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Revisiting the Exchange Rate Pass-through in Emerging Markets

Abstract This paper aims to investigate the links between exchange rate pass-through (ERPT) and monetary policy. We examine the degree of ERPT to consumer prices for 11 emerging markets (6 inflation targeters and 5 non-inflation targeters) using both multivariate cointegrated VAR (CVAR) and impulse responses derived from the vector error correction model (VECM). Results of cointegration analyses suggest that the degree of ERPT is lower in ITers than in non-ITers. Besides, the impulse response estimates at 48 months are extremely close to the cointegration estimates in IT countries compared to those non-IT countries. The adjustment process is fully completed during the considered time horizon in the impulse response analysis. This finding confirms the literature review on the importance of the inflation environment and the monetary policy credibility in determining ERPT. The level of ERPT tend to decline in the countries where monetary policy moved strongly towards stabilizing inflation.

Keywords: Exchange Rate pass-through; Domestic prices; Cointegration; Emerging Markets.
JEL classification: E31; F31

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1 Introduction

Exchange rate pass-through (ERPT) is generally defined as the percentage change of domestic prices resulting from a one percent change in the exchange rate between domestic and foreign countries. During the last two decade, the study of exchange rate pass-through has acquired excessive importance and became an important issue in international macroeconomics literature due to its far reaching implications for monetary policy. A low degree of exchange rate pass-through makes monetary policy more independent. So, the monetary authority isn't worry about inflation when adjusting exchange rate policy. In the context of a high level of pass-through, however, the monetary authority will have to be more concerned by the inflationary effects of exchange rate changes. The large fluctuations of the exchange rate changes will be translated into inflationary pressure in the economy. Therefore, it is important for a country to ascertain the extent of ERPT to understand, design, and conduct better monetary policy.

In recent years, various studies report that ERPT has declined, particularly in developed economies. As this decline coincides with significant decrease in the level of inflation, researchers were interested on the relationship between the degree of ERPT and the inflation environment. Taylor (2000) suggest that the establishment of a credible and strong nominal anchor low inflation policy regime leads to a decline in pass-through exchange rate. Thus, the decrease in pass-through is related to low inflationary environment. Taylor's (2000) hypothesis was provided by Campa and Goldberg (2005), Gagnon and Ihrig (2004) Bailliu and Fujii (2004), Choudhri and Hakura (2006) and Ca'Zorzi et al. (2007).

Falling into this strand of the literature, this study aims to assess the exchange rate pass-through on consumer prices for emerging economies by focusing on the relationship between monetary policy and pass-through. The case of emerging countries is particularly interesting since these economies have undergone a currency crises and subsequent transitions to new policy regimes in the last two decades.

Most of previous empirical studies on ERPT in emerging countries have employed the techniques and tools of the vector autoregression (VAR) model (impulse response functions, variance decompositions) to study the inflationary effects of exchange rate changes. Yet, these models neglected the time-series properties of the data in particularly the non-stationarity and the cointegration issues and ignored the information contained in 'levels' variables. Therefore, to achieve our objective of estimating the exchange rate pass-through on domestic prices, we propose a cointegrated VAR by focusing on the long-run equilibrium relationship contained in the cointegrating space. Congruently, the impulse response functions from the VECM are used to analyze the response of the domestic to shocks imposed on the exchange rate for each country.

The remainder of the paper is organized as follows. Section 2 outlines the data and the methodology used. Section 3 discusses our econometric results. Finally, section 4 concludes by highlighting the main policy implications of our empirical findings.

2 Methodology and Data

In this study, we attempt to investigate the effects of exchange rate changes on domestic prices focusing on a possible role for the inflation environment in influencing it. For this purpose, we follow the studies of McCarthy, 2007; Hunfner and Schröder, 2002; and Beirne and Bijstubosch, 2011) and include the distribution chain of pricing (producer and consumer prices[1]). This methodology gives us the opportunity to study how exchange rate fluctuations pass through the production process from producer prices to consumer prices. Moreover, consumer and producer prices changes are assumed to be affected by supply shocks and demand shocks. In our model, the oil prices serve as a proxy for supply shocks and the demand shocks are proxied by industrial production.

