10. ASYMMETRIC ADJUSTMENT IN THE LENDING-DEPOSIT RATE SPREAD: EVIDENCE FROM EASTERN EUROPEAN COUNTRIES

Chi-Wei SU*
Hsu-Ling CHANG**

Abstract

This study carries out an examination of the potential non-linear cointegration between the lending and deposit rates of eight Eastern European countries using the threshold models by Enders and Granger (1998) and Enders and Siklos (2001). Based upon our adoption in this study of the threshold error-correction model (TECM), we find solid evidence of an asymmetric price transmission effect between the lending and deposit rates. Thus, our results reveal that there are indeed such long-run non-linear cointegration relationships between the lending and deposit rates in these Eastern European countries. Furthermore, we go on to successfully capture the dynamic adjustment of the spread.

Keywords: Lending-Deposit Rates Spread, Threshold Model, Threshold Error-Correction Model (TECM)

JEL Classification: C22, E43, G12

1. Introduction

The central bank usually attain to their economics target by manipulation of monetary market, with the implementation of its monetary policy having direct effects on the country's interest rates. The transmission mechanism of such monetary policy includes both credit and monetary transmission pipeline mechanisms, with the

* Department of International Trade, Tamkang University; Department of Finance, Xiamen University; Taipei, Taiwan. Phone: +886-4-22920677. Address: No.151, Yingzhuan Rd., Danshui Town, Taipei County 25137, Taiwan (R.O.C.), E-mail: cwsu@mail.tku.edu.tw.

** Department of Accounting and Information, Ling Tung University; Department of Finance, Xiamen University; Taipei, Taiwan.

transmission of credit affecting the lending rate and the monetary pipeline affecting the deposit rate (Arden *et al*. 2000). When the central bank adjusts the interest rate, it does so in the hope that banks will simultaneously adjust their lending and deposit rates in order to increase the money supply into the financial market. The primary purpose behind the manipulation of the monetary market by the central bank is an attempt to achieve its target by either raising or lowering interest rates. However, both lending and borrowing business are the primary areas of business for the banks, and also one of their most important sources of stable income; therefore, when the central bank adjusts the interest rate, banks are unlikely to simultaneously adjust their lending and deposit rates.

A common phenomenon shows that when policymakers proclaim to adjust the interest rate, Diebold and Sharpe (1990), and Hutchison (1995) have suggested that banks may adjust their lending rates asymmetrically; that is, raising their lending rates faster when market interest rates are rising than lowering lending rates when market rates are declining. The range to increase of the lending rate is usually more than the range to decrease, that situation may let policy inefficient. In other word, downward-sticky lending rates could lower the effect of expansionary monetary policy. This asymmetric relationship between lending rates and the money market rates has been studied extensively. For example, Cover (1992), Rhee and Rich (1995) and Karras (1996) have each documented the asymmetric effect of downward-sticky lending rates potentially minimizing the effect of an expansionary monetary policy. Furthermore, when relaxing the assumptions of linearity and symmetry, Arden *et al.* (2000) find that the asymmetric effects of a country's monetary policy run in both the direction of the shock and the particular phase of the business cycle.

One exception is the examination of the lending and deposit rates undertaken by Thompson (2006), who indicated that it was only the prime lending rate which was found to adjust to discrepancies in the spread; indeed, banks may well set their lending rate according to a certain 'mark-up' relative to the deposit rate. However, if such a mark-up becomes too high or too low, the marketplace will place pressure upon the banking industry to adjust back to some 'normal' or equilibrium spread. The notion of equilibrium spread is supported by Ewing *et al.* (1998) who find stationarity in the spread between the prime lending and deposit rates. In specific terms, stationarity implies that following a shock, the spread returns will recover to their long-run equilibrium position. If the banks have market power, they could gain profits that are above the 'norm' simply by making downward adjustments to their lending rates at a slower rate than the declining deposit rates, even though such a policy may be regarded as unfair to the general public. Dueker (2000) nevertheless argues that banks are unlikely to want to be the first to lower their lending rates during cyclical downturns, essentially because of the higher risk of default. Thus, such risk-averse behavior by banks may result in lending rates adjusting asymmetrically to market rate movements.

