An assessment of Argentina's Inflation based on Purchasing Power Parity Theory (PPP) and Soybean's Price

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Abstract

The paper contains a discussion about the possibility of elaborating an instrument to measure the differences between the figures produced regarding official Argentina's inflation rate and the current Argentinians' feeling of dissatisfaction with the numbers disclosed and the reality felt in their pockets. For this, we used the PPP and the law of one price (LOP) theory; soybean prices and parallel exchange rates among other data.

The results were: the LOP applies to Argentina's soybean, and in relation to the absolute PPP the conclusion points out that there is reasons to believe in the possibility of questioning if the official data disclosed are true or not. Yet in relation to the absolute version the results indicate that PPP applies to Argentina's basket of goods, although the prices were not good as the LOP. On the other hand, the results for the relative version were not satisfactory.

KEY WORDS: Argentina's Inflation; Purchasing Power Parity; Consumption Basket

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1. Introduction and Objective

The Brazilian press, reflecting coming news from Argentina, systematically publishes that the government index of Argentina's inflation does not show the reality. It actually is underestimated. Private institutions has been building their own index. This fact arouse the curiosity of measuring the inflation rate as an indirect way by using exchange rates and foreign price index, whose purpose is to estimate the monthly inflation rate and then, to compare to the official figures.

The difference among price indices elaborated by private domestic institutions has aroused the scholar's curiosity because one of the main features to manage adequately the economy is the confidence in the government actions. According to Pierre Salama (2012), Professor of Paris III University, the behavior of the Gross National Product (GNP) of Argentina and the inflation during Kirchner administration (Néstor and Cristina), which started in 2003 and remains until now, the growth rate of GNP, in this period, was higher than Brazil's rate and with income distribution less unequal. The policies of the head of government reduced the poverty and raised the employment level and, additionally, showed surplus in the trade items of balance of payments.

Regarding to the level of domestic price, Salama (2012, p171), points out that "the actual rates of inflation show a higher and strong[i]er level than the one announced by the government, and therefore reduces the purchasing power among the poorest categories of the population". He claims that "since 2007 the elevation of inflation rates is remarkable, despite of *existing price indices manipulation,* and he adds "in fact the process of calculating the inflation rate is being manipulated since the middle of 2007…", (p.159)[ii] (emphasis added).

The manipulation of price indices would have started because of the strong elevation occurred in the year of 2006, which was measured at the time of the existing indices. The high rate led to a feeling of dissatisfaction to the government chiefs, whose action was to modify the composition of the indices and, by the circumstances, the creation of a new index to underestimate the inflation rate. Regarding this matter, Cunha (2011, p.45) made a comprehensive and interesting research and so she appointed the exact date of the beginning of the manipulating process of the inflation calculus. In her words, the beginning was in January 29, 2007. In that date has occurred the resign of Graciela Bevacqua, director of price indices at Indec (National Institute of Statistics and Census of Argentina Republic), agency responsible for calculating and disclosing the prices indices. At the same time, her boss, Clyde Trabuche, also resigned and then, in the end of 2007, Beatriz Paglieri was hired as a substitute of Bevacqua.

> The scenario for changes at Indec and at the same time, in the inflation rate, was seen since the second semester of 2006, as we can prove in Bullrich & Juegen, according to the quotation of Cunha (2011, p.40):

Even with the agreements [forced] to reduce the prices to the consumer, the prices continued increasing as well as the inflation. Guilherme Moreno, Secretary of the International Trade, has received the task to lower the index. In order to fulfill his objective, Moreno forced people responsible for the prices' department at Indec to provide him with the list of enterprises and products that compounded the calculus of CPI, but he did not get the list immediately […] because the list was considered a secret document…".

Cunha (2011, p.42/3), yet talking about the same subject, based in her Argentina's knowledge highlighted: "the price paid by the manipulation of the index was higher than the couple Néstor and Cristina Kirchner expected". As a consequence, the couple had the "access closed to the volunteers' [financial] market and an interest rate higher than the practiced rate at the time prior to that decision". Cunha quotes that Kanenguiser pointed out that before the beginning of the price manipulation, in January 2007, Argentina's country risk was 170 basis point lower than Brazil's and shortly thereafter the scenario has changed and Argentina started to pay interest rates higher in a daily basis...

Although the population know about the difference between the official numbers of inflation and its consequences felt in its pocket, when the salary runs out, people yet are faced with expenses to pay, and then, a new reality is brought by the changes in the index. On the other hand, there is a benefit to the government when the changes in the index accomplish a political function, we can say, when they can disclose favorable indices to the government. In addition, when we consider the government point of view, there are positive externalities, for instance. a) when the index affects the public debt, usually indexed by inflation rates, the lower the index is, the lower is the need for money to pay the debt; b) additionally the retired people are paid by social security, thus, the lower the index, the lower the need for money to pay this people and so on.

