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## AUTHORS

Chu V. Nguyen  
Anisul M. Islam  
Muhammad Mahboob Ali

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Chu V. Nguyen (USA), Anisul M. Islam (USA), Muhammad Mahboob Ali (Bangladesh)

## Cambodian lending-deposit rate spread: the results of non-market influences

### Abstract

In the study the asymmetric adjustments in the Cambodian lending-deposit rate spread are documented. This article plans to apply Enders and Siklos (2001) procedure to test for the long-run asymmetric co-integrating relationship and Granger causality between the lending rate and the deposit rate for Cambodian, a poor developing country in Southeast Asia using monthly time series data over the period from May 1994 to June 2010. The deposit rates adjust faster when the spread is narrowing than when it is widening. These findings are consistent with the observed monopolistic/oligopolistic structure of the banking sector. The revealed predatory pricing behavior impede Cambodian industrial developments and hence slow economic developments and social progresses. The root causes of the problems are excessive government intervention and political connections, management corruptions, inefficiency and ineffectiveness. Strong political will and commitment to implement would be needed to establish a more competitive market economy for further economic growth and social progress in Cambodia.

**Keywords:** asymmetry, lending rate, deposit rate, lending-deposit rate spread, Cambodia.

**JEL Classification:** C01, E32, E44, E51.

### Introduction

The financial sector in general, and the banking sector in particular, play a significant role in promoting industrialization and economic development of a country and are well documented in finance and economics literature. This sector is expected to provide efficient intermediation to mobilize savings and channel them into productive investments and thus promote industrialization, economic development and social progress. These intermediaries would make profit from the spread between the lending rate charged to borrowers and deposit rate paid to savers. In this transmission mechanism, commercial banks' behavior in setting their deposit and lending rates significantly influences the effectiveness of the monetary authority in its monetary policy making. Furthermore, if the lending rate or the spread is high or asymmetric adjustment in interest rates exists, they might reflect inefficiency and/or lack of competition, and the banking system would not be able to fulfill its expected role in the economic development process. In developed economies, Thompson (2006) theorizes that banks set their lending rates as some markup or premium over their deposit rates. If the financial market perceives the premium to be too high or low, it will discipline banks to adjust back to some equilibrium spread.

This paper proposes to apply Enders and Siklos (2001) procedure to test for the long-run asymmetric co-integrating relationship and Granger causality between the lending rate and the deposit rate for Cambodian, a poor developing country in Southeast Asia using monthly time series data over the period from May 1994 to June 2010. This type of study has not been conducted before for Cambodia and there-

fore this paper will make an important contribution in filling this gap in literature. The study will be useful for academics, researchers, policy makers, and banking industry practitioners both at home and abroad.

### 1. Literature review

The asymmetries in the returns on financial market instruments have been studied extensively and documented in the literature of the indirect financing segments of the financial industry in developed economies. Ausubel (1991), Neumark and Sharpe (1992), Calem and Mester (1995), Dueker (2000), and Thompson (2006), have documented the asymmetric adjustment in the US lending rates. There are three main theoretical explanations for commercial bank interest rate asymmetries in the literature<sup>2</sup>. Neumark and Sharpe (1992) argue that when market interest rates fluctuate in either direction, banks in more concentrated markets adjust deposit rates and lending rates at different speeds that allow them to extract more surpluses from the consumers. Rosen (2002) and Calem and Mester (1995) theorize, based on the characteristics of the consumers, that the greater the proportion of unsophisticated consumers relative to sophisticated consumers in the market together with the potential search and switching costs give banks greater ability to adjust interest rates to their advantage.

However, Stiglitz and Weiss (1981) argue that banks operating in the high rate environment 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. The expected costs to the banks of not raising the lending rates, when their marginal cost of fund increas-

es, will be offset by the benefit from not encouraging the higher risk customers to borrow. Therefore, the adjustment of lending rates upward is slow when the deposit rates increase.

