Journal of Economics and Sustainable Development
ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online)
Vol.7, No.14, 2016

Purchasing Power Parity Hypothesis: Empirical Validity of Purchasing Power Parity in the Long Run among the Developing and Developed Countries Using Co-integration and OLS Techniques.

Guo Ping[1], Mohammed Saud M Alotaish[2] and Waqar Ameer[3*]
1- School of Economics and Trade, Hunan University, Yuelushan, Changsha, Hunan Province, 410079, People's Republic of China
2- School of Economics and Trade, Hunan University, Yuelushan, Changsha, Hunan Province, 410079, People's Republic of China
3- School of Economics and Trade, Hunan University, Yuelushan, Changsha, Hunan Province, 410079, People's Republic of China

Abstract
This study finds the empirical validity of exchange rate and price relationship implied by purchasing power parity among the seven countries .i.e. (Australia, Canada, Pakistan, India, Japan, Spain and Korea) using the Augmented Dickey Fuller, Engel Granger, Johansen and ordinary least squares econometrics techniques based on quarterly data instead of annually data .We have used both developing and developed countries in the PPP testing and compared the econometric results of developing and developed countries with each other. Using the quarterly data over the time period of 1961 to 2010, We have found the long run validity of purchasing power parity theory among the three developing and four developed countries. We have applied different econometric methodologies, PPP results differ among different econometric techniques. So, it can be implied that choice of price level and appropriate econometric methodology is very important in the PPP testing.
Keywords: Purchasing power parity; Exchange rate; Developed and Developing countries

1. Introduction

The purchasing power parity is the oldest theory of exchange rate determination which finds relationship between nominal exchange rate and price levels. The term "purchasing power parity" was introduced eighty years ago (Cassel, 1918), it has very older history in economics. We have chosen this topic owing to this reason that many companies are trying to enlarge their businesses at international levels, so it is important for the global managers and investors while making investment decisions to measure the effects of variation of tradable and non tradable goods prices on the profitability of their businesses (Osei-Boateng et al, 2005). Gustav Cassel is generally ascribed as the inventor of the PPP theory but its origin is found in the writings of the British economist David Ricardo (Pilbeam, 2006).

The main concept lies under the PPP theory is that the arbitrage forces come in to play for the equalisation of the goods prices internationally when the goods prices are measured in the same currency. This is called law of one price which is the basic pillar of the PPP theory (Pilbeam, 2006).The theory of purchasing power parity is most widely studied and among the most controversial theories in economics (Osei-Boateng et al, 2005).The PPP concept is widely used in different exchange rate models. Frenkel (1976), Mussa(1976) and Billson(1978) assumes in the flexible price model that PPP holds on continuous basis but the sticky price model of Dornbush (1976) assumes that PPP holds only in the long run. However, validity of these models depends upon the empirical results of the PPP hypothesis.

This study illustrates the empirical validity of exchange rate and price level relationship implied by purchasing power parity theory among three developing and four developed countries: Pakistan, India, Australia, Korea, Spain, Canada and Japan. This study uses co-integration and OLS techniques to check the validity of PPP theory. The results are based on quarterly data covering 50-years period from January 1961 to December 2010, on nominal exchange rates, consumer price index and wholesale price index for each pair of countries.

This study comprises of five sections. The section one explains the basic concept of purchasing power parity theory, different versions of PPP theory, issues of controversy, practical implications of PPP in explaining real world developments and limitations of PPP theory. The section two illustrates the PPP performance in the 1970s, some recent empirical results on the validity of PPP theory and in the end, there are concluding remarks. The section three consists of data and methodology. Section four consists of explanation of econometrics results by using co integration and ordinary least squares regression analysis techniques. The section five consists of conclusion.

2. Purchasing power parity theories

The PPP theory has a very longer history in economics but particular term purchasing power parity was fabricated after the world war one during international debate policy for the use of appropriate exchange rates

among the developed countries after high level of inflation during the post war period (Cassel, 1918). The origins of purchasing power parity is traced back to the writings of scholars of salamanaca school in the fifteenth and sixteenth century(Officer,1982).In different most influential articles, Gustav Cassel emphasized the use of PPP as a vehicle for maintaining gold parities. He computed CPI inflation rates from the period of 1914s and used these inflation differentials to estimate the changes in exchange rate to know whether PPP theory holds or not (Rogoff,1996).Although purchasing power parity was debated previously by different economist such as Lud wig Von Mises , Alfred Marshal, Viscount Goschen and John Staurt but the Cassel was the first to use PPP as practically applicable theory (Rogoff,1996).The purchasing power parity exchange rate is the exchange rate between two currencies' that would equate two relevant national price levels if expressed in common currency, so that Purchasing power parity of a unit of one currency would be the same in both countries (Sarno&Taylor,2002). The basic concept underlying PPP theory is that arbitrage forces will lead to the equalization of goods prices internationally, once the prices of goods are measured in same currency. As such theory represents an application of the 'law of one price' (Pilbeam, 2006).

2.1. The Law of one price

The law of one price is the basic pillar of purchasing power parity theory. According to law of one price, the same goods have similar prices in different countries when expressed in terms of common currency (Sarno &Taylor, 2002). If $\mathbf{P_{i,t}}$ denotes the price of good **i** in terms of domestic currency at time **t**, $\mathbf{P^*_{i,t}}$ denotes the price of good **i** in terms of foreign currency at time **t**, and $\mathbf{S_t}$ denotes exchange rate expressed as domestic currency per unit of foreign currency. In algebraic form, it can be expressed as follows:

$$P_{i,t} = S_t P^*_{i,t} \qquad \mathbf{i} = 1,2,\ldots..,N \qquad \mathbf{(1)}$$

The law of one price is based upon the idea of goods arbitrage. LOP is only valid if goods traded internationally are perfect substitutes. However, in the presence of transportation costs, tariffs and non-tariff barriers, there is a violation of the law of one price. The assumption of the goods perfect substitutability is very fundamental for the validity of the law of one price (Sarno&Taylor, 2002).The law of one price holds very well for highly traded goods, in case of gold it holds absolutely well (Rogoff ,1996).

2.2. Absolute PPP Version.

The absolute PPP illustrates that not only individual prices but also national price levels are equal when defined in one common currency and exchange rate that finds this relationship is absolute PPP exchange rate .It holds only when the price of the average basket of goods should be the same in any two countries when expressed in one standard currency. The concept of absolute PPP is quite similar to the law of one price. Absolute PPP is broader and generalised form of PPP relative to law of one price which is more restrictive form of PPP (Osei-Boateng et al, 2005). In algebraic form, it can be expresses as

$$s = \frac{Pi}{Pi*} \qquad \mathbf{(2)}$$

$\mathbf{P_i}$ is the price of bundle of goods in terms of domestic currency , **s** is the exchange rate expressed as domestic currency per unit of foreign currency, $\mathbf{P_i^*}$ is the price of bundle of goods in terms of foreign currency (Pilbeam,2006). In absolute PPP, the price of basket of goods are assumed to be similar alike but they are not exactly the same in real world which cast doubt upon the validity of the theory from holding true (Osei-Boateng et al, 2005). **For instance**, if the price of the bundle of goods costs £200 in the UK and the same bundle costs $400 in the US, then the exchange rate defined as pounds per dollar will be £200/$400=£0.50/$1.According to absolute PPP, a rise in the price of domestic good relative to foreign price level will leave to depreciation of home currency against foreign currency. In this example, if price of the US bundle remains same at $400 and the price of the UK bundle rises to £320, then pound will depreciate to £0.80/$1(Pilbeam, 2006).