To verify the effect that the changes in the index can produce, it is possible to verify the results in relation to the public debt. According to Kanenguiser (apud Cunha, 2011, p.42), calculus made in Argentina pointed out an economy generated due to changes in the order of 23 billions of dollars at the end of 2010.

Thus, the objective that permeates this study and is considered the target of it, is the mensuration of eventual deviations among the estimated domestic prices and the observed prices in the market place, considering for the evaluation of the deviations, the price index of the foreign country, its exchange rate and the country chosen as a basis to the study. In this case, Argentina.

The paper is structured in the following way: Abstract, Section 1, Introduction and Objective; 2 Literature review; 3, Material and Methods; 4, Discussion; 5, Final Considerations. .

2. Review of Literature

2.1 Purchasing Power Parity Theory (PPP)

In the previous paragraphs, general considerations about the subject were made. From now on, we shall consider the theoretical framework that will be utilized. That means the theory of the Purchasing Power Parity (PPP). According to Rogoff (1996, p.647), this theory was initially proposed by the Salamanca's scholars in the sixteenth century and it was exposed with a very

admirable simplicity, as a proposition that, once convertible to the common currency, the domestic prices must equalize the international prices.

The PPP comes from the Law of One Price (LOP) that establishes that from several goods, we take the product "i",

(1)
$$P_i = EP_i^*$$

Where Pi is the domestic price of the good "i", Pi* is the price of the same good in a foreign currency, and "E" is the Exchange rate defined as the ratio of the domestic price of the good "i" divided by the price of this good, expressed in the foreign currency. The variables change along the time. The equation (1) suggests that, in general terms, the interpretation is that "E" can be translated as the amount of domestic currency that is needed to buy one unit of the foreign currency.

In Rogoff's words (1996, p.649), the LOP establishes that, if the domestic prices are converted into a common foreign currency, the same good has to be sold by the same price in different countries, certainly withdrawing the transaction costs and the barriers that may exist in the international trade of this good[1]. Summarizing: the law of one price establishes that the price in United States dollars related to a specific good, must be equal in any other country, when the price of this good is expressed in this currency.

Although the proposal is to withdraw the transaction costs and the barrier to the international Market, Taylor & Taylor (2004, p.24) in his critical review regarding the theory, prefers to delegate to Keynes the defense of the importance in considering such frictions. See the text below:

> Heckscher (1916) developed the idea of introducing the concept of "commodity points." Keynes (1923, pp. 89–90, 91–92) highlighted transaction costs as a key substantive issue for the PPP theory:
> At first sight this theory appears to be one of great practical utility... In practical applications of the doctrine there are, however, two further difficulties, which we have allowed so far to escape our attention,—both of them arising from the words *allowance being made for transport charges and imports and export taxes.* The first difficulty is how to make allowance for such charges and taxes. The second difficulty is how to treat purchasing power of goods and service which *do not enter into international trade at all.…*For, if we restrict ourselves to articles entering into international trade and make exact allowance for transport and tariff costs, we should find that the theory is always in accordance with the facts... In fact, the theory, stated thus, is a truism, and as nearly as possible jejune. (Taylor & Taylor, 2004, p. 23/24).

On the other hand, the PPP follows the same principle, but in an aggregate way, that is:

(2)
$$\sum P_i = E \sum P_i^*$$

For the PPP, the prices play a role of a basket of goods, domestic and foreign, that, in principle, must be compounded of identical form in terms of amount of items, quality and weight. It can be said that when considered the relation in the time, instead of one specific data, the PPP becomes a link among the variations in the exchange rate and differences in the inflation rate.

As we can observe from the literature about PPP, this theory has its origins in David Ricardo and Gustav Cassel. This author turned it popular and placed it in the center of a theory regarding exchange rates. Although there is so much controversy about its validity, the theory of PPP highlights important factors behind the movements of the exchange rates.

Considering the equations (1) and (2), we can observe that they are very similar. However, while the equation (1) describes individually, case by case, the validity of the law of one price for "n" categories of goods, the purchasing power parity checks the relations of a set of prices and amounts of the "n" goods that compound a basket of goods, whose prices are expressed by means of a general index.

