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Impact of Exchange Rate Shock on Prices of Imports and Exports

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Abstract:

This study examines the significant impact of exchange rate shock on prices of Malaysian imports and exports. In methodology, the study adopts vector error correction (VECM) model using monthly data of nominal exchange rates, money supply, prices of imports and prices of exports covering the period of M1:1999 to M12:2006. For further analysis, we adopt an innovation accounting by simulating variance decompositions (VDC) and impulse response functions (IRF). VDC and IRF serve as tools for evaluating the dynamic interactions and strength of causal relations among variables in the system. In fact, IRF is used to calculate the exchange rate pass-through on import prices and export prices. The findings indicate that, while the exchange rate shock is significantly affect the fluctuation of import prices, the degree of pass-through is incomplete.

Keywords: Import prices, Export prices, VECM, Impulse Response.

JEL Classification: C51, F10, F30

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1. Introduction:

In recent years, it is found that inflation in a number of industrial and developing countries has remained surprisingly stable in the face of wide swings in exchange rates. Malaysia is not an exceptional. Prior to the mid 1990s, the monetary strategy in Malaysia was based on targeting money aggregates. Up until 1987, M1 was the main policy target and later, greater importance placed on M3 during financial liberalization. Due to fundamental changes to the financial system in the early 1990s, the Central Bank shifted from monetary targeting to interest rate targeting. The shift was precipitated by the financial deregulation and liberalization as well as structural changes in the economy to a more interest-sensitive market. Monetary policy in the country remains supportive of economic activity with inflation moderating to 3 per cent in 2006. Even though the country faced the episode of financial crisis in 1997-1998, it did not push up inflation in the country as well as in other countries in Asia. Since then, inflation has moved at similar pace in four ASEAN countries despite differing exchange rate movements. In most countries, import prices have moved at a considerably slow pace.

This development has drawn attention to the issue of exchange rate pass-through to domestic prices or the impact of exchange rate movement on import/export prices of the country. Is there any evidence of the impact of exchange rate on domestic prices? Is this impact or exchange rate pass-through is declining? These are the focal questions in the current study. A decline in exchange rate pass-through can have important macroeconomic implications. Exchange rate pass-through on import prices, for example, affects expenditure switching in the domestic market by changing the relative prices of imported and domestically produced goods. This raises the question of whether a decline in the exchange rate pass-through has weakened a channel through which current account imbalances can be adjusted.

Exchange rate pass-through (ERPT) refers to the extent to which exchange rate changes alter relative prices. It is used to refer to the effect of exchange rate changes on one of the following: (1) import and export prices, (2) consumer prices, and (3) trade volumes. In this study, we focus on the effects of exchange rates changes on import and export prices.

The textbook definition of exchange rate pass-through is "the percentage change in local currency import/export prices resulting from a one percent change in the exchange rate". Simply, ERPT is given by:

$$\alpha_t = \frac{\Delta P_t / P_t}{\Delta(EP^*)/EP^*} \tag{1}$$

where α_t refers to the estimated coefficient of pass-through for country *i*, P_t is the domestic price level (export prices or import prices or consumer prices) for country *i* at time *t,* Δ denotes changes, *E* denotes nominal exchange rate of country *i* in ringgit per US dollar and P^* denotes foreign prices (Anaya, 2000). Theoretically, complete pass-through occurs when $\alpha_t = 1$ and incomplete pass-through occurs when $0 < \alpha_t < 1$. One standard way to estimate ERPT is by obtaining the coefficient from regressing changes in prices indices on movements in nominal exchange rates.

