

Observatorium on Exchange Rate

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Talking points

- 1 The Economics of Misalignments
 - Exchange Rate Misalignments.
- 2 Obervatorium on Exchange Rate:
 - Approachs for estimating RER misalignment.
 - Econometric Issues.
- 3 Some Results:
 - Fundamental Approach.
 - Bilateral Exchange rate Misalignment
 - Purchasing Power Parity Strikes Back?
 - Next Steps
- 4 PPP and World Price Index
 - Methodology to calculate World Price Index:
 - Some Preliminary Results.
 - Challenges to overcome.
- 5 Main References:

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Defining exchange rate misalignment.

- Difference between actual real effective exchange rate and a long term fundamental;
- Exchange rate misalignment estimative can differ due to:
 - the economic models used to choose the fundamentals variables that drives real exchange rate in the long run;
 - differences in econometrics techniques.
- The construction of misalignment estimative relies on some empirical and theoretical choices;

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Option 1: Effective equilibrium exchange rate based on fundamentals.

- Fundamental Real exchange rate is calculated using a econometric model:
 - Cointegration techniques based on selected series associated with fundamentals;
 - Some possible choices of the fundamentals variables
 - an indicator of relative tradeable and non-tradeable productivity [4];
 - net international investment position as GDP share. [2];

Option 2: Bilateral exchange rate based on fundamentals.

- Converting real effective exchange rate misalignment in bilateral misalignments:
 - From real effective exchange rates estimative calculated under option 1 for a group of countries it is possible to calculate bilateral misalignments for each country using Alberola, Cervero et al. (1999) [2] ;

Option 3: Bilateral exchange rate misalignments based on Purchasing Power Parity.

- Recent advances in the literature suggest that PPP may hold after all for some currencies;
 - Some studies using not temporally aggregated data suggests that PPP may hold in the long run. (Taylor, 2010 [8]);
 - Strong evidence that PPP holds for dollar-pound sterling parity using consumer price deflators and long time series; (Ahmad & Craighead [1])
 - The possible choice of the price index to run the analysis are:
 - Consumer price index;
 - producer price index;
 - gross domestic price deflator;
 - What to do if PPP does not hold?
 - Control for Balassa Samuelson effect;
 - Decompose exchange rate in permanent and transitory components;

Option 4: Sustainable current account.

- Current account approach:
 - This methodology has two steps in order to construct a misalignment measure.
 - The level of current account equilibrium is calculated using panel techniques;
 - The difference between actual real exchange rate and the level of real exchange compatible with the desired current account result is the estimated misalignment;
 - This approach is very closed related to the IMF macroeconomic equilibrium approach.
 - One variant of this approach is the External Equilibrium Approach. After choosing some benchmark value for the Net Foreign Asset, the level of real exchange rate necessary to reach this value is estimated and the level of misalignment can be calculated (Maya e Ha, 2012 [7]);

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Dynamic Time Series Econometric Models

- The usual approach consists in estimating a traditional VECM:
 ([5, 8, 2, 3, 4, 5, 1])

$$\Delta X_t = \Gamma_1 \Delta X_{t-1} + \dots + \Gamma_{k-1} \Delta X_{t-k+1} + \alpha [\beta' \quad \mu] \begin{bmatrix} X_{t-1} \\ 1 \end{bmatrix} + \varepsilon_t \quad (1)$$

where ε_t is a vector of innovations not serially correlated, Ω is a matrix that contains all variances and covariances and $[\Gamma_1, \dots, \Gamma_{k-1}, \alpha, \beta, \mu]$ area parameters to be estimated.

- X_t contains the real exchange rate index and the selected fundamentals;
- The estimation of the long run parameters can be done using alternative techniques;

Decomposing series into permanent and transitory components

- There is a literature that discuss how to decompose the series into permanent and transitory components:

$$X_t = \beta_{\perp} (c' \beta_{\perp})^{-1} c' X_t + c_{\perp} (\beta' c_{\perp})^{-1} \beta' X_t \quad (2)$$

$$P_t \equiv \beta_{\perp} (c' \beta_{\perp})^{-1} c' X_t = A_1 c' X_t = A_1 f_t \quad (3)$$

$$T_t \equiv c_{\perp} (\beta' c_{\perp})^{-1} \beta' X_t = A_2 \beta' X_t = A_2 z_t \quad (4)$$

- The common approach consists in using Gonzalo e Granger decomposition, ([8]), where $c = \alpha_{\perp}$.
- All matrices are obtained from the estimated parameters of the model (1).

