Behavior of lending and deposit rates in Sri Lanka

ABSTRACT— ***This paper analyses the long-run co-integrating relationship and Granger causality between the lending rate and the deposit rate for Sri Lanka. Using monthly data for the period 1992:01 – 2012:12, the paper employed time series techniques. The empirical evidence of Sri Lankan economy illustrates deposit and lending rates have a long run relationship. The estimations of the error correction model reveals that the lending rate and the deposit affect the movement of each other in the short run. The finding of bi-directional Granger causality is important since it reveals that Sri Lankan commercial banks respond to countercyclical monetary policy and that the monetary authority successfully utilizes the policy to influence the financial market conditions. Accordingly, banks in Sri Lanka are unlikely to decrease their lending rates during a recession due to the higher risk of default***.

Keywords— Deposit interest rate, lending interest rate, linear, symmetric, imperfect competition, mark-up theory, error correction models, Sri Lanka.

INTRODUCTION

Understanding monetary policy effectiveness is a fundamental topic of monetary economics. For this reason, large number of economists focused on exploring channels of monetary transmission on both empirical and theoretical levels (e.g., Bernanke & Gertler, 1995; Mishkin, 1995; Clarida, Gali & Gertler, 1999; Ireland, 2005; Poddar, Sab, & Khachatryan; 2006). Through the investigation process the relationship between policy short-term interest rate and banks' retail interest rates i.e. deposit and lending rates has received modest consideration in monetary theory and empirical studies. Lending and deposit rates are retail interest rates or the price determined by banks (Misati, Nyamongo and Kamau, 2011). These rates refer to the cost of borrowing for those who need resources and the reward for lending to those with savings (Bulus, 2010). Bulus (ibid.) elaborates that Low interest rates attract more people to borrowing and spending more. However, when interest rates rise, people

tend to save more and spend less. The cycle of raising expenditure when interest rates are low and reducing expenditure when interest rates are high warrant interest rates volatility to cause instability in output. Interest rates volatility implies higher risk which then translates into a higher risk premium on long-term bonds. Risk hardens financial decisions, lowers productivity and makes the economy less efficient. Thus, central banks are in the position to control risk by controlling short-term interest rates to stabilize the economy. These events are critical to the monetary policy transmission process. However, firms' and households' behaviors are more related to retail interest rates rather than the policy short-term interest rate (Sweidan, 2012). It indicates that commercial banks have a crucial role in the monetary transmission mechanism by setting deposit and lending rates which are vital for lenders and borrowers. Some empirical investigations have found that in certain countries when policy interest rates are rising, retail lending rates respond quickly but deposit rates remain sluggish, while the opposite holds when policy interest rates are declining (Amarasekara, 2005).

Meanwhile, firms' and households' behaviors are more related to retail interest rates rather than the policy short-term interest rate. Accordingly, monetary economists conduct a large number of studies based on data from single and group of countries to investigate the interest rate pass-through (e.g., Hofmann & Mizen, 2004; Liu, Margaritis & Tourani-Rad, 2008; Payne & Waters; 2008; Ozdemir, 2009; Sweidan, 2010). Technically, these studies examine the degree and speed of adjustment of retail interest rates for a change in policy interest rate. Within this framework of analysis, monetary and macro economists confirm that many important economic variables display asymmetric adjustment and asymmetric effect. For example1, Cover (1992) confirmed that positive monetary policy shocks in the U.S. economy do not affect output. On the contrary, negative monetary policy shocks affect output. Other economists claim that retail bank interest rate is sticky, for example, de Bondt (2005) explored the interest rate pass-through process in the euro area. He concluded the immediate pass-through of market interest rates to retail bank interest rates is incomplete.

In this paper, we work on a new link. We believe commercial banks have a crucial role in the monetary transmission mechanism. Setting deposit and lending rates are vital for lenders and borrowers. We accept as true that exploring the long-run relationship between deposit and lending rates help to understand interest rate pass through in depth. Additionally, we highlight on

the nature of the decisions made by the commercial banks' whether it is affected by either their costs or their revenues. Within the current literature review progress, Sweidan (2011) inspected empirically the relationship between short-term policy interest rate and both deposit and lending rates in Jordan. He explored the speed of adjustment and pass-through from policy rate to deposit and lending rates. He ended-up that Jordan's deposit and lending interest rates follow a symmetric movement for their deviations from the long-run equilibrium. Besides, he found Jordan's deposit rate adjusts larger and faster than lending rate for a deviation from the long-run equilibrium.