The interest in pass-through began in the 1960s and early 1970s when open economy monetary models assumed absolute (or relative) Purchasing Power Parity (PPP) to explain the behaviour of exchange rates. Since then, theoretical studies and empirical work in this field have gone through few stages (See Yang (2003), Dornbusch (1988), Krugman (1987), Knetter (1993), Yang (1997)). Recent theoretical developments in open-economy macroeconomics enable a deeper analysis of pass-through issue. Obstfeld and Rogoff (1995), for example, provide a detailed micro-founded framework that enables an assessment of welfare criterion in the form of utility of the representative household. Their study has been extended in subsequent empirical works, particularly by Tille (2000) and Betts and Devereux (2000). Several studies have investigated the degree of pass-through and whether exchange rate pass-through is stable across. This includes studies by Taylor (2000), McCarthy (2000), Campa and Goldberg (2002) and others. Unfortunately, these studies are largely focused on the OECD countries. Interests on this issue on emerging economies only started after the 1997 Asian financial crisis. The crisis necessitates a re-look into the extent of exchange rate pass-through to domestic prices in the East Asia region because it is a key factor in the transmission of shocks (Parsons and Sato, 2005).

Thus, this study attempts to examine the significant impact of exchange rate shock on prices of Malaysian imports and exports or simply ERPT. In methodology, within VAR framework, the study adopts vector error correction (VECM) model to analyze the impact of nominal exchange rate shock on import/export prices in short run and long run. For further analysis, we adopt an innovation accounting by simulating variance decompositions (VDC) and impulse response functions (IRF). The degree of ERPT is then calculated using impulse response functions.

The rest of the paper is organized as follows: the next section presents the empirical methods and preliminary analysis of the data. Section 3 highlights the empirical findings including the data preliminaries and the results based on the unrestricted VAR and VECM tests. Further inferences are then made based on the VDC and IRF analysis. Finally, Section 4 concludes and draws several policy recommendations from the major findings of the paper.

2. Data and Methdology:

Data of nominal exchange rates, money supply M3, import prices and export prices are monthly, ranging from M1:1999 to M12:2006 and sourced from Bank Negara Malaysia's *Quarterly Bulletin* and International Monetary Fund's *IMF Financial Statistics* of various issues. The raw data obtained for most variables are in indices (import prices, export prices and nominal exchange rates) except money supply M3, which is in RM million. All variables are transformed into logarithm, denoted with ln and Δ denotes the first difference operator.

To evaluate the integration properties of the variables, we employ standard augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests (Dickey and Fuller, 1981; Phillips and Perron, 1988). A variable is said to be integrated of order d, written *I*(d) if it requires differencing d times to achieve stationarity. For cointegration, we employ the VAR based tests of Johansen (1988) and Johansen and Juselius (1990).

2.1. The Model:

To test the impact of changes in exchange rate on prices of exports and imports, the vector autoregressive (VAR) model is adopted. In this analysis, there is a set of p=4 endogenous variables, $z = [lnneer, lnm3, lnpx, lnpm]$ where *lnneer,lnm3, lnpx* and *lnpm* refer to log nominal exchange rates, money supply, export prices and import prices, respectively. Following Johansen (1988,1991) and Johansen and Juselius (1990,1992), we consider a *p*-dimensional vector time series *zt* and model it as an Unrestricted Vector Autoregression (VAR) involving up to *k*-lags of *zt*.

$$z_t = A_1 z_{t-1} + ... + A_k z_{t-k} + \mu + \varepsilon_t,\ \varepsilon_t \sim niid(0, \Sigma) \quad (2)$$

where z_t is a *(px1)* matrix and each of the A_i is a *(pxp)* matrix of parameters. The Johansen approach is used with the consideration that it enables hypotheses tests concerning the matrix and the number of equilibrium relationships to be carried out.

Prior to cointegration test, the maximum lag length, *k*, is chosen for the Unrestricted Vector Autoregression Model (VAR). Choosing the appropriate lag length is important since a *k* too small will invalidate the tests, whereas a *k* too large may result in a loss of power (Kanioura, 2001). The appropriate lag is chosen by checking the residuals of VAR model with one lag after another and the selection of lag is based on the one that has the absence of serial correlation in the residuals. Being aware of the lag order, then we construct the long-run equations (Unrestricted VAR model) for the series. The analysis is carried out further by doing the Johansen cointegration test with *k-1* lag. The determination of the number of cointegrating vectors is based on the *maximal eigenvalue* and the *trace* tests.