Is the estimative precise? How to address this question.

- The precision of the estimative must be known;
- The methodology to construct confidence bands must avoid false misalignment detection:
 - Alberola, Cervero et al. (1999) uses Johansen asymptotic results to construct confidence errors; ([3])
 - Our approach consists in using Cavaliere et al. (2011) bootstrap method to construct confidence bands;

How to transform real effective exchange rate misalignments into bilateral ones.

- A base country must be chosen;
- Using the fact that real effective exchange rate consists in a weighted average of bilateral rates, it is possible to link effective real exchange rate misalignment to bilateral misalignments;
- The trade weights for a numerous countries are necessary to use this approach;
- Further details can be found in Alberola, Cervero et al. (1999) [2];

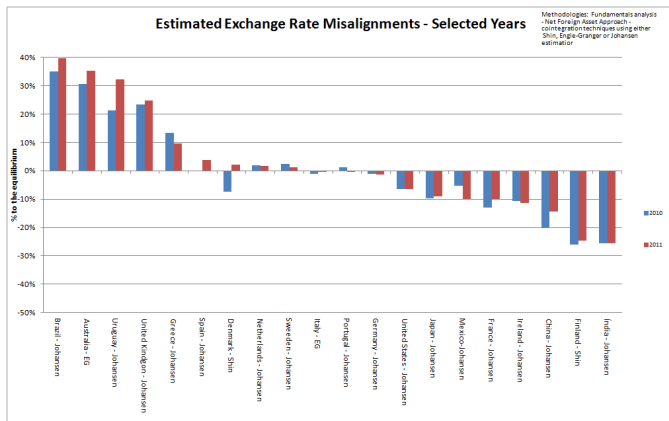
Some recent evidence on PPP

- Recent PPP debate Taylor and Taylor. ([2]);
- Temporal aggregate data seriously distort PPP test ([8]);
- Taylor ([1]) tests the PPP using a sample of 20 countries using a century sample and obtains evidence in favor of PPP;
- Other studies using Taylor series:
 - Kapetanios, Shin and Snell test is applied to Taylor data set ([3]);
 - KPSS confirmatory test was applied to Taylor data with good results in favour of PPP hypothesis ([3]).

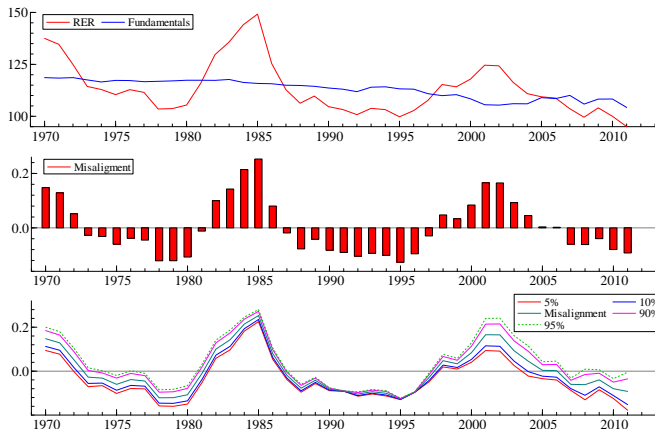
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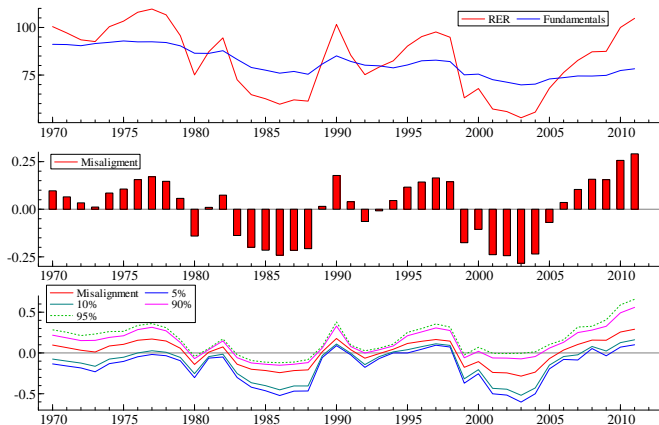
Multilateral mismatch:



North American Effective Real exchange rate misalignment.



