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FINANCIAL ECONOMICS | RESEARCH ARTICLE

The Vietnamese lending rate, policy-related rate, and monetary policy post-1997 Asian financial crisis

Chu V. Nguyen^{1*}

Abstract: Asymmetries in the Vietnamese lending central bank's policy-related rate spread were documented. Empirical results revealed that the spread adjusts to the threshold faster when the central bank's policy-related rates decrease relative to the lending rates than when the central bank's policy-related rates move in the opposite direction. Additionally, the empirical findings indicate that Vietnamese commercial banks exhibit competitive rate setting behavior which may be attributable to graft maximization by bank's management. The results also show bidirectional Granger causality between the Vietnamese lending rate and the central bank's policy-related rate, indicating that the lending rate and the central bank's policy-related rate affect each other's movements. These results suggest that monetary authority can use its countercyclical monetary policy instruments to achieve its macroeconomics objectives. However, the estimation results of the GARCH (2, 3)-in-Mean model suggest that they should intervene more frequently and by small policy measures to minimize the conditional variance of the spread to minimize the magnitude of the cycle of the lending rate.

Subjects: Monetary Economics; Banking; Credit & Credit Institutions

Keywords: asymmetry; lending rate; central bank's policy-related rate; intermediation premium; Vietnam; predatory pricing behavior; Granger causality; countercyclical monetary policy

JEL classifications: C22; E44; G21

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PUBLIC INTEREST STATEMENT

The Vietnamese economy has experienced remarkable progress since the 1997 Asian financial crisis of international dimension. This paper explores the current rate setting behavior of Vietnamese commercial banks after the Asian financial crisis and compares it to that of commercial banks in advanced economies. The results suggest that the Vietnamese lending rate and the policy-related rate are directly proportional; if one goes up or down the other one will follow suit. This finding indicates the competitive pricing behavior of the Vietnamese lending institutions. These results seem to contradict those reported in advanced and emerging economies. Given the fact that Vietnam is ranked as highly corrupt and low economic-free country, this empirical results may alternatively interpreted as the consequence of the "graft" maximizing behavior of the bank management.

1. Introduction

Financial intermediation is a critical facilitator of investment and economic growth (McKinnon, 1973; Patrick, 1966; Schumpeter, 1912). Commercial banks play a crucial role in determining the spread or the basis between the lending rate charged to borrowers and the cost of funds. Their cost of funds is affected, directly through discount window borrowing and indirectly by deposit and other borrowed money cost, by the central bank's countercyclical monetary policy measures. In addition to creating interest income for financial intermediaries, this spread affects the economy's savings and investment level, and the effectiveness of a central bank's monetary policies as well as economic development and social progress. Some of the spread is risk related to the instrument; that is, the intermediation premium over and above the "cost of funds" level. This "risk" portion provides useful insights into banks' behavior. Accordingly, this paper explores the behavior of Vietnamese banks in particular—with an emphasis on the factors that affect the spread between Vietnamese lending rates and the central bank's policy-related rates, and the dynamic relationships amongst these factors.

Additionally, the Vietnamese banking sector has become more and more internationalized and the economic landscape, over the last two decades or so, has been dotted with international political and social turmoil. These developments precipitate the central bank to utilize its policy instruments more often since now it has to counter international contagions in addition to domestic business matters. This phenomenon, in turn, exacerbates the variance of the spread and causes the variance to be different from some sub-periods to others over the sample period. Therefore, another important question is whether the fluctuations in the variance of the basis from one month affect the spreads and their variances in the subsequent months. This information is very important for countercyclical monetary policy-makers with regard to whether they should intervene to bring the economy to its long-term trend less frequently and by large policy measures or more frequently and by small policy measures because these two alternative policy actions result in a different variance of the spread. An increase in variance is indicative of an increased risk associated with the debt instrument, which, in turn, exacerbates the lending rate in the banking sector. This investigation specifies and estimates a simple GARCH(s, r)-in-Mean (GARCH-M) model to discern this possibility.

In theory, banks operating in a free market economy could be expected to consider all sources of risk in determining and setting the basis that separates the rate paid to lenders from the rate charged to borrowers. If banks set a spread either too high or too low, market forces would normally force an adjustment back to some equilibrium spread. Three main hypotheses explain this rate setting behavior are: the bank concentration hypothesis, the consumer characteristic hypothesis, and the consumer reaction hypothesis. The bank concentration hypothesis theorizes that oligopolistic banks are quick to raise their lending rates when the central bank increases its discount rates, but only slowly reduce the rates charged to borrowers when the central bank decreases its discount rates (Hannan & Berger, 1991; Neumark & Sharpe, 1992). The consumer characteristic hypothesis posits that banks can adjust rates to widen the spread and increase their profitability to the extent that consumers are unsophisticated and/or are saddled with higher costs of searching and switching (Calem & Mester, 1995; Hutchison, 1995, Rosen, 2002).

The consumer reaction hypothesis proposes that asymmetric adjustments in lending rates may actually benefit consumers, because the presence of asymmetric information can foster an adverse selection problem in lending markets such that higher interest rates will tend to attract riskier borrowers (Stiglitz & Weiss, 1981). Therefore, even if the market rates rise, banks would be reluctant to raise lending rates, because the expected cost to the banks of not raising the lending rates (when their marginal cost of funds increases) is offset by the risk reduction benefits of not encouraging the higher risk borrowers.

