Modelling Capital Controls under the Purchasing Power Parity Assumption

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Abstract

This study explores the effects of capital controls in the long run. At this juncture the assumption of purchasing power parity has been employed. The model of the study is based on differential equation systems analysis. The present study results show that capital constraints reduce the volatility of the exchange rate in the long run.

Keywords: Capital Controls, Differential Equation Systems, Purchasing Power Parity, Volatility of Exchange Rate.

INTRODUCTION

The theoretical part of the study includes both Keynesian macroeconomics and purchasing power parity assumption in order to describe the economic matrix of capital controls in the long run. The key intuition about economics is the distinction between long and short term. Behind the most important tip how to analyze an economic phenomenon, event or policy and how to deal with the matter and which tools to use, while a total combination of instruments belonging to the economic theory are available, lies the fact that the discussed phenomenon has a long or short term character. One of the most important lessons we take from the economic literature is that in the long run obstacles on price mechanism such as price rigidities and contracts are removed and so the curve of aggregate supply is detected to be quite upright and therefore the total demand (shifting left or right that is to say increase or decrease) does not have much effect on the output. This intuition provides us an insight in laying emphasis on supply-side and needing to find other ways to move the upright supply curve right. This classical price mechanism approach, which regards economy as a matrix of prices, in which a large number of goods and services are evaluated in terms of each other, has two key categories: growth and efficiency. The main issue in this picture, where each supply creates its own demand, is to increase the total supply (or more precisely to shift the curve of the long-term potential total supply to the right) or to reach the most effective cost and resource allocation which maximize the social welfare, while supply is constant. At this point, a total tool of microeconomics borrowed from classical economics stand in front of us. One of the most important shortages in the literature of capital controls is the fact that such a primary distinction is often not made and the microeconomics aspect of the matter is often not be included.

The second most important lesson we take from the literature of economics is the presence of some obstacles on the price mechanism, such as short-term price rigidities and contracts and so the aggregate supply curve is positive (shifting left or right depending on variables such as the total price level expectations, i.e. increases or decreases) and therefore the total demand (shifting right and left i.e. increase or decrease) has a very significant effect on output. This intuition gives us the idea of putting emphasis on the short-term demand and needing to find the combination of output, price, interest and exchange rates, which is the most appropriate to the state of the economic matrix. The Keynesian approach which considers the economy (in which an increase in a demand item causes a smaller increase than itself in the other demand items and thus the total impact of this increase can be estimated approximately) as the total cumulative demand has two key categories: economic fluctuations and inflation.

In this picture where the output is constantly changing, when the upward sloping supply curve is just a data and demand increases or decreases according to conjuncture, the main matter is to minimize the fluctuations around the trend of output/product and cyclical unemployment in association with that or to control inflation, which is another instability variable. [Indeed, inflation reduces total supply taking price expectations into account in the next term (sliding the short-term supply curve to the left). More importantly, when we design a cycle consisting of several short periods, it is clear that inflation would result in a price-output waving in this period (and that period is considered to be included in the analysis for a short-term)]. At this point, the total of macroeconomic instruments borrowed from Keynesian economics lie ahead of us. The axis of capital controls' literature seems to be limited to a set of macroeconomic relations without making a primary distinction between long-short or activity / growth-fluctuation / stability species.

Relations from long-term to short-term and vice versa should not be overlooked in the economy resembling a multidimensional chess game. Indeed, due to its character of distorting price mechanism and preventing investments, inflation is also considered as an important variable in the long-term growth and activity analysis.

The theoretical part of the study includes two main headings; the Keynesian content of capital controls and purchasing power parity. The first one has the same character as an analysis for short term. The second one, which is purchasing power parity, gives the analysis long run perspective. In the preparation of the macroeconomic context, the category of Magud and others has been studied and the titles in this category have been analyzed in detail.

1. Discuss the Theoretical Literature

While sorting the motivations of the capital constraints policy, the constraints are stated to have reduced the amount of capital flows, to have turned the product of capital flows in favor of long-term capital, to have increased real exchange rate and reduced the exchange fluctuation and to have made the monetary policy more free (Magud and Reinhart, 2006: 4-6). When finding out the macroeconomic effectiveness of capital controls, such things as whether these goals have been accomplished or to what extent these goals have been achieved are analyzed.

It is clear that we do not have a strong activity / pareto optimal analysis tool as in the microeconomics to measure the effectiveness of a "macro" policy. However, the weighted average of the success of the earlier mentioned objectives can be used to represent the efficiency like the objectives of capital controls which are now being referred to. In particular, the intuition of trade off which is a reality in the economics should be here considered and emphasized: In an economic matrix, during the change of a variable in the desired direction, changes in the opposite direction in another variable or variables are usually tolerable. Trade off character is observed between objective variables (that is very explicit in the short term at least) such as inflation, growth, current account deficit, exchange rate and interest rate and if the analyses are internalized; this intuition gives us the idea of finding an optimal point /combination. So, in an economic matrix, in which inflation and the current account deficit cannot be reduced at the same time, an optimal point of each macroeconomic policy in the short term (targeted combination of macro variables) should be introduced in the same way as inflation and current account deficit closest to maximize the social welfare should be sought. The effectiveness of a policy in a multi-dimensional matrix (resulting from the policy) is represented most effectively by destination / distance to combination of the de facto point /combination.

However, it is particularly difficult to measure the effectiveness of capital controls (Habermeier, Kokenye and Baba, 2011: 7). Indeed, capital constraints are often implemented as part of a wider policy mixing, and as expressed in the introduction section, the analysis of a specific application / policy influence by distinguishing others includes existential (unavoidable) problems.

Now, let us make a more detailed analysis of the theoretical macroeconomic context of the capital control policy by analyzing theoretical arguments which reveal the motivation of capital constraints.

"Reduce the Capital Flows?"

The primary argument explaining constraints in macroeconomic context of the literature of capital controls indicates that capital constraints reduce the amount of capital flows. This motivation (pointing out to the fact that constraints increase the real exchange rate and reduce the exchange rate volatility and make monetary policy more independent) is included by the next other two arguments. So that in the analysis of these two arguments, the first effect of the capital constraints on economic matrix is the decrease of the amount of capital flows and increasing prices[1]. The reason why the argument of "Reduce the Capital Flows?" is addressed as a separate heading is the fact that the reduction in the amount of capital flows is considered as a variable of

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[1] The increasing effect of capital controls as a kind of tax on the costs and thus decreasing impact of them on the capital supply can be clearly observed. In theory, when all other things are fixed, the equilibrium amount is expected to decrease, while the equilibrium price is expected to increase, as the supply decreases. However, even if the supply decreases, it has been observed in some cases that the amount of capital has not changed, and only the price of capital increased. In this case, changes in equity prices and / or total expenditure for capital (price * quantity component), constitutes the first part of the effect chains suggested by 'other two arguments'.