The vector error correction model (VECM) restricts the long-run behaviour of the endogenous variables to converge to their cointegrating relationships while allowing for short-run adjustment dynamics. In this case, the cointegration terms are the correction terms since a series of partial short-run adjustments correct gradually the deviation from long-run equilibrium. The VECM corresponds to a restricted VAR of order *k-1* for the first differenced series, with the inclusion of error-correction terms for the cointegrating vectors.

We write a *p*-dimensional vector error correction model (VECM) as follows:

$$\Delta y_t = \sum_{i}^{k-1} \Gamma_i \Delta y_{t-i} + \Pi y_{t-1} + \mu + \varepsilon_t, \quad t = 1, \ldots T \tag{3}$$

where y_t is the set of *I*(1) variables discuss above; $\varepsilon_t \sim niid(0,\Sigma)$; μ is a drift parameter, and Π is a (*p* x *p*) matrix of the form $\Pi = \alpha\beta'$ where α and β are both (*p* x *r*) matrices of full rank, with β containing the r cointegrating vectors and α carrying the corresponding loadings in each of the *r* vectors. The adjustment coefficients in matrix α refer to the coefficients of the Error Correction (ECM) terms.

Additionally, we adopt an innovation accounting by simulating variance decompositions (VDC) and impulse response functions (IRF) for further inferences. VDC and IRF serve as tools for evaluating the dynamic interactions and strength of causal relations among variables in the system. The VDC indicate the percentages of a variable's forecast error variance attributable to its own innovations and innovations in other variables. Thus, from the VDC, we can measure the relative importance of fluctuation of one country FPI inflow in accounting for fluctuation in FPI inflows from other countries. Moreover, the IRF trace the directional responses of a variable to a one standard deviation shock of another variable. This means that we can observe the direction, magnitude and persistence of FPI inflow of one country to variation in FPI inflows from other countries. In fact, IRF could be used to calculate the exchange rate pass-through on import prices and export prices.

Within a vector autoregression (VAR) framework, ERPT is defined as the response of import/export prices to an impulse in nominal exchange rate. The degree of pass-through is calculated either by the immediate impact of changes in the exchange rate on import/export prices (short-run pass-through) or by the cumulative effect of such changes (long-run pass-through, calculated as the estimated short-run coefficient divided by one minus the estimated inflation lags). To be more specific, pass-through coefficient is calculated using cumulative impulse responses as follows:

$$ERPT = \frac{\sum_{t=1}^{t+j} \Delta imp_t}{\sum_{t=1}^{t+j} \Delta neer_t} \tag{4}$$

(2)

3. Empirical Findings:

As a preliminary step, we first subject each variable to Augmented Dickey Fuller (ADF) and Phillip-Perron (P-P) unit root tests. The results of the tests are displayed on Table 1. The results generally suggest that most variables, in particular, nominal exchange rates, money supply and export prices, are integrated of order one as the null hypothesis that the series are not stationary is accepted at level but rejected at first difference. In other words, the variables are stationary at first difference or I(1). Only series of import prices is stationary at level or I(0). Since *lnneer, lnm3r* and *lnpx* are non-stationary or random walk stochastic processes and they are integrated of the same order, the linear combination of these variables might be stationary or we could say that they are cointegrated. Since they are cointegrated, there is a long-term equilibrium relationship between the variables.

Table 1. Unit Root Tests

Variable	ADF test statistic (with trend and intercept)		P-P test statistic (with trend and intercept)	
	Level	***First Difference***	***Level***	***First Difference***
Lnpm	-5.61***	-14.38***	-5.77***	-14.61***
Lnpx	-2.73	-10.55***	-2.69	-10.55***
Lnneer	-1.68	-7.08***	-1.82	-7.06***
lnm3	-0.74	-10.06***	-0.69	-10.06***

Source: Author

Note: *** , ** and * denote significance at 1%, 5% and 10% level, respectively

In order to test for cointegration, the VAR model is developed which consists of 4 endogenous variables : *z = [lnneer, lnm3, lnpx, lnpm]*. The maximum lag length, *k*, of 2 is chosen. Based on *Maximum Eigenvalue* and *Trace* tests of cointegration, there is one cointegrating vector existed among the variables. Table 2 provides detail results of these cointegration tests.

