Determinants of Islamic Banks' Deposits in Indonesia: An ARDL Modeling Approach

Prof. Dato' Dr. Mohd. Azmi Omar[*]
Deputy Rector (Academic & Research)
International Islamic University Malaysia
P.O Box 10, 50728 Kuala Lumpur Malaysia
azmiomar@iiu.edu.my

Nyimas Rohmah[**]
Kulliyyah of Economisc & Management Sciences
International Islamic University Malaysia
P.O Box 10, 50728 Kuala Lumpur Malaysia
nyimas_rohmah@bi.go.id

ABSTRACT

There are not many studies investigating the determinants of banks' deposit especially the Islamic banks' deposit. Thus the purpose of this study is to examine the relationship between the real level of deposit in Islamic banks in Indonesia and its measurable determinants such as real rate of return, real interest rate, number of Islamic banks' branches, and real income. We employ the Autoregressive Distributed Lag (ARDL) modeling approach to test the existence of long-run relationship between the variables. This method was proposed by Pesaran and Shin (1995/1997). The main advantage of this approach is that it can be applied irrespective whether the underlying regressors are I(0) or I(1). The data used in this study is monthly data from March 2000 to February 2006 (72 observations). The result shows that there is a long-run relationship between real level of deposits and its predictors. Islamic banks' depositors are rational depositors who are influenced by the fluctuations of the real rate of return as well as the real interest rate. It also indicates that the displaced commercial risk does exist in Islamic banking system in Indonesia. This study also shows that the number of Islamic banks' branches and income have positive effect on the real level of deposit. The error correction term is found to be negative and significant. The finding gives more evidence that the model is cointegrated in the long-run.

Keywords: *Deposit Determinants, Depositors Behaviour, Islamic Bank, Displaced Commercial Risk, Autoregressive Distributed Lag Model, Bounds Tests, Cointegration, Indonesia*

INTRODUCTION

The first Islamic bank in Indonesia, Bank Muamalat Indonesia (BMI), was established in 1992. The Act 1998 No. 10 based on the amendment of the Act 1992 No. 7 concerning banking came into force to give stronger legal foundation for the existence of Islamic banking system in Indonesia. Thus, Indonesia applies dual banking system whereby Islamic and conventional banking systems operate side by side to serve the public.

As an intermediary institution, Islamic bank in Indonesia also mobilizes funds from Surplus Spending Units (SSUs) in the form of deposits and channels the funds to Deficit Spending Units (DSUs). Thus, Islamic bank also depends on depositors' money to run its business. Bank Indonesia statistics showed that until February 2006, 73% percent of the total assets of Islamic banks in Indonesia are financed by the funds from depositors. In the Islamic banking development framework, it is obvious that the factors that determine the level of deposit in Islamic banking are important issues to be looked at.

There are numerous researches on the saving determinants from macroeconomics perspectives. However, the study that focused on determinants of banking's deposit is not that much. One such study has been conducted by Shrestha and Chowdhury in 2005. They tested the effect of interest rate, income, and number of branches on deposit held at a bank in Nepal.

Furthermore, little research has been carried out on Islamic banks' deposit. Most studies are found for Malaysian case (Haron and Shanmugam, 1995; Haron and Norafifah, 2000; Sukmana and Rosylin, 2005). However, one pioneer study for Indonesian case has been conducted by Mangkuto in 2004. All of these studies only attempted to see the effect of rate of return and interest rate on Islamic banks deposit. A more comprehensive study on this area has been conducted by Haron and Wan Nursofiza in 2005. Besides the financial variables such as rate of return and interest rate, they also incorporated some macroeconomic variables in the model.

Studies on Islamic banks' customers' behaviour based on survey using questionnaires gained more attention. The studies have been conducted in several countries such as Jordan (Erol and El-Bdour, 1989; Naser, Jamal, and Al-Khatib, 1999), Malaysia (Haron, Norafifah, and Planisek, 1994), Singapore (Gerrard and Cunningham, 1997), and Bahrain (Metawa and Almossawi, 1998). In Indonesia, the studies on potency, preference, and people's behaviour toward Islamic bank have been conducted by Bank Indonesia since 2000 to 2005. With collaboration from several universities, Bank Indonesia had carried out the study covering at least 11 provinces in Indonesia. The studies revealed that most people choose Islamic bank because of its conformity with *sharia* principles and the location of the branch. They also found that rate of return is not a significant reason in preferring Islamic bank. The perception on interest rate is ambiguous. Most of the respondents agreed that interest rate is prohibited in Islam. However, they are not against the interest rate application in banking system.

In the dual banking system environment, Islamic banks have to meet challenges to compete with their conventional counterparts. They have to face the same pool of funds provider with various bank selection criteria. Previous studies did not give clear indication whether religious reason is a dominant factor in choosing Islamic banks or not. However, other researchers found that financial factors such as rate of return and conventional interest rate as significant factors that determine the level of deposits in Islamic banks.

The main purpose of this study is to quantify the purported link between the level of deposit of Islamic banks in Indonesia and its measurable determinants such as rate of return, interest rate, number of Islamic banks' branches, and income. There are several objectives in this study. The first one is to determine whether the Islamic banks' depositors are motivated by profit objective. It can be seen in the significance of rate of return and interest rate variables in determining the level of deposit. The significance of the interest rate variable also reveals whether displaced commercial risk (withdrawal risk) exists or not in Islamic banking system in Indonesia. This study also attempts to determine whether the policy to increase the number of Islamic banks' branches is the right one within the Islamic banking development framework. Lastly, we want to determine whether the increase of level of income also has a positive relationship with the increase in the level of deposit of Islamic banks.

There is only one study that has been done to examine the relationship between level of deposit in Islamic banks and its determinants in Indonesia. By using simple regression (OLS), Mangkuto (2004) captured only two financial variables such as the rate of return and interest rate in his model. Furthermore, the object of the study is only one Islamic bank in Indonesia i.e. Bank Muamalat Indonesia (BMI). He found that both explanatory variables affect the level of deposit. However, the study done by Bank Indonesia found that profit objective did not motivate people to deposit their fund in Islamic Bank.

Therefore, this study will improve the previous study done by Mangkuto (2004). We will use the latest development of time series econometrics method. Furthermore, there will be more explanatory variables to be used in this study such as rate of return, interest rate, number of Islamic banks' branches, and income. This study will also cover all Islamic banks in Indonesia including the Islamic banking units. Thus, this study will be the first study that represents the Islamic banking industry in Indonesia.

The rest of this paper is structured as follows. First, the extant literatures on determinants of saving behaviour, Islamic banks deposit, and Islamic banks' customers' behaviour are reviewed. This is followed by a description of the data and research method used in the study. Then the findings are discussed and summarized. Finally, implications, limitations, and directions for future research are offered.

