"Asymmetric dynamics in current account - interest rate nexus: evidence from Asian countries"

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Asymmetric dynamics in current account-interest rate nexus: evidence from Asian countries

Abstract

This paper uses cointegration and asymmetric error correction models to examine the relationship between current account and interest rate for India, Korea, the Philippines, and Thailand. Specifically, the paper uses a battery of linearity tests including BDS, Hinich, and White procedures to determine whether or not current account and interest rate exhibit asymmetric behavior. The NLADF is applied to determine the time series properties of current account and interest rate. Nonlinear cointegration is conducted through the TAR and M-TAR models. For asymmetric adjustment, the paper implemented the Enders and Granger nonlinear error correction model. The results from the various linearity tests suggest that current account and interest rate for the sample countries exhibit nonlinear behavior. Further, the results from the TAR and M-TAR nonlinear cointegration procedures provide evidence in support of equilibrium long-run relationship between current account and interest rate. The results from the asymmetric error correction models indicate a web of interactions between the current account and interest rate series. From policy perspective, the authorities can alter current account imbalances by manipulating interest rate and vice versa.

Keywords: TAR, M-TAR, current account, interest rate, asymmetry, nonlinear cointegration.
JEL Classification: F30, F31, F41.

Introduction

This paper examines the relationship between current account and interest rate for four Asian countries including India, Korea, the Philippines and Thailand using nonlinear testing procedures. A clear understanding of the relationship between current account and interest rate is important to international economists, investors, and policy makers. In macroeconomics, current account is the difference between domestic saving and investment. Interest rate is a major determinant of both saving and investment. As such, movements in interest rate will unarguably affect current account.

A number of studies have examined the linear relationship between current account and interest rate but only a handful of studies have investigated the nonlinear aspect of such relationship. Obstfeld and Rogoff (2000) using intertemporal model maintain that movements in current account have negative effect on interest rates in the presence of transaction costs under assumption of perfect capital mobility. Belloc and Gandolfo (2005) used the smooth transition autoregressive models (STAR) and the nonlinear vector autoregressive (NLVAR) procedures to investigate the relationship between current account and interest rate for 11 OECD countries. They find substantial evidence in support of the notion that the relationship between current account and interest rate is nonlinear. Their results corroborate those reported by Obstfeld and Rogoff (2000) with respect to the existence of nonlinear relationship between current account and interest rate.

Bergin and Sheffrin (2000) using a testable intertemporal model examined the relationship between current account, interest rate, and exchange rate for Australia, Canada, and the United Kingdom. They find that the inclusion of interest rate significantly enhanced the ability of the model to predict movements in current account for two of the three sample countries, including Canada and Australia. For the United Kingdom, the model was unable to significantly predict movements in current account. Bernhardsen (2000) using panel data regression investigated the relationship between interest rate differentials and macroeconomic variables including current accounts for nine European countries. He finds that current account differentials have significant effect on interest rate differentials for France, Belgium, Denmark, Italy, the Netherlands, Austria, Great Britain, Norway, and Sweden for the time period 1979 through 1995. Lane and Milesi-Ferretti (2002) examined the relationship between current account, country risk, and real interest rate differentials. They conclude that both the country risk and interest rate differential series have significant impact on current account adjustments among the sample countries.

Obstfeld and Rogoff, (2000) and Chortareas et al. (2004) suggest that the relationship between current and interest rate should be modeled using nonlinear techniques because of the presence of transaction costs in the international markets and policy interventions designed to either enforce or reinforce stabilization programs. Similarly, Taylor (2002) suggests that the existence of capital mobility serves as an additional source of asymmetry in current accounts.

The mixed results provided by the previous studies can be blamed on the fact that most of them relied on linear models. However, a number of studies including Obstfeld and Rogoff, (2000), Taylor (2002), Chortareas et al. (2004), Kapetanios et al. (2003), Maki (2005), and Koustas and Lamarche (2005) have shown that macroeconomic time series including interest rates and current accounts exhibit asymmetric adjustment. The presence of asymmetry suggests that the relationship between current account and interest rate should be explored by the application of nonlinear models.