Table 2. Johansen Cointegration Tests Results

Null Hypothesis about Rank (r)	*Max-Eigen* Statistic	5% Critical Value	*Trace* Statistic	5% Critical Value
r=0	28.32	27.58	49.86	47.86
r≤1	11.33	21.13	29.79	29.79
r≤2	8.61	14.26	15.49	15.49

Source: Author

Normalising *lnpx*, following is the suggested vector or error correction term (*ect*) or long-run relationship among the variables (the number in parentheses are t-ratios):

ect = *lnpx* – 0.308565*lnm3* + 2.330129*lnpm* + 0.904140*lnneer* – 15.49346

We then proceed with an estimated error correction model to illustrate how the cointegration results might be utilised. The vector error correction model (VECM) restricts the long-run behaviour of the endogenous variables to converge to their cointegrating relationships while allowing for short-run adjustment dynamics. Table 3 displays short-run equations. All coefficients of short-run equation are coefficients relating to the short run dynamics of the model's convergence to equilibrium and coefficients of lag *ect* represent the speed of adjustment. The negative sign of the ECM terms is the correct sign of the error correction and its significance shows the evidence of causality in at least one direction. However, from both equations, there is no evidence of significant role of exchange rates in changes of import and export prices in short-run.

To test the robustness of the error correction model, we apply a number of diagnostic tests. We find no evidence of normality failure, serial correlation, heteroskedasticity and ARCH (Autoregressive Conditional Heteroskedasticity) effect in the disturbances for equation 1 and equation 2 only suffers problem of normality failure in its residuals.

Table 3. The Vector Error Correction Model

Equation / Ind. Variable	Dependent Variable	
	(1) $\Delta lnpx$	(2) $\Delta lnpm$
Constant	-0.00014	-0.0054
$\Delta lnpm_{t-1}$	-0.026	-0.311***
$\Delta lnpm_{t-2}$	0.07	-0.120
$\Delta lnpx_{t-1}$	0.009	0.271***
$\Delta lnpx_{t-2}$	0.055	0.158
$\Delta lnm3_{t-1}$	0.401	0.089
$\Delta lnm3_{t-2}$	-0.152	0.976***
$\Delta lnneer_{t-1}$	0.309	-0.009
$\Delta lnneer_{t-2}$	0.165	0.002
ect_{t-1}	-0.101**	-0.150***
Included observation	93	93
Adjusted R^2	-0.019	0.351
Diagnostic test: (F-statistics)		
JBnormal	1.820	6.019**
Far	0.606	0.999
Farch	0.005	3.744*
Fhet	0.544	1.417

Source: Author

Notes: 1. *Far* is the F-statistic of Breusch-Godfrey Serial Correlation LM Tes

Farch is the F-statistic of ARCH Test

JBnormal is the Jarque-Bera Statistic of Normality Test

Fhet is the F-statistic of White Heteroskedasticity Test

2. *** , ** and * denote significance at 1%, 5% and 10% level, respectively.

From an estimated VAR, we compute variance decompositions and impulse-response functions, which serve as tools for evaluating the dynamic interactions and strength of causal relations among variables in the system. The results of variance decomposition and impulse response functions are displayed in Table 4 and Figure 1, respectively.

From Figure 1, the IRF can produce the time path of dependent variables in the VAR, to shocks from all the explanatory variables. It could be seen that import prices react significantly to nominal exchange rate innovations as it respond negatively for the first 10 months before subsides to zero. Shock in nominal exchange rates, however, does not give significant impact on both export prices and money supply. These results imply that import prices are more sensitive than export prices to shock in nominal exchange rates. However, the significant response could only be traced in short-run but not in long-run