policy goal such as the decrease of the exchange rates or liberation of the monetary policy. Behind this background lies the idea that the amount of capital inside has a positive correlation with the financial fragility of the economy or being open to the crisis, particularly in developing countries in shocks like a sudden stop. However, it is not possible to say that the thesis arguing the fact that capital constraints decrease capital flows is supported in the literature or not. (So, the research question is not clear even in the first part.) The fact that empirical studies contradict each other can be partly explained by the previously mentioned existential issue through measuring the impact or effectiveness of capital controls implemented often as part of the larger policy combination. And the problem should be considered to be layered with the problem of endogeneity (internality). Indeed, capital constraints have often been implemented in the most economies with the increased capital flows. To overcome such an endogenous (internal) problem, ie, it is difficult to distinguish causality relationship, and the condition of occurring together (without a causal relationship). This kind of a case which is often overlooked in the econometric analysis plays a key role in solving some puzzles. Many econometric methods related to that (such as advanced VAR including artificial variables) have been developed. However, the models having been developed with these methods are sensitive to the selected model specification type or the included control variables and accordingly give different results (Habermeier, Kokenyne ve Baba, 2011: 9).

The analysis of the heading "Reduce the capital flows?" being away from a consensus is the projection of other factors pointing the basic puzzle mentioned in the introduction (the puzzle of theory / plan-oriented model and the conflict of empirical facts). The most important is the fact that the effect of capital constraints decrease over time. Indeed, markets explore ways to overcome these kinds of constraints in a larger time period. Therefore, studies involving data from shorter time periods (daily or weekly), usually predicts the implementation of capital controls more effectively (Magud and Reinhart, 2006: 18). It clear that studies that do not include the fact that constraints lose their effectiveness over time convey a measurement error (De Gregoria, Edwards and Vales, 2000: 73). The fact that from which time period data has been obtained and what kind of theoretical results it would lead to or what to understand from the long or short term are not highlighted in the conducted economic analysis helps us to perceive the conflicting results of the literature and to solve puzzles, the answers of which remain unsolved.

We handle the issue of "ex post- ex ante confusion" on which an analytical framework should be drawn, as another factor (the second one). (This issue included in the basic puzzle was named "ex post- ex ante confusion ". Although this problem is one of the most important keys in the basic puzzle, not being addressed sufficiently in the literature resulted in naming it and also drawing its analytical framework.)

An identity reveals what is going on as "ex post" and is a permanent relationship or function. That is to say an identity describes the existing and sine qua non equality and is independent from economic schooling and difference of opinions. Let us assume that "X + Y = Z" is a simple identity. Ensuring of this equality any time before and now no matter what, ensure, makes it an identity and it is closed to discussion. Findings similar to

statements such as when everything else is fixed, the X increases, Y decreases or when all other things are constant, X decreases, Y increases, can be removed from such an identity. However, "everything else" is often not settled in the economic matrix. For example, the increase in X can increase Z over other variables or functions. So, we design a function such as 3X - Z = R, X increases while Z is expected to increase. Z can increase so much that X increases while Y increases in the identity of "X + Y = Z" and eventually a contradictory statement at the beginning stating that an increase in X causes an increase in Y can be produced. However, this does not mean that the identity loses its validity. Identity is again provided, even if X and Y increase, the total is always Z, and it is an ex post fact. It should be emphasized here that the analysis carried out by taking the identity into account that we always expect to come true includes a logical error. However, the real economic matrix flows through ex ante, namely through relations / functions the results of which results are not predetermined and ultimately even when the identity proves to be right, it requires a more thorough analysis. Here, the drawback of the only finding that capital controls reduce capital flows, while all other things are constant should be emphasized.

Third, effectiveness of a policy and of the capital constraints in the strict sense vary from time to time and from country to country depending on their design and styles of implementation in a constantly changing economic matrix through interaction of numerous variables such as technological, political, social, economic, and so on. The term "effectiveness" mentioned in the macroeconomic context varies from the subject of "activity" referred in the microeconomic context with regard to its logical background. So, the category of activity is the title given based on the comparison of potential pictures which are designed on the grounds of analyzing a condition or result with the criterion of "pareto optimality". The category of effectiveness describes the effect of any variable on any other variables without having such a pre-analytical framework and comparison in our mind).Therefore, studies addressing the same countries can give results that are closer to each other (IMF). Finally, technical differences in the economic analysis can be said to draw away compromise on the effectiveness of the constraints on capital flows. Some studies measure the intensity of capital controls based on which set of constraints are applied. Some just look at the number of actual regulation of the economy for the same measure. And others are just based on the law and regulations. In addition, the measurement of capital flows has also a heterogeneous character. Studies conducted over more narrowly defined capital flows are able to find more effective constraints (Habermeier, Kokenyne and Baba, 2011: 10).

"Tip the Resultant Capital Flows in Favor of Long-Term Capital?"

The secondary argument that explains the constraints in the macroeconomic context refers to the term or the structure rather than the amount of capital flows. Such a change in the combination of capital flows is often included in the analysis of other (last) two arguments. The reason for dealing with this argument as a separate heading is the fact that enabling longer-term capital flows is taken as a policy goal variable such as the decrease of the amount of capital, of the exchange rate or the liberation of the monetary policy. Behind the background lies the idea that particularly in developing countries and in

shocks like a sudden downturn, particularly the amount of short-term capital has a positive correlation with the financial fragility or with the openness of the economy to crisis. In spite of the presence of studies including opposite results, we can say that this study or motivation is supported both theoretically and empirically.This is evident in the pioneering works of Cardoso and Goldfajn (1998), De Gregorio, Edwards, and Valdes (2000), Cardenas (2007), Jankov (2009), Goh (2005), Jittrapanum and Prasartset (2009) that they have conducted for respectively Brazil, Chile, Colombia, Croatia, Malaysia and Thailand. In one part of the literature it is stated that the decline created in the short-term capital flows of capital constraints is balanced by a long-term increase in capital flows, i.e., the resultant changes without a change in the amount of overall capital flows (Fiestas, 2003: 4). Although the study stating that studies having been carried out on the capital constraints and on the resultant of capital flows are far from a consensus has been mentioned many times before, we make an analytical evaluation. (Please remember the paradoxical situation in which it is referred to x without mentioning x).

