.

Further research needs to be conducted in several directions. In particular, the paper deduces the results for the two alternative monetary systems from their respective monetary system with long range of data. Moreover, the period examined in the paper covers four years (monthly data). Although the sample appears sizeable and, in fact, exhaust all available data, reliable cointegration tests may require an even longer span of time. It is also possible that model specifications, measurement errors, or other estimation problems are wholly or party responsible for the empirical results reported in the study.

Finally, this study examines the monetary aggregates performance in dual banking system in the context of aggregate (macro) data. It would be interesting to focus attention on the relative monetary efficiency at the individual bank (micro) level.

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