2.3. Relative PPP Version.

Due to existence of transportation costs, Imperfect competition, tariffs and non-tariff barriers, the possibility of absolute PPP to hold is very low. However, it is assumed that in the presence of these barriers, the weaker form of PPP, the relative PPP still holds. The relative PPP is expressed as the adjustment of the exchange rate by the amount of inflation differential between the economies of the any two countries (Pilbeam, 2006). In algebraic form, it can be expressed as

$$\%\Delta S = \%\Delta P - \%\Delta P^* \qquad \mathbf{(3)}$$

Where **%ΔS** is the percentage change in the exchange rate, **%ΔP** is the percentage change in the domestic price level and **%ΔP*** is the percentage change in the foreign price level (Pilbeam, 2006).There are some most important facts about absolute and relative PPP. If absolute PPP holds, then relative PPP must hold. But if relative PPP holds then it is not necessary that absolute PPP will hold. It is possible that same level of changes in nominal exchange rate are taking place at various purchasing power levels of two currencies, for instance, it may be due to transportation costs or many other factors (Taylor and Taylor,2004).

2.4 Issues of controversy:

One of the main problems involved in the testing for PPP theory is the selection of the appropriate price index. The major controversy involved is to decide whether PPP theory is valid for both traded and nontrade goods or one category of goods. If the theory holds for traded goods only, then price index should be made of traded goods. Similar alike, if theory is supposed to be valid for both traded and non traded goods, then general price level should be used. Generally, researchers use wholesale or manufacturing price indices for testing PPP for the traded goods. If the testing of the PPP theory involved both traded and non traded goods, then consumer price index should be used which weighs both traded and non-traded goods (Pilbeam, 1998).

The researchers face problems that PPP holds for similar basket of goods but national price level assign different weights to various categories of goods. For example, in developed countries, consumer price indices assign very low weights for foods and very high weights for consumer goods but in the developing countries, CPI has high weights for food. There are also some statistical problems involved in testing for PPP which is the choice of base year (Pilbeam, 1998). All goods are not traded between the countries and weights assigned to the goods are not similar in different countries. Furthermore, different countries manufacture goods which are differentiated goods but these are not close substitutes. However, some of the problems can be resolved by using more accurate data (Taylor and Taylor, 2004).

2.5. Practical implications of PPP in explaining real world developments.

2.5.1 PPP's significance to global managers and international investors.

It is worthwhile to say why we spend time discussing PPP. As, it is clear that PPP is a useful tool for economist and financial analysts. However, PPP concept is also very important for global managers and international investors who wish to invest in different geographical locations beyond their national boundaries. If PPP holds in the long run, it can give managers and investors useful foresight in the long run performance of the various currencies and this information would be extremely useful in certain long run investment decisions (Osei-Boateng et al, 2005). Suppose, if the difference between the PPP exchange rate and actual exchange rate observed in the market suggests that currency is overvalued, then management and investors know to invest in this currency would not be wise and vice versa otherwise. The other area in which PPP is very important is the multinational companies in assessing for employees at similar competency levels with different compensations who work in different countries. So, in a nutshell, the PPP theory is very useful guide to global managers, international investors, financial analysts, and economists (Osei-Boateng et al, 2005).

2.5.2 Practical usage of PPP.

Purchasing power parity measures are used for the comparison of expenditure shares between the economies, for example, investments, food, health care etc. To analyse whether the consumer goods are cheaper than capital goods and to make comparison between the economies to analyse which factors are adding to the difference in growth rates, the PPP results are very important. PPP results are also used for the estimation of international poverty threshold. Its results are also utilised to gauge health inequality between the economies and provide the platform for international organisations to create effective programs. The European commission also rely on PPP results to assign funds among the member countries. (International Bank for Reconstruction and Development/The World Bank, 2008).The purchasing power parity exchange rate is also used for measuring the level of nominal exchange misalignment, maintaining exchange rate equalities, making good policy responses and making comparison of international national income programs. So, PPP is very important for examining the performance of economies of different countries (Sarno and Taylor, 2002).

2. Literature Review.

2.1. The performance of PPP in the 1970s.

During the 1970s, one of the very important facts to appear is the poor performance of the simple version of PPP theory (Miller, 1984). Frenkel(1978,1981) puts forward that during the time span of 1920s, PPP holds very well with the flexible exchange rate, but PPP produced very poor results during the period of 1970s.Comparing the results of PPP during the period of 1920s relative to that of 1970s, PPP failed to hold during the period of 1970s (Frenkel, 1981b).During the time period of 1973-1980s, Using the results of table 1 ,2, and 3 which explains quarterly results of U.S.dollar/pound, U.S.dollar/deutschemark and U.S.dollar/French Franc exchange rates, it is obvious that PPP produced very poor results. It holds in only six out of thirty quarters for U.S.dollar/pound rate, five out of thirty quarters for U.S.dollar/French franc rate, and in case of U.S.dollar/deutschemark rate, it holds five out of thirty quarters. The poor performance of PPP during the era of 1970s is obvious from the fact that over the whole time period, the deviation from PPP is significantly different from zero for all the above mentioned exchange rates. In case of U.S.dollar/French, U.S. dollar/deutschemark and U.S. dollar/pound rate, the deviations from the relative PPP are 16.4%, 22.6% and 41.7% respectively. From the results, it is clear that PPP performance is very poor over the long run time period during the time span of 1970s (Miller, 1984). The period of 1970s was followed by real shocks and failure of PPP can be considered as increase in relative importance of real shocks in comparison to monetary shocks (Davutyan and Pippenger, 1985). Hakkio (1984) tested the PPP models over the time periods of 1970s and 1920s and inferred that PPP did very well during the period of 1920s relative to that of 1970s.

2.2 Some recent empirical results on validity of PPP theory.

PPP is performing better for countries which are geographically close to one another and where trade linkages are high (Frenkel, 1981).Using the data of twenty two OECD countries over the time span (1974-91) found that although there have been prolonged short run deviations from PPP, it cannot be rejected between three to six years in the long run (Lothian, 1997).Frenkel (1980) and Mussa (1980) and MacDonald (1988) explains that exchange rates are more volatile than national price levels. PPP holds better for traded goods than non-traded goods (Officer, 1986). Using the latest econometric techniques, Sarno and Taylor (2002) supported the long run validity of PPP. PPP is more likely to hold if whole sale price index is used than consumer price index. It holds significantly better if tradable price index is used (Xu, 2003).

