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THE PERSISTENCE OF NZ DOLLAR MISALIGNMENTS RELATIVE TO PURCHASING POWER PARITY

ABSTRACT

This paper examines the Purchasing Power Parity (PPP) relationship between the New Zealand dollar and the Australian dollar, Japanese Yen, the UK sterling, the US dollar and the Trade-Weighted Index respectively, using the ADF and Phillips-Perron unit root tests, Engle-Granger cointegration test and Johansen cointegration test. We use high frequency monthly data running from 1985 to 2001 for the analysis. In addition, this study analyzes the adjustment dynamics of real exchange rates of New Zealand through impulse response analysis and constructs confidence intervals for the half-life persistence estimates based on the simple and bootstrap methods.

While the unit root tests and cointegration tests show mixed results for the long-run PPP, there is sufficient evidence that relative price levels help determine the value of the NZ dollar in the medium term. In particular, the point estimates and the confidence intervals of the half-life persistence estimates are found to be significantly lower than previous studies, 1-3 years compared with 3-5 years. Moreover, the half-life of PPP reversion between New Zealand and Australia is less than 1 year, which suggests that misalignments between NZ and AU dollar are not very persistent.

INTRODUCTION

In a recent study, Rogoff (1996) describes the Purchasing Power Parity (PPP) puzzle as the question of "How can one reconcile the enormous short-term volatility of real exchange rates with the extremely slow rate at which shocks appear to damp out?" Reviewing the empirical literature, he finds a 'remarkable consensus' of 3-5 year half-lives of PPP deviations among studies using long-horizon figures,[1] seeming far too long to be explained by nominal rigidities. Several recent studies have attempted to explain the PPP puzzle. Hegwood and Papell (1998) studied the structural change, and found that once the structural change is accounted for real exchange rates display a mean reversion that is much faster than previously calculated. Taylor and Peel (2000) analyzed the puzzle using nonlinear mean reversion. This approach allowed for nonlinearities and found that the speed of mean reversion increases with the size of the deviation from equilibrium. Cheung and Lai (2000b) used impulse response analysis and compute confidence intervals of half-lives of PPP deviations for a relation of post-1973 real exchange rates. The lower bounds of confidence intervals were all estimated at less than 1.5 years, and argue that this is low enough to be explained by models with nominal rigidities. More recently, Murray and Papell (2002) conclude that Rogoff's 'remarkable consensus' of 3-5 year half-lives of PPP deviations was based on the results of studies that did not consider serial correlation, and did not report confidence intervals. Using median-unbiased estimates that allow for serial correlation, Murray and Papell found that the confidence intervals are wide enough to be consistent with any results from models with nominal rigidities to models or in models where PPP does not hold.

Since the launch of the Euro as a single currency within the Eurozone countries of the European Union (EU) there has been renewed and significant interest in the proposition of an ANZAC currency union. However, most of the literature focuses on the policy aspects, such as monetary independence, and social, cultural and political ramifications between Australia and New Zealand. Also, there is no single conclusion on the broad ANZAC currency union debate. One of the few studies using the PPP approach to discuss this issue was Citu, Plantier and Scrimgeour (2002). In their study, they employed US dollar based exchange rates for Australia and New

Zealand. They found a very effective error correction mechanism existing between the Australian and New Zealand currencies. The half-life of the PPP mean reversion mechanism was around 1 year. One limitation of their study was its focus on only two bilateral exchange rates, rather than using all the components of the TWI to investigate the persistence of NZ dollar misalignments relative to PPP.

In the wake of these studies, this paper tests the PPP hypothesis between New Zealand and four other OECD countries: Australia (AU), Japan (JP), the United Kingdom (UK) and the United States (US), and the Trade-Weighted Index (TWI) constructed by ourselves[2] using the ADF unit root test, Phillips-Perron unit root test, Engle-Granger cointergration test and Johansen cointegration. Although we adopt high frequency monthly data, January 1985 to December 2001, the test results are mixed. We then estimate the point estimates and confidence intervals of the half-life of real exchange rate reversion. Simple method and bootstrap methods have been employed to construct the confidence intervals. The results show that both point estimates and confidence intervals are lower than the 3-5 years half-lives estimated in the existing literature.

