

Impact of Foreign Exchange Rate on the Market Price Behaviour of Select Scrips in India–Structural Equation Modelling with IBM[®] SPSS[®] Amos

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Abstract—Indian Capital and Foreign Exchange markets have undergone tremendous changes since 1991, when the government has adopted liberalization and globalization policy. The reform process geared up more from the year 2000 specifically decreasing the trade barriers in the domestic economy integrating with international economy. This financial liberalization paved a new way of growth and development to the Indian economy especially during the period from 2005-2012. Indian businesses expanded globally and more prominently with substantial inflow of foreign capital into India. This eventually increased the revenues and expenses inturn inviting greater exchange rate exposures adversely impacting the company financials. With the above backdrop, the paper attempts to explore the causal relationship between Foreign Exchange (Forex) Rate and Market Prices of the Share (MPS) of select scrips by using the Structural Equation Model.

1. INTRODUCTION

Indian Capital and Foreign Exchange markets have undergone tremendous changes since 1991, when the government has adopted liberalization and globalization policy. The reform process geared up more from the year 2000 specifically decreasing the trade barriers in the domestic economy integrating with international economy. This financial liberalization paved a new way of growth and development to the Indian economy especially during the period from 2005-2012. Indian businesses expanded globally and more prominently with substantial inflow of foreign capital into India. This eventually increased the revenues and expenses inturn inviting greater exchange rate exposures adversely impacting the company financials.

In the light of the above, the current paper evaluates the impact of currency appreciation or depreciation on market price of select companies. The paper attempts to explore the causal relationship between Foreign Exchange (Forex) Rate and Market Prices of the Share (MPS) of select scrips by using the Structural Equation Model. The study period considered is 8 years from the year 2005 - 2012 which is considered as highly robust period in the Indian stock market.

2. OBJECTIVE OF THE STUDY

The basic and prime objective of the study is to know the impact of Forex Rate on select Indian companies MPS by using Structural Equation Model.

3. SCOPE OF THE STUDY

This research covers about 12 select company scrips from 4 major sectors/industries which are trading in Bombay Stock Exchange (BSE). Analysis will be done for the 8 years period from year 2005 - 2012 which almost covers 2 stock market cycles.

Table 1: List of Sample Companies from Four Industries listed in BSE

Information Technology	Telecommunications	Fast Moving Consumer Goods (FMCG)	Pharmaceuticals
Tata Consultancy Services (TCS)	Bharti AirTel Limited	Hindustan Unilever Limited (HUL)	Cipla Limited
Infosys Limited	Idea Cellular Limited	ITC Limited	Sun Pharmaceutical Industries Ltd
Wipro Limited	Mahanagar Telephone Nigam limited (MTNL)	Nestle India Limited	Ranbaxy Laboratories Limited

Following table lists the values of Foreign Exchange Rate & Sensex of Bombay Stock Exchange during 2005-2012:

Table 2: Values of Foreign Exchange Rate (\$ Vs Rs.) and %Change During 2005–12

Year	Ex. Rate (\$ Vs Rs.)	% Change
2005	44.10	5740.99
2006	45.31	2.744
2007	41.33	-8.78
2008	43.51	5.275
2009	48.40	11.24
2010	45.73	-5.52
2011	44.99	-1.62
2012	53.38	18.63

The following table lists the Average Market Prices (Rs.) of the select scrips for the years from 2005-2012.

Table 3: Market Price Averages for during the period 2005-2012

Company	2005	2006	2007	2008	2009	2010	2011	2012
Infosys	2783.6	2546	2277.1	1776.7	1481.4	2189.9	2961.62	2748.3
TCS	1248.4	1602.39	1166.1	954.8	568.37	715.58	1095.81	889.07
Wipro	797.67	537.03	542.85	486.34	337.95	556.64	472.61	400.63
AirTel	174.26	214.73	532.1	889.76	737.48	453.6	322.96	378.17
Idea Cellular	0	0	0	122.95	70.01	66.16	65.83	89.32
MTNL	136	131.88	153.79	149.25	83.79	83.35	57.72	35.13
HUL	133.97	183.99	229.12	209.77	240.92	258.18	275.78	355.54
ITC	1145.6	762.9	178.65	182.58	186.26	232.13	211.04	203.92
Nestle	573.55	875.41	1061.6	1313.5	1589.6	2301.9	3284.55	4251.5
Cipla	356.15	398.42	244.64	197.3	207.62	288.09	330.81	312.37
Ranbaxy	1025.1	730.47	407.07	389.05	388.62	300.59	497.93	486.33
SunPharma	467.32	649.45	918.49	1079.9	1255.6	1373.6	1242.35	508.2