In addition, most of the earlier studies examined the relationship between current account and interest rate in the context of the OECD countries. Asian countries including India, Korea, the Philippines, and Thailand have not received adequate attention on this issue. This paper therefore extends the current account-interest rate nexus debate to these Asian countries. Furthermore, unlike most of the earlier studies that applied linear models, on the assumption that current accounts and interest rates are linearly related, the present study applies nonlinear techniques. In particular, this study employs a battery of nonlinearity tests including the BDS [Brock et al. (1987, 1996)], Hinich (1989), and White (1989) procedures to ensure that the appropriate models are adopted to avoid biased inferences relative to the relationship between current account and interest rate. The nonlinear augmented Dickey-Fuller (NLADF) unit root procedures were utilized to determine the time series properties of current account and interest rate. For nonlinear equilibrium relationship between current account and interest rate, the study implements the threshold autoregressive (TAR) and the momentum threshold autoregressive (M-TAR) models. The study further applied the nonlinear error correction procedure proposed by Enders and Granger (1998) to obtain consistent estimates of the threshold models.

The remainder of the paper is structured as follows. Section 1 furnishes the methodology. Section 2 presents the data and the summary statistics, and discusses the empirical results. The last section provides the conclusions and the policy implications of the study.

1. Methodology

This section discusses the methodology of the study. Prior to unit root testing, the paper applies the BDS nonlinearity test developed by Brock et al. (1987, 1996) to determine the existence of nonlinear dependence in the data. The BDS test is applied to the residual of the series. The presence of nonlinearity in the data will cause the test statistic to exceed the critical value for the standard normal distribution at the conventional levels. The BDS nonlinearity test is based on the correlation integral of the time series. The test statistic is calculated as follows:

$$W_m(\varepsilon,T) = \frac{\sqrt{T}[C_m(\varepsilon,T) - C_1(\varepsilon,T)^m]}{\sigma_m(\varepsilon,T)}, \tag{1}$$

where $W_m(\varepsilon,T)$ represents the BDS test statistic, $\sigma_m(\varepsilon,T)$ is the standard deviation of $C_m(\varepsilon,T)$, m is the embedding dimension, while ε represents the maximum difference between pairs of observations considered in calculating the correlation integral. The BDS procedure is asymptotically normally distributed with zero mean and unit variance [i.e. $N(0,1)$]. The null hypothesis under the BDS nonlinearity test is that the data are independently, identically distributed (iid). The null hypothesis of linearity is rejected if the computed test statistic exceeds the critical value at the conventional level. The rejection of the null hypothesis indicates the presence of nonlinear dependence in the data. Brock et al. (1987, 1996) provide detailed description of the BDS framework.

If the BDS test provides evidence that the current account and interest rate series are nonlinear, then the conventional unit root tests such as the Dickey-Fuller (1981) and the Phillip-Perron (1988) frameworks will not yield meaningful results. To this end, the study implements the Bierens (1997) nonlinear augmented Dickey-Fuller (NLADF) test to ascertain the time series properties of the current account and interest rate series for the sample countries. The NLADF unit root procedure allows the trend to be an almost arbitrary deterministic function of time. Unlike the conventional unit root tests, the NLADF uses Chebishev time polynomials instead of the regular time polynomials. It also uses parametric specification of the dynamics rather than the Newey-West (1987) type long-run variance estimator. The null hypothesis under the NLADF is that the series of interest is a unit root with drift process. The alternative hypothesis on the other hand, is that the series is a nonlinear trend stationary process. Bierens (1997) points out that the Chebishev polynomials should be preferred over the regular time polynomials because they are orthogonal and bounded.

The NLADF tests are based on the following ADF-type auxiliary regression:

$$\Delta X_t^k = \alpha_0 X_{t-1}^k + \sum_{j=1}^{q} \alpha_j \Delta X_{t-j}^k + \theta^{T1} P^{(m)} + \mu_t \ , \tag{2}$$

where $P^{(m)} = [P^*_{0,n}(t),\ P^*_{1,n}(t),\ \ldots, P^*_{m,n}(t)]^T$ represents a vector of orthogonal Chebishev polynomials.

In equation (2), the null hypothesis of unit root, $\alpha_0 = 0$, and $\theta^T = 0$. The unit root hypothesis is tested based on the *t*-statistic of α_0, the test statistic $Am = (n- p-1)\ \alpha_0\left|1-\sum_{j=1}^{q}\alpha_j\right|$ and the *F*-test of the joint hypothesis that α_0 and the last *m* components of *m* are zero.