In Sri Lanka lending rate against the deposit rate, the two variables move in the same direction for the entire period. The lending-deposit spread narrowed in some time period. Sri lanka has a symmetric control and effect on deposit and lending rates to keep their spread within a certain margin. Hence, a long-run relationship between deposit and lending rates in Sri Lanka is expected. These trends seem to suggest some kind of special relationship between the two retail rates. Hence, an empirical verification of the kind of relationship that holds between these two rates is necessary. Financial system creates enormous intellectual curiosity and lead to questions as to how the lending institutions set their lending and deposit rates. To formally investigate this matter, Granger causality between the Sri Lankan lending and deposit rates will be used.

The remainder of this paper is organized as follows. Section 1 briefly reviews the literature. Section 2 characterizes the Sri Lankan financial sector and its operational environment. Section 3 summarizes data for this study. Section 4 briefly describes the methodology that will be used in the investigation. Section 5 reports test statistics and empirical test results for cointegration. It presents the results of the cointegration and asymmetry tests. Section 6 examines the results of the asymmetric error-correction model to determine the Granger causality between the lending rates, and the deposit rates, and the Final section provides some concluding remarks.

Objective of the study

The objective of study is twofold.

- To establish the causal relationship between lending rate and deposit rates.
- To find the direction of the causation if such a causal relationship exists.

2. LITERATURE REVIEW

2.1 Theoretical Literature

It is widely acknowledged that banks are part and parcel of any national monetary policy transmission mechanism (Nguyen, Islam and Ali, 2010). The implementation of monetary policy has direct effects on the spread set as well as the relationship between the operations and the levels of profitability of banks. This process of monetary policy transmission constitutes both a credit channel and a money channel, with the former affecting the lending rate and the latter affecting the deposit rate (Chang and Su, 2010). On the relationship between lending rates and deposit rates, Thompson (2006) theorizes that banks set their lending rates as some markup or premium relative to their deposit rates.

However, if the financial market perceives such a mark-up as too high or too low, the marketplace will castigate the banking industry to adjust back to some “normal” or equilibrium spread. Neumark and Sharpe (1992) share similar sentiments about lending-deposit rate adjustments by taking a slightly different view that banks in more concentrated markets adjust deposit rates and lending rates at different speeds, which enables them to extract more surpluses from the consumers. The preceding argument stems from the pre-assumption that banks operate under imperfect competition on markets for loans and deposits. Hence, it is argued that assuming perfect competition in the banking sector is not appropriate because of barriers to entry, product differentiation, etc. (Freixas and Rochet, 1997 and Hannan and Berger, 1991). So, to a certain extent, banks have some power in price setting for these products, or are assumed to follow a markup pricing rule (Hofmann and Mizen, 2004 and Winker, 1999). For instance, the rates on loans granted may depend on the cost of raising deposits rather than issuing securities. This means that such a deposit-based funding of loan activities could suggest that retail bank rates remain less responsive to market conditions once deposit rates are accounted for.

In relation to the mark-up theory, studies measuring banking activity, productivity and efficiency interrogate whether deposits are inputs or outputs in the production process of a banking firm. The asset or intermediation approach argues that deposits are inputs to loan-making (Burgstaller, 2005). However, the production or service provision approach contends that from a customer's point of view the role of deposits as a service to the banks' customers is considered as outputs. This stems from the production or service provision approach (Mlima and Hjalmarsson, 2002).

Rosen (2002) and Calem and Mester (1995) theorized the lending-deposit rates relationship from the consumer perspective particularly, based on the characteristics of the consumers. That is, the greater the proportion of unsophisticated consumers relative to sophisticated consumers (better known as customer reaction hypothesis) in the market, the greater the ability of banks to adjust interest rates to their advantage echoing Neuman and Sharpe's (1992) conclusion. This behavior by the bank is due to the presence of the potential search and switching costs. However, Stiglitz and Weiss (1981) argue that banks operating in the environment with a high rate may fear a negative reaction from customers in response to lending rate increases. Thus, the presence of asymmetric information may create an adverse selection problem in lending markets because the higher interest rates tend to attract riskier borrowers. There will be expected costs to the banks resultant from not raising the lending rates, when their marginal cost of fund increases. The costs will discourage the higher risk customers to borrow. Hence, the adjustment of lending rates upward is slow when the deposit rates increase.

