An Empirical Analysis of Foreign Exchange Exposure of CNX 100 Companies

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Abstract

The present study has empirically examined the level of foreign exchange exposure and its determinants of CNX 100 companies. For the purpose of study, the relationship between exchange rate changes and stock returns for a sample of 82 companies was determined for the period April 2011-March 2016. The study finds that 49% of the sample companies had significant positive foreign exchange rate exposure and the found that the companies could be exporters or net importers. To explore factors determining foreign exchange rate exposure, variables such as export ratio, import ratio, size of a company, hedging activities were regressed against the exchange exposure and the study found that none of the factors was influencing the exchange rate exposure. The study concludes that the reasons for insignificant influence of the variables could be the natural hedging practices of companies, offsetting of exports and imports and heterogeneous of the sample size. The study offers few directions for future research in this area.

Keywords: CNX 100 Companies, Foreign Exchange Rate Exposure, Export Ratio, Import Ratio, Size, Hedging

JEL Classification: F23, F30 and F31

Introduction

The exchange rate policies of a country are one of the pertinent macroeconomic factors which determine the competitiveness of companies as the movement in exchange rates affect the cash flows and subsequently the value of companies. The countries which follow floating exchange rate regime are supposed to face more volatility in exchange rates. The sensitivity of companies' cash flows to the fluctuation in exchange rate is known as foreign exchange exposure. The exposure is broadly classified into three categories as mentioned by Eun and Resnick (1998). The first exposure is transaction exposure which is defined as the sensitivity of realised domestic currency values of a company's contractual cash flows denominated in foreign currencies to unexpected exchange rate changes. The second is translation exposure, which refers to the potential that the company's consolidated financial statements can be affected by changes in the exchange rates. Economic exposure is defined as the extent to which the value of a company would be affected by unanticipated changes in the exchange rates. The three types of exchange rate exposure affect the company's potential as well as current cash flows. It is logical to discuss about the relationship between the exchange rate changes and value of a company. This is because the value of a company is the present value of its future cash flow streams and the exchange rate variability will affect the value of the company ultimately. In order to give a shape to this conceptual relationship, empirical studies have used stock return as a proxy for the value of a company.

The issue of exchange rate exposure and its measurement for companies have been the thrust of the researchers for some time. The issue became more important with the collapse of fixed exchange regime of Bretton Woods System in 1970 and introduction of flexible exchange rate system. Moreover, the advent of liberalisation, privatisation, and globalisation by emerging economies including India led to abolishing of foreign exchange controls and increased financial trade among the countries globally. The incentive of low cost and high margins induced the companies to go global and become multinationals. The high involvement of cross border transactions by

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companies increased their exposure to exchange rate risk. Therefore measurement of exchange rate exposure and its determinants became important for companies to grow in a competitive environment and evinced considerable interest among researchers. Most of the research studies focused on U.S and other developed countries. The focus shifted dramatically towards the developing nations thanks to Asian Crisis in 1997. The Asian crisis motivated the researchers to empirically evaluate the impact of changes in exchange rates on the company's value and encouraged researchers to evaluate the impact of changes in exchange rates on the company value and to identify the determinants, specifically for the emerging markets. The findings based on the developed economies could not be generalised for emerging economies since most of them were following managed float exchange rate regime. The focus of most of the studies in emerging markets was either at market level or at industry level and a few studies focused at a company level exposure. India is the second largest economy among the developing countries and very few studies have been done in Indian context. With this background, the study is undertaken with the following objectives:

- To assess the foreign exchange rate exposure of CNX 100 companies in India.
- To determine the factors affecting the foreign exchange exposure of companies and interpret the results thereof.

Review of Literature

Studies Related to Exchange Rate Exposure in U.S

The seminal work by Dumas (1978), Adler et al. (1984) and Hodder (1982) has been followed by empirical studies in which the exchange rate exposure is measured by the slope coefficient from a regression of stock returns on exchange rate changes. Later, the inclusion of value weighted market index return in the model was proposed by Jorion (1990 to control for market movements. Amihud (1994) tested the exchange rate exposure for 32 U.S. exporting firms and did not find any effect of exchange rate on value of exporters. Same results were found by Bartov and Bodnar (1994) by examining 208 firms. Choi and Prasad (1995) and Bodnar and Wong (2003) have reportedly found significantly higher number of firms exposing to foreign exchange risk. Choi and Prasad (1995) examined exchange rate exposure at firm and industry level and found that 15% of firms had significant foreign exchange exposure. Jorion (1990) found that only 5% of the firms have significant exchange rate exposure.