If the results from the NLADF unit root tests reveal that the current account and interest rate series are first difference nonlinear trend stationary processes, then the threshold autoregressive (TAR) and the momentum threshold (M-TAR) models can be applied to test for nonlinear cointegration. Enders and Siklos (2001) suggest the application of the TAR model to examine the long-run relationships between time series, especially in the presence of asymmetry.

The TAR model is formulated as follows:

$$\Delta\varepsilon_t = I_t\rho\varepsilon_{t-1} + (1-I_t)\rho\varepsilon_{t-i} + \varpi_t, \qquad (3)$$

where ε is the residual recovered from the cointegrating regression of current account on interest rate, I_t is the Heaviside indicator such that:

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

where τ is the threshold value. In addition to the TAR, the study implements the momentum threshold (M-TAR). The M-TAR model is appropriate given that in most cases the researcher does not know the nature of the nonlinear relationship between the time series in the study. Under the M-TAR framework, the adjustment speed is allowed to depend on the first difference of ε_{1-t} rather than on its level. The following equation is implemented for the M-TAR model:

$$\Delta\varepsilon_t = M_t\rho\varepsilon_{t-1} + (1-M_t)\rho\varepsilon_{t-i} + \varpi_t, \qquad (5)$$

$$M_t = \begin{cases} 1 & \text{if } \Delta\varepsilon_{t-1} \geq \tau \\ 0 & \text{if } \Delta\varepsilon_{t-1} < \tau \end{cases}. \qquad (6)$$

The M-TAR procedure captures the properties when the threshold depends on changes in e_t in the previous period. Equations (3) and (5) can be reformulated as follows if the adjustment processes are serially correlated:

$$\Delta\varepsilon_t = I_t p_1\varepsilon_{t-1} + (1-I_t)p_2\varepsilon_{t-1} + \sum_{i=1}^{n}\beta_i\Delta\varepsilon_{t-i} + \varpi_t, \qquad (7)$$

$$\Delta\varepsilon_t = M_t\rho_1\varepsilon_{t-1} + (1-M_t)\rho_2\varepsilon_{t-i} + \sum_{i=1}^{n}\beta_i\Delta\varepsilon_{t-i} + \varpi_t. \qquad (8)$$

The Enders and Siklos (2001) threshold cointegration procedure provides two test statistics, namely – the Φ and the *t*-Max. Under the Φ procedure, the *F*-statistic is used to test the null hypothesis that $\rho_1 = \rho_2 = 0$. However for the *t*-Max test, the standard *t*-statistic is used to test the statistical significance of ρ_1 and ρ_2. If the null hypothesis of no cointegration is rejected in favor of the alternative of cointegration, then one can test the hypothesis that $\rho_1 = \rho_2 = 0$, given that the system is stationary.

If the TAR and M-TAR frameworks provide evidence of cointegration between the series in the system, Enders and Granger (1998) propose the implementation of an error correction model (ECM) that accounts for asymmetric adjustment. The study implements the following asymmetric ECM:

$$\Delta CA_t = \beta_{11}(L)\Delta CA_{t-1} + \beta_{12}(L)\Delta RIR_{t-1} + \beta_{13}z\_plus_{t-1} + \beta_{14}z\_minus_{t-1} + \mu_t, \qquad (9)$$

$$\Delta RIR_t = \beta_{11}(L)\Delta CA_{t-1} + \beta_{12}(L)\Delta RIR_{t-1} + \beta_{13}z\_plus_{t-1} + \beta_{14}z\_minus_{t-1} + \mu_t, \qquad (10)$$

where Δ is difference operator, *CA* represents current account, *RIR* stands for short-term interest rate, *L* is the lag operator, while the *z_plus* and *z_minus* are error correction terms which serve as the speed of adjustments.

2. Data and empirical results

The data used in this study consist of quarterly observations on current accounts and nominal short-term interest rates (proxied by lending rate) for India, Korea, the Philippines, and Thailand. The interest rate series are deflated using the consumer price index. The sample period covers 1980:1 through 2003:4. The data were collected from the *International Financial Statistics* (IFS) CD-ROM, published by International Monetary Fund, 2006.