2.2 Empirical Literature

Having reviewed the theoretical literature regarding relationship between lending-deposit rates, it is important to explore existing findings and experiences with regard to this relationship. There are many studies that have investigated the relationship between lending rates and deposit rates. There are few studies that have explored the relationship between deposit and lending rates. The attention on this imperative relationship is essential to understand monetary policy effectiveness, particularly interest rate pass-through. Dueker (2000) checked whether an asymmetric relationship exists between lending rate and market interest rate or not. He found an asymmetric behavior; lending rate

responds faster to positive shocks of market rate. Accordingly, he stated banks are unlikely to decrease their lending rates during a recession due to the higher risk of default. This risk-averse behavior of bankers may result in lending rate displaying asymmetric movements to a change in market rate.

Thompson (2006) demonstrated that banks may set their prime lending rates as some mark-up or margin over their deposit rates. If the markup is perceived to be too high or too low, the market force will command banks to alter back to some normal equilibrium spread. This conclusion is supported by the findings of Ewing, Payne, and Forbes (1998) and Ewing and Kruse (2007). Both studies confirmed that the spread returns back to its long-run equilibrium situation following a shock. With more details, the former confirmed the existence a long-run cointegration between lending rate and deposit rate. As a result, lending rate modifies to eliminate any disequilibrium position. The latter concludes that the relationship between prime-deposit rate spread is affected by economic growth, inflation rate and monetary policy. Technically, shocks to inflation enlarge the spread. In contrast, unpredicted changes in the federal funds rate and economic growth narrow the spread. Additionally, Thompson (2006) suggested a considerable idea which is banks may use this technique of asymmetric retail interest rate setting behavior even though it may not be optimal in the long-run. If banks have market power, they can expand of the spread by slowly adjusting their lending rates to the falling deposit rates. Nevertheless, other competing banks would simply alter their lending rates first to capture more customers and gain larger market share. On the international assessment level, Chatrath et al. (1997) investigated the long-run relationship between bank lending and borrowing markets across six industrialized countries. Their finding illustrated an increase of integration among banks lending and borrowing markets. It is a vital conclusion and consistent with the movement towards the globalization. Recently, Su and Chang (2010) employed the threshold error-correction model to examine the presence of a non-linear cointegration between lending and deposit rates of eight Eastern European countries. Their results proved the existence of asymmetric behavior.

Among these studies is that of Bellando and Lavigne (1992), who conducted an empirical investigation between deposit rates and lending rates in four European countries (Germany, Great Britain, Italy and Spain), where there are no ceilings on deposit rates. The study employed the Granger-causality test. The study demonstrated that the causality depends on the degree of

interbank competition. For example, a highly competitive deposit market leads to a one-way causality from deposit rates to lending rates, whereas an oligopolistion behavior on the deposit market weakens the causal relationship which may even be reversed. The Spanish case shows that, at least in the short run, increasing competition in the deposit market strengthens the causality from deposit rates to lending rates.

Ewing et al.'s (1998) study showed that the equilibrium spread between the lending rate and the deposit rate certificate is stationary, which implies that the spread returns to its long-run equilibrium position following a shock. Therefore, if banks have market power, they could realize profits higher than usual or abnormal profits. Similarly, Burgstaller (2005) also examined the relationship between the lending rate and deposit rate in Austria for the period March 1995 to June 2003. This study employed Granger-non causality in a vector autoregression framework. In particular, the study followed Toda and Yamamoto (1995) in adding one augmenting lag to the dynamic structure, which is not used by the test but enables valid Granger-noncausality inference to be conducted in models that contain unit roots. The results showed that lending rate responses to deposit rate changes are insignificant for the months after the shock. Deposit rates have no predictive content for lending rates beyond that of market interest rates. The study concluded that the results tend to support that deposits are to be classified as outputs of banks' production process. In other words, this is considered as additional evidence of deposits being outputs in bank production.

