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# AN INVESTIGATION OF FACTORS AFFECTING EXCHANGE RATE FLUCTUATIONS IN SRI LANKA

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**A B S T R A C T**

This article examines the factors that affect exchange rate fluctuations in Sri Lanka. The relevance of this article relies on how do the changes in Inflation, Interest Rates, Terms of Trade, Net Foreign Purchases (a proxy for Net Capital Inflows), Official Intervention and remittances affect the fluctuations in Sri Lanka's Exchange Rate. The article is carried out with respect to three objectives, namely; examine the factors that affect exchange rate fluctuations, identify the relationship between the factors and the exchange rate fluctuations and investigate the impact of the factors that had on the exchange rate. Two different econometric models (Multiple Regression Model and VAR Model) have been used to analyses the results, with monthly data, for the period 2001:01 to 2010:12. Results obtained by Multiple Regression Model suggest that net official intervention is the most effective and significant determinant of exchange rate during the sample period. Inflation and net foreign purchases (as a proxy for Net Capital Inflows) are rendered to be less effective and non-significant determinants of the exchange rate. However, it can be seen that there is a direct link between the two determinants of net official intervention and net foreign purchases. A negative relationship exists between exchange rate and inflation, interest rate, remittances, and terms of trade, whereas a positive relationship exists between exchange rate and net foreign purchases. According to the estimation results of Vector Auto Regression net official intervention, net foreign purchases and call money rate cause the most of fluctuations in the exchange rate.

**Keywords:** Exchange Rate, Inflation, Interest Rate, Terms of Trade, Remittances, Sri Lanka.

JEL subject code: H-63

## INTRODUCTION

The exchange rate of a country's currency is the value of its money for an international trade in goods, services and finance and, therefore, it is a part and parcel of the monetary condition of a country. Therefore, the central banks being the monetary authorities have been given discretionary powers under the relevant statutes to decide appropriate foreign exchange policies along with its monetary, financial and economic development policies. In macroeconomic perspective, foreign exchange rate policies are instrumental in the mobilization of foreign savings and capital to fill the domestic resource gap and investment expansion. Various public views are often expressed as to how the central banks should decide exchange rate policies and what factors should be taken into consideration.

**Why studying exchange rates is important?** The changes in exchange rates will have both favourable and unfavourable impacts on economic activities and living standard of the public because of the largely globalized trade and finance involving the exchange of currencies. In general, appreciation of a country's currency will have the following effects whereas depreciation will have the opposite effects.

- Lowering the domestic prices of imports because the cost of imports in the domestic currency will be less due to higher value of the domestic currency, i.e., to pay for any given foreign price of imports will require fewer units of domestic currency. As a result, inflation will be lower depending on the extent of the imports in the domestic consumption and production activities.
    - Country's outstanding foreign debt equivalent

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of domestic currency will be lower and, therefore, the burden on foreign debt repayment will be less.

- One unfavourable effect will be that the lower import prices will encourage imports and worsen the country's trade balance (net position between exports and imports).
- Another unfavourable effect will be that exporters will be discouraged by a reduction in their income in domestic currency which will adversely affect the export industries. However, if domestic inflation would become lowered due to reduced import prices, there will be higher foreign demand for exports which will offset the initial reduction in exporters' income.

In the case of small, open, developing countries such as Sri Lanka, an external shock could exert pressure on the exchange rate in addition to domestic factors, resulting in the depreciation of the domestic currency. While such a change in the external price of the currency affects domestic prices of consumer goods, intermediate goods as well as investment goods, and these price changes could result in further increases in prices.

As described below in the Literature Review, about ninety percent of the studies (both internationally and locally) have used the following factors on exchange rate determinants, Differentials in inflation, Differentials in interest rate, Current account deficit, Public debt, Terms of trade, Political stability and Economic Performance and Stock market.

Many of the Sri Lankan studies mentioned, they have examined a particular issue. In other words, they have done a partial study of the exchange rate determinants. E.g. Wimalasuriya (2007) has identified changes in the exchange rate could have significant implications for the trade balance using the vector autoregressive approach and Log-Linear Regression Model. Alawattage (2005) has identified changes in Balance of Payments as one of the key exchange rate determinant using the Regression Model.

Wijesinghe (1999) has identified Terms of Trade, Tariffs & Capital Inflows as key exchange rate determinants for the period 1960 – 1996 using the statistical properties of two alternative series of exchange rate.

Hence this article conducts a comprehensive study for the period 2001-2010 using interest rates, terms of trade, and capital inflows as the key exchange rate determinants and to understand the relationship of these variables with the exchange rate. Especially, this article examines the impact of the exchange rate from the capital inflows as the capital account was substantially liberalized during the year 2010. Furthermore, the data which Wijesinghe (1999) used does not account for the impact on the capital account liberalization and has used data during the 1960-1996 period.

**Objectives:** There are three main objectives of this article, namely; examine the factors that affect exchange rate fluctuations; identify the relationship between the factors and the exchange rate, and investigate the impact of the factors that had on the exchange rate.

**THEORETICAL AND EMPIRICAL STUDIES**

Simone and Razzak (1999) examines some unsettled theoretical and empirical issues regarding the relationship between nominal exchange rates and interest rate differentials and provide a model for the behaviour of exchange rate in the long run, where interest rates are determined in the bond market. The model predicts that an increase in the differential, appreciates the home currency. They have tested the model for the U. S. Dollar against the Deusche Mark, the British Pound, the Japanese Yen, and the Canadian Dollar. The first two pairs of exchange rates- for which purchasing power parity seems to hold- display a strong relationship with interest rate differentials.