Our empirical methodology is based on cointegrated VAR (CVAR) framework (using Johansen procedure). This approach allows us to take into account of the non-stationarity of the data. In addition, it enables retention of the important information contained in "levels" variables. In other words, we can measure the long-run ERPT in the "equilibrium" relationship.

In this study , we focus our analysis on 11 emerging markets that may be divided into two groups: the first one comprises inflation targeting economies (Brazil, Hungary, Philippines, Poland, Korea, South Africa), and the second one is composed of non inflation targeting economies (Bulgaria, Costa Rica, Pakistan, Malaysia, and Uruguay). For each country, we use five variables: oil price (Oil), nominal effective exchange rate (NEER[2]), producer price index (PPI), consumer price index (CPI) and industrial production index (IPI). For Costa Rica and Uruguay, the data of industrial production are not available.

We use monthly data provided from the IMF International Financial Statistics

[1] Import price isn't include in our distribution chain given the lack of data with monthly frequency

[2] A decrease in the index means a depreciation of the domestic currency

over the sample period of 1993M1 to 2013M7. For Brazil, the sample spans from 1995M1 to 2013M7. The data is transformed to logarithms.

Firstly, we consider the following vector of variables for each country:

$$\mathbf{Y' = (CPI_t, PPI_t, OIL_t, NEER_t, IPI_t)'} \quad \textbf{(1)}$$

The empirical studies starts by testing the time series properties of the variables using the Augmented Dickey Fuller (ADF) and Phillips and Perron (PP) unit root tests to examine the order of integration for the series. The results of the unit root tests (Appendix 1) show that all variables are non-stationary at level and are stationary at first difference. Thus, all variables are integrated in the first order I(1). Then, we perform the cointegration tests for each country to check the presence of long-term links between the variables. In doing so, we use the Johansen test to assess whether or not cointegration exists between variables. In order to describe this, we consider the following VAR(k) model:

$$\mathbf{Y_t = A_1Y_{t-1} + \ldots\ldots + A_kY_{t-k} + \mu + \omega S_t + \varepsilon_t} \quad \textbf{(2)}$$

Equation (2) can be converted into a VECM (vector error correction model) equation as follows (in first-differenced form):

$$\mathbf{\Delta Y_t = \Gamma_t Y_{t-1} + \ldots\ldots + \Gamma_{k-1} Y_{t-k+1} + \mu + \omega S_t + \varepsilon_t} \quad \textbf{(3)}$$

Where, $\varepsilon_t \rightarrow$Niid(0, Σ) for t=1, . . .,n ; S_t is a vector including deterministic variables (seasonal dummies and intervention dummies) ; μ is a constant term ; Σ is the variance-covariance matrix of the disturbances, $\Gamma_i = I - A_1 - \ldots\ldots - A_k$ (i=1……..k-1) and $\Pi = \sum_{i=1}^{k} A_i - I$.

Equation (3) allows us to estimate the short and long term relationships. Γi gives information on short-term dynamics of the model, while Π contains information about long-run relationships among the variables and the matrix, Π can be decomposed as $\Pi=\alpha\beta'$ where the matrix $\boldsymbol{\alpha}$ represents the speed of adjustment to equilibrium, and β represents the cointegrating vectors coefficients. The linear combination expresses $\beta' Y_{t-1}$=ECT as the cointegration relationships (error correction terms) between the variables.

The number of cointegrating vectors (r) in the system, i.e. the cointegration rank is determined by the Trace test statistics which is estimated by using Johansen's maximum likelihood procedure as reported in Appendix 3. In addition, it is important to include the appropriate number of lags before rank tests are undertaken. After having identified the appropriate model for the system in terms of lag length and cointegration rank, the coefficients on the β matrix reveal the long-run dynamic.

