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### Abstract

This paper highlights briefs about theories of the exchange rate parity conditions and tests its empirical validity. It covered four parity conditions PPP (Purchasing Power Parity), FE (Fisher Effects), IFE (International Fisher Effects), and IRP (Interest rate Parity), Each of these parity conditions based on the future spot rate of exchange can be determined. Regression analysis applied to monthly nominal interest differentials, inflation differential and exchange rate change between the years 2011- 2017, along with lags. The investigated country pairs are US- India, US-South Africa, US-Brazil, US-China and US-Russia. The result shows that only international fisher effect is partially worked and other parity theory do not hold exchange rate. This means that the exchange rate movement reacts to other factor.

### Key Words:

PPP (Purchasing Power Parity), FE (Fisher Effects), IFE (International Fisher Effects), and IRP (Interest rate Parity), Nominal interest rate, Exchange rate, Inflation.



### Introduction:

With the development of increasing integration in global financial markets and the growth in the international trade and financial liberalisation, the whole world economies have attracted enormous attention on exchange rate fluctuation and manage exchange rate. After the liberalization, privatization and globalization of the whole world, whole world converted in to one nation economy that time nation currency play a vital role for the decision making.

Exchange rate is a main factor for the international trade. And it is highly affected for import and export. BRICS country it is highly emerging country because global economic leadership is progressively shifting from the G7 to the BRICS, the popular symbol use to refer to Brazil, Russia, India, China and South Africa. Goldman and Sachs (Wilson and Purushothaman, 2003) projects that the BRICS will “overtake” the G6 (UK, US, France, Italy, Japan and Germany) by 2040. Because BRICS country have a lot of internal strength. BRICS represent 30% of the global economic growth, 40% of the world's population and 25% of the global land mass (Sule, 2011)<sup>1</sup>. Their combined GDP is estimated at \$8.7 trillion (Sule, 2011).

## Purchasing Power Parity Theory

**Figure 2.1 PPP-6-4-20246-505 Inflation Differential, home country relative to foreign country Percentage change in home currency value to foreign currency**

An economic theory that estimates the amount of adjustment needed on the exchange rate between countries in order for the exchange to be equivalent to each currency's purchasing power.

Equation of Purchasing Power Parity

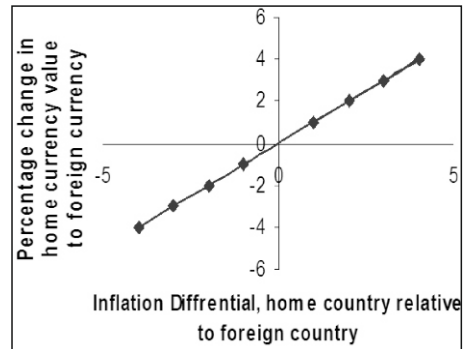
$$\frac{(S_{t+1} - S_t)}{S_t} = \frac{(i_{h,t} - i_{f,t})}{(1 + i_{f,t})}$$

$i_{h,t}$  = Inflation Rate Of Home Country USA, at time t

$i_{f,t}$  = Inflation Rate Of Foreign Country, at time t

$S_t$  = Spot Exchange rate At Time t

This approximation relates inflation to exchange rate changes stating that inflation differentials will be offset by exchange rate changes. Equation 2.2 is valid in the foreign inflation is relatively small (Shapiro 2002, 153)



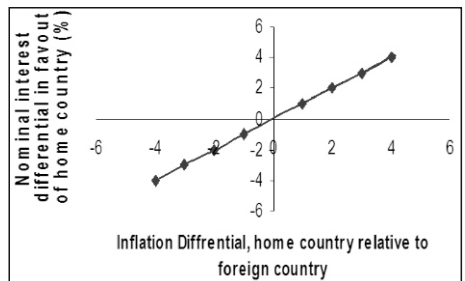
**Figure 2.2 Fisher Effect-6-4-20246-6-4-20246 Inflation Differential, home country relative to foreign country Nominal interest differential in favour of home country (%)**

### Fisher Effect

Fisher effect says that currencies with high rates of inflation should bear higher rate than currencies with lower rate of inflation. (Shapiro 2002, 161)