4. METHODOLOGY – CAUSE AND EFFECT

A simple Structural Equation Modelling (SEM) is an attempt to model causal relations between variables by including all variables that are known to have some involvement in the process of interest. In SEM, the causality can be inferred, but only from the model originally constructed and not from the statistical test of that model. The benefit of the SEM is simply the flexibility with which models can be built.

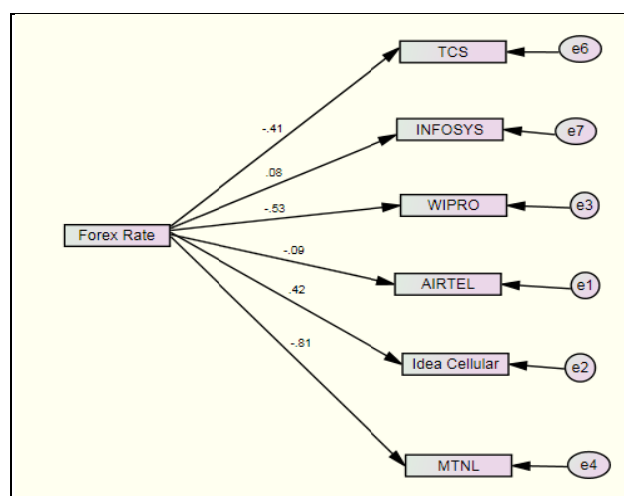
The following describes the steps involved in Structural Equation Modelling (SEM):

Step 1: Model Specification: Usually done by drawing pictures using SEM software

Step 2: Parameter estimation. SEM software performs this step and is an iterative process. Final result is a set of parameters that produce best fit to data possible.

Step 3: Assessment of fit: For analysis, the data is divided as two groups with each group comprising of two sectors each.

Structural Equation Model (SEM) is used to Study the Impact of Forex Rate on MPS. The following Fig. shows the impact of Forex Rate on Information Technology and Telecommunication companies which are purely technology based.

**Fig. 1: Impact of Forex Rate on MPS of IT and Telecom companies****Table 4: Regression Weights: (Group number 1 - Default model)**

Scrip Name		Estimate	S.E.	C.R.	P	Std. Regression Weight Estimates
AirTel	<- Forex Rate	-5.818	24.451	-.238	.812	-.898
Idea Cellular	<- Forex Rate	5.379	4.387	1.226	.228	.428
Wipro	<- Forex Rate	-19.794	11.963	-1.655	.098	-.538
MTNL	<- Forex Rate	-5.975	2.794	-3.608	***	-.813
TCS	<- Forex Rate	-36.341	30.629	-1.186	.236	-.489
Infosys	<- Forex Rate	11.629	53.398	.218	.828	.082

If Critical Ratio (C.R) value is if greater than + 1.96 or less than -1.96 then only the impact is considered as significant. The p value is at 0.05 significant levels. Therefore from the above table it is clearly evident that Forex Rate is showing its significant impact on MTNL. Forex rate has -0.813 impact on MTNL.

5. MODEL FIT

The following table lists the values that were found in the study for each parameter to test model fit:

Table 5: Parameter value for Model Fit measures with SPSS Amos

Name of the Parameter	Value
Goodness of Fit Index (GFI)	0.901
Adjusted Goodness of Fit Index (AGFI)	0.932
Normed Fit Index (NFI)	0.924
Comparative Fit Index (CFI)	0.929
Tucker-Lewis Index(TLI)	0.949
Incremental Fit Index(IFI)	0.967
Relative Fit Index(RFI)	0.921
Root Mean Square Error of Approximation (RMSEA)	0.036

Based on various studies conducted by Bentler and Bonett (1980), Jöreskog, and Sörbom (1974), Bollen's (1989) and Bentler (1980) it was suggested that if the Index value is greater than 0.9 and if RMSEA value is less than 0.05 it indicates model is fit and accepted.