Using the autoregressive model and data on dollar real exchange rate among France, Germany, the United Kingdom, the United States and Japan, unit root hypothesis is rejected against the alternative hypothesis of non-linear mean reversion real exchange rate and found that for mild real exchange rate shocks, half-life of adjustment is up to three years but for bigger real shocks half-life of decay is much smaller(Taylor, Peel and Sarno,2001).The empirical studies show that PPP holds better with high inflation countries and most effectively in case of hyperinflation. Studies using long run data find mean reversion of real exchange rate towards PPP at a very slow rate between three to five years before half of the deviation is eliminated (Neary, 2004).

Recent studies explain that there are different explanations for the PPP puzzle; it implies that mean reversion of the real exchange rate towards PPP is slower for the smaller deviations but it occurs very rapidly for the larger deviations (Neary, 2004). During the 1970s, PPP produced extremely poor results for industrialised countries, beta coefficients were far away from one. Even some countries have negative beta coefficients and some have yielded values of the beta estimates more than two (Frenkel, 1981).Collapse of PPP may be ascribed to the sticky goods prices and real shocks. As in the short run different factors preclude the beta estimates for getting value equal to one but even PPP is still valid in the long run(Frenkel,1981).

Kim (1990) found that real exchange rates based upon consumer price index do not follow stationary process, but the real exchange rates based upon whole sale price index between U.S and its trading partners follow a stationary process. Contrary to above evidence, the behaviour of real exchange rate based upon wholesale price index between U.S. and its trading partners performed poorly under both fixed and flexible exchange rate periods (Enders, 1988).During the current float period, PPP hypothesis is tested in the financial crises period for developing countries i.e.(Indonesia, Korea, Malaysia, Philippines, Singapore and Thailand), PPP hypothesis is highly supported for Thailand, Indonesia, Malaysia and Korea by using the KPSS econometrics methodology. PPP hypothesis weakly holds for Korea and Thailand but strongly holds for Indonesia by applying ADF and Perron test methodologies (Nusair,2003).

Most of the literature on PPP for post-Bretton woods period is the time series analysis for short time period where the developed countries were the major focus and PPP holds very weakly in this case. Using the data for the time period 1970 to 1995 on quarterly basis, we accept the null hypothesis of unit root and no co integration for U.K. and U.S. countries (Engel, 2000).In 1973, during the flexible exchange rate period after the failure of Bretton woods system, it was well accepted that PPP does not hold during the short span period, but the validity of PPP hypothesis in the long run is still under consideration. Depending upon the econometric methodology and sample size applied, some empirical studies support the PPP hypothesis in the long run but the speed of convergence towards PPP is very low suggesting the deviations seem to be eliminated approximately 15% annually. It implies half of the deviation can be eliminated between three to five years' time period(Nusair,2003).Using the co integration methodologies, to check the validity of PPP hypothesis for developing countries, PPP support is very weak for India, Pakistan, Indonesia and Philippines but PPP results are highly supportive for turkey when johansen technique is applied (Doganlar,1997). Hakkio (1986) tested the real exchange rate for PPP and concluded that unit root test cannot be rejected. Many different time series paper have revealed that if the number of observations will not be increased, the unit root test results have very low power (Yeoboh, 1996).

There are different ways to eliminate the low power problem. One way to get rid of low power problem is to use long run time series data to increase the quantity of data (Yeoboh, 1996).Contrary to above evidence of accepting the unit root test, Lothian and Taylor (1996) and Kim (1990) supported long run PPP using different econometric techniques. Increasing the power of test, the PPP hypothesis was supported for OECD and G-6 countries during the period of flexible exchange rate, it was proved that there were evidences for the failure to PPP hold in the earlier researches because of the low power test by applying unit root tests.

The empirical evidence on validity of the purchasing power parity hypothesis in the long run is mixed; the PPP results depend upon the econometric methodology applied, price level and time period data. After doing the literature review, I have inferred that evidence in favour of PPP in most of the cases is very weak for the less developed countries but the PPP results for the developed counties are better than developing countries. Among the industrialised countries, PPP evidence is very strong in the long run period of time during current float period (Kim, 1990; and Cheung and Lai, 1993a and b). Co integration econometric testing shows very important results

about the data. When the exchange rate is fixed instead of floating, the null hypothesis of co integration cannot be accepted. When the wholesale price index is used instead of consumer price index, the purchasing power parity results are more favourable and these results are more accurate when price index of traded (TPI) goods is used (Sarno and Taylor, 2002).After reading the couple of articles, I have found that null hypothesis of unit root cannot be rejected due to low power of test which results in weak evidence for PPP but power of the test can be increased either by increasing the number of countries or increasing the long run time series data to produce strong results in favour of PPP. Hence, there are controversies regarding these issues that are still to be resolved in the future.

3. Data and methodology

Due to availability of data for each country, I have selected seven countries for the testing of the purchasing power parity theory. These seven countries consist of three developing and four developed countries which are included for testing of the purchasing power parity theory: Australia, Canada, Japan, Pakistan, India, Korea and Spain. I have chosen U.S. as a foreign country because of its vital role in the world economy and because of the easy availability of the data. The data needed are bilateral nominal exchange rates, consumer price indices and whole sale price indices. I have also tried to use traded price index so that I can compare the results of traded price index with the consumer price index and wholesale price index ,in this case, the results could be more authentic and more critically analysed but unfortunately, I could not be able to find the data of Traded price index, therefore, due to lack of availability of data for Traded price level, I have only used CPI and WPI price levels .Using CPI and WPI as price indices , I will check whether PPP holds for these seven countries or not. Actually, I want to compare the econometrics results of developing countries with developed countries so that to empirically test the validity of PPP theory among developed and developing countries. I accessed data of these countries from international financial statistics on quarterly basis from the first quarter of 1961 to the last quarter of 2010.I will prefer to use quarterly basis data instead of annually data because using quarterly data will produce more accurate results. I have selected bilateral nominal exchange rate which is measured by the end of the period market exchange rate (RF.ZF) defined as national currency per U.S. dollar.WPI and CPI are measured by the wholesale/producer price index (63…ZF) and Consumer price index (64…ZF),respectively. These series are taken directly from international financial statistics. I have selected all those countries which have no missing data so that stata results should be more accurate. The econometrics results for long run PPP are based upon the following equations:

$$S_t = \alpha + \beta 1 p_t + \beta 2 p_t^* + \mu_t \qquad (4)^1$$

Where $\mathbf{S_t}$ is the log of nominal exchange rate, $\mathbf{p_t}$ is the log of domestic price level and $\mathbf{p_t^*}$ is the log of foreign price level. The restrictions implied on the parameters are $\alpha=0$, $\beta_1=1$, and $\beta_2 = -1$(Bleaney, 1991; Kugler and Lenz, 1993; Mossa, 1994).