To achieve our objective of estimating the pass-through effect of exchange rate changes to consumer prices, the coefficients estimated of the cointegrating vectors are normalized on consumer prices. Thus, the coefficients of exchange rate represent the degree of pass-through. After having determined the degree of exchange rate pass-through in the long-run, we pass to check if there is full or zero pass-through to consumer prices by testing a number of restrictions which are imposed on long-run parameters:

H1: Full ERPT to consumer prices with zero constraints on other long-run parameters, i.e. test of whether the first cointegrating is as follows: {1 0 0 1 0}

H2: Full ERPT to consumer prices with other parameters unrestricted, i.e. test of whether the first cointegrating is as follows :{1 φ λ 1 γ }

H3: Zero ERPT to consumer prices with zero constraints on other long-run parameters, i.e. test of whether the first cointegrating is as follows: {1 0 0 0 0}

H4: Zero ERPT to consumer prices with other parameters unrestricted, i.e. test of whether the first cointegrating is as follows :{1 φ λ 0 γ}

The pass-through of exchange rate is fully transmitted to consumer prices if H1 or H2 holds. However, there is zero pass-through if H3 or H4 holds, which implies that consumer prices do not respond to exchange rate fluctuations.

In the extension of studies on the ERPT, we will proceed to analyze the impulse response functions (IRF) derived by VECM over time in order to assess the magnitude and timing of exchange rate pass-through to consumer prices.

3 Empirical Results

3.1 Cointegration Analysis

Appropriate lag length for each country was selected by using the final prediction error, Akaike, Schwarz, Hannan-Quinn information criteria in conjunction with well-behaved residuals. The misspecification tests achieved across each system of variables (see Appendix

2) show that there is no sign of autoregressive behaviour, non-normality, ARCH or heteroskedasticity.

The results of the trace test statistics (Appendix 3) suggest the existence of some variation in the number of cointegrating relationships across the countries. The null hypothesis of no cointegration was rejected for all countries, with a cointegration rank identified between one and four. Table 1 reports the number of cointegrating vectors identified across each country, as well as the optimal lag length.

Table 1: Summary of VEC-Models

Country	VAR Lags	Rank
Brazil	2	2
Bulgaria	2	1
Costa Rica	2	1
Korea	2	2
Hungary	1	3
Malaysia	2	1
Pakistan	2	3
Philippines	1	2
Poland	1	4
South Africa	2	1
Uruguay	2	1

Our major interest in this study is the long-run relationships presented in the cointegrating space. For this reason, we will concentrate on assessing the relative signs and the extent of the pass-through coefficients in long-run across countries.

Table 2: Long-run Matrix: Coefficients of First Cointegrating Vector

	CPI	*IPI*	*PPI*	*NEER*	*OIL*	*C*	T	ECT
Inflation Targeters								
Brazil	1.000	-0.421* (0.167)	0.846* (0.046)	-0.362* (0.030)	0.022 (0.023)	-	-	-0.033* (0.007)
Hungary	1.000	0.355 * (0.065)	0.372** (0.196)	-0.295* (0.175)	0.056* (0.030)		0.002* (0.000)	-0.053* (0.008)
Korea	1.000	0.054 (0.207)	0.248* (0.057)	-0.189** (0.091)	0.067** (0.031)	-	-	-0.020* (0.009)
Philippines	1.000	-0.591** (0.291)	0.472** (0.205)	- 0.540** (0.264)	0.233* (0.078)	6.65* (2.170)	-	-0.009* (0.001)
Poland	1.000	0.125 (0.126)	0.537* (0.146)	-0.258** (0.139)	0.031 (0.038)	2.678* (0.993)	-	-0.041* (0.004)
South Africa	1.000	- 0.179** (0.087)	0.820* (0.060)	- 0.117** (0.044)	0.020 (0.020)	2.128* (0.596)	-	-0.053* (0.009)
Non-Inflation Targeters								
Bulgaria	1.000	0.459* (0.113)	1.483* (0.170)	-0.621* (0.172)	0.315* (0.073)	-	-	-0.037* (0.005)
Costa Rica	1.000	-	0.143** (0.053)	-0.575* (0.264)	1.927* (0.437)	-	0.021* (0.010)	-0.002* (0.000)
Malaysia	1.000	-0.237 (0.228)	0.635* (0.241)	-0.799* (0.302)	0.452* (0.101)	-	-	-0.013* (0.001)
Pakistan	1.000	0.157* (0.042)	0.619* (0.106)	-0.819* (0.150)	0.168* (0.002)	-	0.004* (0.000)	-0.044* (0.010)
Uruguay	1.000	-	0.733* (0.032)	-0.770* (0.036)	0.034 (0.022)	-	-	-0.037* (0.005)

Note: * and ** denote significance level at 1% and 5% respectively. Standard errors are in parentheses.
C, T and ECT respectively refer to intercept, trend and error-correction terms.

