Credibility of the Philippine Central Bank: Evidenced by the Interest Rate Pass-Through

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ARTICLE DETAILS	ABSTRACT
History *Revised format: May 2017* *Available Online: June 2017*	**Purpose:** This study investigates the Philippine interest rate pass-through over the December 2001 through January 2016 period. The empirical findings suggest that the Philippine Central Bank has not been very effective in formulating and implementing its countercyclical monetary policy. Specifically, the empirical results reveal very low short-run and long- run interest rate pass-through. The Bounds test results indicate no long-term relationship between countercyclical monetary policy and market rates. Notwithstanding the banking system's remarkable performance in the recent years, amid lingering uncertainties in global financial markets, the Philippine Central Bank lacked the credibility in conducting its countercyclical monetary policy. This empirical finding may not be desirable but it forewarns the monetary policy makers of challenges in formulating and implementing their monetary policy.
Keywords *Monetary Policy,* *Commercial Banks,* *Lending Rate,* *Interest Pass Through,* *Central Bank Discount Rate*	
JEL classification: E40, E43, E52, E60	

1. Introduction

As reported by the Bangko Sentral Ng Pilipinas (BSP), the Central Bank of the Philippines (2016), the banking system performed remarkably well in 2016 amid lingering uncertainties in global financial markets. Key statistics showed that commercial banks experienced double-digit growths in assets, loans, deposits and capital. Commercial banks maintained sufficient liquidity to meet their operational requirements and related funding needs. There was also notable rebalancing of banks' portfolios particularly in cash and credit related accounts as banks shored up liquidity to manage potential market volatilities at the onset of rising interest rates.

The emerging landscape of the banking sector also became more streamlined, technologically responsive and inclusive in 2016 as it expanded client reach to cater to the diverse needs of modern Filipino banking clients. The industry consolidation and digital transformation have banking services. The commercial banking system strived to provide efficient, reliable and affordable delivery of banking products and services to banking clients.

The BSP's promotion of merger and consolidation in the industry resulted in reduction of the number of operating banks down from 996 in 1998 to 602 banks at the end of 2016. There were five recorded cases

of mergers, acquisitions, and consolidations in 2016. Main features of industry consolidation include the strategic partnership between foreign and domestic banks. Additionally, some large domestic banks acquired smaller banks in frontier areas to allow the former to explore growth opportunities and business synergies. In addition, the most common feature of industry consolidation is the merger of rural banks to improve their viability and leverage on each other's branch network to reach a wider base of clientele. Overall, these types of industry consolidation activities influenced the structure of the banking system.

The BSP maintains its policy thrust on merger and consolidation by gradually lifting the moratorium on the grant of new banking licenses or establishment of new domestic banks. This is to provide parallel opportunities for domestic banks following the liberalization of foreign bank entry in 2014. Consequently, the overall branch network expanded by almost 1.6 times to 10,576 branches since 1998. These branches and offices are normally within shopping malls and other commercial places with heavy foot traffic. The growth was supported by the BSP's rationalization of branching guidelines, which provide banks with more flexibility in expanding their network to strategic locations.

The rapid evolution of digital technology particularly the proliferation of smart phones at the turn of the new millennium revolutionized the way banking and financial products and services are delivered. Digital technology provides unprecedented financial services access to customers, allowing them to perform banking transactions and make payments at their own convenience. From a policy standpoint, these electronic service delivery channels provide a faster and more efficient alternative means to reach a wider base of clientele particularly those in rural communities.

Recognizing the upside from electronic banking in terms of expanding client reach and in improving financial access, the BSP allowed banks to engage in electronic banking as early as 2000. Since then, banks engaged in electronic banking grew from nine banks as of the end of the 2000 calendar year to one hundred and nineteen banks as of yearend 2016. Moreover, the banking system had 19,084 automated teller machines by the end of 2016.

Additionally, in 2009 the BSP's rationalization of branching guidelines allowed electronic money as an instrument of efficient and affordable delivery of financial services to low-income households in non-urbanized and underbanked areas of the country. Electronic Money Issuers are encouraged to develop business models and explore outsourcing arrangements with qualified Electronic Money Network Service Providers to support the growth of e-banking and e-money. Two of the most popular forms of e-money today are SMART Money and Globe's G-Cash. BSP (2016) reported that as of end-December 2016, net inflow of e-money transactions reached 1.1 trillion pesos and 78.2 percent or 870.1 billion pesos of these transactions were e-money transactions coursed through banks.