Studies related to Exchange Rate Exposure in Asian and other Developing Countries

Abdalla and Murinde (1997) examined the causality of stock return and exchange rate at country level and found unidirectional causality from exchange rates to stock prices in all the sample countries, except the Philippines. Kho and Stulz (2000) studied the currency exposure of the banking sector in five East Asian Countries during the Asian financial crisis. They found that currency exposures had a negative impact on the sector's stock returns only in Indonesia and Philippines. Parsley and Popper (2002) studied how exchange rate pegs influence the exchange rate exposure of East Asian firms and concluded that countries with fixed exchange rate against another currency exhibit no less exposure to other currencies. Lin (2011) estimated the foreign exchange exposure at market and firm level in six Asian countries including India and found that 1% appreciation of the Indian Rupee would on average cause 6.99% decrease in the market returns in India, while 1% depreciation in that currency would lead to no change in the Indian market returns. Chueet al. (2002) analysed the foreign exchange exposure for 15 emerging markets including India at country and firm level and found only 5% of firms were significantly exposed to foreign exchange risk. The study concluded that only a small number of firms were exposed to foreign exchange exposure in developing countries. He and Ng (1998) found that 25% of 171 Japanese multinational firms had significantly economic exchange exposure for the period January 1979-1993. Kanagaraj and Sikarwar (2011) examined 361 Indian non-financial firms and found that only 16% of firms were exposed to exchange rate exposure. Furthermore, 86% of the firms having significant exposure were negatively affected by an appreciation of the rupee thereby confirming that such firms were net exporters. Kiymaz (2003) investigated the foreign exchange exposure of firms in a highly inflationary environment in Turkey. The author concluded that Turkish firms are highly exposed to foreign exchange risks and the degree of risks is more pronounced for textile, machineries, and financial industries.

Empirical evidences with respect to the determinants of foreign exchange exposure are almost conclusive for developed countries but very limited and contrasted on emerging markets including India. The fundamental source of exchange rate exposure is the involvement of firms in foreign activities. Jorion (1990) found that foreign sales ratio is positively related to foreign exchange exposure. The findings was consistent with other studies viz., Allayannis and Ofek (1996), Choi and Prasad (1995), and He and Ng (1998). Foreign exchange exposure was also found to be increased with the firm size. It was argued that big firms were involved in the international activities and therefore were exposed to foreign exchange risk. Size is found to be significant determinant by the earlier studies of Choi and Prasad (1995), Allayannis and Ofek (1996) for developed countries. Dominguez and Tesar (2006) examined the marginal exchange rate exposure of firms from eight countries, two of which were emerging markets and found that neither firm size nor foreign sales were significantly determining the foreign exchange exposure. The reduction in foreign exchange exposure by using hedging instruments was reported in some studies such as He and Ng (1998), Allayannis and Ofek (1996).

From the discussions on the review of earlier studies, it is evident that few studies have been done in the Indian context and more so at a company level. The present study is an attempt to address the gap prevalent in the existing literature.

Data and Methodology

Data and Period of Study

The month end closing prices of all the CNX 100 companies have been collected from Capital Line database. The period of study is from April, 2011 to March, 2016. In line with the existing studies, the monthly index returns of CNX 100 are used and the same has been sourced from https://in.finance.yahoo.com. Similarly, the monthly 36 countries Nominal Effective Exchange Rate index (NEER) was sourced from https://dbie.rbi.org.in/DBIE. Trade based weights index is used for the present study. Monthly stock returns and exchange rate returns are calculated based on the following:

$R_{i,t}=\Delta P_t / P_{t-1}$ .... (1)

where,

ΔP_t= Change in the price of company i for period t,

P_{t-1}= Previous month's price of company i

The NEER is the weighted geometric average of the bilateral nominal exchange rates of the home currency in terms of foreign currencies. Any increase in this index indicates an appreciation of the Indian currency against the basket of foreign currencies. The reason of selecting an index against the bilateral exchange rates is, as Schnabel (1989) points out, if the exposure coefficients to exchange rate risk are to be expressed in as many independent variables as the number of foreign currencies that appear in a firm's transactions, this multi-currency approach may well give rise to multicollinearity problems, due to the high correlation that exists between the different exchange rates. So, it is better to employ an index that measures the effective exchange rate of rupee against all of the other currencies.