The long-run parameters for each unrestricted CVAR model in Table 2 include those present in the first (most statistically significant) cointegrating vector. The signs of the parameters appear in most cases to accord with priors. Producer prices and Oil prices have positive coefficients, while the coefficient of the exchange rate has a negative sign (depreciation of the domestic currency) in all countries. Thus, the signs of parameters indicate that the increase of producer prices and oil prices are associated with an increase in consumer prices, while a depreciation of the domestic currency is associated with a rise in consumer prices. Therefore, the coefficient of the exchange rate could be interpreted as the long-run pass-through coefficient.

Concerning the degree of ERPT, there are differences in the responsiveness of domestic prices cross-country. Korea and South Africa have the lowest long-run response of domestic prices in our sample of emerging economies, with pass through not exceeding 0.200. However, the degree of ERPT appears to be most prevalent in Malaysia, Pakistan, and Uruguay. For Pakistan, a 1% fall in the NEER (i.e. a depreciation) increases domestic consumer prices by 0.819, while for Malaysia, domestic prices rise by 0.799 following one percent depreciation of exchange rate and Uruguay yields a pass-through to domestic prices of 0.770.

From the pass-through coefficients presented in table 4, the average ERPT is 0.761 across the non-ITers (Bulgaria, Costa Rica, Malaysia, Pakistan, and Uruguay).While, across ITers (Brazil, Hungary, Korea, Philippines, Poland and South Africa), the average yields a pass-through to domestic prices of 0.293.These results show that the transmission of the variation in the exchange rates is lower in ITers. Lower pass-through estimated appears to be evident where inflation has become more subdued over time. The inflation targeting policy adopted by several emerging countries may have had a strong role to play in contributing to low ERPT. Thus, the level of ERPT tended to decline in the countries where monetary policy moved strongly towards stabilizing inflation (especially under IT regime). The results found go in line with Campa and Goldberg (2005), Bailliu and Fujii (2004), Gagnon and Ihrig (2004), Choudhri and Hakura (2006) and Bouakez and Rebei (2007).

The coefficients of error correction terms (ECT) are negative and significant. This confirms that the dynamic system converges to a long run equilibrium.

The final step in our cointegration analysis consists of investigating the tests of restrictions on the long-run parameters to examine full ERPT (H1 and H2) and zero ERPT (H3 and H4).

Table 3: Restrictions on long-run parameters to examine full and zero pass-through of exchange rate on domestic prices ((λ^2)

	Full Pass-Trought		Zero Pass-Throught	
	H1	**H2**	**H3**	**H4**
Inflation Targeters				
Brazil	59.61(0.00)	60.16(0.00)	57.12(0.00)	55.87(0.00)
Hungary	17.37(0.00)	7.47 (0.00)	12.72(0.00)	6.44(0.01)
Korea	27.21(0.00)	31.78(0.00)	14.54 (0.00)	8.91(0.00)
Philippines	17.65(0.00)	9.46(0.00)	20.52(0.00)	21.60(0.00)
Poland	42.24(0.00)	10.55(0.00)	20.72(0.00)	52.35(0.00)
South Africa	8.08(0.04)	7.18(0.00)	31.01(0.00)	4.59(0.03)
Non Inflation Targeters				
Bulgaria	26.86(0.04)	1.03(0.30)	27.64(0.00)	9.24(0.00)
Costa Rica	51.45(0.00)	61.17(0.00)	10.70 (0.01)	10.61(0.01)
Malaysia	5.71(0.01)	0.007(0.93)	26.64(0.00)	14.00(0.00)
Pakistan	44.16(0.00)	0.007(0.93)	44.81(0.00)	11.88(0.00)
Uruguay	86.75(0.00)	0.66(0.41)	79.25(0.00)	15.47(0.00)

Notes: Restrictions based on Likelihood Ratio tests with a chi-squared distribution, with the number of degrees of freedom equal to the number of restrictions imposed; p-values in parentheses.