Wimalasuriya (2007) uses PPP as the theoretical basis to examine exchange rate pass-through into domestic prices in Sri Lanka. The relevance of the study lies in the fact that domestic price changes due to changes in the exchange rate could be significant in monetary policy decision making. Pass-through is estimated taking two approaches. First, pass-through into import prices is estimated with the use of a Log-Linear Regression Model. The results obtained suggest that exchange rate pass-through into import prices is around fifty percent, that is, import prices increase by about 0.5 percent as a result of a 1 percent depreciation of the Nominal Effective Exchange Rate. Second, taking a Vector Autoregressive Approach, exchange rate pass-through into a set of prices in the "pricing chain" is estimated. Namely, exchange rate pass-through to factor input prices, trade prices, wholesale producer prices and retail consumer prices is examined, with the presumption that changes in the exchange rate are due to shocks, exogenous to the model. The results obtained for this model suggest that exchange rate pass-through into consumer prices is about thirty percent, although pass-through into wholesale producer prices was found to be

complete. The findings from the second model further suggest that changes in the exchange rate could have significant implications for the trade balance.

Nelson and Sul (2000) study the long-run relationship between nominal exchange rates and monetary fundamentals in a quarterly panel of 19 countries extending from 1973.1 to 1997.1. Their analysis has centred on two issues. The first issue is that tested whether exchange rates are cointegrated with long-run determinants predicted by economic theory. This result generally supports the hypothesis of cointegration. Panel regression estimates and panel-based forecasts confirm that their forecasting power is significant.

An improvement in the fiscal balance will have an ambiguous effect on the exchange rate. On one hand, depreciation would tend to occur because, the improved fiscal balance would normally induce a less-than-proportional reduction in private saving so that total domestic demand would decrease while overall savings would increase. As part of the decline in spending falls on nontradable goods, their prices would drop, bringing about a depreciation of the exchange rate. The effect is likely to be stronger if the fiscal improvement comes from a reduction in government consumption, as opposed to an increase in taxes, to the extent that government consumption falls more intensively on nontradable goods than private spending (in which case, the depreciation would be reinforced in the presence of imperfectly substitutable traded goods). In principle, the fiscal effect should simply be part of the main aggregate demand effect described above; whether the interest rate fully captures both effects is an empirical question. On the other hand, a further effect would operate on the relative price of traded goods in a model which features stock-flow consistency (such as the Portfolio Balance Model). In such a model, the current account surplus generated by the initial depreciation would have to be annihilated in the long run by a real appreciation which ensures a sufficient trade deficit to offset the positive net foreign assets.

In contrast to the preponderance of developed country studies of the behaviour of exchange rates, evidence on the behaviour of developing country exchange rates has been scarce. Those studies which have examined the determinants of developing country exchange rates have largely focused on Latin America, and have emphasized the role of movements in the terms of trade in driving exchange rate movements (see Diaz-Alejandro (1982), and (1989)). There is also an extensive literature for some developed countries which links exogenous movements in the terms of trade of commodity-exporting countries and changes in their exchange rates, particularly for commodity exporters in Canada and Australia (see, Amano and van Norden (1995) and Gruen and Wilkinson (1994)).

Muhammad *et al. (*2007) empirically examine the potential role of nominal and real variables in determining nominal exchange rates in Pakistan. For this purpose, variable equations determining the value of nominal exchange rate of Pak-Rupee vis-à-vis its major trading partners have been estimated using Generalized Method of Movements (GMM) estimations. The results show that nominal exchange rate depends upon a number of endogenous and policy variables both in the domestic and foreign economy. Particularly, policy-induced shocks are shown to be the principal cause of instability in nominal exchange rates.

An increase in the world price of the commodities that a country exports would also tend to appreciate the exchange rate. Such an increase would induce a positive wealth effect, which would raise domestic demand and, hence, the price of nontradables (see Diaz-Alejandro (1982)). In principle, this effect should be captured more comprehensively by the terms of trade, as their numerator encompasses all exports—as opposed to only commodity-based exports— and their denominator reflects the price of the country-specific imports, as opposed to a generic industrial country export deflator. In practice, few studies find a significant effect of the terms of trade (see, Goldfajn and Valdes (1999)), while many researchers find commodity prices to be strongly cointegrated with the exchange rate of commodity exporters. One rationale for the findings is provided by the relative accuracy of the measurement of commodity prices, as opposed to the arbitrariness involved in the construction of country-specific export and import deflators. Another rationale relates to, how frequently commodity price data are made available which may allow financial markets to tailor their financial decisions about the currencies of commodity exporters to the prices of these commodities.

Importantly, Obstfeld and Rogoff (2000) point out that in the presence of sticky producer prices and perfect pass-throughs, standard measures of the terms of trade will mechanically move one to one with the exchange rate, making it extremely difficult to identify causality between

the exchange rate and terms of trade. More generally, if the extent of exchange rate pass-through is less for exports than for imports, a depreciation of the local currency will raise the local currency price of exports relatively less than it will raise the local currency price of imports—this will yield a decline in the terms of trade. Deaton and Miller (1996) used a measure of the terms of trade expressed in world prices to ameliorate this potential endogeneity problem. They followed Deaton and Miller and constructed, for each commodity-dependent economy, indices of real commodity prices which are defined as the world (nominal) price of their commodity exports relative to the world price of manufactured goods exports. Their measure of the world price of commodity exports aggregates changes in world commodity prices using actual national export shares of the commodity exports. For large commodity-exporting countries, world relative commodity prices are likely to be better at capturing the exogenous component of terms of trade shocks than standard terms of trade measures (Chen and Rogoff (2002)).

A more open trade regime is likely to be associated with a more depreciated exchange rate. Trade restrictions increase the domestic price of tradable goods, thereby raising the overall price level and the exchange rate (see Goldfajn and Valdes (1999)). In the present study, openness is proxied by the ratio of exports plus imports to GDP. Such a measure is widely used, even though it is an imperfect substitute reflecting also a multiplicity of other factors than trade and exchange restrictions. In the context of the present papers, these drawbacks are likely to have a limited impact. In fact, the endogeneity of the openness ratio to the exchange rate is corrected automatically by the econometric methodology employed. The ratio would also reflect the effect of trade sanctions during the ten-year period, which is likely to induce a similar effect on the domestic price of the tradable goods and, hence, on the exchange rate.

