TESTING THE THEORY OF PURCHASING POWER PARITY FOR SELECTED COMMONWEALTH OF INDEPENDENT STATES

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Introduction

In obvious terms, purchasing power parity (PPP) presents the ability of one unit of currency to affect the demand for a consumer basket in the country one as it may in equivalent foreign currency at existing exchange rate in another foreign country. The price of the same commodity can be converted to one of the common currencies such as US dollar to see the dollar variations in the prices of the product (Taylor et al. 2004, p.134). For example, what is the price of the same quality of Unilever margarine in Azerbaijan and Georgia? If the price in the same currency would be below the other from a foreign country then it would imply that currency is undervalued. Purchasing Power Parity theory states that nominal exchange rates for two currencies are equal to the ratio of the aggregate price level for different countries so that the unit price of a country can express equal purchasing power in different countries. PPP was developed after World War 1, when inflation hit the nominal exchange rates for main industrialized countries (Taylor et al., 2004, p.134). In fact, Taylor et al. (2004, p.135) quote Dornbusch and Krugman as having noted the theory as the PPP theory of the exchange rate. The PPP resigns to an un-steady pattern in the short run whilst in the long run it is steady (Islam et al. 1999, p. 96).

The theory is important in understanding international economies. The two currencies achieve the same value after conversion into the same currency in absolute terms. The theory explains equality in exchange rates and price differences in different countries. Prices are considered based on different products and weights that make the comparison between countries difficult (Dimitrios 2006, p.137). Further, production costs and trade restrictions affect the real exchange rate. The purchasing power parity theory was formulated in 1932 by Gustav Cassel and has empirically recently developed. The comparisons of static real exchange rates amount to the strong form of PPP. Further, the analysis of PPP theory co-integrates nominal exchange rate, the

domestic price and foreign price indices. The theory falls short of failing to derive conclusions for validity of PPP in the long term. Equally, the real exchange rates have high violability in the short run compared to the long run. Thus, PPP debate can sway to support or fail to sustain the debate (Boršič et al. 2006, p.82; Kozul 2013, p.254).

Strong PPP form revolves around the exchange rate that is fixed since they are formulated from the monetary policy. There is advancement of fixed exchange rates in some economies that ignore the equilibrium exchange rate. The comparison between fixed and equilibrium exchange rates based on existing monetary policy attests in different countries the relevance of PPP without real and nominal exchange rates. Thus, the question is whether PPP hypothesis should hold or not? (Taylor et al. 2004, p.135). The undervaluing of a currency is critical in international business since they affect the cost borrowing, exports and imports. However, prices variations for the same product in two different countries also imply the differentiation in international trade for the inputs. Nonetheless, PPP provides an overview of the relative value of the currency in a foreign currency. The resulting value of PPP should be treated with caution amidst the above considerations (Kasman 2010, p.54).

According to Dabrowski (2013, p.15) all the countries of study do have any exchange restrictions on multiple currency practices. Russia and Kazakhstan exchange rates have been flexible in the course of time. The rest had a floated exchange rate until the worldwide financial crisis that occurred between the year 2008 and 2009. The exchange rates are not stable against the dollar for the five countries. The currencies in Russia, Ukraine, Kazakhstan and Georgia have appreciated against the dollar since the financial crisis Dabrowski (2013, p.26).

The paper intends to test the Purchasing Power Parity (PPP) in selected Commonwealth Independent States (CIS) namely; Azerbaijan, Georgia, Kazakhstan, Russia and Ukraine. The hypothesis is tested through three methods. The stationarity is tested using the ADF root tests, new root tests and co-integration functions for the currencies of these countries to the US $ dollar.

Thus, the study objective is to carry out an examination the validity of PPP theory in the above mentioned countries.

From the research objective the following research questions can be derived.

1. Can stationarity of real exchange rates hold for the selected five CIS countries?
2. Can co-integration functions hold for the selected five CIS countries?
3. To what extent is the PPP theory valid for the selected five CIS countries?

PPP theory advances the idea that the price of similar commodities should have a value in the different currencies. On the other hand, CIS countries share the same economic heritage from Soviet Union whose economic structure was communism. Macroeconomic structures are different since selected countries have adopted various liberation mechanisms towards market economies. At the same time, prices are further affected by logistics and trade barriers different from production costs. The theory acknowledges the two scenarios. Thus, the hypotheses can hold that PPP cater for both un-steady and steady patterns for the short and long run respectively. Ultimately, the two PPP hypotheses should hold for the five selected countries for which the study validates.

