Dynamic Relations between Stock Prices and Exchange Rates in Sri Lanka: Some Empirical Evidence

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Abstract

This paper examines the dynamic relations between stock prices and exchange rates in Sri Lanka. We use monthly data on four foreign exchange rates and the All Share Price Index (ASPI) of the Colombo Stock Exchange for the period January 1986 to December 2004 in the empirical analysis. The time series properties of the variables are examined using recently developed unit root tests that have better size and power properties than the widely-used Dickey-Fuller type tests. The Johansen's cointegration test finds no long-run relationships between stock prices (ASPI) and any of the four exchange rates during the sample period. Therefore, we proceed to test for short-run causal relationships between stock prices and exchanges rates and found one unidirectional relationship from stock prices to the US dollar exchange rate.

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The causal relationship between exchange rates and stock prices has received considerable attention in both developed and developing countries. This interest emanated with the growth in international trade and financial liberalisation. As a result of international trade activities, firms have been exposed to foreign exchange risk. Fluctuations in exchange rates affect input prices and assets denominated in foreign currencies (Bodnar and Gentry, 1993). Therefore, share prices of firms engaged in foreign trade are affected by the changes in profits due to exchange rate fluctuations. The share prices of firms with no foreign trade may also be indirectly affected as these firms interact domestically with those firms that are engaged in foreign trade. In contrast, Bahmani-Oskooee and Sohrabian (1992) argue that changes in stock prices may affect exchange rates through firms' portfolio adjustments. Qiao (1996) also provides a similar argument that capital outflows affect exchange rates if changes in stock prices are sufficiently persistent to generate or destroy confidence of stock market investors.

There have been a number of studies examining the causal nexus between stock prices and exchange rates. These studies provided mixed results. Some of these studies are reviewed below. Abdalla and Murinde (1997) investigated the interaction between stock prices and the real effective exchange rates in India, Korea, Pakistan and the Philippines. They found unidirectional causalities form exchange rates to stock prices in all sample countries but the Philippines. Granger *et al*. (2000) studied the causal relationships between stock prices and exchange rates using Asian flu data. They reported that the data from South Korea are consistent with the traditional approach that exchange rates lead stock prices. However, the data for the Philippines were consistent with portfolio approach: stock prices lead exchange rates with negative correlation. Data form Hong Kong, Malaysia, Singapore, Thailand and Taiwan indicated strong feedback relations. The data for Indonesia and Japan did not find any causal relationship.

Ibrahim (2000) examined both bivariate and multivariate cointegration and Granger causality between stock prices and exchange rates in Malaysia. This study used three measures of exchange rate, real effective exchange rate, nominal effective exchange rate and the exchange rate between ringgit and the US dollar, in the empirical analysis. Although this study did not find any long-run or cointegrating relationship between exchange rate measures and stock prices in the bivariate models, there was cointegration between measures of exchange rate and stock prices when money supply (M2) and reserves were included in the cointegrating relationship. Findings of the multivariate model indicated that, in the short-run, a concerted stance on monetary, exchange rate and reserve policies is vital for stock market stability. Yong and Isa (2000) also studied the relationship between exchange rates and stock prices in Malaysia with the objective of finding whether currency depreciation during East Asian crisis affected the stock market prices. They reported that exchange rates tended to move in tandem with the stock prices during the currency crisis. This indicates that a depreciation of the Malaysian ringgit was accompanied by a decrease in stock prices. However, this result was not consistent with that for the period prior to the currency crisis. They point out that this may been due to the erosion of investor confidence in the Malaysian currency. They used Granger causality test as the major econometric tool in the empirical analysis. However, they have not examined the time series properties of the variables used before conducting Granger causality tests. This raises questions about the validity of their results.

In a recent study, Hong (2002) examined whether Malaysian stock prices respond asymmetrically to interest rates and exchange rates using cointegration and error-correction models. This study found for the models for the stock price and interest rates that positive deviations from equilibrium tend to have a greater effect than the negative deviations. The model for the exchange rate indicated that the exchange rate does not respond to own shocks, stock price and interest rate deviations from equilibrium. Baharumshah *et al.* (2002) applied an augmented monetary model to the ringgit/US dollar exchange rate and ringgit/yen exchange rate. They found that the augmented monetary model was cointegrated. However, this model was subject to parameter instability and the parameter time dependency could be attributed at leat partly to a particular subset of variables in the system including stock prices. They found that a restricted vector auto regression model which imposes exogeneity restrictions on I(1) variables, such as stock prices, among others, exhibits both cointegration and parameter stability. They showed that exchange rate adjusted to clear any disequilibrium in the long-run relationship. The findings of this study suggest that the equity market is significant in affecting exchange rate and in explaining at least in part the parameter instability evidenced in the cointegrating system. Therefore, they suggested that the models of equilibrium exchange rate should be extended to include equity markets in addition to bond markets.

Wu (2000) focussed on the asymmetric effect of four different exchange rates on Singapore stock prices and the effects' sensitivity to economic instability. The results of this study found that Singapore currency appreciation against the US dollar and Malaysian ringgit and depreciation against Japanese yen and Indonesian rupiah lead to a long-run increase in stock prices in most of the selected periods in the 1990s. However, during the 1997-98 crisis period and the 1999-2000 period, the effect associated with the US dollar displayed a sign reversal. This study further found that the influence of exchange rates on stock prices increased in a chronological order in the 1990s.

The dynamic relationship between stock prices and exchange rates in G-7 was examined in a study by Nieh and Lee (2001). This study did not find any long-run significant relationship between stock prices and exchange rates. They found a short-run significant relationship only for one day in certain G-7 countries. For example, currency depreciation often dragged down stock returns in the German financial market, but it stimulated the Canadian and UK markets on the following day. However, an increase in stock price often caused currency depreciation the next day in Italy and Japan. Kim (2003) studied the long-run equilibrium relationships among stock price, industrial production, real exchange rate, interest rate and inflation in the United States. This study found that the S&P 500 index is positively related to the industrial production but negatively to the real exchange rate, interest rate and inflation. Error-correction models estimated revealed that the stock price, industrial production and inflation adjust to correct disequilibrium among the five variables. Variance decomposition analysis showed that the stock price was driven to a considerable extent by innovations in interest rate.