Alawattage (2005) examines the effectiveness of exchange rate policy of Sri Lanka in achieving external competitiveness since the liberalization of the economy in 1977. This paper uses Marshall- Lerner Theory and the conventional two-country trade model that explains the traditional approach to Balance of Payment (BOP) and was applied using quarterly data covering the period of 1978:1 to 2000:4. Results reveal that the Real Effective Exchange Rate (REER) does not have a significant impact on improving the Trade Balance (TB), particularly in the short run, implying a blurred J-Curve phenomenon. Even though the co-integration tests reveal that there is a long run relationship between TB and the REER, it shows very marginal impact in improving TB in long run.

On the other hand, Xiangming Li (2003) shows that exchange rates depreciate after countries open their economies to trade. In countries with multiple liberalization episodes, however, real exchange appreciates during early episodes, suggesting that partial or non-credible trade liberalizations are associated with real appreciation.

The size of net foreign assets is likely to be associated with a more appreciated exchange rate in the long run. Higher net foreign assets induce larger expenditure on domestic goods, thus raising the price of non-tradable, and appreciating the exchange rate. An alternative mechanism is based on the absence of price equalization of tradables: a country that reaches a higher level of net foreign assets can afford to finance a worse current account balance and can, therefore, sustain a loss in competitiveness associated with a more appreciated exchange rate. For a theoretical discussion and empirical evidence, see Lane and Milesi-Ferretti (2000).

Ezirim, and Muoghalu (2006) use three theories namely, Debt Burden theory, Foreign Direct Investment theory and Contemporary Exchange Rate theory. The methods used in this study are OLS (Ordinary Least Square) Method and EML (Exact Maximum Likelihood) Model. The study found clear-cut and significant relationships between the three-external sector economic crises. Relatively, foreign investment burden, international oil prices and previous exchange rate conditions are important arguments in explaining current exchange rate crisis in a typical LDC. External debt burden was not found to be a consistent factor contributing to exchange rates crisis in Nigeria. A major imperative of these results is that the observed role of the investment burden was that of putting immense pressures on the exchange rates, and thus aggravates the crisis condition. External debt burden does not have the same magnitude of the effect.

From the foregone review, we see that nationally the authors have done partial and comprehensive studies on exchange rates. Partial studies have only used one variable and its effect on the exchange rate. Comprehensive studies were very much related to exchange rate regimes using past data. However, internationally, authors have done cross-sectional data studies using two countries. Further, when choosing the

exchange rate determinants, they have taken into account the macroeconomic situation of that country. Both national and international studies have not used 'Net Capital Inflows' as a variable due to their capital account not being fully liberalized during the time of their study. This article sets out to contribute to knowledge in this area using a simple and convenient procedure that would enable useful and reliable conclusions.

**METHODOLOGY**

**Scope and Method of Study:** This article analyses what are the factors that affect exchange rate fluctuations in Sri Lanka. It is intended to use different econometrics models to obtain outcomes such as The Multiple Regression Model (OLS Method), Vector Auto Regression Model (VAR), Impulse Response and Variance decomposition test and diagnostic techniques (Unit- root test, lag selection criteria, AR Roots test). These outcomes are obtained by analysing secondary data collected from different sources.

**Data Description:** The main purpose of the article is to examine the factors that affect the exchange rate fluctuations in Sri Lanka, using monthly data for the period 2001 to 2010. Given that some of the variables used in the above models are not directly available, a proxy variable (Net Foreign Purchases), would be used, which will be chosen on the basis of their economic and econometric properties. Secondary data was used from previous studies, Internal Databases of CBSL, Annual Reports of the Central Bank of Sri Lanka, Monthly Bulletin, and Recent Development Trends of The CBSL and other publication of the CBSL.

**Endogenous and Exogenous Variables**

- Dependent variable - Nominal Exchange Rate
- Independent variables – Inflation rate, weighted average call money rate, net official interventions, net foreign purchases, terms of trade and monthly remittances.

**Empirical Models**

**Model 01: The Multiple Regression Model**

**Ordinary Least Squares (OLS) Method:** In statistics, ordinary least squares (OLS) is a method for estimating the unknown parameters in a linear regression model. This method minimizes the sum of squared vertical distances between the observed responses in the dataset, and the responses predicted by the linear approximation. The resulting estimator can be expressed by a simple formula, especially in the case of a single regressor on the right-hand side.

**The Multiple Regression Model:** It is intendant to use Multiple Regression, which relates to a given dependent variable 'Y' to several independent variables, X1, X2, X3, ……Xk. The multiple regression models have the following general formulation.

$$Y = \beta 1X + \beta 2X + \beta 3X + \ldots\ldots + \beta kX + U$$

**The Econometric Model:** $NER = \beta 1 + \beta 2INF + \beta 3IR + \beta 4NFP + \beta 5OINT + \beta 6TOT + \beta 7REM + U$

Where 'Y' is the dependent variable, i.e. Nominal Exchange Rate. β1, β2, β3, β4, β5, β6, β7 are the parameters known as the intercept and slope coefficient in the equation respectively and U is the classical random disturbance term.

Unit root test was used to identify whether time series variables are stationary or non- stationary using an Autoregressive Model through Augmented Dickey-Fuller (ADF) test. Most of the macroeconomic variables appear to be non-stationary because time series data were highly dependent on the actual time and does not have constant mean and variance, (Gujarati 2007). Hence for non-stationary variables, unit root test was used in order to avoid the problem of spurious regressions as follows.

Augmented Dickey-Fuller Unit root tests are carried out to test whether the series is level stationary (I (0)) or first difference stationary (I (1)). If the data series is non-stationary, it has to be taken first difference or first difference with log value. If the mean is not constant, take the first difference of the series. The series can be converted to stationary. If the mean and variance both are not constant, it is taken the lag first difference.