By applying these restrictions, the error term μ_t determines real exchange rate q_t,

$$q_t = s_t - p_t + p_t^* \qquad (5)^2$$

If the PPP theory is valid, the long time period movement of the variables s_t, p_t and p_t^* will be eliminated which implies that all three variables s_t, p_t and p_t^* are co integrated. There are two different econometrics methodologies are generally used to determine whether variables i.e. (s_t, p_t and p_t^*) move together or not (Xu, 2003). The Engel Granger methodology for co integration determines whether q_t or μ_t follows a stationary process or not but on the other hand, second co integration econometrics methodology measures whether there any co integrating vector in the (s_t, p_t , p_t^*) space with (1 -1 1) the expected coefficients or not (Xu,2003). I have explained below in the Section IV that PPP for the long run period of time cannot be supported by implying these restrictions on real exchange rate and price level data. In the absence of these restrictions, it is very highly supported.

First of all, I have tested all the variables to check the stationarity. ADF test results for single unit root and second unit root are explained below in the Table three. All the models are selected based on Schwarz's Bayesian Information Criterion(SBC),the null hypothesis of the unit root is accepted for Australia CPI and WPI , Canada CPI, WPI and exchange rate, Pakistan WPI , India CPI, WPI and exchange rate, japans' WPI, Korea exchange rate, Spain CPI, WPI and exchange rate and US WPI and CPI. The models are selected on the basis of information criteria, so the null hypothesis of unit root is rejected for Australia exchange rate, Pakistan CPI and exchange rate, Japan CPI and exchange rate and Korea CPI and WPI respectively .As the p-values of the variables are high, therefore, unit root hypothesis is accepted for nearly all the variables. As we have accepted the null hypothesis of unit root for more or less for all variables, so there is a need for test of the second unit root .i.e. (means first difference of series).The test results for the second unit root are reported below in the table three. We reject the null hypothesis of second unit root for approximately all the variables .It means all

[1] (Xu,2003,p.108)

[2] (Xu,2003,p.108)

variables are difference stationary and integrated of the same order. So, the models selected on the basis of information criteria are rejected for the second unit root. Therefore, in logarithmic form, more or less all variables are non stationary but all variables are stationary in first difference.

4. Result Estimations

Two different versions of PPP between US and other seven different countries are tested based upon the Engel Granger co integration technique, considering U.S. as foreign country and other seven countries as domestic countries .The first version of the PPP determines that real exchange rate is stationary or not. It is based upon equation (5) with the restrictions implied on price levels and real exchange rate data. On the other side, the second version of PPP examines that μ_t based upon equation (4) is stationary or not. In the second version of the PPP, the restrictions implied on $\alpha=0$, $\beta_1=1$ and $\beta_2= -1$ are ignored in the ordinary least squares estimation of equation(4).The final results of the ADF tests for the residuals and the real exchange rates are explained below in the table 4 .

The results of the table four illustrates that real exchange rate either it is based upon WPI or CPI is not stationary for all countries except WPI for Canada, CPI for Japan, CPI and WPI for Korea. The null hypothesis for the unit root cannot be rejected for 10 out of 14 real exchange rates. Thus, the supporting evidence for purchasing power parity theory to hold in the long run is weak. Secondly, all the estimated residuals based on the equation (5) are stationary for whole sale price index, suggesting there is a long run PPP relationship between U.S. and other seven different countries, it implies that PPP hypothesis is highly supported while ignoring the restrictions but in case of consumer price level, all the estimated residuals do not follow stationary process, CPI for Canada is not stationary variable. Therefore, PPP hypothesis is highly supported in case of wholesale price index, but contrary to WPI, PPP evidence for the consumer price index is weaker than wholesale price index.

Table 3: Testing for stationarity

	Test for single unit root[b]		Test for second unit root[b]	
Australia	**Model**	**Test statistics**	**Model**	**Test statistics**
P_{cpi}	c(4)	0.36 (-1.834)	c(3)	0.12 (-2.480)
p_{wpi}	c(4)	0.44 (-1.683)	c(2)	0.00 (-5.162)***
			T(2)	0.00 (-5.422)***
			N(2)	0.00(-3.488)***
s_{Aus-Us}	c(0)	0.00(-14.064)***	c(0)	0.00 (-79.601)***
	T(0)	0.00(-22.981)***	T(0)	0.00 (-78.987)***
	N(0)	0.00(-13.318)***	N(0)	0.00(-80.002)***

	Test for single unit root[b]		Test for second unit root[b]	
Canada	**Model**	**Test statistics**	**Model**	**Test statistics**
P_{cpi}	c (4)	0.29 (-1.984)	c(3)	0.21 (-2.165)
p_{wpi}	c(4)	0.50 (-1.550)	c(2)	0.0001(-4.666)***
			T(2)	0.0003(-4.932)***
			N(2)	0.0000(-3.483)***
S_{can-Us}	c(1)	0.59 (-1.372)	C(0)	0.00(-142.099)***
			T(0)	0.00(-141.346)***
			N(0)	0.00(-142.826)***

	Test for single unit root[b]		Test for second unit root[b]	
Pakistan	**Model**	**Test statistics**	**Model**	**Test statistics**
P_{cpi}	T(4)	0.08(-3.223)*	c(4)	0.0004(-4.336)***
			T(4)	0.0027(-4.340)***
			N(4)	0.0000 (-1.872)*
P_{wpi}	c(4)	0.99 (0.734)	c(3)	0.0001(-4.764)***
			T(3)	0.0004(-4.857)***
			N(3)	0.0000(-2.345)**
S_{pak-Us}	T(0)	0.06(-3.320)*	c(0)	0.0000(-13.690)****
			T(0)	0.0000(-13.674)***
			N(0)	0.0000(-13.078)***

	Test for single unit root[b]		Test for second unit root[b]	
India	**Model**	**Test statistics**	**Model**	**Test statistics**
P_{cpi}	c(6)	0.89(-0.481)	c(5)	0.0000(-7.074)***
			T(5)	0.0000(-7.074)***
			N(5)	0.0000(-3.332)***
P_{wpi}	c(8)	0.48(-1.594)	c(8)	0.0000(-5.027)***
			T(8)	0.0001(-5.264)***
			N(8)	0.000 (-2.116)**
$S_{ind\text{-}Us}$	c(2)	0.83(-0.735)	c(0)	0.0000(-10.393)***
			T(0)	0.0000(-10.374)***
			N(0)	0.0000(-9.834)***

