4. Research Methodology

4.1 Research Questions and Hypotheses

Given the mixed findings of previous literature and other mentioned research gaps, this study addresses two research questions.

First, how do unanticipated changes in exchange rates affect the value of the firm?

Prior empirical studies have used stock price as a proxy for the value of the firm (Chue & Cook, 2008; Dominguez & Tesar, 2006; Hutson & Laing, 2014; Jorion, 1990). Consistent with previous literature, this thesis uses stock returns as a proxy for the value of the firm and examines the impact of unanticipated exchange rate changes on firms’ stock returns. A significant relationship between unanticipated changes in exchange rate and firm value is expected in line with the theory.

The second question examined by this study is: how does firm-level internal corporate governance affect the level of exchange rate exposure of firms?

The corporate governance environment of a firm plays a central role in determining the extent to which the interests of owners and managers are aligned. At the firm-level, a strong corporate governance environment provides lower managerial agency conflict which encourages managers to conduct value-enhancing hedging activities and manage risk optimally. Therefore, strongly governed firms, in which agency costs and monitoring problems are lower, should have lower exchange rate exposure.

At this point, however, it is essential to declare that the reduction of exchange rate exposure is consistent with the firms’ ultimate objective of maximising shareholders’ wealth or firm value. According to financial theory, the value of the firm is the present value of its current and future expected cash flows discounted at firm’s weighted average cost of capital. The exchange rate risk exposure affects firm value through its impact on both cash flows and cost of capital. According to Madura (2014: pp.530), “a firm’s cash flows could be more volatile
than those of other firms in the same industry if it is highly exposed to exchange rate risk. This reduces the firm’s ability to make interest payments on its outstanding debts, which increases the likelihood of bankruptcy. In addition, a firm that is more exposed to exchange rate fluctuations will usually have a wider (more dispersed) distribution of possible cash flows in future periods. This could lead creditors and shareholders to require a higher return, which would increase the firm’s cost of capital.”

Amihud (1994) also mentions that exchange rate risk exposure affects the corporate cost of capital. His study states that exchange rate changes constitute one of the macroeconomic factors which investors price in the market - that is, there may be a risk premium to compensate the holders of securities whose value is affected by exchange rate changes for the risk associated with this factor. Investors require higher return from firms that are more exposed to exchange rate changes. Consequently, the exchange rate exposure affects the firm’s cost of capital and the valuation of their cash flows.

Empirical evidence also reveals that the currency risk premium could be a large component of the cost of equity (Adler & Dumas, 1983; Solnik, 1974), even if exchange rate changes have no effect on ex-post returns. Particularly, Francis et al. (2008) find that all of their sample industries have a significant currency premium that adds about 2.47 percentage points to the cost of equity and accounts for approximately 11.7 percent of total risk premium in absolute value. Francis & Hunter (2010) also find that exchange rate exposure increases the cost of debt by providing evidence of bank loans. Given the above-mentioned theoretical and empirical evidence, it can be assumed that the reduction of exchange rate exposure reduces the volatility of firms’ cash flows and cost of capital which leads to higher firm valuations. Therefore, it is imperative for firms to reduce their exposure to exchange rate risk.

This thesis postulates that firm-level internal governance mechanisms can help firms to reduce their exchange rate exposure. Corporate governance literature provides a wide range
of mechanisms that govern, or control, the actions of managers. In emerging economies, external mechanisms are less developed, and therefore, governance of listed corporations takes place mainly through internal mechanisms (Douma, George, & Kabir, 2006). Specifically, in emerging markets like India, where the enforcement of shareholders rights as reflected in the efficiency of the judicial system and the rule of law is somewhat weaker, ownership concentration becomes a substitute for legal investor protection (La Porta, Lopez-De-Silanes, Shleifer, & Vishny, 1998). In this way, ownership structures play a central role in determining the extent to which the interests of owners and managers are aligned (Dalton, Daily, Certo, & Roengpitya, 2003). Therefore, measuring the strength of firm-level internal corporate governance by ownership structures is appropriate and justifiable.

To test whether exchange rate exposure is lower for firms that have strong internal governance, this study considers ownership structures of firms and uses them to measure the degree of agency and monitoring problems.

Several studies argue that concentrated outside owners have greater incentives to actively and effectively monitor deviant managers because of their substantial investment in the firm, enough voting rights to maintain control and informational advantage, even when there may not be enough legal protection (Shleifer & Vishny, 1986, 1997). La Porta et al. (1998) also show that large shareholders often participate in management. Even if owners are a part of management, a high concentrated ownership is associated with higher firm value because of the negligent principal-agency problem (Schulze, Lubatkin, Dino, & Buchholtz, 2001). A recent study by Singh and Gaur (2009) finds that, in case of India and China, where dominant owners often also work as managers, higher ownership concentration has a positive impact on firm value. Higher concentrated ownership associated with lower agency conflicts or higher monitoring of managerial activities causes managers to conduct value-enhancing activities and thus leads to lower exchange rate exposure. Therefore, a negative relationship between
ownership concentration and currency exposure is hypothesized. Ownership concentration is defined as the equity shareholding of the firm’s largest shareholder (Singh & Gaur, 2009).