**Model 02: Unrestricted Vector Auto Regression Model:** The following econometric tool is used in this analysis:

**A. Vector Auto Regression-** A Vector Auto Regression (VAR) model is a system of equation in which each variable is explained by its own lags and current value and lags of the other variables in the system. The VAR approach also provides an appropriate framework for making sectorial comparisons. The same reduced form equations can be used in all sectors for estimating the response of output to a monetary shock. Also, the VAR approach allows the data to determine the shape of the impulse responses for different sectors. With Vector Autoregressive Model, it is possible to approximate the actual process by arbitrarily choosing lagged variables.

Thereby, one can form economic variables into a time series model without an explicit theoretical idea of the dynamic relations. The most easy Multivariate Time

Series Model is the Bivariate Vector Autoregressive Model with two dependent variables 'y1,t' and 'y2,t', where t = 1, ..., T. This means, the explanatory variables in the Simplest model are 'y1,t-1' and' y2,t-1'. The VAR (1) with lagged values for each variable is determined by:

$y1,t = \alpha11y1,t-1 + \alpha12y2,t-1+ \varepsilon1,t$

$y2,t = \alpha21y1,t-1 + \alpha22y2,t-1+ \varepsilon2,t$

$yt = A1yt-1+ \varepsilon t$

$$A1 = \begin{pmatrix} \alpha11 & \alpha12 \\ \alpha21 & \alpha22 \end{pmatrix}$$

**Assumptions about the Error Terms:**

The expected residuals are zero: $E(\varepsilon i,t) = 0$ with i=1,2

The error terms are not autocorrelated:

$E\ \varepsilon i,(t \cdot \varepsilon j,\dagger = 0)$ with $t \neq \dagger$

VAR-Model does not allow us to make statements about causal relationships. This holds when VAR-Model is only approximately adjusted to an unknown time series process, while a causal interpretation requires an underlying economic model. However, VAR-Models allow interpretations about the dynamic relationship between the indicated variables.

**VAR (p)-Models with more than two Variables**

A VAR (p)-Model, with p variables, is given as:

$yt = A1yt-1+ A2yt-2+.....+ Apyt-p +\varepsilon t$

If one wants to expand the equation with a trend, intercept or seasonal adjustment, it will be necessary to augment the Vector 'xt', which includes all the deterministic components, and the matrix B (VARX-Model):$yt = A1yt-1+ A2yt-2+.....+ Apyt-p +Bxt +\varepsilon$

**B. Impulse Response -** Impulse Response function gives how the other variables react, when there is a shock to one variable. The dynamic adjustment of reciprocal dependency is not considered immediately. The impulse response test shows the effects of an exogenous shock on the whole process over time. Therefore, one can detect the dynamic relationships over time. Initially, look at the adjustment of the endogenous variables over time, after a hypothetical shock isn't'. This adjustment is compared with the time series process without a shock, i.e. the actual process. The impulse response sequences plot the difference between these two-time paths.

**C. Variance Decomposition** – It is necessary that all the variables in the model are stationary for analysis in terms of variance decomposition. An alternative of the impulse response, to receive a compact overview of the dynamic structures of a VAR Model, is variance decomposition sequences. This method is also based on a Vector Moving Average Model and orthogonal error terms. In contrast to the impulse response, the task of variance decomposition is to achieve information about the forecast ability. The idea is that even a perfect model involves ambiguity about the realization of 'yt-1' because the error terms associated uncertainty. According to the interactions between the equations, the uncertainty is transformed to all equations. The aim of the decomposition is to reduce the uncertainty in one equation to the variance of error terms in all equations.

**D. AR Root Test -** AR Root test confirms that whether the variables used in the analysis are stationary or non-stationary.

**ANALYSIS, ESTIMATION STRATEGY & DISCUSSION**

This section explains the empirical findings with regard to factors that determine the exchange rate. Firstly, a brief explanation with regards to descriptive statistics is mentioned below. Secondly, it has estimated the Multiple Regression Model and discussed the correlation between exchange rate and other independent variables, as well as its coefficients. Finally, results are discussed by means of impulse response functions of a VAR Model.

Table 01 depicts the average nominal exchange rate to be 103.4162, the average inflation rate is around 11.27 percent and the interest rate is to be 11.92 percent. A higher volatility can be observed in official intervention and terms of trade. According to the Jarque – Bera values, this data distribution is not a normal distribution.

**Unit Root Test:** Many macroeconomic data is non-stationary data. Therefore, it has to be converted those non- stationary data to stationary data. Unit Root test is carried out to test whether the series is level stationary (I (0)) or first difference stationary (I (1)). To check the stationary of variables, Augmented Dickey-Fuller Test is used. There are five variables in DLOG form (Growth rate), namely; exchange rate, inflation, interest rate, remittances and terms of trade. The results of unit root test for all variables are given in table 02 below. Results of the Augmented-Dickey Fuller tests confirm that, thee variables (Exchange Rate, Inflation and Remittances) are non-stationary at the level. The variables became stationary only after taking the first difference.

Table 1. Results of Descriptive Statistics.

| | ER | INF | IR | NFP | OINTV | REMI | TOT |
|---|---|---|---|---|---|---|---|
| Mean | 103.4162 | 11.27228 | 11.92420 | 0.500000 | 6.744305 | 185.9546 | -252.1145 |
| Median | 102.8732 | 10.75624 | 10.59000 | 2.000000 | 0.000000 | 163.5683 | -233.4756 |
| Maximum | 117.3699 | 28.23584 | 24.23000 | 90.00000 | 1130.750 | 381.4847 | 110.2653 |
| Minimum | 83.66220 | 0.517117 | 7.470000 | -479 | -587.7 | 92.65000 | -765.9135 |
| Std. Dev. | 8.086121 | 6.394444 | 3.961933 | 53.97556 | 151.6359 | 78.01695 | 155.6924 |
| Skewness | -0.177604 | 0.456558 | 1.168569 | -6.150496 | 3.084103 | 0.657211 | -0.672948 |
| Kurtosis | 2.083628 | 2.657085 | 3.805913 | 54.32179 | 28.87417 | 2.427789 | 3.482043 |
| Jarque-Bera | 4.829547 | 4.756854 | 30.55853 | 13926.20 | 3537.596 | 10.27566 | 10.21900 |
| Probability | 0.089388 | 0.092696 | 0.000000 | 0.000000 | 0.000000 | 0.005870 | 0.006039 |
| Sum | 12409.94 | 1352.674 | 1430.904 | 60.00000 | 809.3165 | 22314.55 | -30253.74 |
| Sum Sq. Dev. | 7780.858 | 4865.780 | 1867.933 | 346690.0 | 2736220. | 724310.8 | 2884574. |
| Observations | 120 | 120 | 120 | 120 | 120 | 120 | 120 |