	Test for single unit root[b]		Test for second unit root[b]	
Japan	**Model**	**Test statistics**	**Model**	**Test statistics**
P_{cpi}	c(5)	0.08 (-2.640)*	c(4)	0.0646 (-2.757)*
			T(4)	0.0092(-3.986)**
			N(4)	0.000 (-2.248)**
p_{wpi}	c(1)	0.39 (-1.778)	c(0)	0.0000(-5.997)***
			T(0)	0.0000(-6.169)***
			N(0)	0.0000 (-5.840)***
$S_{jap\text{-}Us}$	N(3)	0.00 (-1.728)*	c(2)	0.0000(-6.810)***
			T(2)	0.0000 (-6.798)***
			N(2)	0.0000 (-6.572)***

	Test for single unit root[b]		Test for second unit root[b]	
Korea	**Model**	**Test statistics**	**Model**	**Test statistics**
P_{cpi}	c(4)	0.07 (-2.712)*	c(3)	0.0534 (-2.835)*
			T(3)	0.0314 (-3.582) **
			N(3)	0.00 (-2.074) **
p_{wpi}	c(3)	0.02 (-3.097) **	c(2)	0.0003(-4.433)***
			T(2)	0.0001(-5.194)***
			N(2)	0.0000(-3.434)***
$S_{kor\text{-}Us}$	c(0)	0.16 (-2.327)	c(0)	0.0000(-15.151)***
			T(0)	0.000(-15.306) ***

	Test for single unit root[b]		Test for second unit root[b]	
Spain	**Model**	**Test statistics**	**Model**	**Test statistics**
P_{cpi}	c(8)	0.35 (-1.846)	c(7)	0.7033(-1.129)
p_{wpi}	c(5)	0.61(-1.328)	c(4)	0.0155(-3.285)**
			T(4)	0.0316(-3.580)**
			N(4)	0.0000(-2.187)**
$S_{spain-Us}$	c(1)	0.80 (-0.850)	c(0)	0.0000(-10.071)***
			T(0)	0.0000(-10.039)***
			N(0)	0.0000(-9.984)***

	Test for single unit root[b]		Test for second unit root[b]	
U.S.	**Model**	**Test statistics**	**Model**	**Test statistics**
P_{cpi}	c(3)	0.42(-1.704)	c(2)	0.0450(-2.903)**
			T(2)	0.0767(-3.240)*
p_{wpi}	c(1)	0.75(-0.989)	c(0)	0.0000(-8.608)***
			T(0)	0.0000(-8.627)***
			N(0)	0.0000(-7.364)***

[b] The models for the ADF test are chosen on the basis of information criteria. **N**, **c**, and **T** denote no constant and no deterministic trend, a constant without deterministic trend and a constant with deterministic trend, respectively. The number in the parenthesis in column two and four are the number of lags selected on the basis of information criteria. The number in the parenthesis in column three and five are computed values of the ADF statistics, p_{cpi}=CPI, P_{wpi}=WPI and s_{i_us} is the nominal exchange rate between currency of the ith country with the US dollar. All time series are measured in logarithmic form. The critical values at 10, 5 and 1% levels of significance are -1.62,-1.94,and -2.59 without a constant and without deterministic trend, with a constant and deterministic trend are -3.15,-3.46 and -4.06 and with a constant and without deterministic trend are -2.58,-2.89 and-3.50 respectively. The values next to the test statistics in the column three and five are the p-values. ***, **,* show that test statistics is significant at 1%, 5% and 10% respectively .No asterisk denotes that series is not stationary (Xu, 2003).

Table No: 4 The results of the Engle-Granger co integration test

	Real exchange rate[c]		The Residual[c]	
Australia	**Model**	**Test statistics**	**Model**	**Test statistics**
P_{cpi}	c(1)	0.4643(-1.636)	N(1)	0.00 (-1.669)*
p_{wpi}	c(1)	0.1507 (-2.369)	c(1)	0.0351(-2.997)**
			N(1)	0.0000(-2.932)***

	Real exchange rate[c]		The Residual[c]	
Canada	**Model**	**Test statistics**	**Model**	**Test statistics**
P_{cpi}	c(1)	0.5187(-1.530)	c(1)	0.5784 (-1.408)
p_{wpi}	c(1)	0.0620(-2.774)*	c(1)	0.0349(-3.000)**
			T(1)	0.0814(-3.215)*
			N(1)	0.0000(-2.918)***

	Real exchange rate[c]		The Residual[c]	
Pakistan	**Model**	**Test statistics**	**Model**	**Test statistics**
P_{cpi}	c(0)	0.6357(-1.286)	c(0)	0.0325(-3.026)**
			N(0)	0.0000(-3.036)***
p_{wpi}	c(0)	0.2603(-2.061)	c(0)	0.0070(-3.539)***
			T(0)	0.0376(-3.517)**
			N(0)	0.0000(-3.550)***

	Real exchange rate[c]		The Residual[c]	
Japan	**Model**	**Test statistics**	**Model**	**Test statistics**
P_{cpi}	N(2)	0.00 (-1.623)*	c(3)	0.0107(-3.409)**
			T(3)	0.0516(-3.398)*
			N(3)	0.0000(-3.419)***
p_{wpi}	c(2)	0.3651(-1.831)	N(2)	0.000(-2.438)**

	Real exchange rate[c]		The Residual[c]	
India	**Model**	**Test statistics**	**Model**	**Test statistics**
P_{cpi}	c(1)	0.5916(-1.381)	N(1)	0.0000(-2.216)**
p_{wpi}	c(1)	0.5916(-1.381)	c(1)	0.0022(-3.883)***
			T(1)	0.0133(-3.871)**
			N(1)	0.0000(-3.897)***

	Real exchange rate [c]		The Residual[c]	
Korea	**Model**	**Test statistics**	**Model**	**Test statistics**
P_{cpi}	c(0)	0.0236(3.143)**	c(0)	0.0182 (-3.231)**
	T(0)	0.0698 (-3.279)*	T(0)	0.0802 (-3.221)*
			N(0)	0.0000 (-3.241)***
p_{wpi}	c(0)	0.0266 (-3.100)**	c(0)	0.0030(-3.787)***
	T(0)	0.0018 (-4.446)***	T(0)	0.0124(-3.894)**
			N(0)	0.0000(-3.796)***

	Real exchange rate[c]		The Residual[c]	
Spain	**Model**	**Test statistics**	**Model**	**Test statistics**
P_{cpi}	c(1)	0.2872(-1.999)	N(1)	0.0000(-2.173)**
p_{wpi}	c(0)	0.1733(-2.296)	N(0)	0.0000(-2.333)**

[c] The test of stationarity for real exchange rate is based upon equation (5).Test of stationarity for the estimated residuals are based upon equation (4). ***, **,* show that test statistics is significant at 1%, 5% and 10% respectively. The values next to the test statistics in the column three and column five are the p-values .No asterisk denotes that series is not stationary (Xu, 2003).