As is discussed in the next section, in the last two decades which were dotted with considerable international, political, and social turmoil, the Vietnamese banking sector has gone through a drastic transformation from a mono to a more market-oriented banking system. However, the transformation

process is not yet complete and, as articulated by Ho and Baxter (2011), the Vietnamese government will face a number of challenges as it moves forward with further reform and development of the banking sector.

Therefore, it is now of special interest to assess the Vietnamese commercial banks' rate setting behavior after almost two decades of liberalization and reforms of the banking sector. It is also of interest to compare the Vietnamese banks' rate setting behavior to those of their counterparts in advanced market economies to gauge the effectiveness of the aforementioned liberalization and reforms. To this end, this paper explores whether asymmetries exist in the Vietnamese lending policy-related rate spread and, if such asymmetries are present, how lending and central bank's policy-related rates respond to these asymmetries. Furthermore, this paper explores whether responses to such asymmetries are independent or are dynamically interrelated. Also, this analysis seeks to determine whether the Vietnamese lending institutions exhibit competitive or predatory pricing behaviors, and to what extent. Finally, this study investigates whether the variance of the basis from one month affects the variances and spreads in the subsequent months. This information is very important for countercyclical monetary policy-makers with regard to whether they should intervene to bring the economy to its long-term trend less frequently and by large policy measures or more frequently and by small policy measures because these two alternative policy actions result in different variance of the spread.

The remainder of this study is organized as follows: Section 2 summarizes the literature on asymmetric rate adjustments by international lending institutions and the Vietnamese banking sector; Section 3 describes the data and the descriptive statistics used in the analysis; Section 4 describes the methodology used in the investigation; Section 5 that follows reports the empirical results; and Section 6 provides a summary of the study's takeaways and offers concluding remarks and policy implications.

2. Asymmetric rate adjustments and the Vietnamese banking sector

2.1. Asymmetric rate adjustments

The rationale for hypothesizing asymmetric responses to the national countercyclical monetary policy can be attributed to the documented asymmetric rate setting behavior of the commercial banks in the context of rates of return on financial market instruments. Economically, the theoretical rationale for hypothesizing the asymmetric adjustment process of the basis between the banks' lending rates and central bank's policy-related rates may be attributable to the seemingly opposite effect of the lending market and the countercyclical monetary policy over different phases of business cycles. More specifically, during the expansionary phases of business cycles, the countercyclical monetary policy would lower the policy-related rates while the information from that state of the economy would precipitate the lending institutions to resist adjusting their spread between the lending rate and central bank's policy-related rates downward because their perceived risk profiles of loan applicants increase. Consequently, the basis would increase or widen. By the same logic, it may be argued that the spread between the commercial banks' lending rates and the central bank's policy-related rates would decrease or narrow during the contractionary phases of the business cycles while the central bank's policy-related rate is increasing.

As to reports in the literature on emerging and advanced economies, Dueker (2000) and Tkacz (2001) have reported asymmetries in the US prime lending rate in the past. Thompson (2006) found asymmetries in the US prime lending–deposit rate spread. Sarno and Thornton (2003) found asymmetries in the US Treasury securities in their studies. Frost and Bowden (1999) and Scholnick (1999) reported asymmetries in mortgage rates in New Zealand and Canada. Hofmann and Mizen (2004) indicated asymmetric behavior of retail rates in the UK. Hannan and Berger (1991) and Neumark and Sharpe (1992) examined various deposit rates for the same behavior. Several studies have found asymmetric cointegration between bank lending and deposit rates. For instance, Nguyen, Pointer, and Smith (2008) documented similar asymmetries in Mexican lending and deposit rates. Nguyen and

Islam (2010) reported asymmetries in the Thai bank lending and deposit rates. Nguyen and Henney (2013) found asymmetries in the US housing mortgage market. Chang and Su (2010) reported nonlinear cointegration between the lending and the deposit rates in 10 Eastern European countries. Also, Haug and Basher (2011) found nonlinear cointegration in the purchasing power parity relationships for Canada, Japan, Switzerland, the UK, Belgium, France, Germany, Italy, and Netherlands.

2.2. The Vietnamese banking sector

The current Vietnamese banking structure was initiated by the banking reforms in 1988–1989 when the mono-bank system that served the needs of the centrally planned economy was split into a two-tier banking system. This system then consisted of the State Bank of Vietnam as the central bank and four state-owned commercial banks. The National Assembly approved in December 1997 two new laws relating to the operations of the central bank and commercial banks, which became effective in October 1998. In 1990, the rule on sectorial specialization of these banks was abolished and entry into the banking system was liberalized.

This liberalization precipitated the formation of the joint-stock, joint venture banks mostly in 1991–1993. Shareholders of joint-stock banks are state-owned commercial banks, state-owned enterprises, and private entities. Joint venture banks are partnerships between a state-owned commercial bank and a foreign bank which are subject to the same restrictions on deposit taking as foreign banks. Operations of commercial banks and other financial institutions are supervised by the State Bank of Vietnam. Prudential regulations provide for offsite and onsite inspections, set prudential limits on lending, and stipulate minimum capital requirements.