Table 2. ADF Test Result.

| Variable | Level (P Value) | 1st Difference (P value) |
|---|---|---|
| ER | 0.3821 | 0.0000 |
| INF | 0.2457 | 0.0000 |
| IR | 0.0551 | * |
| REMI | 0.8030 | 0.0000 |
| OINTV | 0.0000 | * |
| NFP | 0.0000 | * |
| GRTOT | 0.0001 | * |

* Already significant at Level

**Model 01: Findings:** Multiple Regression Results: Dependent Variables NER.

Table 03. OLS Results of Multiple Regression Model.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.002534 | 0.000909 | 2.789256 | 0.0062 |
| DLOG(INF) | -0.002654 | 0.002713 | -0.977981 | 0.3302 |
| DLOG(IR) | -0.000745 | 0.011377 | -0.065493 | 0.9479 |
| DLOG(REMI) | -0.013351 | 0.007269 | -1.836642 | 0.0689 |
| OINTV | -1.11E-05 | 5.97E-06 | -1.853063 | 0.0665 |
| NFP | 6.31E-11 | 5.14E-11 | 1.228412 | 0.2219 |
| GRTOT | -7.68E-06 | 1.95E-06 | -3.944056 | 0.0001 |
| R-squared | 0.179901 | Mean dependent var | | 0.00244 |
| Adjusted R Squared | 0.135572 | S.D. dependent var | | 0.010478 |
| S.E. of regression | 0.009742 | Akaike info criterion | | -6.367348 |
| Sum squared Resid | 0.010534 | Schwarz criterion | | -6.202985 |
| Log likelihood | 382.6735 | Hannan-Quinn criter | | -6.300611 |
| F-statistic | 4.05826 | **Durbin-Watson stat** | | **1.591854** |
| Prob(F-statistic) | 0.001023 | | | |

**Regression Coefficients**

**Nominal Exchange Rate and Inflation:** The empirical studies by Fry (1976), Bilson (1978), Messe and Rogoff (1983), Sebastian (1983), Woo (1985), and Oloyede (1997), can be used to show that the CAM model can be used to explain the stylized facts of the behaviour of the

inflation rate and the nominal exchange rate in many small open economies. For example, countries with relatively high rates of monetary growth are expected to have high rates of inflation and depreciating exchange rates. However, using OLS model, I found that my result shows a negative relationship between exchange rate and inflation as the coefficient is negative when inflation increased by 1 percent, the rupee is appreciated by 0.002 percent. This may be due to the effects of some highly volatile periods of inflation. However, the estimated coefficient is statistically insignificant.

**Nominal Exchange Rate and Call Money Rates:** According to the output of this study when inflation increases call money rates will also increase and as a result exchange rate will appreciate. When interest rate increases by 1 percent exchange rate will appreciate by 0.0007 percent. Hence the results indicate a negative relationship between call money rates and the nominal exchange rates. This can be empirically supported by Bjrnland (2009) who identifies a similar relationship to research by imposing a long-run neutrality restriction on the exchange rate, thereby allowing for contemporaneous interaction between the interest rate and the exchange rate. In particular, a contractionary monetary policy shock has a strong effect on the exchange rate, which appreciates on impact.

**Nominal Exchange Rate and Remittances:** If worker remittances increase exchange rate should appreciate. Therefore, I have found a negative relationship between exchange rate and remittances where the remittances increase by 1 percent exchange rate will appreciate by 0.01 percent. In contrast, Lin (2001) paper analyzes the determinants of remittances to Tonga. The results indicate that macroeconomic conditions in remitting countries and exchange rate fluctuations influence remittances. In particular, remittances growth falls when the Tongan currency appreciates, but increases with higher real GDP growth and lower unemployment in remitting countries. The analysis also found that the influence of these determinants varies with the recipients of remittances, with remittances to non-profit organizations being more sensitive to an appreciation of the Tongan currency.

**Nominal Exchange Rate and Net Official Intervention:** As per the results of this study, there is a negative relationship between exchange rates and net official interventions because when Central Bank injects dollars to the market rupee will appreciate against the dollar. Behera *et al. (*2000) paper empirically explore the relationship between Central Bank intervention and exchange rate behaviour in the Indian foreign exchange market. Specifically, the paper investigates the effects of RBI intervention on exchange rate level and volatility. The results from GARCH model confirms that the intervention of RBI is effective in reducing volatility in the Indian foreign exchange market. Whereas Canales et. al (2003) paper offers guidance on the operational aspects of official intervention in the foreign exchange market, particularly in developing countries with flexible exchange rate regimes. The analysis highlights the difficulty of detecting exchange rate misalignments and disorderly markets, and argues in favour of parsimony in official intervention.

**Nominal Exchange Rate and Net foreign purchases:** According to the analytical result, there is a positive relationship between net foreign purchases and the exchange rates. When net foreign purchases decrease (net sales increase) it will lead to an outflow of more dollars from the country. Therefore, the nominal exchange rate will appreciate. Thus, the results of this study empirically supported by Peng *et al. (*2003) paper which assesses the equilibrium value of the yen within a VECM framework by considering a number of fundamental factors, in particular, net foreign purchases holdings. Based on an established co-integrating relationship between the exchange rate and economic fundamentals, the trend value of the yen is estimated to have remained broadly stable since the early 1990s. The continuous accumulation of net foreign purchase has underpinned the strength of the yen, as its positive impact offsets the downward pressure arising from deterioration of the terms of trade and slower relative productivity growth.