The study is justified since the selected countries experienced the same economic conditions in the previous administration under the Soviet Union. The countries picked different transition schemes since the fall of the Soviet Union in 1991. They had almost the same economic condition at the beginning of the transition and there was much dependence of Russia. The five selected countries are part of the twelve countries that formed the Commonwealth Independent Countries for which the countries are integrated. Depending on CIS integration and reforms, the countries have unique economic levels which cause price variations in the consumer basket. The exchange rates for the select countries are liberalized for the exchange rates. Therefore, for economies from same economic origin and regional union, the study considers if a commodity of similar qualities cost the similar prices in the selected countries using the stationarity of exchange rates and co-linearity between prices and exchange rates.

This dissertation tests validity of PPP in selected Commonwealth of Independent States (CIS) not only against US dollar, but testing against their main trading partners currencies including the US dollar, EURO, Chinese Yuan, Turkish lira and Russian Ruble. In applying the econometric techniques, the researcher believes that can have a strong contribution and fill the gap in the literature.

Literature Review

Purchasing Power Parity tests consider stationary and co-integration techniques based on the chosen econometric methodology. Testing the stationarity functions for time series of real exchange rates and co-integration functions the relationship between nominal exchange rates and relative prices. The results vary based on the methodology used. According to Mladenović et al. (2012, p.17), the standard unit root test for PPP stationarity tests include ADF, KPSS and DFGLS. However, new unit root tests have been developed to employ structural and non-linear qualities. The two types of tests produce different results in specific ways. In other words, stationary tests can produce different results from those of co-integration tests for the same sample. Equally, conventional and recent unit root tests can also produce differing results for the same sample (Mladenović et al., 2012, p.18). Finally, both tests in the same sample may differ based on the base currency such that PPP theory holds in euro exchange rate and fails in dollar exchange rate (Mladenović et al. 2012, p.17; Dimitrios 2006 p.140). The three scenarios are covered in the literature review.

Olayungbo (2011, p.270) argues that PPP is important as a tool in selecting a common currency for multiple nations since it evaluates the economic relation between the countries. In an econometric model for PPP, real exchange rates expressed as a function of nominal exchange rates and relative prices of commodities, subject unit root tests as strong measures of PPP (Olayungbo 2011, p.270; Taylor et al. 2004, p.142). The study is an application of univariate ADL units root tests for the stationarity of real exchange rates. In examining 16 Sub-Saharan countries, the study identified a unit root for fourteen countries except Ghana and Uganda between 1980 and 2005 (Olayungbo 2011, p.272). The panel data unit root tests indicated stationary supporting the PPP theory (Olayungbo 2011, p.272; Kozul 2013, p.266). However, the

exclusion of Ghana and Uganda in panel test distorted the pattern. Thus, the conclusion was that the conformity of PPP is low in Sub-Saharan countries (Olayungbo 2011, p.272).

Similarly, Kozul (2013, p.267) applies two co-integration tests to check the significance of PPP theory in Croatia. Both ADL and Engle-Granger tests fail to hold the PPP hypothesis for Croatia since there is no long relationship between the price level expressed in Croatian currency and price level in Euro.

Recent unit root tests involve structural breaks to test the PPP theory. A study conducted by Kasman et al. 2010 on fourteen countries in Europe based on LM unit root tests with one and two structural breaks identified stationarity in exchange rates in only seven countries. Mladenović et al. (2012, p.17) identified in the same pattern of time series for real exchange rates in all sample countries except Turkey whose real exchange rate is euro based. For Turkey and Hungary, the alternate hypothesis is adopted due to the euro factor in real exchange rates. The countries with U.S dollar show parity leading to the assumption of non-stationarity.