Different categories of concentrated owners may have different preferences and priorities with respect to corporate risk, stability, growth, performance, and have different incentives to spend resources on monitoring which determine their relative power and ability to monitor managers (Douma et al., 2006; E. Gedajlovic, Yoshikawa, & Hashimoto, 2005). Also, different investors have different access to inside information which determines their ability to influence firm management (Kim & Lee, 2008). Thus, in developing further hypotheses, the ownership of several distinct types of owners such as promoters, institutions and dispersed individuals are used, which have been shown in prior work to have an important role in influencing agency costs and in monitoring managers.

Specifically, founding family and promoter control is predominant in Indian firms (Khanna & Palepu, 2000). In the Indian context, promoter share reflects the direct insider or the family holding in the firm (Pant & Pattanayak, 2007). Existing studies report that many Indian firms have a promoter family member participating in the management. For example, Singla, Veliyath, & George (2014) reported that 62 percent of their sample firms were family managed and Selarka (2005) found that 58.59 percent of her sample firms were managed by the promoter.

When the promoter does not take part in management, a positive association between promoter family ownership and firm value can be theorized due to significant monitoring benefits. In this case, founding families have both the incentives as well as the means to effectively monitor the management team and influence managerial decisions because of their large undiversified equity position, control, historical long presence, close link of family’s wealth with firm welfare, long-term orientation and inside knowledge of the firm’s business activities (Anderson & Reeb, 2003; Demsetz & Lehn, 1985; Fama & Jensen, 1983;
Schulze et al., 2001; Shleifer & Vishny, 1997). Higher promoter ownership provides tighter monitoring over managers which induces managers to indulge in value enhancing hedging and thus leads to lower exposure.

When founders actively take part in management, monitoring is not needed. However, according to Jensen and Meckling’s (1976) convergence-of-interest hypothesis, as insider (Manager/promoter) equity ownership increases, conflicts between managers and shareholders are likely to be reduced causing the conflicts of interests to converge. The reduced agency costs because of the natural alignment of owner-managers' interests about growth opportunities and risk encourage owner-managers to conduct value-enhancing activities (Audretsch, Hülsbeck, & Lehmann, 2013). Therefore, in this case also, higher promoter ownership reduces the agency costs related to manager-shareholder conflict, which encourages firms to conduct value-added hedging and thus leads to lower exposure. Overall, it is hypothesized that firms with higher promoter ownership face lower exchange rate exposure.

Several studies (Mcconnell & Servaes, 1990; Pant & Pattanayak, 2007; Sarkar & Sarkar, 2000) suggest a non-linear relationship between insider/promoter ownership and firm value on account of the entrenchment hypothesis which postulates that when a manager owns a substantial fraction of the firm’s shares, it gives him enough voting power or influence. This may make him pursue his personal agenda or non-value maximizing activities. Therefore, higher promoter ownership initially induces value maximising activities on account of convergence of interest hypothesis and then leads to non-value added activities on account of entrenchment or expropriation. Therefore, it is expected that exposure of firms first decreases and then, subsequently increases with promoter ownership and thus have a non-linear relationship with promoter ownership. Following Fauver and Naranjo (2010), this study also
tests for a potential nonlinear relationship between promoter ownership and exchange rate exposure by including squared measure of promoter ownership.

Chibber and Majumdar (1999) argue that for a foreign firm with majority ownership, the agency costs are lowered by efficient monitoring. This is possible because control of ownership in the hands of a foreign corporate owner means that managers in domestic subsidiaries no longer have an informational advantage vis-à-vis the institutional owners of corporations. Also, shareholdings of firms with foreign direct investment are larger and less fragmented than the shareholdings of foreign institutional investors which incentivise these shareholders to perform an effective monitoring role (Douma et al., 2006). Sarkar and Sarkar (2000) further confirm that with substantial foreign corporate holding, the diversion of benefits by insiders becomes less feasible and hence the possibility of stronger external monitoring goes up. Pant and Pattanayak (2007) further find that firms having foreign promoters tend to show higher valuations than domestic firms irrespective of their equity holding. This indicates that firms with larger ownership of foreign promoters are more likely to have well-monitored managers who perform in the best interests of shareholders and may indulge in value-added hedging activities. Therefore, a negative relationship between foreign promoter ownership and currency exposure is postulated.