Data for variables such as export sales, total sales, import cost of raw materials, total cost of production, total assets have all been collected from Capital Line database.

Exchange Rate Exposure (Coefficient)

Dumas (1978) and Adler and Dumas (1984) define exchange rate exposure as the effect of exchange rate changes on the value of a company. The standard two factor model proposed by the authors has been used in the earlier studies and the same is adopted in this research work. In two factor model, foreign exposure could be determined by calculating the coefficient βxi in the time series regression of returns on a given asset, $R_{i,t}$,with respect to the market returns, R_m,tand the monthly fluctuations of foreign exchange rate $R_{x,t}$.. The equation is as follows:

$R_{i\,t} = \beta_{0i}+ \beta_{mi} R_{mt}+ \beta_{xi} R_{x\,t} + \varepsilon_{i\,t}$.............................. (2)

here, i= 1 to 40 and t=1 to 60 months, coefficients β_{mi} and β_{xi} represent a measure of sensitivity of stock return, i,to market risk and exchange risk; $\varepsilon_{i\,t}$ is the disturbance term. The introduction of market returns, Rmt , as a second independent variable, explicitly controls market movements, thereby reducing any correlation between disturbances. The potential problem of multicollinearity may arise in estimating such a two factor model from the possibility that the market and exchange rate factors are correlated. In order to control this problem, the exchange rate factor has been orthogonalised by using the approach of Bris, Koskinen, and Pons (2004) and Kiymaz (2003). Firms' exchange rate exposure was estimated by following a two step procedure.

In the first step, the return of market portfolio is regressed on the changes in the exchange rate as shown below.

$R_{mt}= \gamma_0+ \gamma_1 R_{x\,t} + \varepsilon_t$.. (3)

Then, the component of the market portfolio return that is orthogonal to the changes in the exchange rate is arrived by the following calculation,

$$U_{mt} = R_{mt} - (\gamma_0 + \gamma_1 R_{x\,t}) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

Finally, a company's exchange rate exposure is estimated by regressing company's stock market returns on the orthogonal component of the market portfolio and on the changes in the exchange rate as shown below.

$$R_{i\,t} = a_i + \beta_{mi} U_{mt} + \beta_{xi} R_{xt} + v_{i\,t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (5)$$

where, $R_{i\,t}$ is the stock return of firm i, U_{mt} is the estimated orthogonal component of the market portfolio (CNX 100), and $R_{x\,t}$ is the percentage change in the exchange rate index (36 NEER) over the same period. The value obtained for β_{xi} for the different companies can be interpreted as the level of exposure to foreign exchange rates, since it indicates the sensitivity that a stock shows towards these fluctuations. β_{xi}, the slope coefficient of the regression measures the sensitivity of stock returns to unanticipated changes in the exchange rates. The above regression model is used to examine the levels of exposure to foreign exchange rate changes that should be reflected in the statistical significance of the coefficient β_{xi} and the direction of such exposure, which is indicated by the sign that accompanies the coefficient. A positive coefficient means that stock return increases when the Indian rupee is appreciated against the basket of other currencies. The β_{xi} coefficient should be positive for exporting companies and negative for importing companies (Heand Ng, 1998). However, the sign of β_{xi} becomes less distinct for a company which exports as well as imports. Unless pertinent information about the type of companies is available, the resulting sign of βxi is empirically determined by equation (5).