**Nominal Exchange Rate and Terms of Trades:** There is a negative relationship between exchange rate and terms of trade. When domestic terms of trade worsen exchange rate will depreciate. Findings from the model of Wimalasuriya (2007) suggest that changes in the exchange rate could have significant implications for the trade balance. More precisely, the most important variable affecting the exchange rate equilibrium level is the terms of trade. Although, Drine *et al. (*2003) show that an improvement in the terms of trade entails a long-run appreciation of the exchange rate. On the other hand, an increase of the domestic investment and of the degree of openness of the economy entails an exchange rate depreciation; the effect of public spending increase being ambiguous.

**Model 02: Findings** The data analysis method used in this article is to identify the determinants of the exchange rate. The results were estimated using the Vector Auto Regression (VAR) model.

Table 4. Intermediate ADF test results Untitled.

| Series | Prob. | Lag | Max Lag | Obs |
|---|---|---|---|---|
| DLOG(ER) | 0.0000 | 0 | 12 | 118 |
| DLOG(INF) | 0.0000 | 0 | 12 | 118 |
| DLOG(IR) | 0.0000 | 1 | 12 | 117 |
| DLOG(REMI) | 0.0000 | 1 | 12 | 117 |
| OINTV | 0.0000 | 0 | 12 | 119 |
| NFP | 0.0000 | 0 | 12 | 119 |
| GRTOT | 0.0000 | 0 | 12 | 118 |

If the Augmented Dickey-Fuller test statistic value is smaller than the critical values, the null hypotheses of all variables are rejected. Alternatively, the probability value can be used. According to table 02, unit root test for all five variables confirm that, they are stationary in the level of 1 percent level of significance.

**Lag selection criteria:** The determination of lag length is a trade-off between the curses of dimensionality and abbreviates models, which are not appropriate to indicate the dynamic adjustment. If the lag length is too short, the autocorrelation of the error terms could lead to apparently significant and inefficient estimators. Therefore, one would receive wrong results. On the other hand, with increasing number of parameters, the degrees of freedom decrease, which could possibly result in significant of inefficient estimators.

The idea of information criteria is similar to the trade-off discussed above. On one hand, the model should be able to reflect the observed process as precise as possible (error terms should be as small as possible) and on the other hand, too many variables lead to inefficient estimators. Therefore, the information criteria are combined out of the squared sum of residuals and a penalty term for the number of lags. In detail, for 'T' observations it was chosen the lag length 'P' in a way that the reduction of the squared residuals after augmenting lag 'P+1', is smaller than the according to boost in the penalty term. Hence it was selected 1st lag based on the AIC (refer table 05).

Table 5. Lag selection criteria.

**Endogenous variables:** DLOG(ER) DLOG (INF) DLOG (IR) DLOG (REMI) OINTV NFP GRTOT

Exogenous variables: C

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -2835.54 | NA | 6.58e+13 | 51.68254 | 51.85439* | 51.75224* |
| 1 | -2778.201 | 106.3375 | 5.66e+13* | 51.53092* | 52.90571 | 52.08855 |
| 2 | -2732.603 | 78.76024 | 6.09e+13 | 51.59278 | 54.17051 | 52.63832 |
| 3 | -2704.746 | 44.57023 | 9.18e+13 | 51.97721 | 55.75788 | 53.51067 |
| 4 | -2652.731 | 76.60391* | 9.14e+13 | 51.92239 | 56.90600 | 53.94377 |
| 5 | -2612.79 | 53.73878 | 1.17e+14 | 52.08710 | 58.27365 | 54.59640 |
| 6 | -2566.965 | 55.82345 | 1.42e+14 | 52.14482 | 59.53432 | 55.14204 |
| 7 | -2511.004 | 61.04855 | 1.52e+14 | 52.01825 | 60.61069 | 55.50339 |
| 8 | -2453.308 | 55.59811 | 1.71e+14 | 51.86014 | 61.65552 | 55.83320 |

* indicates lag order selected by the criterion; LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion SC: Schwarz information criterion HQ: Hannan-Quinn information criterion

**Mean root graph:** Further, Autoregressive Roots graph (figure 1) for Vector Auto Regression Model confirms that all the variables used in this analysis are stationary, as a system.