Nguyen, Islam and Ali (2010) studied the relationship between the lending rate and the deposit rate in Bangladesh. The study utilizes monthly data for the period 1997:2 to 2010:2 focusing mostly on the post-reform period. An asymmetric error-correction model was estimated to examine short-run and long-run dynamics. The results reveal that the lending rate and the deposit rate affect the movement of each other. The results further suggest that the lending rate adjusts to the long-run equilibrium faster when a shock narrows compared to when it widens the basis. On the contrary, the deposit rate only responds when the basis is widening but not when it is narrowing.

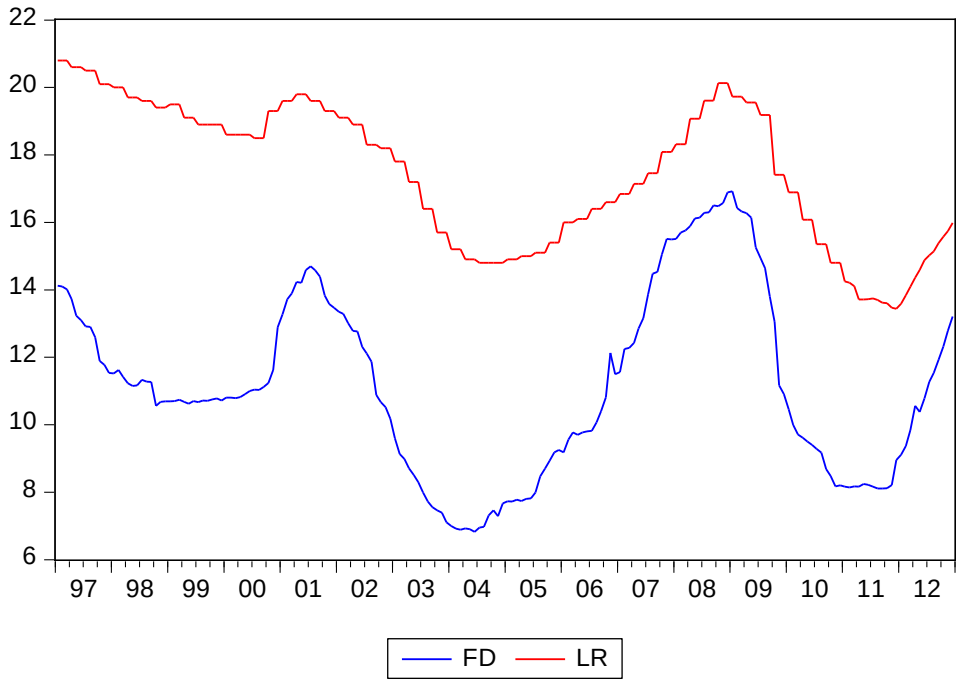
Chang and Su (2010) examined the relationship between the lending rate and the deposit rate in Eastern Europe. In this study, asymmetric error-correction models were estimated to describe the dynamic adjustments to the lending-deposit spreads, particularly the study employed threshold models by Enders and Granger (1998) and Enders and Siklos (2001). The data used in this study are monthly observations on the lending rate (LR), and the 1-month certificate of the deposit rate (DR) from 1998 to 2007. The results reveal that there are indeed such long-run non-linear cointegration relationships between the lending and deposit rates. In the same manner Chang, Chen, Su, Zhu and Liu (2011) used a non-parametric rank test proposed by Breitung (2001), in order to determine whether any non-linear long-run equilibrium relationship exists between the lending and deposit rates of G8 countries. The study further adopted a Threshold Error-Correction Model (TECM) to determine whether a similar relationship is discernible possibly non-linear functions of the lending and deposit rates. Monthly observations for the period covering 1998 to 2009 were used for these estimations. The findings showed that there are indeed long-run non-linear cointegration relationships between the lending and deposit rates and successfully capture the dynamic adjustment in G8 countries.