Financial intermediation is a critical facilitator of investment and economic growth (Schumpeter 1912; Patrick 1966; McKinnon 1973). Commercial banks are an integral part of the monetary policy transmission mechanism since through their interest rate pass-though, commercial banks change the lending rates in the economy, which in turn transmit the countercyclical monetary policy measures to consumption and investment activities of the economy. Changes in these two macroeconomic variables will change the macroeconomic policy target variables: unemployment, inflation and GDP.

Illes and Lombardi (2013) further argued that over the last few decades, setting policy rates has been viewed as the standard tool of monetary policy. The implementation of the monetary policy stance via open market operations ensures that policy rates transmit to the interest rates at which financial institutions refinance themselves. In turn, competition in lending and funding markets should ensure that changes in the policy stance are also passed on to other interest rates. A reduction in the policy rate is thus expected to translate into a decline in lending rates for firms and households, which should stimulate consumption and investment. This is the interest rate channel of monetary policy transmission.

Given what has transpired since the early years of 2000s, it is very interesting to learn the nature of the interest rate pass-through. More specifically, the objective of this study is to investigate how commercial banks passed changes in their cost of funds due to countercyclical monetary policy, as reflected in changes in the Central Bank's discount rate, to their customers through the short- and long-run interest rate pass-through processes in the post U.S. subprime mortgage crisis. The remainder of the paper is structured as follows: Section 2 briefly reviews the literature. Section 3 describes the data and specifies an empirical model for the investigation and the estimation method to calculate the short and long-run pass-through. Section 4 presents estimation results. Section 5 briefly discusses the empirical findings. Finally, Section 6 summarizes and concludes the paper.

2. Review of Literature

As summarized by Nguyen (2017-a), many theoretical approaches and methodologies have been used to study interest rate setting behaviors of lending institutions around the globe. Espinosa-Vega and Rebucci (2003) applied a standard Error Correction Model to consider whether interest rate pass-through in Chile's experience was atypical compared to ten other countries, including the United States. These authors found that the adjustment in the Chilean banking sector was incomplete – like in other countries – but generally faster than those in the rest of their sample. In addition, Espinosa-Vega and Rebucci (2003) reported that the adjustment process was affected by institutional changes in the exchange rate regime and Chile's monetary policy targeting.

Hofmann and Mizen (2004) used seventeen years of monthly data for rates on thirteen deposit and mortgage products offered by U.K. financial institutions to empirically investigate the potential non-linearity in adjustment of retail rates to base rates, due to menu costs. They reported that the speed of adjustment responded nonlinearly to the expected size of the gap between the base rate and retail rate in the near future. In other words, the perceived (expected) "aggressiveness" in base rate management was a significant factor in explaining the speed of pass-through effects.

Sørensen and Werner (2006) performed Euro-area cross-country comparisons and reported empirical evidence of high-degree heterogeneity in pass-through of base rates to bank interest rates. Among other cyclical and structural factors, Sørensen and Werner (2006) found different degrees of competition in the national banking sector to be the most significant determinants of pass-through speed.

Tonooka and Koyama (2003) searched for but found no relationship between interest rates on loans and market concentration in the Brazilian banking sector. Alencar (2003) estimated the speed of pass-through effects from changes in benchmark interest rates and compared them to those observed in retail banking. The revelation that the time lag for monthly-average retail rates to fully adjust to changes in the opportunity cost of money is less than 12 months was pointed out as evidence of a significant degree of competition, driving banks to operate efficiently.

Bernanke and Blinder (1992) investigated the response of credit aggregates to monetary policy shocks. Borio and Fritz (1995) and Cottarelli and Kourelis (1994) focused more specifically on the pass-through of policy rates to lending rates, which is also the focus of this investigation. Studies on the heterogeneity in the pass-through at the individual bank level are limited to a few country studies (Weth 2002; Gambacorta 2008). The bulk of the empirical literature has resorted to cointegrated time series models developed by Engle and Granger (1987) to account for co-movements of policy and lending rates. European Central Bank (2003) focuses on major euro area countries, reporting evidence of heterogeneity between core and peripheral countries. Additionally, Coelho, De Mello, and Garcia (2010) found that the pass-through is higher for larger banks using a sample from June 2000 to December 2006.

Moreover, the monetary policy regime can affect adjustments and volatility of retail rates. For example, one would expect nominal prices to adjust faster or the pass-through to be larger when inflation is higher (Mojon, 2000). The important factors of the country's financial structure are bank competition, development of financial markets and banking system ownership. If financial markets are

well developed, financially solid businesses tend to opt for alternative sources of financing when retail rates rise, increasing the overall risk to bank loan portfolios. In that case, banks increase lending rates to compensate for the higher risk instead of rationing credit (Sander and Kleimeier, 2004).