Determinants of Exchange Rate Exposure

In order to explore the factors determining exchange rate exposure of sample companies, a cross-sectional regression between the coefficients of exposure, βxias estimated in equation (5) and the corresponding explanatory factors are proposed. The proposed model takes the following forms:

$$\beta_{xi} = \gamma + \gamma_1 ER_i + \gamma_2 IR_i + \gamma_3 SIZE_i + \gamma_4 HEDGE_i + \mu_i \ldots\ldots \quad (6)$$

where, β_{xi} is the value of foreign exchange rate exposure coefficient of company i, ER_i is the average export to total sales ratio for 5 years for company i, IR is the average of total import cost ofraw materials to cost of production ratio for company i for 5 years,$HEDGE_i$ is the dummy variable having value 1, if the company is involved in hedging activity or 0, otherwise. $SIZE_i$ is the size of the company i, which proxies by log of the average of total assets for the period of 5 years. The problem of heterskedasticity could arise in equation (6) which is a cross sectional regression, is corrected by White's approach.

Table 1: Distribution of Exchange Rate Coefficients of CNX Nifty Companies (April 2011- March 2016)

Particulars	Forex Beta (βxi)
Minimum	0.193
Mean	0.3165
Maximum	0.497
Median	0.3105
First Quartile	0.254
Third Quartile	0.363
Cross Sectional Mean	0.3165
Cross-sectional Standard Deviation	0.081
Companies in Sample	82 (100%)*
Companies with positive significant exposure	40 (49%)

* NIFTY 100 is a diversified 100 stock index representing major sectors of the economy. Banking, Non- Banking and Financial Services companies are excluded and hence a sample of 82.

Table 1 presents the distribution of exchange rate coefficients of CNX Nifty Companies for the period of study. The coefficients are derived from equation(5). It can be seen from the table that 49% of the companies have significant positive exposure thereby indicating that the companies benefit from an appreciation(strengthening) of Indian Rupee. 51% of the sample does not have any significant exchange rate exposure. The results indicate that the companies with significant exposure in the sample could be exporters or net importers. The descriptive statistics shows that the exchange rate coefficients vary from 0.193 to 0.497 respectively. The cross-section mean is 0.3165. On an average, a 1% appreciation(strengthening) of Indian Rupee leads to 0.3165 increase in stock returns. In hindsight, the mean value of 0.3165 shows a low level of exchange rate exposure of Indian companies. The low level of exchange rate exposure could be explained by the argument given by Lin (2011) that it is difficult to detect the foreign exchange exposure of Asian countries as central banks intervene in the market to influence the exchange rate in favourable directions.

The results may not align with the previous studies viz., Kanagaraj and Sikarwar (2011), Chue et al. (2008), and Heand Ng (1998) which report low number of firms facing exchange rate exposure. This is because of the fact that the sample size of the present study is relatively small and hence more percentage of firms facing significant exchange rate exposure.

Table 2: Exchange Rate Exposure of CNX Nifty Companies

Company	Industry#	R^2	B_{xi}	U_{mt}	F statistic	Sign.
ABB	Capital Goods	0.42	0.331 (3.342)	0.557 (5.611)	21.323	0.00**
ACC	Cement	0.434	0.233 (2.375)	0.616 (6.291)	22.61	0.00**
Adani Ports	Infrastructure	0.340	0.233 (2.2010)	0.535 (5.5056)	15.201	0.00**
Ashok Leyland	Automobile	0.447	0.363 (3.15)	0.562 (5.904)	8.365	0.00**
Asian Paints	Paint/Varnish	0.221	0.258 (2.245)	0.393 (3.419)	23.873	0.00**
Aurobindo Pharma	Pharma	0.330	0.266 (2.495)	0.539 (4.78)	16.483	0.00**
BHEL	Capital Goods	0.526	0.411 (4.585)	0.598 (6.6670	32.397	0.00**
Bharath Forge	Castings & Forgings	0.358	0.269 (2.58)	0.535 (5.129)	14.56	0.00**
Bharti Airtel	Tele-communication	0.222	0.258 (2.224)	0.394 (3.433)	8.41	0.00**
Bosch	Auto Ancillaries	0.300	0.259 (2.245)	0.393 (3.419)	8.365	0.00**
Castrol	Chemicals	0.216	0.229 (2.075)	0.399 (3.465)	8.15	0.001**
Coal India	Mining	0.259	0.268 (2.391)	0.432 (3.857)	10.297	0.00**
Container Corp	Logistics	0.321	0.358 (3.332)	0.439 (4.090)	13.918	0.00**
Cummins India	Capital Goods	0.375	0.335 (3.251)	0.513 (4.981)	17.689	0.00**
DLF	Realty	0.379	0.288 (2.875)	0.544 (5.2980	17.97	0.00**
Grasim Ind	Textiles	0.452	0.324 (3.363)	0.589 (6.117)	24.365	0.00**
HPCL	Refineries	0.491	0.497 (5.282)	0.50 (5.281)	28.425	0.00**
Havells India	Capital Goods	0.291	0.224 (2.046)*	0.491 (4.474)	10.990	0.00**
Hindustan Zinc	Non-Ferrous Metals	0.255	0.215 (1.917)*	0.457 (4.0630)	10.990	0.00**
Hindalco	Non-Ferrous Metals	0.373	0.193 (1.972)	0.580 (5.625)	17.573	0.00**
IOCL	Refineries	0.260	0.440 (3.559)	0.317 (2.830)	10.371	0.00**