Table No : 5 Estimations of nominal exchange rates using price indices[d]

Australia	α	β1	β_2	R^2	F-statistics	D W
CPI-based	0.9021	1.3263	-1.461	0.2620	34.97	.7891
	(1.56)	(3.14)*	(-2.66)*			
WPI-based	1.5065	1.4231	-1.6949	0.3590	55.16	.9193
	(4.08)*	(7.25)*	(-6.19)*			

Canada	α	β_1	β_2	R^2	F-statistics	D W
CPI-based	-0.02036	0.7388	-0.68738	0.0433	4.45	.9016
	(-0.16)	(1.48)	(-1.33)			
WPI-based	0.49848	1.3098	-1.37920	0.1286	14.53	.9960
	(2.69)*	(4.82)*	(-4.53)*			

Pakistan	α	β_1	β_2	R^2	F-statistics	D W
CPI-based	0.20326	1.11172	-0.5660	0.9749	3821.45	.1991
	(7.58)*	(20.14)*	(-5.84)*			
WPI-based	2.281743	1.021489	0.63158	0.9817	5216.31	.2782
	(13.28)*	(34.63)*	(-9.77)*			

India	α	β_1	β_2	R^2	F-statistics	D W
CPI-based	2.0560	1.2124	-0.83325	0.9698	3163.15	.0941
	(13.34)*	(25.49)*	(-10.63)*			
WPI-based	3.2613	1.44136	-1.3193	0.9853	6613.99	.2118
	(28.36)*	(52.11)*	(-26.09)*			

Japan	α	β_1	β_2	R^2	F-statistics	D W
CPI-based	7.573822	.2647278	-.9020191	(0.9189)	1115.57	.1477
	(81.97)*	(4.52)*	(-18.98)*			
WPI-based	6.28094	.7656534	-1.133332	(0.9032)	919.54	.1365
	(26.47)*	(9.17)*	(-26.89)*			

Korea	α	β_1	β_2	R^2	F-statistics	D W
CPI-based	5.984356	.75655	-.5387459	0.8863	627.33	.2433
	(12.89)*	(4.82)*	(-2.09)*			
WPI-based	5.874908	.9039072	-.679937	0.9494	1849.95	.2752
	(27.32)*	(17.05)*	(-6.77)*			

Spain	α	β_1	β_2	R^2	F-statistics	D W
CPI-based	4.517129	.5137263	-.427281	(0.7810)	265.68	.0790
	(5.84)*	(2.51)*	(-1.12)			
WPI-based	5.35539	1.042307	-1.152871	(0.8646)	475.65	.1322
	(20.02)*	(11.93)*	(-7.86)*			

[d] The numbers in the parenthesis are the t-statistics corresponding to H_0: α =0, H_0:β1=1 and H_0: β_2=-1, respectively. The values in the column six are F-statistics for the joint null hypothesis: α=0, β1=1 and β_2=-1. * show that test statistics is significant at 5%. DW denotes Durbin-Watson test statistics. No asterisk denotes that variable is not significant (Xu, 2003).

Table five shows the values of coefficients obtained from ordinary least squares equation (4).The values of the coefficients reported above in the table five shows that symmetry and proportionality restrictions do not hold in general. The individual null hypothesis for α, β_1 and β_2 is H_0: α=0, H_0: β_1=1 and H_0=-1 respectively. The values of coefficients α, β1 and β_2 are reported above in the table five and relevant t-statistics values (in the parenthesis) are given below the values of the coefficients. Out of the 14 estimates, the t-statistics show that 12 estimates of α are statistically different from zero except for Canada CPI and Australia CPI, 13 estimates of β1 are statistically different from one except for Canada CPI and also 12 estimates of β2 are statistically different from negative one except for Canada CPI and Spain CPI, at 5% level of significance.

The table five results show that for the coefficient α, the null hypothesis α=0 is rejected for Australia WPI, Canada WPI, Pakistan CPI and WPI, India CPI and WPI, Korea CPI and WPI, Spain WPI and CPI and for Japan WPI and CPI. In simple words, we can say that α is significantly different from zero. But, only in case of Australia and Canada CPI, the null hypothesis of α=0 is valid. In case of coefficient β_1, the consumer price index and wholesale price index for all countries are significantly different from one except Canada consumer price index. But if we consider the coefficient β_2, the results are more or less quite similar to β_1 coefficient. The consumer and wholesale price indexes for all countries are significantly different from minus one except for Canada and Spain CPI. The results of table five show that overall evidence for PPP theory to hold in the long run among four developed and three developing countries based upon consumer and wholesale price indexes is very weak but in case of Canada consumer price index, results are highly supportive for PPP hypothesis to hold in the long run because all the parameters of null hypothesis full fill the restrictions in the long run PPP hypothesis. In the Table five, the results of the Durbin-Watson statistics in consumer and wholesale price levels are less than 0.50 which shows that there is autocorrelation in the variables, it means PPP results are not satisfactory .In case of Pakistan, India, Korea, Spain and Japan, the value of the Durbin-Watson statistics is quite low in case of both consumer and producer price levels which means they have high autocorrelation in the data. Contrary to these five countries, the values of Durbin-Watson statistics of Australia and Canada price indexes are high which shows much better results.

Table No: 6 Results of Johansen co integration methodology[e]

Australia	Null Hypothesis	Alternative hypothesis	λ_{trace}	**95%**
CPI-based	ρ=0	ρ >0	17.3578	29.68
WPI-based	ρ≤ 2	ρ >2	1.3000	3.76

Australia	Null Hypothesis	Alternative hypothesis	λ_{max}	**95%**
CPI-based	ρ=0	ρ =1	11.6032	20.97
WPI-based	ρ= 2	ρ =3	1.3000	3.76

Canada	Null Hypothesis	Alternative hypothesis	λ_{trace}	**95%**
CPI-based	ρ=0	ρ >0	12.2811	29.68
WPI-based	ρ≤ 2	ρ >2	0.1205	3.76

Canada	Null Hypothesis	Alternative hypothesis	λ_{max}	**95%**
CPI-based	ρ=0	ρ = 1	5.8692	20.97
WPI-based	ρ≤ 2	ρ = 3	0.1205	3.76

Pakistan	Null Hypothesis	Alternative hypothesis	λ_{trace}	**95%**
CPI-based	ρ=0	ρ > 0	12.7856	29.68
WPI-based	ρ = 0	ρ > 0	25.2322	29.68

Pakistan	Null Hypothesis	Alternative hypothesis	λ_{max}	**95%**
CPI-based	ρ=0	ρ = 1	9.4713	20.97
WPI-based	ρ = 0	ρ = 1	17.0604	20.97

India	Null Hypothesis	Alternative hypothesis	λ_{trace}	**95%**
CPI-based	ρ=0	ρ > 0	13.7275	29.68
WPI-based	ρ = 0	ρ > 0	14.7157	29.68