Additionally, over the past two decades, the Vietnamese government has undertaken a series of reforms to strengthen and modernize the sector as part of the country's move toward a more open and market-oriented economy. Many of these reforms have also been motivated by Vietnam's growing participation in international agreements and ongoing efforts to adopt international standards such as the Basel capital framework. The objectives of reforms include a restructuring of the banking system, a gradual opening to foreign investment, the partial privatization of state-owned banking institutions, and measures to strengthen the capitalization of Vietnamese banks.

Leung (2009) argued that since the new millennium, *Doi Moi 2* has “unleashed” the domestic private sector and addressed the discrimination inherent in the trade and investment regime. This process started with the Enterprises law in 2000, the Unified Enterprises Law in 2005, the Vietnam–US Bilateral Trade Agreement in 2006, and culminated in the Vietnam's entry into the WTO in 2007. The author further posited that, for Vietnam to realize its goal of becoming a modern industrialized economy by 2020, it needed to have world-class public institutions to complement a flexible and entrepreneurial private sector. The most important issue is that effective policy-making and skillful regulation have to be balanced against profitable risk taking, all set against a background of commitment to a one-party state where social and political stability still reigns supreme.

The Vietnamese banking sector currently consists of four primary types of institutions: (1) six state-owned commercial banks, (2) 35 joint-stock commercial banks, (3) 4 joint venture banks, and (4) 48 wholly foreign-owned banks. The foreign banks' accesses to the Vietnamese market were initially limited to taking a minority share in joint venture banks and establishing branches and representative offices until 2004, when the government amended the 1998 Law on Credit Institutions to comply with the terms of the US–Vietnam Bilateral Trade Agreement. This amendment provided the legal foundation for Vietnam to allow 100% US-owned subsidiary banks by 2010. The amendments to the law set the stage for the establishment of wholly foreign-owned banks by investors from any country, which would eventually be required under Vietnam's WTO accession in 2007.

To this end, since 2006, the State Bank of Vietnam has granted licenses to 48 foreign banks to operate as wholly foreign-owned banks. In their limited years of operation, the wholly foreign-owned banks have been profitable, in part due to high demand by foreign investors in Vietnam to

open accounts with foreign banks and to use their trade finance and foreign exchange services. These banks have also looked to the growing Vietnamese middle class as potential customers for services in which foreign banks are perceived as having a competitive advantage over domestic banks, such as retail banking and wealth management services.

To complement opening home banking markets to foreign players, the government tried to strengthen the competitiveness of domestic banks. In this regard, the government announced on May 2006 plans to “equitize,” or partially privatize, the state-owned commercial banks and reduce government ownership to 51% by 2010. Additionally, to help facilitate this process, in 2007, the government raised the maximum stake a single strategic foreign investor could hold in a domestic commercial bank, including state-owned commercial banks, from 10 to 15% of the bank’s chartered capital.

Despite the government’s goal of equitizing all state-owned commercial banks by 2010, as of April 2011 only two: Vietcombank and Vietinbank—had successfully sold shares to private investors. Vietcombank became the first state-owned commercial bank to hold an initial public offering, selling a 6.5% stake for VND 10.5 trillion (USD 652 million) in December 2007. However, it was unable to attract a single strategic foreign investor willing to take a 15% stake, a requirement of the bank’s equitization plan. Because the bank was not in compliance with the equitization plan, in December 2009 the government halted Vietcombank’s plans to raise an additional VND 1 trillion (USD 48 million) through the sale of shares to existing shareholders (Ho & Baxter, 2011). As long as the privatizations of state-owned enterprises (financial institutions or otherwise) are not completed, the State Bank of Vietnam must continue to focus its operations on the need to meet the economic growth objective set by the National Assembly. As a result, open market operations at this time have been used primarily to inject liquidity into the banking system as needed to support the state-owned commercial banks’ owned budget shortfalls, and the financing of large public infrastructure projects and state-owned enterprises.

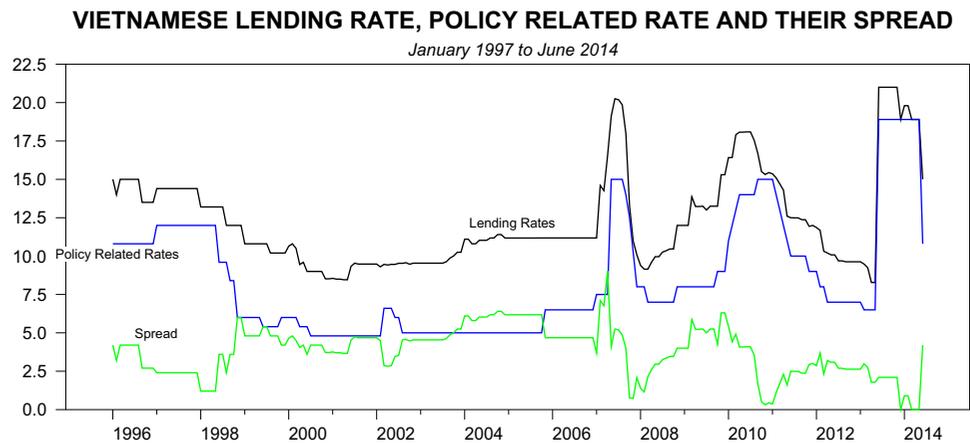
As to the near future, Ho and Baxter (2011) conjectured that the government will face a number of challenges as it moves forward with further reform and development of the banking sector. As of December 2011, the deadline for the new minimum capitalization requirement, competition for capital among banks increased. Capital raising efforts were made more difficult by declines in equity values. Lower equity prices also created difficulties for the government as it continued to search for strategic shareholders to provide investment and expertise to newly equitized state-owned commercial banks. Furthermore, the State Bank of Vietnam has announced new limitations on foreign investment in state-owned commercial banks, requiring at least USD 20 billion in assets for investors wishing to invest in more than 15%. These restrictions could limit the number of potential investors and delay the equitization process.