JSW Steel	Steel	0.409	0.332 (3.317)	0.547 (5.468)	20.452	0.00**
L&T	Infrastructure	0.645	0.408 (5.262)	0.692 (8.928)	53.689	0.00**
Maruti Suzuki	Infrastructure	0.629	0.447 (5.637)	0.655 (8.256)	49.561	0.00**
Motherson Sumi	Auto Ancillaries	0.475	0.497 (5.274)	0.479 (5.085)	26.838	0.00**
NTPC	Power Generation	0.330	0.313 (2.935)	0.482 (4.523)	13.345	0.00**
ONGC	Crude Oil & Natural Gas	0.418	0.233 (2.935)	0.482 (4.523)	14.534	0.00**
Oil India	Crude Oil & Natural Gas	0.250	0.308 (2.713)	0.394 (3.49)	21.224	0.00**
Power Fin Corp	Power Generation	0.402	0.322 (3.199)	0.394 19.803	(3.490)	0.00**
Power Grid Corp	Power Generation	0.436	0.303 (3.094)	0.586 (5.996)	22.762	0.00**
Reliance Ind	Refineries	0.465	0.285 (2.994)	0.620 (6.511)	22.678	0.001**
SAIL	Steel	0.489	0.245 (2.638)	0.655 (7.037)	22.075	0.00**
Shree Cement	Cement	0.428	0.363 (3.682)	0.545 (5.531)	22.075	0.00**
Siemens	Capital Goods	0.52	0.455 (5.159)	0.552 (6.120)	32.039	0.00**
Tata Motors	Automobile	0.49	0.229 (2.414)	0.663 (7.139)	28.456	0.00**
Tata Power	Power Generation	0.548	0.371 (4.240)	0.641 (7.322)	35.794	0.00**
Titan Company	Diamond, Gems &Jewellery	0.421	0.448 (4.44)	0.472 (4.763)	21.413	0.00**
Ultratech Cement	Cement	0.314	0.322 (2.991)	0.450 (4.253)	13.518	0.00**
UPL	Agro chemicals	0.321	0.355 (3.306)	0.442 (4.125)	13.973	0.00**
ZEE Entertainment	Entertainment	0.266	0.224 (2.008)*	0.465 (4.164)	10.650	0.00**

*Source: Capital line database *significant@5% **significant@1% figures in the parenthesis indicates t statistic*

Table 2 shows the results of the regression model derived from equation (5) for individual companies. The R^2 values indicate the joint influence of forex beta and market returns on the individual returns of the companies. For all the companies, both the variables jointly influence the individual stock returns. Among the sample, HPCL had the highest exchange rate exposure relatively. Similarly, Hindalco had the lowest exchange rate exposure when compared to other companies. All the models are statistically significant @ 1%. The individual beta coefficients will be considered for further analysis in the ensuing pages. The analysis will focus on factors determining the exchange rate exposure of companies considered for the study.