Elsewhere, Arak et al. (1983), Goldberger (1984), Forbes and Mayne (1989), Levine and Loeb (1989), Mester and Saunders, (1995), Dueker, (2000), and Tkacz (2001) have reported asymmetries in the U.S. prime lending rate in the past. Thompson (2006) found asymmetries in the US prime lending-deposit rate spread. Cook and Hahn (1989), and Sarno and Thornton (2003) found asymmetries in the US Treasury securities in their studies. Frost and Bowden (1999) and Scholnick (1999) reported asymmetries in lending rates in New Zealand, and Canada. Heffernan (1997) and Hofmann and Mizen (2004) indicated asymmetric behavior of retail rates in the United Kingdom. Hannan and Berger (1991), and Neumark and Sharpe (1992), Diebold and Sharpe (1992) examine various deposit rates for the same behavior. Nguyen and Islam (2010) found asymmetric behavior to be present in the Thai banking sector and attributed it to bank concentration hypothesis. Nguyen, Islam and Ali (2010) found that as to the short-run and long-run dynamics of the Bangladeshi lending and deposit rates, the estimations of the asymmetric error-correction model 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 than when it widens the basis. However, the results seem to indicate that the deposit rate in Bangladesh only responds when the basis is widening but not when it is narrowing.

## 2. The Cambodian economy and the banking sector

Since the independence of the country in 1953, Cambodia's economic policies were shaped by successive governments with different ideologies. Prince Sihanouk pursued the policy to attract unconditional foreign aid from the East and the West. Despite Sihanouk's professed economic progress, Cambodian industrial output was just about 12 percent of its GDP, and about one-third of agricultural output. Rice and rubber were the only two principal commodity exports. The Laissez-faire economic policy of Premier Lon Nol's government was impeded by the war. The economic policy of the Khmer Rouge's government based on a fanatical and doctrinaire self-reliance ravaged the nation and the Cambodian people. Though nominally a democracy, Cambodia has been ruled either formally or de facto by Prime Minister Hun Sen since 1993. Over this period, through many reforms, the economy has been trans-

formed from centrally planned to an early stage of the market-based system.

As articulated by many others such as Calavan et al. (2004) and Feinberg (2009), corruption is pervasive in Cambodia. In an ex-socialist country in early stages of transition, political and economic "reforms", extensive government interventions in the form of licenses and permits as well as directives inevitably resulted in pervasive corruption. From a different perspective, according to the Transparency International's 2007 corruption index, Cambodia ranks 162 among 180 countries, as compared to 123, 168 and 179 for Vietnam, Laos, and Myanmar respectively. Consequently, the ownership of private institutions and controls of public institutions including the banking industry are given to a few politically well-connected individuals.

In regard to the financial sector development, Khmer Rouge abolished the banking system and money in the late 1970s. To facilitate economic transitions nationwide in the post Khmer Rouge period, successive Cambodian governments established the National Bank of Cambodia (NBC), a state-owned monobank, whose role included central, commercial, and development banking activities, according to the Soviet-styled socialist economic model in November 1979. The currency, the riel, was reintroduced in March 1980. In 1989, as part of the overall reform of the economy towards a market-based system, the commercial bank functions were separated from the NBC, and private commercial banks were allowed as limited liability companies. Private commercial bank licenses began to be granted 1991 and foreign banks were encouraged to enter the Cambodian financial market. Frequently, the foreign bank presence in Cambodia was in joint venture arrangements with the national bank (IMF Country Report No. 03/59, 2003, pp. 34-35).

The proliferation of banks that followed left Cambodia with an excessively large number of banks relative to its size and development. This development arose partially due to the relaxation of requirements for obtaining a license which essentially required applicants to meet a low minimum capital requirement. Consequently, at the end of 1999, Cambodian banking system consisted of 31 banks, comprising 2 state-owned banks, 7 foreign bank branches, and 22 privately-owned commercial banks. This proliferation strained the regulatory and supervisory capacities of the NBC, prompting the NBC authority to impose a moratorium on new licenses in 1994, despite prevailing strong demand by potential investors. The Cambodian banking authority resumed granting licenses in June 1996 (IMF Country Report No. 03/59, 2003, pp. 35-36).

Additionally, as reported by IMF staff (IMF Country Report No. 03/59, 2003, p. 35), not enough business opportunities precipitated many banks to speculate in the overseas commodity resulting in loss of most of capital of one of the smallest banks and another closed voluntarily. Also, the 1997 Asian financial crisis caused difficulties for some of the foreign-owned banks to meet the minimum capital requirements, as these banks were under financial pressure in their respective home countries.