The assumption in a number of studies, including Ho and Saunders (1981), McShane and Sharpe (1985) and Allen (1988) is that the variables of the spread model are linear and symmetrical; however, Laxton *et al.* (1993) prove that in those cases where the economic variables are non-linear and asymmetrical, any tests that are undertaken using linear and symmetrical methods would result in the model having very low power. It is, therefore, quite difficult for a linear model to capture the characteristics of dynamic adjustment behavior; and indeed, if a non-linear adjustment relationship is found to exist, then this may produce spurious regressions (Sarno and Chowdhury, 2003).

In this study, we employ threshold models by Enders and Granger (1998) and Enders and Siklos (2001) to examine the dynamic adjustment and asymmetry to a long run relationship of lending-deposit rate across the Eastern European[1] countries. Enders and Granger (1998) and Enders and Siklos (2001) indicate that nonlinear asymmetric threshold model can show the long-run dynamic equilibrium than traditional linear Error Correction Model (ECM). The aim of the present study is to use threshold models to determine whether a non-linear long-run relationship towards equilibrium is discernible in the lending-deposit spreads of the Eastern European countries; thus, the present empirical study contributes significantly to this field of research. We go on to apply asymmetric error-correction models to describe the dynamic adjustments to the lending-deposit spreads of these Eastern European countries, which may serve as a guideline for future macro policy.

The remainder of the paper is organized as follows. A discussion of the data and methodology adopted for this study is provided in Section 2, followed in Section 3 by the presentation of our empirical results. Finally, the conclusions drawn from this study are presented in Section 4.

2. Methodology

The findings of the I(1) series for both lending rate (LR) and deposit rate (DR) as enable us to proceed with a further test for the long-run equilibrium (cointegrating) relationship between these two variables. On the basis of non-linearity, we employ the specific threshold cointegration approach proposed by Enders and Granger (1998) and Enders and Siklos (2001); thus, we adopt the full residual-based two-stage estimation, as developed by Engle and Granger (1987), with the first-stage cointegration equations being estimated as follows:

$$Y_t = \lambda_0 + \lambda_1 X_t + \varepsilon_t \tag{1}$$

where Y_t is the lending rate (LR), and X_t is the deposit rate (DR), λ_0 and λ_1 are the parameters to be estimated; and ε_t is the disturbance term, which may be serially correlated. The existence of a long-run equilibrium relationship will involve the stationary of ε_t. In the second stage procedure, this is given by:

$$\Delta\varepsilon_t = \rho\varepsilon_{t-1} + u_t \tag{2}$$

where u_t is the white-noise distribution, with the residuals from the regression model being used to estimate $\Delta\varepsilon_t$. The rejection of the null hypothesis of no cointegration implies that the residuals in Equation (2) are stationary, with mean zero. Hence, the

[1] Eastern European countries are included Bulgaria, Czech Republic, Hungary, Poland, Romania, Russia, Slovakia and Ukraine.

long-run equilibrium relationship in Equation (1) is accepted, with symmetric adjustment in Equation (2).

The standard cointegration framework, which assumes symmetrical adjustment towards equilibrium in Equation (2), will be misspecified if the adjustment process is asymmetric. A formal way of introducing asymmetric adjustment is therefore to allow the deviation from the long-run equilibrium in Equation (1) to behave as a 'threshold autoregressive' (TAR) process. Based upon the test for threshold cointegration proposed by Enders and Siklos (2001), the residuals from Equation (1) are estimated under the following form:

$$\Delta\varepsilon_t = I_t\rho_1\varepsilon_{t-1} + (1-I_t)\rho_2\varepsilon_{t-1} + u_t \quad (3)$$

where I_t is the Heaviside indicator, such that:

$$I_t = \begin{cases} 1 & if \quad \varepsilon_{t-1} \geq \tau \\ 0 & if \quad \varepsilon_{t-1} < \tau \end{cases} \quad (4)$$

where ***T*** is the threshold value.