Now we can learn from Dornbusch (1985, p.2/3) lesson:

> Let "p" represent the price of the commodity at home and abroad, stated in home and foreign currency respectively, and "e" the exchange rate. The exchange rate is quoted […] as the number of units of domestic currency per unit of foreign money. Further let P and P* be the price level at home and abroad quoted in the respective currencies. The strong or absolute version of PPP relies on the "law of one price" in an integrated, competitive market. Abstracting from all and any frictions the price of a given good will be the same in all locations when quoted in the same currency, say dollars: = ep. Consider now a domestic price index P and a foreign price index P*. If the prices of each good, in dollars, are equalized across countries, and if the same goods enter each country's market basket with the same weights (i.e. the homogenous-of--degree-one g(.) and f(.) functions are the same) then absolute PPP prevails. The law of one price in this special case extends not only to individual goods but also to aggregate price levels. Spatial arbitrage then takes the form of the strong or absolute version of PPP: e = $ price of a standard market basket of foods/£ price of the same standard basket.

Regarding the validity of the law of one price and the purchasing power parity, one basket of goods that contains "n" goods, and each one satisfies the LOP, then, the PPP also will be true for this basket of goods. Therefore, the authors that defend the PPP, consider that it can be applied independently of the LOP be applied or not, as consider the authors Krugman & Obstfeld (2010) about this interpretation. For them, even when the law of a one price is no longer valid for each commodity, the distance, among the results forecasted by PPP, the exchange rates and prices, is not so big. They add that although the LOP not being integrally true all the time; the underlying economic forces will help in the equalization of the currency purchasing power in all countries.

The equation (2) expresses what is named absolute PPP and, therefore, we have the relative PPP, that can be written as the percentage of the exchange rate variation between two variations in the level of domestic prices. Then it is possible to leave the relations over price indices and the exchange rate, to the observation of variation in time related to a price index and the exchange rate. For Levi (2009, p.103), if the PPP has validity in its absolute way, in a certain point in the time, then in the end of a period, the PPP still remains valid, it requires:

(3) $$P(1 + \Delta P) = E(1 + \Delta E)P^*(1 + \Delta P^*)$$

Where, Δ expresses the occurred variation.

Taking the ratio of equation (3) to the absolute form of PPP (P = EP*), by taking the ratios of both sides we get another way to show the form relative of PPP, that is.

$$(4) \qquad (1 + \Delta P) = (1 + \Delta E)(1 + \Delta P^*)$$

Krugman and Obstfeld (2010, p.292) remind us that according to the purchasing power parity theory (PPP), the ratio among two countries' currencies is equal the ratio of the level of the prices in these countries. In addition, if there is a fall in purchasing power of domestic currency, through price elevation, it will be associated to a proportional depreciation of the exchange rate in the market. Therefore, an increase in the purchasing power will cause a movement in the opposite direction. The authors ask themselves if it is valid to discuss the theory of purchasing power parity, considering that it presents several exceptions and it looks like contradictory when faced with the data. However, when the exchange rate and the price level are related in the long run, they understand that there is a starting point to establish concepts regarding the exchange rate behavior in the long run, and conclude:

> Whenever all disturbances are monetary by nature, the exchange rates obey the relative PPP in the long run. In that case, the monetary disturbance affects only the general purchasing power and this change in the purchasing power equally modifies the value of the currency in relation to the domestic and foreign goods. When the disturbances occur in the production market, it ís not probable that the exchange rate obeys the relative PPP, even in the long run (Kugrman & Obstfeld, 2010, p.310).

According to Dornbusch understanding (1985, p.1), the purchasing power parity (PPP) is defined as the theory of exchange rate determination and adds "in the most common form, changes in the exchange rates between two currencies over any period of time is determined by the change in the two countries' relative price levels. Because the theory points out price level changes as the overriding determinant of exchange rates movements it has also been called the "inflation theory of exchange rates". This aspect motivates the current study. Estimate the level of prices variation and to confront it with the prices reality divulged by Indec, the agency responsible for the Argentina inflation calculus and to compare it with the non official figures, if possible, elaborated by Consulting Enterprises.

It is still necessary to consider that the authors who work in this field of economics, specifically with the PPP theory, used to segment it in short or long run and they look for explanations about the subject when considering the segments of tradable and non- tradable goods. (LEVI, 2009; KRUGMAN & OBSTFELD, 2010, ROGOFF, 1996; DORNBUSH, 1985, among others).

2.1.1 Some empirical results

One of the main concerns of the researchers in the field of PPP has been to have the capacity to calculate *ex ante* the exchange rate (to anticipate the value). Darby (1980) argues that there are two distinct concepts that people usually consider when studying this matter: The price level and the growth concepts. The first one is the ability to predict the domestic price level given the exchange rate and the foreign price level. The other concept refers to forecasting inflation rate. In both cases, we can determine the other variables, one by one, considering that the other two variables are given. Thus, in this study, the determination of Argentina's price level was the variable chosen, as a proxy of the real inflation rate in that country.