In regard to the Cambodian banking intermediation process, credit is allocated on market terms, but the government influences lending decisions. Individual banks tend to concentrate lending in specific sectors with 12 of 15 commercial banks having over 30 percent of their credit in one sector and 4 with more than 80 percent (IMF Country Report No. 07/291, 2007, p. 27). There are no bond or securities markets. Cambodia's financial system is characterized as segmented, underdeveloped, and subject to government influence. As of December 2009, the Cambodian banking sector is still not in compliance with the National Bank of Cambodia's regulations, as IMF staff observed that a number of banks continue to inaccurately report few or no non-performing loans. Additionally, the ever-greening of loans and capitalization of interest still take place (IMF Country Report No. 09/325, 2009, p. 17). With regard to the banking market structure, IMF staff argued that "Until recently, the banking market was dominated by two Cambodian banks, FTB and Canadia Bank, which owns FTB, these four banks held almost half of all deposits. Other banks were small and generally associated with specific sectors or nationalities (IMF Country Report No. 07/291, 2007, p. 25).

As a poor developing nation, Cambodia has been supported by the IMF Poverty Reduction and Growth Facility (PRGF) program. An integral part of the national economic policy of the PRGF-supported program was the banking system policy that encompassed three pillars: (1) re-licensing (by NBC) of commercial banks under the new promulgated Banking and Financial Institutions Law in late 1999; (2) strengthening bank supervision; and (3) reforming and eventually privatizing the state-owned FTB to further reduce direct government involvement. As reported in IMF Country Report No. 07/291 (2007, p. 24), FTB was sold to a consortium led by the market-leading Canadia Bank in late 2005. The Banking and Financial Institutions Law was promulgated in November 1999. The re-licensing process of this Law was completed in April 2002. In this process the NBC closed 15 banks that were either insolvent or not in compliance with the law; at the same time, a new bank was granted a banking license and stated operations in November 2002 (IMF Country Report No. 03/59, 2003, p. 35). The implementation of Banking and Financial Institutions

Law might have significantly changed the Cambodian banking structure.

The above political and economic transpirations as well as the structure of the financial sector would be expected to result in monopoly and oligopoly behavior along with government interference either implicitly or explicitly – a symptom of crony capitalism. These phenomena would invariably result in pervasive corruption throughout the economy. Particularly in the banking industry, the corruption and monopolistic/oligopolistic market power manifest to higher lending rates, lower deposit rates and hence higher lending-deposit rate spread.

In light of the aforementioned, this study applies Thompson's analysis (2006) to the Cambodian economy to investigate the following questions. First, given the above political, economic, and financial developments, has the lending deposit rate spread encountered a structural break? Secondly, are asymmetries present in the lending-deposit rate spread in the Cambodian banking industry? Third, if asymmetries are present, how do the Cambodian lending rate and deposit rate respond to such asymmetries? Finally, do the asymmetries reveal a predatory or competitive banking product pricing behavior of Cambodian lending institution? The remainder of the paper is organized as follows. Section 3 summarizes the data and descriptive statistics; section 4 presents the methodology, and reports empirical results; section 5 discusses the empirical results and policy implication; and the final section provides the concluding remarks.

### 3. The data

This study of the Cambodian banks' lending-deposit rate spread utilizes monthly data from the International Financial Statistics, published by the IMF, over the period from May 1994 to June 2010 for which monthly data were available. The lending-deposit rate spread ( $SP_t$ ) is defined as the difference between the commercial banks' lending rates and their deposit rates. Figure 1 displays the behavior of the respective lending rates, the deposit rates, and their spreads over the sample period.

Figure 1 displays the behavior of the Cambodian lending rates, deposit rates and their spread. The lending rates and deposit rates were fairly stable from the beginning of the sample period to early 2001 and then oscillated around a very steep downward sloped trend until the end of 2001. The lending rates then followed a steep upward sloped trend, and then oscillated around a very moderate downward trend; while the deposit rates fluctuated around a very sharp downward trend to the end of 2001 and then oscillated around a moderate downward trend over the remainder of the sample period. The Cam-

bodian lending-deposit rate spread hovered around its flat 10 percent trend from the beginning of the sample to early 2000. The spread began to oscillate around a very steep upward sloped trend until the end of 2002, and then hovered around a slightly downward sloped trend over the remaining period of the sample. Moreover, for a given level of the lending rate, a monetary policy action or an economic shock causing the deposit rates decrease, would increase the lending-deposit rate spread. The opposite is true if the deposit rate changes in the other direction.