The study concludes a failure in PPP theory in the selected European countries that include Czech Republic, Romania, Lithuania, Hungary, Latvia, Poland, Serbia and Turkey. The use of conventional and modern unit root tests produce different positions in PPP testing. According to Teletar et al. (2009, p.164) in testing PPP theory in commonwealth of Independent states, the popular conventional unit root tests eight of the ten countries indicate stationarity. To the contrary, when recently developed unit root tests are employed with structural breaks and non-linearity, the success rate of stationarity of exchange rate lowers (Teletar et al. 2009, p.164). Therefore, for the latter case, the impact of PPP theory is reduced in the sample. Öge Güney et al. (2012, p.140) present an opposite result in re-examining PPP theory for emerging and African

economies. The results indicate the significance for PPP hypothesis in few cases unlike in new non-linear tests.

Dimitrios (2006, p.140) employed co-integration techniques and failed to prove the validity of PPP theory in seventeen countries. The studies use the Johansen co-integration and panel co-integration methodology (Dimitrios 2006, p.134). The co-integrated factor showed symmetry change and proportionality. Thus, it failed to prove the set hypothesis of PPP (Dimitrios 2006, p.141). The main cause of the deviation was foreign exchange markets. This is in spite the analysis indicating a long run support for PPP theory.

The long run PPP was tested for each economy against the economy of US. The same situation is replicated in studies by Islam et al. (1999, p. 108). In examining, empirically, the purchasing power parity in Korea using co-integration for dollar exchange rate and prices, the study found partial evidence to support PPP theory (Islam et al. 1999, p. 109). The partial co-integration results showed a relationship between Korean exchange rate and domestic and foreign prices (Islam et al. 1999, p. 109). The short run relationship built a strong function between exchange rates and relative prices with an adjustment speed of 24% (Islam et al. 1999, p. 109). The result revolved around the exchange rate controlled by the government Kozul (2013, p.266).

Testing PPP can also imply both stationary and co-integration tests at the same time for the same sample. According to Bekő et al. (2007, p. 415), unit tests failed to support stationarity of real exchange rates. However, co-integration was present between nominal exchange rate and price index. Thus, the studies failed to prove PPP for Czech Republic, Hungary and Slovenia (Bekő et al. 2007, p. 429). Taylor argues from a divergent opinion after testing more than twenty countries over 100 years. He argues that in the twenty first century, there is little integration in

the international market to stabilize the shocks of the exchange rates (Bekő et al. 2007, p. 430). Thus, the extent of changes in exchange rates depend on the monetary policy and subsequent exchange deployed in the economy. In this relation, residual variation analysis indicates instances where floating exchange rates deviate considerably from PPP that relate further to the real exchange rate. The results of long run PPP are obtained using modern multivariate and univariate test (Taylor 2002, p.151).

According to Islam et al. (1999, p. 96), there are differences in results between expectations of theoretical and empirical studies. The short run PPP deviations are expected due to transport and trade barrier costs (Taylor 2002, p. 137). However, the theoretical framework requires a steady PPP relationship in the long run. Thus, the mixture in results explained above. Islam implies that long term deviations are cumulative and permanent hence the invalidity of PPP theory. PPP deviations are random. Further, the non-trade industries result in economic growth causing deviations in PPP. The statement is more valid in developed than developing countries. The expectation of PPP theory is an equilibrium state between national prices and exchange rates. The causality tests, as used by Islam, examine how previous changes in one variable affect current changes in another variable. Contextually, the long run coefficient variable is found to be more than 1% for relative price co-efficient from the theoretical model. Empirically, the coefficient of relative price is 0.73 hence the relationship is invalid since the variables are non-stationary (Islam et al. 1999, p. 96).

Research on PPP by Choundry (1999) provided the evidence that relative PPP hold in Russia and Ukraine. The study investigated the PPP between US and Russia. On the other hand, Noorbakhsh (2000) tested the PPP for East and Central European countries and the evidence established was that PPP was based on the long-run equilibrium. However, the co-integrating

vectors did not reveal proportionality and symmetry restriction as defined in the PPP hypothesis formulated for these countries.

Moreover, a panel unit-root tests for real exchange in all of the countries that were included in the study rejected the hypothesis of null stationarity. Using co-integration methodology approach to test the PPP for Romania, Czech Republic, and Poland, without including the PPP evidence against developed economies, revealed asymmetrical relationship in PPP between developed and developing economies. Debates among economists have been about the long-run effect of PPP in Commonwealth of Independent States and Central and East European countries. Through unit-test hypothesis for real exchange rates in these countries, the data rejected the unit-root null for the selected countries (Kasman, Kasman & Duygu 2010, p. 112).

