

A Firm Level Analysis of the Exchange Rate Exposure of Indian Firms

A. Kanagaraj¹ and Ekta Sikarwar²

Abstract

The study examines the level of foreign exchange exposure and its determinants for a sample of Indian firms. For this purpose, the relationship between exchange rate changes and stock returns for a sample of 361 Indian non financial firms is determined over April 2006-March 2011. The study finds that only 16 percent of the firms are exposed to exchange rate exposure at 10 percent level of significance. Furthermore, out of the firms having significant exposure, 86 percent firms are negatively affected by an appreciation of the rupee which confirms that Indian firms are net exporters. With respect to the determinants of exchange rate exposure, it reveals that export ratio is positively and hedging activity is negatively related to the exchange rate exposure of pure exporter firms.

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¹ Department of Finance and Accounting, Indian Institute of Management, Indore,
email: kanagaraj@iimidr.ac.in

² Research Scholar (FPM), Indian Institute of Management, Indore,
email: f10ektas@iimidr.ac.in

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1 Introduction

Exchange rate regime of any country is one of the major macroeconomic factors, which affects the competitiveness of the firms. The countries, which follow floating exchange rate regime, are supposed to face more volatility in exchange rates, which results in more variability of cash flows for the firms. The sensitivity of firms' cash flows to the fluctuations in exchange rate is known as *Foreign Exchange Exposure*. This exposure could be conventionally classified into three categories as mentioned by Eun and Resnick [16]. First, *Transaction Exposure* which is defined as the sensitivity of "realized" domestic currency values of the firm's contractual cash flows denominated in foreign currencies to unexpected exchange rates. Second, *Economic Exposure* can be defined as the extent to which the value of the firm would be affected by unanticipated changes in exchange rates. Any anticipated changes in exchange rates would have been already discounted and reflected in the firm's value. Third, *Translation exposure* refers to the potential that the firm's consolidated financial statements can be affected by changes in exchange rates. These three types of exchange rate exposure alter the firm's potential and current cash flows. Since the value of a firm is the present value of its future cash flows streams, the exchange rate variability ultimately affects the value of a firm. So it is logical to talk about the relationship between changes in exchange rates and the value of the firm. In order to operationalize this conceptual relationship, empirical studies have used stock return as a proxy for the value of the firm.

The issue of foreign exchange exposure and its measurement for firms is not new and has been seeking attention since long by researchers. The

maximization of an objective function by firms which is based on their current net worth and exposure to exchange rate risk has been postulated by Kenen [21]. The issue became more prevalent with the introduction of flexible exchange rate regime after the collapse of Bretton Woods system in 1970. Moreover, the advent of Globalization and Liberalization led to abolish foreign exchange controls and increased international trade among developing countries. The incentive of low cost, better resources and high margins induced the firms to become Multinational. This high involvement in cross border transactions by the firms increased their exposure to exchange rate risk. Therefore measurement of exchange rate exposure and its determinants became pertinent for firms to grow in the competitive environment and so gained a considerable attention by researchers.

Most of the early research studies during post liberalization era were focussed either on USA Multinationals (Jorion [20]; Choi and Prasad [9]; Bartav and Bodnar [4]; Amihud [3]) or other developed countries (He and Ng [19]; Dominguez and Tesar [12]; Glaum et al. [17]; Nydahl [27]). Later the focus was shifted towards the developing nations. Erb et al. [15] discovered that the 1997 Asian crisis had a widespread impact on currency valuation. Therefore the Asian crisis motivated researchers to empirically evaluate the impact of changes in exchange rates on the firm value and to identify its determinants, specifically for the emerging market firms since the findings of developed economies could not be generalized for emerging economies [8]. Also most of the developing countries follow *Managed Float* exchange rate regime rather the *Independent Floating* exchange rate system followed in developed countries.