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very steep downward sloped trend until the end of 2001. However, the lending rates then followed a steep upward trend, and then oscillated around a very moderate downward trend; while the deposit rates fluctuated around a downward trend over the remainder of the sample period. The Cambodian lending-deposit rate spread hovered around its flat 10 percent trend from the beginning of the sample to early 2000. The spread began to oscillate around a very steep upward sloped trend until the end of 2002, and then hovered around a slightly downward sloped trend over the remaining period of the sample. Moreover, for a given level of the lending rate, a monetary policy action or an economic shock causing the deposit rates decrease, would increase the lending-deposit rate spread. The opposite is true if the deposit rate changes in the other direction.

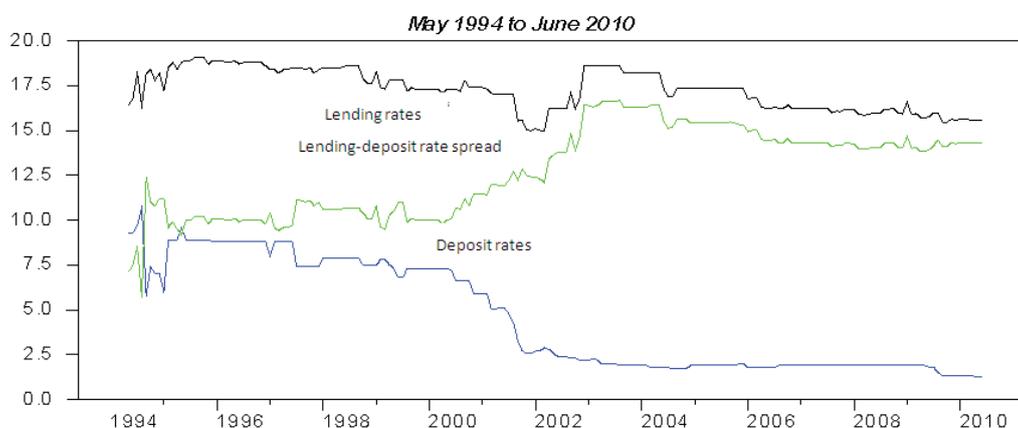


Fig 1. Cambodian lending rates, deposit rates, and lending-deposit rate spread

Additionally, descriptive statistics reveals that the mean Cambodian lending rate during the sample period was 17.27 percent, and ranged from 14.98 to 19.10 percent, with the standard deviation being 1.13 percent, while the mean deposit rate was 4.55 percent, and ranged from 1.25 to 10.70 percent, with the standard deviation being 3.01 percent. Also, the mean lending-deposit rate spread over the sample period was 12.72 percent, and ranged from 5.70 to 16.70 percent, with the standard deviation being 2.42 percent. More interestingly, the mean inflation as measured by percentage changes in the consumer price index (CPI) over the period from November 1994 to June 2010, for which the CPI is available, is 11.84 percent, resulting in the calculated mean real deposit rate over this period to be -0.99 percent. Also, as evidenced in Figure 1, it is very likely that the Cambodian lending-deposit rate spread experienced a structural shift over the sample period. It is also interesting to note that the mean lending rate, mean deposit rate, and mean lending-deposit rate spread for the period of May 1994-June 1999 were 18.35, 8.24, and 10.11 per-

cent respectively. Their respective figures for the July 1999-December 2002 were 16.79, 4.94, and 11.85 percent; while their corresponding levels for the remainder of the sample period were 16.76, 1.83, and 14.93 percent. These descriptive statistics reveal and Figure 1 illustrates that lowering deposit rates was not followed by declining lending-deposit rate spreads. In fact, the spread seems to increase as the deposit rate dropped significantly over the period of January 2003-June 2010. This rise in the spread in spite of declining deposit rates indicates serious inefficiency in the Cambodian banking system.

#### 4. Methodology and empirical results

**4.1. Methodology.** To discern the structural break possibility and to allow for the possibility of endogenous breaks in the lending-deposit rate spread, following Perron (1997) procedure, an endogenous unit root test function with the intercept, slope, and the dummy were specified and estimated to test the hypothesis that the Cambodian lending-deposit rate spread has a unit root.

$$SP_t = \mu + \theta DU + \alpha t + \gamma DT + \delta D(T_b) + \beta SP_{t-1} + \sum_{i=1}^k \psi_i \Delta SP_{t-i} + \varepsilon_t, \quad (1)$$

where  $DU = 1(t > T_b)$  is a post-break constant dummy variable;  $t$  is a linear time trend;  $DU = 1(t > T_b)t$  is a post-break slope dummy variable;  $D(T_b) = 1(t = T_b + 1)$  is the break dummy variable; and  $\varepsilon_t$  are white-noise error terms. The null hypothesis of a unit root is stated as  $\beta = 1$ . The break date,  $T_b$ , is selected based on the minimum t-statistic for testing  $\beta = 1$  (see Perron, 1997, pp. 358-359).