Darby, in his paper adopted another path. He showed the logarithm of the purchasing power ratio (PPR) for seven countries and three alternative price indices He was searching a stationary and

invertible process, considering the first differences. This means permanent shifts in the parity value accumulated over time. The variance of the level of PPR goes towards infinite while the variance of its average growth rate goes to zero, and he adds that it is not possible to maintain a pegged exchange rate or achieve an exchange rate growth goal by manipulating monetary growth according to relative price levels.

This subject (PPP) has been studied by many researchers in Brazil and worldwide. Almost all studies search the empiric proof of the theory, like two Brazilian authors as Freixo and Barbosa (2004). They made use of the smooth transition autoregressive nonlinear model (STAR), proposed by Granger and Terasvirta (1993) to the Brazilian real exchange rate (RER) aiming to test the validity of PPP. Its results show a nonlinear behavior, being stationary when distant from the equilibrium and with an explosive tendency when close to parity.

Rogoff (1996), in his turn, highlights that there is a puzzle[iii] in the PPP and he describes that puzzle as "how can one reconcile the enormous short-term volatility of real exchange rates with the extremely slow rate at which shocks appear to damp out". After his navigation from the experiences of several scholars, we can summarize his conclusions, as "international goods markets, though becoming more integrated all the time, remain quite segmented, with large trading friction across a broad range of goods.

Mishkin (1984) conducts empirical tests of the equality of real interest rates across countries. The empirical evidence strongly rejects the hypothesis of the real rate equality and the joint hypotheses of uncovered interest parity and ex ante relative PPP, or the unbiasedness of forward rate forecasts and ex ante relative PPP. The evidence suggests that it is worth studying open economy models, which allows: 1) domestic real rates to differ from world rates, 2) time varying risk premiums in the forward market, or 3) deviations from ex ante relative PPP.

Azzoni (2003) adopts a different approach. His objective writing the paper was to present two ways to elaborate regional price indices, with simultaneous comparison of these methods and applicable to all Brazilian's data. He was looking for the most convincing method. The paper brings the theoretical approach to elaborate indices to measure the inter-regional cost of life and was motivated to apply the two methodologies for calculating the indices to the 11 Brazilian metropolitan regions relative to the 1996-2002 period. The results suggest that there are big differences of relative prices among Brazilian cities. These results are expected due to the size of Brazil territory and its cultural and income diversity.

Prior to developing the purchasing power parity concept, and how to measure it, the expectation was to get an applicable method destined to the international use. In order to satisfy this need, Kilsztajn (2000), reports that the utilization of a unique domestic currency represents a rough way of approximating international comparison. The author in his paper had these objectives: divulge the PPP's concept, to show, supported by data, the relationship between the PPP and the income by inhabitant. Additionally he expected to use PPP to compound other economic indicators, such as the gross capital formation, exchange rates, and regional indicators.

2.2 The importance of soybean cultivation in Argentina and Brazil

Argentina and Brazil are two countries whose economy relies strongly on the rural sector and, in this sector, the soybean occupies a remarkable place not only because the value of the

production, but also because it constituted an induction channel of countryside modernization and the system of agricultural exploitation, especially in Brazil. The soybean[iv] production already showed signifying numbers when, in 1967, important changes were introduced in the economy including the rural sector. In addition, the large-scale agriculture (incipient at that time) was benefited by a 1975 wind frost that almost eliminated the coffee plantation in the south of Brazil. This region was the cradle of soybean and the elimination of coffee trees became the opportunity for farmers to change its activity, especially because the climate of the south of Brazil is not that appropriate for the exploitation of the coffee culture. The coffee crisis opened an opportunity to the soybean producers that adopted new practices in its production system. The focus of the new era was to incorporate technology, thus, the new era becomes technology-based agriculture.

The government encouraged the producers to adopt procedures to increase the productivity and the production. With this objective, they adopted policies addressed to the development of agriculture, mainly through the destination of specialized credit, policies of prices and incentive to trade. In addition, the government encouraged the adoption of what was called at that time "modern inputs", consisting of using improved seeds, fertilizers, correction of the level of soil acidity, adoption of planting and harvesting using tractors and combines etc. (GONZALEZ & COSTA, 1998).

The endeavor of modernization has transformed the Brazilian agriculture, including positive externalities which facilitated the agribusiness to achieve 22.5% of participation in the 2013 GNP, and the participation of soybean could represent 25,4%[v] of the Brazilian agriculture production value in the same year.

Yet in relation to the significance of the rural sector in the Brazilian economy, whose agriculture is strongly soybean, corn and cotton based (these are the main not perennial species), we noted that in the 1970s there was a big advance in the modernization process, which had soybean as its dynamic element. The soybean, with its attractive prices in that period provided the conditions of a technological jump in the agriculture and cattle raising that we can thereafter observe. (GONZALEZ & COSTA, 1988).