There are lessons to be learned from both theoretical and empirical literature. First, the mark-up theory appears to be dominant. Secondly, studies yield mixed results due to the fact that different methodologies and techniques have been applied. There are two strands. One strand follows a traditional approach where it is assumed that the spread variables, such as the lending-deposit spread, are linear and symmetric. Hence, the variables used in such studies have tended to be linear. Under that assumption the usual techniques of causality and error correction can be used. The other strand assumes that the variables are non-linear and the adjustment process is asymmetric. Hence, with this assumption, other techniques such as threshold vector autoregression (T-VAR) or threshold vector error correction (T-VAR) etc. were applied. It is important at this stage to point out that results that do not conform to a particular strand do not necessarily imply that the methodology used is wrong. Experience has taught us that different techniques are bound to produce different results at times.

In the case of Sri Lanka, the literature on the relationship between the lending rate and the deposit rate is very limited. The study that comes close to this topic is that by Eita (2012).

Although this study does not directly study the relationship between the two variables, it gives an insight into the factors that play a role in widening or narrowing the gap between these two variables. For instance, financial deepening is said to increase interbank competition and subsequently reduce the interest rate spread. This is in line with the proposition that banks operate under imperfect competition on markets for loans and deposits. It is against this background that a study in the context of one of the strands described above is necessary

3. Deposit and Lending Rates in Sri Lanka



Sri Lankan banking industry plays a significant economic role in Sri Lanka and is highly concentrated and dominated by the two large domestic banks Perera, et al. (2012). The three largest banks account for 64 percent of the total banking sector assets in Sri Lanka. The Sri Lankan domestic banks dominate the industry because most foreign banks have centered their operations in the major cities and operate limited branch networks and held approximately 7 percent of Sri Lanka's banking sector assets.

To empirically investigate the lending and deposit rate behavior, this analysis utilizes monthly data from Central Bank over the period from January 1997 to December 2012. The monthly lending rates and the deposit rates are denoted by LR_t and DR_t , respectively. Figure 1 displays the behavior of the respective lending and deposit rates over the sample period.

As Figure 1 suggests, the Sri Lankan lending and deposit rates oscillated around a downward trend from the beginning of the sample period (after the Asian financial crisis) to early 2000. They then fluctuated around fairly steep upward trends through the middle of 2001. These rates again oscillated around their very steep downward trends until 2004. These rates took huge jumps to their highest peaks in late 2008, dropped sharply to levels 2004 in late 2011, and then oscillated around their moderately upward trends until the 2012. Both rates took a sharp drop at late 2008 and then increased significantly at the beginning of 2011.

Figure 1 displays the behavior of the respective lending and Central Bank discount rates over the sample period. As figure 1 suggests, the Sri Lankan lending oscillated around a downward trend from the beginning of the sample to the late 1999, then fluctuated around a fairly steep upward trend until the middle of 2001, and then oscillated around a steep downward trend until the early 2005. The Sri Lankan lending rate then gradually climbed to another peak peak in the early 2009 and then slowly descended until the end of the sample period. The Central Bank discount rate made a steep jump in the late 1990 and then was held constant until the middle of 1991. It then dropped and recovered sharply in the middle 0f 1991. The Central Bank discount rate was again held constant the middle of 1991 the late 2000. It increased sharply reaching the peak the early 2001and then declined sharply until the end of 2001. It remained constant until the middle of 2003, took a sharp drop and ten maintained at about 15 percent for the remainder of the sample period.

The mean lending rate during the sample period was 15.36 percent, and ranged from 8.90 percent to 22.86 percent with the standard error being 3.78 percent. The mean Central Bank discount rate over the same period was 16.57 percent, and ranged from 10.00 percent to 25.00 percent with the standard error being 2.16 percent. The mean lending-discount rate spread during the sample period was -1.17 percent, and ranged from -7.94 percent to 9.58 percent with the standard error being 3.51 percent. Moreover, as suggested by Figure 1, it is likely that the Sri Lankan lending-discount rate spread experienced a structural shift over the sample period.

The mean lending rate during the sample period was 17.45, and ranged from 13.4 percent to 20.8 with the standard error being 2.111 percent. The mean deposit rate over the same period was 11.17, and ranged from 6.8 to 16.9 with the standard error being 2.08. Their correlation was 0.733.