Similarly, foreign institutional investors are expected to exert efficient monitoring over managers which may persuade them to perform value-enhancing hedging. Thus, higher foreign institutional ownership should be associated with lower exchange exposure. Khanna and Palepu (2000) argue that foreign institutional investment is associated with significant monitoring benefits as existing investors lack both skills and adequate incentives, and this leads to higher firm value. Foreign institutional investors were allowed to participate in Indian stock markets in the post 1991 period. Restrictions on the entry of foreign investors were eliminated, and regulations on their investments were substantially relaxed. With the
changes in regulations and increased equity holdings in India, these foreign institutional investors now exercise a larger influence on the firm than ever before (Khanna & Palepu, 2000).

Domestic institutional investors have strong incentives to incur the cost of monitoring firms because they often hold substantial ownership blocks in firms (Kim & Lee, 2008) and they cannot always sell the shares of underperforming firms due to potential adverse price effects, as well as due to indexing (Coffee, 1991; Gillan & Starks, 2000). Shleifer and Vishny (1997) also argue that institutions with large shareholding have a stronger financial incentive to monitor management. The monitoring role of financial institutions has also been supported by various empirical studies (Allen, Bernardo, & Welch, 2000; Eric Gedajlovic & Shapiro, 2002; Hartzell & Starks, 2003; Lichtenberg & Pushner, 1994; Mcconnell & Servaes, 1990). This indicates that in the presence of large domestic financial institutions, managers are not able to pursue non-value maximising activities due to strict monitoring. Therefore, the negative relationship between shareholding of domestic financial institutions and exchange rate exposure is hypothesized.

Conversely, dispersed individual ownership is hypothesized to have a positive relationship with exchange rate exposure. The rationale is that dispersed-outside individual shareholders are not able to effectively monitor managers because of higher coordination costs and information asymmetry problems (Grossman & Hart, 1980). Additionally, the shareholdings of individual shareholders are too small to influence management decisions, even if the benefits are great enough to provide adequate incentives to become informed (Zeckhauser & Pound, 1990). It is referred to as the free-rider problem when dispersed shareholders refrain from investing their personal resources in monitoring activity (Grossman & Hart, 1980). In the absence of proper monitoring, managers may pursue non-value maximising hedging activities which are not beneficial to shareholders.
Finally, to capture overall firm-level internal governance and test its influence on exchange rate exposure, an aggregate firm-level internal governance index is developed in the spirit of Schmidt (2008) and Fauver and Naranjo (2010). They use a standard approach in literature whereby the index gives an equal weight to each of the inputs (Allayannis et al., 2012; Bebchuk, Cohen, & Ferrell, 2009; Chen, Kao, Tsao, & Wu, 2007; Gompers, Ishii, & Metrick, 2003; La Porta et al., 1998; Lel, 2012).

Firm-level internal governance index includes six variables: ownership concentration, promoter ownership, foreign promoter ownership, foreign institutional ownership, domestic institutional ownership and dispersed individuals ownership. Each of the index input variables along with their predicted signs on agency costs and monitoring problems are shown in Table 3.

Except for dispersed individual ownership, each variable within the index takes on a value of one if the variable’s respective value is above its industry median, and zero otherwise. For dispersed individual ownership, the value is one if the respective value of each of the variables is below its industry median, and zero otherwise. High shareholding of individuals is associated with higher agency and monitoring problems. The index ranges from 0 to 6, with higher index values implying lower agency and monitoring problems. A detailed description of the method used to construct firm-level governance index is presented in Appendix A.

It is well established by literature that firms with good corporate governance show high valuations. This suggests that firms with strong firm-level governance in terms of lower agency and monitoring problems should have higher value. The validity of index i.e. is it measuring what it intends to measure, is an important issue to examine. If the index actually measures the strength of firm-level governance, the firms with higher values of this index should have higher valuations. Therefore, the constructed index is supposed to be valid if it
has a positive association with firm value. The validity of the index is examined following Chen et al., 2007 (see Appendix A). The advantage of such an index is that it is possible to make use of the whole sample which should add to the power of the tests. Also examining each characteristic separately may lead to invalid inferences because some governance mechanisms may complement or substitute each other (Chen et al., 2007; Lel, 2012). A higher value of firm-level governance index indicates lower agency costs and monitoring problems, which encourage managers to conduct value-enhancing hedging activities and to manage risk optimally. Therefore, it is hypothesized that firms with strong firm-level internal governance index should have lower exchange rate exposure.