Phylaktis and Ravazzollo (2005) focussed on the dynamic relationship between stock prices and exchange rates in the pacific countries. This study found that stock and foreign exchange markets are positively related and that the US stock market acted as a conduit for these links. Furthermore, these links were not caused by foreign exchange restrictions. The recursive estimates provided evidence that the financial crisis had a temporary impact on the long-run comovement of these markets.

Mishra (2004) investigated the relationships between stock and foreign exchange markets in India. This study found evidence for a unidirectional causality between exchange rate return and interest rate and between exchange rate return and demand for money. The variance decomposition analysis performed indicated that the exchange rate return affects demand for money, the interest rate causes exchange rate return change, exchange rate return affects the stock return, the demand for money affects stock return, interest rate affects the stock return and the demand for money affects interest rate.

The main objective of this paper is to examine the causal relationships between stock market prices and exchange rates in Sri Lanka. To author's knowledge, no previous study has undertaken such a task. The rest of this paper is organised as follows. The next section outlines the methodology and data used, the third section presents the analysis of empirical results and the fourth section concludes the paper.

Methodology and data

Ng-Perron unit root tests

Ng and Perron (2001) constructed four unit root test statistics that are calculated using generalized least squares (GLS) de-trended data for a variable. Compared to the widely-used Dickey-Fuller (DF) and Phillips-Perron (PP) unit root tests, these have better power and size properties.. The first unit root test statistic developed by Ng and Perron calculates the Elliot, Rothenberg, and Stock (ERS) point optimal statistic for GLS de-trended data as follows:

$$MP_T^d = \begin{cases} (\bar{c}_k^2 - \bar{c}T^{-1}(y_T^d)^2)/f_0 & \text{if } x_t = \{1\} \\ (\bar{c}_k^2 + (1-\bar{c})T^{-1}(y_T^d)^2)/f_0 & \text{if } x_t = \{1, t\} \end{cases} \tag{1}$$

where $k = \sum_{t=2}^{T} (y_{t-1}^d)^2 / T^2$, $\bar{c} = \begin{cases} -7 & \text{if } x_t = \{1\} \\ -13.5 & \text{if } x_t = \{1, t\} \end{cases}$, f_0 is the zero frequency spectrum term, and y_T^d is the generalized least squares (GLS) de-trended value of the variable.

The other three statistics, MZ_α^d , MZ_t^d and MSB^d , are the enhancements of the Phillips-Peron (PP) test statistics which correct for size distortions when residuals are negatively correlated. These test statistics are calculated using the following equations:

$$MZ_\alpha^d = (T^{-1}(y_T^d)^2 - f_0)/2k \tag{2}$$

$$MZ_t^d = MZ_\alpha \times MSB^d \tag{3}$$

$$MSB^d = (k / f_0)^{1/2} \tag{4}$$

All four test statistics above are based on a specification for x_t and a method for estimating f_0, the zero frequency spectrum term. The specification for x_t can take one of two forms. That is, a constant or a constant and a linear trend. The consistent estimate of the residual spectrum at frequency zero is obtained on the basis of autoregressive (AR) spectral regression (GLS-detrended).

Johansen's multivariate cointegration test

This paper adopts Johansen (1991, 1995) cointegration tests. These procedures are carried out in two steps. One condition when applying cointegration tests is that the variables entering the cointegrating equation should be integrated of the same order. If the variables are integrated of the same order, the second step is to test for cointegration among the variables of interest. Johansen's multivarite cointegration test is based on the following vector autoregression equation:

$$y_t = A_1 y_{t-1} + \ldots + A_p y_{t-p} + Bx_t + \varepsilon_t \tag{3}$$

where y_t and x_t are, respectively, a k-vector of non-stationary $I(1)$ variables and a vector of deterministic variables and ε_t is a vector of innovations.

In making inferences about the number of cointegrating relations, two statistics known as the trace statistic and the maximal eigenvalue statistic are used. The trace statistic is determined using the following formula:

$$\lambda_{trace} = -T \sum_{i=r+1}^{n} \log(1 - \hat{\lambda}_i) \qquad r = 0,\ 1,\ 2, \ldots, n-1$$

where T is the number of observations and $\hat{\lambda}_i$ is the ith eigenvalue.

The maximum eigenvalue statistic is determined using the following formula:

$$\lambda_{\max} = -T\log(1-\hat{\lambda}_{r+1}) \qquad\qquad r = 0, 1, 2, \ldots, n\text{-}2, n\text{-}1$$

To make inferences regarding the number of cointegrating relationships, the trace and maximum eigenvalue statistics are compared with the critical values tabulated in Osterwald-Lenum (1992).

Error-correction model, short and long-run causality and variance decomposition analysis

According to Engle and Granger (1987), if two variables are cointegrated, there exists an error-correction model of the following form:

$$\Delta x_t = a_1 + b_1 ect_{t-1} + \sum_{i=1}^{m} c_1 \Delta x_{t-i} + \sum_{i=1}^{n} d_1 \Delta y_{t-i} + e_{1t} \tag{4}$$

$$\Delta y_t = a_2 + b_2 ect_{t-1} + \sum_{i=1}^{m} c_2 \Delta y_{t-i} + \sum_{i=1}^{n} d_2 \Delta x_{t-i} + e_{2t} \tag{5}$$

where x_t and y_t are the variables which are cointegrated, Δ is the difference operator, m and n are the lag lengths of the variables, ect_t denotes the residuals from the cointegrating equation and e_{1t} and e_{2t} are the white-noise residuals.

The error-correction model opens up another channel of causality through the error-correction term which is ignored in standard Granger causality tests. Therefore, causality can also be tested by examining (i) the statistical significance of the error-correction term by a separate t-test, (ii) the joint significance of the lags of each explanatory variable by an F- or Wald χ^2 test; or by testing (iii) the error-correction terms and lagged term of each explanatory variable simultaneously by a joint F- or Wald χ^2 test.

Granger causality test results can be interpreted as within-sample causality tests and can be used to make inferences about causal relationships within the sample period only. Therefore, to make inferences on causal relationships beyond the sample period, variance decomposition analysis is used. In variance decomposition analysis, variance of the forecast error of a particular variable is partitioned into proportions attributable to innovations (or shocks) in each variable in the system, including its own. If a variable can be optimally forecast from its own lags, then it will have all its forecast variance accounted for by its own disturbances (Sims, 1982).