3. Methodology and Model Specification
It is expected that long time series data and their relationships will experience structural breaks. Failure to account for structural break my result in model misspecification. To discern this possibility, this investigation utilizes the Perron's (1997) endogenous unit root test to search endogenously for the possibility of any structural break in the relationship between the two time series. If the structural break is found, a dummy independent variable d_t, with the value of 1 from the structural break date onward and 0 elsewhere, will be included in the model.

The objective of this study investigates the reactions to or how the commercial banks responded to changes in countercyclical monetary policy measures by the Central Bank reflected in changes in the discount rate. To this end, this investigation follows Wickens and Breusch (1988) and Pereira and Maia-Filho (2013) to specify and estimate an Autoregressive Distributed Lag [ARDL(n,m,s)] model hypothesizing the relationship between the endogenous variable i_t, the independent variables r_t, and d_t (if the aforementioned structural break exists).

$$i_t = \mu + \sum_{j=1}^{n} \beta_j i_{t-j} + \sum_{k=0}^{m} \delta_k r_{t-k} + \sum_{l=0}^{s} \rho_l d_{t-l} + \varepsilon_t \qquad (1)$$

where "i_t" is the lending interest rate and "r_t" is the Central Bank's discount rate at time t. As defined above, d_t is a dummy independent variable an independent variable accounting for the structural break in the relationship between the lending rate and Central bank's discount rate. $\delta_0 + \rho_0$ is the short-run effect within the month after the Central Bank changes the discount rate. It is a priori expectation that $0 < \delta_0 + \rho_0 \leq 1$. $\delta_0 + \rho_0 < 1$ indicates sluggish adjustment, also known as lending rate stickiness. $\delta_0 + \rho_0 = 1$ represents a complete pass-through in the short run.

Theoretically, the ARDL method proposed by Pesaran et al. (1997) has been a valuable tool for testing for the presence of long-run relationships between economic time-series. The advantage of the ARDL model is its ability to estimate both the long- and short-term model parameters without requiring a pre-testing to determine the order of the cointegration of the variables; thus, avoiding the problems posed by non-stationary time series. This pre-testing is particularly problematic in the unit-root- cointegration literature where the power of the unit-root tests is typically very low, and there is a switch in the distribution function of the test statistics as one or more roots of the right hand side variables process approach unity. Furthermore, the ARDL procedure is robust to small samples, allowing different optimal lags of variables.

As to the empirical estimation, Enders (2015) suggested that the process to estimate the coefficients for equation (1) is to utilize the Akaike information criterion to select the largest values of n, m and s, deemed feasible; CUSUM test is used to test for model stability. Breusch-Pagan-Godfrey heteroskedasticity Test and Breusch-Godfrey Serial Correlation Lagrange Multiplier (LM) Test are then used as diagnostics to test the hypotheses that the residuals $\{\varepsilon_t\}$ are white noise and there is no correlation among independent variables.

As articulated by Pereira and Maia-Filho (2013), given the estimation results for equation (1), the long-run effect is calculated as:

$$\Phi = \frac{\sum_{k=0}^{m} \delta_k + \sum_{l=0}^{s} \rho_l}{1 - \sum_{j=1}^{n} \beta_j} \qquad (2)$$

As articulated by Berstein and Fuentes (2003), Φ should be positive and close to 1. $\Phi = 1$ implies a

complete pass-through in the long run, which can be considered evidence of significant competition in the banking system. If $\Phi < 1$ or $\Phi > 1$, it implies either stickiness (less than perfect pass-through) or overshooting, respectively, of retail rates with respect to changes in the policy rate. Explanatory factors include monetary policy regime and the country's financial structure (Sørensen and Werner, 2006).