At this point the finding that provides us a gestalt leap in the solution of fundamental and other puzzles of the economy (literally looking a relationship more deeply such as the detection of a derivative or the derivative of a derivative rather than its function)is the fact that the determinants of a variable in the analysis and in our minds (as a result of different causal channels although there is no such a causal relationship between them) are confused with other simultaneously occurring variables and with the results of the same variable (it is a fact that our mind arranges all of them in the same environment to facilitate our job , although it is not possible logically,). In the previous sections, the problem of "endogeneity" of and "confusing the emergence of the state with the causality," about it was addressed. In a more general context we have been trying to highlight, when it is assumed that there is a causality relationship from x to y, from y to z and from x to k, we often fail to recognize the fact that x is the determinant of y and z is the outcome of y and k and y appear without a causality between them (as a result of different causality channels). This case (mentioned finding) clearly will appear upon comparing the results of the studies which deal with the resultant of capital flows as one of the determinants of capital constraints, findings of other studies addressing the resultant of capital flows as a result of capital controls and the predictions of the studies addressing the effect of risk variables like CDS on capital flows and capital controls. Although these studies often look like giving opposite results, actually the truth that they consider the causality of the different aspects and variables, and therefore do not falsify each other should be realized.

Of course, capital constraints can also be considered as a result of the discussions between schools of economics like other interventions. Each school interprets policies/ interventions and the relationship or the lacking relationship between goal variables according to the role of the state in an economic matrix by which they explain the economic system.

However, upon considering that the variables affect mutually each other, and this interaction has changed over time, depending constantly on to the studies and analyses having been carried out by a causality channel is risky. Therefore, a flexible approach and system approach helps the economic

analysis. That is to say, it should also be noted that while looking for the best approach that describes certain economic facts under certain circumstances, different approaches can be useful in different circumstances or for different cases.

"Increases the Real Exchange Rate and Decreases the Exchange Rate Volatility?"

An increase in capital flows (i.e., the increase in foreign demand for domestic assets most of which is in the national currency) is expected to lead to an increase[2] demand in the domestic currency, and thus to evaluate the national currency, in other terms, to raise the nominal exchange rate. It is clear that the increase in the nominal exchange rate in the short term when the prices are high or sticky increases the real exchange rate. The resulting impact of changes in the real exchange rate on the output and on the other major macroeconomic variables is often analyzed. However, in the macroeconomic context of the literature of capital constraints, rather than this analysis, the fragility of an environment overvalued by the real exchange rate in shocks such as a sudden downturn or its openness to crisis is discussed and highlighted. Even taking the issue of a step (or a derivative) further, the correlation between the volatility of the real exchange rate as an instability variable and capital flows is analyzed.

In this section, we establish a model to reveal the effect of the capital constraints on the main macroeconomic variables. The aim here is to understand the holistic picture of the economy and to emphasize the impact of the economic constraints, especially exchange rates and exchange rate volatility. It can be stated that our model has a logical consistency and is supported empirically[3]. In order to understand the matter better before dealing

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[2] Even in a simple economy in which two other goods are produced and interchanged, the value of a goods in terms of the other can be analysed in two separate markets. Of course, these two markets give continuously results just like two sides of the coin. Because both markets are the projection of the matrix of the same supply and demand functions. In other terms, demand for x in a market refers to the the supply of y in other markets. So, demand for the national currency in the domestic currency market in which the national currency is bought and sold (in determining the value of the national currency) refers to the supply of foreign currency in the foreign exchange market where foreign currency is bought and sold. And (vice versa) national money supply in the national currency market refers to the demand for currency in the foreign exchange market. The analysis is performed without using a market analysis tool by developing a similar approach to the offer curves in the two-commodity model, i.e., by expressing both the supply and demand of both goods in terms of each other at the same time. However, upon considering a model consisting of a large number of goods, the market analysis tool is very useful. The increase in capital flows must be considered to evaluate the national currency by increasing demand in the national currency market or the supply of foreign currency in the foreign currency market (the second side of the coin).

[3] In the scientific tradition, the degree of a theory or model being scientific is evaluated according to whether it has a logical consistency within itself and is supported by the real-world experience. Look at the Economic Growth by Yahya Sezai Tezel published in 2003 to identify this kind of an important finding and so deep thoughts

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with the equations and mathematical relationships which constitute the formal structure of this analysis, the model is analyzed under two sub-headings.

(i) The term of "intuition" often referred to in this study is used consciously. Looking at the big picture from a broad perspective, human beings with scientific experience try to explain separate things and thus assign identification (objects, facts, events, concepts…) and while doing that, he/she is in a struggle for revealing relations between things/ variables anytime.

(It is a definitional fact that explaining the meaning of a variable is to be made out of other variables anytime. So it is not possible to tell the location of an object or point in R^3 without using data from at least one another point). In the analysis of models having been designed according to the scientific tradition (with generally accepted scientific methods), such things as which part of the reality is highlighted, that is to say which part of the major matrix formed by the numerous combinations of interactions between a number of variables are questioned .In particular, when evaluating a study produced by using equations and mathematical approaches, these findings should not be overlooked; in fact, as it happens often, handling formulas and equations just formally prevents us from observing the deeper underlying relationships in the background.

So, instead of being satisfied with the formal procedures pointed out by the mathematical relationships as equations, matrix, optimality criteria, limits, logarithm, derivative, the integral used in the analysis and model, only intuition can be obtained by internalizing the logic of each of these mathematical tools and by not missing the main question solved by them.

(ii) The Dornbusch model needs to be internalized to understand the basic assumptions, axioms and the dynamic fiction of our model conducted in accordance with these. Although our model has a very different set of assumptions and intuition from the Dornbusch model, interest rate parity content of the Dornbusch model is a guide for our model. In addition, as our model will be built on difference equations, comparing our model with the Dornbusch model or considering it together with that model is useful to sense the different logical grounds of different types of analysis. In the Dornbusch model being a type of the Mundell-Fleming model developed with additional assumptions and intuitions, some basic assumptions are made stating that prices in the short term are sticky and the interest rate is flexible (Kibritçioğlu, 1996: 134). So it is clear that the model has two key categories. The first one is the purchasing power parity. As prices in the commodity market adapt late to changes in demand in the short term, the purchasing power parity is not valid. So, the argument that the real value of goods is equal everywhere on unlimited arbitrage under the assumption of rational actors would not be valid. In other words, the nominal exchange rate may be addressed to deviate from the sine qua non (which provides PPP) value. Or (when the nominal exchange rate is taken as data in $R^{3)}$ it can be stated that prices deviate from the sine qua non value (which provides PPP)[4]. The second category is the interest rate parity.

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[4] Upon considering that the nominal Exchange Rate is x Price = the Real Exchange Rate and the Real Exchange Rate (i.e. the real value of the domestically produced

In the short term, interest rate parity is valid due to the fact that asset yields in financial markets adapt flexibly to changes in supply and demand emerging in this market. So, the argument that the real return assets (the value with which they are expressed in the same currency) are equal everywhere through unlimited arbitrage under the assumption of rational actors, is valid. In other words, its value can be said to be equal to the value the interest rate parity should have (provided by IPR). IPR can be formulated as in the following equation[5].

$$(i_d - i_f) - (e_x - e)/e = 0$$

Here i_d, i_f, e and e_x respectively refers to domestic interest rate, foreign interest rate, nominal exchange rate and the expected nominal exchange rate. When transaction costs and other variables are excluded, the expected return of international investors is determined by the interest rate of the assets discussed and the expected change in the value of the currency stated in this asset. So, when investors enter the domestic market and buy assets, they expect to gain a return as much as the increase in the value of the national currency and the interest of assets at the end of the period through which assets are calculated. The argument that the expected returns of assets should be the same everywhere argument indicates that the differences between interest rates are stabilized by the expected change in the exchange rate. Likewise the term $(e_x - e)/e$ refers to the expected proportional change in the exchange rate.

