

Testing the Validity of Purchasing Power Parity: A Comparison of Sri Lanka and Pakistan

**W.D.N. Madhavika^{*}, N. Nagendrakumar
H. Abusaly, N.M.D Nawarathna, H.P.Y.S. Yohan
L.G. Attanayaka and D. Fernando**

*Department of Information Management, SLIIT Business School
Sri Lanka Institute of Information Technology, Malabe, Sri Lanka*

Abstract: This study investigates the strong and the weak relationship between macroeconomic variables and the purchasing power parity of Sri Lanka and Pakistan. Purchasing power parity is compared with the relative price level of identical product available in both countries. This paper includes 20 years of macroeconomic annual data from 1997 to 2016. These data have been analyzed using descriptive statistic, reliability test and time series multiple regression. Result reveals that real exchange rate is not constant in both economies of Sri Lanka and Pakistan, and this illustrates Sri Lanka has weak relationship between the purchasing power parity and exchange rate, inflation, interest rate, money supply, gross domestic product, foreign direct investment, whereas Pakistan has strong relationship between the selected macroeconomic variables and the purchasing power parity. This study helps enhance knowledge about how purchasing power parity affects the growth of the economies.

Keywords: Exchange Rate, Inflation, Interest Rate, Foreign Direct Investment, Money Supply, Purchasing Power Parity, Reliability Test

1. Introduction

Purchasing power parity is a cornerstone of many theoretical models in international finance. It asserts that the price of a particular commodity, when expressed in a common currency, should be the same in every country (Wickremasinghe, 2005). Purchasing power parity is an exchange rate determination model and an important theory in global economics. The purchasing power parity theory of exchange rates has the same status in the history of economic thoughts and economic policy as the quantity theory of money. It claims that the exchange rate between two countries must be identical to the rational aggregate price levels in those two countries, in simple terms, the value of one unit of the home country must be equal to the value of one unit in a foreign country. A less strict version of this concept suggests that change in the exchange rate is equal to the inflation differential of companies that /are involved in multinational business operations (Muchiri, 2017).

^{*} The first author is a lecturer, the second author is a senior lecturer(HG) and the rest of the authors are graduates.

The Purchasing Power Parity can be calculated using the formula as follows:

$$S = P1/P2$$

Where, S = Exchange rate of currency 1 to currency 2, $P1$ = Costs of goods X in currency 1 and $P2$ = Costs of goods X in currency 2

There are several studies have been undertaken to test the validity of the purchasing power parity, especially for developed countries in general. The purchasing power parity is a valid long-run equilibrium condition in industrial economics. It is credible in long term equilibrium conditions. The purchasing power parity is considered an extension of one price law, and also it is acknowledged as the analytical basis for determining the exchange rate and a tool for comparison between countries (Asab et al., 2014). The inflation of a nation is the benchmark that substantiates the amount of money behind the small quantity of goods. When there is inflation, it will lead to a loss in the purchasing power parity. When the purchasing power parity is violated, then there is a steep level of risk for multinational corporations, therefore multinational companies will be affected, and the financial performance of these companies will lead to high cost. Inflation is a problem in any economy characterized by a continuous price increase (Sercu, et al., 1995).

A concern in discerning the direction and quantum of commerce and foreign trade can be raised /augmented by the exchange rate stability. In addition, one of the major problems in any economy continues to hike in prices and a synchronous plunge in the buying power of the nation's currency can characterize inflation (Weliwita, 1998). To concern with unanticipated fluctuations in the exchange rate, interest rate, a monetary policy instrument aimed at concern with a critical part of policy variance. The purchasing power parity theory implies that the rate of exchange between the currencies of two nations equals the ratio between the prices of the goods in such nations (Shalishali & Ho, 2012).

2. Literature review

The Purchasing Power Parity is a model established to understand the behavior of the exchange rate fluctuations in an economy. The theory states that the prices of goods and services are equalized by arbitrage factors at the domestic market and overseas when measured by a single currency. The purchasing power parity theory is based on the law of one price which states that a product should have the same price despite the place it sold. The purchasing power parity uses the market basket approach to compare the currencies in two different countries. An increase in import and decrease in the export will depend on congruence with the purchasing power parity theory when the inflation rate of a nation elaborates comparison of the various nations. Moistening the steep inflation, currency because of aggravating current and trade balances. The purchase power parity aids as a

benchmark for identifying equilibrium exchange rates and estimate whether the real exchange rate abbreviates in the future.

The inflation of a nation is the benchmark that substantiates the amount of money behind the small quantity of goods. When there is inflation, it will lead to a loss in the purchasing power parity. When the purchasing power parity is violated, then there is a steep level of risk for multinational corporations, therefore multinational companies will be affected, and the financial performance of these companies will lead to high cost. Inflation is a problem in any economy characterized by a continuous price increase.