In spite of the extensive research on this topic, empirical findings are mixed and not able to provide a strong relationship between variability of exchange rates and the value of the firm. Some of these studies show only small number of firms have been significantly affected by exchange rate changes in developed markets (Jorion [20]; Amihud [3]; Bartav and Bodnar [4]) and

emerging markets (Lin [32]; Cheu and Cook [10]). Other studies reveal significant number of firms facing currency exposure (He and Ng [19]; Choi and Prasad [9]; Bodnar and Gentry [6]).

Also the focus of most of the studies in emerging markets are either at market level (Abdalla and Murinde [34]; Parsley and Popper [28]) or industry level (Kho and Stulz [22]; Dominguez and Tesar [12]). The studies on firm level analysis of foreign exchange exposure for emerging markets are quite few and mostly focussed around East Asian countries (Muller and Verschoor [25]; Dominguez and Tesar [12]). Since the aggregate data at the business-cycle frequency is often limited in quality and quantity in developing economies, the firm level analysis is important to analyse the foreign exchange exposure.

India has emerged as a second-largest economy amongst Asian developing countries after China in terms of GDP growth, private investment, private consumption and world trade [37]. The volume of exports has witnessed strong growth during 2010 in emerging economies including India and has already recovered to or beyond pre crisis peaks in contrast to the developed countries.

Moreover, the need of proper determination of currency exposure and use of appropriate hedging techniques were also evident by the firms during global financial crisis of 2008. The huge losses incurred by Indian firms during crisis by using currency derivatives reveal the weakness towards the lack of proper measurement of currency exposure and its management by professionals [29]. Therefore the firm level study for the determination of foreign exchange exposure for Indian firms is essential. The existing studies focussing on the firm level analysis of exchange rate exposure of developing countries including Indian firms are very few (Lin [32]; Cheu and Cook [10]) and do not cover the determinants of exchange rate exposure in focus.

Therefore, in light of the above mentioned gaps in the literature, the primary purpose of the current study is to conduct the firm level analysis of foreign exchange exposure of 361 Indian non financial companies for the period

of April 2006-March 2011. For this effect, first the impact of changes in exchange rates on stock returns of each company is calculated for estimating the level of foreign exchange exposure. Secondly, the impact of firm specific variables i.e. export ratio, import ratio, size and hedging activity on foreign exchange exposure is determined. One novelty of this paper is the consideration of a large sample size in contrast to other studies.

2 Related Literature

The seminal work by Dumas [14], Alder and Dumas [1] and Hodder [34] 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 [20] to control for market movements. For the set of US Firms, Jorion [20] finds only 5 percent of the firms having significant exchange rate exposure. Other familiar studies on US Multinationals are Amihud [3], Bartav and Bodnar [4], Choi and Prasad [9] and Bodnar and Gentry [6]. The findings of these studies are mixed and do not provide any strong conclusive evidence. Amihud [3] tests the exchange rate exposure for 32 US exporting firms and did not find any effect of exchange rate on value of exporters. Bartav and Bodnar [4] also confirm it by examining the 208 firms. Choi and Prasad [9] and Bodnar and Gentry [6] on the other hand, report significantly higher number of firms exposing to foreign exchange risk. Choi and Prasad [9] examine exchange rate exposure at firm and industry level and find that 15 percent of firms were having significant foreign exchange exposure. The non US studies includes He and Ng [19] for Japanese firms, Dominguez and Tesar [12] for eight countries, Glaum et al. [17] for German firms and Nydahl [27] for Swedish firms which also provide mixed evidences.