Dynamic planning of the Dornbusch model is highlighted on the impact of a change as a decline in domestic interest rate on the nominal exchange rate. It is clear that the decline in the domestic interest rate currency[6] will decrease foreign exchange supply in the foreign exchange market or national currency demand in the national currency market and will increase the nominal exchange rate, i.e. will reduce the nominal value of the national currency. The

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goods) is thought to be equal to the real value of the goods produced abroad (let call it c), a condition pointing to the equality of a x b = c appears in our minds. If this condition is not valid, a can be stated to deviate from the value it should actually have , while b is data or vice versa, i.e b can be said to deviate from the value it should actually have, when a is used as data. It can also be stated that they are two distinct projections of our minds or (as the coin is just one and the same) and the coin has two different sides.

[5] This is a clear representation of the interest rate parity. When the actual exchange rate is used instead of the expected exchange rate in the open interest rate parity equation, then the representation is called as covered interest rate parity.

[6] At this point, while a decrease in the domestic interest rate and the effect of it are handled, behind its background lies the fact that a change in demand or supply in the domestic financial market in which the domestic interest rate is determined occurred before. It is a fact that this change, such as the decline in the supply (in the supply of asset / fund) will lead to firstly greatly decreasing and, then increasing (but despite of an increase, as it can be proved analytically, remaining constantly under the old equilibrium interest rate) interest rates in a market analysis (in an analysis such as the adaptation of the amount to the market equilibrium), until a new equilibrium interest rate occurs. However, the emphasis here is put on the new equilibrium interest rate and the fact that it is under the initial interest rate instead of analyzing this type of transition rates. Also, it is unimportant to know which particular factors caused a change in supply or demand in the domestic financial market.

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answer to the question of how much it will reduce is the rate at which IPR pointed out[7]. Indeed, the foreign exchange market and the national currency market, respectively, continues to decline in supply and demand until the difference between the expected return on domestic and foreign assets disappears .

The decline in domestic interest rate in the Dornbusch model in the short term leads to an excessive increase of the nominal exchange rate, in other words, causes it to fly high (Dornbusch, 1976: 1169). The term "excessive" implies that the rate exceeds the PPP value, because in the model prices are not flexible in the commodity markets in the short term. However, the same model assumes that prices are flexible in the commodity market in the long term[8] and thus provided the PPP. Thus, the exchange rate takes a value at which PPP and IPR are provided simultaneously in the long run. Interest rates, exchange rates and commodity prices should be considered to provide PPP and IPR simultaneously, resulting in supply and demand changes in the markets where these elements are determined. Indeed, the motivation behind the supply and demand changes in this market is PPP and IPR. So, "the law of one price" pointed out by this parity or an unlimited arbitrage of rational actors in the case of a different price or return determine supply and demand[9] in these markets. For example, when exchange rates decrease excessively in the long run in the direction pointed out by PPP, how will that affect the interest rate that varies according to IPR which is applicable both for a short and long term? The fact that the IPR or parity is valid must be perceived as an axiom. Changes in the supply and demand in the market must be perceived to arise with this motivation until the parity is provided. In economic analysis, formulas and equations representing the relationship between the variables are used, while this mentioned point often remains closed. That is, as the equations point out formally, the fact that supply and demand changes provide parity is revealed but in fact that the parity introduces changes in supply and demand, and thus validate itself constantly is not perceived. Going back to the question, it is clear that the argument that returns will be balanced via unlimited arbitrage of rational actors anywhere is valid for each period, and while the decrease of

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[7] Of course, changes in the exchange rate have a similar effect on the interest rate (domestic financial markets). For example, when the exchange rates increase, the investors whose expected return on the expected change in the exchange rate increases also increase the demand for funds in the domestic financial markets and its effect on the equilibrium interest rate. [The effects being in an opposite direction (from the exchange rate to the interest rate or vice versa) can be clearly shown in a general equilibrium model approach.] Thus, it is clear that the interest rate and exchange rate will undergo changes, until a general equilibrium is achieved. However, the main emphasis here is put on the fact that the new equilibrium interest rate is under the initial interest rate and the new equilibrium exchange rate is above the initial equilibrium rate (as both of them will be proven analytically)instead of emphasizing this kind of transition interest-exchange rate combinations.

[8] The inclusion of the long-term in the highlighted short-term macroeconomic content of the theoretical part of the study is not a mistake. Because the main emphasis here is put on the difference between short-term and long-term.

[9] It is clear that the terms of "supply" and "demand" or supply and demand changes (such as an increase in supply and a decrease in demand) used in this study are different from the terms of amount of demand and supply technically.

exchange rate is used as data, other components determining the return, that is to say, interest rates change. However, being satisfied just by explaining that is another example of a logic error mentioned in the economic analysis. Rather than detecting automatically that interest changes in the way as the system of equation or equations points out, domestic asset markets that determine the interest rate should be focused on and it should also be perceived that while exchange rate decreases (whilst the national currency gains a value) the demand of international investors for domestic assets decreases as the returns expected by an international investor to obtain from the expected change in the exchange rate will decrease (a decrease in demand in the domestic asset markets) and / or because of increasing investments and domestic demand[10], a decrease in the interest rates will cause inflation and output growth and the inflation will decrease the domestic real money supply (decrease in the supply of rival commodities) and thus interest rates will increase.

In the dynamic planning of the Dornbusch model, initially, when the domestic interest rate is decreased, the nominal exchange rates rise steeply in the short term but remain in the long term at the level (at a higher level compared to the earlier decrease in the interest rates).

2. A Model Adapted To the Purchasing Power Parity

Changes in the general level of prices in the commodity market were previously assumed to be determined by the difference between domestic aggregate demand and aggregate supply. It is a mistake to interpret that this change occurs as a result of changes in other variables, in supply and /or demand in the market where prices are flexible. So that the commodity market in our model includes sticky prices, unlike other markets.

Therefore, it can be said that there is a price change derived from a non-equilibrium Keynesian state rather than equilibrium in our model. At this point even if an imperfect competition comes into question in the classical school for economics, the equilibrium state emerging as a result of balancing the supply and demand is internalized and it should also be perceived that in the Keynesian doctrine, the non-equilibrium state in which supply and demand are not balanced, constitutes the basis, as determined by the sticky prices[11].