Equation of Fisher Effect

$$\frac{(1 + r_{h,t})}{(1 + r_{f,t})} = \frac{(1 + E(I_{h,t}))}{(1 + E(I_{f,t}))}$$



### International Fisher Effect

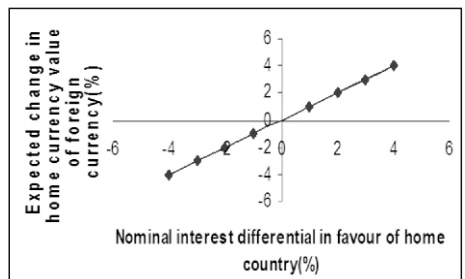
**Figure 2.3 International Fisher Effect-6-4-20246-6-4-20246 Nominal interest differential in favour of home country (%) Expected change in home currency value of foreign currency (%)**

International Fisher Effect is the counter part of the fisher effect. It can be seen as a combination of the generalized version of the fisher effect and relative version of the PPP.

$$\frac{(S_{t+1} - S_t)}{S_t} = \frac{(i_{h,t} - i_{f,t})}{(1 + i_{f,t})} \text{ and } \frac{(1 + r_{h,t})}{(1 + r_{f,t})} = \frac{(1 + E(I_{h,t}))}{(1 + E(I_{f,t}))}$$

By the combination of two equations we get international fisher relation

$$\frac{(S_{t+1} - S_t)}{S_t} = \frac{(r_{h,t} - r_{f,t})}{(1 + r_{f,t})}$$



The international fisher effect shows the relationship between the percentage change in the spot exchange rate over time and differential between comparable interest rate in different nominal capital market (Madhu Vij 2003, 214).

### **Research Methodology**

#### **Aim of the study**

To conduct an empirical investigation of PPP (purchasing Power Parity), FE (Fisher Effect), and IFE (International Fisher Effect) parity condition for Brazil, Russia, India, China and South Africa. During study follow descriptive research method is adopted to find out the degree of relationship between the dependent variable and independent variable in respective parity condition model. In research follow only 3 parity conditions on BRICS countries so there is a wide scope for further study and apply this parity condition on other nation also.

#### **Significant of Study**

With the help of this research paper we can assists the business in making the international decision, which involves transactions in multi currency. and also focuses on the condition of the market, and evaluates whether the economy is truly governed by market forces, or else there are some interventions hindering the free flow of transactions in the economy.

#### **Data Collection Method**

Secondary data collection method is used.

Time duration: Monthly January 2011 to December 2017

<b>Types of data</b>	<b>Characteristics of data</b>	<b>Source of data</b>
Nominal Interest rate	Treasury bill	Country's central bank
Exchange rate	European Currency Quotation	International Monetary Fund
Nominal inflation rate	CPI	World Bank and International Monetary Fund
GDP		Trading Economy and country economy
Future Rate	European currency Quotation	NSE Currency Future MCX Currency Future

Tools are used for data analysis are, excel and OLS (Ordinary Least Square) method. Ho:  $\alpha = 1$ ,  $\beta=0$ . A t-test will be applied to  $\alpha$  and  $\beta$ , whose hypothesis value are 1 and 0 respectively. The regression use ordinary lest square estimates of Alpha and Beta.