4. Methodology

As mentioned, the Sri Lankan economy and its financial sector are distinctly different from emerging economies and have gone through many changes and experienced many economic shocks; therefore, it is possible that the lending-deposit rate relationship might experience structural breaks over the sample period. To discern this possibility, this study followed ADF procedure to specify and estimate the unit root test function with the intercept, slope, and the trend dummies to test the hypothesis that the Sri Lankan lending rate has experienced structural shifts over the sample period. In fact, most of the economic and financial data series are non-stationary at their levels. The use of such series in regression analyses lead to spurious regression (Granger and Newbold, 1974). For this reason, to explore the order of integration of the series in question we will use two tests: Augmented Dickey-Fuller test (1979) test and Phillips-Perron (1988) test. The ADF test is employed using the ordinary least square (OLS) estimation of model (1):

$$\Delta y_t = a_0 + a_1 y_{t-1} + \sum_{i=1}^{p} \emptyset_i \Delta y_{t-i} + u_t \qquad \text{.....(1)}$$

where y_t is the time series, Δ is the first difference operator, u_t is the error term with zero mean and constant variance, and a_0, a_1, $\emptyset i$ (i = 1, …, p) are parameters to be estimated. The non-rejection of the null hypothesis a_1 =0 implies that y_t is nonstationary series. In this case differences are necessary to reach stationarity. Once the order of integration is determined, cointegration test is implemented using Johansen procedure (1988) and Johansen and Juselius technique (1990). These researchers have developed two tests to detect the number of cointegrating vectors: the maximum-likelihood test and the trace test. Once the variables are proved to be cointegrated, two different kinds of equations can be derived:

a) The long-run equation:

$$LR_t = \beta_0 + \beta_1 DR_t + \mathcal{E}_t \qquad \text{.....(2)}$$

where LR_t and DR_t are denoted as the lending rate and the deposit rate respectively. In addition, $\mathcal{E}_t$ is the stochastic error term with mean zero and a constant variance.

b) The short-run model or the vector error-correction representations:

$$LR_t = \beta_0 + \beta_1 DR_t + \beta_2 U_{t-1} + e_{it} \qquad \text{.....(3)}$$

$$DR_t = \beta_0 + \beta_1 LR_t + \beta_2 U_{t-1} + e_{it} \qquad \text{.....(4)}$$

where Δ represents the difference operator, p is the number of lags, U_{t-1} is referred to the error terms derived from the long run relationship, and e_{it} (i =1, 2) is the stochastic error term with mean zero and a constant variance. In order to check the causal relationship between the variables we will use Granger causality test that was developed by Granger (1969). According to Granger (1988), causality tests are valid only if there exists cointegration among the involved variables. Thus a necessary precondition to causality testing is to check the cointegrationg properties of the variables of interest. We apply the standard Granger causality test on the equations (3) and (4).

5. Data and Variables Description

This study employs monthly series of lending rate and deposit rate over the period 1997-2012. The causality analysis is not achievable without using the market values of banks' interest rates. We thereby process our data through averaging the loan and the deposit interest rate values. The Average Weighted Fixed Deposit Rate (AWFDR) is calculated by the Central Bank monthly based on all outstanding fixed (time) deposits of commercial banks and the corresponding interest rates. The Average Weighted Lending Rate (AWLR) is calculated by the Central Bank monthly (computed quarterly up to 2010), based on all outstanding loans and advances granted by commercial banks to the private sector and the corresponding interest rates. Banks' interest rate data before the last quarter of 2013 are not published. Therefore, we sample the period from 1997 to the last quarter of 2012, which makes 192 observations.

6. Results and Discussions

We use quarterly data from Sri Lanka during the period (1994:1-2010:2). The data source is the CB monthly statistical bulletin. The model has two variables, which they are deposit rate and lending rate. The first step in the empirical results is to explore whether the data on the level has a unit root or not. This is a fundamental step to avoid producing a spurious regression. Consequently, we perform Augmented Dickey-Fuller (ADF) unit root test without trend and intercept7. Results are reported in Table (1). The lag length of ADF test is selected based on Schwartz Criterion. The two series have a unit root on the level. However, all of them are stationary at the first difference.