3. The data and descriptive statistics

This study used the monthly lending rates from the Vietnamese commercial banks and the central bank’s policy-related rates from 1997:01 to 2014:06, reported by the International Monetary Fund, which constitutes the post-1997 Asian financial crisis. Consequently, the results describe how the Vietnamese commercial banks behave after the Asian financial crisis that affected financial markets internationally. The monthly Vietnamese lending rates, central bank’s policy-related rates, and their spreads are denoted by LR_t , PR_t , and SP_t , respectively. Figure 1 describes the movements of LR_t , PR_t , and SP_t over the sample period.

The mean lending rate during this period is 12.32% and ranges from 8.28 to 21.00, with a standard deviation of 3.13. The mean central policy-related rate over the same period is 8.50% and ranges from 4.80 to 18.90, with a standard deviation of 3.88. The mean spread during this period is 3.82%, and ranges from 0.00 to 9.03, with a standard deviation of 1.60. Their correlation is 90.66%. Figure 1 suggests that the Vietnamese lending policy-related rate spread experiences a structural change over the sample period.

Figure 1. Vietnamese lending rate, policy-related rate, and their spread since 1997.



4. Methodological issues and analytical framework

4.1. Structural break

This study specifies and estimates Perron’s (1997) endogenous unit root test function with the intercept, slope, and the trend dummy to test the hypothesis that the Vietnamese lending central bank’s policy-related rate spread has a unit root.

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

where $DU = 1(t > T_b)$ is a post-break constant dummy variable; t is a time trend; $DT = 1(t > T_b)$ is a post-break slope dummy variable; $D(T_b) = 1(t = T_b + 1)$ is the break dummy variable; and ε_t are white-noise error terms. Δ denotes the change in, i.e. ΔSP_{t-i} is the change in SP_{t-i} . 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 $\beta = 1$ (Perron, 1997).

4.2. Nonlinear cointegration

Breitung (2001) articulated that there is often a nonlinear relationship between economic and financial time series, implying that LR_t and PR_t may be nonlinearly cointegrated. To discern this possibility, this investigation utilizes Breitung’s nonparametric procedure to test for their nonlinear cointegration.

Breitung’s nonparametric testing procedure consists of the cointegration test, known as the rank test for cointegration, and the nonlinearity test, referred to as the score statistic for a rank test of neglected nonlinear cointegration. To calculate the rank test for cointegration, this study first defines a ranked series as $R_T(LR_t)$ [of LR_t among LR_1, \dots, LR_T] and $R_T(PR_t)$. Breitung’s two-sided rank test statistic, testing for cointegration, denoted by Ξ_T^* , is then calculated as follows:

$$\Xi_T^* = T^{-3} \sum_{i=1}^T (r_i^R)^2 / (\sigma_{\Delta r}^2) \quad (2)$$

where T is the sample size, r_i^R is the least squares residual from a regression of $R_T(LR_t)$ on $R_T(PR_t)$. According to Haug and Basher (2011), $\sigma_{\Delta r}^2$ is the variance of Δr_i^R , which is included to adjust for the potential correlation between the two time series LR_t and PR_t . The critical values for this rank test are found in Table 1 of Breitung (2001).

Given a positive result of the rank test, the first step in calculating Breitung’s score statistic for a rank test of neglected nonlinear cointegration (testing for nonlinearity) is to regress the Vietnamese lending rate, LR_t , on a constant, the central bank’s policy-related rate, PR_t , the ranked series of the central bank’s policy-related rate, $R_T(PR_t)$, and the disturbance ζ_t .

Table 1. Estimation results, Vietnamese monthly data, 1997:01–2014:06

$SP_t = 3.673451 + 0.010189 Trend_t - 2.507404 Dummy_t + \varepsilon_t$ (13.6911*) (3.2184*) (-6.4358*)		
ln L = -347.5726 $R^2 = 0.83934$	DW statistic ^(a) = 0.3510	$F_{(2, 207)} = 30.2036^*$

Notes: As articulated by Enders and Siklos (2001, p. 166), in this type of model specification, ε_t may be contemporaneously correlated.

*Significances at 1% level.

$$LP_t = \delta_0 + \delta_1 PR_t + \delta_2 R_t^*(PR_t) + \zeta_t \tag{3}$$

where $\delta_0 + \delta_1 DR_t$ is the linear part.