It is therefore important to study the long-run relationship between countercyclical monetary policy and market rates. To this end, this investigation follows Pereira and Maia-Filho (2013) to use the bounds testing approach (Pesaran, Shin, and Smith, 2001) for the following error correction representation of the Autoregressive Distributed Lag model:

$$\Delta i_t = \varphi + \sum_{j=1}^{n} \eta_j \Delta i_{t-j} + \sum_{k=0}^{m} \pi_k \Delta r_{t-k} + \sum_{l=0}^{s} \omega_l \Delta d_{t-l} + \lambda_1 i_{t-1} + \lambda_2 r_{t-1} + \lambda_3 d_{t-1} + \varepsilon_t \qquad (3)$$

where Δ is difference operator and the null hypothesis of "non-existing of the long-run relationship" is stated as $\lambda_1 = \lambda_2 = \lambda_3 = 0$. The relevant F-statistics for the joint significance of the $\lambda's$ are calculated and compared with the critical values tabulated by Pesaran, Shin, and Smith (2001). If the estimated F-statistic is greater than the upper bound critical value, the variables are cointegrated. If it is below the lower bound, the null hypothesis cannot be rejected, i.e., there is no support evidence for long-run relationship between countercyclical monetary policy and market rates.

3.1 Data and Empirical Results

The sample of the time series data for the commercial banks' lending rate on the credit market and the Central Bank's discount rate for this empirical estimation were collected from the International Financial Statistics, maintained by the International Monetary Fund. The sample period was from December 2001 through January 2016, where the data is available.

The Perron's (1997) endogenous unit root test was used to search endogenously for the possibility of any structural break in the relationship between the commercial banks' lending rate in the credit market and the Central Bank's discount rate. The searching process strongly suggested a structural break on October 2006. Therefore, a dummy independent variable d_t, with the value of one from October 2006 onward and zero elsewhere in the sample period, was included in the model to be estimated.

As discussed in the methodology section and based on the Akaike information criterion, the estimation process indicates that the optimal values are n = 5, m = 4, and s = 0 as the reported values for AIC in Exhibit 4 suggests, the ARDL (5, 4, 0) model has the lowest AIC value, therefore, it will be used for this investigation. The estimation results and diagnostic statistics for the autoregressive model, ARDL (5, 4, 0), are summarized in the following Exhibits 1, 2 and Figure 1.

Exhibit 1: Estimation Results for ARDL (5, 4, 0) Model and Bounds Test, 2001:12 – 2016:01

ARDL (5, 4, 0): i_t is a dependent variable			ARDL Bounds Test: Δi_t is a dependent variable		
Variables	**Coefficient**	**t-statistic**	**Variables**	**Coefficient**	**t-statistic**
i_{-1}	0.266066*	3.730412	Δi_{-1}	-0.694257*	-8.587526
i_{-2}	0.270936*	2.653710	Δi_{-2}	-0.422670*	-4.484424
i_{-3}	0.212207*	2.870687	Δi_{-3}	-0.211633**	-2.431208
i_{-4}	0.120013	1.363689	Δi_{-4}	-0.091179	-1.296905
i_{-5}	0.090389	1.162643	Δr_0	0.332230*	3.429888
r_0	0.333644*	3.394934	Δr_{-1}	0.338666*	3.447400
r_{-1}	0.059219	0.551707	Δr_{-2}	0.200485**	2.030409
r_{-2}	-0.135068	-0.702827	Δr_{-3}	0.266831*	2.660222
r_{-3}	0.063595	0.383978	i_{-1}	-0.037449	-1.243411
r_{-4}	-0.267300*	-2.783011	r_{-1}	0.057165	1.200947
d_0	-0.018586	-0.738956	d_{-1}	-0.012266	-0.521583
constant	0.071977	0.268120	constant	0.017218	0.063904

$R^2 = 0.946163$ and $\overline{R}^2 = 0.942292$	$R^2 = 0.403532$ and $\overline{R}^2 = 0.360649$
F-value = 244.4458* and AIC = 1.202518	F-value = 9.410004* **and Bounds Test F = 1.146796, k = 2**

Note: "*", "*" and "***" indicate the 1 percent and the 5 percent significance levels, respectively.
   For the sample of 165, critical values for bounds tests at 10 percent: I(0) = 2.713, I(1) = 3.453;
   5 percent: I(0) = 3.3235, I(1) = 4.053; 1percent: I(0) = 4.358, I(1) = 5.393.

The left panel of Exhibit 2 reports the diagnostic testing for the correlation among the independent variables and the possibility for the variance of the error term to depend on regressors included in the estimated the model. The right panel of Exhibit 2 reveals the AIC-values of the five best estimated models.

Exhibit 2: Diagnostic Tests and Five Best Models According to AIC Criteria

Diagnostic Tests	Model Selection Criteria	
	Five Best Models	**AIC**
Breusch-Godfrey Serial Correlation LM Test: H_0: There is no serial correlation in the residuals. $F_{(2,151)} = 0.118583$, p-value = 0.8883	**ARDL (5, 4, 0)** ARDL (5, 4, 1) ARDL (5, 5, 0) ARDL (6, 4, 0) ARDL (12, 4, 0)	**1.175** 1.183 1.186 1.187 1.188
Breusch-Pagan-Godfrey Heteroskedasticity Test: H_0: The residual's variance is constant. $F_{(11,153)} = 1.656782$, p-value = 0.0884		

Note: Data are from calculations by author.