General Background Information

The Ukraine was the second strongest economy after the Soviet Union's fall. It followed after Russia. The country was predominantly governed through communism until the separation. The country received loans from the International Monetary Fund (IMF); United States, Russia and European Union to settle her debts in the early 1990s. The country received the first loan of $371 Million from IMF in 1994. Subsequently, in 1995 it received additional loans worth $1.5 billion from IMF, $100 Million from US and $2.5 billion from Russia. In this time, the government initiated massive economic reforms dropping their stack in government firms (Shoemaker 2013, p.164).

The Ukraine has tumult financial and monetary policies that have led the country to experience soaring prices of essential commodities. The economy of the country is much reliant on the oil products most of which come from Russia. A slight disruption in the supply systems of

the major commodities is likely to bring up a big change in the financial and exchange rates of the country. The country's banking system, which follows the monetary policies established by the central bank, has allowed the country to have high interest rates per year averaging to 30 percent. The interest rates are high to prevent capital from leaving the country as well speculation in exchange rates with major currencies. The country also has experienced a large and increasing current account deficit forcing the devaluation of the domestic currency. The country's monetary policy system puts a gap on the free floating of the exchange rate.

Kazakhstan adopted more aggressive economic liberalization strategies after independence. The country adopted various policy reforms in trade liberalization, price liberalization, small privatization and interest rate liberalization. However, it failed to reinstitute enterprise governance and competition policy. The country suffered economic depression in 1992 due to the effects of separation from the Soviet Union. By 1999, Kazakhstan had only recovered 63% of the GDP level it had in 1991 (Alam 2000, p.6).

Within the same time frame, the economy of Kazakhstan downsized by 9 percent. Nonetheless, the country succeeded in keeping the inflation rates down due to strong fiscal and monetary policies. The country has also been successful in attracting foreign direct investments that have strengthened its balance of trade (Alam 2000, pp.6-11). However, the economy is vulnerable due to overreliance on exports. The exports suffer from cheap products in the international markets especially from Russia (Alam 2000, p 21). Thus, the performance of the economy depends on the prices of petroleum products produced for exports. The economy of Kazakhstan is majorly depended on minerals, oil, capital goods manufacturing and construction materials (CIA 2014, p.1).

The economy of Kazakhstan has recovered from the effects that results from global financial crisis based on the implementation of monetary policies that helped to keep the inflation low as well as regulate the exchange rates. The monetary policies that were implemented by the Central Bank enable the country to record 7.5 percent economic growth in 2010. However, the actual GDP growth slowed down in 2012 as a result of the decline in oil and agricultural output. The major inflation averaged 6 percent since 2010 approximately half the rate of core inflation in the subsequent years. In 2014, the central bank devaluated the country's domestic currency—tenge to reflect the concerns of global competitiveness, depreciation of the Russian ruble against world major currencies, among others. The exchange rate of the country's currency is controlled under regulation of liquidity by the country's banking system. There has also been an introduction of minimum reserve requirements by banks so that the financial system excludes the cash held in hand and the corresponding accounts with foreign currency from the reserve asset structures (Epstein & Portillo, 2014, p. 24).

The economy of Georgia can be understood in two eras. There is the pre-revolution era and the post-revolution era (Papava 2006 p. 665). The pre-revolution era can further be broken down into the period of disregarding economics, period of consistent economic reforms and period of rising corruption. Disengaging economics was experienced between 1991 and 1994. The economy declined up to three times whilst inflation rose to about 70%. The country introduced an interim currency, coupon that lost its value as soon it came into existence. The country liberalized prices except that of bread to move toward a market economy. The era of economic reforms began in mid 1994 to 1998 when there were greater economic and institution reforms. The government raised the price of bread, managed lending from the central bank and banned extensions by commercial banks (Papava 2006 p. 665).