Empirical studies for developing countries are quite few. Most familiar are Muller and Verschoor [25] for East Asian countries, Dominguez and Tesar [13] for Chile and Thailand, Lin [32] for six Asian countries, Cheu and Cook [10] for 15 emerging markets, Abdalla and Murinde [33] for four Asian countries, Kho and Stulz [22] for five East Asian countries and Parsley and Popper [28] for East Asian countries. Abdalla and Murinde [33] examine the causality of stock return and exchange rate at country level and find the unidirectional causality from exchange rates to stock prices in all the sample countries, except the Philippines. Kho and Stulz [22] study the currency exposure of the banking sector in five East Asian countries during the Asian financial crisis. They find that currency exposures had a negative impact on the sector's stock returns only in Indonesia and the Philippines. Parsley and Popper [28] study how exchange-rate pegs influence the exchange-rate exposure of East Asian firms, and find that countries with a fixed exchange rate against one currency exhibit no less exposure to other currencies. Lin [32] estimates the foreign exchange exposure at market and firm level in six Asian countries including India and finds that a 1 percent appreciation of the Indian Rupee would, on average, cause a -6.99 percent (0-6.99%) decrease in the Indian market returns, while 1 percent depreciation in that currency would lead to no change in the Indian market returns. It also reports that only 8.61 percent of the firms were exposed to exchange rate exposure during the global financial crisis of 2008. Cheu and Cook [10] analyse foreign exchange exposure for 15 emerging markets including India at country and firm level, and found that only 4.9 percent of the firms were significantly exposed to foreign exchange risk during January 1st, 1999 to May 31st, 2002 at 5 percent level. Therefore these studies conclude small number of firms exposed to the foreign exchange exposure in developing countries during the period under study.

Finally, empirical evidences with respect to the determinants of foreign exchange exposure are somewhat conclusive for developed countries but contrasted by studies of emerging markets. The primary source of exchange rate

exposure is the involvement of firms in the foreign activities. Therefore, Jorion [20] found that foreign sales ratio is positively related to foreign exchange exposure. This relation was also confirmed by Allayannis and Ofek [35] and Allayannis [36]. Choi and Prasad [9] find that domestic and foreign operating profits, sales and assets are positively related to the foreign exchange exposure. He and Ng [19] find that extent to which a firm is exposed to exchange-rate fluctuations can be explained by the level of its export ratio and by variables that are proxies for its hedging needs. The foreign exchange exposure increases with the firm's export ratio and decreases with the level of hedging activity. Foreign exchange exposure is also found to be increased with firm size. Although size is not a direct source of exchange rate exposure but it is argued that firms having big size are more involved in the international activity and therefore are more exposed to exchange rate risk. Size is found to be significant determinant by the studies performed for developed markets (Choi and Prasad [9]; Allayannis and Ofek [2]). Dominguez and Tesar [12] examine the marginal exchange-rate exposure of firms from eight countries, two of which (Chile and Thailand) are emerging markets. For these two countries, they find that neither firm size nor foreign sales is a significant determinant of exposure. The reduction of foreign exchange exposure by using hedging instruments has been reported by most of the studies (He and Ng [19]; Allayannis and Ofek [2]; Nydahl [27]). Therefore the drivers of foreign exchange exposure could be different in developing countries and should be analysed independently at firm level.

3 Data and Methodology

3.1 Data

The sample of firms for the study has been primarily sourced from S&P CNX 500 index which covers broad range of firms disaggregated into 71

industries. Since the primary focus of the study was on non financial firms, 437 firms were initially identified from prowest database under this category. Omission of some firms because of the non availability of stock price data during the period of study i.e. from April 2006 to March 2011 reduced the final sample size to 361. The decision to examine only non financial firms was based on the complexity of foreign exchange rate exposure and risk management techniques used by the financial firms.

Opening and closing monthly stock prices were taken from prowest database. Furthermore, 36 countries nominal effective exchange rate index (NEER) published in RBI monthly bulletin was used for the purpose of calculating the monthly exchange returns. Monthly stock returns and exchange rate returns were calculated as a log differences. 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. RBI has changed the base year of its exchange rate indices from 1993-94 to 2004-05 in November 2005. Therefore the period of analysis was considered from April 2006 to March 2011 to eliminate the differences of the changes that RBI made to its prior 36 countries and 5 countries nominal exchange rate index.

The reason of selecting an index against the bilateral exchange rates is as Schnabel [30] 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 the Rupee against all of the other currencies. Also the selection of NEER against the real exchange rate index (REER) can be justified by the argument given by Khoo [23] that if changes in exchange rates are measured

in real terms, all the variables in the regression equation must be adjusted to inflation for consistency purposes.