The two special features of this study are: (1) The attempt to more thoroughly test the PPP hypothesis between New Zealand and four other OECD countries and TWCPI by using New Zealand dollar as a base currency; (2) The attempt to more thoroughly investigate the persistence of NZ dollar misalignments relative to PPP because exchange rate misalignments are important for a number of public policy issues, including the debate on currency union..

The remainder of this paper is organized as follows. Section 2 provides the descriptions of methodology and data in this study. Section 3 first examines the PPP hypothesis by using ADF and Phillips-Perron unit root tests, Engle-Granger cointegration test and Johansen cointegration test. Then, impulse response analysis and two types of point estimates and confidence intervals are provided to measure the half-life reversion. Section 4 provides a summary by way of concluding the paper.

Methodology And Data

Empirical tests for the long run PPP in this study are based on Equation (1),

(1) $$s_t = \alpha + \beta_1 p_t + \beta_2 p_t^* + \mu_t$$

Where s_t is the logarithm of the nominal exchange rate, defined as the domestic price of foreign currency, p_t and p_t^* are the logarithms of the domestic and foreign prices, α, β_1 and β_2 are parameters, and μ_t is the error term. The symmetry and proportionality restrictions commonly imposed on the parameters are $\alpha = 0$, $\beta_1 = 1$, and $\beta_2 = -1$.

With these restrictions, the error term μ_t becomes a measure of the real exchange rate q_t,

(2) $$q_t = s_t - p_t + p_t^*$$

If PPP holds, the long run movement of s_t, p_t and p_t^* cancel out, that is, (s_t, p_t, p_t^*) are cointegrated. The Engle-Granger cointegration test examines whether μ_t or q_t follows a stationary process, whereas the Johansen cointegration test investigates whether there exists a cointegration vector in the (s_t, p_t, p_t^*) space with (1, –1, 1) as the expected coefficients for the cointegrating vector.

The empirical tests will focus on the long-run PPP relationship between New Zealand and other four OECD countries, Australia, Japan, the United Kingdom and the United States between 1985 and 2001. The nominal exchange rates between New Zealand dollar and the Australia dollar, Japanese Yen, The UK sterling and the US dollar are obtained as monthly data from the website of the Reserve Bank of New Zealand (www.rbnz.govt.nz). They are measured as foreign currency units per NZ dollar. The consumer price index of Japan (15864...ZF...), the United Kingdom (11264...ZF...) and the United States (11164...ZF...) are taken from the IMF International Financial Statistics (IFS) CD-ROM (2002) on the monthly basis from January 1985 to December 2001.[3] The consumer price index of Australia (19364...ZF...) and New Zealand (19664...ZF...) are taken from the same database, but on the quarterly basis from the first quarter of 1985 to the fourth quarter of 2001. Because the monthly CPI data of Australia and New Zealand are not available, we use a simple extrapolation method to proxy the monthly data based on the quarterly data.[4] The Choice of 1985 as the starting point is based on the following considerations. First, New Zealand introduced the floating exchange rate regime from 1985. March of 1985 was the beginning of the floating exchange rate system of New Zealand. Second, some high frequency economic data series of New Zealand and Australia were not available before 1985. We also construct the Trade-Weighted Consumer Price Index (TWCPI) of New Zealand's major trading partners based on RBNZ information.

EMPIRICAL RESULTS

We begin our analysis by using the more traditional unit root test. In this context, unit root rests are conducted to ensure that nominal exchange rates and local and foreign price indexes have the same order of integration. The results of the augmented Dickey-Fuller (1979) (ADF) unit root tests are reported in Table 1, and Phillips-Perron (1988) (PP) unit root tests are presented in Table. [5]

The null hypothesis of the nonstationarity of the nominal exchange rate and the CPI indexes is tested against the alternative hypothesis of stationarity. C and N indicate that the ADF test included 'a constant but no deterministic trend' and 'no constant and deterministic trend', respectively. The numbers in the parentheses under 'Model' are the orders of the lagged dependent variable chosen by Akaike Information Criterion. The first values under column 'Test Statistics' are the estimates of the root, while the numbers in the parentheses next to them are the computed values of the ADF statistics.