Under the null hypothesis, $R_t^*(PR_t) = 0$, implying that LR_t and PR_t are linearly cointegrated. Under the alternate hypothesis, $R_t^*(PR_t) \neq 0$, implying that LR_t and PR_t are nonlinearly cointegrated. The score test statistic is given by $T \cdot R^2$, where R^2 is the coefficient of determination of the least squares regression of ζ_t , under the null hypothesis, on a constant, the ranked series of the central bank's policy-related rate, $R_t(PR_t)$, and a disturbance term. T is the sample size. As explained by Breitung (2001), under the null hypothesis of linear cointegration, the score statistic for a rank test of neglected nonlinear cointegration is asymptotically Chi-Square distributed with one degree of freedom.

4.3. Threshold autoregressive model

If the results of Breitung's nonparametric tests are positive, this study follows Thompson (2006) to regress the spread, SP_t , on a constant, a linear trend and an intercept dummy (with values of zero prior to the structural break date and values of one for the structural break date and thereafter) to formally examine the Vietnamese LR_t , PR_t , and SP_t . The estimation results are reported in Table 1. The saved residuals from the above estimated model, denoted by $\hat{\varepsilon}_t$, are then used to estimate the following threshold autoregressive (TAR) model:

$$\Delta \hat{\varepsilon}_t = I_t \rho_1 \hat{\varepsilon}_{t-1} + (1 - I_t) \rho_2 \hat{\varepsilon}_{t-1} + \sum_{i=1}^p \alpha_i \Delta \hat{\varepsilon}_{t-p} + \hat{u}_t \tag{4}$$

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:

$$I_t = \begin{cases} 1 & \text{if } \hat{\varepsilon}_{t-1} \geq \tau \\ 0 & \text{if } \hat{\varepsilon}_{t-1} < \tau \end{cases} \tag{5}$$

The threshold value, τ , is endogenously determined using Chan's (1993) procedure, which obtains τ by minimizing the sum of squares residuals after sorting the estimated residuals in ascending order, and eliminating the largest and smallest 15% of values. The elimination of the largest and the smallest values assures that the $\hat{\varepsilon}_t$ series crosses through the threshold in the sample period.

The TAR model allows the degree of autoregressive decay to depend on the state of the spread between the lending rates and the central bank's policy-related rates, i.e. the "deepness" of cycles. The estimated TAR model reveals whether the basis reverts back to the long-run position faster when the spread is above or below the threshold. Therefore, the TAR model indicates whether troughs or peaks persist more when countercyclical monetary policy actions or economic shocks push the basis out of its long-run equilibrium path. The null hypothesis (that the basis contains a unit root) is expressed as $\rho_1 = \rho_2 = 0$, while the hypothesis that the spread is stationary with symmetric adjustments is expressed as $\rho_1 = \rho_2$.

4.4. The asymmetric error-correction model

If the results of the above asymmetric cointegration tests are positive, a Threshold Autoregressive Vector Error-Correction (TAR-VEC) model is specified and estimated to continue an investigation into any asymmetric short-run dynamic behaviors that occur between lending rates and the central bank's policy-related rates. Results of this model can be used to study the Granger causality between lending rates and the central bank's policy-related rates. The Granger causality will help to evaluate empirically (through statistics) how the Vietnamese lending rates and the central bank's policy-related rates respond to the widening and the narrowing of the spread due to external economic shocks or countercyclical policy measures. Again, conventional error-correction models do not suffice for this purpose, because they do not allow the asymmetric adjustments toward the long-run equilibrium that the TAR-VEC model does.

$$\Delta LR_t = \alpha_0 + \rho_1 I_t \hat{\varepsilon}_{t-1} + \rho_2 (1 - I_t) \hat{\varepsilon}_{t-1} + A_{11}(L) \Delta LR_{t-i} + A_{12}(L) \Delta PR_{t-i} + u_{1t} \quad (6)$$

$$\Delta PR_t = \tilde{\alpha}_0 + \tilde{\rho}_1 I_t \hat{\varepsilon}_{t-1} + \tilde{\rho}_2 (1 - I_t) \hat{\varepsilon}_{t-1} + A_{21}(L) \Delta LR_{t-i} + A_{22}(L) \Delta PR_{t-i} + u_{2t} \quad (7)$$

where $u_{1,2t} \sim i.i.d.(0, \sigma^2)$ and the Heaviside indicator function is set in accordance with (5). This assumes that the Vietnamese lending rates may respond differently depending on whether the spread is widening or narrowing as a result of expansionary monetary policy, contractionary monetary policy, or external shocks.

4.5. GARCH(s, r)-M model

As previously mentioned, this investigation specifies and estimates the following GARCH(s, r)-in-Mean (GARCH-M) model to discern the important question that is whether the fluctuations in the spread and hence its variance from one month affect the spreads and the variances in the future months. This information is very important for countercyclical monetary policy-makers with regard to whether they should intervene to bring the economy to its long-term trend less frequently and by large policy measures or more frequently and by small policy measures because these two alternative policy actions result in different variances of the basis. It is of some interest to note that GARCH-M models have been very popular and effective for modeling the volatility dynamics in many asset markets.

$$SP_t = c + \lambda \omega_t^2 + \varepsilon_t \quad (8)$$

$$\omega_t^2 = \alpha + \sum_{l=1}^r \beta_l \varepsilon_{t-l}^2 + \sum_{m=1}^s \eta_m \omega_{t-m}^2 \quad (9)$$

where SP_t is the basis, and ω_t^2 is its variance at time t ; ε_t is a disturbance; c is a constant; λ , α , β_l and η_m are the parameters to be estimated of the model. The retentions of these estimated coefficients are determined by the calculated z-statistics at the 5% level of significance. The r and s indices are the highest subscripts l and m of retained β_l and η_m .