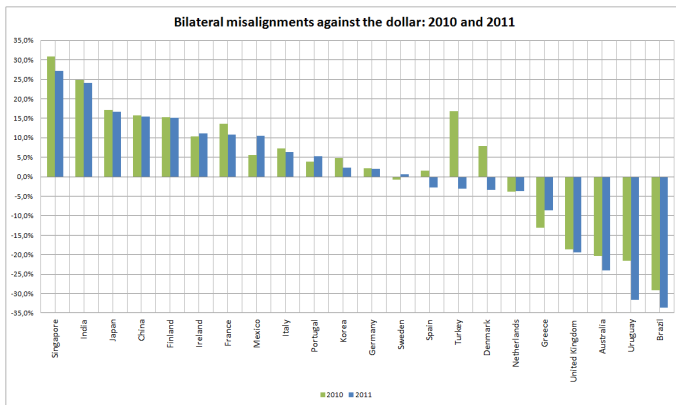
Brazilian Real Effective Exchange rate misalignment.



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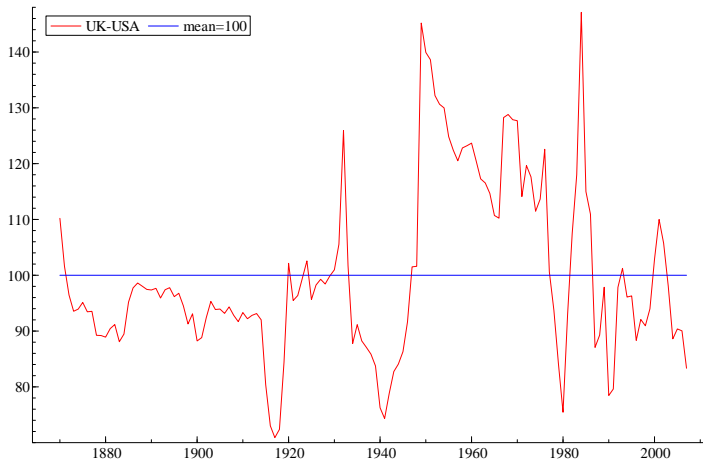
Bilateral Real exchange rate mismatch - dollar as base currency.



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PPP: One Example - UK and USA.



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Work to do:

- Periodical Releases of the misalignments estimative using different approaches;
- Working on calculating other methodologies;
- Working on understading effects of misalignments on trade flows: Is there evidence of sectoral hysteresis?

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Motivation to construct PPP based on world index.

- Early test of PPP in the eighties and nineties failed to obtain evidence in favor of PPP hypothesis;
 - Low power of unit root test;
 - Time aggregation problem;
 - Too short data set in time dimension;
 - No linearity in adjustment towards long run equilibrium;
- In recent studies in the literature some authors obtained evidence in favor of PPP using longer data set:
 - Taylor (2000) - time aggregation problem causes overestimation of half-life of the shocks;
 - Longer time data set evidence in favor of PPP;

How world price index was constructed.

- The world price index consists in a trade weighted average of consumer price index for a group of nations that contains the countries with the biggest trade volumes excepting OPEC members:

$$P_t^{world} = \sum_{i=1}^N w_{it} P_t^i \quad (5)$$

- where w_{it} denotes the trade share of country i in period t in the index;

How the PPP index was calculated.