	Test unit root in level		Test unit root in 1st difference		Test unit root in 2nd difference	
	Model	*ADF test statistics*	*Model*	*ADF test statistics*	*Model*	*ADF test statistics*
$s_{nz/au}$	C (8)	-0.047 (-2.300)	N (12)	-0.985 (-5.018)***	N (12)	-4.877 (-6.248)***
$s_{nz/jp}$	C (2)	-0.023 (-2.313)	N (1)	-0.761 (-9.455)***	N (9)	-5.583 (-8.680)***
$s_{nz/uk}$	C (3)	-0.028 (-1.689)	N (1)	-1.018 (-11.26)***	N (7)	-5.107 (-9.525)***
$s_{nz/us}$	C (8)	-0.025 (-2.033)	N (7)	-0.602 (-3.971)***	N (6)	-4.309 (-10.45)***
s_{twi}	C (8)	-0.042 (-2.622)	N (4)	-0.891 (-6.396)***	N (6)	-4.541 (-10.98)***
cpi_{nz}	C (6)	-0.013 (-3.336)	C (5)	-0.328 (-3.056)**	N (4)	-4.167 (-13.15)***
cpi_{au}	C (9)	-0.005 (-2.127)	C (8)	-0.244 (-2.159)	N (7)	-5.691 (-8.964)***
cpi_{jp}	C (12)	-0.007 (-1.615)	N (11)	-0.295 (-1.645)	N (12)	-8.975 (-6.472)***
cpi_{uk}	C (12)	-0.002 (-1.647)	N (12)	-0.072 (-1.150)	N (11)	-6.461 (-7.769)***
cpi_{us}	C (12)	-0.002 (-1.505)	C (12)	-0.417 (-2.622)*	N (11)	-5.509 (-6.186)***
cpi_{twi}	C (12)	-0.002 (-1.776)	N (12)	-0.059 (-1.141)	N (12)	-6.293 (-5.611)***

Table 1: ADF unit root test on nominal exchange rates and the CPI indexes

Note: (a) All variables are in the log-form. (b) The critical values at 10%, 5%, and 1% levels of significance are, respectively, -1.62, -1.94, -2.58 without a constant and a deterministic trend, -2.57, -2.88, and –3.46 with a constant but without a deterministic trend.

	Test unit root in level		Test unit root in 1st difference	
	Model	*PP test statistics*	*Model*	*PP test statistics*
$s_{nz/au}$	C (2)	-4.275***	N (5)	-12.344***
$s_{nz/jp}$	C (3)	-2.286	N (9)	-10.368***
$s_{nz/uk}$	C (2)	-2.074	N (7)	-12.866***
$s_{nz/us}$	C (3)	-1.752	N (8)	-12.753***
s_{twi}	C (4)	-1.922	N (10)	-11.768***
cpi_{nz}	C (2)	-8.045***	C (8)	-16.637***
cpi_{au}	C (0)	-3.996***	C (8)	-17.540***
cpi_{jp}	C (84)	-1.900	C (199)	-11.578***
cpi_{uk}	C (5)	-3.403**	C (5)	-11.193***
cpi_{us}	C (2)	-2.495*	C (3)	-9.873***
cpi_{twi}	C (9)	-4.105***	C (0)	-12.571***

Table 2: Phillips-Perron unit root test on nominal exchange rates and the CPI indexes

Based on the models chosen by Akaike Information Criterion (AIC), the results of running the ADF test on the nominal exchange rates and CPI indexes in level form suggests that the null hypothesis cannot be rejected at the 10 percent level and that the time series variables are all nonstationary in level form. The acceptance of the unit root hypothesis for all series in level form requires a test in the difference form. The results in first difference are mixed. All nominal exchange rate series are stationary in first difference form. But the results of CPI indexes indicate four out of six CPI time series are not stationary even in their first differences. However, after second differencing, the null hypothesis of unit root is rejected in all time series.