Table (1): Augmented Dickey -Fuller Unit Root Test

Variable	Test specification	Augmented Dicky-Fuller		
FD		Constant	Constant and Trend	none
	level	-1.064954	-0.960158	-0.433790
	1st difference	**-8.041577**	**-8.130204**	**-8.063373**
LR	Level	-1.445352	-1.119186	-1.517223
	1st difference	**-13.19723**	**-13.22032**	**-13.11071**

Note: *, **, and *** show the statistical significance at the 10%, 5%, and 1% level of significance respectively.

The next step in the empirical results is to test if there is a bivariate cointegration relationship between lending rate and deposit rate. We use Johansen test and the results are reported in Table (2). The maximum eigenvalue illustrate that there is one cointegration relation between lending and deposit rates at 5 percent and 1 percent significant levels. The result confirms the existence of a long-run relationship.

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.208649	43.99451	14.26460	0.0000
At most 1 *	0.040693	7.810364	3.841466	0.0052

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

Using autoregression model (VAR), Granger test is made to identify the posited causality. Two lags are included on both interest rates. The empirical model in this study is hence estimated as the following:

$$LR_t = \delta_0 + \delta_1 * LR_{t-1} + \delta_2 * LR_{t-2} + \psi_1 * DR_{t-1} + \psi 2 * DR_{t-2} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

$$DR_t = \delta_0 + \delta_1 * DR_{t-1} + \delta_2 * DR_{t-2} + \psi_1 * LR_{t-1} + \psi 2 * LR_{t-2} + \varepsilon\varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

where t stands for time, LR for loan interest rates, DR for deposit interest rates, and the error terms of LR and DR respectively $\varepsilon_{t\ and}\ \varepsilon\varepsilon_t$. The above-mentioned empirical analyses facilitate a concurrent view on the degrees of the correlation, causation and association between the loan interest rates and deposit interest rates of commercial banks. Table 2 presents the bivariate correlation test results between loan and deposit interest rates. Pearson correlation coefficient reports that loan interest rates are 73.3% correlated to deposit interest rates. This linkage is positive.

Table 2: Correlations: Loan Interest Rate Deposit Interest Rate

N = 192	FD	LR
FD	1.000	
LR	0.733*** 14.8517	1.000

*Notes: Table 2 presents the correlations between loan interest rate and deposit interest rate. LR and DR stand for loan interest rate and deposit interest rate respectively. N that refers to the number of observations is 192*** indicates the significance at 1 percent level.*

Table 4. Normalized cointegration vector

DFD(-1)	constant	DFD
1.00	-0.042	-1.8
Standard Error		.179
t-statistics		-10.03

The previous results of cointegration analysis refer to the existence of a long run equilibrium relationship between the changes in deposit rate and lending rate, but it doesn't give any information about the direction of the causality between them. By specifying the long run relationship between variables in an error correction model, the short run, as well as the long run effects of all right hand side variables in equation, are estimated in one step. The adjustment process may take a number of periods and thus the equation of the ECM should have lagged

variables. It is important to include the appropriate number of lags. The appropriate number of lags (2) is determined by Akaike AIC statistics where the appropriate lags is associated with the lowest value of AIC.

VAR Model

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$$DLR_t = -\underset{(0.01707)}{0.0325} - \underset{(0.07167)}{0.1752}\, DLR_{t-1} - \underset{(0.07650)}{0.237} DLR_{t-2} + \underset{(0.06251)}{0.245} * DFDR_{t-1} + \underset{(0.05744)}{0.259} DFDR_{t-2}$$

$$DFDR_t = \underset{(0.02010)}{0.017} + \underset{(0.08442)}{0.4776} DLR_{t-1} + \underset{(0.09011)}{0.206} * DLR_{t-2} + \underset{(0.07362)}{0.205} DFDR_{t-1} + \underset{(0.06766)}{0.184} DFDR_{t-2}$$

The normalized cointegration equation reveals that deposit rate has a negative effect on the changes in Lending rate. The deposit coefficient is (-1.8) and is significant at 5%, implying that a one percent increase in fixed deposit rate while others keep constant contributes 1.82% decrease in the changes in lending rate. This result confirms the bank concentration hypothesis states that banks are more likely to decrease deposit rates and increase lending rates when they are able to exercise market power and adjust interest rates to their advantage. In other words, when banks operate in a highly competitive environment, they may fear a negative reaction from customers in response to lending rate increases or deposit rate decreases. In Sri Lanka, this phenomenon may be explained by increased competition within the banking sector via privatization.