In order to demonstrate the world importance of Brazil and Argentina agriculture, we can quote USDA (2014) to show some figures: the soybean production in 2013 was 284.94 tons and the participation of United States, Brazil and Argentina was, respectively, 31.1%, 30.9% and 19.1%."Other" countries supplies the difference to complete 100%.

In relation to Argentina, Aizen et al. (2009), cites that before the decade of 1900, it was almost impossible to see any plantation that was not wheat and alfalfa to overlap 30% of planted area in each year. The dominant cultivation presented average values of 25% and around 2006 the middle of acres planted in Argentina was soybean, and it is important to record that the growth occurred more intensively after the beginning of the years 1990.

Yet according Aizen et al., until the beginning of the seventies, the wheat and alfalfa alternated as the main planted product in that country, but in the seventies and eighties, the wheat was the dominant cultivation, but from the nineties on the place was yielded to the soybean. The

soybean, changed the specie dominant in amount produced and, in addition, brought a new identity to the sector.

Argentina, whose GNP is US$ 488.2 billion, received in 2013 as a contribution from rural sector 9.3% related to the production of goods and services. This country has been facing with many questions linked to the reality of economics data. Because of these questioning we can consider that the exchange rate and the price of soybean can play an important role in the task of discovering the real numbers.

3. Data and Methodology

The data comes from government and privates institutions and are public and available on the internet. They were extracted from the internet sites, as: Instituto Nacional de Estadística y Censos, for Argentina official inflation rates and exchange rates; Bolsa de Comercio de Rosario, for Argentina soybean's prices, United States Department of Agriculture, for United States soybean's price, considered as international price, mainly because Brazil and Argentina follow the quotation from Chicago Mercantile Exchange.

The data were placed in a monthly basis and the period considered was April, 2002 to November, 2013, totalizing 152 observations.

3.1 The law of One Price (LOP)

Before verifying the validity of the law of one price, we made a data exploration with the intention to learn about it. We considered both the average and the standard deviation showed in Table 1.

Regarding the figures contained in Table 1, must be pointed out that the standard deviation of non- official exchange rate (parallel), as we could forecast is higher than the official one perhaps because the market of parallel is subjected to major volatility (free market)[vi]. On the other hand, the higher medium price of Argentina and United States' soybean has occurred in February and the exchange rate has occurred in 2014 November and September, respectively.

TABLE 1 Soybean and Exchange Rates Statistics

Variable	Average	Standard Deviation	Minimum	Maximum
Soybean Price – Argentina[a]	38,18	22,20	13,26	100,55
Soybean Price – USAP.EUA[b]	9,50	3,28	4,47	16,20
Official Exchange Rate – Arg	3,97	1,38	2,82	8,53
Parallel Exchange Rate - Arg	4,65	2,73	2,81	14,80

Source: Elaborated by the Authors

[a]: Pesos per bushel; [b] :Dolllars per bushel and the exchange rate is pesos for dollars

According to Rogoff (1996, p.654), the international arbitrage in the short run, that influences both, the law of one price as purchasing power parity, has a limited effect in the equalization of international prices of goods. This situation may allow getting the deviations in relation to the PPPs effectivity, allowing then to measure the inflation differences. The measuring of these differences is the target of this paper. The results that we are looking for has the support on the following methodology.

The econometric model follows the model specified by the economic theory of the Law of One Price (LOP) that comes from equation (1), that is,

$$P_i = E_i P_i^*$$

Applying the natural logarithm in both sides of the equation (1), we get:

(5) $$\ln(P_i) = \ln(E_i) + \ln(P_i^*)$$

Thus, the stochastic model, is given for:

(6) $$\ln(P_i) = \alpha + \beta_1 \ln(E_i) + \beta_2 \ln(P_i^*) + \epsilon$$

Where P_i is the price average of Argentina's soybean price for the month "i"; E_i is the monthly average of Exchange rates, considering the ratio Pesos/Dollar and P_i^* is the monthly average of United States' soybean price in determined month "i", and the last, ϵ is the random error.

In order for the (LOP) be valid, the coefficients of the model has to be: $\alpha = 0$, $\beta_1 = 1$ e $\beta_2 = 1$.

Due to the importance of foreign currency market in Argentina and its peculiarity, the decision was to make two model estimates. One of them, using the official exchange rate and the other using the parallel exchange rate. This strategy was due the necessity of knowing the results to choose the estimate that fits well into the reality.

It was utilized then the generalized least squares with correction of heteroscedasticity.Table 2 presents the results.