Table 3 reports that H3 and H4 are rejected for all countries, indicating that EPRT is not zero for our sample. Besides, H1 is rejected for all countries, implying that full ERPT is rejected when other variables in the system (oil prices, producer prices, industrial production) are constrained to have no effect on consumer prices. Concerning H2, the hypothesis of full pass-through cannot be rejected at below the 5% level for the majority of non-ITers (Bulgaria, Malaysia, Pakistan and Uruguay) when the other variables in the system are left unrestricted.

3.2 Impulse Response Functions

In order to assess the responses of domestic consumer prices to shocks imposed on exchange rate, we use the traditional orthogonalized impulse response functions analysis (a standard Cholesky decomposition).

Following the studies of McCarthy (2007) and Ca'Zorzi et al. (2007), the variables are classified from the most exogenous to that which is less exogenous. Thus, the first variable in the scheme is Oil prices as the most exogenous, while domestic consumer prices are ordered as the last variable in the scheme, the variables are classified as follows:

OIL →NEER →IPI →PPI →CPI

Table 4 only reports the result of the estimates for the accumulated response of CPI to an orthogonalised 1% shock imposed on the exchange rate at 6, 12, and 48 month time horizons. Also, report the degree of exchange rate pass-through estimates from the cointegration analysis.

Table 4: Summary of ERPT Estimates

Country	Accumulated response of CPI to 1% NEER Shock				Cointegration
	6 months	12months	24months	48 months	
Inflation Targeters					
Brazil	0.084	0.203	0.332	0.342	0.362
Philippines	0.004	0.016	0.055	0.167	0.540
Poland	0.005	0.021	0.071	0.132	0.117
South Africa	0.015	0.041	0.104	0.244	0.258
Hungary	0.010	0.036	0.109	0.293	0.295
Korea	0.019	0.043	0.097	0.189	0.189
Non Inflation Targeters					
Bulgaria	0.020	0.055	0.144	0.337	0.621
Costa Rica	0.013	0.041	0.109	0.266	0.575
Malaysia	0.003	0.009	0.036	0.336	0.799
Pakistan	0.017	0.050	0.121	0.264	0.819
Uruguay	0.003	0.025	0.121	0.418	0.770

The results show that the response of CPI due to an orgonalised 1% shock imposed on the exchange rate is low during the first 6 months, it comes to be remarkable at 24 months then it continuous increase at the 48 months. In addition, our results suggest that the impulse response estimates at 48 months are extremely close to the cointegration estimates in the majority of IT countries (Brazil, Hungry, Korea, South Africa). However, the pass-through is higher in cointegration analysis of long-term then in impulse response function in most non-ITers countries. The adjustment process is not fully completed during the considered time horizon in the impulse response analysis.

4 Conclusion

This paper investigates the degree of exchange rate pass-through to consumer prices by focusing on the role of inflation environment in 11 emerging markets (6 inflation targeters, 5 non inflation targeters). We use a cointegrated VAR approach and impulse responses derived from the VECM. These methodologies allow us to take account of the non-stationarity of several variables. In addition, it enables the management of the important information contained in 'levels' variables and capture the responsiveness of inflation to exchange rate movements in a long-run equilibrium. The cointegration analyses indicate that the degree of ERPT is lower in ITers compared to those non-ITers. In addition, the hypothesis of full pass-through cannot be rejected at below the 5% level for the majority of non-ITers (Bulgaria, Malaysia, Pakistan and Uruguay) when the other variables in the system are left unrestricted. Besides, the results of the impulse response analysis suggest that the degree of exchange rate pass-through in cointegration analysis is higher than in the impulse response analysis in most non-ITers countries. The adjustment process is not fully completed during the considered time horizon in the impulse response analysis. However, the impulse response estimates at 48 months are extremely close to the cointegration estimates in the majority of IT countries.