If $\varepsilon_{t-1} \geq \tau$, then I_t = 1, and the speed of adjustment in Equation (3) is ρ_1; conversely, if $\varepsilon_{t-1} < \tau$, then I_t = 0, and the speed of adjustment is ρ_2. A necessary and sufficient condition for $\{\varepsilon_t\}$ to be stationary is $-2 < (\rho_1, \rho_2) < 0$. If the value of ε_{t-1} is above τ, then the adjustment is $\rho_1\varepsilon_{t-1}$, and if the value of ε_{t-1} is below τ, then the adjustment is $\rho_2\varepsilon_{t-1}$. When the adjustment process is serially correlated, Equation (3) can be re-written as:

$$\Delta\varepsilon_t = I_t\rho_1\varepsilon_{t-1} + (1-I_t)\rho_2\varepsilon_{t-1} + \sum_{i=1}^{l}\gamma_i\Delta\varepsilon_{t-i} + u_t \quad (5)$$

As opposed to estimating Equation (1) with the Heaviside indicator being dependent upon the level of ε_{t-1}, the decay could also be allowed to be dependent upon the change in ε_{t-1} in the previous period; in this case, the Heaviside indicator of Equation (4) becomes:

$$I_t = \begin{cases} 1 & if \quad \Delta\varepsilon_{t-1} \geq \tau \\ 0 & if \quad \Delta\varepsilon_{t-1} < \tau \end{cases} \quad (6)$$

According to Enders and Granger (1998), this model is of particular value when the adjustment is asymmetric (where the series exhibits more 'momentum' in one direction than in the other). This model, which is referred to as the 'momentum threshold autoregressive' (M-TAR) model, is designed to capture 'deep' asymmetric movements in the series of deviations from long-run equilibrium; that is, it determines whether positive deviations are more prolonged than negative deviations. The method adopted by Chan (1993) can be applied to determine both the minimum value of the square terms of the residual errors and the threshold value τ.[2] Enders and Siklos (2001) propose the application of the 'Akaike information criterion' (AIC) and the 'Schwartz Bayesian information criterion' (SBC) in order to determine the selection of the TAR or M-TAR model.

Finally, we perform a number of statistical tests on the estimated coefficients in order to ascertain whether the variables are cointegrated, and, in such a case, whether or not the adjustment is symmetric. Two separate tests are proposed by Enders and Siklos (2001), use the *F*-statistic, involves a procedure for testing for the null hypothesis of $\rho_1 = \rho_2 = 0$, and use the *t*-statistic, requires a test for the null hypothesis with the largest $\rho_i = 0$ between ρ_1 and ρ_2. If the null hypothesis of no cointegration is rejected, then a test for the null hypothesis of $\rho_1 = \rho_2$ can be undertaken using a standard *F*-statistic because the system is stationary. The equilibrium relationship with symmetric adjustment is accepted when the null hypothesis with no cointegration is rejected and the null hypothesis of $\rho_1 = \rho_2$ is accepted. In this case, the Engle-Granger (E-G) test for cointegration is a special case of Equation (3).

3. Empirical Results

The data used in this study consist of monthly observations on the lending rate (LR), and the 1-month certificate of the deposit rate (DR) from 1998 to 2007. The reason we choice sample period is avoiding from subprime storm with the potential presence of structural breaks in the sample LR and DR studies. The data are collected from the International Financial Statistics (IFS). The descriptive statistics of the variables for each Eastern European country under examination are provided in Table 1, from which we can see that both the lending and deposit rates of Romania are the highest throughout the sample, whilst the lending and deposit rates of the Czech Republic are the lowest. The Jarque-Bera tests on the Eastern European countries examined in this study show that for all of the variables for each country, the distribution is approximately non-normal.