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[10] Changes in the currency rate and interest rate pointed by IRP affect variables such as inflation. However, the developments emerging independently from IRP stimulate these variables. However, IRP continues to function in the matrix in which such changes are included. Indeed exogenously induced changes in other variables, such as the general level of prices, change the picture partially, that is to say it has an effect on the interest rate level achieved by the IRP, but that does not change the validity of the IRP. In addition, when the exchange rate flies high, the presence of inflation increases nominal exchange rate predicted by the PPP (remember that the exchange rate pointed by PPP remains far below the exchange rate flying high in the short term, while all other things are data, and there is no inflation), and decreases the real money supply and helps to increase of the interest rate in the assets market and accelerates the process of IRP and PPP achieving to reach to the state of equilibrium.

[11] Please note that the exchange rate differential variables in our model are derived from the equilibrium rather than the non-equilibrium state. The foreign exchange

However, as the time period stretches, flexible prices clean the commodity market. Therefore, we can develop a model with flexible prices by extending the period of time at which we discuss the matter. In our new model designed with that intuition, the validity of the purchasing power parity is predicted by assuming the global feature of the flexible prices and the price system functioning efficiently. Under the rational actor assumptions, the unlimited global arbitrage equalizes the domestic and foreign value of the standard goods in cases where prices are flexible enough. Therefore, this equality occurs independently from the value of the domestic aggregate demand and aggregate supply. Here it should be internalized that the arbitrage motive guaranteeing that the parity will take place equalizes the domestic aggregate demand to the aggregate supply by changing exports and imports. It is planned that that value determines the changes in the general level of prices on condition that foreign prices are considered to be fixed and that value determines the real exchange rate with the exchange rate in the economy. Thus it is clear that the assumption of the small country is accepted. Therefore the causality in the opposite direction affecting the general level of prices is not included in the economy. Similar to the planning of the dominant firm model in the microeconomics literature, the domestically produced goods has the real value predicted by the foreign market aggregated with the rest of the world. So that this value is taken as data in the country and the amount of supply and demand is determined accordingly. At this point the differential variable is taken for the general level of prices instead of the level change. It is clear that that change is derived from the state of equilibrium. Therefore, the main equation joining the equation system from the commodity market can be expressed in our new model as follows. When e, p * and p, respectively, refer to the foreign exchange rate, foreign and domestic general level of prices, then

$dp = (e + p^* - p)$.

As the money and foreign exchange markets is accepted as flexible in the previous model, the planning of these new models is protected in the model. In order to represent the output in the money market, any one of the domestic aggregate demand and aggregate supply can be selected. It is clear in this model that they are equal. The following simple equation is used for the general output term that will be employed in the currency market. At this point, it should be perceived that $(e + p^* - p)$ is equal to zero and the real exchange rate does not change, when the purchasing power parity is valid. Therefore, the other part of our equation system can be expressed as follows.

$y = bg(\tau)$[12] $- ci_d + fy^*$ ve b, c, f > 0 ve $dg(\tau)/d\tau > 0$

$m - p = uy - \lambda i_d$ ve u, $\lambda > 0$ ve $0 < u < 1$

$de = i_d - i_f - \tau(1 + \alpha - \prod e)$

Now the exchange rate differential variable can be predicted to include these three equations. In order to enable that, the domestic interest rate, money market equilibrium and the domestic aggregate demand equations appearing

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market is established on a very fast and efficient functioning price that is, it is based on the foreign exchange rate.

[12] Here g (τ) does not show a multiplying. It is stated here that g is a function of the τ.

in the equation where the exchange rate differential variable was described, should be provided simultaneously. Therefore, this interest rate can primarily be derived from the following equations.

$y + ci_d = bg(\tau) + fy^*$

$-uy + \lambda i_d = p - m.$

Let us solve this system of equations for the y_d and i_d.

$i_d = [(p - m) + u(bg(\tau) + fy^*)] / (\lambda + uc)$ is obtained.

Therefore $de = [(p - m) + u(bg(\tau) + fy^*)] / (\lambda + uc) - i_f - \tau(1 + \alpha)$.

The differential variable of the general level of prices was explained before. Thus our difference equation system can be written as follows.

$dp = (e + p^* - p)$

$de = [(p - m) + u(bg(\tau) + fy^*)] / (\lambda + uc) - i_f - \tau(1 + \alpha - \eta e).$

$$\begin{pmatrix} dp \\ de \end{pmatrix} = \begin{pmatrix} -1 & 1 \\ \frac{1}{\lambda + uc} & \tau\eta \end{pmatrix} \begin{pmatrix} p \\ e \end{pmatrix} +$$

$$\begin{pmatrix} p^* \\ g(\tau)(bu)/(\lambda + uc) + y^*(uf)/(\lambda + uc) + m(-1)/(\lambda + uc) - i_f - \tau(1 + \alpha) \end{pmatrix}$$

Thus, upon implementing capital constraints, when both the purchasing power parity and interest rate parity are valid, the slope of the dp=0 and de=0 lines, respectively becomes equal to +1 ve $\frac{-1}{(\lambda + uc)\tau\eta}$. In other words in the new model adapted to the purchasing power parity, the lines of de=0 and dp=0 actually have a negative and a positive slope, respectively. In this case, a dynamic planning similar to the other models and a negatively sloped equilibrium path emerge. However, the fact that the lines of de=0 and dp=0 have the same slope is not sufficient in order that this similar planning and the equilibrium path having the same slope are valid. At this point, impacts of the exchange rates and general level of prices are decisive on the differential variables of them. Thus, it should be perceived that these effects determine both the slope of the lines and in which direction to proceed in the dynamic planning. For example, as the effect of the general level of prices and exchange rate on the differential variable of the general level of prices in this model are respectively negative and positive, the line of dp=0 has actually a positive slope. However, in the combinations on the left of the dp=0 line as the general level of prices is under the expected value, the fact that it increases cannot be represented only by the line of dp=0 having a positive slope. When the effect of the general level of prices and exchange rates on the differential variable of the general level of prices are respectively positive and negative, the line of dp=0 that has a positive slope appears. However at this point the general level of prices decreases in the combinations that are on the left of the dp=0 line. In other words, our model adapted to the PPP should not be interpreted shallowly only by taking the slope of the lines into account. In our model, the line of the equilibrium path has a rather negative slope. It can be concluded that the SP line (As the line passing through the I and II or III and IV areas will also not be able to pass through the simultaneous equilibrium point and will move away from the equilibrium on the line passing through II and III areas) has a

negative slope passing through I and IV areas and the exchange rate decreases and increases in the I and IV areas, respectively.