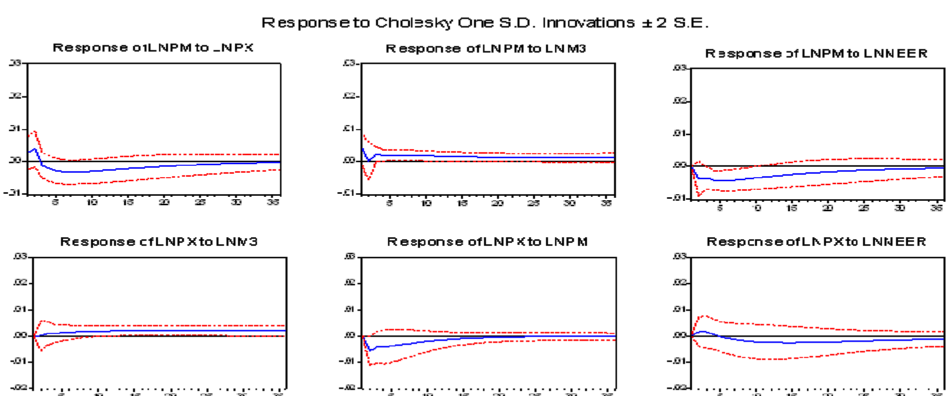

Figure 1. Impulse Response Functions

Table 4. Variance Decompositions

Variance Decomposition of LNM3:					
Period (mthly)	S.E.	LNPX	LNM3	LNPM	LNNEER
2	0.033414	1.737918	98.14749	0.071262	0.043326
4	0.039612	2.272163	97.50441	0.089685	0.133747
10	0.044150	2.218091	96.97816	0.211296	0.592450
16	0.045064	1.910669	96.65862	0.271762	1.158951
24	0.045876	1.500559	96.31797	0.299482	1.881987
30	0.046346	1.255188	96.10291	0.303958	2.337945
36	0.046720	1.063449	95.92237	0.303172	2.711008
Variance Decomposition of LNNEER:					
Period (mthly)	S.E.	LNPX	LNM3	LNPM	LNNEER
2	0.010479	0.123973	7.539062	2.388100	89.94887
4	0.014812	2.271058	7.088062	2.194361	88.44652
10	0.024201	12.17138	6.264713	1.239215	80.32469
16	0.031786	18.38429	5.777685	0.922962	74.91506
24	0.040919	22.05406	5.471260	0.853847	71.62084
30	0.047457	23.09938	5.374130	0.855566	70.67092
36	0.053898	23.52575	5.329460	0.861047	70.28374
Variance Decomposition of LNPM:					
Period (mthly)	S.E.	LNPX	LNM3	LNPM	LNNEER
2	0.026489	2.983915	2.768997	92.23292	2.014171
4	0.027940	3.521756	3.612358	87.18034	5.685547
10	0.031073	9.281462	5.191076	71.01218	14.51529
16	0.032635	12.09226	6.126015	64.41904	17.36269
24	0.033470	13.24164	7.089333	61.26701	18.40202
30	0.033748	13.41006	7.739464	60.26551	18.58496
36	0.033929	13.39046	8.376524	59.62622	18.60680
Variance Decomposition of LNPX:					
Period (mthly)	S.E.	LNPX	LNM3	LNPM	LNNEER
2	0.013452	97.02076	0.004247	2.708707	0.266289
4	0.020173	95.38451	0.143710	4.085377	0.386404
10	0.031421	92.25203	0.993776	5.812271	0.941919
16	0.036655	89.27898	2.194486	5.997258	2.529274
24	0.039400	86.27308	3.751665	5.842378	4.132876
30	0.040096	84.71167	4.819644	5.727100	4.741586
36	0.040355	83.46755	5.848001	5.635974	5.048471
Cholesky Ordering: LNPX LNM3 LNPM LNNEER					

Source: Author

As discussed earlier, the variance decomposition is an alternative method to IRF for examining the effects of shocks to the dependent variables. It determines how much of the forecast error variance for any variable in a system is explained by innovations to each explanatory variable, over a series of time horizons. Usually own series shocks explain most of the error variance, although the shock will also affect other variables in the system. From Table 4, looking along the main diagonal, the results reveal that the own shock is relatively high for money supply, nominal exchange rates and export prices. This

implies the exogeneity of these variables in variance decompositions as after the shock, the variance appears to be less explained by innovations in other explanatory variables. On the other hand, the results shows that the percentage of variance explained by own shock for import prices are relatively smaller especially. In fact, the own shock's contribution is declining in long run from 92% in second months to 60% in 36 months period which indicates that import prices are highly endogenous as compared to other variables.