Table 1

Descriptive statistics of the variables for each country

Country[a]	Mean	Min.	Max.	S.D.	Skewness	Kurtosis	J-B[b]
Bulgaria							
LR	10.412	7.010	15.430	2.144	0.591	2.154	10.564***
DR	3.096	2.710	3.710	0.242	0.769	3.476	12.964***
Czech Republic							
LR	7.169	5.540	13.680	2.141	1.939	5.849	115.779***
DR	2.714	1.100	8.470	2.123	1.620	4.663	66.335***

[2] As a general rule, the threshold value τ is unknown. The method adopted in Chan (1993) involves arranging the residual error terms in order, from small to large; the first and last 15 per cent are then removed, and the middle 70 per cent are selected. The sum of the squares of the residual errors is then minimized prior to the value being determined.

Country[a]	Mean	Min.	Max.	S.D.	Skewness	Kurtosis	J-B[b]
			Hungary				
LR	11.869	7.000	20.300	3.541	0.814	2.753	13.545***
DR	9.086	3.890	16.770	3.002	0.812	2.936	13.189***
			Poland				
LR	12.495	5.430	26.900	6.683	0.534	1.872	12.067***
DR	7.710	2.150	19.700	5.511	0.707	2.137	13.725***
			Romania				
LR	35.361	12.920	75.600	18.184	0.402	1.879	9.514***
DR	20.279	4.000	52.100	14.241	0.577	1.973	11.932***
			Russia				
LR	19.482	9.200	49.000	11.896	1.232	3.095	30.388***
DR	6.845	3.300	27.300	5.133	2.358	8.003	236.314***
			Slovakia				
LR	11.852	6.230	23.930	5.288	1.023	2.585	21.787***
DR	7.140	2.250	18.570	4.534	1.081	2.861	23.453***
			Ukraine				
LR	28.906	13.310	71.520	15.886	0.909	2.595	17.340***
DR	11.458	6.140	28.220	5.728	1.308	3.426	35.123***

Notes: [a] LR denotes the lending rate; and DR denotes the deposit rate of the one-month certificate.

[b] *J-B refers to the Jarque-Bera test for normality, with *** indicating significance at the 0.01 level.*

3.1 Threshold Cointegration Tests

For each type of asymmetry, we set the indicator function I_t according to Equation (3) or Equation (4). The AIC and SBC are used to select the most appropriate lag length and to determine whether the adjustment mechanism is best captured as a TAR or M-TAR process. Widespread support is found for the method adopted by Chan (1993) for obtaining consistent threshold estimates with the M-TAR model, except Czech Republic with TAR model, as shown in Table 2.

As shown in Table 2, In the Czech Republic case, based on AIC and SBC, the TAR model with the consistent estimate of the threshold is selected and the null hypothesis of $\rho_1 = \rho_2 = 0$ is rejected at the 5% significance level, in addition the M-TAR model with the consistent estimate of the threshold are selected and the null hypotheses of $\rho_1 = \rho_2 = 0$ is rejected at the 1% significance level for Romania, Russia, Slovak and Ukraine, could be rejected at the 5% significance level for Bulgaria, Hungary and Poland.

Table 2

The results of threshold cointegration tests

Country	Model	lags	τ	ρ_1	ρ_2	AIC/SBC[1]	$\rho_1 = \rho_2 = 0$[2]	$\rho_1 = \rho_2$[3]	Q(12)[4]
Bulgaria	MTAR	1	2.799	-1.042** (-2.297)	-0.151*** (-2.986)	592.537/ 600.849	7.718** (0.001)	6.960** 0.010	16.596 [0.288]
Czech Republic	TAR	5	0.334	-0.412*** (-3.609)	-0.105** (-1.943)	158.804/ 177.957	7.744** (0.001)	6.392* (0.012)	3.879 [0.985]
Hungary	MTAR	0	-0.592	-0.145*** (-2.76)	-0.523*** (-2.60)	282.979/ 288.538	7.235** (0.001)	3.309 (0.071)	11.292 [0.504]
Poland	MTAR	6	0.178	-0.360*** (-4.070)	-0.006 (-0.104)	320.012/ 341.831	8.330** (0.001)	12.310*** (0.001)	8.924 [0.709]
Romania	MTAR	0	2.108	-0.689*** (-4.982)	-0.040 (-1.115)	577.979/ 583.538	13.036*** (0.0000)	20.599*** (0.0000)	26.432 [0.256]
Russia	MTAR	5	-0.975	-0.166*** (-2.599)	-0.411*** (-3.930)	783.802/ 802.955	9.365*** (0.000)	4.904 (0.028)	20.935 [0.702]
Slovak	MTAR	1	-1.289	-0.001 (-0.006)	-0.566*** (-5.597)	571.788/ 580.101	15.941*** (0.000)	16.156*** (0.000)	5.448 [0.941]
Ukraine	MTAR	0	4.24	-0.578*** (-1.098)	-0.257*** (-2.127)	900.625/ -157.559	12.464*** (0.000)	3.191 (0.000)	28.320 [0.683]