The final step in the empirical results is to estimate the error correction model (ECM). Let us examine the ECM[8] results which are presented in Table (5).

Table (5): The Results of the Error Correction Model

Error Correction:	D(DFD)	D(DLR)
CointEq1	-0.493655	0.282158
	(0.10323)	(0.07695)
	[-4.78204]	[3.66686]
D(DFD(-1))	-0.335327	-0.141477
	(0.09082)	(0.06770)
	[-3.69218]	[-2.08984]
D(DFD(-2))	-0.223938	-0.085509
	(0.06897)	(0.05141)
	[-3.24679]	[-1.66322]
D(DLR(-1))	-0.396286	-0.523215
	(0.14304)	(0.10662)
	[-2.77053]	[-4.90736]
D(DLR(-2))	-0.150508	-0.587461
	(0.09069)	(0.06760)
	[-1.65966]	[-8.69062]
C	0.005768	0.004012
	(0.01960)	(0.01461)
	[0.29433]	[0.27465]
R-squared	0.440554	0.699238
Adj. R-squared	0.425185	0.690975
Sum sq. resids	13.13859	7.300000
F-statistic	28.66442	84.62586

Table 5 summarizes the results of the ECM. The error correction term (ECT) describes the short-run dynamics or adjustments of the cointegrated variables towards their equilibrium values. The estimation results of the Error-Correction Model suggested a bidirectional Granger-causality between Sri Lankan lending and deposit rates. These results imply that both the Sri Lankan lending and deposit rates adjustments affected each other's movements.

First consider the lending rate regression. Lending rate adjusts significantly of its 1st and 2nd lagged values. The short-run and long run changes in the lagged lending is 52 percent and 58 percent respectively and its status have a negative impact on changes in lending rate statistical significant different from zero. . A possible explanations that in the short-run banks are revising their lending rate downward because of the high competition in the market. The short-run adjustment speed of lending rate deviation from its long-run equilibrium is corrected roughly by 28 percent in the current period. Economically, this result

suggests that the lending rate responds more strongly to expansionary monetary policy in the long run.

Second consider the deposit rate regression. Deposit rate responds significantly of its short-run and long-run lagged values. In the short-run deposit rate is affected negatively by its first and second lagged, the value of this influence is 33 percent and 22 percent, respectively, and it is statistically significant different from zero.Economically, this result suggests that the deposit rate responds more strongly to contractionary than to expansionary monetary policy in the long run.

To check the normal distribution of the residuals, Histogram-Normality test is conducted and Jarque-Berastatistics is 0.944 (p-value 0.624) which indicates that the residuals are normally distributed. Also, LM test of serial correlation is conducted to check if the ECM has any serial correlation. The results of Breusch-Godfreyserial correlation LM test confirm that there is no serial correlation in the model. Finally, results of White Heteroscedasticity test show that the model is homoscedasticity. From the previous results, it is concluded that the model is well fitted, and thus the results of the ECM model can be accepted.

5. CONCLUSIONS

The aim of this study is whether banks use deposit interest rate values in pricing their loan interest rate values. Researcher aimed to support to the bank margin (profitability) literature through documenting the predicted causality between bank deposit interest rates and loan interest rates. To achieve this aim, researcher performed three empirical tests. A bivariate correlation test was first made to see how, and to what extent these two margin-determining interest rates correlate to each other. Pearson correlation coefficient indicated that loan interest rates are 73.5% correlated to deposit interest rates. This linkage was found to be positive and significant at 1 percent level.

Using autoregression model (VAR), Granger test was made to identify the posited causality. Empirical documentations provide strong evidence that there is a two-way causality between deposit interest rates and loan interest rates. This causation is significant at 5 percent level, which is robust as well. As to the long-run behavior of lending and deposit rates, the empirical results

indicated that while the Sri Lankan lending rate responded to expansionary monetary policy, the deposit rate responded to contractionary monetary policy, It imply that banks in Sri Lanka are unlikely to decrease their lending rates during a recession due to the higher risk of default. This risk-averse behavior of bankers may result in lending rate displaying asymmetric movements to a change in market rate.