LITERATURE REVIEW
To see the relationship between the level of deposit in Islamic banks and its determinants, we have to review the theory and empirical researches on saving determinants from macroeconomics perspectives. Then we shall explore the studies on the Islamic banks' deposit itself. To give a better perspective on this topic, we will also assess the depositors' behaviour of Islamic banks.

Most of the saving theory is derived from the consumption theory. Keynes (1936) stated that saving means the excess of income over expenditure on consumption. Thus saving is a function of income. Further development of the saving theory is proposed by Modigliani and Brumberg (1954). The theory is known as life-cycle hypothesis. There are many empirical studies on the saving behaviour all over the world. However, only the important ones are described in this section, especially those which focus on private saving behaviour in developing countries.

Snyder (1974) sought to review the econometric literature on household saving behaviour in developing countries. Based on several existing literatures at that time,

he classified at least six determinants of household saving such as current income, permanent income, wealth, interest rate, price level, and demographic characteristics.

Masson, Bayoumi, and Samiei (1998) extended the empirical knowledge of private saving behaviour by looking at a broad set of possible determinants of private saving. They identified at least five variables that could affect the private saving in those countries, i.e., demographic factor, GDP growth, GDP per capita, real interest rate, and term of trade.

Loayza, Hebbel, and Serven (2000) also extended the previous literatures in several dimensions. Based on the previous panel studies, they identified nine determinants of the private saving ratio such as income; rate of return uncertainty; domestic borrowing constraints; foreign borrowing constraints; financial depth; fiscal policy; pension system; demographics; and income and wealth distribution.

Another study that focused on Asian countries has been conducted by Agrawal (2001). He attempted to estimate the saving functions in seven Asian countries, i.e., South Korea, Taiwan, Singapore, Malaysia, Thailand, Indonesia, and India. He examined the relationship between savings rate and its potential determinants such as real income per capita, growth, dependency ratio, real interest rate, foreign savings per GNP, and provident fund rate.

A study that focused on the determinants of deposits held at banks has been conducted by Shrestha and Chowdhury in 2005. By using Autoregressive Distributed Lag (ARDL) model, they sought to test the relationship in Nepal case. They identified three explanatory variables such as real GDP, real deposit rate, and average population density per bank branch. They found that there is a long-run relationship in the model. The real interest rate has a significant effect on the real time deposits in long-run. Meanwhile, in the short-run, a change in real income and real interest rate are associated with a change in the real savings.

The macroeconomics factors give wide array on potential determinants of private saving behavior. Based on theories and empirical studies, we can identify many variables such as income (absolute income hypothesis), wealth, dependency ratio (life-cycle hypothesis), interest rate (liquidity constraint), inflation (precautionary saving), terms of trade, and pension system. However, in this study we will focus on relevant macroeconomic variables for Indonesia case such as income, interest rate of consumption credit, and inflation.

There are several studies that have been conducted to examine the relationship between Islamic bank's deposit and its determinants. Most studies are found for Malaysian case. However, there is one study for Indonesian case. These studies only focus on rate of return and conventional bank's interest rate as the potential determinants. Though, the latest study also incorporated the macroeconomics variables on their model.

Haron and Shanmugam (1995) measured the strength of the relationship between the various types of deposits facilities of Islamic banks and their 'rate of profit'. The observation period was ten years from 1984 to 1993. The result showed that there is inverse effect between the rates of profit and the level of deposits. This inverse effect is contrary to the normal behaviour of people of wealth maximization. They concluded that Islamic bank customers do not consider returns from the investment as an incentive to maintain funds with the Islamic bank.

By using a simple regression, Haron and Norafifah (2000) examined the effect of the interest rates and rates of profit on funds deposited in Islamic banks in Malaysia. The study adopted 'Adaptive Expectation Model' using monthly data from January

1984 to December 1998. The result showed that the rates of profit have strong positive relationship with Islamic banks' deposits. Meanwhile the interest rates have strong negative relationship. They concluded that Islamic banks' customers in Malaysia are guided by the profit motive.

A similar study has been applied in Indonesia by Mangkuto (2004). He examined the effect of *mudaraba* deposit yield in Islamic bank and time deposit interest rate in conventional bank on *mudaraba* deposit in Islamic bank. The 1-month *mudaraba* deposit was used as the dependent variable. As the explanatory variables, he used 1-month *mudaraba* deposit yield (lag 1) and 1-month conventional deposit yield. Bank Muamalat Indonesia as the first Islamic bank in Indonesia was used as the object of the study. The result showed that *mudaraba* deposit yield has positive correlation with the *mudaraba* deposit while conventional deposit yield has negative correlation. He concluded that depositor decision to put his/her money in Islamic bank was determined by the yield of the deposit.

Futhermore, Sukmana and Rosylin (2005) sought to extend the study by Haron and Norafifah (2000). They examined the short-run and long-run relationship among the rate of return of deposit in Islamic banking scheme, the interest rate of the conventional banks, and the amount of saving deposits in Islamic banking scheme in Malaysia. The findings supported the previous research by Haron and Norafifah (2000). The empirical evidence suggested that interest rate remains to be a significant variable in determining people to deposit in Islamic bank. They also noted that as long as Malaysia practices dual banking system, there will always be movements of funds between the two systems -conventional and Islamic- since the products are seen as substitutes rather than complements.

The most recent study has been done by Haron and Wan Nursofiza (2005). They classified the depositors of Islamic banking system in Malaysia into four economic units such as government, financial institutions, business enterprises, and individuals. They measured the relationship between the level of deposit and its determinants. Besides the financial variables such as rate of return and interest rate, they also incorporated the macroeconomic variables such as Base Lending Rate (BLR), Kuala Lumpur Composite Index (KLCI), Consumer Price Index (CPI), money supply (M3), and Gross Domestic Product (GDP). They found that there is a long-run relationship between the amount of deposits placed in the Islamic banking system in Malaysia and financial and also economic variables. Their findings suggested that economic units have similar behavioural patterns. They also found that all Islamic bank depositors are sensitive to the movement in financial variables. Generally, all economic variables had significant relationship with the level of deposit

Based on the empirical studies above, we can conclude that the level of deposit in Islamic banks is determined by its rate of return and also by the interest rate offered by the conventional bank. Thus those studies proved that the displaced commercial risk does exist in Islamic banks. Moreover, the level of deposit in Islamic banks was also determined by macroeconomic variables. This is due to the fact that deposit in Islamic banks is also part of the national saving of a country.

Displaced commercial risk is a new term in the banking risk literature that mainly arises from the risk faced by Islamic banks in the liabilities' side. There are not many literatures that discussed on this topic. The most recent and structured concept is set up by Islamic Financial Services Board (IFSB). At the end of year 2005, they issued Guiding Principles of Risk Management for Institutions Offering Only Islamic Financial Services (IIFS). Based on the guideline, displaced commercial risk

is a consequence of rate of return risk. IIFS may be under market pressure to pay a return that exceeds the rate that has been earned on assets financed by depositors when the return on assets is underperforming as compared with competitors' rate.