Figure 1: illustrates the graph of the CUSUM Test over the sample period.
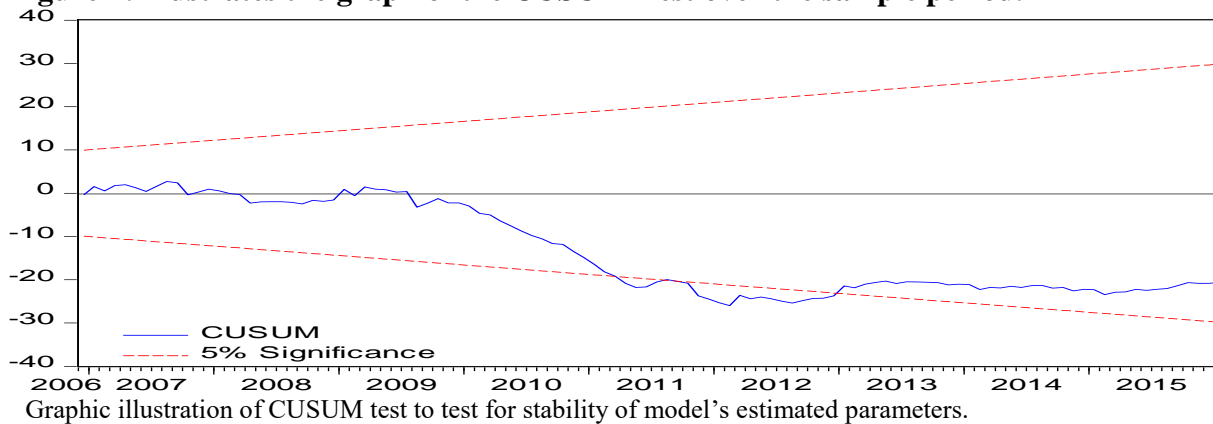
Graphic illustration of CUSUM test to test for stability of model's estimated parameters.

An analysis of the overall estimation results indicates that there exists no serial correlation and that the model exhibits strong predictive power, as evidenced by the strength of the Breusch-Godfrey Serial Correlation Lagrange Multiplier Test $F(2,151) = 0.118583$ with the p-value being 0.8883. This finding in turn suggests failure to reject the null hypothesis that there is no is no serial correlation in the residuals. Also, Breusch-Pagan-Godfrey Heteroskedasticity Test, $F(11,153) = 1.656782$ with the p-value being 0.0884 which fails to reject the null hypothesis that the variance of the residual is constant or no heteroscedasticity at the 5 percent level of significance. Figure 1 illustrates, the CUSUM Test statistic falls in the band of the 5 percent level of significance, except for the 2011-2012 period when it oscillated slightly outside of the band. This empirical finding indicates the relative stabilities of the estimated parameters of the model over the sample period. Overall, the diagnostic analysis indicates that the estimated ARDL(5,4,0) model is very reliable.

As reported in Exhibit 1, the estimated sum of $\delta_0 + \rho_0$ is 0.315058 (0.333644 - 0.018586 = 0.315058). In addition, using the estimated coefficients of equation (1), the following calculation indicates that the estimated long-run interest rate pass-through rate in the Philippine banking system is $\Phi = 0.879051$.

$$\Phi = \frac{\sum_{k=0}^{m}\delta_k + \sum_{l=0}^{s}\rho_l}{1 - \sum_{j=1}^{n}\beta_j} = \frac{0.05409 - 0.018586}{1 - 0.959611} = 0.879051$$

Finally, to test the null hypothesis of "non-existing of the long-run relationship- $H_0 : \lambda_1 = \lambda_2 = \lambda_3 = 0$", the calculated value of the relevant F-statistic being 1.46796 for the joint significance of the hypothesis is compared to the critical upper values bounds at 5 percent level of significance. Comparing the value of the F-statistic of 1.146796 to the critical value of the lower bound I(0) = 3.235 indicates that the null hypothesis of "non-existing of the long-run relationship" in the banking sector could not be rejected at the five percent level of significance. Failure to reject the null hypothesis suggests that there is no long-tern relationship between the Central Bank's discount rate and that the lending rate in the commercial banks' lending market.