TABLE 2 – Results for LOP

Official Exchange Rate		Parallel Exchange Rate	
Variable	Results	Variable	Results
Constant	0,383585***	Constant	0,815777***
Ln(E)	1,03782***	Ln(E)	0,65543***
LN(P*)	0,790393***	LN(P*)	0,800841***
R²corrected	0,971883	R²corrected	0,971765
P-value	***	P-value	***

Source : Elaborated by authors; *** P-value inferior to 1%

4. Discussion

4.1 The law of one price

Considering the estimated model based on the official exchange rate, the β coefficients achieves values close to the unity. There was a minimum deviation of ln(E), we mean, only 0.038 and the deviation from ln(P*) was equal to –0.209 while the constant value had worse result than the βs taken into account the expected value of zero, with value of 0.383. All the variables of the model were effectives to 1% of the significance level and when considered all variables together. Examining the R^2, we can say that 97% of the Argentina soybean prices can be explained by the exchange rate and the USA soybean prices.

To simplify we did the calculus of Argentina soybean estimated prices only for the last month of the series, that is, from December of 2002 to December of 2013, but, even so we can verify from Graphic 1, the narrow relationship between the estimated price (EP*) and the observed price (P).

GRAPHIC 1 – Argentina Soybean Price – Observed and Estimated
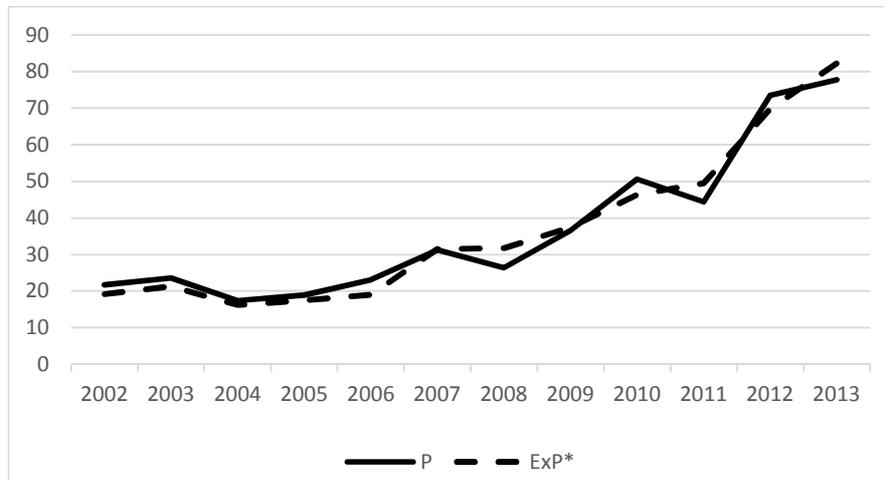
Feijó and Morales (2008), made a list of presuppositions to analyze if the LOP can apply: there is no transportation cost; the existence of perfect information; free trade: there are not barriers to trade (tariffs or any other kind of obstacle) and homogeneous goods.

There were small differences between estimated and observed prices. Such differences could be related to the incomplete observance of all presuppositions requested by LOP. In the soybean market there is no such difficulty to get information because there are many channels of communication; the product is homogeneous and, in relation to the cost of transportation, there are only three countries acting strongly in the international market, thus the costs have the trend to be neutralized for the producers. In relation to the barriers, here we have a weakness, this presupposition in general case, is the most difficult to be eliminated.

Taking the parallel exchange rate (PER) as a substitute to official rate (OER), we find similar results (see Table 1), but worse than the previous estimate. The deviation in relation to expected betas of Ln(E) e Ln(P*) were: – 0.345 and – 0.20 to PER, while to OER the deviation were: for betas 0.038 and – 0.209. Moreover, when the variable is the "constant" the coefficient was very higher than the expected value, zero, showing deviation of 0,816. Despite the bad result to parallel exchange rate in comparison to the official one, the expected results are satisfactory because the variables were effective to 1% significance level when considered individually or separately. Talking about the R^2, it was good. It explains 97% of dependent variable.

Using the same techniques of Graphic 1 it was then generated the Graphic 2 with the utilization of parallel exchange rate, instead of the official exchange rate. It is possible to verify the difference between the two graphics, particularly the period 2010 until 2013 relating to the observed and estimated values. One explanation comes from the changing in exchange rate policy. For instance: in 2010, when the government took two decisions that affected the mind of investors and population: constraints the buying of dollar and authorization to use international reservations, controlled by Central Bank, to pay external debt.