Another approach to examine the behaviour of Islamic banks' depositors has been done by using qualitative research. Several studies have been conducted to investigate the factors that determine the behaviour of Islamic banks' depositors by using questionnaires.

Erol and El-Bdour (1989) attempted to investigate the attitudes of bank customers toward Islamic banks in Jordan. They also attempted to determine the selected patronage factors in choosing conventional banks or Islamic banks. Their interesting finding was that religious motivation did not appear to be the primary criterion for the selection of Islamic banking services. On the other hand, the highest responses were obtained in profitability motives. Thus, it signified the profit maximizing behaviour of Islamic banks' customers. They also found that there is a tendency for depositors to withdraw their funds from Islamic banks in case the Islamic banks announce that they will not distribute profits.

For the bank selection criteria, the result showed that generally there are not significant differences between conventional and Islamic bank customers when choosing a bank. However, there were significant differences between conventional and Islamic bank customers in financial factors such as interest payment on saving. Islamic bank customers saw "higher interest payment on saving" less important when choosing a bank compared to conventional bank customers. Some factors that considered being important for both conventional and Islamic bank customers such as fast and efficient service; bank's reputation and image; confidentiality of the bank; friendliness of bank personnel; and location being near home or work.

A similar study also has been conducted in Malaysia by Haron, Ahmad, and Planisek (1994). They found that the most important reason why people patronizing BIMB were both religion and profit factor. However, this result is a little bit different with the Erol and El-Bdour (1989) findings. Malaysian still view religious factor as one of the factor that determine the bank selection. Interestingly, they found that there is no significant difference between Muslim and non-Muslim bank customers on "higher interest payments on saving accounts" factor. Some important of selection factors for Muslim customers based on the rank were fast and efficient services; speed of transactions; friendliness of bank personnel; and confidentiality of a bank.

Another study has been conducted in Singapore by Gerrard and Cunningham (1997). They attempted to examine the attitudes of the respondents towards Islamic banking. They found similar result with Haron et al., (1994) that the most important reason which motivates people to deposit their money at an Islamic bank was "religious and profitability reasons combined". As expected, the respondents have a tendency to agree that more people will utilize the services provided by Islamic banks if more branches are open up. Furthermore, they also found that Muslim customers will remain a depositor at the Islamic bank even if it announced that it had no profit to distribute. However, non-Muslim customers will withdraw all deposits at once and put them to other banks which guarantee a return if the Islamic bank do not distribute any profit. These facts are supported by the result in bank selection criteria. Muslim and non-Muslim customers have significant difference in viewing "higher interest payment on savings" factor. Muslim customers saw the factor less important (ranking 12) compared to non-Muslim customers (ranking 2). This finding supported the previous study done by Erol and Bdour (1989). However, it was different with the

finding of Haron et al., (1994). Some of the important factors for both Muslim and non-Muslim customers in choosing a bank were provision of fast and efficient service, confidentiality of bank, confidence in bank's management, a wide range of services provided, and bank's reputation and image.

Another study in Bahrain has been done by Metawa and Almossawi (1998). They investigated the degree of importance of factors affecting the customer choice of Islamic banks. They found that Islamic principle was the most important factor in the bank selection process. They concluded that the selection of Islamic banks appears to be predominantly a religious-based decision. Other important factors in the selection of Islamic banks were rate of return, family and friend recommendation, and convenient location.

Another study in Jordan has been conducted by Naser, Jamal, and Al-Khatib (1999). The result showed some of the important reasons behind dealing with the Islamic bank (based on the rank) were bank reputation, religious reasons only, the Islamic bank offers the same facilities, bank confidentiality, and religious and profitability reasons. Interestingly, they found that "profitability reasons (high return on investment) only" did not appear to play a major role in banking choice of Islamic bank customers.

Study on potency, preference, and people's behaviour toward Islamic bank also has been done by Bank Indonesia in year 2000 to 2005. Bank Indonesia performed this study with collaboration with several universities to cover at least 11 provinces in Indonesia. The studies revealed that the main reason to choose bank service; in both conventional and Islamic; was the location (the people's accessibility to the bank). However, Islamic bank actually had an advantage on religious factor that became dominant in people's consideration in bank selection. However, the perception on interest rate was ambiguous. Most of the respondents agreed that interest rate was prohibited in Islam. But, they were not against the interest rate application in banking system. Furthermore they also found that rate of return was not a significant reason in adopting Islamic bank.

Based on the empirical studies above, there are mixed results on the factors that determine people to become Islamic banks' depositors. Some studies showed that the respondents view religious factor as the important factor in Islamic banks. Other studies suggested that profitability factor or combination of religious and profitability factor as the significant factor in choosing Islamic banks. Furthermore, there are other factors that influence people to deal with Islamic banks such as location, fast and efficient service, bank confidentiality, friendliness of bank personnel, and bank's reputation and image. In general, there are no significant differences between Muslim and non-Muslim customers in viewing those factors. The location factor could be proxied by the number of branches of Islamic banks. The other factors, however, are difficult to measure quantitatively.

DATA AND METHODOLOGY

Following Shrestha and Chowdhury (2005) and the previous literatures, our empirical model is written as follows:

$$LNRDEP_t = \alpha_0 + \alpha_1 RR1LAG1_t + \alpha_2 RI1_t + \alpha_3 LNBRANCH_t + \alpha_4 LNIPI_t + \varepsilon_t \quad (1)$$

where, $LNRDEP$ is the real level of *mudaraba*-investment deposit in Islamic banks (in log form), $RR1LAG1$ is the real rate of return for 1-month *mudaraba*-investment deposit in Islamic banks (lag 1 month), $RI1$ is the real interest rate for 1-month time

deposit in conventional banks, *LNBRANCH* is the number of Islamic banks' branches (in log form), and *LNIPI* is the industrial production index (in log form).

Figure 1 about here

It is clear from Figure 1 above that real level of deposit and number of Islamic banks' branches (in log form) show steadily rising trends with real level of deposit growing at a faster rate than number of bank branches. This suggests, at least initially, that a linear trend should be included in the ARDL model. Meanwhile, the industrial production index does not show any increasing pattern.

Figure 2 about here

From Figure 2, we can see that the real rate of return (1-month lag) and the real interest rate are sharing relatively the same pattern. From March 2000 to August 2003, the real rate of return was below the real interest rate. Afterward the real rate of return slightly exceeded the real interest rate. However, since October 2005 the real rate of return was below the real interest rate again.

We employ data over the period March 2000 to February 2006 (72 monthly observations). All of these data are obtained from Bank Indonesia.