A concern in discerning the direction and quantum of commerce and foreign trade can be raised /augmented by the exchange rate stability. In addition, one of the major problems in any economy continues to hike in prices and a synchronous plunge in the buying power of the nation's currency can characterize inflation. To concern with unanticipated fluctuations in the exchange rate, interest rate, a monetary policy instrument aimed at concern with a critical part of policy variance. The PPP theory implies that the rate of exchange between the currencies of two nations equals the ratio between the prices of the goods in such nations (Shalishali & Ho, 2012).

A benchmark that indicates whether government monetary policies, fiscal and legal are synchronized in inflation can lead to stability in consumer price. The purchasing power for payers and recipients of fixed interest rates can be garbled by inflation (Morosan & Zubas, 2015). Transferring foreign currencies and obtaining that nation's currency reacts in a spontaneous acknowledgment of money value in affiliation to other currencies. In reverse, the abatement of enthusiasm in the nation leads venture capitalists to liquidate assets', this influences the money value. Transfer in that nation is consummated by the purchase of foreign currency and has the repercussions of deflation of the domestic currency across other nations' currencies (Calvo & Reinhart, 2002).

This study wants to make the comparison between two countries named as Sri Lanka and Pakistan to test whether both countries have same factors which influence the purchasing power parity. Following are the hypothesis of this study.

- H1:** There is a negative relationship between EXR and PPP
- H2:** There is a negative relationship between INF and PPP
- H3:** There is a negative relationship between INT and PPP
- H4:** There is a positive relationship between FDI rate and PPP
- H5:** There is a positive relationship between MS and PPP
- H6:** There is a positive relationship between GDP and PPP

3. The Model

Inflation highly influences the exchange rate volatility of a country; the value of the currency will decrease if the country faces inflation and as a result of that the purchasing power parity will be low. In opposite, the low inflation rate affects the purchasing power rising and boosting the value of the currency. Inflation occurs as a result of the consequently increasing price levels of the goods and services in any country (Enders & Dibooglu, 2001). Theoretically, this interrelationship can be explained by assessing the purchasing power parity theory. It indicates that, as soon as the inflation rate in a country increases relative to another country, the consumers and firms in the home country will tend to focus more on importing and less on exporting (Dickey & Fuller, 1979).

The respected model for the purchasing power parity can be derived mathematically as below; following the law of one price, free trade must lead to equal prices across countries (Isard, 1977). Home country is denoted by "h" and the Sign for foreign country denoted by "f". The inflation rate of the home country is denoted by "I_h" and the inflation rate for the foreign country is denoted by "I_f". Impact of inflation on the price index of the home country becomes P_hI_h

Therefore, after the addition of the impact of inflation the price index for the home country as under;

$$P + P_h I_h \text{ and } P_h (1 + I_h) \tag{1}$$

In the opposite direction price index for the foreign country (f) as under;

$$P_f + P_f I_f \text{ and } P_f (1 + I_f) \tag{2}$$

The Purchasing power parity (PPP) theory recommends the rate of exchange for any country has not remained constant and it can be maintained to adjust the purchasing power parity. If the exchange rate of the foreign currency changes due to the occurrence of inflation the foreign price index for the home country perspective will be as under (Asab, et al., 2014):

$$P_f + P_f I_f + P_f e_f + p_f I_f e_f = P_f (1 + I_f) (1 + e_f) \tag{3}$$

Where e_f = Percentage change in the value of the foreign currency.

The solution for e_f under the PPP, as follows:

$$P_f (1 + I_f) (1 + e_f) = P_h (1 + I_h) \tag{4}$$

$$1 + e_f = P_h (1 + I_h) / P_f (1 + I_f) \tag{5a}$$

$$e_f = [P_h (1 + I_h) / P_f (1 + I_f)] - 1 \tag{5b}$$

P_h = P_f (based on the assumption that price indexes are equal), they cancel the price index:

$$e_f = [(1 + I_h)/(1 + I_f)] - 1 \tag{6}$$

Multiple regression model for the study is specified as follows:

$$PPP = \beta_0 + \beta_1 INF + \beta_2 INT + \beta_3 FDI + \beta_4 MS + \beta_5 GDP + \beta_6 EXR + e$$

Where *PPP* = Purchasing Power Parity, *INF* = Inflation, *INT* = Interest rate on external debt, *FDI* = Foreign Direct Investment, *MS* = Money Supply, *GDP* = Gross Domestic Product, *EXR* = Exchange Rate, β_0 = Constant or the intercept, β_1, \dots, β_6 = Beta coefficients of the regression equation and *e* = Error term

4. Analysis and Findings

4.1. Reliability Test

According to the results given in Table 1 generated from Sri Lanka and Pakistan macroeconomic aspects, we can conclude that there is no collinearity problem for the sample period. All the selected variables for both countries have a tolerance value which is higher than the benchmark value of 0.2 and there is no VIF which is higher than the benchmark value of 10 for any of the variables for both countries.