In the line of the previous research, a market index has been added to reduce noise in the model. For this purpose, the monthly index returns of S&P CNX 500 from prowest database are used. Data for determinant factors i.e. Export to Total Sales (Export ratio), Imports to Raw Material Purchases (Import ratio), Total Assets, Export and Import revenues has been collected from prowest.

3.2 Methodology

3.2.1 Exchange Rate Exposure

The standard two factor model to determine foreign exchange exposure of firms was proposed by Alder and Dumas [1] and Jorion [20] which has been extensively used throughout the literature. In two factor model, foreign exchange economic exposure could be determined by calculating the coefficient β_{xi} in the time series regression of returns on a given asset, R_{it} , with respect to the market returns, R_{mt} , and the monthly fluctuations of foreign exchange rate R_{xt} .

In other words:

$$R_{it} = \beta_{0i} + \beta_{mi}R_{mt} + \beta_{xi}R_{xt} + \varepsilon_{it} \quad (1)$$

where, $i = 1, \dots, 361$ and $t = 1, \dots, 60$, where the coefficients β_{mi} and β_{xi} represent a measure of sensitivity of stock return, i , to market risk and exchange risk; ε_{it} is the disturbance term. The introduction of market returns, R_{mt} , 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 orthogonalized by using the approach of Bris et al. [7] and Kiyamaz [24]. 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 by Equation (2),

$$R_{mt} = \gamma_0 + \gamma_1 R_{xt} + \varepsilon_t \quad (2)$$

Then, the component of the market portfolio return that is orthogonal to the changes in the exchange rate is obtained by calculating

$$F_{mt} = R_{mt} - (\gamma_0 + \gamma_1 R_{xt})$$

Finally, firms' exchange rate exposure is estimated by regressing firms' stock market returns on the orthogonal component of the market portfolio and on the changes in the exchange rate, as illustrated by Equation (3),

$$R_{it} = a_i + \beta_{mi} F_{mt} + \beta_{xi} R_{xt} + v_{it} \quad (3)$$

where R_{it} is the stock return of firm i , F_{mt} is the estimated orthogonal component of the market portfolio (CNX 500), and R_{xt} is the percentage change in the exchange rate index (36 NEER) over the same period. The value obtained for β_{xi} for the different firms can be interpreted as the level of exposure to foreign exchange rates, since it indicates the sensitivity that a stock shows towards these fluctuations. 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} , (two-tailed test) 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 time series regression model in equation (3) may create biased estimators if not corrected for main econometric problems of stationarity, multicollinearity,

autocorrelation and heteroskedasticity. To test for stationarity, the Augmented Dickey-Fuller [11] (ADF) unit root method was applied to all the variables in equation (3). The multicollinearity problem has already been diminished by orthogonalization of exchange rate factor mentioned above. Autocorrelation and heteroskedasticity were eliminated by correcting the OLS standard errors using Newey and West [26] method. If a sample is reasonably large, one should use the Newey-West procedure to correct OLS standard errors not only in situations of Autocorrelation only but also in cases of heteroskedasticity [18].

3.2.2 Model for Determinant factors

In order to identify the determinant factors of exposure to foreign exchange risk, a cross-sectional regression between the coefficient of exposure, β_{xi} as estimated in equation (3), and the corresponding explanatory factors is proposed. The proposed model takes the following form:

$$|\beta_{xi}| = \gamma + \gamma_1 ER_i + \gamma_2 IR_i + \gamma_3 SIZE_i + \gamma_4 HEDGE_i + \mu_i \quad (4)$$

where $|\beta_{xi}|$ is the absolute value of significant foreign exchange rate exposure coefficient of firm i , ER_i is the average of export to total sales ratio for 5 years i.e. 2006-07 to 2010-11 for firm i , IR_i is the average of raw material imports to total raw material purchases ratio for firm i for 5 years, $SIZE_i$ is the size of the firm i , which proxies by log of the average of Total Assets for the period of 5 years and $HEDGE_i$ is the dummy variable having value 1, if the firm is involved in hedging activity or 0, otherwise. To have a proxy for hedging activity, the difference between Exports revenue and Import costs was determined. If this difference is zero or negligible, it was assumed that export revenue and import cost are offsetting each other and hence exposure to exchange rate risk might be lower and firm is not involved in hedging activity. If this difference exists, then the firm would have hedged their positions. μ_i , the error terms are assumed to be normally

distributed. The problem of heteroskedasticity could arise in equation (4) which is corrected by White's [31] approach.