In this study we used Autoregressive Distributed Lag (ARDL) Modeling Approach. This methodology has been proposed by Pesaran and Shin (1995/1997). They examine the use of ARDL model for analysis of long-run relation. The advantage of this approach is that it can be applied to studies that have a small sample, such as the present study (72 observations). However, the main advantage of this new procedure lies in the fact that it can be applied irrespective whether the underlying regressors are I(0) or I(1). This avoids the pre-testing problems associated with standard cointegration analysis which requires the classification of the variables into I(1) and I(0) (Pesaran and Pesaran, 1997/2002). This method also estimates the long-run and short run components of the model simultaneously, removing problems associated with omitted variables and autocorrelation (Narayan, 2004).

The ARDL procedure involves at least three stages, i.e., lag determination, bounds testing, and the estimation of long-run relation as well as the associated error correction model. We used Microfit 4.1 developed by Pesaran and Pesaran (1997/2002) in conducting this procedure.

First, the error correction version of the ARDL model in the variables *LNRDEP*, *RR*1*LAG*1, *RI*1, *LNBRANCH* and *LNIPI* is given by:

$$
\Delta LNRDEP_t = a_0 + a_1 t + \sum_{i=1}^{p-1} b_i \Delta LNRDEP_{t-i} + \sum_{i=0}^{p-1} d_i \Delta RR1LAG1_{t-i} + \sum_{i=0}^{p-1} e_i \Delta RI1_{t-i}
$$

$$
+ \sum_{i=0}^{p-1} f_i \Delta LNBRANCH_{t-i} + \sum_{i=0}^{p-1} g_i \Delta LNIPI_{t-i} \quad\quad (2)
$$

$$
+ \delta_1 LNRDEP_{t-1} + \delta_2 RR1LAG1_{t-1} + \delta_3 RI1_{t-1}
$$

$$
+ \delta_4 LNBRANCH_{t-1} + \delta_5 LNIPI_{t-1} + \mu_t
$$

In the above equation, the terms with the summation signs represent the error correction dynamics, while the second part (terms with δ s) correspond to the long-run relationship.

The above specification is also based on the assumption that the disturbances μ_t are serially uncorrelated. It is therefore important that the lag order p of the underlying model is selected appropriately (Pesaran, Shin, and Smith, 2001). A

decision on the appropriate lag length also must be made concerning the time trend in equation (2) and whether its coefficient should be restricted. To determine the appropriate lag length *p* and whether a deterministic trend is required, we estimate (2) by Least Squares (LS), with and without a linear time trend (t). Since our observations are monthly, it is a good idea to include at least 12 lags in the regression (Hamilton, 1994). After we found the appropriate lag length based on AIC or SBC with no serial correlation in the model, we can continue to the next stage, i.e., bounds testing.

The existence of long-run relation is tested by computing the F-statistic for testing the significance of the lagged levels of the variables in the conditional unrestricted error correction form of the underlying ARDL model (2). The hypothesis that we will be testing is the null of 'non-existence of the long-run relationship' defined by $H_0 : \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = 0$

against $H_1 : \delta_1 \neq 0, \quad \delta_2 \neq 0, \quad \delta_3 \neq 0, \quad \delta_4 \neq 0, \quad \delta_5 \neq 0$

The relevant statistic is the F-statistic for the joint significance of δ_1, δ_2, δ_3, δ_4, and δ_5. However, the (asymptotic) distribution of this F-statistic is non standard, irrespective of whether the regressors are I(0) or I(1). Pesaran, et al. (2001) have provided two sets of asymptotic critical values for different number of regressors (k), and whether the ARDL model contains an intercept and/or trend.[1] The first set assuming that all variables in the ARDL model are purely I(1) and the other if they are all purely I(0). The first one is known as the upper bound and the latter is known as the lower bound. Thus, it is called bounds testing approach. If the computed F-statistic exceeds the upper bound, we can conclude that there is long-run relationship between the variables. If the F-statistic falls below the lower bound, we can conclude that there is no long-run relationship between the variables. If the F-statistic falls within lower and upper bound, we cannot make a conclusive decision. The result of inference depends on whether the underlying variables are I(0) or I(1). Thus, we have to carry out unit root tests on the variables. If there is a long-run relationship based on the bounds test, we can continue to the last stage, i.e., estimation of long-run coefficients and the associated error correction model.

Having found a long-run relationship (cointegration), equation (1) is estimated using the following ARDL (m_1, m_2, m_3, m_4, m_5) model:

$$LNRDEP_t = \alpha_0 + \sum_{i=1}^{m_1} \alpha_1 LNRDEP_{t-i} + \sum_{i=0}^{m_2} \alpha_2 RR1LAG1_{t-i} + \sum_{i=0}^{m_3} \alpha_3 RI1_{t-i}$$
$$+ \sum_{i=0}^{m_4} \alpha_4 LNBRANCH_{t-i} + \sum_{i=0}^{m_5} \alpha_5 LNIPI_{t-i} + \omega_t \qquad (3)$$

In the presence of cointegration, short-run coefficients can also be derived by constructing an Error Correction Model (ECM) of the following form:

$$\Delta LNRDEP_t = \beta_0 + \sum_{i=1}^{p-1} \beta_1 \Delta LNRDEP_{t-i} + \sum_{i=0}^{p-1} \beta_2 \Delta RR1LAG1_{t-i} + \sum_{i=0}^{p-1} \beta_3 \Delta RI1_{t-i}$$
$$+ \sum_{i=0}^{p-1} \beta_4 \Delta LNBRANCH_{t-i} + \sum_{i=0}^{p-1} \beta_5 \Delta LNIPI_{t-i} + \psi \, ECM_{t-1} + \vartheta_t \qquad (4)$$

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[1] Narayan (2004) also has provided a new set of critical values for sample sizes ranging from 30 observations to 80 observations.

For the estimation of levels effects and short-run dynamic or real level of deposit adjustment, the use of a more parsimonious specification seems advisable (Pesaran, et al., 2001). Microfit will select the lag orders of an ARDL (m_1, m_2, m_3, m_4, m_5) model in the five variables ($LNRDEP_t$, $RR1LAG1_t$, $RI1_t$, $LNBRANCH_t$, $LNIPI_t$) by searching across the $(p+1)^{k+1}$ different ARDL models in order to obtain the optimal lags for each variable.[2] The selection can be based on four criteria: the $\overline{R}^2$ criterion, Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SBC), or the Hannan-Quinn Criterion (HQC). However, in this study, we will only use the two most common criteria such as AIC and SBC. SBC method is slightly more superior than AIC.[3]

The program then computes the long-run coefficients and their asymptotic standard errors for the selected ARDL model. It also provides estimates of the Error Correction Model (ECM) which corresponds to the selected ARDL model. The ECM integrates the short-run dynamics with the long-run equilibrium without losing long-run information. Thus, the changes in the dependent variable are a function of both the level of disequilibrium in the cointegration relationship (represented by the ECM) and the changes in the explanatory variables.