The estimation results of Perron's endogenous unit root tests are summarized in Table 1. The

post-break intercept dummy variable,  $DU$ , is positive, while the post-break slope dummy variable,  $DT$ , is negative and they are significant at any conventional level. However, the break dummy variable,  $D(T_b)$ , is statistically significant at 1 percent level. The results of this test suggest that the Cambodian lending-deposit rate followed a stationary trend process with a break date of February 2002, corresponding completion of the bank restructuring process provided by the Banking and Financial Institutions Law.

Table 1. Perron's endogenous unit root test, Cambodian data (May 1994 to June 2010)

|                                                                                       |                           |                                |
|---------------------------------------------------------------------------------------|---------------------------|--------------------------------|
| $SP_t = 1.7874 + 1.7750DU + 0.0052t - 0.0099DT - 0.9799D(T_b) + 0.8065SP_{t-1} + v_t$ |                           |                                |
| (5.2576*) (5.3672*) (2.9529*) (-4.0847*) (-2.7547*) (22.9938*)                        |                           |                                |
| Number of augmented lags: $k = 11$                                                    | Break Date: February 2002 | $t(\alpha = 1) = -5.5166^{**}$ |

Notes: Critical values for t-statistics are in parentheses. Critical values based  $n = 100$  sample for the break date (Perron, 1997). \* and \*\* indicate significance at the 1% and 5% levels.

The Dickey-Fuller standard unit root tests and their extension assume that the adjustment process is symmetric. If the adjustment process is asymmetric, then the implicitly assumed restrictive symmetric adjustment is indicative of model misspecification. To formally investigate the possibility of asymmetric adjustment process, the threshold autoregressive (TAR) method developed by Enders and Siklos (2001) are estimated to examine the behavior of the Cambodian lending-deposit rate spread.

The threshold autoregressive model allows the degree of autoregressive decay to depend on the state of the lending-deposit rate spread (i.e., "deepness" of cycles). The estimated TAR model empirically reveal if the spread tends to revert back to the long run position faster when the spread is above or below the threshold. Therefore, TAR model indicate whether troughs or peaks persist more when shocks push the spread out of its long-term path. In this model's specification, the null hypothesis that the lending-deposit rate spread contains a unit root can be expressed as  $\rho_1 = \rho_2 = 0$ , while the hypothesis that the spread is stationary with symmetric adjustments can be stated as  $\rho_1 = \rho_2$ .

To formally examine the behavior of the lending-deposit rate spread, this study follows Thompson (2006) to regress the Cambodian lending-deposit rate spread on a constant, linear intercept dummy (with values of zero prior to February 2002 and values of one for February 2002 and thereafter). The saved residuals from the above estimated model, denoted by  $\hat{\varepsilon}_t$ , are then used to estimate the following TAR model:

$$\Delta \hat{\varepsilon}_t = I_t \rho_1 \hat{\varepsilon}_{t-1} + (1 - I_t) \rho_2 \hat{\varepsilon}_{t-1} + \sum_{i=1}^k \alpha_i \Delta \hat{\varepsilon}_{t-p} + \hat{u}_t, \quad (2)$$

where  $\hat{u}_t \sim i.i.d.(0, \sigma^2)$ , and the lagged values of  $\Delta \hat{\varepsilon}_t$  are meant to yield uncorrelated residuals. As defined by Enders and Granger (1998), the Heaviside indicator function for the TAR specification is given as:

$$I_t = \begin{cases} 1, & \text{if } \hat{\varepsilon}_{t-1} \geq \tau \\ 0, & \text{if } \hat{\varepsilon}_{t-1} < \tau \end{cases}. \quad (3)$$