Russia is the strongest economy in the CIS system. Having Russia separated from the Soviet Union, it introduced market economy and democracy in Russia (CIA 2014, p.1). The country has many democratic political parties and elections. Since 1991, numerous economic, administrative and political reforms have been implemented. The economic reforms focused on privatization and liberalization. Most small businesses have been privatized. However, the state possesses considerable control over large factories and is yet to privatize the agricultural sector. The number of privately owned businesses doubled between 1998 and 2005 (Wolf et al. 2006, p.28). At the same time, trade has changed between Russia and former soviet partners whereby the country engages more in trade with West. The economic growth of Russia depends a lot on oil, gas and raw materials. The economy is, therefore, sensitive to world prices. Similarly, the economy still has strong government influence to date (Robinson 2012, p.44). Russia is yet to settle in a market economy though evidence suggests a turn to communism. Russia has extensively liberalized international trade and division of labor (Robinson 2012, p.22). Russia has also implemented controversial tax reforms, a flat individual and corporate income tax systems at 13% and 24% respectively.

Like many globally linked economies, the Russian economy was affected in an adverse was by the 2008 economic crisis. It also heralded a monetary policy that has formed the government agenda in the past five years. As a result, the Bank of Russia has initiated a transition of its economy from an exchange rate based monetary policy to a price focused policy. It has led to the flexibility in the exchange rate as well as a change in the exchange rate regime as part of the medium-term strategy to make the country competitive in its purchasing power parity against major economies of the world. Russia has also had a surplus current account leading to an appreciation of the country's domestic currency against the major global currencies. In effect,

the resultant high inflation and interest rates create the one-way bet on the domestic currency. For a long period, Russia economy has been characterized by excess supply of foreign currency.

Azerbaijan has a purchasing power parity of 100 billion dollars in 2013. The country's GDP is mostly calculated against the US dollars as most of the goods that are produced in the country are converted into the US dollar price. Just like is the case with many developing nations, the utilization of PPP to compute the GDP is difficult since the US dollar or the Euro has to be applied to all goods and services that are produced in the country? Azerbaijan has had one of the most successful monetary policies in the region. The policies that are reviewed annually by the central bank have contributed to propelling the country's GDP forward. The relationship with the IMF in terms of funding also contributes to the economic growth of the country and hence a strong currency that affects its purchasing power parity in the region. The monetary policies were implemented by the Central Bank of the Republic of Azerbaijan in 2013 to foster the environmental sustainability of macroeconomic stability as well as diversify the economy. Because of the policies, Azerbaijan economy recorded a growing economy amid a subtle global economic growth that has become too sensitive to the slight changes in the financial systems. Azerbaijan has a favorable position in the foreign economics due to high economic activities. In 2013, the Central Bank focused on achieving a low one digit inflation and a stable exchange rate of the country's currency against the Euro and the US dollar as well as achieves financial stability. The policies that have been put in policies by the Central Bank within the previous year have enabled the country to experience an average annual inflation of 2.4 as well as the stable exchange of the domestic currency—manat. These factors have contributed to a strong PPP in the country as well as a single digit inflation level. As a result, Azerbaijan occupies a better

position in the global economy to compete effectively with other non-oil economy (The Central Bank of the Republic of Azerbaijan, 2014).

Theory

The theory of PPP is much founded in the Law of One Price. According to Olayungbo (2011, p.272) and Kozul (2013, p.266), the law provides that arbitration of prices for goods helps to ensure the stability of prices in the country of manufacturing and also abroad. However, this will depend on the currency in which the prices are expressed, so that a common currency makes the law to hold. Where the same price is not applicable to similar goods, it is far much easier to exploit the buyer by increasing the prices of the same goods in places where the demand is high. The value of a particular commodity should rise in places where it was cheaper but sell it more in places where it was expensive. In effect, the foreign exchange rate should adjust to make commodities cheaper in a producing country compared a consuming country. The PPP theory provides a mechanism through which traders can adjust the exchange rates to accommodate the changes occurring in prices due to the differences in terms of purchasing power between the two or more countries (Craig 2005, p. 1).

The PPP theory formulated by Gustove Cassel in 1916 is based on the principle that exchange rate between two currencies can be found by calculating the ratio in the corresponding levels of national prices. Thus, when the prices are converted in the same currency, there should be equal price levels between the countries in comparison. Researchers have studied the empirical validity of the PPP theory using a number of methodological approaches mostly comparing data from developing and developed countries. The findings of their investigations are as varied as the researchers themselves. The use of standard 2SLS and GLS by economist Frenkel in a 1981 study revealed that the theory did not hold. However, Froot & Rogoff (2008,

p.5) noted that PPP only held during the early 20th century but also in the 1970s when the US president devalued the dollar.