3.3 The Empirical Results and Discussion

Table 1 presents the exchange rate exposure for the sample of firms which has been calculated from equation (3). It reveals that 58 (16 percent) firms are significantly exposed to exchange rate risk at 10 percent level, 30 (8 percent) firms at 5 percent level and only 7 (2 percent) firms at 1 percent level. Furthermore, only 8 firms (14 percent), out of 58, are having positive significant exposure at 10 percent level which shows that only 14 percent of the firms benefit from an appreciation of the Rupee. Rest of the 50 firms (86 percent) are significantly exposed to negative exchange rate exposure and face a decrease in their stock returns from an appreciation of the Rupee. The results are in alignment with the fact that most of the firms are net exporters in the sample. Table 1 also provides the descriptive statistics for 58 firms which are significantly exposed to the exchange rate risk at 10 percent level. It reflects that exchange rate coefficients vary from -1.0095 to 0.5617. The cross-sectional mean is -0.4217 which shows that, on an average, a 1 percent appreciation of Rupee leads to the 0.42 percent decrease in the stock return. Overall Indian firms incur loss from an appreciation of the Rupee which indicates that most of the firms are exporters.

The results are supporting the previous studies conducted for the emerging markets by Cheu and Cook [10] and Lin [32] which report significantly low number of firms(4.9 percent and 8 percent respectively at 5 percent level) facing exchange rate exposure. The low number of Indian firms exposing to exchange rate risk could be explained by the argument given by Lin [32] which says 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.

Table 1: Distribution of Exchange Rate Coefficients of Indian Non Financial firms (April 2006-March2011)

	Forex Beta(β_{xi})
Minimum	-1.009
First Quartile	-0.630
Median	-0.504
Third Quartile	-0.405
Maximum	0.561
Cross sectional Mean	-0.421
Cross Sectional Standard Deviation	0.407
Firms in Sample	361
Firms with significant exposure at the	
1% level	7 (2%)
5% level	30 (8%)
10% level	58 (16%)
Firms with positive significant exposure at the	
1% level	0
5% level	2
10% level	8 (14%)
Firms with negative significant exposure at the	
1% level	7
5% level	28
10% level	50 (86%)

This table reports the significant coefficients for the estimated foreign exchanges exposure of a sample of 361 non financial Indian firms. These coefficients have been estimated from the monthly time-series regressions of stock returns on the orthogonal component of market portfolio and on exchange rate changes (equation 3). The summary statistics are given for 58 firms with significant exchange rate exposure at 10%. The OLS standard errors are corrected for Autocorrelation and Heteroskadasticity by Newey and West Method (1987).

Table 2 demonstrates the descriptive statistics of explanatory variables for a full sample (361) of firms and the firms (58) having significant exchange rate exposure. The annual data for these variables were available. The average of each variable over the period of study i.e. 5 years was taken for each firm. It is evident from the table that the average value of exports (Rs. 12060.71 million) for the full sample of the firms is approximately 3 times of the average value of imports (Rs. 4946.29 million). It reveals that the majority of firms in the sample are exporters. Similar is the case with the firms having significant exchange rate exposure. The average value of exports (Rs. 8695.46 million) for these firms is twice as of the average of imports (Rs. 4013.43 million). The minimum value of exports as well as of imports is zero which shows that there are some firms in the sample which are pure importers and exporters also. Average export ratio and import ratio for the firms, having significant currency exposure, are higher than the firms in the full sample. It is intuitively explained as firms which are more involved in foreign activity are significantly exposed to exchange rate risk. The average value of Total Assets for a full sample of firms is Rs. 67096.36 million and Rs. 51926.99 million for the firms having significant currency exposure. It indicates that most of the firms exposing to significant exchange rate exposure are big in terms of their size having minimum asset value of Rs. 2580.58 million.