- The PPP index was calculated using the following formula:

$$PPP - WTC_t^j = \left(\frac{\sum_{i=1}^N w_{it} E_t^{ij}}{P_t^{world}} \right) P_t^j \quad (6)$$

- where E_{it} denotes the nominal exchange rate expressed as the quantity of currency of country i is necessary to buy one unit of currency j;
- P_t^j denotes the consumer price index of country j at time t;

Sources of the data

Data Sources:

- Consumer Price Indexes: IFS-IMF database;
- Exchange rate Data;
- Trade Volumes: IMF;
- Taylor Data set;

Frequency:

- Monthly and Annual Data;
- From 1960 to 2012 and from 1900 to 2012;

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Summary of Unit Root test - Secular Time Span.

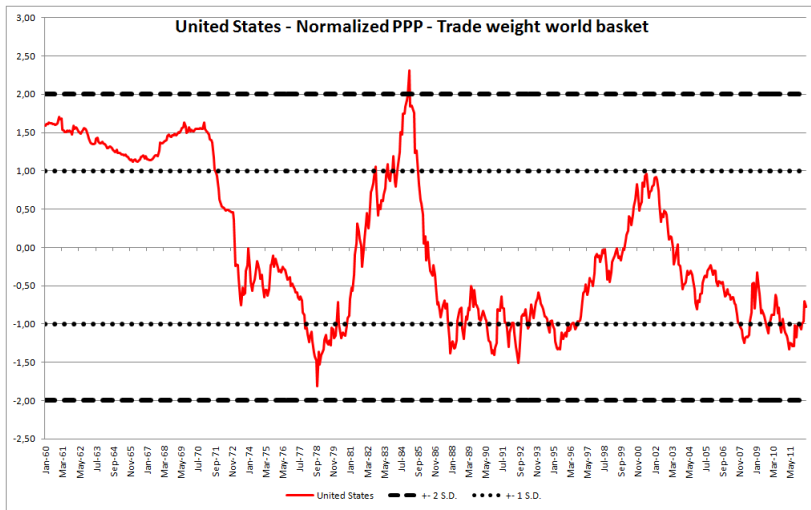
Country	The null for ADF test is rejected and the null for KPSS is accepted	The null for ADF test is accepted and the null for KPSS is rejected	The null for ADF test is rejected and the null for KPSS is rejected	The null for ADF test is accepted and the null for KPSS is accepted
Argentina	Stationarity			
Australia		Non stationary		
Austria	Stationarity			
Belgium	Stationarity			
Brazil	Stationarity			
Canada		Non stationary		
Chile	Stationarity			
China	Stationarity			
Czech Republic				Inconclusive
Denmark		Non stationary		
Finland	Stationarity			
France		Non stationary		
Germany		Non stationary		
Hong Kong	Stationarity			
India	Stationarity			
Indonesia	Stationarity			
Italy	Stationarity			
Japan		Non stationary		
Malaysia	Stationarity			
Mexico		Non stationary		
Netherlands		Non stationary		
Norway	Stationarity			
Poland	Stationarity			
Russia				Inconclusive
Singapore	Stationarity			
South Korea	Stationarity			
Spain		Non stationary		
Sweden			Inconclusive	
Switzerland		Non stationary		
Thailand	Stationarity			
Turkey	Stationarity			
United Kingdom		Non stationary		
United States		Non stationary		

Summary of Unit Root test - Shorter Time Span.