### **RESULTS**

#### **Purchasing Power Parity**

Lags	Brazil				Russia				India				China				South Africa				
	R	Beta	P-Value	R	Beta	P-Value	R	Beta	P-Value	R	Beta	P-Value	R	Beta	P-Value	R	Beta	P-Value	R	Beta	P-Value
Lag 1	0.0217	0.0031	0.8088	0.0420	0.0015	0.6396	0.0455	-0.0006	0.6144	0.2945	-0.1014	0.6144	0.1671	0.0222	0.6144	0.1671	0.0222	0.6144	0.1671	0.0222	0.6144
Lag 2	0.0469	0.0067	0.6018	0.0979	0.0035	0.2754	0.0039	-0.0001	0.9655	0.2502	-0.0866	0.0047*	0.1742	0.0233	0.0047*	0.1742	0.0233	0.0047*	0.1742	0.0233	0.0047*
Lag 3	0.0522	0.0075	0.5628	0.0954	0.0035	0.2900	0.0208	0.0003	0.8160	0.2279	0.0795	0.1016*	0.1509	0.0203	0.1016*	0.1509	0.0203	0.1016*	0.1509	0.0203	0.1016*
Lag 4	0.0274	0.0040	0.7624	0.1006	0.0037	0.2662	0.0164	0.0002	0.8577	0.2166	0.0762	0.0157*	0.1320	0.0178	0.0157*	0.1320	0.0178	0.0157*	0.1320	0.0178	0.0157*
Lag 5	0.0129	0.0019	0.8872	0.0804	0.0029	0.3767	0.0736	0.0010	0.4223	0.2061	0.0732	0.0222*	0.119	0.0152	0.0222*	0.119	0.0152	0.0222*	0.119	0.0152	0.0222*
Lag 6	0.0064	0.0009	0.9446	0.0324	0.0012	0.7232	0.0239	0.0003	0.7956	0.2138	0.0766	0.0181*	0.0597	0.0081	0.0181*	0.0597	0.0081	0.0181*	0.0597	0.0081	0.0181*
Lag 7	0.0370	0.0054	0.6869	0.0750	0.0028	0.4189	0.0051	0.0001	0.9559	0.1709	0.0617	0.0610*	0.0319	0.0043	0.0610*	0.0319	0.0043	0.0610*	0.0319	0.0043	0.0610*
Lag 8	0.0247	0.0037	0.7885	0.1629	0.0061	0.0755	0.0977	0.0013	0.2927	0.0938	0.0332	0.3084	0.0576	0.0078	0.3084	0.0576	0.0078	0.3084	0.0576	0.0078	0.3084
Lag 9	0.0269	0.0040	0.7713	0.1386	0.0052	0.1328	0.1245	0.0056	0.1811	0.0606	0.0216	0.5128	0.0546	0.0074	0.5128	0.0546	0.0074	0.5128	0.0546	0.0074	0.5128
Lag 10	0.0621	0.0083	0.5140	0.1121	0.0042	0.2267	0.1296	0.0072	0.1657	0.0721	0.0257	0.4377	0.0218	0.0030	0.4377	0.0218	0.0030	0.4377	0.0218	0.0030	0.4377
Lag 11	0.0678	0.0101	0.4677	0.0882	0.0037	0.2923	0.0330	0.0022	0.7262	0.0730	0.0261	0.4339	0.0486	0.0066	0.4339	0.0486	0.0066	0.4339	0.0486	0.0066	0.4339
Lag 12	0.0928	0.0139	0.3220	0.0751	0.0028	0.4232	0.0119	0.0008	0.9003	0.0565	0.0202	0.5472	0.0885	0.0120	0.5472	0.0885	0.0120	0.5472	0.0885	0.0120	0.5472

Result - \* indicate P - value less than 0.05 means H0 is rejected so there is relationship between inflation differential and exchange rate differential. In china PPP hold a good condition. There is significant relationship between exchange rate and inflation. Negative beta also raise the question against its validity because it indicate that there is negative relation between variable which is not supported by theories.