In the results of Phillips-Perron test, C and N still indicate 'a constant but no deterministic trend' and 'no constant and deterministic trend', respectively. However, the numbers in the parentheses under 'Model' are the Newey-West bandwidth based on Bartlett kernel spectral estimation method chosen by Akaike Information Criterion. The values under column 'Test Statistics' are the computed values of the Phillips-Perron statistics. The Phillips-Perron test results indicate that the nominal exchange rates and CPI indexes series are not stationary in their levels. Nevertheless, after first differencing, the null hypothesis of unit root is rejected in all of the cases. Combining the ADF and PP test statistic results, it is indicates one order of integration for all of the series.

To perform the Engle-Granger (1987) cointegration test, Equation (1) was first estimated using OLS to obtain the estimated residuals that were then analysed for stationarity using the ADF test. It is worth noting that the restrictions $\alpha = 0$ and $\beta_1 = -\beta_2 = 1$ were not imposed in the OLS estimation of Equation (1) in order to allow for measurement errors in the price indexes. Yet the restrictions were implicitly imposed on the test of the real exchange rates in Equation (2). The results of the ADF test for the real exchange rates and the residuals are reported in Table 3.

	Real Exchange Rate		The Residuals	
	Model	Test statistics	Model	Test statistics
NZ/AU	C (8)	-0.050 (-2.549)	N (2)	-0.068 (-2.860)***
NZ/JP	C (4)	-0.028 (-1.742)	N (4)	-0.033 (-1.893)*
NZ/UK	C (8)	-0.027 (-1.739)	N (3)	-0.030 (-1.677)*
NZ/US	C (8)	-0.020 (-1.738)	N (6)	-0.032 (-1.731)*
TWI	C (3)	-0.024 (-1.887)	N (8)	-0.046 (-2.380)**

Table 3: The result of the Engle-Granger cointergration test

Note: (a) The test for the stationarity of the real exchange rate is based on Equation (2), and the test for the stationarity of the estimated residuals is based on Equation (1). (b) The critical values at 10%, 5%, and 1% levels of significance are, respectively, -1.62, -1.94, -2.59 without a constant and a deterministic trend, -2.59, -2.90, and –3.51 with a constant but without a deterministic trend.

	α	β_1	β_2	Adjusted R^2	Durbin-Watwon
NZ/AU	0.992 (8.529)	-1.119 (-6.369)	0.947 (5.372)	0.280	0.121
NZ/JP	-10.966 (-8.660)	0.769 (6.135)	0.706 (1.835)	0.636	0.064
NZ/UK	0.351 (1.721)	-0.181 (-1.183)	0.334 (2.373)	0.077	0.065
NZ/US	-0.776 (-3.332)	-1.316 (-9.883)	1.608 (10.586)	0.348	0.063
NZ/TWI	5.764 (26.376)	0.242 (2.267)	-0.612 (-4.372)	0.246	0.069

Table 4: The OLS estimation results

In the Table 3, the ADF test shows that the unit root hypothesis must be accepted for the real exchange rate. The nonstationary real exchange rates suggest that the long-run PPP between New Zealand and Australia, Japan, the United Kingdom and the United States should be rejected. With the allowance of measurement errors in prices, however, the ADF test results show that the estimated residuals follow a stationary process, [6] indicating the long-run PPP relationships between New Zealand and other four OECD countries are supported.

In order to understand the ambiguous results of the Engle-Granger cointegration test, we need explore further to examine the long-run PPP between New Zealand and other four OECD countries. Table 4 shows the OLS estimation results based on Equation (1).

The numbers below α, β_1 and β_2 are estimated coefficients and the numbers in the parentheses are the values of t-statistic. The estimates in Table 4 all carry the wrong signs except TWI case. The values of Durbin-Watson test are too low to reject the hypothesis of no cointegration even at the 10 percent level.[7] And in all equations, the constant terms are significantly different from zero, and the coefficients of the price variables are not anywhere near unity. These results indicate that the price indexes of New Zealand and other four OECD countries didn't explain the nominal exchange rates between the New Zealand dollar and Australia dollar, Japanese Yen, The UK sterling and the US dollar well and support the nonstationary real exchange rates in Table 3.

After using the OLS simple null hypothesis test, unit root test and the Engle-Granger cointegration test, the final step to test the long-run PPP relationships between New Zealand and other four OECD countries is based on Johansen cointegration test based on Equation (3).