The diagnostic tests such as no residual serial correlation, no functional form mis-specification, normal errors, and homoskedasticity are automatically computed by the program. However, we can add cumulative sum (CUSUM) and cumulative sum squares (CUSUM squares) analysis to check the stability of the model.

EMPIRICAL RESULT
To determine the appropriate lag length p and whether a deterministic trend is required, we estimated (2) by LS, with and without linear time trend. We start our regression from lag 1 until lag 12. However, due to limited number of observations, we can only include maximum 9 lags in our model. Table 1 and 2 gives AIC and SBC value for each lag in model (3.4) with and without deterministic trends. These tables also present the Langrange Multiplier (LM) statistics for testing the hypothesis of no residual serial correlation against orders 1 and 4 denoted by $\chi^2_{SC}(1)$ and $\chi^2_{SC}(4)$ respectively.

Table 1 - 2 about here

From table 1 and 2 above, we can see that there is relatively similar result generated by the conditional ECM with and without a linear deterministic trend. Both cases show that the χ^2_{SC} statistics suggest using lag one. Interestingly, the highest value based on SBC is lag one as well for both cases. Thus, based on the χ^2_{SC} statistics and the value of SBC it seems prudent to select p = 1.

The calculated F-statistics for lag one are 5.7938 (with deterministic trends) and 5.9345 (without deterministic trends). Those F-statistics should be compared with the critical value bounds provided by Pesaran, et al. (2001). However, Narayan in 2004 has reformulated the new set critical values for small samples studies ranging from 30 to 80 observations.[4] Since our study employ 72 observations, it seems more appropriate for us to use Narayan's critical values for the bounds test. For F-statistics

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[2] p is the maximum number of lags to be used and k is the number of regressors.
[3] It is in accordance with the fact that the SBC is a consistent model selection criterion, meanwhile the AIC is not (Pesaran and Shin, 1995/1997).
[4] It is the first study that generates critical values specific to sample size.

with deterministic trends, we will use Case III (restricted intercept and trend). Meanwhile for F-statistics without deterministic trends, we will use Case II (restricted intercept and no trend). In each case, Narayan provided 1%, 5%, and 10% lower bounds (I(0)) as well as upper bounds (I(1)). Those critical values are presented in Table 3 below.

Table 3 about here

Based on the comparison, we can observe that the calculated F-statistics for p = 1 is higher than the upper bound critical value at 1 percent level of significance in both cases (with and without deterministic trends). Thus, the null hypothesis of non existence of the long-run relation is rejected. In other words, the real level of deposit and its determinants are cointegrated in the long-run.

Based on the result in the previous sections, we will use maximum lag 1 in our ARDL model to estimate the long-run coefficients and the associated error correction model. The lag orders of an ARDL (m_1, m_2, m_3, m_4, m_5) model in the five variables ($LNRDEP_t$, $RR1LAG1_t$, $RI1_t$, $LNBRANCH_t$, $LNIPI_t$) were selected by searching across the $(2)^5$ = 32 different ARDL models. This resulted in the choice of an ARDL (1,0,1,0,0) specification.[5] This model gives the Adjusted R^2 value of 0.99845. It means approximately 99 percent of the variation in the dependent variable, real level of deposit, can be explained by the model. Furthermore, the F-statistic value of 7498.7 means the model is statistically significant to explain the dependent variable even at 1 percent level. Hence, the ARDL model shows that the overall goodness of fit of the model is satisfactory.

The long-run test statistics (Table 4) reveal that all regressors are the significant determinants of the real level of deposit in Islamic banks and have the expected signs.

Table 4 about here

The coefficient of previous month real rate of return (RR1LAG1) is 0.10557, which is positive and statistically significant at 1 percent level. The result shows that depositors in Islamic banks are rational depositors, i.e., their saving behaviour are driven by profit motive. It suggests that in the long run, if Islamic banking industry in Indonesia increases its real rate of return by 1%, it would be expected that its real level of deposit will increase by 0.10% in the following month. This result supports the study done by Mangkuto (2004). He found that *mudaraba* deposit yield (lag 1 month) had positive and significant relationship with *mudaraba* deposit in Bank Muamalat Indonesia (BMI).[6] However this finding is contrary to the results obtained by Bank Indonesia's studies focusing in areas such as South Kalimantan, South Sumatera, North Sumatera, and West Java provinces. In these four provinces, Bank Indonesia found that the rate of return is not a significant factor in determining depositors' decision to choose Islamic banks.[7] However, we have to remember that the studies conducted by Bank Indonesia are qualitative researches by using questionnaires. They tried to capture the respondents that can represent the society as

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[5] Both AIC and SBC gives the same result of ARDL specification.
[6] This result also support the studies on Malaysian case (Haron and Norafifah, 2000; Sukmana and Rosylin, 2005; Haron and Wan Nursofiza, 2005).
[7] Only 0.3% (West Java), 0.6% (South Kalimantan and North Sumatera), and 6.6% in South Sumatera from total respondents that considered the rate of return is an important factor in choosing Islamic banks (Bank Indonesia, 2005).

a whole. The respondents were chosen based on the variety of both conventional as well as Islamic banks' depositors, type of occupation, and location of the residence. However, the sensitivity towards the deposits' yield might be influenced by the amount of deposits that a depositor has. Nevertheless, it is not easy to get such data due to bank' confidentiality principle.

Meanwhile, the coefficient of real interest rate (RI1) is -0.17467, which is negative and significant at 5 percent level. This result implies that if the conventional banks as a whole increase its interest rate by 1%, the real level of deposit in Islamic banks will decrease by 0.17%. We can easily conclude that there is displaced commercial risk in Islamic banks in Indonesia. It also shows that Islamic banks' depositors are rational depositors who are affected by the changing real interest rate in conventional banks. The same result also found in Mangkuto (2004), Haron and Norafifah (2000), Sukmana and Rosylin (2005), and Haron and Wan Nursofiza (2005).

The researches conducted by Bank Indonesia found that perception of the people on interest rate is ambiguous. Most of the respondent agreed that interest rate is prohibited in Islam. However, they are not against the interest rate application in banking system. Furthermore, this inconsistent perception is found to be relatively small in certain groups of respondents. Those who are categorized as practicing-Muslims tend to have higher consistency in their perception. The respondents that have sufficient knowledge on Islamic banking also found to be more consistent than those who have less knowledge (Bank Indonesia, 2005).

As might be expected, the coefficient of number of Islamic banks' branches (LNBRANCH) is positive (0.61829) and significant at 10 percent level. If the number of Islamic banks' branches increase by 1%, the real level of deposit in Islamic banks will increase by 0.62% in the long run. This result gives more evidence on the previous studies based on questionnaires such as Erol and El-Bdour (1989), Gerrard and Cunningham (1997), Metawa and Almossawi (1998), and Bank Indonesia (2005). Those qualitative researches found that location is an important factor in preferencing Islamic banks. Thus, Bank Indonesia's policy of giving more opportunities for Islamic banks to increase their branches or open a new Islamic bank is already on the right track in furthering the Islamic banking development in Indonesia. As of per February 2006, there are totally 443 Islamic banks' branches in Indonesia (Bank Indonesia, 2006). If we compare the number in February 2000, there are only 41 branches or almost ten times increasing in the last six years.