India	Null Hypothesis	Alternative hypothesis	λ_{max}	**95%**
CPI-based	ρ= 0	ρ = 1	10.8712	20.97
WPI-based	ρ = 0	ρ = 1	8.4714	20.97

Japan	Null Hypothesis	Alternative hypothesis	λ_{trace}	**95%**
CPI-based	ρ≤2	ρ >3	7.9621*	3.76
WPI-based	ρ = 0	ρ >0	13.9364	29.68

Japan	Null Hypothesis	Alternative hypothesis	λ_{max}	**95%**
CPI-based	ρ = 2	ρ = 3	7.9621*	3.76
WPI-based	ρ = 0	ρ = 1	8.2955	20.97

Korea	Null Hypothesis	Alternative hypothesis	λ_{trace}	**95%**
CPI-based	ρ≤2	ρ >2	6.5100*	3.76
WPI-based	ρ ≤1	ρ >1	12.5829	15.41

Korea	Null Hypothesis	Alternative hypothesis	λ_{max}	**95%**
CPI-based	ρ = 2	ρ = 3	6.5100*	3.76
WPI-based	ρ = 1	ρ = 2	9.3583	14.07

Spain	Null Hypothesis	Alternative hypothesis	λ_{trace}	**95%**
CPI-based	ρ=0	ρ >0	26.8333	29.68
WPI-based	ρ ≤2	ρ >2	1.9244	3.76

Spain	Null Hypothesis	Alternative hypothesis	λ_{max}	**95%**
CPI-based	ρ=0	ρ = 1	15.1775	20.97
WPI-based	ρ = 2	ρ = 3	1.9244	3.76

[e] λ_{trace} denotes the trace statistics that tests the null hypothesis **ρ ≤ r** against the alternative hypothesis **ρ> r.** λ_{max} denotes the maximal eigenvalue statistics that tests the null hypothesis of **ρ=0** against alternative hypothesis **ρ=1 or ρ=1** against **ρ=2** etc .The column four with the heading of 95% is the critical values obtained from osterwald-Lenum (1992).* denotes the rejection of null hypothesis at 5% level of significance (Zhang, 2000).

Engle and Granger (1987) econometric technique has main limitations. Dependent variable selection in the regression can produce reverse findings. The other limitation of the Engle Granger methodology is that it can produce unreliable results when we use small samples. Johansen (1988) and Johansen and Juselius (1990) introduced an econometric test which bridged up all the limitations (Doganlar, 1999).For that reason, I have also applied johansen test in this paper.

The Johansen methodology finds the co integrating vectors among time series vectors .Suppose, X_t is a vector of p time series variables. Let X_t transformed as vector auto regression (Doganlar, 1999).

$$X_t = \Pi_1 X_t + \Pi_{t-2} X_{t-2} + \ldots\ldots\ldots + \Pi_{t-k} X_{t-k} + \mu + e_t \qquad \textbf{(6)}^1$$

The Π matrix is a matrix of long run time period. The rank r of Π matrix finds number of co integrating vectors. If r is zero, it means there is no co integrating vectors. There are two different types of likelihood ratio tests to know the exact number of co integrating vectors (Doganlar, 1999). These are trace (λ_{trace}) and maximum Eigen value (λ_{max}) statistic tests which are given below:

$$\lambda_{max} = -2 \ln (Q) = -T \ln (1 - \lambda_{r0^- +1}) \qquad \textbf{(7)}^2$$

$$\lambda_{trace} = -2 \ln (Q) = -T \sum_{j=r0+1}^{p} \ln(1-\lambda j) \qquad \textbf{(8)}^3$$

First of all, I have selected appropriate number of lags by applying the varsoc command. Using the johansen methodology, the table six results show that in case of both consumer and wholesale price index, the supporting evidence for purchasing power parity hypothesis to hold in the long run for Pakistan and India is very weak when we use both maximal Eigen value statistics and trace statistics at 5% level of significance. The results show that we do not find co integrating vectors between price levels and nominal exchange rate in case of Pakistan and India, using both wholesale and consumer price levels. In case of Korea, using both maximal and trace statistics, the supporting evidence for PPP to hold in the long run is very strong when we use consumer price index because we accept the alternative hypothesis that there are more than two co integrating vectors but in case of whole sale price index we accept the alternative hypothesis that at most there are one co integrating vectors, the supporting evidence for PPP to hold in the long run is not very high. if we consider Spain for consumer price level, the evidence for PPP to hold in the long run is very weak using both max and trace statistics at 5% level of significance but contrary to consumer price index when we use wholesale price index, the supporting evidence for PPP hypothesis to hold in the long run is strong, when we accept the null hypothesis that there are two co integrating vectors using both trace and max statistics.

If we consider Australia for consumer price index, we accept the null hypothesis of zero co integrating vectors, the supporting evidence for PPP to hold is very weak when we use the results of both max and trace statistics at 5% level of significance but using wholesale price index, the supporting evidence for PPP to hold in the long run is strong because we accept the null hypothesis that there are two co integrating vectors, using both test statistics at 5% level of significance. In case of Canada, the PPP results are quite similar to Australia, the PPP holds using wholesale price index but it does not hold when we use consumer price index in the long run .In case of last

1 (Doganlar,1999,p.149)

2 (Doganlar,1999,p.150)

3 (Doganlar,1999,p.150)

country Japan, the evidence for PPP to hold in the long run using consumer price index is strong because we accept the null hypothesis that there are two co integrating vectors but contrary to CPI , when we use wholesale price index, the evidence for PPP to hold in the long run is very weak, using both max and trace statistics at 5% level of significance. In general, evidence for PPP to hold in the long run using wholesale price index is much better than using consumer price index when we apply johansen co integration methodology. So, it can be implied that using wholesale price index, the results are more accurate than consumer price index because wholesale price index is the composition of tradable goods.

5. Conclusion

In this paper, I have tested the validity of PPP hypothesis in the long run using CPI and WPI price indices among the four developed countries .i.e.(Australia, Canada, Spain and Japan) and three developing countries(Pakistan, India and Korea) using ADF, Engle Granger, johansen and ordinary least squares econometrics methodologies .The validity of the PPP hypothesis between U.S. and other seven countries is weakly supported while applying the restrictions on the price level and exchange rates but the PPP hypothesis is highly supported while relaxing the restrictions when Engle Granger co integration methodology is applied. My results are quite similar to the results of published paper (Xu, 2003) in which PPP hypothesis is tested between U.S. and other eight trading partners. Failure to find co integration between developing countries and U.S., and developed countries and U.S. may result from various factors; it can be trade barriers, tariffs, transportation costs, technology differences, economic reforms difference or may be geographically distance i.e.(border effects issue) which have impact on the cost of production and prices (Doganlar, 1999).