Table 1: Results of Reliability Test

	Tolerance		VIF	
	SL	PAK	SL	PAK
EXR	0.387	0.235	2.587	4.252
INF	0.516	0.487	1.937	2.055
INT	0.904	0.462	1.106	2.165
FDI	0.507	0.232	1.974	4.302
MS	0.373	0.192	2.679	5.205
GDP	0.707	0.469	1.414	2.132

4.2. Comprehensive Regression Analysis

The regression analysis results have generated by using EViews software version 10. The regression analysis is used to determine the statistical relationship between independent and dependent variables. The coefficient is used to identify whether the relationship is positive or negative while the p value and t values can be used to designate the significance of the relationship between the selected variables. The estimated regression analysis results for Sri Lanka and Pakistan have shown as below in Table 2.

Table 2: Results of Purchasing Power Parity of Sri Lanka and Pakistan

Sri Lanka				
Variable	Coefficient	Std. Error	t-statistic	Prob.
C	2.780217	4.078040	0.681753	0.5074
EXR	-0.043125	0.025970	-1.660555	0.1207
INF	0.079960	0.111885	0.714660	0.4875
INT	0.661742	0.388121	1.704987	0.1120
FDI	-1.515875	1.170017	-1.295600	0.2176
MS	0.043517	0.113055	0.384921	0.7065
GDP	0.080122	0.198591	0.403452	0.6932
Pakistan				
C	0.977540	0.740071	1.320873	0.2093
EXR	0.010514	0.005258	1.999530	0.0669
INF	-0.014905	0.016621	-0.896775	0.3861
INT	-0.016950	0.053625	-0.316086	0.7570
FDI	0.214914	0.113059	1.900906	0.0797
MS	-0.016552	0.023120	-0.715933	0.4867
GDP	0.019297	0.044580	0.432876	0.6722

Hypothesis One: To investigate the relationship between Purchasing Power Parity and exchange rate in Sri Lanka and Pakistan, the study has developed the hypothesis which is based on the empirical studies relating to the purchasing power parity of emerging economies. The estimated regression analysis results indicate the P value 0.1207 and t value -1.6606 and the coefficient is negative for Sri Lanka therefore the hypothesis. On that premise, we have arrived at the conclusion that the exchange rate has a positive relationship with Purchasing Power Parity in Pakistan because the p value is 0.0669 and the t value is 1.9995 and the coefficient has a positive sign and reject the hypothesis.

Hypothesis Two: To investigate the relationship between Purchasing Power Parity and inflation. The estimated regression analysis results indicate the P value 0.4875 and t value 0.7147 and the coefficient is positive for Sri Lanka. Therefore, we reject the hypothesis and arrived at the conclusion that there is an insignificant positive relationship between the Purchasing Power Parity and inflation in Sri Lanka. we have arrived at the conclusion that inflation has a weak negative relationship with Purchasing Power Parity in Pakistan because the p value is 0.3861 and the t value is -0.8967 and the coefficient has a negative sign and accept the hypothesis.

Hypothesis Three: To investigate the relationship between Purchasing Power Parity and interest rate. The estimated regression analysis results indicate the P value 0.1120 and t value 1.7049 and the coefficient is positive for Sri Lanka. Therefore, we reject the

hypothesis and arrived at the conclusion that there is an insignificant positive relationship between the Purchasing Power Parity and interest rate in Sri Lanka. we have arrived at the conclusion that interest rate has a weak negative relationship with Purchasing Power Parity in Pakistan because the p value is 0.7570 and the t value is -0.3161 and the coefficient has a negative sign and accept the hypothesis.

Hypothesis Four: To investigate the relationship between Purchasing Power Parity and foreign direct investment. Regression analysis results indicate the P value 0.2176 and t value -1.2956 and the coefficient is negative for Sri Lanka. Therefore, we reject the hypothesis and arrived at the conclusion that there is an insignificant negative relationship between the Purchasing Power Parity and foreign direct investment in Sri Lanka. Foreign direct investment has a strong positive relationship with Purchasing Power Parity in Pakistan because the p value is 0.0797 and the t value is 1.9009 and the coefficient has a positive sign and accepts the hypothesis.

Hypothesis Five: To investigate the relationship between Purchasing Power Parity and money supply. Regression analysis results indicate the P value 0.7065 and t value 0.3849 and the coefficient is positive for Sri Lanka. Therefore, we accept the hypothesis and arrived at the conclusion that there is an insignificant positive relationship between the Purchasing Power Parity and money supply in Sri Lanka. The money supply has a weak negative relationship with Purchasing Power Parity in Pakistan because the p value is 0.4867 and the t value is -0.7159 and the coefficient has a negative sign and reject the hypothesis.