The results may indicate a stronger link between exchange rate and domestic prices in non-ITers given they have a higher ERPT to domestic prices. For ITers, inflation targeting policy may have had a strong role to play in contributing to low ERPT. This finding confirms the literature review on the importance of the inflation environment and the monetary policy credibility in determining ERPT. A credible monetary policy focusing explicitly on anchoring inflationary expectations will tend to reduce the exchange rate pass-through (Eichengreen, 2002; and Schmidt Hebbel and Werner, 2002).

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Appendix 1

Augmented Dickey-Fuller Unit Root Test

	NEER	*DNEER*	*PPI*	*DPPI*	*CPI*	*DCPI*	*IPI*	*DIPI*	*OIL*	*DOIL*
Brazil	-1.52	-5.46*	-0.45	*-3.17***	-2.12	-5.77*	-1.55	-17.55*	-3.37	-12.9*
Bulgaria	-1.46	-10.335*	-1.05	*-10.01**	-2.90	-10.77*	-1.78	-11.82*	-3.37	-12.9*
Costa Rica	-1.84	-9.05*	-1.09	*-6.00**	-0.436	-10.47*	-	-	-3.37	-12.9*
Hungary	-2.79	-11.75*	-2.33	-8.15*	-2.75	-4.52*	-1.63	-3.07**	-3.37	-12.9*
Korea	-2.25	-10.76*	-1.18	*-8.46**	-2.73	-10.77*	-1.02	-5.13*	-3.37	-12.9*
Malaysia	-1.72	-13.52*	-0.79	*-11.52**	-1.29	-11.77*	-2.29	-3.64*	-3.37	-12.9*
Pakistan	-0.51	-11.37*	0.18	*-10.15**	-0.63	-5.89*	-0.77	-6.09*	-3.37	-12.9*
Philippines	-1.58	-10.79*	-2.26	*-15.24**	-2.81	-12.53*	-2.34	-5.33*	-3.37	-12.9*
Poland	-1.47	-11.79*	-1.078	-12.19*	-2.55	-3.32**	-1.42	-3.42**	-3.37	-12.9*
South Africa	-1.44	-12.41*	-1.86	-9.17*	-1.77	-11.52*	-0.76	-9.13*	-3.37	-12.9*
Uruguay	-1.259	-10.37*	-2.66	-9.90*	-1.66	-4.85*	-	-	-.337	-12.9*

Note: ** and *respectively refer to significance at the 1% and 5%.

Philip-Perron Unit Root Test

	NEER	*DNEER*	*PPI*	*DPPI*	*CPI*	*DCPI*	*IPI*	*DIPI*	*OIL*	*DOIL*
Brazil	-1.60	-4.96*	-0.23	*-3.54**	-2.57	-5.71*	-1.48	-17.55*	-2.55	-12.9*
Bulgaria	-1.53	-10.22*	-1.06	*-9.99**	-2.73	-10.77*	-2.39	-19.95*	-2.55	-12.9*
Costa Rica	-1.74	-9.10*	-0.56	*-9.95**	-0.107	-10.36*	-	-	-2.55	-12.9*
Hungry	-2.88	-11.67*	-2.16	*-13.86**	-3.002	-9.47*	-2.16	-38.72*	-2.55	-12.9*
Korea	-2.29	-9.35*	-1.10	*-8.32**	-2.55	-10.78*	-1.55	-25.52*	-2.55	-12.9*
Malaysia	-1.85	-13.56	-0.74	*-11.59**	-2.07	-11.77*	-2.34	-29.76*	-2.55	-12.9*
Pakistan	-2.90	-12.05*	-1.07	*-10.03**	-0.507	-12.94*	-2.27	-16.95*	-2.55	-12.9*
Philippines	-1.51	-10.7*	-2.04	*-15.52**	-2.79	-12.62*	-2.01	-26.25*	-2.55	-12.9*
Poland	-1.63	-11.65*	3.55	*-6.81**	3.64	-6.03*	-1.49	-37.84*	-2.55	-12.9*
South Africa	-1.35	-12.41*	-1.81	*-24.9**	-1.67	-11.77*	-0.82	-11.43*	-2.55	-12.9*
Uruguay	-1.14	-10.30*	-2.80	-9.90*	-3.37	-4.80*	-	-	-2.55	-12.9*

Note: * refer to significance at the 1%.