The empirical investigation of the study begins by testing the data for nonlinearity to ensure that the appropriate models are applied. Table 1 displays the BDS nonlinearity test results. Panel A of Table 1 reveals the linearity test for current accounts for India, Korea, the Philippines, and Thailand. The results reveal that the null hypothesis of linearity should be rejected at the 1 percent level of significance for the current account series in all of the cases. Similarly, the BDS test results for the interest rate series presented in Panel B of Table 1 suggest that the null hypothesis of linearity should be rejected in favor of the alternative hypothesis of nonlinearity at the 1 percent level of significance in all of the cases.

Table 1. BDS test of independence

Dimension (m)	India	Korea	Philippines	Thailand
Panel A. Linearity test for current accounts				
2	5.37***	10.47***	8.44***	16.59***
3	5.37***	11.20***	8.76***	18.78***
4	6.88***	12.29***	9.67***	20.48***
5	6.90***	13.67***	11.27***	21.95***
6	6.87***	15.15***	12.29***	24.03***
Panel B. Linearity test for real interest rates				
2	12.12***	14.79***	12.06***	14.64***
3	11.14***	15.20***	12.23***	14.99***
4	10.44***	15.57***	12.61***	15.70***
5	10.29***	16.03***	13.30***	16.94***
6	10.26***	16.96***	14.14***	18.86***

Notes: *** indicates rejection of the null hypothesis of linearity at the 1 percent significance level. m = number of lags. The critical values are 2.33, 1.96 and 1.64, respectively at the 1, 5 and 10 percent level. The null hypothesis is that the residuals are independent and identically distributed (iid).

To check the robustness of the BDS test results, the study also applied the Hinich (1989) and the White (1989) nonlinearity tests to the data. Table 2 displays the Hinich (1989) nonlinearity tests. Panel A reveals the test results for current accounts for India, Korea, the Philippines, and Thailand. The results suggest that the null hypothesis of linearity in the current account series for India and the Philippines should be rejected in favor of the alternative of nonlinearity at the 5 percent level of significance. However, for Korea and Thailand, the null hypothesis of linearity is rejected at the 10 percent level of significance. The results for the interest rate series presented in Panel B of Table 2 suggest that the null hypothesis of linearity should be rejected at the 1 percent level for India, Korea, and Thailand. However, for the Philippines, the null hypothesis is rejected at the 10 percent level of significance.

Table 2. Hinich nonlinearity test results

	India	Korea	Philippines	Thailand
Panel A. Current accounts (CA)				
Test statistic	1.64**	1.29*	1.61**	1.42*
P-value	0.05	0.09	0.05	0.08
Panel B. Real interest rates (RIR)				
Test statistic	4.44***	5.85***	1.40*	3.29***
P-value	0.00	0.00	0.08	0.00

Note: ***, ** and * indicate rejection of the null hypothesis of linearity at the 1, 5 and 10 percent significance level, respectively.

Table 3 presents the p-values for the White (1989) nonlinearity test for India, Korea, the Philippines, and Thailand. The lags (m) were automatically determined within the model. From Panel A, the results suggest that the null hypothesis of linearity in current accounts should be rejected at the 1 percent level for Korea, the Philippines, and Thailand. However, for India, the null hypothesis is rejected at the 5 percent level of significance. From Panel B, the null hypothesis of linearity in interest rate for India, Korea, the Philippines, and Thailand is rejected at the 1 percent level of significance. In all, the three linearity tests conducted in this study suggest that the current account and interest series for the sample countries are nonlinear in all of the cases[1].

Table 3. *P*-values for White nonlinearity tests

	India	Korea	Philippines	Thailand
Panel A. Current accounts (CA)				
Test statistic	0.02	0.00	0.00	0.00
Lags (m)	1	1	1	5
Panel B. Real interest rates (RIR)				
Test statistic	0.00	0.00	0.00	0.01
Lags (m)	2	8	3	2

Notes: ** and * indicate rejection of the null hypothesis at the 5 and 10 percent significance level, respectively. The critical values at the 1, 5 and 10% level are -3.93, -3.40, and -3.13, respectively