The VDC substantiate the significant role played by nominal exchange rates in accounting for fluctuations in import prices. At 2 month horizon, the fraction of exchange rates forecast error variance attributable to variations in import prices is only 2%. It then increases at longer horizon and at 36-month horizon the contributions are almost 19%. Obviously, the contribution of nominal exchange rates to fluctuations in export prices is increasing but less than 10%. The results thus strengthen the findings earlier that nominal exchange rates significantly affect import prices as compared to export prices in a case of Malaysia.

The ERPT on import/export prices are calculated for 12-month (1 year) and 36-month (3 years) period using accumulated response. ERPT on import and export prices are found to be less than 1 or incomplete. Specifically, ERPT on import prices are 41% and 43% in 12 months and 36 months, respectively. ERPT on export prices are 8% and 30%, respectively.

The overall findings, thus, indicate that, while the exchange rate shock is significantly affect the fluctuation of import prices, the degree of pass-through is incomplete. This is due to the fact that Malaysia is having low inflation environment particularly in mid 1990s and early 2000. This low inflation environment itself is induced by a credible monetary policy of the country. The average inflation rate was 3.3 per cent during the early 1980s and declined to 2.01 per cent during 2000-2006. This is consistent with Ca'Zorzi et.al (2007) findings that for emerging economies with single digit inflation, ERPT is low and similar to that of the developed economies. There are also possibilities that low ERPT is subject to significant non-linear behaviour of the exchange rate which could probably be tested in future studies.

Since it is found that ERPT is low and incomplete, depreciation of the currency is not associated with an increase in import prices or decrease in export prices for the period under review in Malaysia. Therefore, domestic policies still have a significant role in controlling domestic prices. Thus, if there is an increase in inflation environment in the country, it is recommended that policy-makers to pay attention to exchange rates, as they have an effect on the inflation development. The degree of pass-through is also crucial in analyzing international transmission of shocks. With complete pass-through, monetary policy shocks produce a positive cross-country correlation of consumption, but the sign of this correlation is reversed when pass-through becomes sufficiently low (See Devereux and Engel(2002)). This suggests, to the extent that monetary policy shocks are important in explaining business cycles, the declining pass-through implies that those business cycles are becoming more synchronized. The monetary policy trade-off between inflation and output variability is eased as the degree of ERPT decreases, since the exchange rate channel then transmits monetary policy, and foreign disturbances, to a smaller extent. Hence, policy-makers in Malaysia may not need to be overly sensitive to exchange rate fluctuations resulting from regional or global financial crisis. The low degree of pass-through also implies that the use of exchange rate adjustment to improve trade balance may be less effective. The exchange rate policy may be a blunt instrument when used to restore external balance since relative price adjustments is limited. Besides, the lower ERPT, the less is the substitution between foreign goods and domestic consumption and this leads to a dampening of expenditure-switching effects.

4. Conclusion:

By employing the VECM model the study finds evidence supporting the importance of nominal exchange rate shock to fluctuation of import prices in a case of Malaysia after the crisis period. This implies that a small open economy like Malaysia is highly susceptible to external shock such as a shock in exchange rates. If the degree of volatility in import or export prices is high due to the shock, it might give greater effect on real activities of the economy that are exogenous to monetary policy. The extent to which exchange rate changes alter import/export prices is known as exchange rate pass-through. The study finds that the degree of ERPT on both import and export prices are lesser than 1 or incomplete. The findings reflect that ERPT is endogeneous to Malaysian inflationary environment and monetary policy credibility. Thus, the policy makers are suggested not to be very sensitive to exchange rate fluctuations. Importantly, the use of exchange rate adjustment to improve trade balance is found to be less effective with low ERPT.