GRAPHIC 2 – Argentina Soybean Price – observed and estimated
Parallel Exchange Rate
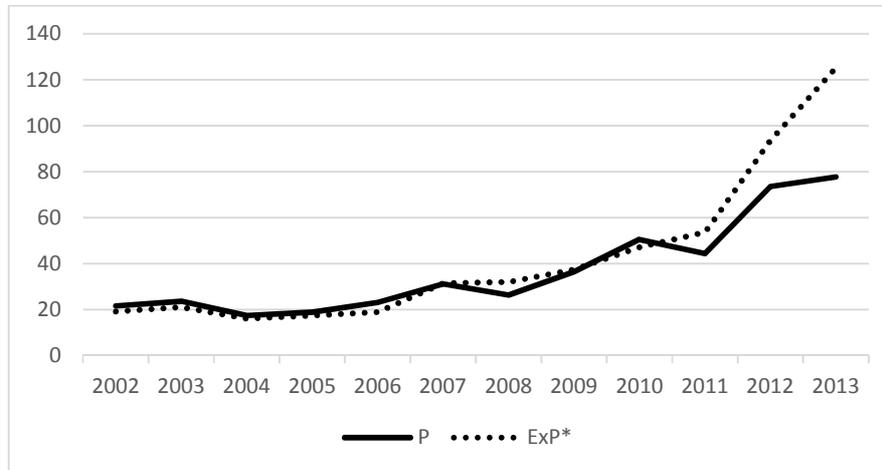
Source: Elaborated by the authors.

On the other hand, the soybean market is a formal market. Its business practices are guided by formal rules, including the use of official exchange rate, instead of parallel market. Thus the feature of business is to use official quotations of exchange rate, mainly because the country exports a big part of its production, creating in this way a close relation to the official market of dollars and by consequence the official figures fit well in the process of LOP verification, leaving apart the parallel dollar.

4.2 The purchasing power parity

Table 3 below contains the official indices of Argentina's inflation, disclosed by Indec and an index that was elaborated having the soybean price as a basis. We can verify that until 2009 the price of soybean was below the inflation index, therefore in 2010 that indicator overlay the inflation index, going down in 2011, although very close. In 2012 and 2013 the soybean price variation stands in a higher level in comparison to the inflation. The difference extent and the change of indices behavior bring us a doubt about the truthfulness of official inflation indices, mainly because the soybean is an important product of exportation and follows the international price.

TABLE 3 – **Inflation Rate and Soybean Prices**

Year	Soybean	Inflation	Year	Soybean	Inflation
2003	108.9107	103.661	2009	168.4850	169.9928
2004	80.29934	109.981	2010	233,2555	188.5612
2005	87.28159	123.5405	2011	204.6069	206.4904
2006	106.5505	135.6957	2012	338.6157	228.8791
2007	143.8829	147,1942	2013	358.3689	253.9313
2008	121.5224	157.8472			

Source: elaborated by authors. Data:Indec/Bolsa de Cereales - Rosario

After done the observation relative to the detachment of indices, we verify the validity of PPP, being in its absolute or relative way.

To the absolute PPP, we considered, as a domestic price, the value of consumption basket in the value of 1.665 pesos to April 2005 (Hintze, 2005), and the value was adjusted to the time series based in the official inflation rate and allocated on its respective month. In order to estimate the domestic price it was used the econometric model according equation (5), where $\ln(P_i)$ *is* the natural logarithm of basket consumption; $\ln(E_i)$ is the natural logarithm of official exchange rate, while $\ln(P_i^*)$ is the natural logarithm of soybean international price. After calculation positive betas are expected almost equal to one for $\ln(E_i)$ *and* $\ln(P_i^*)$ and close to zero for the constant. The results are in Table 4.

TABlE 4 – **Results of Absolute PPP**

Variable	Results
Constant	5,65742***
Ln(E)	0,387191***
LN(P*)	0,657677***
R²adjusted	0,943071
P-value	***

Source: Elaborated by the authors
*** P-less than 1%

The Ordinary Least Squares (OLS) with corrected heteroscedasticity was the model utilized. The Ramsey's Reset Test points out to a correct specification of it. All variables were effective to 1%. The results indicate that the consumption basket price is influenced by soybean international price and by official exchange rate, however the values were not so close as expected. The betas were positives, but showed values far from the unity. This fact indicates that the price of consumption basket can be influenced by these variables, but not completely, although we can say that it is very reasonable. The constant was positive and its value is higher than the expected one, we mean, zero. The found results confirm that the dependent variable is not been totally explained by the independent variable. The possibility is that it has been influenced by more variables contained in the consumption basket, which gives support to the index price.