Table 3: Descriptive Statistics of Determinant Factors for n=40 Companies

Variable	Mean	Standard Deviation	Minimum	Maximum
Average Total Exports*	7558.68	32553.20	0	207032.40
Average Total Imports*	30451.44	97913.70746	0	504890
Average Total Assets*	41243.51	59173.39	629.344	287610.64
Exports/Sales Ratio (%)	13.03	18.40	0	73.50
Import Ratio (%)	15.70	32.24	0	139.35

**Rs in Millions*

Table 3 provides the descriptive statistics of the explanatory variables for the companies which have significant exchange rate exposure. The table shows that the average value of exports (Rs.7558.68 million) is lower than the average value of imports (Rs. 30451.44 million). In other words, the imports are four times more than exports and the sample companies are net importers for the period considered for the study. The minimum value of exports and imports is zero, which indicates that there are companies in the sample who are either pure exporters or pure importers. The table also shows that companies with significant exchange rate exposure are big in terms of total assets with maximum value being Rs. 287610.6 million and minimum of Rs. 41243.51 million.

Table 4: Determinants of Exchange Rate Exposure- Regression Summary

R^2=0.111 R^2=0.111 F=1.0972 Sign=0.373

Model	Coefficients	Standard Error	t statistics	p value
(Constant)	0.4744	0.1135	4.191	0.0017
ER	-0.0819	0.0736	-1.1215	0.269
Size	-0.0158	0.0110	-1.442	0.157
IR	0.0995	0.0509	1.9530	0.0588
HEDGE	-0.0102	0.0320	-0.3202	0.7506

Table 4 shows the findings of the regression model based on equation (6). The results indicate that the determining factors for these companies are neither involvement in foreign activities nor their size and hedging activity. None of the variables was significantly influencing the exchange rate exposure of companies. The output leads to the understanding that the companies are either off setting their positions of exports and imports or involved in some other natural hedging activities. Another possible reason could be that the companies are too heterogeneous in terms of their operating variables which could affect the currency exposure and therefore the explanatory variables considered for the analysis are not able to capture the effect on the dependent variable. Table 2 shows the heterogeneity of the companies. White's' heteroskedasticity test was carried out. The F statistics (1.875) and corresponding Prob.F (0.0836) revealed that there was not any heteroskedasticity problem in the model. Therefore, it is suggested that a further analysis of these factors on a particular group which could be of homogenous in nature can throw more light on the determinants of exchange rate exposure.

Findings and Directions for Future Research

The study examined the relationship between exchange rate changes and stock returns for CNX 100 companies for the period April, 2011 to March, 2016. It was found that 49% of the companies were exposed to significant exchange rate exposure at 1%. All the companies had significant positive exchange rate exposure leading to the conclusion that the companies could be exporters or net importers. The highest exchange rate exposure was 0.497; the minimum was 0.197 and the average 0.3165. The study finds that the exchange rate exposure of companies was quite low. The findings based on the above points are highly inconsistent with some of the earlier studies viz., Kanagaraj and Sikarwar (2011), He and Ng (1998), Kiymaz (2003), Prasad and Suprabha (2016). The earlier studies had companies with negative exchange rate exposure and positive exchange rate exposure and the average exchange rate exposure was quite high.

With respect to determinants of exchange rate exposure, four variables namely, export ratio, import ratio, size of the company and hedging practices were identified as explanatory variables and were regressed on the exchange rate coefficients of the companies. The results conclude that none of the variables was significantly influencing the exchange rate exposure of companies and the plausible reasons could be that companies under take natural hedging practices, offsetting their positions of exports and imports and heterogeneity of companies. The findings are consistent with Kanagaraj and Sikarwar (2011) and varies completely with other studies such as Allayannis (1997), Choi and Prasad (1995), and Jorion (1990). Their studies indicate that foreign sales ratio, variables which are proxy to the hedging needs, and asset size as significant variables affect foreign exchange rate exposure.

The study provides directions for future research. It is suggested that a few more variables could be included in future studies and essentially firm specific characteristics such as leverage ratios, liquidity ratios and proxy variables for 'size' to derive more logical conclusions from the analysis. Sector specific studies with more sample size will help contribute to the existing literature. It is also intuitively logical the very few Indian companies are multinationals in the sample studied and are not big enough to influence their foreign exchange exposure and the present study vehemently supports it.

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