References:

1. Anaya, J. A. G. (2000), Exchange Rate Pass-Through and Partial Dollarization: Is There a Link? CREDPR Working Paper, 81.
2. Bank Negara Malaysia, Monthly Statistical Bulletin, Various issues.
3. Betts, C. and M. B. Devereux (2000), " Exchange Rate Dynamics in A Model of Pricing-to-Market," J*ournal of International Economics*, 50(1), 215-244.
4. Ca'Zorzi, M., E. Hahn and M. Sanchez (2007), Exchange Rate Pass-Through in Emerging Markets, Working Paper Series, No. 739, European Central Bank.
5. Campa, J. M. and L. S. Goldberg (2002), Exchange Rate Pass-Through into Import Prices: A Macro or Micro Phenomenon, NBER Working Paper No. 8934.
6. Devereux, M. B. and C. Engel (2002), "Exchange Rate Pass-Through, Exchnage Rate Volatility and Exchange Rate Disconnect, Carnegie Rochester Conference, Carnegie Mellon University.
7. Dickey, D. A. And W. A. Fuller (1981), "The Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root," *Econometrica*, 49 (4), 251-76.
8. Dornbusch, R. (1988), Exchange Rates and Inflation, USA: MIT Press.
9. International Monetary Fund, International Financial Statistics, Various issues.
10. Johansen, S. and K. Juselius (1990), "Maximum Likelihood Estimation and Inference on Cointegration: with Applications to the Demand for Money," *Oxford Bulletin of Economics and Statistics,* 52, 169-210.
11. Johansen, S. and K. Juselius (1992), "Testing Structural Hypotheses in a Multivariate Cointegration Analysis of the PPP and the UIP for UK," *Journal of Econometrics*, 53, 211-244.
12. Johansen, S. (1988) "Statistical Analysis of Cointegration Vector". *Journal of Economics Dynamics and* Contro*l*, 12, 231-254.
13. Johansen, S. (1991) "Estimation and Hypothesis Testing of Cointegrating Vectors in Gaussian Vector Autoregressive Models," *Econometrica*, 59, (6), 1551-1580.
14. Kanioura, A. (2001), A Cointegration Analysis of US Interest Rates, Working Paper, No. 3, Department of Economics, University of Sheffield.

15. Knetter, M. M. (1993), "International Comparisons of Pricing-to-Market Behavior", *American Economic Review*, Vol. 83, 473-486.
16. Krugman, P. K. (1987), Pricing to Market When the Exchange Rate Changes, in *Real Financial Linkages Among Open Economies*, ed. by S. W. Arndt and J. David Richarson, MIT Press, Cambridge, Massachusetts.
17. McCarthy, J. (2000), Pass-Through of Exchange Rates and Import Prices to Domestic Inflation in Some Industrialized Economies, Staff Reports of Federal Reserve Bank of New York, No. 111.
18. Obstfeld, M. and K. Rogoff (1995), "Exchange Rate Dynamics Redux," *The Journal of Political Economy*, 103(3), 624-660.
19. Parsons, C. and K. Sato (2005), Exchange Rate Pass-Through in East Asia, Center for International Trade Studies (CITS) Working Paper, Faculty of Economics, Yokohama International University.
20. Phillips, P. C. B. and P. Perron (1988), "Testing for a Unit Root in Time Series Regression," *Biometrika*, **75**(2), 335-346.
21. Taylor, J. B. (2000), "Low Inflation, Pass Through and The Pricing Power of Firms," *European Economic Review*, 44(7), 1389-1408.
22. Tille, C. (2000), Beggar-Thy-Neighbor or Beggar-Thyself? The Income Effect of Exchnage Rate Fluctuations, Federal Reserve Bank of New York.
23. Yang, J. (1997), Exchange Rate Pass-Through in U.S. Manufacturing Industries, *Review of Economics and Statistics,* 79, 95-104.
24. Yang, J. (2003), Is Exchange Rate Pass-Through Symmetric? Evidence From US Imports, School of Business and Public Management, George Washington University, Washington D. C.