The result also shows that income level is an important factor that determines the level of deposit in Islamic banks. It suggest that in the long-run, if the industrial production index (LNIPI) as the income proxy increases by 1%, it will increase the real deposit in Islamic banks by 1.95%. This result is significant at 10 percent level. This result supports the previous studies such as Snyder (1974) and Loayza, Hebbel, and Serven (2000). Thus, the Absolute Income Hypothesis proposed by Keynes is relevant in Islamic banks' case.

The error correction representation for the selected ARDL model is given in Table 5 below. These estimates provide further direct evidence on the short-run dynamics that seem to exist between real level of deposit and its determinants. The results indicate that rate of return (1-month lag) and industrial production index have positive and significant impacts on the real level of deposit. Thus, a change in real rate of return and income is associated with a change in real level of deposit in the short-run. Shrestha and Chowdhury (2005) also found similar result. They found that the real income had positive and significant effect on real deposit in the short run.

However, the effect of interest rate and number of Islamic banks' branches in short-run is different from their long-run impact. Even though the results appear with the correct sign, both variables are not statistically significant. In other words, we cannot expect that a change in real interest rate as well as number of Islamic banks' branches will change real level of deposit in the short-run.

Table 5 about here

The error correction coefficient is found to be negative and statistically significant at 1 percent level. It shows that there is a long-run relationship between the variables. The coefficient of ECM$_{t-1}$ is estimated as -0.1124 which suggests a relatively slow adjustment process. Only around 11 percent of the disequilibria of the previous month's shock adjust back to the long-run equilibrium in the current month.

To ascertain the appropriateness of the ARDL model, we applied a number of diagnostic tests to the ARDL model. The results are shown in Table 6 below. The regression passes the diagnostic tests against heteroskedasticity and serial correlation at lag 1 [$\chi^2_{SC}(1)$] and 4 [$\chi^2_{SC}(4)$]. It means that the residuals have constant variance and are not correlated.

Table 6 about here

The model also passes the test for functional form mis-specification at 5 percent level. However, the mis-specification assumption is not fulfilled at 10 percent level. Pesaran et al. (2001) also faced a similar problem. They argued that the rejection of no functional form mis-specification may be linked to the presence of some non-linear effects or asymmetries in the adjustment of the regressand that their linear specification is incapable of taking into account. However, the associated cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) plots suggest that the regression coefficients are generally stable over the sample period (see Figure 3 and 4).

Figure 3 – 4 about here

Our model rejects the null hypothesis of the normal errors. Further investigation shows that this might be resulted from the mesokurtic characteristic of the dependent variable which has skewness and kurtosis values as -0.21 and 1.76 respectively. However, based on the extension of the central limit theorem, the OLS estimators are still normally distributed asymptotically under the assumption of fixed X's and constant variance even though the disturbances are not normally distributed. Hence, the usual hypothesis testing such as t and F-tests are still valid (Gujarati, 2003).

CONCLUSION

This study provides evidence regarding the relationship between the amount of deposit placed in the Islamic banking system in Indonesia and its determinants such as rate of return, interest rate, number of Islamic banks' branches, and income. By using ARDL modeling approach, we find that there is a long-run relationship between the real deposit level and its explanatory variables. In other words, the real level of deposit and its determinants are cointegrated in the long-run.

The estimation shows that all independent variables have the expected signs and significant in the long-run. Real rate of return is estimated to have positive impact on the real level of deposit in the following month. Meanwhile, the real interest rate of conventional banks is estimated to have negative relationship with the real level of

deposit in Islamic banks. Based on that result, we can observe that displaced commercial risk does exist in Islamic banking system in Indonesia. Thus, we can conclude that Islamic banks' depositors in Indonesia are guided by profit motive.

The increase of Islamic banks' branches will increase the real level of deposit in the long-run. Bank Indonesia as the banking authority in Indonesia supports Islamic banks to enlarge their coverage so that more people can access to Islamic banks. Thus, such encouraging policy within the Islamic banking development framework should be continued in the future. The study also finds that level of income also has positive effect on the real level of deposit in the long-run. Thus, the Absolute Income Hypothesis by Keynes is valid in Islamic banks in Indonesia.

In the short-run, the changes in real rate of return and income have positive and significant impact at 1 percent level on the changes in real level of deposit. Meanwhile the changes in real interest rate has the expected signs (negative) but insignificant. It means that the changes in real interest rate will not immediately affect the changes in real level of deposit in Islamic banks. The changes in number of Islamic banks' branches also have the expected sign (positive) but not significant. It construes that the effect of the increasing number of Islamic banks' branches can not be observed in the short-run. The error correction coefficient is found to be negative and significant. It confirms that the model is cointegrated in the long-run. Any shock will adjust back to the long-run equilibrium in the next month by 11 percent.

The existence of displaced commercial risk or withdrawal risk in Islamic banks in Indonesia should be concerned mostly by the Islamic banks management. The fact that their depositors will withdraw their funds and put it in the conventional banks should make the Islamic bankers to put more attention on this matter. They should watch carefully the performance of their financings to gain optimal revenue. Internally, they should keep improving their efficiencies in order to remain competitive. To mitigate the displaced commercial risk, IFSB (Islamic Financial Services Board) have introduced the PER (Profit Equalization Reserves) concept. A PER is the amount set aside by the Islamic financial institutions out of their gross income in order to maintain a certain level of rate of return for their depositors. However, the PER concept has not been incorporated into Islamic banks regulations in Indonesia. In practice, the Islamic bankers can give out "their share" of profit to their depositors to maintain the desired rate of return.

Displaced commercial risk also can be reduced by increasing the people's knowledge about the Islamic banking itself. Islamic banks' depositors that have a good understanding on the spirit of Islamic bank tend to be consistent and less influenced by the movement of conventional interest rate. Public education activities should be supported. An independent body comprising all elements in Islamic economics/financial sectors in Indonesia called Islamic Economics Information Centre (*Pusat Komunikasi Ekonomi Syariah*) has been established in 2004. One of the backgrounds of this establishment is to give accurate perception and understanding about condition and features of Islamic banking to the public. Bank Indonesia as the banking authority also has done many strategic programs on public education. During year 2005, Bank Indonesia has participated in more than 50 seminars or trainings conducted by other institutions (Bank Indonesia, 2005).