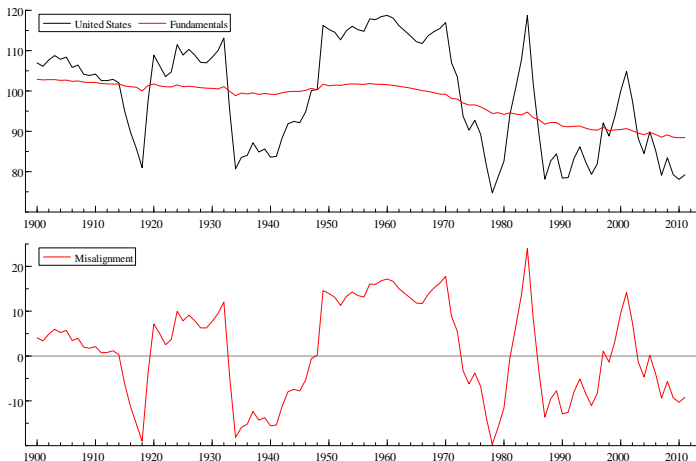
Country	The null for ADF test is rejected and the null for KPSS is accepted	The null for ADF test is accepted and the null for KPSS is rejected	The null for ADF test is rejected and the null for KPSS is rejected	The null for ADF test is accepted and the null for KPSS is accepted
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Australia		Non Stationarity		
Austria			Inconclusive	
Belgium			Inconclusive	
Brazil			Inconclusive	
Canada		Non Stationarity		
China	Stationarity			
France		Non Stationarity		
Germany		Non Stationarity		
India			Inconclusive	
Italy	Stationarity			
Japan			Inconclusive	
Malaysia			Inconclusive	
Mexico		Non Stationarity		
Netherlands			Inconclusive	
South Korea	Stationarity			
Spain		Non Stationarity		
Sweden		Non Stationarity		
Switzerland			Inconclusive	
United Kingdom		Non Stationarity		
United States		Non Stationarity		

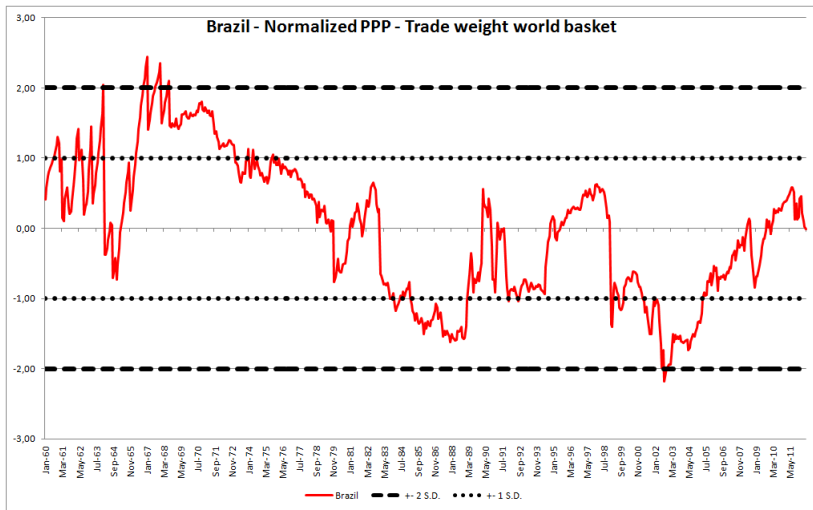
WTC- United States Currency against world Index



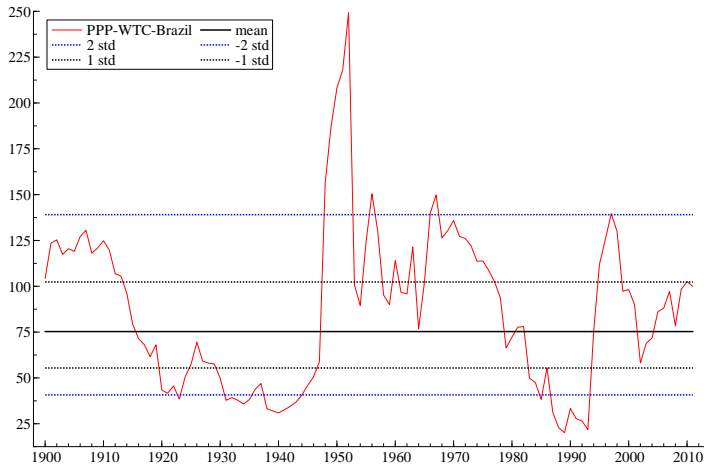
WTC- Secular - United States Currency against world Index



PPP - Brazilian Currency against world Index



PPP - Brazilian Currency against world Index



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Problems to be addressed

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- Investigate the time series properties of these indexes;
- Investigate alternative options such as Gross Domestic Deflators;
- The N-1 problem
- To calculate and compare different decompositions;

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