5. Empirical results

5.1. Structural break

Table 2 summarizes the results of Perron's endogenous unit root tests.

The post-break intercept dummy variable, DU , is positive and insignificant at the 10% level. The post-break slope dummy variable, DT , is negative, the break dummy, $D(T_b)$ is positive, and both are significant at any conventional level. The time trend, t , is positive and is significant at the 1% level. These results suggest a stationary trend process, with a break date of March 2007, for the Vietnamese spread between the lending rates and the central bank's policy-related rates. This break date suggests a possible connection to the impact of changes that the Vietnamese banking sector has gone through to meet the conditions for the country to join the WTO.

Table 2. Perron’s endogenous unit root test, Vietnamese data, 1997:01–2014:06

$SP_t = 1.2306 + 1.3333 DU + 0.0090t - 0.0161 DT + 2.9775 D(T_b) + 0.6057 SP_{t-1} + v_t$ <p style="text-align: center;">(4.6964*) (1.7023***) (3.0487*) (-2.7621*) (3.7574*) (8.1231*)</p>		
Number of augmented lags: $k = 12$	Break Date: March 2007	$t(\alpha = 1) = -5.28907^*$

Note: Critical values for t-statistics in parentheses. Critical values based on $n = 100$ sample for the break date (Perron, 1997).

*Significances at 1% level.

***Significances at 10% level.

5.2. Results of Breitung’s nonparametric tests

Breitung’s nonparametric rank tests calculates to be 0.00057448, a result that fails to reject the null hypothesis of cointegration, while the score test calculates to be 9.339739, which rejects the null hypothesis of linear cointegration. These results show that, at all conventional levels of significance, the Vietnamese lending rates and the central bank’s policy-related rates are nonlinearly cointegrated.

5.3. Results of the cointegration test with asymmetric adjustment

Also, analyzing the overall estimation results of the TAR model (summarized in Table 3) indicates that the estimation results are without serial correlation and have good predicting power, as shown by the Ljung–Box statistics and the overall F -statistics, respectively. The model confirms that the Vietnamese lending-the central bank’s policy-related rate spread is stationary, as statistic $\Phi_\mu = 13.8472$ indicates that the null hypothesis of no cointegration, $\rho_1 = \rho_2 = 0$, should be rejected at the 1% significant level.

The results also show that both ρ_1 and ρ_2 are statistically significant at the 1% level. In fact, the estimation results reveal that the spread tends to decay at the rate of $|\rho_1| = 0.7754$ for $\hat{\epsilon}_{t-1}$ above the threshold, $\tau = 1.38076$, and at the rate of $|\rho_2| = 0.1317$ for $\hat{\epsilon}_{t-1}$ below the threshold. On the strength of the partial $F = 15.8852$, the null hypothesis of symmetry, $\rho_1 = \rho_2$, should be rejected at the 1% significance level, indicating statistically asymmetric adjustments around the threshold value of the Vietnamese spread between the lending and the central bank’s policy-related rates.

Specifically, the adjustment of the spread toward the long-run equilibrium tends to persist more when the basis is shrinking than when it is widening, given the finding of $|\rho_1| > |\rho_2|$. This suggests that Vietnamese commercial banks react differently to rising central bank’s policy-related rates than they do to declining central bank’s policy-related rates. These findings may also show that these institutions react differently to expansionary monetary policy than to contractionary monetary policy, since the central bank’s policy-related rate is itself the countercyclical monetary policy of the central bank. The empirical results indicate the competitive pricing behavior of the Vietnamese lending institutions. These results seem to contradict those reported in advanced and emerging economies. Furthermore, these empirical findings support the aforementioned consumer reaction hypothesis as articulated by Stiglitz and Weiss (1981).

Table 3. Unit root and tests of asymmetry, Vietnamese data, 1997:01–2014:06

ρ_1	ρ_2	τ	$H_0 : \rho_1 = \rho_2 = 0$	$H_0 : \rho_1 = \rho_2$	aic	sic
-0.7754*	-0.1317*	1.38076	$\Phi_\mu = 13.8472^*$	$F = 15.8852^*$	-0.3910	-0.3889
$Q_{LB(12)} = 15.2350[0.2288]$			$\ln L = -241.3522$	$F_{(4, 203)} = 11.7963^*$	D.W. = 1.8414	

Notes: The null hypothesis of a unit root, $H_0 : \rho_1 = \rho_2 = 0$, uses the critical values from Enders and Siklos (2001). The null hypothesis of symmetry, $H_0 : \rho_1 = \rho_2$, uses the standard F distribution. τ is the threshold value determined via the Chan’s (1993) method. $Q_{LB(12)}$ denotes the Ljung–Box Q -statistic with twelve lags.

*Significance at 1% level.