It is clear that the determinant of the coefficient matrix of the equation system $(-\tau\eta - \frac{1}{\lambda+uc})$ is negative. That sign constitutes the formal mathematical proof for the stability of the equilibrium path described intuitively in this model in Figure 1.
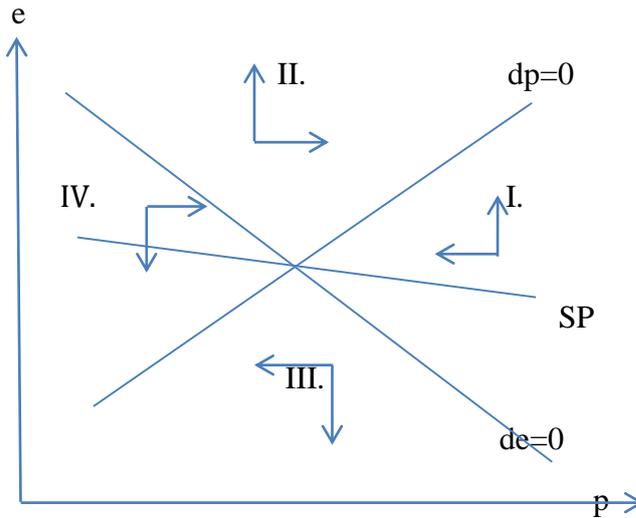

Figure 1: A Model adjusted to the PPP

Now let us estimate the values of the endogenous variables of the model in the steady state.

$$\begin{pmatrix} 0 \\ 0 \end{pmatrix} = \begin{pmatrix} dp \\ de \end{pmatrix} = \begin{pmatrix} -1 & 1 \\ \frac{1}{\lambda+uc} & \tau\eta \end{pmatrix} \begin{pmatrix} p \\ e \end{pmatrix} \quad +$$

$$\begin{pmatrix} p^* \\ g(\tau)(bu)/(\lambda+uc) + y^*(uf)/(\lambda+uc) + m(-1)/(\lambda+uc) - i_f - \tau(1+\alpha) \end{pmatrix}$$

$$\begin{pmatrix} -1 & 1 \\ \frac{1}{\lambda+uc} & \tau\eta \end{pmatrix} \begin{pmatrix} p \\ e \end{pmatrix} = \begin{pmatrix} -p^* \\ -\frac{g(\tau)(bu)}{\lambda+uc} - \frac{y^*(uf)}{\lambda+uc} + \frac{m}{\lambda+uc} + i_f + \tau(1+\alpha) \end{pmatrix}$$

In order to highlight the values of the general price level and exchange rate in the steady state, the following equations can be derived by using respectively the symbols of p_d and e_d.

$p_d = [(-p^*\tau\eta) + g(\tau)(bu)/(\lambda+uc) + y^*(uf)/(\lambda+uc) + m(-1)/(\lambda+uc) - i_f - \tau(1+\alpha)] / (-\tau\eta - \frac{1}{\lambda+uc})$

$e_d = [g(\tau)(bu)/(\lambda+uc) + y^*(uf)/(\lambda+uc) + m(-1)/(\lambda+uc) - i_f - \tau(1+\alpha) + (p^*\tau\eta)] / (-\tau\eta - \frac{1}{\lambda+uc})$

Now let us discuss the effects of capital constraints on the endogenous variables of the model with the help of the comparative static analysis.

$dp_d/d\tau = [[-p^*\eta \quad + \quad (bu/(\lambda + uc))d\,g(\tau)/d\tau \ - \ 1 \ - \alpha] \left(-\tau\eta - \frac{1}{\lambda+uc}\right) + \eta\,[(-p^*\tau\eta) \ + \ g(\tau)(bu)/(\lambda + uc) \ + \ y^*(uf)/(\lambda + uc) \ + \ m(-1)/(\lambda + uc) - i_f - \tau(1 + \ \alpha)] \ ] / (-\tau\eta - \frac{1}{\lambda+uc})^2$

$de_d/d\tau = [\ (bu/(\lambda + uc))d\,g(\tau)/d\tau \text{ -1 - } \alpha] \left(-\tau\eta - \frac{1}{\lambda+uc}\right) + \eta[g(\tau)(bu)/(\lambda + uc) \ + \ y^*(uf)/(\lambda + uc) \ + \ m(-1)/(\lambda + uc) - i_f - \tau(1 + \ \alpha) \ + \ (p^*\tau\eta)] \ ] / (-\tau\eta - \frac{1}{\lambda+uc})^2$

The increase in capital constraints actually shifts the line of de=0 to the right. Because in cases where the exchange rate is fixed, a higher general level of prices is needed at the level of each data exchange rate to compensate for the changes in the exchange rate induced by the decrease caused by the expected return on the domestic assets of capital constraints. Also increased capital constraints not only shift the line of de=0 to the right but also, its slope decreases in absolute value, i.e. becomes sloped. Because while constraints increase, so does the deviation ratio resulting from the expected changes in the exchange rate and the impact of the exchange rate on the exchange rate differential variable also increases and the line of de=0 actually becomes sloped. On the other hand when capital constraints increase, the line of dp=0 actually shifts to the right. Because the tax obtained from capital constraints increase the government income and thus the government spending (as previously mentioned, dg(τ) > 0), and therefore a lower exchange rate is needed at each data price level to compensate for the changes in the general level of prices stimulated by the government spending.

Explanations and shapes of our previous model can be viewed for the general planning of the comparative static analysis of capital constraints. Indeed, as previously the causes of which were mentioned, the signs of the impact of the exchange rate and general level of prices on the differential variables are the same as our previous model[13]. Thus, as it can be easily perceived, as the line of de=0 shifts precisely to the right, both the general level of prices and the steady state value of the exchange rate increase. The sign of the effect of the de=0 line becoming sloped on the differential variables, as the reason of which was previously described in detail, actually depends on the relative shift of the dp=0 line. However, even when this effect has a negative sign, it will not exceed the effect of the rightward shift of the line of de=0 in the absolute value and thus it would not be a mistake to represent the last changes in the position of de=0 line with the rightward shift of the de=0 line. The rightward shift of the dp=0 line reduces and increases the exchange rate and the steady-state value of the general level of prices, respectively. Therefore, it is certain that the steady state value of the general level of prices will increase in the event of capital constraints. Considering the fact that the relative effects of the rightward shift of the dp=0 line are very low, it can be easily perceived that the steady-state value of the exchange rate will increase. The real exchange rate does not change in our model in which the purchasing power parity is adopted. That is to say, the real value of foreign and domestic goods is constantly the same (e + p * - p) = 0. Now let us consider the impact of the

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[13] But it must be recognized that the absolute values of the changes are different.

capital constraints on the domestic interest rate, the other endogenous variables of the model. As it will be easily read in the money market equilibrium illustrated below again, the increase in the general level of prices stimulated by capital constraints decreases the real money supply and increases the domestic interest rate. However, government spending increasing with capital constraints decreases the domestic interest rate by increasing the domestic aggregate demand and thus the real money demand. Considering the fact that the second effect remained low, it can be stated that the domestic interest rate increases.