Appendix 2

Misspecification Tests

Country	variable	Normality Test	ARCH Test	Aucorrelation Test	Heteroskedsticity Test
Brazil	IPI	3,06(0,21)	1.04(0.30)	0,73(0,71)	1,41(0,23)
	CPI	4.60(0.10)	0,80 (0,65)	0,22 (0,63)	0,98 (0,46)
	PPI	1,89(0,38)	1.51(0.14)	1,00(0,44)	1.58(0.20)
	NEER	3,82(0,14)	0,90(0,54)	0,99(0,48)	0,01(0,89)
	OIL	4,60(0,10)	0,82(0,62)	0,56(0,86)	0,63(0,42)
	System	0,96(0,61)	0,38(0,96)	0,63(0,81)	0,11(0,73)
Bulgaria	IPI	2,31(0,31)	0,91(0,52)	0,73(0,26)	0,10(0,75)
	CPI	0,56 (0,75)	1,07(0,38)	1.05(0.38)	1,35 (0,18)
	PPI	1,07(0,58)	0,95(0,49)	0,14(0,81)	1,19(0,27)
	NEER	0,97(0,61)	1,09(0,29)	0,30(0,87)	0,19(0,66)
	OIL	6,79(0,03)**	0,36(0,97)	2,57(0,32)	1,63(0,20)
	System	2,54(0,28)	1,09(0,36)	0,54(0,57)	1,15(0,28)
Costa Rica	CPI	1,03 (0,59)	0,30 (0,98)	0,21 (0,64)	0,78 (0,66)
	PPI	0,38(0,82)	0,115(0,73)	1,61(0,20)	0,56(0,45)
	NEER	0,58(0,74)	0,86(0,35)	1.99(0.13)	0,07(0,78)
	OIL	0,58(0,74)	0,94(0,33)	0,36(0,69)	0,04(0,82)
	System	1,04(0,59)	0.68(0.66)	3.12(0.07)	1,45(0,22)
Korea	IPI	0,98(0,61)	0,18(0,66)	0,87(0,42)	3,04(0,08)
	CPI	1,49 (0,47)	0,52 (0,89)	0,25 (0,61)	1,49(0,22)
	PPI	1,95(0,37)	1,20(0,27)	0,02(0,97)	0,95(0,32)
	NEER	0,08(0,95)	2,09(0,14)	0,78(0,45)	0,002(0,96)
	OIL	0,10(0,95)	0,15(0,69)	0,37(0,68)	0,02(0,88)
Hungry	IPI	1,175(0,55)	1,36(0,18)	0,73(0,66)	1,90(0,16)
	CPI	1,01 (0,60)	1,18 (0,29)	0,58 (0,44)	0,74 (0,70)
	PPI	1,98(0,37)	0,53(0,89)	1,26(0,23)	2,18(0,14)
	NEER	0,36(0,83)	1,67(0,07)	1,10(0,36)	1,16(0,28)
	OIL	0,36(0,83)	0,31(0,96)	0,65(0,79)	0,38(0,53)
	System	0,28(0,86)	1,39(0,16)	0,16(0,84)	0.71(0.48)
Malaysia	IPI	0,55(0,75)	1.22(0.26)	0,43(0,64)	2,09(0,14)
	CPI	3.31(0.21)	1.90(0.11)	0.81(0.44)	0.74(0.47)
	PPI	2,07(0,35)	0,23(0,63)	2,59(0,07)	2,98(0,08)
	NEER	1,98(0,37)	0,90(0,54)	1,02(0,35)	3,35(0,06)
	OIL	3,57(0,15)	0,67(0,77)	0.15(0.85)	0,57(0,95)
	system	1,08(0,28)	0,69(0,93)	0,37(0,68)	0,46(0,49)
Pakistan	IPI	4.60(0.10)	1.23(0.26)	1.84(0.16)	0.63(0.42)
	CPI	2,69 (0,26)	0,97(0,47)	0.53(0.58)	0,62 (0,81)
	PPI	2.03(0.36)	1.21(0.27)	1.60(0.20)	0.07(0.77)
	NEER	1.75(0.41)	0.07(0.78)	0.57(0.56)	2.31(0.12)
	OIL	0.89(0.63)	0.02(0.87)	0.90(0.40)	0.45(0.49)
	system	0.38(0.82)	0.23(0.62)	0.10(0.90)	1.88(0.17)
Philippines	IPI	0.53(0.58)	2,69 (0,26)	0,97(0,47)	0,62 (0,81)
	CPI	1,09 (0,57)	0,83 (0,61)	0.38(0.86)	1,08 (0,37)
	PPI	4,12(0,12)	1,68(0,19)	0,10(0,90)	0,23(0,63)
	NEER	0,83(0,65)	0,69(0,40)	0,54(0,57)	0,85(0,35)
	OIL	5,23(0,07)	1,18(0,27)	1,72(0,56)	0.19(0.65)
	System	2,16(0,33)	1,45(0,22)	0,35(0,70)	0,92(0,82)