Hypothesis Six: To investigate the relationship between Purchasing Power Parity and gross domestic product. Regression analysis results indicate the P value 0.6932 and t value 0.4035 and the coefficient is positive for Sri Lanka. Therefore, we accept the hypothesis. Gross domestic product has a positive relationship with Purchasing Power Parity in Pakistan because the p value is 0.6722 and the t value is 0.4329 and the coefficient has a positive sign and accepts the hypothesis.

5. Conclusion

Purchasing power parity is one of the most puzzling parameters in finance since it was introduced first time by Prof. Cassel in the 20th century. This study encompasses indicators that contribute demonstration about the weakness and strength combination of purchase power parity in both economies of Sri Lanka and Pakistan. Results report that Sri Lanka has weak support to purchase power parity as compared to Pakistan. This paper finds that in Sri Lanka there is an insignificant and negative relationship between exchange rate and purchasing power parity whereas Pakistan has positive and significant relationship between exchange rate and purchasing power parity. Gross domestic product has

insignificant and positive relationship with purchasing power parity in both countries. Foreign direct investment has significant and positive relationship with Pakistan's purchase power parity while negative insignificant relationship in Sri Lanka. Inflation and money supply have insignificant relationship with purchasing power parity in both economics. Our study recommends that entire purchase power parity perhaps acknowledges as a serious practical elucidation that advocates the study.

References

- Abuaf, N. and Jorion, P., 1990, Purchasing power parity in the long run, *Journal of Finance*, 45:157-174.
- Andrews, D., 1993, Exactly median-unbiased estimation of autoregressive/unit root models, *Econometrica*, 61: 139-166.
- Andrews, D. and Chen, H-Y., 1994, Approximately median-unbiased estimation of autoregressive models, *Journal of Business and Economic Statistics*, 12: 187-204.
- Bahmani-Oskooee, M., and Nasir, A.B.M., 2005, Productivity bias hypothesis and the purchasing power parity: A review article, *Journal of Economic Surveys*, 19: 671-696.
- Balassa, B., 1964, The purchasing power parity doctrine: a reappraisal, *Journal of Political Economy*, 72: 584-596.
- Cheung, Y-K. and Lai, K., 2000, On purchasing power parity puzzle, *Journal of International Economics*, 52: 321-330.
- Fung, H. and Lo, W., 1992, Deviations from purchasing power parity, *The Financial Review*, 27:553-570.
- Devereux, M., and Engel, C., 2002, Exchange rate pass-through, exchange rate volatility, and exchange rate disconnect, *Journal of Monetary Economics*, 49: 913-940.
- Dickey & Fuller, 1979. Distribution for the Estimates for Auto Regressive Time Series with a Unit Root., *Journal of the American Statistical Association*, 74, 427-431.
- Enders & Dibooglu, 2001., Long-Run Purchasing Power Parity with Asymmetric Adjustment, *Southern Economic Journal*, 68, 433-445.
- Frankel, J. and Rose, A., 1996, A panel project on purchasing power parity: mean reversion and between countries, *Journal of International Economics*, 40: 209-224.
- Froot, K. and Rogoff, K., 1995, Perspectives on PPP and long run real exchange rates, In G. Grossman and K. Rogoff (eds), *Handbook of International Economics*, Amsterdam: North-Holland Press, 16471688.

Koedijk, K., Ben, T. and Mathijs, A., 2004, Purchasing power parity and the euro area., *Journal of International Money and Finance*, 23: 1081-1107.

Muchiri, M., 2017, Effect of inflation and interest rate on foreign exchange rate in Kenya, Master thesis, University of Nairobi, Kenya.

Asab, M.Z., Abdullah, M., Shakoor, M.I. and Arshad, U., 2014. Testing Purchasing Power Parity: A Comparison of Pakistan and India, *International Journal of African and Asian Studies*, 6, 37-45.

Pillips, P.C.B and Perron, P., 1988, Testing for a Unit Root in Time Series Regression, *Biometrika*, 75, 335-346.

Sercu, U. and Hull, V., 1995, The Exchange Rate in the Presence of Transaction Costs: Implications for Tests of Purchasing Power Parity, *Journal of Finance*, 50, 1309-1319.

Shalishali, M.K. and Ho, J.C., 2012,. Effect of inflation and interest rates on foreign exchange rates in Kenya, *Journal of Economics and Economics Education Research*, 3, 1, 107-115.

Weliwita, A., 1998, Cointegration Tests and the Long-Run Purchasing Power Parity: Examination of Six Currencies in Asia, *Journal of Economic Development*, 23, 103-115.

Wickremasinghe, G. B., 2005, Purchasing Power Parity Hypothesis in Developing Economies: Some Empirical Evidence from Sri Lanka, *International Finance 0406005*, University Library of Munich, Germany.