Prior to determining the order of integration for the current account and interest rate series, the study used the AIC to ascertain the optimal lag (p) and the order of the Chebisbev time polynomials. Tables 4 and 5 display the results of the NLADF tests and their critical values. Panel A of Table 4 displays the results of the NLADF based on the level of the current account series for India, Korea, the Philippines, and Thailand. The *t*-stat, Am, and *F*-test results suggest that, even after allowing for nonlinear trend breaks, the unit root hypothesis still could not be rejected for all of the countries, because the computed t-statistics are all less than the critical values at the conventional levels. For instance, in the case of India, the computed test statistics -0.25, -12.70, and 1.96, respectively for the *t*-stat, Am, and *F*-test procedures are all below the reported critical values at the 5 percent significance level. Turning to the results from the NLADF unit root test for interest rates presented in Panel B of Table 4, it can be seen that the computed test statistics for the *t*-stat, Am, and *F*-test procedures are all below the critical val-

[1] The various nonlinearity test results reported in this paper were obtained through RATS 7.0 statistical program.

ues. From the results presented in Panels A and B of Table 4 it can be surmised that the null hypothesis of unit root with drift on the levels of the current account and interest rate series should not be rejected in all of the cases.

Table 4. Bierens nonlinear ADF unit root tests based on levels of the series

	India	Korea	Philippines	Thailand
Panel A. Current accounts				
t-stat	-0.25	-2.69	-1.86	-2.16
Am	-12.70	-14.89	-9.49	-9.72
F-test	1.96	2.52	1.40	1.76
Panel B. Real interest rates				
t-stat	-3.47	-2.20	-2.90	-2.60
Am	-17.61	-8.70	-14.98	-9.74
F-test	4.26	2.96	3.00	4.85

Notes: The critical value for the *t*-stat is -3.97 at the 5 percent level. The critical value for the Am test at the 5 and 10 percent are -27.2 and -23.0, respectively. The 5 and 10 percent critical values for the F-test are -4.88 and -5.68, respectively.

Table 5. Bierens nonlinear ADF unit root tests based on first differences of the series

	India	Korea	Philippines	Thailand
Panel A. Current accounts				
t-stat	-6.72***	-5.55***	-3.98***	-7.44***
Am	-143.06***	-68.88***	-169.61***	-117.83***
F-test	15.08***	10.43***	5.29***	18.43***
Panel B. Real interest rates				
t-stat	-5.73***	-6.75***	-6.14***	-5.23***
Am	-113.66***	-77.39***	-55.22***	-79.66***
F-test	10.95***	16.88***	12.59***	9.18***

Notes: *** indicates rejection of the null hypothesis at the 1 percent significance level. The critical value for the *t*-stat is -3.97 at the 5 percent level. The critical value for the Am test at the 5 and 10 percent are -27.2 and -23.0, respectively. The 5 and 10 percent critical values for the F-test are -4.88 and -5.68, respectively.

Table 5 presents the results of the NLADF based on the first differences of the current account and interest rate series for India, Korea, the Philippines, and Thailand. The *t*-stat, Am, and *F*-test results presented in Panel A for current accounts suggest that the unit root hypothesis should be rejected at least at the 5 percent level of significance for all of the countries since the computed statistics are all greater than the reported critical values. For instance, in the case of Korea, the computed test statistics -5.55, -68.88, and 10.43, respectively for the *t*-stat, Am, and *F*-test procedures are all below the reported critical values at the 1 percent significance level. From the NLADF unit root test for interest rates presented in Panel B of Table 4, it can be seen that the computed test statistics for the *t*-stat, Am, and *F*-test procedures all exceed the critical values at the 1 percent significance level. In all, the results presented in Panels A and B of Table 5 suggest that the current account and interest rate series are first-difference nonlinear trend stationary processes in all of the cases.

Having established that current accounts and interest rates have the same order of integration, the study next applies the TAR and M-TAR cointegration techniques to ascertain the long-run relationship between the two series. Table 6 presents the TAR and M-TAR cointegration test results. The results from the TAR and M-TAR techniques provide evidence in favor of nonlinear cointegration between current accounts and interest rates for India, Korea, the Philippines, and Thailand. As can be seen in Table 6, the regression coefficients on ρ_1 are statistically significant at least at the 10 percent level in the cases of India, the Philippines, and Thailand under the TAR framework. However, under the M-TAR model, the regression coefficient on ρ_1 is statistically significant at least at the 10 percent level in the cases of India, Korea, and the Philippines. The regression coefficient on ρ_2 is statistically significant at least at the 10 percent level in the cases of Korea and the Philippines under the TAR model. However, under the M-TAR model, the regression coefficient on ρ_2 is statistically significant at the 5 percent level of significance in the cases of Korea, the Philippines, and Thailand.