Poland	**IPI**	1,67(0,43)	0,53(0,89)	0,64(0,80)	0.92(0.44)
	CPI	0,11 (0,94)	1,71 (0,06)	0,78(0,37)	0,71 (0,73)
	PPI	0,19(0,90)	0,65(0,79)	0,39(0,67)	0,72(0,93)
	NEER	0,94(0,62)	0,82(0,62)	0,68(0,76)	0,17(0,67)
	OIL	0,03(0,98)	0,16(0,91)	0,01(0,91)	3,52(0,06)
	system	0,59(0,74)	1,14(0,32)	0,65(0,57)	0.55(0.45)
South Africa	**IPI**	0,69(0,70)	1,50(0,22)	0,33(0,71)	0,98(0,32)
	CPI	1,12 (0,56)	0,73 (0,72)	0.80(0.45)	0,68 (0,76)
	PPI	1,75(0,41)	0.58(0.70)	0,37(0,66)	2,31(0,12)
	NEER	0,89(0,63)	0,25(0,61)	1,57(0,20)	0,45(0,49)
	OIL	3,06(0,21)	0,52(0,89)	1,98(0,13)	1,49(0,22)
	system	1,16(0,55)	0,56(0,86)	1,60(0,20)	0.88(0.36)
Uruguay	**CPI**	3.38(0.18)	0.53(0.58)	0.61(0.54)	0.22(0.79)
	PPI	1,49(0,47)	1,16(0,31)	0,33(0,56)	1,10(0,29)
	NEER	4,53(0,10)	1,13(0,32)	2,32(0,12)	2,10(0,14)
	OIL	1,52(0,46)	0,68(0,76)	1,20(0,94)	0,03(0,84)
	System	0,54(0,76)	1,45(0,14)	0,55(0,45)	0,03(0,85)

Note: **represents statistical significance at the 5% level.

Appendix 3

Johansen Trace Test

	Hypotheses	*Trace Statistic*
Brazil	None	107.59 (0.00)
	At most 1	62.68 (0.00)
	At most2	28.08(0.07)
Bulgaria	None	100.82(0.00)
	At most 1	36.09 (0.12)
Costa Rica	None	77.70(0.02)
	At most 1	36.61(0.18)
Korea	None	84.114(0.00)
	At most 1	54.587(0.01)
	At most2	29.347(0.056)
Hungary	None	160.82 (0.00)
	At most 1	102.57 (0.00)
	At most2	55.848 (0.00)
	At most 3	21.973(0.14)
Malaysia	None	81.58(0.03)
	At most 1	49.90(0.13)
Pakistan	None	139.29(0.00)
	At most 1	90.48(0.00)
	At most2	43.57(0.04)
	At most 3	20.03(0.224)
Philippines	None	107.78(0.00)
	At most 1	58.778(0.01)
	At most2	27.865(0.24)
Poland	None	211.98(0.00)
	At most 1	97.55(0.00)
	At most2	53.12(0.00)
	At most 3	25.74(0.00)
	At most 4	3.376(0.51)
South Africa	None	91.4204(0.00)
	At most 1	47.692(0.16)
Uruguay	None	124.10 (0.00)
	At most 1	26.11 (0.12)

Note: MacKinnon-Haug-Michelis (1999) p-values are in parentheses.