Table 4. Vietnamese lending and central bank's policy-related rates, data, 1997:01–2014:06

$\Delta LR_t = -0.0301 + 0.0836I_t\hat{\epsilon}_{t-1} - 0.0716(1 - I_t)\hat{\epsilon}_{t-1} + A_{11}(L)\Delta LR_{t-j} + A_{12}(L)\Delta PR_{t-j} + u_{1t}$				
(-0.3494)	(0.9164)	(-0.9369)	$F_{11} = 0.7808[0.44594]$	$F_{12} = 6.4677[0.0003]$
$Q_{(12)} = 6.3060[0.8999]$		$\ln L = -312.9573$	$F_{(7,201)}\text{-statistic} = 3.3189^{**}$	
<hr/>				
$\Delta PR_t = 0.1052 + 0.3804I_t\hat{\epsilon}_{t-1} - 0.0467(1 - I_t)\hat{\epsilon}_{t-1} + A_{21}(L)\Delta LR_{t-j} + A_{22}(L)\Delta PR_{t-j} + u_{2t}$				
(-1.4845)	(4.1277)*	(0.6032)	$F_{21} = 30.4878[0.0000]$	$F_{22} = 0.2233[0.8001]$
$Q_{(12)} = 3.8950[0.9853]$		$\ln L = -320.2305$	$F_{(5,203)}\text{-statistic} = 10.5865^*$	

*Significances at 1% level.

**Significances at 10% level.

5.4. Results of the asymmetric error-correction model

The estimation results of the TAR-VEC model, specified by Equations 5–7, using the Vietnamese lending rates and the central bank's policy-related rates are summarized in Table 4. Therein, $A_j(L)$ is the first-order polynomial in the lag operator L . F_{ij} is the calculated F -statistic (with the p -value in brackets), which tests the null hypothesis that all coefficients of A_j are equal to zero. $Q_{(12)}$ is the Ljung–Box statistic (with its significance in brackets), which tests whether the first twelves of the residual autocorrelations are both equal to zero. $\ln L$ is the log likelihood.

The empirical results suggest that the estimated Equations 6 and 7 are without serial correlation and have good predicting power, as shown by the Ljung–Box statistics and the overall F -statistic, respectively. The estimation results of Equation 6 of the TAR-VEC model indicate that both ρ_1 and ρ_2 are insignificant at conventional levels. This finding shows that the Vietnamese lending rates do not respond to the spread both when it widens and when it narrows in the long run, and suggests that Vietnamese lending institutions do not respond to either expansionary or contractionary monetary policy in the long run. Regarding the long-term adjustment of the central bank's policy-related rates, the estimation results of Equation 7 show that $\hat{\rho}_1$ is statistically significant at the 1% level, while $\hat{\rho}_2$ is insignificant at any level.

In addition to estimating the long-run equilibrium relationship and asymmetric adjustment, the estimated TAR-VEC model also allows for determinations of the Granger causality between the Vietnamese lending rates and central bank's policy-related rates. Equation 6 reveals in the partial F -statistic that the lending rate responds to the lagged changes in the central bank's policy-related rate, but not to its own lagged changes. Similarly, the estimation results of Equation 7 show that the central bank's policy-related rate responds to lagged changes of the lending rates but not its own lagged changes. These findings suggest a bidirectional Granger-causality between the Vietnamese lending rate and the central bank's policy-related rate and reveal that the Vietnamese lending rate and the central bank's policy-related rate affect the movements of each other's rates in the short run in the period after the 1997 Asian financial crisis.

5.5. GARCH(s, r)-M model

As aforementioned, the retentions of the estimated coefficients of Equations 7 and 8 are determined by the calculated z -statistics at the 5% level of significance. The r and s indices are the highest subscripts l and m of retained β_1 and η_m which are $l = 2$ and $m = 3$, respectively. The values of l and m , in turn, suggest GARCH (2, 3) be the best model for this investigation. The estimation results of the GARCH (2, 3)-M model are reported in Exhibit 5.

An analysis of the estimation results of the GARCH(r, s)-M model suggests the presence of the GARCH (2, 3) effect on the Vietnamese intermediation premium and its variance. Financially, the empirical results indicate that the fluctuations in the Vietnamese spread between the lending rates and the central bank's policy-related rate, and hence, its variance from the one month affects the basis and the variances in the subsequent months.

Exhibit 5-GARCH (2, 3)-M model results, Vietnamese data, 1997:01–2104:06.

$$SP_t = 4.605419 - 0.101972\omega_t^2 + \varepsilon_t$$

(196.0087*) (-7.8247*)

$$\omega_t^2 = 0.247836 + 0.859074 \varepsilon_{t-1}^2 + 827174 \varepsilon_{t-2}^2 - 0.971880 \omega_{t-1}^2 + 0.167535 \omega_{t-2}^2 + 0.234490 \omega_{t-3}^2$$

(10.9836*) (14.6937*) (15.8759*) (-30.6617*) (6.6117*) (7.0224*)

Notes: Akaike info criterion = 3.145035; Schwarz criterion = 3.200070; Hannan-Quinn criterion = 3.166380; Log likelihood = -1015.7090; Durbin-Watson Statistic = 0.247254.

*Significance at 1% level.