**4.2. Empirical results.** The overall empirical results in Table 2 indicate that the estimation results are devoid of serial correlation and have good predicting power as evidenced by the Ljung-Box statistics and the overall  $F$ -statistics, respectively. With the calculated statistic  $\Phi_\mu = 10.8422$ , the null hypothesis of a unit root ( $\rho_1 = \rho_2 = 0$ ) is rejected at the 1 percent significance level (i.e., the spread is stationary). Given the partial test statistic  $F = 43.0373$ , the null hypothesis of symmetry,  $\rho_1 = \rho_2 = 0$  is also rejected at any conventional significance level. Thus, the empirical results indicate that adjustments around the threshold value of the Cambodian lending-deposit rate spread are asymmetric. In fact, the point estimates suggest that the spread tends to decay at the rate of  $|\rho_1| = 0.1066$  for  $\hat{\varepsilon}_{t-1}$  above the threshold,  $\tau = -0.7845$  and at the rate of  $|\rho_2| = 1.0383$  for  $\hat{\varepsilon}_{t-1}$  below the threshold. Moreover, while  $\rho_2$  is statistically significant at any conventional level,  $\rho_1$  is also significant at 5 percent level. Furthermore, As shown by Petrucelli and Woolford (1984), the necessary and sufficient condition for the spread to be stationary is:  $\rho_1 < 0$ ,  $\rho_2 < 0$  and  $(1 + \rho_1)(1 + \rho_2) < 1$ ;

thus, the estimates of  $\rho_1$  and  $\rho_2$  satisfy the stationary (convergence) conditions. With regard to the stationarity of the spread, Ewing et al. (2006, p. 14) pointed out that this simple finding is consistent

with the two underlying series that comprise the spread (the lending rates and the deposit rates) being co-integrated in the *conventional, linear combination sense*.

Table 2. Unit root and tests of asymmetry, Cambodian data (May 1994 to June 2010)

| $\rho_1$                       | $\rho_2$ | $\tau$  | $H_0: \rho_1 = \rho_2 = 0$ | $H_0: \rho_1 = \rho_2$    | AIC       |
|--------------------------------|----------|---------|----------------------------|---------------------------|-----------|
| -0.1066**                      | -1.0383* | -0.7845 | $\Phi_{\mu} = 10.4822^*$   | $F = 43.0373^*$           | 1182.2967 |
| $Q_{LB(12)} = 18.717 [0.0956]$ |          |         | $\ln L = -166.8650$        | $F_{(4,187)} = 27.9798^*$ |           |

Notes: The null hypothesis of a unit root,  $H_0: \rho_1 = \rho_2 = 0$ , uses the critical values from Enders and Siklos (2001, p. 170, Table 1 for four lagged changes and  $n = 100$ ). \* indicates 1 percent level of significance. The null hypothesis of symmetry,  $H_0: \rho_1 = \rho_2$ , uses the standard F distribution.  $\tau$  is the threshold value determined via the Chan (1993) method.  $Q_{LB(12)}$  denotes the Ljung-Box Q-statistic with 12 lags.

Given  $|\rho_2| > |\rho_1|$ , the Cambodian lending-deposit rate spread adjusts to the threshold value slower when a policy action or an economic shock causes the deposit rates to fall relative to the lending rates, widening the spread, than when the deposit rates move in the opposite direction, narrowing the spread. These findings seem to support the position

articulated by the market concentration and the consumer characteristics hypotheses.

The presence of asymmetric adjustments in the Cambodian lending-deposit rate spread necessitates the estimation of an TAR VEC model to further investigate the short-run and long-run dynamics with respect to the lending rate ( $LR_t$ ) and the deposit rate ( $DR_t$ ).

$$\Delta LR_t = \alpha_0 + \rho_1 I_t \hat{\epsilon}_{t-1} + \rho_2 (1 - I_t) \hat{\epsilon}_{t-1} + A_{11}(L) \Delta LR_{t-i} + A_{12}(L) \Delta DR_{t-i} + u_{1t}, \tag{4}$$

$$\Delta DR_t = \tilde{\alpha}_0 + \tilde{\rho}_1 I_t \hat{\epsilon}_{t-1} + \tilde{\rho}_2 (1 - I_t) \hat{\epsilon}_{t-1} + A_{21}(L) \Delta LR_{t-i} + A_{22}(L) \Delta DR_{t-i} + u_{2t}, \tag{5}$$

where  $u_{1,2t} \sim i.i.d.(0, \sigma^2)$  and  $I_t$  is set in accordance with equation (3). As pointed out by Thompson (2006, pp. 327-328) the above specified TAR VEC model differs from the conventional error-correction models by allowing asymmetric adjustments toward the long-run equilibrium. Also, the asymmetric error correction model replaces the single symmetric error correction term with two error correction terms. Thus, in addition to estimating the long-run equilibrium relationship and asymmetric adjustment, the model also allow for tests of short-run dynamic between changes in lending rate and deposit rate. This in turn reveals the nature of their Granger causality.

zero. The  $t$ -statistics are reported with “\*”, “\*\*”, and “\*\*\*”, indicating the 1%, 5% and 10% significant levels.  $Q_{LB(12)}$  is the Ljung-Box statistics and its significance is in squared brackets, testing for the first twelve of the residual autocorrelations to be jointly equal to zero.  $\ln L$  is the log likelihood. The overall  $F$ -statistic with “\*” indicates the significance level of 1 percent.