Table 2 : Descriptive Statistics of Determinant Factors

Variable	For Full sample n= 361				For n= 58 firms			
	Mean	Standard Deviation	Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum
Total Exports	12,060.71	60,775.29	0.00	929,088.65	8,695.46	26,162.75	0.00	176,423.23
Total Imports	4,946.30	20,552.83	0.00	281,725.92	4,013.43	8,911.40	0.00	46,697.79
Total Assets	67,096.37	185,928.66	1,504.88	2,099,806.50	51,926.99	93,929.99	2,580.58	462,323.62
Export to Sales ratio	19.98	25.49	0.00	99.77	24.22	28.85	0.00	92.44
Import ratio	22.65	24.92	0.00	99.65	28.04	26.46	0.00	99.65

Table 2 contains summary statistics for the full sample (361 firms) and for the firms having significant exchange rate exposure (58 firms). Means, standard deviations, maximum and minimum values are reported for the determinant factors including Total Exports (Rs. million), Total Imports (Rs. million), Total assets (Rs. million), Export to Sales ratio (%) and Import ratio (%).

Now Table 3 presents the results of the multiple cross-sectional regression equation (4). Only the firms having significant exchange rate exposures at 10 percent level are considered for this analysis. The logic of taking only the firms which are having significant exchange rate exposure could be justified from the argument given by Choi and Prasad [9] that if the exposure is insignificant, it cannot be used to derive any reliable conclusion. In the first model, regression has been performed for 58 firms taking all the variables into the model. It is surprising to note that neither of the variables is found to be significant. The findings are consistent with the Dominguez and Tesar [12] which finds that neither size nor the foreign sales are significant determinant of foreign exchange rate exposure for two emerging market economies, Thailand and Chile. In the second model, only those firms, which are pure exporters (10) out of the 58 firms, are considered for analysis. It is evident from the results that for a group of pure exporters, export to total sales ratio and hedging activity are found to be significant at 10 percent and 5 percent level respectively. The export to total sales ratio is found to be positively related to the exchange rate exposure. The hedging activity affects level of currency exposure negatively. So involvement in hedging activity reduces the exposure of firms to exchange rate risk.

The insignificant findings for 58 firms in Model 1 indicate that the determining factors for these firms are neither involvement in foreign activities nor their size and hedging activity. It may also lead to the inference that the firms are either offsetting their positions of exports and imports or involved in some natural hedges. Another explanation could be that the firms are too heterogeneous in terms of their specific operating variables which could affect their currency exposure and therefore the explanatory variables considered for the study are not able to capture it. It suggests a further analysis by examining the impact of these factors on a particular group which would be homogeneous in nature. Therefore, Model 2 in Table 3 has been used by taking only pure exporter firms in the analysis.

Table 3: Determinants of Exchange Rate Exposure

Variable	Model 1	Model 2
Intercept	0.368 (0.207)	0.375 (0.206)*
<i>ERi</i>	0.0004 (0.001)	0.002 (0.0008)**
<i>IRi</i>	-0.001 (0.001)	-
<i>SIZEi</i>	.044 (0.046)	0.066 (0.047)
<i>HEDGEi</i>	.061 (0.098)	-0.213 (0.038)**
No of Observations	58	10
R square	.054	0.658
Adjusted R square	-.018	0.487
F Statistics	0.754	3.849

Table 3 reports the cross sectional regression between absolute value of significant exchange rate exposure coefficients (β_{xi}), calculated from equation (3), and explanatory factors mentioned in equation (4). The Model 1 includes 58 firms which are having significant foreign exchange exposure and Model 2 shows the results for pure exporter firms. Standard errors in paranthesis are consistent with heteroskedasticity.