### 3.2 Fisher Effect

Lags	Brazil				Russia				India				China				South Africa				
	R	Beta	P-Value	R	Beta	P-Value	R	Beta	P-Value	R	Beta	P-Value	R	Beta	P-Value	R	Beta	P-Value	R	Beta	P-Value
Lag 1	0.3748	0.0801	0.0000*	0.2699	0.0182	0.0021*	0.0783	-0.0028	0.3798	0.1082	1.3673	0.2242	0.0920	-0.0686	0.2242	0.0920	-0.0686	0.2242	0.0920	-0.0686	0.2242
Lag 2	0.3624	0.0781	0.0000*	0.2045	0.0188	0.0211*	0.0777	0.0028	0.3852	0.0361	0.4585	0.6867	0.0569	0.0425	0.6867	0.0569	0.0425	0.6867	0.0569	0.0425	0.6867
Lag 3	0.3272	0.0711	0.0002*	0.1346	0.0091	0.1329	0.0854	-0.0030	0.3419	0.0568	-0.7245	0.5274	0.0851	-0.0486	0.5274	0.0851	-0.0486	0.5274	0.0851	-0.0486	0.5274
Lag 4	0.2806	0.0614	0.0015*	0.0521	0.0035	0.5642	0.1017	0.0036	0.2593	0.1515	-1.9363	0.0917	0.1026	0.0768	0.0917	0.1026	0.0768	0.0917	0.1026	0.0768	0.0917
Lag 5	0.2354	0.0520	0.0085*	0.0289	0.0020	0.7488	0.0987	0.0035	0.2754	0.2242	2.8829	0.0123*	0.1269	0.0955	0.0123*	0.1269	0.0955	0.0123*	0.1269	0.0955	0.0123*
Lag 6	0.1913	0.0427	0.0340*	0.1063	0.0073	0.2420	0.0962	0.0034	0.2901	0.2805	3.6392	0.0017*	0.1373	0.1039	0.0017*	0.1373	0.1039	0.0017*	0.1373	0.1039	0.0017*
Lag 7	0.1606	0.0362	0.0772	0.1441	-0.0100	0.1134	0.1044	-0.0036	0.2527	0.3015	-3.9467	0.0007*	0.1314	-0.0897	0.0007*	0.1314	-0.0897	0.0007*	0.1314	-0.0897	0.0007*
Lag 8	0.1544	0.0351	0.0908	0.1572	-0.0110	0.0850	0.0900	-0.0031	0.3263	0.2871	-3.7900	0.0014*	0.146	-0.0874	0.0014*	0.146	-0.0874	0.0014*	0.146	-0.0874	0.0014*
Lag 9	0.1574	0.0362	0.0859	0.1684	0.0119	0.0660	0.0786	0.0027	0.3936	0.2579	3.4342	0.0045*	0.1970	0.0744	0.0045*	0.1970	0.0744	0.0045*	0.1970	0.0744	0.0045*
Lag 10	0.1772	0.0409	0.0538	0.1639	0.0117	0.0748	0.0799	0.0027	0.3877	0.2052	2.7417	0.0252*	0.0704	0.0542	0.0252*	0.0704	0.0542	0.0252*	0.0704	0.0542	0.0252*
Lag 11	0.2192	0.0508	0.0171*	0.1404	0.0100	0.1295	0.0910	0.0031	0.3273	0.1368	1.8254	0.1397	0.0400	0.0309	0.1397	0.0400	0.0309	0.1397	0.0400	0.0309	0.1397
Lag 12	0.2632	0.0611	0.0041*	0.1266	-0.0090	0.1739	0.0195	0.0056	0.8346	0.0711	0.9460	0.4463	0.0181	-0.0440	0.4463	0.0181	-0.0440	0.4463	0.0181	-0.0440	0.4463

Result - \* indicate P – value less than 0.05 means H0 is rejected so there is relationship between inflation differential and interest rate differential. In Brazil FE hold a good condition at initial stage and latter on china hold good condition after 5 month. There is significant relationship between interest rate and inflation. Negative beta also raises the question against its validity because the beta value turns out to be negative, which is opposite to our hypothesis and the theoretical relationship.