Review of Empirical Literature (Discussion of Approaches and Findings)

Most researches that have been done in the area of PPP in most countries around the world are focused on finding the evidence that indeed PPP holds in the long run. However, the findings have shown little evidence to that effect. Taylor & Taylor found that "the general idea behind purchasing power parity is that a unit of currency should be able to buy the same basket of goods in one country as the equivalent amount of foreign currency, at the going exchange rate, can buy in a foreign country, so that there is parity in the purchasing power of the unit of currency across the two economies" (Taylor & Taylor 2004, p. 136). As such, until 2010, most of the economists were of the view that PPP exerted a weak pull on the exchange rates. The relationship between PPP and exchange rates in developing countries showed statistical weaknesses because it takes a long time to be empirically relevant.

The findings were the same even in studies where the researchers were more careful in measuring the prices of tradable goods. What is interesting in these research findings is that strong results should be expected where a single price is applied. It is the same idea that has appealed to the proponents of the PPP theory for a very long time. Countries around the world have formulated their economic models around the theory of PPP without sufficient evidence as the basis of modeling international economics. However, there has been a relative success in the countries whose economic models are based on their PPP with their neighboring countries (Suranovic 2007, p. 3).

The value of US dollar had been pegged against that of gold. This led to the fluctuation of the worlds currencies. The recent developments in econometric have adopted the value of the US

dollar when testing the PPP between countries. The use of co-integration and unit root tests analyses have resulted in mixed findings (Froot &Rogoff, 2008, p.5). OLS approach using the co-integration technique rejects the PPP. The Maximum-likelihood approach, however, supports the PPP when based on the co-integration but not unit root methods. The empirical support of PPP means that a long-run and direct relationship exists between relative prices and the exchange rate. Empirical support also identifies domestic inflation as the major cause of depreciation between currencies especially in countries that have high inflation. The transition of former Soviet Union and the Eastern Europe countries to market economies gave rise to high inflation and currency depreciation in many countries. Evidence shows that such transition produced a new set of data that gave important information to test the PPP theory and its applicability (Taylor & Taylor 2004, p. 139).

One response to the failure of the PPP in the short run was the development of exchange rate theory that allowed PPP to retain a long-run equilibrium with significant short run variations, as a result, of sticky prices. Formal evidence tests for a long run phenomenon in PPP are based on the empirical examination of the actual exchange rates between different currencies. The real exchange rate displays reversion to the mean when it settles at any level. The mean reversion is a necessary condition for long-run PPP (Froot & Rogoff 2008, p.5)

Absolute Purchasing Power Parity

PPP can be expressed in two concepts of Absolute PPP and Relative PPP. The absolute PPP measures the exchange rate between the countries with identical ration prices. It is derived from the law of one price theory, where the actual price of commodities is expected to be the same across the world if all conditions are kept constant. The weight average of prices for

commodities in a country is maintained at the currency exchange rate prevailing between the countries of trade. This is expressed in the following formula:

S= P ÷ P*

$$\frac{\$}{£} = \frac{P_{US}}{P_{UK}}$$

S is the spot rate of exchange between the trading countries and represents the amount of foreign currency required to trade with domestic currency, P represents the price index for the domestic country, whereas p* is the price index of the trading country.

Nevertheless, Absolute PPP rule only holds when the goods of every country are allowed to move freely between borders and the international market. Equally, the price index for every two countries must conform to the same basket of goods rule and, finally, the prices should be indexed within the same year. The holding of the law of one price across the countries does not mean that weighting differences will automatically cause the Absolute PPP. Instead, the comparison of the average national prices level should be used as it is easier to calculate and get around the challenges of comparability very easily.

Relative Purchasing Power Parity

The Relative Purchasing Power Parity implies an exchange of two countries that expect the rate of inflation in their countries to change with the exchange rates of their currencies. As argued in the concept of Relative PPP, inflation has the impact of reducing the actual purchasing power especially in terms of the domestic currency. A country that has a 10% inflation rate should be able to purchase 10% less goods at the end of the year. Relative PPP helps to evaluate the changes in level of prices comparably between two countries that have maintained their exchange rates so as to compensate for the inflation differentials.