*sig at 10%, **sig at 5%

The significant findings for pure exporter firms are understandable as export ratio is the dominant and only source, which influences their exchange rate exposure and lead them to be highly reliable on hedging. These findings also indicate that foreign exchange exposure is highly firm specific and varies as per the homogeneous operational variables of the group of firms. It suggests making further improvement in the study to find more specific characteristics of firms, grouping them in terms of their homogeneous nature i.e. Industry and also clues for the need of contextual studies. Size is insignificant for both the models which

could be intuitively logical as very few Indian firms are multinationals in the given sample and rest of the firms are not much big enough to influence their level of foreign exchange exposure. The inclusion of some more accurate proxy variables for the hedging activity might be helpful to improve the findings of the study, which could be one of the limitations of the study.

4 Conclusion

The study examines the relationship between exchange rate changes and stock returns for a sample of Indian nonfinancial firms for the period of April 2006 to March 2011. It was found that only 16 percent of the firms are exposed to exchange rate exposure at 10 percent level of significance. Furthermore, out of the firms having significant exchange rate exposure, 86 percent of the firms are negatively affected by an appreciation of the rupee which indicates that Indian firms are net exporters. The findings have implications at macro as well as at micro level. Since, Indian firms are negatively affected by an appreciation of Rupee, any deliberate effort or regular interventions by Government to appreciate rupee after a certain level would not be beneficial for economy as a whole. With respect to the determinants of exchange rate exposure, it was found that export ratio is positively and hedging activity is negatively related to the exchange rate exposure for pure exporter firms. These findings are pertinent for Indian firms to avoid any kind of exposure to exchange rate risk and to hedge for their position appropriately.

References

- [1] Michael, Adler and Bernard Dumas, The exposure of long-term foreign currency bonds, *Journal of Financial and Quantitative Analysis*, **15**, (November, 1980), 973-995.
- [2] G. Allayanis and E. Ofek, Exchange Rate Exposure, Hedging, and the Use of Foreign Currency Derivatives, *Journal of International Money and Finance*, **20**, (2001), 273-296.
- [3] Y. Amihud, Evidence on Exchange Rates and the Valuation of Equity Shares, in Exchange Rates and Corporate Performance, p. 49–59, Y. Amihud and R.M. Levich eds. New York, Irwin, 1994.
- [4] E. Bartov and G.M. Bodnar, Firm Valuation, Earnings Expectations, and the Exchange Rate Exposure Effect, *Journal of Finance*, **49**, (1994), 1755-1785.
- [5] G.M. Bodnar and F. Wong, Estimating Exchange Rate Exposures: Issues in Model Structure, *Financial Management*, **32**(1), (2003), 35-67.
- [6] G.M. Bodnar and W.M. Gentry, Exchange Rate Exposure and Industry Characteristics: Evidence from Canada, Japan, and the USA, *Journal of International Money and Finance*, **12**, (1993), 29-45.
- [7] A. Bris, Y. Koskinen and V. Pons, Corporate Financial Policies and Performance Around Currency Crises, *Journal of Business*, **77**(4), (2004), 749-796.
- [8] G. Calvo and C. Reinhart, Fixing for your life, *NBER Working Paper*, **8006**, (2000).
- [9] J.J. Choi and A.M. Prasad, Exchange Risk Sensitivity and its Determinants: A Firm and Industry Analysis of US Multinationals, *Financial Management*, **24**, (1995), 77-88.
- [10] Timothy K. Chue and David Cook, Emerging market exchange rate exposure, *Journal of Banking & Finance*, **32**(7), (2008), 1349-1362.