$i_d = [(p - m) + u(bg(\tau) + fy^*)] / (\lambda + uc)$.

Now, finally, let us discuss the effect of the capital constraints on the product. Government spending stimulated by the increase in government income increases as a result of the implementation of capital constraints. But on the other hand, the domestic interest rate increases. As previously adopted as the prevailing consideration in other parts of the study, the shift in the line of dp=0 or the increasing effect of capital constraints on the domestic aggregate demand by increasing the government spending deserves a theoretical explanation, as it happened in this study, but it is thought to be negligible in determining the sign of the aggregate effects. Therefore, it is estimated that capital constraints somewhat decrease the product. Compared the results with the predictions of the other model and comprehend again that the purchasing power parity eliminates the effect of the real exchange rate.

$y = bg(\tau)^{14} - ci_d + fy^*$

Now, let us prove in a formal way that SP equilibrium path has a negative slope with the help of the processes, the intuitive proof of which was previously performed.

$$\begin{vmatrix} -1 - x & 1 \\ \frac{1}{\lambda + uc} & \tau\eta - x \end{vmatrix} = 0$$

$$x^2 + x(1 - \tau\eta) - \frac{1}{\lambda + uc} - \tau\eta = 0$$

At this point, the negative eigenvalues x_1 can be obtained in the following equation. $\dfrac{-1 + \tau\eta - \sqrt{(1 - \tau\eta)^2 + 4\left(\frac{1}{\lambda + uc} + \tau\eta\right)}}{2}$

$$\left(-1 - \frac{-1 + \tau\eta - \sqrt{(1 - \tau\eta)^2 + 4\left(\frac{1}{\lambda + uc} + \tau\eta\right)}}{2} \qquad 1 \atop \frac{1}{\lambda + uc} \qquad \tau\eta - \frac{-1 + \tau\eta - \sqrt{(1 - \tau\eta)^2 + 4\left(\frac{1}{\lambda + uc} + \tau\eta\right)}}{2} \right) \begin{pmatrix} p \\ e \end{pmatrix}$$
$$= \begin{pmatrix} 0 \\ 0 \end{pmatrix}$$

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[14] Here g (τ) does not show a multiplying. It is stated here that g is a function of the τ. In addition, this term indicating the government spending should not be confused with g used as the real wage coefficient in the supply equation on page 41.

As the lines of this matrix are linearly dependent, the proposition pointed out by the multiplying can be represented by selecting any one of these lines.

$$(-1 - \frac{-1+\tau\eta - \sqrt{(1-\tau\eta)^2 + 4\left(\frac{1}{\lambda+uc} + \tau\eta\right)}}{2})p + e = 0$$

Thus, for the SP equilibrium path $de/dp = 1 + \frac{-1+\tau\eta - \sqrt{(1-\tau\eta)^2 + 4\left(\frac{1}{\lambda+uc} + \tau\eta\right)}}{2}$

$$de/dp = \frac{1+\tau\eta - \sqrt{(1-\tau\eta)^2 + 4\left(\frac{1}{\lambda+uc} + \tau\eta\right)}}{2}$$

$$(1 + \tau\eta)^2 = (1 - \tau\eta)^2 + 4\tau\eta$$

Thus, the radical term can be written as follows.

$$\sqrt{(1 - \tau\eta)^2 + 4\left(\frac{1}{\lambda+uc} + \tau\eta\right)} = \sqrt{(1 + \tau\eta)^2 + 4\frac{1}{\lambda+uc}}$$

Accordingly $1 + \tau\eta < \sqrt{(1 + \tau\eta)^2 + 4\frac{1}{\lambda+uc}}$

Thus $1 + \tau\eta - \sqrt{(1 - \tau\eta)^2 + 4\left(\frac{1}{\lambda+uc} + \tau\eta\right)} < 0$ and

$$de/dp = \frac{1+\tau\eta - \sqrt{(1-\tau\eta)^2 + 4\left(\frac{1}{\lambda+uc} + \tau\eta\right)}}{2} = \frac{1+\tau\eta - \sqrt{(1+\tau\eta)^2 + \frac{4}{\lambda+uc}}}{2} < 0.$$

Now let us consider the one unit effect of capital constraints on the slope of the SP equilibrium path.

$$d(de/dp) / d\tau = \frac{d(\frac{1+\tau\eta - \sqrt{(1+\tau\eta)^2 + \frac{4}{\lambda+uc}}}{2})}{d\tau}$$

The one unit effect of the τ on the first term $(1 + \tau\eta)$ is up to $+\eta$ in the sum representing the numerator in the slope equation of SP. The absolute value of a one unit effect of the τ on the second term $(- \sqrt{(1 + \tau\eta)^2 + \frac{4}{\lambda+uc}}$ in the sum which represents the numerator in the slope equation of SP is less than η. Because when $\frac{4}{\lambda+uc}$ is assumed to be zero, the one unit effect of τ on $(- \sqrt{(1 + \tau\eta)^2}$ will be up to η, and the total effect it was to be equal to zero. However, when $\frac{4}{\lambda+uc}$ is positive (which is certainly positive, since λ, u and c are strictly positive) the one unit effect of the τ on $(- \sqrt{(1 + \tau\eta)^2 + \frac{4}{\lambda+uc}}$ is less than the absolute value η. While the square of the numbers is taken along the number line, the obtained value runs up increasingly, and in the case of a cumulative square with a positive constant, the 'marginal' contribution should be detected to be lower than the other. After all as the one unit effect of τ on the $1 + \tau\eta$ is larger in the absolute value than its one unit effect on the

$\sqrt{(1+\tau\eta)^2 + \frac{4}{\lambda+uc}}$, the one unit effect of τ on $\left(1+\tau\eta - \right.$

$\left. \sqrt{(1+\tau\eta)^2 + \frac{4}{\lambda+uc}} \right)$ hence on the $\left(\frac{1+\tau\eta - \sqrt{(1+\tau\eta)^2 + \frac{4}{\lambda+uc}}}{2} \right)$ is positive.

It means that the absolute value of the slope of the SP equilibrium path that has a negative slope decreases. Namely capital constraints, as pointed out in this formal proof, create a sloped SP equilibrium path. And we could have predicted that result through the information and intuition set having been obtained so far. In the model adapted according to the purchasing power parity, capital constraints create a sloped de=0 line and also a sloped SP equilibrium path by increasing the impact of the exchange rate on the exchange rate differential variable. It is a fact that the volatility of the exchange rate decreases, while the SP equilibrium path becomes sloped. In our model, the difference between maximum or minimum values of the exchange rate ranging as a result of changes in an exogenous variable until the steady state is achieved and the steady state value decreases, as SP becomes sloped. In sum it is clear that the capital constraint reduces the volatility of the exchange rate both in our model adapted according to the purchasing power parity and in the 'main' model. And these predictions do not require any assumptions similar to the assumption of smallness of the relative shift of the dp=0 line. That is, this is one of the propositions referred to in the dynamics planning designed under 'the principle of being consistent' of the beginning axioms and assumptions of the model and thus requires no additional assumptions.