### International Fisher Effect

Lags	Brazil				Russia				India				China				South Africa				
	R	Beta	P-Value	R	Beta	P-Value	R	Beta	P-Value	R	Beta	P-Value	R	Beta	P-Value	R	Beta	P-Value	R	Beta	P-Value
Lag 1	0.2853	-0.1937	0.0011*	0.2298	-0.1236	0.0094*	0.2103	-0.0263	0.0221*	0.1551	-0.0015	0.5387	0.1936	0.0346	0.0292*	0.1936	0.0346	0.0292*	0.1936	0.0346	0.0292*
Lag 2	0.2743	-0.1902	0.0018*	0.1655	-0.0905	0.0624	0.2078	-0.0270	0.0195*	0.0540	-0.0015	0.5485	0.2829	0.0508	0.0013*	0.2829	0.0508	0.0013*	0.2829	0.0508	0.0013*
Lag 3	0.2632	-0.1857	0.0028*	0.1182	-0.0649	0.1891	0.2144	-0.0279	0.0163*	0.1102	-0.0030	0.2213	0.2420	0.0436	0.0055*	0.2420	0.0436	0.0055*	0.2420	0.0436	0.0055*
Lag 4	0.2141	-0.1529	0.0165*	0.1041	-0.0579	0.2498	0.1909	-0.0250	0.0338*	0.1760	-0.0048	0.0505	0.1190	0.0215	0.1881	0.1190	0.0215	0.1881	0.1190	0.0215	0.1881
Lag 5	0.1863	-0.1347	0.0383	0.0810	-0.0458	0.3731	0.1642	-0.0216	0.0696	0.2255	-0.0062	0.0121*	0.0370	0.0067	0.6846	0.0370	0.0067	0.6846	0.0370	0.0067	0.6846
Lag 6	0.2185	-0.1612	0.0152*	0.0581	-0.0334	0.5252	0.1715	-0.0227	0.0590	0.2698	-0.0075	0.0026*	0.0305	-0.0055	0.7391	0.0305	-0.0055	0.7391	0.0305	-0.0055	0.7391
Lag 7	0.2413	-0.1823	0.0074*	0.0705	-0.0410	0.4423	0.1744	-0.0233	0.0557	0.2891	-0.0080	0.0013*	0.1215	-0.0224	0.1843	0.1215	-0.0224	0.1843	0.1215	-0.0224	0.1843
Lag 8	0.2216	-0.1706	0.0146*	0.0360	-0.0211	0.6961	0.1420	-0.0188	0.1217	0.2595	-0.0071	0.0042*	0.2211	-0.0409	0.0152*	0.2211	-0.0409	0.0152*	0.2211	-0.0409	0.0152*
Lag 9	0.2190	-0.1626	0.0220*	0.0097	-0.0057	0.9165	0.1620	-0.0213	0.0784	0.2904	-0.0079	0.0014*	0.2468	-0.0457	0.0068*	0.2468	-0.0457	0.0068*	0.2468	-0.0457	0.0068*
Lag 10	0.1705	-0.1339	0.0638	0.0156	0.0093	0.8669	0.1492	-0.0197	0.1058	0.3053	-0.0083	0.0008*	0.2360	-0.0436	0.0101*	0.2360	-0.0436	0.0101*	0.2360	-0.0436	0.0101*
Lag 11	0.1659	-0.1309	0.0725	0.0444	0.0248	0.6580	0.1448	-0.0192	0.1192	0.3005	-0.0082	0.0010*	0.1934	-0.0358	0.0367*	0.1934	-0.0358	0.0367*	0.1934	-0.0358	0.0367*
Lag 12	0.1348	-0.1059	0.1472	0.0323	0.0194	0.7305	0.1425	-0.0189	0.1271	0.3180	-0.0086	0.0006*	0.2083	-0.0382	0.0249*	0.2083	-0.0382	0.0249*	0.2083	-0.0382	0.0249*

cate P – value less than 0.05 means H0 is rejected so there is relationship between inflation differential and interest rate differential. In Brazil FE hold a good condition at initial stage and latter on china hold good condition after 5 month. There is significant relationship between interest rate and inflation. Negative beta also raises the question against its validity because the beta value turns out to be negative, which is opposite to our hypothesis and the theoretical relationship.

### International Fisher Effect

### CONCLUSION

These three parity condition works for specific country, specific time period and with different time lag. There are several reasons, which are attributable to this. They are

The purpose of this paper was to test the validity of the three parity condition i.e. (PPP, FE, IFE) international fisher effect, employing regression analysis. The results were as follows:

For majority of the cases the R2 for all the countries and all parity condition; have turned out to be very low, as well as, the null hypothesis that  $\alpha = 0$  ,  $\beta = 1$  is rejected in majority of the cases. The low beta value shows that the exchange rate movements react to other factors in addition to independent factor differential. While the negative beta value questions the theoretical relation between the independent factor differential and dependence factor differential.

Though the theory is not work in any nation because these theories are introduce before the flexible exchange rate and each country adopting different method of exchange rate measurement. One thing must be noted is that all this parity conditions are meant for floating currencies only i.e. in equilibrium, with no government interference (Shapiro 2002, 160), where china's yuan was managed floated also other exchange rates are influenced by the government intervention.

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