Table 6. Nonlinear cointegration tests

Country	Parameter	TAR	M-TAR
India	ρ_1	-0.36** (-3.20)	-0.50** (-4.57)
	ρ_2	-0.08 (-1.21)	0.16 (1.02)
	Φ	5.67**	10.55**
	F	4.67**	3.70**
Korea	ρ_1	-0.05 (-1.24)	-0.32* (-1.90)
	ρ_2	-0.39** (-3.07)	0.21 (3.15)
	Φ	5.33**	6.03**
	F	5.75**	0.38
Philippines	ρ_1	-0.11** (-2.45)	-0.13* (-1.65)
	ρ_2	-0.41** (-4.45)	0.64** (2.94)
	Φ	12.02**	5.59**
	F	9.09**	4.80**
Thailand	ρ_1	-0.04* (-1.82)	-0.03 (-0.51)
	ρ_2	-0.03 (-0.80)	0.21** (3.28)
	Φ	1.97	5.56**
	F	2.49*	6.99**

Notes: ** and * indicate the rejection of the null hypothesis at the 5% and 10 significance level, respectively. Φ tests the null hypothesis $\rho_1 = \rho_2 = 0$, *F* represents the symmetry test for $\rho_1 = \rho_2$. The lag lengths of 2 for M-TAR; and 1 for TAR were determined by the AIC.

Turning to asymmetric cointegration analysis, the Φ statistic (i.e. $\rho_1 = \rho_2 = 0$) under both the TAR and M-TAR suggests that the current account and interest rate series are nonlinearly cointegrated at the 5 percent significance level for India, Korea, and the Philippines. However, for Thailand, only the M-TAR model provides evidence of nonlinear cointegration as the null hypothesis is rejected at the 5 percent level. Similarly, the *F*-statistic (i.e. $\rho_1 = \rho_2$) rejects the null hypothesis of symmetric relationship between current account and interest rate under both the TAR and M-TAR models for India, the Philippines, and Thailand. For Korea, only the result from the M-TAR model rejects the null hypothesis of symmetric relationship between current account and interest rate. In all, these results suggest that current account and interest rate are asymmetrically cointegrated and adjusted to both negative and positive deviations from long-run equilibrium relationship.

Since the results from the TAR and M-TAR models provided evidence in support of the existence of nonlinear cointegration relationship between current account and interest rate, the study next employed the asymmetric error correction models. Table 7 presents the results from the asymmetric error correction models. Panel A of Table 7 displays the results from the asymmetric error correction model for changes in current account (ΔCA) for India, Korea, the Philippines, and Thailand. It can be observed from the results displayed in Panel A that the regression coefficient on S_Plus_{t-1} is statistically significant at the 5 percent level in the cases of India, Korea, and the Philippines. These results imply that changes in current account respond strongly to positive shocks to changes in interest rate for India, Korea, and the Philippines. The regression coefficient on S_Minus_{t-1} is statistically significant at the 5 percent level in the case of Thailand. This result suggests that changes in current account adjust strongly to positive shocks to changes in interest rate. Panel B of Table 7 reveals the results from the asymmetric error correction model for changes in interest rate (ΔRIR). The results indicate that the regression coefficient on S_Plus_{t-1} is statistically significant for Korea and the Philippines at the 10 percent level. These results indicate that changes in interest rate weakly respond to changes in current account for Korea and the Philippines. Similarly, the regression coefficient on S_Minus_{t-1} is statistically significant at the 5 percent level for Korea and the Philippines. These results suggest that changes in interest rate strongly adjust to negative shocks to changes in current account for these countries. However, for India and Thailand, the results indicate that changes in interest rate do not respond to either positive or negative shocks to current account, as the regression coefficients on S_Plus_{t-1} and S_Minus_{t-1} are statistically insignificant at the conventional levels. In all, the results reported in this study indicate that current account and interest rate are nonlinearly related for the sample countries. This finding is consistent with Obstfeld and Rogoff, (2000) and Chortareas et al. (2004).