(3) $$\Delta F_t = \alpha + \sum_{i=1}^{k-1} \theta_i F_{t-i} + \theta_k F_{t-k} + \varepsilon_t \text{ , where } F_t' = \begin{bmatrix} s_t & p_t & p_t^* \end{bmatrix}$$

In applying the Johansen (1988) cointegration test, one must first decide the deterministic components and the order of the lagged endogenous variables to be included in the test. If PPP holds, the long-run movements of the exchange rates and the price indexes should cancel out over time. The inclusion of a deterministic trend in the long-run equilibrium relationship means that one variable is drifting away from the others, which is inconsistent with the long-run PPP. Hence, only a constant but not a deterministic trend is included in the cointegrating equations. The order of lagged endogenous variables for the cointegration test was selected based on Akaike Information Criteria. One lagged endogenous variable was selected for the VAR that includes the nominal exchange rate and CPI of NZ/JP, and two lags were selected for the VAR that includes the nominal exchange rate and CPI of NZ/AU, NZ/UK, NZ/US and NZ/TWI.

The results of the Johansen cointegration test are reported in Table 5. Under the first column H_0 on r is the hypothesized number of cointegration vectors, or the rank r. The values under Trace Statistic are the computed values of the likelihood ratio for Johansen's cointegration test. The numbers under Cointegration coefficients, the last three columns in Table 5, are the values of the normalized cointegration coefficients with their corresponding standard errors in the parentheses. The critical values at 5% (1%) level of significance are 34.91 (41.07) for r=0, 19.96 (24.60) for $r \le 1$, and 9.24 (12.97) for $r \le 2$, under the assumption that there is a linear deterministic trend in the data but not in the cointegrating equations. The likelihood ratio test rejects one cointegrating equation at the 5% significance level.

	H_0: on r	Eigen value	Trace Statistic	Cointegration coefficients		
$[s_{nz/au}, cpi_{nz}, cpi_{au}]$	None ***	0.557	188.873	1.000	24.225	-10.132
	At most 1 ***	0.077	25.150		(7.583)	(7.486)
	At most 2	0.044	8.987			
$[s_{nz/jp}, cpi_{nz}, cpi_{jp}]$	None ***	0.483	156.088	1.000	-4.214	-1.552
	At most 1 **	0.075	22.227		(0.756)	(2.227)
	At most 2	0.031	6.390			
$[s_{nz/uk}, cpi_{nz}, cpi_{uk}]$	None ***	0.411	139.586	1.000	-46.718	2.664
	At most 1 ***	0.127	31.495		(13.824)	(12.556)
	At most 2	0.018	3.737			
$[s_{nz/us}, cpi_{nz}, cpi_{us}]$	None ***	0.436	170.043	1.000	-2.248	-1.152
	At most 1 ***	0.215	53.300		(0.844)	(0.951)
	At most 2	0.019	3.851			
$[s_{twi}, cpi_{nz}, cpi_{twi}]$	None ***	0.513	187.851	1.000	1.292	2.233
	At most 1 ***	0.179	43.329		(0.883)	(1.145)
	At most 2	0.019	3.759			

Table 5: The results of the Johansen cointegration rest

The likelihood ratio tests reject the hypothesis of no cointegration ($H_0 : r = 0$) and the hypotheses of no more than one cointegrating vector ($H_0 : r \le 1$) in favor of cointegration at the 5% significance level for all cases. But tests cannot reject the hypothesis of no more than two cointegrating vector ($H_0 : r \le 2$). These results indicate that there are more than one cointegrating vectors in the models. In Table 5, none of the vector of the normalized cointegration coefficients is close to the expected values of (1, -1, 1) under the restrictions. Therefore, the results of the Johansen cointegration test suggests that the long-run PPP between New Zealand

and other four OECD countries might not exist, which is consistent with those of the OLS simple null hypothesis test, unit root test and Engle-Granger test on the real exchange rates.