*Notes: 1. AIC=T*ln(RSS)+2*n ; and SBC=T*ln(RSS)+n*ln(T), where n = number of regressors and T = number of usable observations. RSS is the residual sum of squares.*

2. This test follows a non-standard distribution so the test statistics are compared with critical values reported by Enders and Siklos (2001).

3. The numbers reported in this column are F-statistics of symmetric adjustment. The critical values are taken from Enders and Siklos (2001).

4. Q(12) is the Ljung-Box Q-statistic for the joint hypothesis of no serial correlation among the first residuals.

5. Entries in parentheses in this column are the t-statistics for the null hypothesis $\rho_1 = 0$ and $\rho_2 = 0$. Critical values reported by Enders and Siklos (2001).

6. Numbers in brackets are p-value.

*7. The ***, **, and * indicate significance at the 0.01, 0.05 and 0.1 levels, respectively.*

In addition, there is evidence that $|\rho_1| > |\rho_2|$ implying that the speed of adjustment is more rapid for positive than for negative discrepancies. For example, the rate of the Romania converges to its long-run equilibrium τ at the rate of 68.8% for a positive deviation and 4% for a negative deviation. It is reasonable to conclude that the spread of the lending-deposit rate in the Eastern European countries follow nonlinear adjustment and the adjustment mechanisms are asymmetric.

3.2 Threshold Error-Correction Models

Following the positive finding of a non-linear equilibrium relationship, we use the asymmetric threshold error-correction model (TECM) to capture the short-run and long-run dynamic adjustment process with regard to the lending rate $(LR)_t$ and the deposit rate $(DR)_t$ of the Eastern European countries. We apply the AIC to determine the appropriate lag lengths, with the estimated coefficients determining the speed of adjustment for positive and negative deviations from fundamental value. We specify and estimate the asymmetric error-correction model with regard to the lending and deposit rates, and the asymmetric TECM, for the case of Romania, as follows:

$$\Delta(LR)_t = \underset{(0.931)}{0.018} - \underset{(-3.726)^{**}}{0.807} I_t \hat{\varepsilon}_{t-1} - \underset{(-1.164)}{0.202}(1-I_t)\hat{\varepsilon}_{t-1} + A_{11}(L)\Delta(LR)_{t-1} + A_{12}(L)\Delta(DR)_{t-1} + \mu_{1t} \quad (7)$$

$$\Delta(DR)_t = -\underset{(-1.149)}{0.010} + \underset{(-2.661)^{***}}{0.105} I_t \hat{\varepsilon}_{t-1} - \underset{(0.139)}{0.542}(1-I_t)\hat{\varepsilon}_{t-1} + A_{21}(L)\Delta(LR)_{t-1} + A_{22}(L)\Delta(DR)_{t-1} + \mu_{2t} \quad (8)$$

where I_t is the Heaviside indicator and $A_{ij}(L)$ is first-order polynomials in the lag operator L. Within the TECM, $|\rho_1|$ is the adjusted speed above the threshold and $|\rho_2|$ is the adjusted speed below the threshold.