The estimation results are reported in Table 3. In the summary of the estimation results,  $A_{ij}(L)$  represents the first-order polynomials in the lag operator  $L$ . The  $F_{ij}$  represents the calculated partial  $F$ -statistics with the p-value in squared brackets testing the null hypothesis that all coefficients of  $A_{ij}$  are equal to

Overall empirical results suggest that the estimated equations (4) and (5) are absent of serial correlation and have good predicting power as evidenced by the Ljung-Box statistics and the overall  $F$ -statistics, respectively. As to the short-run dynamic adjustment, the calculated partial  $F$ -statistics in equations (4) and (5) indicate bi-directional Granger-causality between Cambodian lending and deposit rates. These results imply that the Cambodian lending rate and deposit rate adjustments affected each other’s movements, i.e., there is evidence of Granger bi-directional causality.

Table 3. Asymmetric error correction model, Cambodian data (May 1994 to June 2010)

|                                                                                                                                                                                                                                                                                               |                    |                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------------|
| $\Delta LR_t = -0.0422 - 0.0579I_t \hat{\epsilon}_{t-1} - 0.2627(1 - I_t) \hat{\epsilon}_{t-1} + A_{11}(L)\Delta LR_{t-i} + A_{12}(L)\Delta DR_{t-i} + u_{1t}$ <p style="text-align: center;">-1.8193*** -2.1329** -4.6129* F<sub>11</sub>=4.4404 [0.0049] F<sub>21</sub>=4.7790 [0.0095]</p> |                    |                          |
| $Q_{LB(12)} = 13.525 [0.3321]$                                                                                                                                                                                                                                                                | $\ln L = -20.3486$ | $F_{(7,170)} = 6.5330^*$ |
| $\Delta DR_t = -0.0230 - 0.0028I_t \hat{\epsilon}_{t-1} + 0.0097(1 - I_t) \hat{\epsilon}_{t-1} + A_{21}(L)\Delta LR_{t-i} + A_{22}(L)\Delta DR_{t-i} + u_{2t}$ <p style="text-align: center;">-0.9626 -0.1001 0.1690 F<sub>21</sub>=9.4757 [0.0001] F<sub>22</sub>=2.1257 [0.1224]</p>        |                    |                          |
| $Q_{LB(12)} = 17.616 [0.1279]$                                                                                                                                                                                                                                                                | $\ln L = -31.1613$ | $F_{(6,176)} = 4.3909^*$ |

In addition to revealing the short-run dynamic Granger-causality, the asymmetric error correction model also captures the long-run adjustments of the lending and deposit rates.  $|\rho_2| > |\rho_1|$  in equation (4) is consistent with the TAR model's estimation results and an indication that the lending rate adjusts to the long-run equilibrium faster when a shock or a policy action narrows than when it widens the lending-deposit rate spread. Additionally, while  $\rho_2$  is statistically significant at 1 percent,  $\rho_1$  is significant at 5% level. Economically, this result suggests that the Cambodian lending rate responds more strongly to contractionary than to expansionary monetary policy in the long run. With regard to the deposit rate, the estimation results for equation (5) show that  $|\tilde{\rho}_2| > |\tilde{\rho}_1|$ ; but neither  $|\tilde{\rho}_2|$  nor  $\tilde{\rho}_2$  is significant. These findings suggest that the deposit rate responds to neither contractionary nor expansionary monetary policy in the long run.