6. Discussions of the empirical results: a possible alternate interpretation

The estimation results of the TAR model, represented by Equations 4 and 5, reveal that the adjustment of the spread toward the long-run equilibrium tends to persist more when the basis is shrinking than when it is widening, given the finding of $|\rho_1| > |\rho_2|$. This finding indicates the competitive pricing behavior of the Vietnamese lending institutions. These results seem to contradict those reported in advanced and emerging economies. Even though, this empirical result is consistent with the aforementioned consumer reaction hypothesis, it however contradicts all findings reported in the literature on rate setting behaviors of lending institutions in emerging and advanced economies in the world.

Besides being inconsistent with the pricing behaviors of banks in the emerging and advanced economies, the finding of the competitive rate setting behavior of the Vietnamese banks is very difficult to reconcile with the lack of economic freedom and pervasive corruption in the economy. According to the Heritage Foundation, the 2013 Corruption Perceptions Index, which measures the perceived levels of public sector corruption, ranked Vietnam 116th out of 177 countries and territories. As to the economic freedom, Vietnam was ranked 147th among 186 countries and territories and 33rd out of 42 countries in the Asia-Pacific region in the 2014 index. In these rankings, the lower the rank, the less corrupt or freer the country is. Therefore, the empirical finding of this study suggests new adverse predicaments for the authorities.

The empirical results reported above appear to be in contradiction to those reported by Thompson (2006) in the US and findings by other studies of advanced and emerging economies. Interpretation of the empirical results of the Vietnamese transitional economy based on economic theoretical foundations based on western culture economies may be misleading. That is, customarily, originating loans would provide some non-interest income besides the interest income to the originating institutions in any market economy. However, in a fairly corrupt environment, there may be some “other benefits” or “grafts” imposed by the management of the originating institutions when a loan is originated. Naturally, to “justify” their grafts, the bank’s management must provide some “perceived” favor to the borrowers in return. Additionally, it is important to note that: (1) the consumer reaction hypothesis was theorized in an economic environment with high interest rates; (2) the interest rate that the borrower must pay is actual the price to use the loan amount; and (3) microeconomic theory articulates that the elasticity of demand for any product is high at relatively high prices.

By international standards, as well as comparisons with Asian neighbors, the lending rates in Vietnam are relatively high. Moreover, bribes in loan originations in Vietnam are often a percentage of the loan amount. Therefore, the more loans that are originated, the larger the grafts bank management officials will enjoy. As a result, when the central bank increases the policy-related rate, commercial bank officials will not raise interest rates too quickly in order to minimize the decline in the number of loan originations, thereby, minimizing the decline in their grafts and at the same time offering the aforementioned “perceived” favor of lower interest rates to borrowers. Conversely, when the central bank reduces the policy-related rate, commercial bank officials will reduce interest rates quickly to maximize growth in the number of loan originations to maximize their grafts and to provide their borrowers the “perceived” favor of lower interest rates to justify their bribes. This

alternate interpretation is consistent with the empirical findings of the Vietnamese asymmetric adjustments of the lending rate and the lending central bank's policy-related rate spreads, the Granger bidirectional causality and the economic reality of the Vietnamese economy.

7. Concluding remark and policy implications

This study investigated the behavior of the Vietnamese lending rates, the Central Bank's Policy-related rates, and their spreads in the post-1997 Asian financial crisis, by estimating the TAR model developed by Enders and Siklos (2001).

First, the study tested the hypothesis that the Vietnamese spread has a unit root by specifying and estimating Perron's (1997) endogenous unit root test function with the intercept, slope, and trend. This test suggested that the premium followed a stationary trend process with a structural break in March 2007, which may be attributable to changes that Vietnamese banking sector has gone through to meet the conditions for the country to join WTO.

Second, the study tested whether the Vietnamese lending rates and the central bank's policy-related rates are linearly and/or nonlinearly cointegrated. Breitung's nonparametric rank tests reveal nonlinear cointegration at all conventional levels of significance.

Third, the estimation results of the TAR model reveal that Vietnamese commercial banks react differently to rising versus declining central bank's policy-related rates. These findings suggest that these institutions react differently to expansionary monetary policy than to contractionary. Furthermore, these results on asymmetric responses reveal the competitive pricing behavior of the Vietnamese lending institutions. Given the current characteristics of the Vietnamese financial sector, the empirical findings may be attributable to the graft-seeking behavior of the management of Vietnamese lending institutions. Clearly, reform undertaken by the Vietnamese government to strengthen and modernize the financial sector has to improve the banking industry significantly. As to the near future, the government will face a number of challenges as it moves forward with further reform and development of the banking sector.

Finally, the study tested for Granger causality between the lending rates and the central bank's policy-related rates in the short run by the empirical estimation of the TAR-VEC model. This revealed bidirectional Granger causality, and indicates that the lending rate and the central bank's policy-related rate affect each other's movement in the short run. This finding also reveals asymmetric responses of financial markets to contractionary and expansionary monetary policy actions, and confirms the ability of the Vietnamese monetary authority to use its countercyclical monetary policy instruments to alter the banks' lending rates. However, the GARCH(2, 3)-M model results suggest that monetary policy-makers should intervene to bring the economy to its long-term trend more frequently and by small policy measures to minimize the conditional variance of the intermediation premium and to minimize the magnitude of the cycle of the lending rate.

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