- [11] D. Dickey and Wayne Fuller, Likelihood Ratio Statistics for Autoregressive Times Series with a Unit Root, *Econometrica*, **49**, (1981), 1057-1072.
- [12] K. Dominguez and L. Tesar, Exchange Rate Exposure, National Bureau of Economic Research, *Working paper*, **8453**, (2001).
- [13] K. Dominguez and L. Tesar, Exchange Rate Exposure, *Journal of International Economics*, **68**, (2006), 188-218.
- [14] Bernard Dumas, The theory of the trading firm revisited, *Journal of Finance*, **33**, (1978), 1019-1029.
- [15] C.B. Erb, C.R. Harvey and T.E. Viskanta, Contagion and risk. *Emerging Markets Quarterly*, **2**, (1998), 46-64.
- [16] Cheol S. Eun and Bruce G. Resnick, *International Financial Management*, second edition, McGraw Hill, 1998.
- [17] M. Glaum, M. Brunner and H. Himmel, The DAX and the Dollar: the Economic Exchange Rate Exposure of German Corporations, *Journal of International Business Studies*, **31**, (2000), 715-724.
- [18] Damodaran N. Gujrati and Sangeetha, *Basic Econometrics*, forth edition, Tata McGrawhill, 2007.
- [19] J. He and L.K. Ng, The Foreign Exchange Exposure of Japanese Multinational Corporations, *Journal of Finance*, **53**, (1998), 733-753.
- [20] P. Jorion, The Exchange-Rate Exposure of US Multinationals, *Journal of Business*, **63**, (1990), 331-345.
- [21] P. Kenen, Trade, Speculation and the Forward Exchange Rate, in Baldwin *et al. Trade, Growth and the Balance of Payments*, Chicago, (1966).
- [22] B. Kho and R. M. Stulz, Banks, the IMF, and the Asian crisis, *Pacific-Basin Finance Journal*, **8**, (2000), 177-216.
- [23] A. Khoo, Estimation of Foreign Exchange Exposure: an Application to Mining Companies in Australia, *Journal of International Money and Finance*, **13**(3), (1994), 342-363.

- [24] H. Kiymaz, Estimation of Foreign Exchange Exposure: An Emerging Market Application, *Journal of Multinational Financial Management*, **13**(1), (2003), 71-84.
- [25] A. Muller and W. Verschoor, Asian Foreign Exchange Risk Exposure, *Journal of the Japanese and International Economies*, **21**(1), (2007), 16-37.
- [26] W. Newey and K. West, A Simple Positive Semi-definite, Heteroscedasticity and Autocorrelation Consistent Covariance Matrix, *Econometrica*, **55**(3), (1987), 703-708.
- [27] S. Nydahl, Exchange Rate Exposure, Foreign Involvement and Currency Hedging of Firms: Some Swedish Evidence, *European Financial Management*, **5**, (2001), 241-257.
- [28] D. Parsley and H. Popper, Exchange rate pegs and foreign exchange exposure in East Asia, *Working Paper*, Vanderbilt University and Santa Clara University, (2002).
- [29] V. Rajwade, *Currency Exposures and Derivatives: Risk, Hedging, Speculation and Accounting-A Corporate Treasurer's Handbook*, New Delhi: Tata McGraw Hill, 2010.
- [30] J.A. Schnabel, Exposure to Foreign Exchange Risk: A Multi-currency Extension, *Managerial & Decision Economics*, **10**, (1989), 331-333.
- [31] H. White, A Heteroscedasticity-Consistent Covariance Matrix and a Direct Test for Heteroscedasticity, *Econometrica*, **48**(4), (1980), 817-838.
- [32] Chien-Hsiu Lin, Exchange rate exposure in the Asian emerging markets, *Journal of Multinational Financial Management*, **21**(4), (2011), 224-238.
- [33] Issam S.A. Abdalla and Victor Murinde, Exchange rate and stock price interactions in emerging financial markets: evidence on India, Korea, Pakistan and the Philippines, *Applied Financial Economics*, **7**(1), (1997), 25-35.
- [34] James Hodder, Exposure to exchange rate movements, *Journal of International Economics*, **13**, (1982), 375-386.

- [35] G. Allayannis and E. Ofek, Exchange Rate Exposure, Hedging, and the Use of Foreign Currency Derivatives, *Working Paper*, Univ. of Virginia, (1996).
- [36] G. Allayannis, The Time-Variation of the Exchange Rate Exposure: An Industry Analysis, *57th Annual American Finance Association Conference*, New Orleans, (January, 1997).
- [37] World Economic Situation and Prospects 2011,
<http://www.un.org/esa/policy/wess/wesp.html>