Data

Data used in this study consist of All share Price Index (ASPI) of the Colombo Stock Exchange, exchange rates for Indian rupee, Japanese yen, UK pound and US dollar expressed as the amount of Sri Lankan rupees per unit of each currency on a monthly basis from January 1986 to December 2004. Data on the ASPI were obtained from the data bases of the CSE. Data on exchange rates were obtained from the Monthly Bulletins publish by the Central Bank of Sri Lanka.

Analysis of Empirical Results

Table 1 presents the descriptive statistics for the natural log values of the ASPI and four exchange rates used in the study. A comparison of mean and medians for the variables indicates that median is less than mean for all exchange rates. However, it is the opposite for the ASPI. This indicates that the distribution of exchange rates is right skewed. In other words there have been a large number of small values and a small number of large values for exchange rates during the sample period. As far as the ASPI is concerned, its distribution is negative skewed as its mean is less than median. This indicates that there has been a large number of large values and small number of small values for the ASPI during the sample period. In other words, there have a large number of with large stock returns and a small number of months with small stock returns. A look at the coefficient of skewness also provides a similar picture.

The highest maximum values are observed for the ASPI, UK pound exchange rate and the US dollar exchange rate. These values are due to the magnitudes of the original series. For example, out the four exchange rates the UK pound exchange rate has the highest maximum as we need a higher amount of Sri Lankan rupees per one pound than the amount of Sri Lankan rupees needed to purchase one unit of other currencies. This is true for the minimum values as well. The magnitude of the original natural log values is the highest for the ASPI and therefore, it has the highest maximum, minimum and range. A perusal of the standard deviations indicates that the ASPI has the highest standard deviation and the Indian rupee/Sri Lankan rupee has the lowest standard deviation. As standard deviation is an absolute measure of variation, to compare the series we can look at the coefficient of variation which is relative measure of variation. Accordingly, the Japanese yen has the highest variation during the sample period followed by the Indian rupee.

The results of the four Ng-Perron unit root tests are shown in Table 2. The column two shows the results for MZ_a test. The first figure for levels and fist differences is the test result when a constant is included in the test equation. The second figure is the result when a constant and a time trend are included in the equation. The results for the levels of the variables show that none of the exchange rates is stationary. However, the results for the first differences indicate that all variables but Japanese yen exchange rate are stationary. Therefore, we can conclude that except for the Japanese yen exchange rate, all other variables have unit roots or follow random walks. Columns three to five of the table show the results for MZ_t, MSB and MPT tests. They show that all variables except for the Japanese yen exchange rate are random walks when both a constant and a constant and a time trend are considered as deterministic components in the test equations. The Japanese yen exchange rate has a random walk only when a constant and a time trend are considered as deterministic components. According to Hansen and Juselius (2002), it is possible to find cointegration among the variables, at least two variables out of the all variables considered in cointegration tests must be integrated of order one. As the unit root test results reported in Table 2 satisfy this condition, it is possible to proceed to the second step of the analysis, testing for cointegration among stock market prices and exchange rates.

Table 3 shows the results of Johansen cointegration test for exchange rates and stock prices. Column two of the table shows the number of lags in vector autoregression selected using likelihood ratio test. Column three of the table shows the trend assumption made in cointegration tests. As cointegration test results are sensitive to the trend assumption made, the trend assumption was selected using the Pantula Principle suggested by Johansen (1992). Most previous studies on stock price exchange rate relationship and other areas have arbitrarily chosen the trend assumption in cointegration tests. This raises the validity of the results of these studies. According to the results reported in columns five and six, both null hypotheses shown in column four are rejected. Therefore, we can conclude that there is no cointegration relationship between stock prices and exchange rates in Sri Lanka.

As we did not find any cointegrating relationship between stock prices and any of the exchange rates, we examined whether we could find any short-run causal relationships between stock prices and exchange rates. Table four shows these results. The first column of the tables shows the cause variable whereas the second column shows the effect variable. The third column of the table shows the Chi-square statistic test results to test the null hypothesis that there is no causality from the variables shown in the first column to the variables shown in the second column. According to the results, the hypothesis of no causality is not rejected for ASPI and Indian rupee, ASPI and Japanese yen, and ASPI and the UK pound. The null hypothesis of no causality is rejected only for the ASPI and USD exchange rate. Accordingly, there is unidirectional causality from the ASPI to the US dollar exchange rate. This indicates that the current US dollar exchange rate can be predicted from the past values of the ASPI.

Granger causality tests indicate only the within-sample causality. To gain insights into out-of-sample causality between stock prices and four exchange rates, we performed variance decomposition analysis. In variance decomposition analysis, variance of the forecast error of a particular variable is partitioned into proportions attributable to innovations (or shocks) in each variable in the system, including its own. Table 5 reports the percentage of forecast variance in the ASPI explained by the innovations of each currency. According to the results, most of the variance of the ASPI, particularly, at longer horizons is explained by the innovations in the Indian rupee. For example, Indian rupee explains approximately 13 per cent and 20 per cent of the variance of the ASPI at horizons thirty six and forty eight, respectively. As far as Japanese yen and the UK pound are concerned, they explain less than 4 per cent of the variance of the ASPI. For example, Japanese yen explains approximately 3 per cent of the ASPI at horizon forty eight whereas the UK pound explains 4 per cent of the variance of the ASPI at the same horizon. The US dollar exchange rate explains a very low percentage of the forecast variance of the ASPI. For example, it explains approximately 1 per cent of the variance of the ASPI at horizon forty eight.

Table 6 shows the forecast variance of each exchange rate explained by the innovations in the ASPI. According to the results, the ASPI explains a very little percentage of the Indian rupee. At horizon one, the ASPI explains approximately 0.9 per cent of forecast variance of the Indian rupee whereas it explains only 0.5 per cent of the variance of the Indian rupee at horizon forty eight. As far as the Japanese yen exchange rate is concerned, the explanatory power of the ASPI goes up with the increase in the time horizon. However, the maximum amount of variance in the Japanese yen exchange rate that the ASPI can explain is approximately seven per cent. The ASPI can explain a maximum of approximately six per cent of the forecast variance of the UK pound exchange rate. The ASPI has the highest degree of explanatory power in relation to the USD dollar exchange rate. At horizon one, the ASPI explains approximately one per cent of forecast variance of the US dollar. This amount increases to 16 per cent at horizon twelve and at horizon 48 it is approximately 31 per cent. Overall, the above results show that there is unidirectional causality from Indian rupee to the ASPI and the ASPI to the US dollar out of sample.