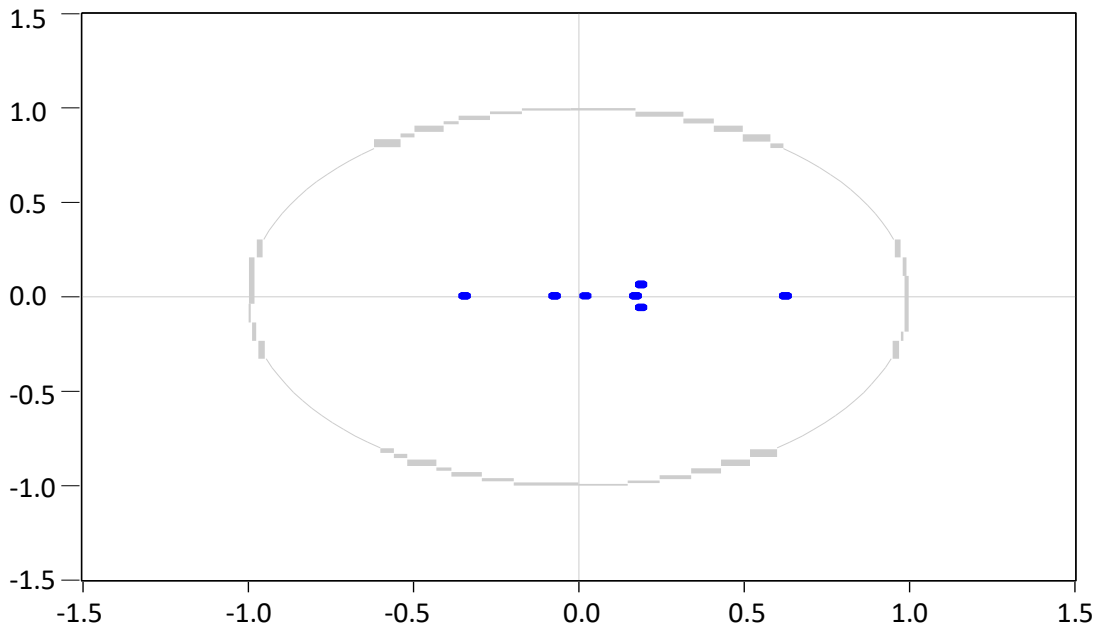


Figure 1. Inverse Roots of AR Characteristic Polynomial.

Table 6. Variance decomposition

| Period | S.E. | DLOG(ER) | DLOG(INF) | DLOG(IR) | DLOG(REMI) | OINTV | NFP | GRTOT |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.009541 | 100.0000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 |
| 2 | 0.009991 | 95.70883 | 0.230313 | 0.310263 | 0.482713 | 2.342029 | 0.279075 | 0.646782 |
| 3 | 0.010102 | 93.81899 | 0.289129 | 0.306257 | 0.496123 | 4.035239 | 0.399681 | 0.654577 |
| 4 | 0.010148 | 93.01329 | 0.287160 | 0.305514 | 0.494788 | 4.818153 | 0.430207 | 0.650884 |
| 5 | 0.010166 | 92.67542 | 0.287292 | 0.310291 | 0.493369 | 5.140369 | 0.444248 | 0.649008 |
| 6 | 0.010174 | 92.53962 | 0.288162 | 0.312393 | 0.492668 | 5.268898 | 0.450018 | 0.648236 |
| 7 | 0.010177 | 92.48544 | 0.288465 | 0.313439 | 0.492381 | 5.319813 | 0.452537 | 0.647927 |
| 8 | 0.010178 | 92.46397 | 0.288610 | 0.313836 | 0.492265 | 5.339961 | 0.453552 | 0.647804 |
| 9 | 0.010179 | 92.45546 | 0.288662 | 0.313999 | 0.492219 | 5.347937 | 0.453964 | 0.647756 |
| 10 | 0.010179 | 92.45209 | 0.288684 | 0.314063 | 0.492201 | 5.351095 | 0.454127 | 0.647736 |

It is necessary that all the variables in the model are stationary for analysis in terms of variance decomposition. Variance decomposition of the growth in the exchange rate (DLOGER) gives the changes in the variable DLOGER attributable to each of the other variables.

The results of the variance decomposition with respect to DLOGER are given in table 6 (Variance decomposition). The variance decomposition of exchange rate gives the changes in the growth in ER attributable to each of the other variables included in the model as well as itself. Within this period (120 Months), about 0.45 of the variance in the growth in ER is from net foreign purchases, about 0.30 of the variance is from the growth in the inflation, about 0.31 of the variance is from the monthly increase in the weighted average call money rate while about 0.45 of the variance is from the growth of net official interventions and about 0.49 of the variance is from monthly remittances whereas 0.65 of the variance is from the terms of trade.