### 5. An interpretation of the empirical findings, and policy implications

As the aforementioned descriptive statistics reveal, Cambodian interest rate spread is not only high in comparison to International standard but also in terms neighboring countries such as Vietnam, China, Sri Lanka, India, Pakistan and even Bangladesh. Additionally, in the real terms, the mean deposit rate over the period of November 1994-June 2010 was negative at -0.99 percent. As found earlier based on the descriptive statistics – throughout the sample period, lowering deposit rates results in higher spreads – indicate that the scope of lowering lending-deposit rate spread through reducing the deposit rate is counterproductive. Furthermore, interest rate is the price of using financial capital or funds, and microeconomic theory demonstrates that in the relatively high price range, the demand for the underlying product is more elastic and the quantity demanded of the product is more likely to be low. In banking industry, the products are loans and credits; thus, low quantity demanded indicates low investment and consumer spending.

Thus, in the banking sector that exhibits a relatively high lending rate environment such as the case of Cambodia, the demand for loans is likely to be relatively more elastic and lower number of loans that could be originated as a result, as compared to in a

more competitive rate environment. This phenomenon clearly is not conducive to more business investments and increase in consumer credit and hence consumption demand in the Cambodian transitional economy! These factors, in turns, partially explain the lack of domestic business precipitated the above mentioned Cambodian banks speculate in foreign commodity market resulting in the aforementioned loss of total equity of one Cambodian bank and closure of another.  $H_0 : \rho_1 = \rho_2$

The empirical findings that the spread tends to decay at the rate of  $|\rho_1| = 0.1066$  for  $\hat{\epsilon}_{t-1}$  above the threshold,  $\tau = -0.7845$  and at the rate of  $|\rho_2| = 1.0383$  for  $\hat{\epsilon}_{t-1}$  below the threshold and both  $\rho_1$  and  $\rho_2$  are statistically significant reveal another undesirable dimension of the Cambodian economy. These findings indicate that Cambodian lending institutions were slower to adjust the spread to its long-run threshold when economic shocks or policy actions lower deposit rates, widening the spread when they increase deposit rate, narrowing the spread. Given the high interest rate environment, hence high elastic demand for loans, and the asymmetries in the lending-deposit rate spread of the Cambodian economy, an economic shock or a contractionary cyclical monetary policy action that increases the deposit rate would quickly increase the lending rate and hence promptly causing a relatively large reduction in number of loans originated. On the other hand, if an economic shock or expansionary monetary policy action reduces the deposit rate that is normally expected to reduce the lending rate and lending-deposit rate spread, the above revealed asymmetric pricing behavior would impede the lending rate's downward adjustment and hence slowing the increase in the number of loans that could have otherwise originated. Taken together, the empirical findings suggest that the National Bank of Cambodia lacks credibility in its conduct of the national countercyclical monetary policy.

As aforementioned, the root causes of the Cambodian banking sector problem are the lack of market economy disciplines. Excessive government intervention and political connections, oligopolistic banking structure, management corruptions, inefficiency and ineffectiveness are part of a vicious circle that inhibits economic development, industrialization, and

social progresses in poor and developing countries in general and in Cambodia in particular. These problems cannot be corrected without the infrastructure of the more effective market economy. In this environment, strong political will to reform the system and strong commitment to implement the reforms would be needed to establish a more competitive and efficient banking sector and the overall economy, whereby, among other things, the National Bank of Cambodia credibility can be established, that would be conducive to economic progress.

## Conclusion

The findings of asymmetric adjustment behaviors of the lending rate, the deposit rate and their spread are the contributions of this study to the literature on the Cambodian banking industry. Another contribution is an articulation that even though the *asymmetries in the lending deposit rate spread seems to support the consumer characteristics and market concentration hypotheses which is theoretically consistent with the observed monopolistic/oligopolistic market structure of the Cambodian banking industry*. These findings may assist the National Bank of Cambodia in designing its counter-cyclical monetary policy more effectively over different phases of business cycles.

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As to the short-run and long-run dynamics of the Cambodian lending and deposit rates, the estimations of the asymmetric error-correction model reveal that the lending rate and the deposit rate affect the movement of each other in the shortrun. The results further suggest that the lending rate adjusts to the long-run equilibrium faster when a shock narrows than when it widens the lending deposit rate spread. However, the results seem to indicate that the deposit rate does not respond to economic shock or countercyclical monetary policy actions. These are indications of serious inefficiencies and hence require commitment to reform and then seriously implement the reform agenda to achieve a more efficient and competitive banking structure and help the country's economic progress in the process.

## Endnotes

Sellon (2002) provides a nice overview of the impact of the changing U.S. financial system on the interest rate channel for monetary policy transmission.

Scholnick (1999) provides the survey on these three types of explanations for commercial banks interest rate asymmetries in the literature.

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