The estimation results for the TECM in Equation (7) indicate that there is a much larger lending rate when the lending-deposit spread is widening ($|\rho_1|$ =0.807), for example, during an economic downturn when there is a fall in the market rate, as compared to the response to a narrowing spread ($|\rho_2|$ = 0.202), for example, during an economic upturn when there is a rise in the market rate. This indicates that for Bulgaria, the Czech Republic, Romania and Ukraine, the lending rate adjusts much more rapidly with a widening spread than when the spread is narrowing; in other words, the lending rates of these countries adjust more rapidly under a declining market rate than under an increasing market rate.

Furthermore, for Hungary, Poland, Russia and Slovakia, we find that the speed of adjustment in the lending rate is much more rapid under a narrowing spread than when the spread is widening. That is, the speed of adjustment in the lending rate for these countries is much more rapid when the market rate is rising, than when it is declining. However, we find that for Bulgaria, the Czech Republic, Poland, Russia and Slovakia, the deposit rate adjusts more rapidly when the spread is widening than when it is narrowing. Furthermore, for Hungary, Romania and the Ukraine, the speed of adjustment is found to be much more rapid under a narrowing spread than when the spread is widening. All of the results of the TECM are presented in Table 3. The model estimated in this study can provide useful policy guidelines for the central banks of Eastern European countries in their attempts to establish appropriate and efficient monetary policies. We find that almost all of the adjustments to the term lending-deposit rate spreads in the Eastern European countries examined in this study are asymmetric.

Table 3

The results of asymmetric error correction model

		$I_t \hat{\rho}_{t-1}$	$(1-I_t)\hat{\rho}_{t-1}$
Bulgaria	LR	0.718(1.617)	-0.126(-2.269)**
	DR	-0.209(-1.739)*	-0.017(-0.560)
Czech Republic	LR	-0.390(-3.726)**	-0.062(1.164)
	DR	-0.077(-2.661)***	0.004(0.139)
Hungary	LR	-0.011(-0.115)	-0.214(-0.682)
	DR	0.002(0.006)	-0.099(-0.914)

		$I_t \hat{\rho}_{t-1}$	$(1-I_t)\hat{\rho}_{t-1}$
Poland	LR	-0.158(-2.189)**	-0.186(-3.346)***
	DR	0.201(3.272)***	-0.133(-1.664)
Romania	LR	-0.807(-2.864)***	-0.202(-4.243)***
	DR	0.105(2.103)**	-0.542(-1.885)*
Russia	LR	-0.099(-3.086)***	-0.126(-2.516)***
	DR	-0.312(-5.246)***	-0.161(-1.399)
Slovak	LR	-0.300(-5.036)***	-0.784(-3.195)***
	DR	-1.056(-6.377)***	-0.042(-0.957)
Ukraine	LR	-0.197(-2.385)***	-0.127(-3.637)***
	DR	-0.142(-0.485)***	-0.262(2.614)

Notes: 1. Numbers in parentheses is t -statistic, respectively.
*2. The ***, **, and * indicate significance at the 0.01, 0.05 and 0.1 levels, respectively.*

The motivation for the examination of such non-linearity can be found in policy-orientated explanations, within which central bank intervention takes place only when the economy deviates from equilibrium by a sufficient amount; thus, the nature of such policy action may differ depending upon the sign of disequilibrium, with central banks paying more attention to rising interest rates than falling rates due to their diverse implications. Furthermore, market-orientated explanations could also provide a rationale for non-linear dynamics, where market agents, such as arbitrageurs, may enter the market only if the deviation from no-arbitrage equilibrium is sufficiently large to compensate them for market friction, such as transaction costs, the bid-ask spread, short-selling and borrowing constraints, as well as the risk arising from the interaction with noise trading. It is argued that any persistent asymmetry in the short-term lending-deposit spread will result in inefficient monetary policy, ultimately leading to a failure to achieve policy targets. Thus, if the central banks of these Eastern European countries wish to make their monetary policy more efficient, they must create the necessary symmetry in the lending-deposit spread; this is why the stable long-run relationship between the lending and deposit rates serves as an appropriate guideline for macro policy.