Relative PPP is expressed in the following formula:

$$\Delta\left(\frac{\$}{£}\right) = \Delta\left(\frac{P_{US}}{P_{UK}}\right)$$ $S_1 / S_0 = (1 + Iy) \div (1 + Ix)$

In the above formula,

S_0 represents the spot of exchange rate at the start of the time period and is usually measured as the y country prices with the currency x

S_1 = exchange rate at the ending of the point period.

Iy is the projected annualized inflation rate for country y (foreign country).

Ix is the projected annualized price- increase rate for country x (the domestic country).

The export restrictions played a crucial role in the understanding of the PPP theory during its early development because of its widespread use. The result of export restrictions has always been that the currency of the country with high tariffs is undervalued relative to PPP of a country that has a lower tariff. In contrast, a country that has high import restrictions has an overvalued currency based on the PPP. An example is the Japanese quota and tariff imposition on beef imports that went as high as 70 percent of its price in the 1990s. Korea also imposed a 30 percent tariff and increased restriction on quantity imported into the country. Such barriers obstructed the natural price equalization throughout the world beside the impact that it had on the domestic prices of beef products in Korea and Japan. In many cases, imposed restrictions have been an excuse for over-valuation of domestic currencies that leads to unfair competition against the US dollar (Olayungbo 2011, p.272).

Studies have also indicated that the theory of PPP is also affected by the information asymmetry (Islam et al. 1999, p. 98; Bekő et al. 2007, p. 425; Mladenović et al. 2012, p.18). The application of the law of one price is based on the assumption that different markets gain access to similar information when it comes to prices. This means that traders can make a profit by hiking the prices of commodities in one market until the demand and supply forces act to create a stable equilibrium in prices. However, market imperfections disrupt the flow of information in different markets and countries hence making it difficult for traders to act. Furthermore, traders are not able to make effective scale of trade to impact on the equalization of prices. Without the similarity of information regarding prices of goods in different countries, traders cannot have an impact on prices so that they converge through market forces. As such, the PPP theory that is based on the law of one price cannot hold in the countries that generate their own information about markets and prices (Dabrowski 2013, p. 117).

Summary and Conclusion

Various studies exist to prove the numerous theories surrounding the application of PPP in determining prices of commodities in different countries. A long held belief about PPP is that the theory provides effective mechanisms to understanding the actual exchange rates and accompanying natural equilibrium behaviors in the long run. Researchers and economists form a consensus that convergence of prices in international markets for the same product is relatively slow when compared to the rapid changes in exchange rates of currencies in these countries. Researchers and scholars note that volatile nature of short run exchange rates is due to market imperfections and conditions that make it difficult to have uniform prices of commodities across international markets. The real exchange rate is the product of the ratio of national price levels

and the nominal exchange rate. The ratio of national price levels is the result of diving the domestic price levels with the foreign price levels of the countries that are in partnership.

The Commonwealth of Independent States have a number of differences in their economic policies and currencies that make it difficult to hold same prices for similar bucket of goods. As such, the puzzle is how to reconcile the erratic and unpredictable volatility of exchange rates in light of the slow rate of PPP correctional mechanisms. A number of formulated aiming at showing that PPP deviations are as a result of non-tradable goods, income disparity across countries, different government policies, and differences in information access. Other factors include productivity differences across countries, and differences in government spending, among other factors. Nevertheless, PPP is an important tool that provides a common ground on which economic conditions of different countries can be compared and analyzed. The weaknesses and limitations therein should be considered whenever the purchasing power parity of Commonwealth of Independent States is being compared as well as in understanding the particular data set.

In conclusion, for the Purchasing Power Parity theory to hold, the tests should show strong stationary relationship for the variables. The null root is rejected at 10% significant level of error. The result ends up with a strong relationship between exchange rate and relative price (Islam et al. 1999, p. 98; Bekő et al. 2007, p. 425; Mladenović et al. 2012, p.18; Olayungbo, 2011, p.272). The materials reviewed provide insightful views on (1) testing stationarity of exchange rates using standard unit root tests; (2) testing stationarity of exchange rates using new unit root tests that accommodate structural and non-linear qualities, and (3) the use co-integration tests for price and exchange rates in validating PPP theory.

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