Regarding the *ulama*s' role on the Islamic banking development, Indonesia Council of Ulama (*Majelis Ulama Indonesia*) has released a fatwa on interest rate on January, 24th 2004. The fatwa stated that the banks' interest rate is equivalent with *riba* and thus prohibited. It is permissible, however, in condition if there is no Islamic

bank in their neighborhood. It is such a good effort in the Islamic banking development process. But, the most important thing is the socialization of this fatwa to the public. The *ulama*s should also understand the Islamic economic concept so that they can socialize the Islamic bank to their follower.

Finally, as a Muslim, we have to aware that the investment choices that we make should not only be based on the profit maximization but also on those returns in the hereafter. Therefore, the decision to place deposits in Islamic banks is not only to earn some profit but also to get the blessing of Allah SWT.

There are several potential studies that can be conducted based on the findings of this study. This study found that displaced commercial risk does exist in Islamic banking industry in Indonesia. Therefore, it is quite interesting to examine the co-movement between the rate of return of Islamic banks' deposit and the interest rate of conventional banks' deposit. By using Granger causality, we can test whether the rate of return caused by the interest rate or vice versa.

A qualitative research also can be done on how to mitigate displaced commercial risk in Islamic banks. Until now, there is no PER concept in Indonesia. However the Islamic bank management can increase the rate of return (even though the profit decreases) by giving their share of profit to depositors. At the end, the rate of return would follow the movement of interest rate. The law of one price will take place. The negative externality of this mode is that people start to think that Islamic bank is the same as conventional bank. Thus, it will be an interesting topic to explore.

This study is an aggregate study for Islamic banking industry in Indonesia covering Islamic Commercial Banks (ICBs) as well as the Islamic Banking Units (IBUs) of conventional banks. However, there might be differences between those two types of Islamic banks in term of their depositors' behaviour. The depositors of ICBs are expected to be stricter in their religious interpretation than the depositors of IBUs. There is a perception that the funds in IBUs will be mixed up with the conventional funds since they are in the same banks. Thus the return of the deposits in IBUs also considered as *haram* (unlawful).

This study also does not differentiate the type of depositors of the Islamic banks. It is possible that each type of economic units such as government, financial institutions, business enterprises, and individuals have different behavioural pattern in depositing their money in Islamic banks. Furthermore, it might be possible that the amount deposited also affect the existence of withdrawal risk. For those depositors which have small amount of deposits, i.e., less than 10 million rupiahs might be not sensitive to the movement of conventional interest rate. However, for rich depositors which have a lot of savings such as more than 1 billion rupiahs, the variability of interest rate might affect them.

Figure 1
The LNRDEP, LNBRANCH, and LNIPI during March 2000 – February 2006
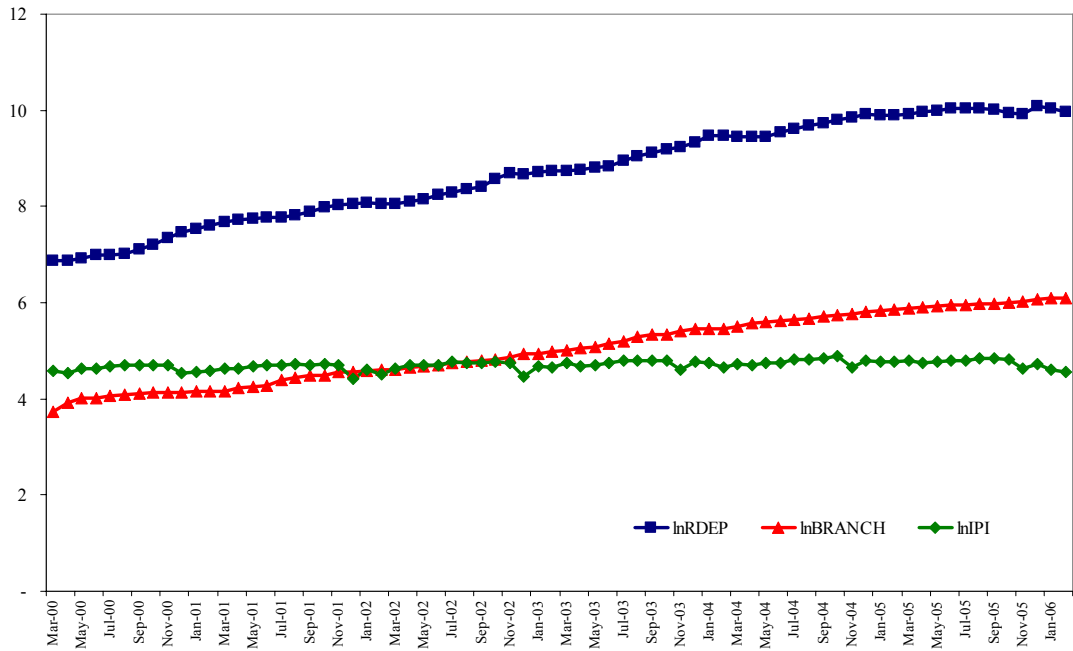

Figure 2
The RR1LAG1 and RI1 during March 2000 – February 2006

Figure 3

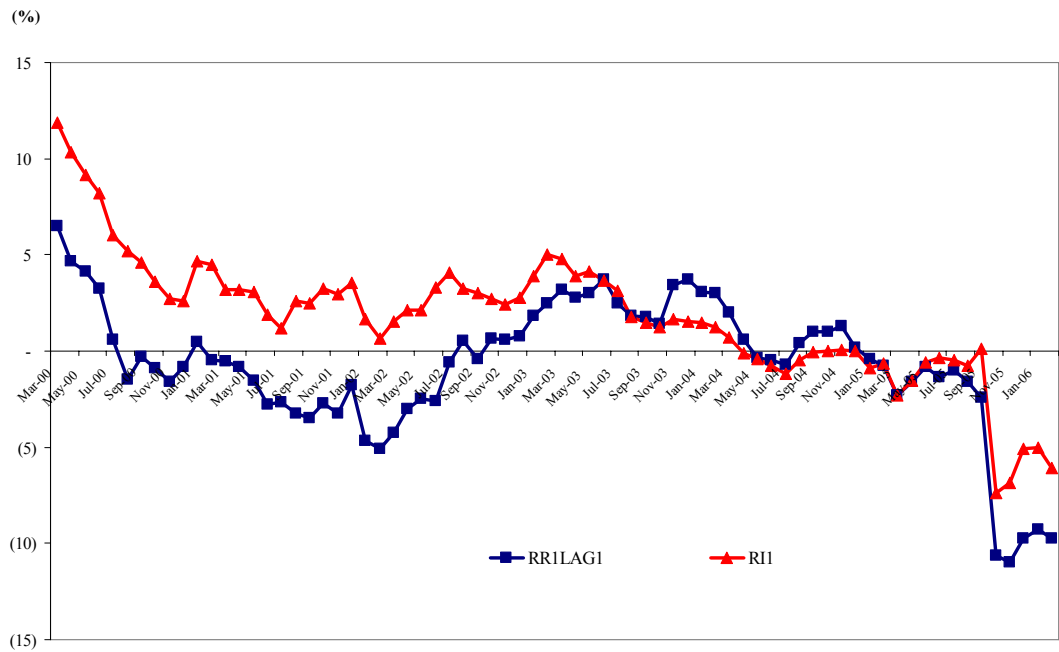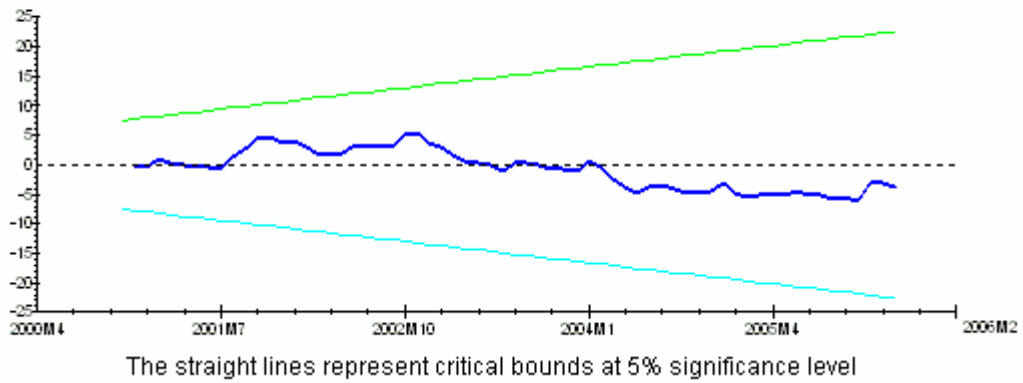Plot of Cumulative Sum of Recursive Residuals