I have assessed that choice of price index and econometric methodology is very important for PPP tests. I have used different econometric methodologies and compared the results of these econometric techniques. Different econometric techniques show different results for consumer and wholesale price indexes for PPP tests. Using ordinary least squares methodology, I have assessed that consumer price index shows better results than wholesale price index for the PPP hypothesis to hold but when I have applied johansen co integration methodology, WPI show better result than CPI. Using johansen co integration methodology ,these results are quite similar to the results of published paper(Doganlar, 1999) in which PPP is tested for five Asian countries while considering U.S. as foreign country but PPP does not hold in case of India, Pakistan, Indonesia, Philippines except Turkey. I have found that using appropriate econometric methodology and choice of price index have very important impact upon the results of the PPP hypothesis to hold or not. Using johansen co integration technique, I have assessed that using wholesale price index, the PPP results are far better than consumer price index. Applying different econometric methodologies, I have concluded that PPP results using wholesale price index are much better than CPI results, so WPI seems more accurate measure for PPP hypothesis and exchange rate testing.

6. References

Rogoff, K. (1996). The Purchasing Power Parity Puzzle. *Journal of Economic Literature*, Vol.34, No.2, pp.647-668.

Pilbeam, K. (2006). International finance, Palgrave MacMillan, 3rd Edition.

Nusair, S.A. (2003).Testing the Validity of Purchasing Power parity for the Asian Countries during the Current Float. *Journal of Economic Development*, Vol.28, No.2, pp.129-147.

Dornbusch, R. (1985). Purchasing Power Parity. *National Bureau of Economic Research*, Working Paper No.1591, pp.1-32.

Xu, Z. (2003). Purchasing Power Parity, Price Indices and Exchange Rate Forecasts. *Journal of International Money and Finance*, Vol. 22, pp.105-130.

Miller, S. (1984). Purchasing power parity and relative price variability. *European Economic Review*, Vol.26, pp.353-367.

Pilbeam, K. (1998). International finance. *Palgrave MacMillan*, 2nd Edition.

Frenkel, J.A. (1980).The Collapse of Purchasing Power Parities during the 1970s'. *National Bureau of Economic Research*, Working Paper No.569, pp.1-19.

Balassa, B. (1964) .The Purchasing Power Parity Doctrine: A Reappraisal. *The Journal of Political Economy*, Vol.72, No.6, pp.584-596.

Doganlar, M. (1999). Testing Long Run Validity of Purchasing Power Parity for Asian Countries. *Applied Economics Letters*, Vol. 6, pp.147-151.

Osei-Boateng, K., Izaguire, and S., Ndjodo, F. (2005). Purchasing Power Parity; International Financial Management. *Havard Business School Final Paper*, December 12, 2005.

Froot, A.K., Rogoff, K. (1994). Perspectives on PPP and Long-Run Real Exchange Rates. *National Bureau of Economic Research*, Working Paper No.4952, pp.1-50.

Sarno, L., Taylor M.P. (2002). Purchasing Power Parity and Real Exchange Rate. *International Monetary Fund*, Vol No.49, No.1, PP.65-105.

Taylor, A.M., Taylor, M.P. (2004). The purchasing Power Parity Debate. *Journal of Economic perspectives*, Vol. 18, pp.135-158.

Dornbusch, R. (1976). Expectations and Exchange Rate Dynamics. *Journal of Political Economy*, Vol. 84, pp. 1161-76.

Officer. (1986). The Law of One Price Cannot be Rejected: Two Tests Based on the Trade able/Nontrade able Goods Dichotomy. *Journal of Macroeconomics*, Vol. 8, pp-159-82.

Frenkel, J.A. (1981).The Collapse of Purchasing Power Parities during 1970s. *European Economic Review*, Vol. 16, pp.145-65.

Frenkel, J.A. and Mussa, M. (1980).The Efficiency of Foreign Exchange Markets and Measures of Turbulence. *American Economic Review*, Vol. 70, pp.375-81.

International Bank for Reconstruction and Development/The World Bank. (2008). Global Purchasing Power Parities and Real Expenditures: 2005 International Comparison Program. Available at www.Worldbank.org (accessed August 1, 2011)

Zhang, Z. (2000). Real Exchange Rate Misalignment in China: An Empirical investigation. *Journal of Comparative Economics*, March 2001, 29(1), pp.80-94.

Neary, J.P. (2004). Purchasing Power Parity. *University College Dublin and CEPR*, pp.1-6.

Mc Nown, R., and Wallace, M.S. (1989). National Price Levels, Purchasing Power Parity and co integration: a test of high inflation economies. Journal of international money *and finance*, Vol. 8, pp.533-545.

Yeob Oh, K. (1996). Purchasing Power Parity and Unit root tests using panel data, Journal of International Money and Finance, Vol.15, N0.3, PP. 405-418.

Frankel, J.A., and Andrew, K.R. (1996). A Panel Project on Purchasing Power parity: Mean reversion within and between countries. *Journal of International Economics*, Vol. 40, and PP.209-224.

Enders, W. (1998). Arima and Co integration Tests of PPP Under Fixed and Flexible Exchange Rate Regimes. *The Review of Economics and Statistics*, Vol. 70, No.3, PP.504-508.

Hakkio, C.S. (1984). A Re-examination of Purchasing Power Parity. *Journal of International Economics*, Vol. 17, pp.265-77.

Lothian, J. (1997). Multi-country Evidence on the Behaviour of Purchasing Power Parity Under the Current Float. *Journal of International Money and Finance*, Vol. 16, No.1, pp.19-35.

MacDonald, R. (1980). Floating Exchange Rates: Theory and Evidence (London: Unwin Hyman)

Officer, L. (1976). The Purchasing Power Parity Theory of Exchange Rates: A Review Articles.*IMF Staff Papers*, Vol. 23, pp.1-61

Officer, L. (1986). The Law of One Price cannot be Rejected: Two Tests Based on the Tradeable/Non-Tradeable Goods Dichotomy. *Journal of Macroeconomics*, Vol.8, pp.159-82

Samuelson, P. (1964). Theoretical Notes on Trade Problems. *Review of Economics and Statistics*, Vol. 46, PP.145-54.

Nurhan, D., and John, P. (1985). Purchasing Power Parity did not Collapse during the 1970's. *The American Economic Review*, Vol. 75, No.5, pp. 1151-58.

Engel, C., and Rogers, J.H. (2000). Deviations from Purchasing Power Parity: Causes and Welfare costs. *Journal of International Economics*, Vol. 55, pp. 29-57.

Kim, Y. (1990). Purchasing Power Parity in the Long Run: A Co integration Approach. *Journal of Money, Credit and Banking*, Vol.22, No.4, pp.491-503.

Lothian, J.R., and Taylor, M.P.(2000). Purchasing Power Parity Over the Two Centuries: Strengthening the Case for Real Exchange Rate Stability A Reply to Cuddington and Liang. *Journal of International Money and Finance*, Vol.19, pp. 759-764.