In addition to the variance decomposition analysis, we also performed an impulse response analysis to investigate how the stock price responds to a standard deviation shock in the equations for exchange rates and vice versa. Figure 3 shows the response of the stock price to a standard deviation shock given to the equations for exchange rates.

Conclusion

In this paper we investigated the dynamic relations between stock prices and the exchange rates of the Sri Lankan rupee against four currencies, namely the Indian rupee, Japanese yen, the UK pound and the US dollar. Unit roots of the above five variables were examined using econometric techniques which are more powerful than the widely used Dickey-Fuller type unit root tests. As we found that all variables have unit roots, we proceeded to examine whether there are any long-run relationships between stock prices and exchange rates in Sri Lanka. For this purpose, we employed Johansen's multiple cointegration test paying careful attention to the selection of lags in the cointegration tests which has been overlooked in most empirical studies in the area of the study as well as in studies in other areas. Our tests indicated that there is no long-run relationship between stock prices and exchange rates in Sri Lanka. This finding prompted us to investigate whether there are any short-run relationships between stock prices and exchange rates of Sri Lanka using Granger-causality tests. These tests found one unidirectional relationship from stock prices in Sri Lanka to the US dollar exchange rate.

As Granger-causality tests indicate only within-sample causal relationships, we used variance decomposition analysis to examine whether there are out-of-sample causal relations between stock prices and exchange rates. The results indicated that most of the variance of the ASPI, particularly, at longer horizons is explained by the Indian rupee and the other currencies explaining a very little variation of the ASPI. We also examined whether the ASPI has any role in explaining the variations in any of the four exchange rates. We found that the ASPI has the most explanatory power in relation to the US dollar exchange rate of the Sri Lankan rupee.

Table 1. Descriptive statistics for the variables

	ASPI	IR	JPY	UKP	USD
Mean	6.206	0.622	-0.819	4.468	3.986
Median	6.364	0.580	-0.726	4.402	3.923
Maximum	7.336	0.869	0.010	5.308	4.652
Minimum	4.837	0.396	-1.984	3.670	3.314
Range	2.499	0.472	1.993	1.638	1.338
Standard Deviation	0.667	0.155	0.491	0.395	0.400
Coefficient of Variation (%)	10.752	24.906	-59.999	8.851	10.028
Skewness	-0.633	0.197	-0.339	0.046	0.051
Kurtosis	2.378	1.377	2.096	2.351	1.904
Jarque-Bera	18.905[a]	26.505[a]	12.136[a]	4.084	11.517[a]

Notes:

1. ‘a’ implies statistical significance at the one percent level.

Table 2. unit root test results

Variable	Unit root test statistic			
	MZa	MZt	MSB	MPT
ASPI	0.905	0.819	0.905	57.463
	-3.789	-1.376	0.363	24.045
ΔASPI	-101.306[a]	-7.115[a]	0.070[a]	0.246[a]
	-107.951[a]	-7.347[a]	0.068[a]	0.845[a]
IR	-1.559	-0.859	0.551	15.249
	-1.444	-0.564	0.391	35.880
ΔIR	-106.846[a]	-7.263[a]	0.068[a]	0.314[a]
	-111.996[a]	-7.470[a]	0.067[a]	0.861[a]
JPY	1.259	2.175	1.728	205.614
	-4.977	-1.548	0.311	18.162
ΔJPY	-0.196	-0.184	0.937	47.619
	-14.128	-2.634[c]	0.186[c]	6.595[c]
UKP	1.838	3.170	1.725	228.979
	-8.031	-1.949	0.243	11.513
ΔUKP	-126.391[a]	-7.921[a]	0.063[a]	0.243[a]
	-141.892[a]	-8.410[a]	0.059[a]	0.686[a]
USD	1.561	3.620	2.319	387.525
	-9.535	-2.180	0.229	9.572
ΔUSD	-65.752[a]	-5.733[a]	0.087[a]	0.374[a]
	-133.462[a]	-8.165[a]	0.061[a]	0.695[a]

Notes:

1. See notes for Table 1 for the definitions of the notations used in column 1.
2. A Δ indicates the first difference of these exchange rates.
3. a, b and c imply statistical significance at the one, five and ten per cent level, respectively.
4. The first figure under each unit root test for a currency or its first difference is the unit root test statistics when a constant is used as the deterministic component. The second figure is the unit root test statistic when a constant and a linear time trend are used as deterministic components.
5. The lag lengths in the Ng-Perron tests were selected using spectral GLS-detrended based on SIC.

Table 3. Johansen Cointegration Test Results for Exchange Rates and Stock Prices

Pairs of Currencies	Number of Lags in VAR	Trend Assumption	Null Hypothesis	Trace Statistic	Maximal EigenValue Statistic
ASPI and IR	2	1	$r = 0$	7.603	6.906
			$r \leq 1$	0.697	0.697
ASPI and JPY	5	2	$r = 0$	7.699	5.415
			$r \leq 1$	2.284	2.284
ASPI and UKP	8	2	$r = 0$	6.665	6.654
			$r \leq 1$	0.011	0.011
ASPI and USD	3	2	$r = 0$	9.487	9.370
			$r \leq 1$	0.117	0.117

Notes:

1. a and b imply significance at the 1% and 5% level, respectively.
2. See note 2 for Table 1 for details of notations in column 1.
3. The deterministic components are selected using the Pantula principale suggested by Johansen (1992). In the trend assumption column, 1 denotes no deterministic trend (restricted constant), 2 denotes linear deterministic trend, and 3 denotes linear deterministic trend (restricted).
4. Lag lengths in vector autoregressions were selected using Likelihood Ratio (LR) test.
5. Critical values for the Trace and Maximal Eigen value test were obtained from Osterwald-Lenum (1992).