IMPULSE RESPONSE AND CONFIDENCE INTERVAL

As in Cheung and Lai (2000b) and Murray and Papell (2002), we report the confidence intervals based on simple method and bootstrap method respectively. The OLS half-lives estimates in Dickey-Fuller regressions are provided in Table 6 . The Dickey-Fuller regression takes the form:

(4) $$q_t = c + \alpha q_{t-1} + u_t$$

where q_t is the New Zealand dollar denominated real exchange rates. Because we use the monthly data, Equation (5) has been employed to measure the half-life.

(5) $$q_t = c + \alpha q_{t-12} + u_t$$

The half-life in Equation (5), defined as the number of periods required for a unit shock to dissipate by one half, is calculated as $\ln(0.5)/\ln(\alpha)$.[8]

In Table 6, the OLS estimates of α range from 0.368 (Australia) to 0.737 (UK), implying point estimates of the half-life of PPP deviations from 0.69 years (Australia) to 2.27 years (UK). The average half-life is 1.46 years and the median half-life is 1.33 years. The point estimates of the half-lives are much lower than those 3-5 years reported in the previous literature. And it is very interesting to find that the half-life of PPP deviations between New Zealand and Australia is significantly lower than the half-lives of PPP deviations between New Zealand and other three OECD countries and the TWCPI.

Country	α	95% CI	HL	95% CI
NZ/AU	0.368	[0.358, 0.378]	0.69	[0.67, 0.71]
NZ/JP	0.594	[0.574, 0.614]	1.33	[1.25, 1.42]
NZ/UK	0.737	[0.717, 0.757]	2.27	[2.08, 2.49]
NZ/US	0.676	[0.654, 0.698]	1.77	[1.63, 1.93]
NZ/TWI	0.574	[0.562, 0.586]	1.25	[1.20, 1.30]

Table 6: The OLS half-lives in Dickey-Fuller regressions (simple method)

Figure 1 shows the adjustment dynamics of real exchange rates. The first 60 impulse responses, which correspond to a time span of 5 years for monthly data, and their confidence intervals are displayed. The solid line indicates the point estimates of impulse responses to a unit shock. The two dashed lines give the 95% confidence band. The impulse response analysis shows that the shock impact tends to amplify first before it disperses. It is interesting to note that the full impact of a shock is not felt until a few periods after the initial shock.

We may access the sampling variability of the OLS estimates by using bootstrap method. As mentioned by Cheung and Lai (2000), "Without resorting to asymptotic normal approximation, bootstrapping has been known to be a powerful tool for approximating the sampling distribution and variance of general statistics." We use a parametric percentile bootstrap. For each parameterization in Table 7, we generate 5000 artificial time series and construct a confidence interval for the OLS half-life. The average lower bound of the confidence intervals is 0.76 year and the average upper bound is 2.43 years, while the median lower bound is 0.83 year and the median upper bound is 2.89 years.

Country	α	95% CI	HL	95% CI
NZ/AU	0.341	[0.207, 0.470]	0.64	[0.44, 0.92]
NZ/JP	0.569	[0.411, 0.731]	1.23	[0.78, 2.21]
NZ/UK	0.646	[0.434, 0.802]	1.59	[0.83, 3.14]
NZ/US	0.649	[0.456, 0.793]	1.60	[0.88, 2.99]
NZ/TWI	0.630	[0.453, 0.787]	1.50	[0.88, 2.89]

Table 7: The OLS half-lives in Dickey-Fuller regressions (bootstrap method)