Based on Structure Equation Model using SPSS Amos 20 it is found that Chi-square (CMIN) = 21.252, Degree of freedom (DF) = 6 and probability level is about 0.0329 which is the evidence against the null hypothesis that it is not significant at the 0.05 level. CMIN/DF is called as the minimum discrepancy which is 3.542 Wheaton et al (1977) suggested that if the minimum discrepancy is less than 5 the model is reasonable fit.

The following Fig. shows the impact of Forex Rate on FMCG and Pharmaceutical companies which are purely product based:

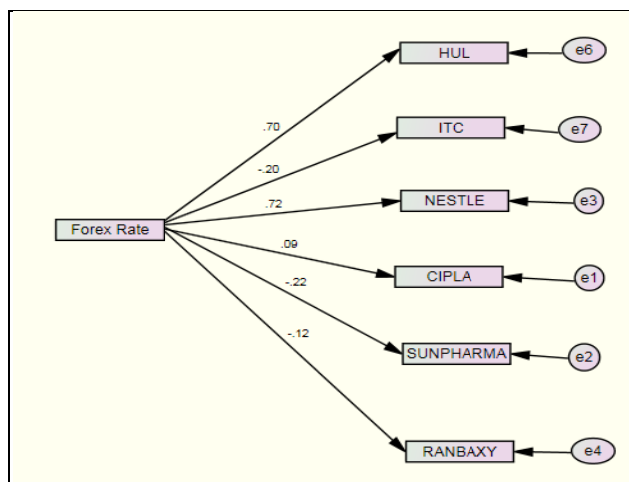


Fig. 2: Impact of Forex Rate on MPS of FMCG and Pharmaceutical companies

Table 6: Regression Weights: (Group number 1 - Default model)

Scrip Names			Estimate	S.E.	C.R.	P	Std. Regression Weight Estimates
Cipla	<	Forex Rate	1.537	7.365	.249	.803	.094
SunPharma	<	Forex Rate	-21.510	36.094	-.596	.551	-.220
Nestle	<	Forex Rate	254.390	92.642	2.764	.006	.722
Ranbaxy	<	Forex Rate	-7.761	24.453	-.317	.751	-.119
HUL	<	Forex Rate	12.604	4.363	2.592	.010	.700
ITC	<	Forex Rate	-19.642	37.030	-.530	.596	-.197

If Critical Ratio (C.R) value is if greater than + 1.96 or less than -1.96 then only the impact is considered as significant. The p values of Nestle and HUL are less than 0.05 at 5% significance levels. Therefore from the above table it is clearly evident that Forex Rate is showing its significant impact on Nestle and HUL as C.R value of Nestle is 2.764 and the C.R value of HUL is 2.592 which are greater than 1.96 respectively.

Model Fit

The following table lists the values that were found in the study for each parameter to test model fit:

Table 7: Parameter value for model fit measures with SPSS Amos

Name of the Parameter	Value
Goodness of Fit Index (GFI)	0.929
Adjusted Goodness of Fit Index (AGFI)	0.924
Normed Fit Index (NFI)	0.998
Comparative Fit Index (CFI)	0.924
Tucker-Lewis Index(TLI)	0.991
Incremental Fit Index(IFI)	0.995
Relative Fit Index(RFI)	0.901
Root Mean Square Error of Approximation (RMSEA)	0.019

Based on various studies conducted by Bentler and Bonett (1980), Jöreskog, and Sörbom (1974), Bollen's (1989) and Bentler (1980) it was suggested that if the Index value is greater than 0.9 and if RMSEA values is less than 0.05 it indicates model is fit and accepted. Forex Rate has 0.700 impact on HUL and 0.722 impact on Nestle respectively.

Based on Structure Equation Model using SPSS Amos 20 it is found that Chi-square (CMIN) = 12.48, Degree of freedom (DF) = 6 and probability level is about 0.024 which is evidence against the null hypothesis that it is not significant at the 0.05 level. CMIN/DF is called as the minimum discrepancy which is 2.08 Wheaton et al (1977) suggested that if the minimum discrepancy is less than 5 the model is reasonable fit.