4. Conclusions

The primary aim of this study is to empirically examine the long-run equilibrium relationships that exist between the lending-deposit spreads of the eight Eastern European countries using threshold models developed by Enders and Granger (1998) and Enders and Siklos (2001). The adoption of this methodology provides much stronger evidence of these long-run non-linear equilibrium relationships. Furthermore, the asymmetric TECM also indicates that the lending rate adjusts to discrepancies in the spread for virtually all of the Eastern European countries examined in this study. The evidence presented in this study of asymmetric adjustment in the spread provides clear support for the hypothesis that banks are very quick to adjust their lending rates when the spread is widening (for example, during a period of economic downturn when there is a fall in the market rate) and may also help to explain the diverse effects that monetary policy is found to have on output. The estimated model in this study can provide useful policy guidelines for the central banks of these Eastern European countries in their attempts to achieve much greater spread stability, and a narrowing of the divergence between the lending and deposit rates. The policy implications of our empirical results are the potential achievement of efficiency within a market economy.

References

Allen, L. (1988), “The Determinants of Banks Interest Margins : A Note”, *Journal of Financial and Quantitative Analysis*, 23: 231-235.

Arden, R., Cook, S., Holly, S. and Turner, P. (2000), “The Asymmetric Effects of Monetary Policy: Some Results from A Macroeconometric Model”, *The Manchester School*, 68: 419–441.

Chan, K. (1993),. “Consistency and Limiting Distribution of the Least Squares Estimator of a Threshold Autoregressive Mode”, *The Annals of Statistics*, 21: 520–533.

Cover, J. (1992), “Asymmetric Effects of Positive and Negative Money Supply Shocks”, *Quarterly Journal of Economics*, 107: 1260–1282.

Diebold, F. and Sharpe, S. (1990), “Post-Deregulation Bank Deposit Rate Pricing: The Multivariate Dynamics”, *Journal of Business & Economic Statistics*, 8: 281–293.

Dueker, M. (2000), “Are Prime Rate Changes Asymmetric”, *Federal Reserve Bank of St. Louis*, 82: 33–40.

Enders, W. and Granger, C. (1998), “Unit Root Tests and Asymmetric Adjustment with An Example Using the Term Structure of Interest rates”, *Journal of Business & Economic Statistics*, 16: 304–311.

Enders, W. and Siklos, P. (2001), “Cointegration and Threshold Adjustmen”, *Journal of Business & Economic Statistics*, 19: 166–176.

Ewing, B., Payne, J. and Forbes, S. (1998), “Co-movements of the Prime Rate, CD Rate, and the S&P Financial Stock Index”, *Journal of Financial Research*, 21: 469–482.

Ho, T. S. Y. and Saunders, A. (1981), “The Determinants of Bank Interest Margins : Theory and Empirical Evidence”, *Journal of Financial and Quantitative Analysis*, 16: 581-600.

Hutchison, D., (1995), “Retail Bank Deposit pricing: An Intertemporal Asset Pricing Approach”, *Journal of Money, Credit and Banking,* 27: 217–231.

Karras, G. (1996), “Are the Output Effects of Monetary Policy Asymmetric? Evidence from a Sample of European Countries”, *Oxford Bulletin of Economics and Statistics*, 58: 267–278.

Laxton, D., Rose, D. and Tetlow, R. (1993), “Is the Canadian Phillips Curve Non-linear”, *Bank of Canada Working paper*, 93-7.

McShane, R. W. and Sharpe, I. G. (1985), "A Time Series/Cross section Analysis of The Determinants of Australian Trading Bank Loan/Deposit Interest margins: 1962-1981", *Journal of Banking and Finance*, 9: 115-136.

Rhee, W. and Rich, R. (1995), "Inflation and the Asymmetric Effects of Money on Output Fluctuations", *Journal of Macroeconomics*, 17, 683–702.

Sarno, L. and Chowdhury, I. (2003), "The behaviour of the real exchange rate: evidence from an alternative price index", *Economic Notes*, 32, 295-333.

Thompson, M. A. (2006), "Asymmetric adjustment in the prime lending–deposit rate spread", *Review of Financial Economics*, 15: 323–329.