Table 7. Estimates of nonlinear error correction models

	Constant	S_Plus_{t-1}	S_Minus_{t-1}	ΔCA_{t-1}	ΔCA_{t-2}	ΔRIR_{t-1}	ΔRIR_{t-2}
Panel A. Equation for ΔCA							
India	--142.96 (-1.00)	-0.246** (-2.13)	-0.06 (-0.14)	-0.27* (-1.80)	-0.10 (-0.85)	-24.52 (-0.45)	-35.92 (-0.64)
Korea	186.19 (0.97)	-0.18** (-2.80)	0.02 (0.06)	0.07 (0.60)	0.24** (2.25)	16.78 (0.14)	41.86 (0.72)
Philippines	-8.57 (-0.14)	-0.19** (-2.27)	0.11 (0.18)	-0.16 (-1.42)	-0.16 (-1.42)	8.02 (0.49)	-7.07 (-0.44)
Thailand	4.61 (0.05)	-0.02 (-0.44)	-0.19** (-2.22)	-0.04 (-0.38)	-0.06 (-0.60)	-1.78 (-0.03)	-5.76 (-0.09)
Panel B. Equation for ΔRIR							
India	006 (0.22)	-0.00 (-0.82)	0.00 (0.94)	-0.00 (-1.61)	-0.00 (0.24)	0.21* (1.74)	-0.17 (-1.47)
Korea	0.01 (0.05)	-0.01* (-1.83)	-0.82** (-3.09)	0.00 (1.36)	-0.00 (-0.23)	0.20* (1.72)	0.06 (0.60)
Philippines	-0.17 (-0.43)	0.06* (1.74)	-0.73** (-2.70)	0.00 (0.31)	-0.00 (-0.31)	0.96 (3.97)	0.025 (0.219)
Thailand	0.24 (1.00)	0.03 (0.14)	-0.00 (-0.95)	-0.00 (-1.46)	-0.00 (-0.35)	0.26 (2.16)	0.06 (0.59)

Notes: ** and * represent rejection of the hypotheses at the 5% and 10% levels of significance. CA represents current account and RIR – short-term interest rate. The figures in parentheses are the *t*-ratios. The Akaike Information Criterion is used to determine the optimal lag lengths.

Summary and policy implications

This paper examined the asymmetric relationship between current account and interest rate for India, Korea, the Philippines, and Thailand using the nonlinear unit root and cointegration procedures. Specifically, the study applied a battery of linearity test procedures including the BDS, Hinich and the White frameworks. The NLADF unit root tests were implemented to ascertain the time series properties of current account and interest rate. For nonlinear cointegration, the study applied the TAR, M-TAR models. The study employed the Enders-Granger nonlinear error correction techniques to obtain consistent estimates of the threshold models.

The results from the BDS, Hinich, and the White linearity tests suggest that current account and interest rate exhibit nonlinear behavior for India, Korea, the Philippines, and Thailand. The results from the NLADF unit root tests indicate that the current account and interest rate series have one order of integration [i.e. I(1)]. The results from the nonlinear cointegration tests including the TAR, M-and the TAR cointegration techniques indicate that current account and interest rate are nonlinearly cointegrated. The results from the Enders-Granger nonlinear error correction models indicate that changes in current account respond significantly to positive shocks to changes in interest rate for India, Korea, and the Philippines. However, current account responds negatively to innovations in interest rate for Thailand. The results further revealed that changes in interest rate respond weakly to negative shocks to changes in current account for Korea and the Philippines. However, changes in interest rate respond strongly to positive shocks to current account for Korea and the Philippines.

Two important policy implications emerge from the study. First, the monetary authorities for India, Korea, the Philippines, and Thailand should be cognizant of the fact that the relationship between current account and interest rate is nonlinear. This understanding will enable them to formulate and implement appropriate strategies to counterbalance economic activity in their respective countries. Second, the fact that current account and interest rate influence each other suggests that the authorities can alter movements in current account by tinkering with interest rate and vice versa. For instance, the authorities can correct current account imbalances by altering domestic interest rates.

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