Table 4. Granger causality test results

Causality		χ^2 test statistic	Direction of causality
From	To		
ASPI	IR	0.001	No causality
IR	ASPI	0.584	
ASPI	JPY	0.001	No causality
JPY	ASPI	0.209	
ASPI	UKP	11.080	No causality
UKP	ASPI	6.489	
ASPI	USD	5.918[c]	ASPI to USD
USD	ASPI	0.003	

Table 5. Percentage of forecast variance in ASPI explained by innovations in				
Months	IR	JPY	UKP	USD
1	0.000	0.000	0.000	0.000
12	2.548	0.157	0.104	0.064
24	7.302	0.449	0.710	0.139
36	13.239	1.482	2.129	0.516
48	19.522	2.895	4.388	1.214

Table 6. Percentage of forecast variance in exchange rates explained by innovations in ASPI

Months	IR	JPY	UKP	USD
1	0.897	0.072	0.578	1.018
12	0.638	0.627	5.415	16.554
24	0.579	1.707	3.192	23.427
36	0.533	4.509	3.664	28.252
48	0.494	7.449	6.171	31.846

Figure 2. Behaviour of All Share Price Index (ASPI) during the sample period

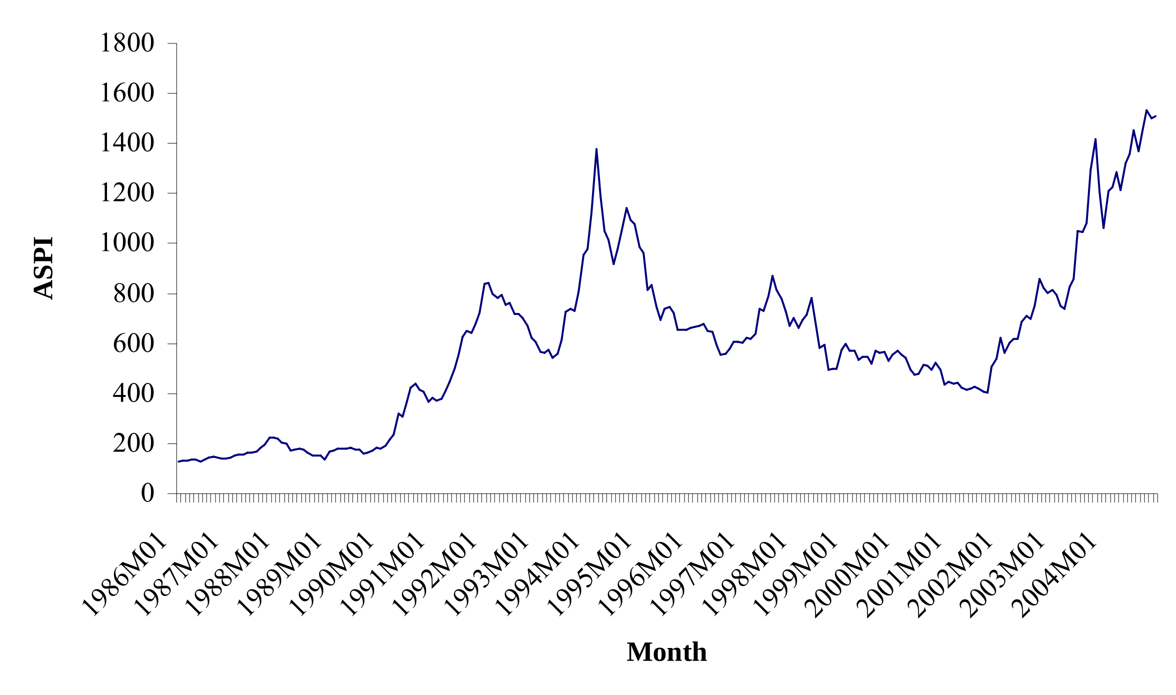
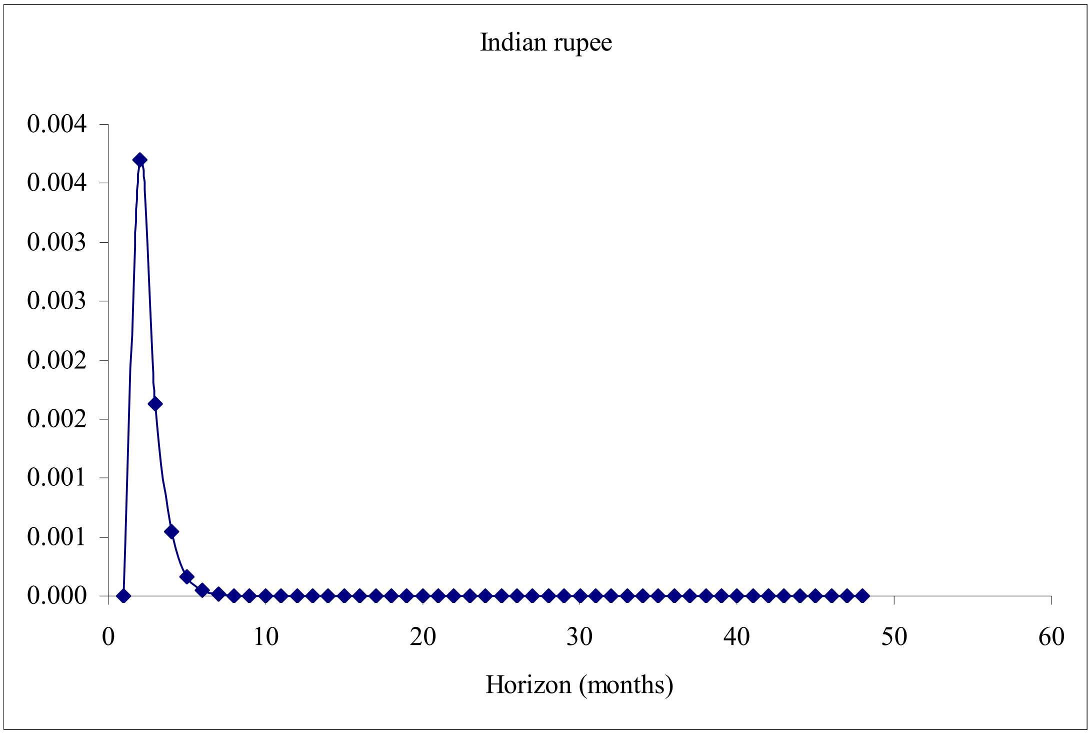
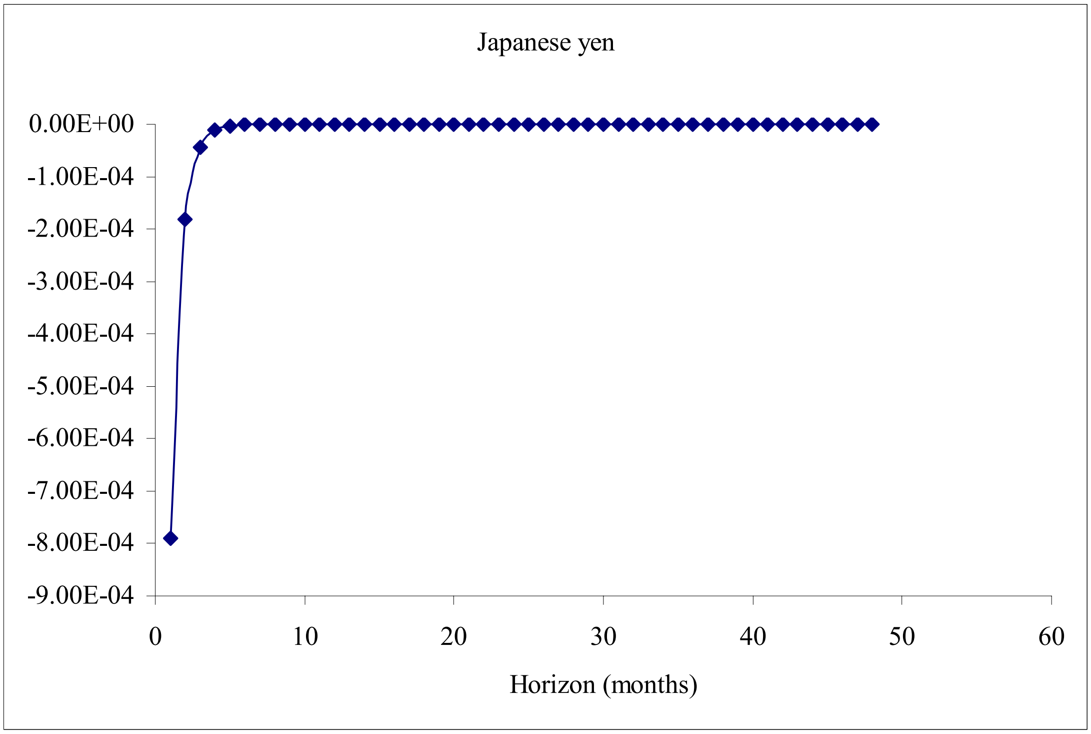
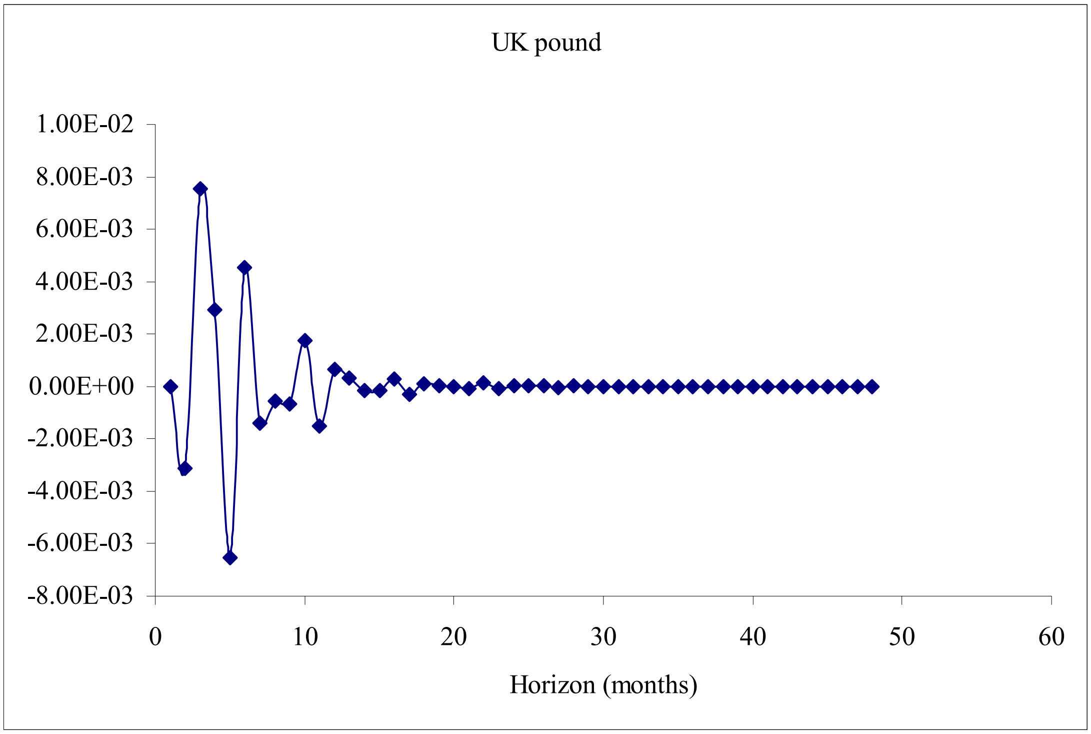