3.2 Discussions of the Empirical Results

The endogenous search process for breaks in the interest rate structure using Perron's (1997) endogenous unit root test found that the relationship between Central Bank's discount rate and commercial bank's lending rate experienced a structural break in October 2006. To account for this structural break, this investigation introduced a dummy variable and assigned the value of 1 from October 2006 onward and 0 elsewhere over the sample period. An analysis of the overall estimation results indicates that there exists no serial correlation and that the model exhibits strong predictive power and confirms that the estimated residuals are white noise.

The estimation results of the Autoregressive Distributed Lag, ARDL(5,4,0) model are represented by equation (1). An analysis of the derived long-run rates of pass-through reveals that the short-run rates of pass-through, $\delta_0 + \rho_0 = 0.315058$ are very low as compared to empirical magnitudes reported in the literature in the emerging and advanced economies (Alencar, 2011, 2003; Pereira and Maia-Filho, 2013, Nguyen 2017-a and 2017-b; Wickens and Breusch, 1988).

Based on the Akaike information criterion, the longest lag retained by the estimation process for the commercial lending rate is five (i_{-5}) and for the Central Bank's discount rate is four (r_{-4}). These findings suggest that the commercial banks considered their lending rate five months prior in determining their current lending rate, while these lending institutions took up to four months to respond to the monetary policies completely. The calculated long-run pass-through rate in the banking industry is $\Phi = 0.879051$.

Finally, one way to measure the credibility of the Central Bank is the existence of the long-run relationship between the its countercyclical monetary policy, as reflected in changes in the Central Bank's discount rate, and the commercial banks' lending rate in the lending markets. In this investigation, this issue is addressed by testing the above stated null hypothesis $H_0 : \lambda_1 = \lambda_2 = \lambda_3 = 0$. The testing procedure indicated that this hypothesis cannot be rejected at five percent level of significance, suggesting there is no long-run relationship between the its countercyclical monetary policy and the commercial banks' lending rate in the lending markets.

3.3 Concluding Remark
The landscape of the Filipino banking services has been transformed by industry consolidation and digital transformation. It strives to provide efficient, reliable and affordable delivery of banking products and services to banking clients. The merger and consolidation in the industry resulted in reduction of the number of operating banks down to 602 banks at the end of the 2016 calendar year. The prominent features of industry consolidation include the strategic partnership between foreign banks and domestic banks. Additionally, the most common feature of industry consolidation is the merger of rural banks to improve their viability and leverage on each other's branch network to reach a wider base of clientele. Overall, these types of industry consolidation activities helped shape the landscape of the banking system.

Financial intermediation is a critical facilitator of investment and economic growth. Commercial banks are an integral part of the monetary policy transmission mechanism since through their interest rate pass-though, commercial banks change the lending rates in the economy which in turn transmit the countercyclical monetary policy measures to consumption and investment activities of the economy. Changes in these two macroeconomic variables will change the macroeconomic policy target variables: unemployment, inflation and GDP. These aforementioned lifestyle factors of the banking sector motivated this investigation to learn the nature of the interest rate pass-through.

To achieve the above objective, this study utilizes an Autoregressive Distributed Lag model to empirically investigate the nature of interest rate pass-through in the economy. Estimation results suggest that, based on the Akaike information criterion, the ARDL(5,4,0) model best fits the data. Estimation results of the ARDL(5,4,0) model reveal that the short-run rates of pass-through ($\delta_0 + \rho_0$ is 0.315058) is very low as compared to empirical magnitudes reported in the literature in the emerging and advanced economies.

The empirical results also indicate that the commercial banks considered their lending rate five months prior in determining their current lending rate, while these lending institutions took up to four months to

respond to the monetary policies completely. The calculated long-run pass-through rate in the banking industry is $\Phi = 0.879051$ which indicates relatively incomplete pass-through in the banking industry. The procedure testing the null hypothesis $H_0 : \lambda_1 = \lambda_2 = \lambda_3 = 0$ indicated that this hypothesis cannot be rejected at the five percent level of significance, suggesting no long-run relationship between the countercyclical monetary policy and the commercial banks' lending rate in the lending markets. One way to measure the credibility of the Central Bank is the existence of the long-run relationship between its countercyclical monetary policy, as reflected in changes to the Central Bank's discount rate, and the commercial banks' lending rate in the lending markets. The failure to reject the above null hypothesis of no long-run relationship is an indicative of the lack of credibility of the Central Bank.

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