The straight lines represent critical bounds at 5% significance level

Figure 4

Plot of Cumulative Sum of Squares of Recursive Residuals

The straight lines represent critical bounds at 5% significance level

17
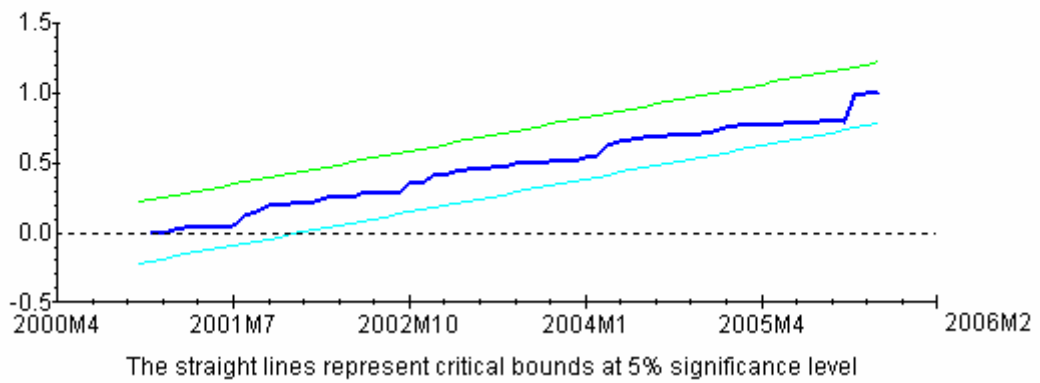
Table 1
Statistics for Selecting the Lag Order (With Deterministic Trends)

P	AIC	SBC	$\chi^2_{SC}(1)$	$\chi^2_{SC}(4)$
1	121.21	103.22	0.0206	7.9210*
2	121.56	98.10	0.7339	20.3077***
3	123.56	94.71	0.8319	15.6951***
4	119.10	84.93	0.0101	19.6277***
5	119.03	79.61	0.1272	20.3850***
6	118.49	73.91	6.3772**	20.6753***
7	119.79	70.13	3.2916*	28.4826***
8	122.01	67.36	0.3899	32.9091***
9	122.14	62.58	1.6088	43.4232***

Note. The symbols *, **, and ***denote significance at 10%, 5%, and 1% levels respectively.

Table 2
Statistics for Selecting the Lag Order (Without Deterministic Trends)

P	AIC	SBC	$\chi^2_{SC}(1)$	$\chi^2_{SC}(4)$
1	121.06	104.20	0.0500	7.2395
2	121.50	99.16	0.8477	19.3572***
3	123.34	95.59	0.2381	12.1237**
4	118.14	85.07	0.0492	14.0172***
5	118.18	79.86	0.1893	14.1880***
6	116.15	72.66	1.0464	14.2052***
7	113.05	64.48	2.0123	27.3034***
8	118.85	65.27	3.4179*	36.7520***
9	119.16	60.66	7.5177***	47.5028***

Note. The symbols *, **, and ***denote significance at 10%, 5%, and 1% levels respectively.

Table 3
Critical Values for the F test (k = 4, n = 70)

	Case III		Case II	
	I(0)	I(1)	I(0)	I(1)
1%	4.098	5.570	3.608	4.860
5%	3.022	4.256	2.725	3.718
10%	2.552	3.648	2.320	3.232

Source: Appendix A1-A6 (Narayan, 2004)

Table 4
ARDL(1,0,1,0,0) Model Long-run Result
Dependent variable: LNRDEP

Regressor	Coefficient	Standard Error	T-Ratio
Constant	-2.8331	3.3753	-0.8394
RR1LAG1	0.1056	0.0396	2.6680***
RI1	-0.1747	0.0686	-2.5449**
LNBRANCH	0.6183	0.3243	1.9065*
LNIPI	1.9551	0.9849	1.9851*

Note. The symbols *, **, and ***denote significance at 10%, 5%, and 1% levels respectively.

Table 5
ARDL(1,0,1,0,0) Model ECM Result
Dependent variable: ΔLNRDEP

Regressor	Coefficient	Standard Error	T-Ratio
Constant	-0.3184	0.3160	-1.0079
ΔRR1LAG1	0.0119	0.0033	3.5879***
ΔRI1	-0.0011	0.0060	-0.1829
ΔLNBRANCH	0.0695	0.0605	1.1485
ΔLNIPI	0.2198	0.0630	3.4865***
ecm(-1)	-0.1124	0.0426	-2.6359***

Note. The symbols *, **, and ***denote significance at 10%, 5%, and 1% levels respectively.

Table 6
Diagnostic Tests

$\chi^2_{SC}(1)$	0.94[.333]
$\chi^2_{SC}(4)$	5.45[.244]
$\chi^2_{FF}(1)$	3.41[.065]
$\chi^2_{N}(2)$	9.11[.010]
$\chi^2_{H}(1)$	0.32[.571]

Note. χ^2_{SC}, χ^2_{FF}, χ^2_{N}, and χ^2_{H} denote chi-squared statistics to test for no residual serial correlation, no functional form mis-specification, normal error, and homoskedasticity respectively with p-values given in [.].

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