Figure 3. Impulse response of ASPI to one standard deviation in the equations for exchange rates






UK pound
1.00E-02
8.00E-03
6.00E-03
4.00E-03
2.00E-03
0.00E+00
-2.00E-03
-4.00E-03
-6.00E-03
-8.00E-03
0
10
20
30
40
50
60
Horizon (months)

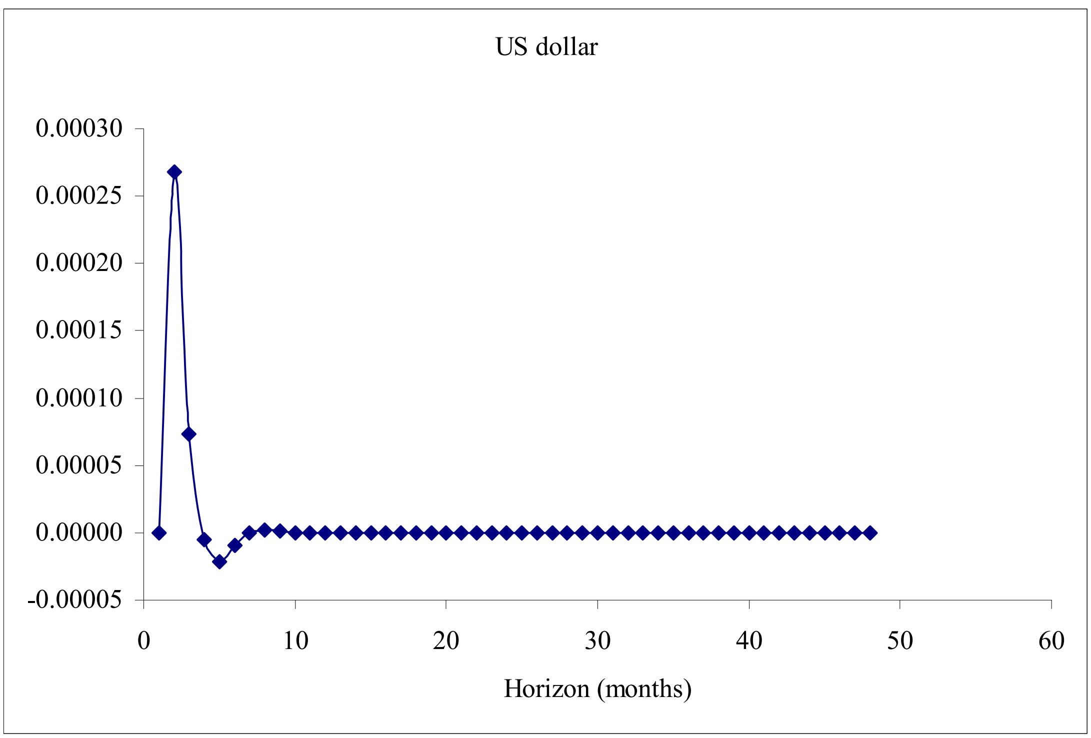
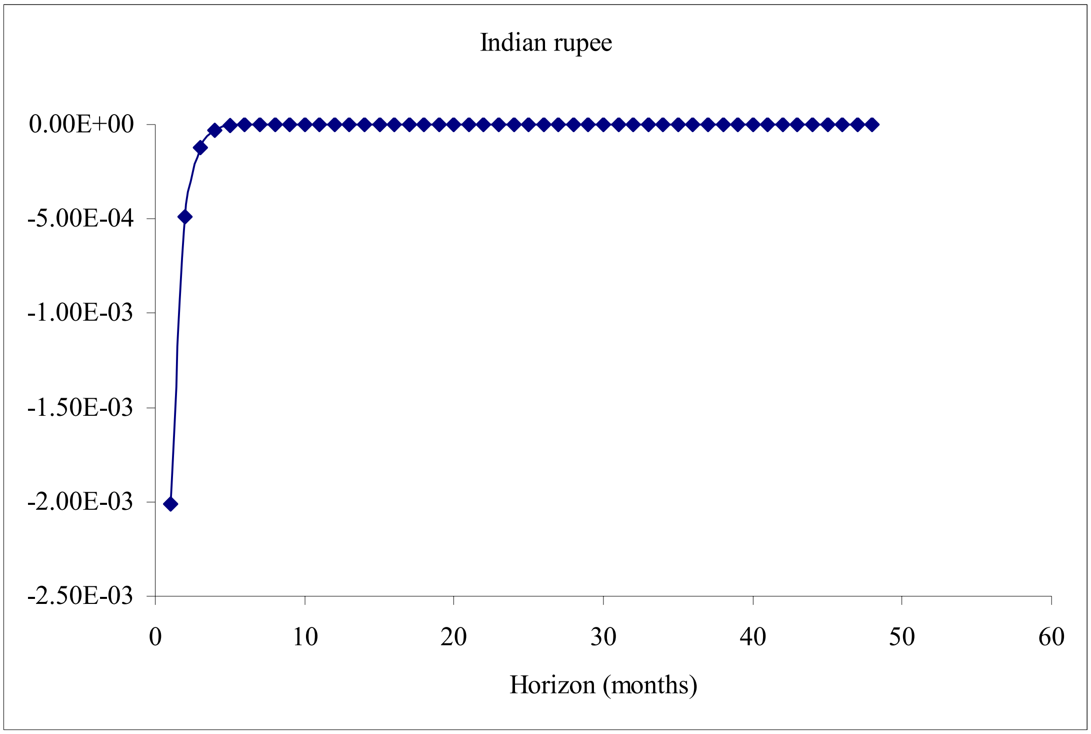
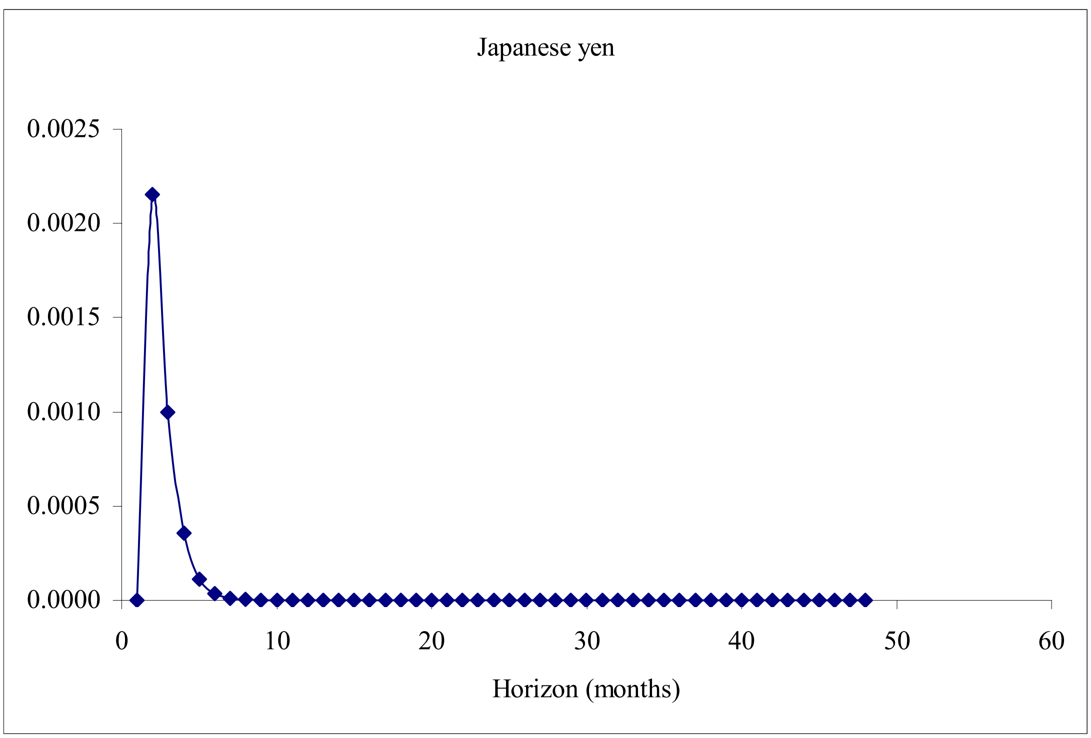
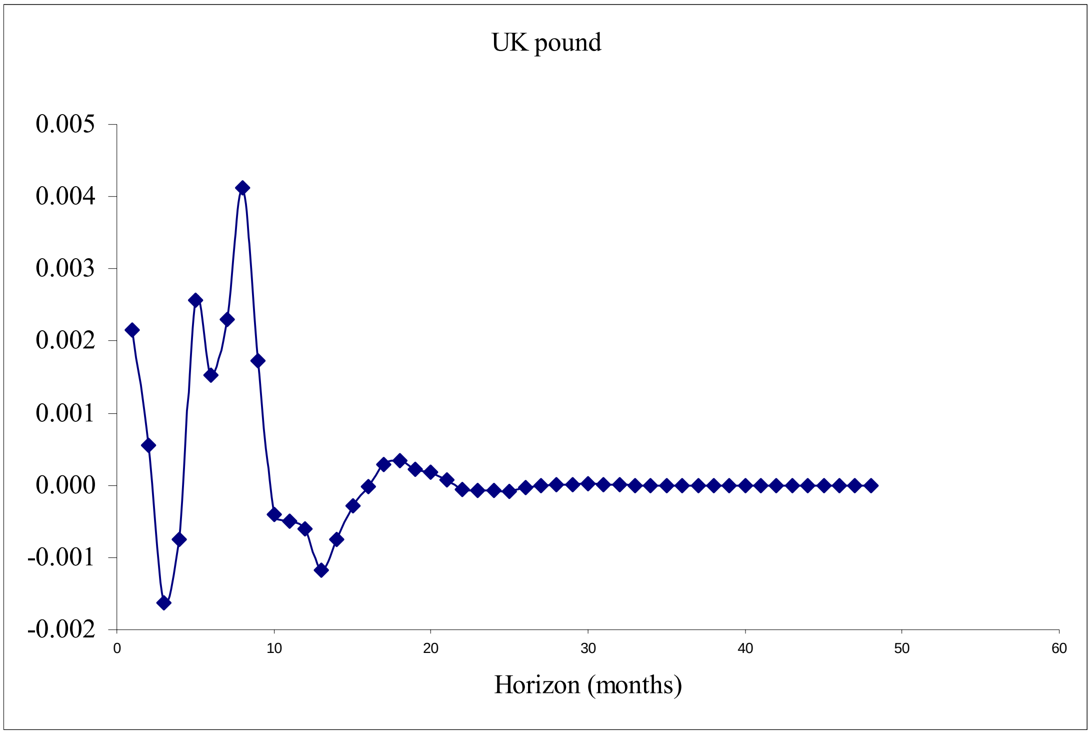
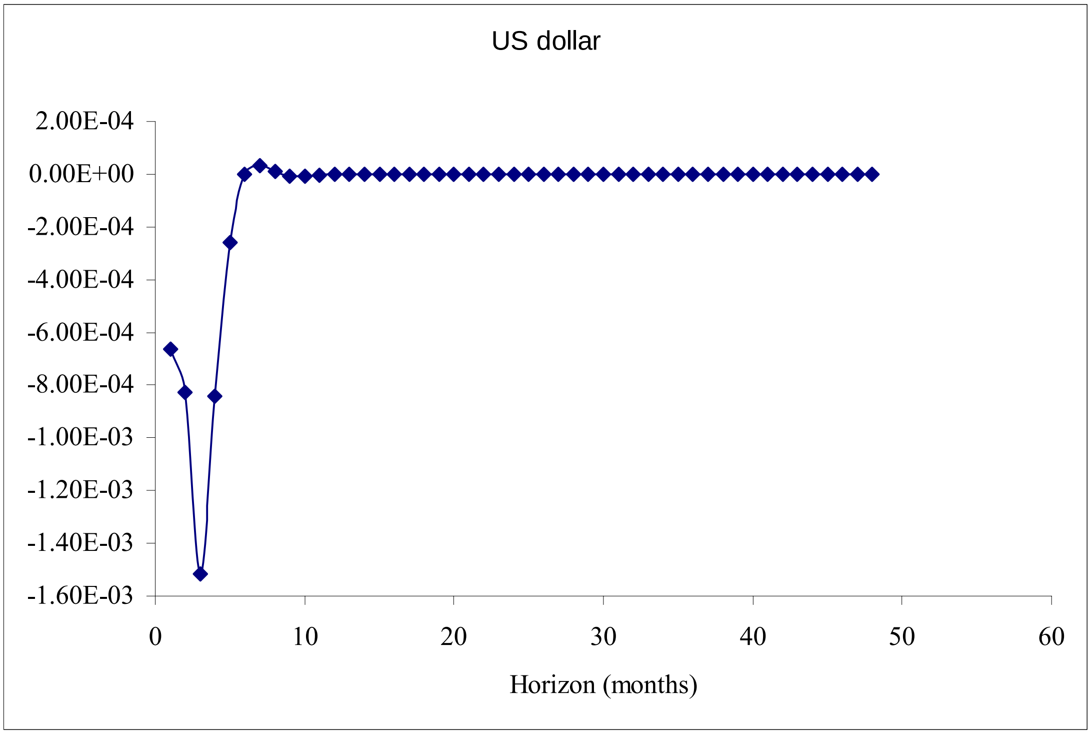

US dollar
0.00030
0.00025
0.00020
0.00015
0.00010
0.00005
0.00000
-0.00005
0
10
20
30
40
50
60
Horizon (months)

Figure 4. Impulse response of exchange rates to one standard deviation shock in the equation for ASPI






UK pound
0.005
0.004
0.003
0.002
0.001
0.000
-0.001
-0.002
0
10
20
30
40
50
60
Horizon (months)


US dollar
2.00E-04
0.00E+00
-2.00E-04
-4.00E-04
-6.00E-04
-8.00E-04
-1.00E-03
-1.20E-03
-1.40E-03
-1.60E-03
0
10
20
30
40
50
60
Horizon (months)

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