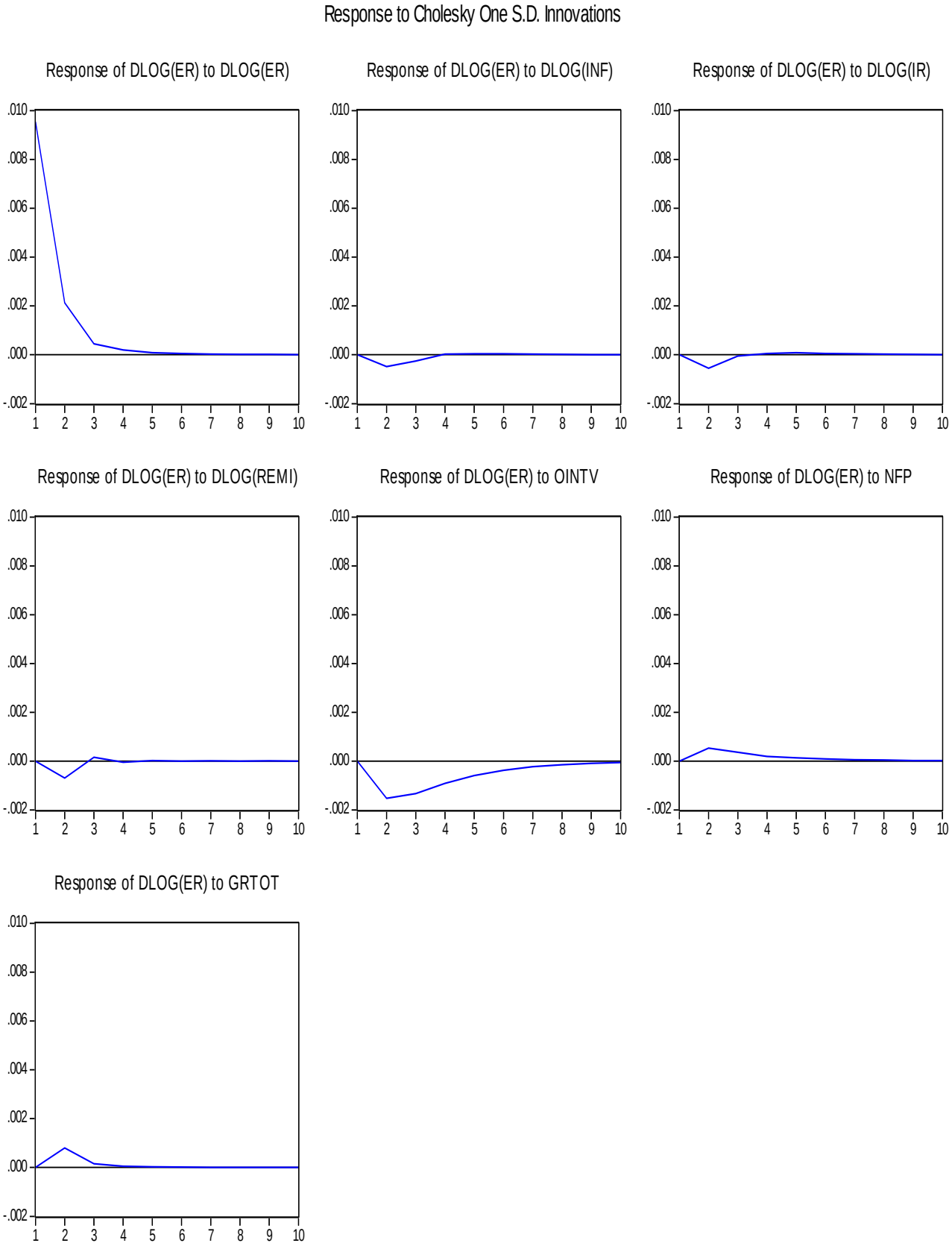


Figure 2. Impulse Response Function

The impulse response function indicates the effect of a one standard deviation shock to one of the innovations on current and future values of the endogenous variables. The results of impulse response functions (except response of NER to NER), are given in figure 2 (Impulse response function) which shows that an increase in the official interventions has a negative impact on nominal exchange rate. On the other hand, an increase in interbank call money market rates have some impact on nominal exchange rate from 1 to 3 months and persists 3 to 6 months after it dies. The response of inflation rate to exchange rate has a negative impact during the first 4 months, thereafter it dies out. It can be seen a positive response to net foreign purchases to exchange rate from 1 to 6 and afterwards it dies out. The response of terms of trade has a positive impact on the exchange rate from 1 to 3 months, subsequently, it dies out. On the other hand, the response of monthly remittances has a negative effect from 1 to 3 months and slightly positive during 3 to 4 months and thereafter dies out.

According to the estimation results of Vector Auto Regression, net official intervention, net foreign purchases and call money rate affect the fluctuations of exchange rate. However, when compared to the pass-through process of inflation rate to exchange rate, it is not much significant.

**CONCLUDING REMARKS**

This article examines the factors that affect Exchange Rate Fluctuations in Sri Lanka. Accordingly, it is analysed how the changes in Inflation, Interest Rates, Terms of Trade, Net Foreign Purchases, Official Intervention and Remittances affect the fluctuations in Sri Lanka's Exchange Rate. It was used two different econometrics models (Multiple Regression Model and VAR Model) to obtain the outcomes and the models would be estimated with data of monthly frequency, for the period 2001 to 2010. The study is carried out with respect to three objectives. First, examine the factors that affect the exchange rate fluctuations. Second, identify the relationship between the factors and the exchange rate. Finally, investigate the impact of the factors that had on the exchange rate.

The exchange rate is one of the factors, which determine the behaviour of domestic prices. With the liberalization of the domestic economy, domestic markets have become increasingly integrated with global markets, which is likely to further heighten the importance of the exchange rate for the movements of domestic prices. Another important factor in this regard is the fact that there would be some degree of second-round pass-through of price increases if domestic prices increase as a result of a depreciation of the rupee.

**MAJOR FINDINGS**

- According to the empirical results, there is a positive relationship between net foreign purchases and the exchange rates. When net foreign purchases decrease (net sales increase) it will lead to an outflow of more dollars from the country. Therefore, nominal exchange rate against the dollar will depreciate. In brief, our result is consonant with the general concern which means that net foreign purchases not only lead to an appreciation of the rupee, which erodes Sri Lanka's competitiveness in the international market but also increases volatility in the foreign exchange market. Therefore, in order to maintain the value of the rupee and control volatility, the CBSL intervenes in the foreign exchange market. The CBSL's policy is to contain volatility instead of removing it completely. This can be evident from my research findings where it shows that Net Official Intervention is the most effective and significant determinant of exchange rate within a long-time span. The results from the VAR model confirms that is a negative relationship between exchange rate and net official intervention because when Central Bank injects dollars to the market rupee will appreciate against the dollar. Hence it can be said that intervention by CBSL is effective in reducing volatility in the Sri Lankan foreign exchange market.
- This study finds that the terms of trade as a determinant of the nominal exchange rate in Sri Lanka. A negative relationship exists between the exchange rate and terms of trade. When our terms of trade worsen the exchange, rate will depreciate.
- There is a negative relationship between exchange rate and inflation because coefficient is negative when inflation increases exchange rate will appreciate against the dollar. In addition, there is a link between inflation and call money rates, whereas when inflation increases call money rates will also increase as a result rupee will appreciate against the dollar. Therefore, there is a negative relationship between call money rates and the nominal exchange rates.
- If worker remittances increase exchange rate should appreciate. Therefore, the results show a negative

relationship between exchange rate and remittances.

- Most variables have a significant impact on the exchange rate, peak effect within a two-month lag. The Durbin-Watson Statistic was found to be 1.60, suggesting that the model specification was somewhat appropriate; this means that relevant variables have been included.

However, the size of the coefficient that relates monetary policy to the exchange rate was found to be relatively small. This points out the need for further research to analyze the impact of the determinants of the exchange rate.

**FUTURE RESEARCH**

Moreover, in this paper, more emphasis is placed on determinants of nominal exchange rate under managed floating exchange rate regime. However, it can be extended to account for the effects of real exchange rate shocks and costs of exchange rate fluctuations with regard to the exchange rate determinants. Furthermore, it compels us to explore future work as to whether there is any economic value to the predictive power of economic fundamentals for nominal exchange rates. Overall, more research may be needed to identify the determinants of the real exchange rate.

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