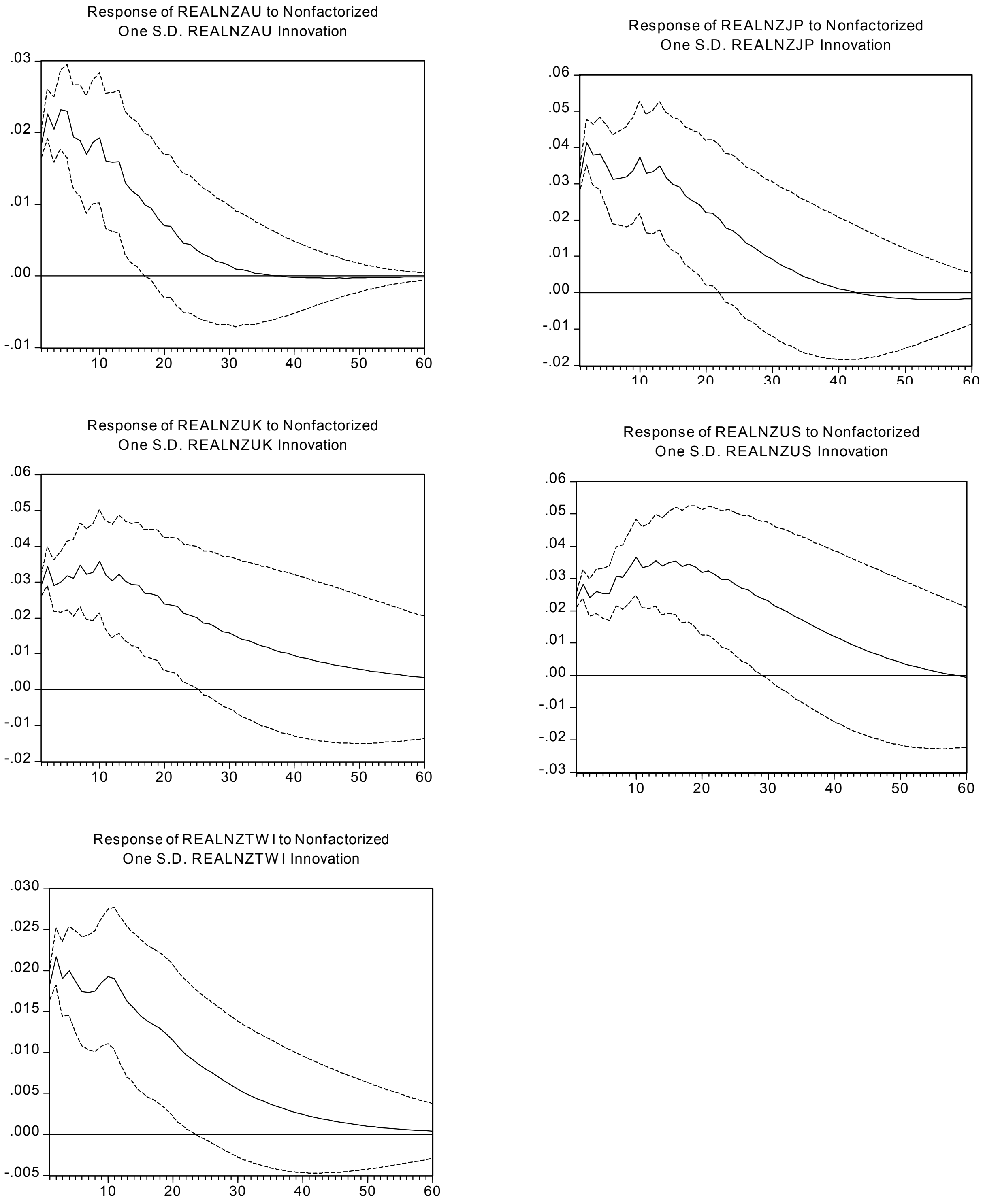

Figure 1: Impulse response on the real exchange rate

CONCLUSIONS

This paper has employed unit root tests and cointegration tests to measure the PPP hypothesis for 5 OECD countries (Australia, Japan, New Zealand, the United Kingdom, and United States). The New Zealand dollar is adopted as the base currency, and we construct the Trade Weighted Consumer Price Index (TWCPI) for the above four OECD countries.

The first column of results in Table 3 shows the evidence that real exchange rate appears to be I(1) using the ADF test. However, the result from the Engle-Granger cointegration test on the residual provides evidence in favour of PPP in the long-run in all of the cases examined (see second column in Table 3). But the negative results from the Engle-Granger cointegration test on the real exchange rate and the Johansen cointegration test make the long-run PPP invalid.