6. CORRELATION BETWEEN FOREX RATE AND MPS

Table 8: Correlation between Forex Rate and MPS of Select IT and Telecom Companies

Forex Vs	Forex	TCS	Infosys	Wipro	Airtel	Idea Cellular	MTNL
Pearson Correlation	1.00	-.409	.082	-.530	-.090	.420	-.513*
Sig.(2 tailed)		.314	.847	.176	.833	.390	.014
N	8	8	8	8	8	8	8

*Correlation is significant at the 0.05 level (2-tailed).

From the above correlation results it is clearly observed that MTNL is showing significant correlation at 0.05 level (2-tailed) as correlation between Forex Rate and MPS is considered significant only when the sig.(2-tailed) is less than 0.05.

The following table shows the correlation of Forex Rate with Select FMCG and Pharma Companies.

Table 9: Correlation between Forex rate and MPS of Select FMCG and Pharma Companies

Forex Vs	Forex	HUL	ITC	Nestle	Cipla	SunPharma	Ranbaxy
Pearson Correlation	1.00	.700	-.197	.722*	.094	-.220	-.119
Sig.(2 tailed)		.049	.641	.043	.825	.601	.779
N	8	8	8	8	8	8	8

*Correlation is significant at the 0.05 level (2-tailed).

From the above correlation results it is clearly observed that Nestle and HUL are showing significant correlation at 0.05 level (2-tailed) as correlation between Forex Rate and MPS is considered significant only when the sig.(2-tailed) is less than 0.05.

From the above results it is clearly evident that out of selected companies only three companies are showing significant relationship with Forex Rate changes and rest of the companies though having Forex Exposures still they were not affected by changes in Forex which may be because of the risk

management approaches they have adopted which were discussed as follows:

7. USE OF DERIVATIVES BY SELECT INDIAN COMPANIES

The derivative and hedging activities by the select 12 Indian companies namely are analysed based on their respective annual reports during the study period. And it is observed that the exchange rate risk is being neutralized (hedged) through use of derivative instruments, as well as with setting up businesses around the world where costs are lower or currencies are more stabilized.

- In Telecom Sector, the Airtel and Idea Cellular companies are using Foreign Exchange option contracts, swap contracts or forward contracts towards hedging risk resulting from changes and fluctuations in foreign currency exchange. Whereas the MTNL did not engage in activities which would require foreign currency exposure hedging. The company mainly transacts in Mauritian Rupees (MUR). The Company is exposed to the risk that the exchange rate of the MUR relative to the foreign currencies may change in a manner which has a material effect on the reported values of the Company's assets and liabilities which are denominated in foreign currencies.
- The IT companies are hedging their bets by expanding in countries, such as China where costs are lower. Further, these companies expanded business with European and Latin American countries whose currencies stay relatively stable compared with the rupee. At the same time, each of these companies resorted to more specific hedging strategies as per their net exposures. TCS favours the use of options; Infosys uses forwards and range barrier options; and Wipro uses floating for floating and floating for fixed cross currency interest rate swaps etc.
- The Pharmaceutical Companies are using various forms of derivative instruments, such as foreign exchange forward contracts, options, currency swaps, and currency cum interest rate swaps to hedge their exposure on account of movements in foreign exchange rates. These derivatives are generally entered with banks and not used for trading or speculation purposes.
- The FMCG Companies are using derivative instruments such as Foreign Exchange forward contracts to hedge their exposure on account of movements in foreign exchange rates.

8. CONCLUSION

It is clear that the Foreign exchange rate seems to have not much impact on Market prices of the select scrips as observed from the results. This is attributable to various factors: the short term fluctuations can impact the companies with Foreign Exchange exposure but the affect is nullified in the long run due to the hedging strategies used by the companies. But it is

noteworthy to say that Forex Rate was one of the prime influential factors on Sensex as evidenced by so many researches. Specifically, the company MTNL did not engage in activities which would require foreign currency exposure hedging and so Forex Rate is showing a negative impact on the scrip's MPS. The companies, Nestle and HUL are resorting to use only Forward contracts and the Forex Rate seems to have influencing these scrips' MPS. Rest of the sample companies' MPS is not much influenced by changes in Forex Rate as it is clearly evident from the annual reports of the company that they are resorting to use various types of derivative contracts not only to net their positions but also making profit out of their hedges.

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