To the relative PPP we utilized the model provided by equation (4), considering its logarithm form, as we can see:

(7) $$Ln\big((1 + \Delta P)\big) = \propto + \beta_1 Ln\big((1 + \Delta E)\big) + \beta_2 Ln\big((1 + \Delta P^*)\big) + \in$$

We expect again close values to the one for the coefficients and zero for the constant, and for the model estimation was utilized the same OLS method, also with corrected heteroscedasticity. However, in this time, the Ramsey's Reset test indicates that the model is not correctly specified. The results can be seen in Table 5.

We can still observe that the results were not satisfactory, because they did not show influence of international soybean price over its domestic price, because the coefficient of beta was negative. This result goes in the opposite direction provided by that theory. Based on this theory we expected positive correlation between domestic and international prices and the causality acting from the international price to the domestic one. Furthermore, the constant showed a higher value than the expected value, what was zero. Probably we have to add more variables in order to improve the model. In addition, when we observe the adjusted R^2 it also demonstrates the incapacity to provide explanation about the basket consumption variations.

Although effective to 1%, the exchange rate shows a very high value in comparison to the value expected. Thus, the results point out that it was not possible to prove, considering the relative PPP, that the exchange rate and the soybean international price have influence over the consumption basket and, in addition, we could not extract information that serve as a basis to discuss the accuracy of Argentina's price index.

TABLE 5 – Results of Relative PPP

Variable	Results
Constant	7,3375***
Ln(E)	7,3633***
LN(P*)	−0,468582
R²adjusted	0,181032
P-value	***

Source: elaborated by the authors

*** P- value less than 1%

5. FINAL CONSIDERATIONS

The Brazilian press, reflecting coming news from Argentina, systematically publishes that the government index of Argentina's inflation does not show the reality. It actually is underestimated, as we can see along the text. The curiosity about the subject led us to search for more information and to know more about the reality of inflation in Argentina.

Although unusual, we chose the law of one price and the purchasing power parity theories as a framework to search for a tool to measure the difference between the official inflation rate and the reality felt by Argentinians when they need to go shopping. We found support in doing it because of the relationship among prices (domestic and foreign) and the exchange rate. Moreover, as we quoted before, Darby (1980) we have to have the ability to predict the domestic price level given the exchange rate and the foreign price level.

To achieve our objective we took a glance in the importance of soybean for Brazil and Argentina because our first motivation were to compare the results for both countries. And we chose soybean taking into account its importance for Brazil's and Argentina's economies, not only because the internal income but also because it is an important good in the balance of payments, and we remembered the Walras' Law about the market equilibrium. Maybe some researcher can find reasons to formulate a similar law for PPP.

Back to the objective again, we would like to say that we intended to discuss and to verify the possibility of elaborating an instrument to measure the differences between the figures produced regarding official Argentina's inflation rate and the current Argentinians' feeling of dissatisfaction with the numbers disclosure and the reality felt in their pockets. For this, we used: the PPP and the law of one price (LOP) theories; soybean prices and parallel exchange rates among other data.

The results were: the LOP applies to Argentina's soybean using the official or the parallel exchange rate quotations; in relation to the PPP, when we used the absolute version, the

conclusion points out that it is possible to verify that there is reasons to believe in the possibility of questioning if the official data disclosure are true or not. Yet in relation to absolute version the results indicate that PPP applies to Argentina's basket of goods, although the prices were not good as the LOP. On the other hand, the results for the relative version were not satisfactory.

As we could not achieve our objective as a whole, we would like to say that we have the feeling that it is necessary to expand the horizon of the research. We mean, including more variables in order to show its importance to the relationship among the focus country and its international trade partners; to exploit the possibility to test autoregressive models, and so on…

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[ii] The government preferred to minimize the effect of the rising of the prices on food products and energetics, subsidizing them instead of adopting a realistic policy against inflation. From 2007 on Salama, in his analyses has adopted a compound index based from the States, which do not modify the existing methodology

[iii] Barbosa (2009) questions the existence of a puzzle. He concludes: *the purchasing power parity puzzle is a statistical artifact produced by the fact that the long run equilibrium real exchange rate is not constant, but changes throughout time. This fact implies that the inertia coefficient has an upward bias.*

[iv] The soybean has such an importance to Brazilian and Argentinian's economies that SALAMA (2012, p.157/8), when citing the rising of inflation, highlights that the elevation of employees' purchasing power is below of what results from the official statistics. The revaluation of the exchange rate in real terms is superior to the one disclosed and the competitive edge of the export is weakened. The Argentinian model, **"saved" by soybean. Will it be sustainable?** (Emphasis added).

[v] The monetary value of the agriculture were updated by the authors based on the IPCA index from IBGE until 2013 aiming to be comparable to the agricultural GNP calculated by Cepea.

[vi] As we can see forward, in 2010 the Argentina's government adopted some actions to change the exchange rate environment. These measures were not well received by the Argentinians.