Now let's consider two research questions on the validity of the purchasing power parity. (i) The existential problem with the purchasing power parity is the standard commodity assumption of this approach. So that goods are not homogeneous in terms of the elements such as the quality on an international scale. Apart from the homogeneity of goods, it is also a fact that any goods are not subject to the trade. (ii) Even if 'homogeneous' goods discussed in the trade are dealt with, weights of the goods in the output vary from country to country and the challenge of creating a basket similar to the inflation basket constitutes another problem (Taylor and Taylor, 2004: 136-137). Thus the mechanism equalizing the real value of the goods works in two ways on an international scale. Firstly when the prices are data, it is the change of the nominal exchange rate to ensure the equality / parity, which is very flexible and fast. However, upon considering a large number of goods, the difficulty of creating a basket that will represent the weighted prices of these goods is quite obvious. The second part of this mechanism is the change of the prices, while the nominal exchange rate is data. The problem may seem to be solved as the price of each commodity is adapted to the parity. However, commodity prices are often sticky in the short term and do not adjust flexibly. It should be emphasized at this point that the purchasing power parity, as previously mentioned, is based on a long enough period of time. That emphasis allows us to converge to the solution of these problems. Going back to the first matter, to overcome the fact that the goods are not homogeneous in terms of elements such as quality, it could be argued that the real value based on each property's quality is balanced, namely the real value of the unit quality of that property

is balanced instead of the real value of the unit goods. However, this solution carries an existential problem. Because no matter which value the nominal exchange rate takes, if the matter is dealt with from a different viewpoint showing that the real value pointed out by that value and the price of the goods represent the quality of the goods, a popular mistake about the logic would have been made. This mistake is called as 'No True Scotsman'. This term referred to by the British philosopher Antony Flew refers to the state in which a study is not empirically supported or falsifies the factor falsifying itself through continuous self-reference and thereby protects itself. The matter can be perceived better with the following simple examples. X says that any Scot does not use sugar in any food. And on the other hand Y says that but McSporran is a Scottish and uses sugar in food. In return for that X states that it may be; but no true Scotsman uses sugar in food (Hayden, 2011: 5-6). It is not possible to falsify the study including this kind of a mistake according to the study. As the factor falsifying is falsified at any time by referring to itself. The wide comment of the purchasing power parity mentioned before includes this mistake. Thus, for example let us assume that the nominal exchange rate is 3 and the foreign price of the Z is 4 dollars (foreign currency). Let us assume that the domestic price of Z is 6 TL (national currency). In this case, the foreign value of the Z is 2 times bigger than the domestic value (3x4 = 6x2) and thus the domestic quality of Z can be said to be one half of the foreign one by adapting the broad interpretation of the purchasing power parity. Let us assume that after a while the domestic and foreign price of the same goods remain unchanged and the nominal exchange rate gets to 1, 5. Thus, it may be argued that the domestic quality of Z is doubled and balanced with the foreign one (1,5x4=6) by adopting the broad interpretation of the purchasing power parity. However, the quality of domestically produced goods is known to be constant. The answer to this problem in the study in which the purchasing power parity is interpreted broadly would be as follows: if the quality of the goods really remained the same, the nominal exchange rate would not take this value! Thus, the 'nominal exchange rate or the real exchange rate pointed out by that, gives the difference in the quality of the value of goods, no matter which value it takes, no empirical reality can 'disprove' the study stating that 'this situation is always right'. It can be stated that a reasonable solution to the first existential problem and to the second problem by extending the time period and by using the assumption that goods are homogenous and overcoming the mistake 'No True Scotsman' and by limiting the purchasing power for goods that are subject to trade. Indeed, the purchasing power parity experiences an empirical support in the long term. Taylor and Taylor analyze the purchasing power parity over a large data set including many countries in their studies dating to 2004 in the period of 1970 - 1998. In this study, upon discussing the inflation and changes in the nominal exchange rate on the basis of annual data, the purchasing power parity is not supported empirically in the short-term. So that the combinations having occurred in the coordinate plane in which the inflation and change of the nominal exchange rate are included, are quite different from the combinations of inflation and exchange rate changes predicted by the purchasing power parity (when the general level of foreign prices is fixed) and are equal to each other.

However, when average inflation and exchange rate changes of the last 29 years are analyzed for each country, the obtained line coincides almost exactly

with the 45- degree line pointed out by the purchasing power parity (when the general level of foreign prices are fixed, and the equality of inflation and exchange rate changes is predicted) (Taylor and Taylor, 2004: 140). Therefore in this study the purchasing power parity is supported in the long term. However, the factor that makes the purchasing power parity a key analysis tool is a result of the assumptions and propositions having a logical consistency rather than supported empirically.

RESULTS

Finally we point out to the last two points. (i) The purchasing power parity is expressed with two different approaches. In the version called as absolute purchasing power parity, the real value of the domestic and foreign prices of the goods, namely the value expressed in the same currency are the same in the absolute value (Dornbusch, 1985: 3). Left[15] and right sides of the equation below, respectively, represent the value of foreign and domestic goods denominated in the national currency.

$ep^* = p$.

In the version called as relative purchasing power parity, this argument is stretched somewhat and the proportional change in the relative prices of the domestic and foreign goods is balanced to the proportional change in the exchange rate (Dornbusch, 1985:4).

$\Delta e + \Delta p^* = \Delta p$ ve $\Delta e = \Delta p - \Delta p^*$

It is obvious that the relative purchasing power parity has been adopted in our model in which logarithmic values of the variables are discussed. Indeed the equation of $e + p^* - p = 0$ is explained in the model based on logarithmic values and the logarithmic value represents a kind of change rate. At this point relationship between absolute and relative purchasing power parity should be perceived: when the absolute purchasing power parity is valid, it is clear that the relative purchasing power parity is absolutely valid. Proportional changes must be equal for the continuation of the absolute equality between the left and right sides of the equation. However, the relative purchasing power parity does not require the validity of the absolute purchasing power parity. Because in the relative purchasing power parity based on the equality of changes, equality of the real exchange rate to one is not a necessary condition. So that, even when the left and right sides of the equation are not necessarily equal in the absolute value, they vary in the same proportion.

(ii) We believe that it is not a mistake to include a long-term parity in the macroeconomic content of the study highlighted for the short-term. Indeed, the aim here is to highlight the short term by comparing with the long term. So that the comparison pointed out by the question of 'capital constraints reduces the volatility of the exchange rate in the short term, but is it also true in the long term?' should be perceived in our study.

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[15] In this study, the term of the exchange rate refers to the value of the foreign currencies denominated in national currency.

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