This study makes two important findings. First, it seems that the purchasing power parity puzzle can be partly explained by the empirical study of New Zealand. The purchasing power parity puzzle reflects the consensus of empirical research showing that the half-lives of PPP deviations are between 3 and 5 years by using univariate methods. However, previous empirical studies are biased for two reasons. First, most of the existent studies use US dollar as the base currency rather than test the PPP between other world currencies. Second, almost all studies simply report point estimates. When bootstrap confidence intervals are computed, the point estimates tend to be unreliable. After we use the NZ dollar as the base currency, we find the OLS point estimates of the half-life of PPP deviations are from 0.69 years (Australia) to 2.27 years (UK), much lower than the 3 to 5 years half-lives in the previous literature. And the average lower bound of the bootstrap confidence intervals is 0.76 year and the average upper bound is 2.43 years. The persistence within this bound can be explained by models with nominal rigidities.

Second, the point estimates and confidence intervals based on the simple and bootstrap methods show that the half-life of exchange rate misalignments between New Zealand and other countries is lower than 3 to 5 years found in previous studies.

For our constructed TWI measure and the US dollar, the confidence interval for the half-life is 1 to 3 years. For the AU dollar, the confidence interval for the half-life is significantly shorter at 6 to 12 months. These results have important implications for those interested in forecasting the TWI or different bilateral exchange rates over medium term horizons, including businesses and the central bank. For example, it would be incorrect for the Reserve Bank of New Zealand (RBNZ) to base its interest rate decisions on PPP studies which suggest much longer half-lives than found here. Fortunately, our results lend support to the RBNZ's assumption that the exchange tends to gradually correct towards PPP in the medium term, although the precise speed of the error correction process still remains an open issue.

Some will argue that these results show that the exchange rate variability of the cross-rate with the AU dollar is not an important issue, and that the gains in terms of reducing volatility are trivial. Others will conclude that New Zealand would give up little if it adopted the AU dollar, since it is already effectively tied to it. We do not take a position on this issue, since we believe the answer depends on what is trying to be achieved by adopting the AU dollar. If the objective is closer ties with AU or some other consideration, this study suggests that NZ would forfeit little because the AU/NZ dollar exchange rate corrects quickly towards relative PPP since 1985. However, if the objective is to reduce exchange rate variability, adopting the AU dollar will not provide huge benefits along this dimension. Instead, the US dollar would likely prove a better option since NZ dollar exchange misalignments are much more persistent versus the US dollar.

ENDNOTES

[1] Abuaf and Jorion (1990) reported an average half-life of 3.3 years for eight series of real exchange rates. Lothian and Taylor (1996) estimated the half-life for the dollar-pound rate to be 4.7 years. More recently, comparable half-lives for a selection of industrial and developing countries were reported by Cheung and Lai (2000a) based on the current float data. The median of industrial countries' half-life estimates is about 3.3 years. However, the half-life estimates for developing countries tend to be less persistent, with a median value of about 1.4 years.

[2] According to the news releases of Reserve Bank of New Zealand on 21 December, the currency weights for the new TWI (Trade-Weighted Exchange Rate Index) are: USD, 30.66%; EUR, 23.14%; JPY, 20.26%; AUD, 18.46%; GBP, 7.48%. Since we don't include the Euro in our study, we recalculate the weight of each country's CPI in our basket as the United States 39.88%, Japan 26.36%, Australia 24.02% and the United Kingdom 9.74% to form the TWCPI (Trade-Weighted Consumer Price Index).

[3] The codes in the parentheses correspond to the series in the IFS CD-ROM.

[4] We use the first quarterly CPI data of each year to proxy the CPI data of January, February and March in that year. The rest may be deduced by analogy.

[5] The estimations were performed using the PC version of E-Views (Ver 3.1), and all time series were measured in logarithmic form.

[6] The estimated residual is significant at 1 percent level for New Zealand and Australia, and significant at the 10 percent level for New Zealand and other 3 OECD countries. The estimated residual based on Trade Weighted Index is significant at the 5 percent level.

[7] For 100 observations, the critical values for test of DW=0 are 0.511, 0.386 and 0.322 are 1 percent, 5 percent and 10 percent level, respectively (See Pindyck and Rubinfeld , 1998, p515).

[8] Note that we are using overlapping observations here, or a long horizon regression. In future work, we hope to explore precisely how the choice of horizon and our use of linearly interpolating AU and NZ CPI data affect our results.

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