Table 3 provides a brief summary of various proxies (i.e. ownership structure) along with their predicted sign on the level of agency and monitoring problems and hypothesized relationships with exchange rate exposure.
Table 3: Hypothetical relationships of firm-level internal governance measures with exchange rate exposure

<table>
<thead>
<tr>
<th>Measure</th>
<th>Variable's predicted sign on degree of agency and monitoring problems</th>
<th>Variable's predicted relationship with exposure</th>
<th>Supported literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ownership Concentration</td>
<td>negative</td>
<td>negative</td>
<td>Shleifer and Vishny (1997), Shleifer and Vishny (1986), La Porta et al. (1998)</td>
</tr>
<tr>
<td>Foreign Promoter ownership</td>
<td>negative</td>
<td>negative</td>
<td>Chhibber and Majumdar (1999), Douma et al. (2006), Sarkar and Sarkar (2000), Pant and Pattanayak (2007)</td>
</tr>
<tr>
<td>Foreign Institutional ownership</td>
<td>negative</td>
<td>negative</td>
<td>Khanna and Palepu (2000)</td>
</tr>
<tr>
<td>Dispersed ownership</td>
<td>positive</td>
<td>positive</td>
<td>Grossman and Hart (1980), Zeckhauser and Pound (1990)</td>
</tr>
<tr>
<td>Firm-level Internal Governance Index</td>
<td>negative</td>
<td>negative</td>
<td>Lel (2012), Allayannis et al. (2012), Fauver and Naranjo (2010)</td>
</tr>
</tbody>
</table>

4.2 Empirical Model Specifications

4.2.1 Measuring exchange rate exposure

The empirical model to measure exchange rate exposure was first proposed by Adler and Dumas (1984) in which exposure is measured by the slope coefficient from a regression of stock returns on exchange rate changes. A shortcoming of this model is that it does not account for other market factors that affect stock returns. Later, value-weighted market index to control for market movements was included in the model by Jorion (1990) which has been
extensively used throughout literature. In this model, foreign exchange exposure can be
determined by calculating the coefficient $\beta_{si}$ in the time series regression of returns on a
given stock, $R_{it}$, with respect to the market returns, $R_{mt}$, and the fluctuations of foreign
exchange rate $R_{st}$.

In other words:

$$R_{it} = \beta_{0i} + \beta_{mi} \cdot R_{mt} + \beta_{si} \cdot R_{st} + \epsilon_{it}$$  \hspace{1cm} (1)

where $R_{it}$ is the monthly stock return of firm $i$ in period $t$; $R_{mt}$ is the monthly return on the
market portfolio in period $t$; $R_{st}$ is the monthly percentage change in the trade-weighted
exchange rate index, measured in units of foreign currency per one Indian Rupee in period $t$.
The increase in the value of $R_{st}$ indicates an appreciation of Indian Rupee against a basket of
foreign currencies. The coefficients $\beta_{mi}$ and $\beta_{si}$ represent a measure of sensitivity of stock
return $i$ to market risk and exchange risk; $\epsilon_{it}$ is the disturbance term. The value obtained for
$\beta_{si}$ for different firms can be interpreted as the level of exposure to exchange rates, indicating
the extent to which the stock return responds to a 1 percent change in the exchange rate after
any market-wide impact from currency risk. The above regression model is used to examine
the levels of exposure to exchange rate changes that should be reflected in the statistical
significance of the coefficient $\beta_{si}$, (two-tailed test) and the direction of such exposure, which
is indicated by the sign that accompanies the coefficient. A positive coefficient means that the
firm’s stock return increases when Indian Rupee appreciates against the basket of other
currencies.

In the above model, $\beta_{si}$ cannot be interpreted as ‘total exposure’ but rather the exposure of
stock over and above that of the market portfolio, i.e. residual exposure. In order to eliminate
the effect of exchange rates from the market portfolio, studies have suggested
orthogonalization procedure (Kiymaz, 2003; Priestley & Ødegaard, 2007) by the following regression:

$$R_{mt} = \alpha_0 + \beta_1 R_{st} + \vartheta_{mt} \quad (2)$$

where $\vartheta_{mt}$ is the error term which is defined as the orthogonal market return, i.e. that part of the return on the market portfolio that is uncorrelated with changes in the exchange rates. $\vartheta_{mt}$ should be used in equation (1) instead of $R_{mt}$ to estimate the ‘total exposure’ of stocks to exchange rates.

The potential measurement bias with Jorion (1990) model may be that it assumes most of the changes in spot exchange rates to be unanticipated, and therefore uses actual changes in exchange rates as a proxy for unanticipated changes to calculate the exposure. However, as discussed earlier, the unanticipated component of foreign exchange movements is a more appropriate measure to examine the extent of exposure (Bredin & Hyde, 2011; Choi et al., 1992). Hence, it is essential to separate the unexpected and expected components of exchange rate changes and use the unanticipated part to measure exposure.

Anticipated changes in exchange rate can be predicted by forecasting methods and can be subtracted from the actual changes to estimate the unexpected part of exchange rate changes. A study by Gao (2000) was the first to use a macroeconomic model of forecasting exchange rates to extract the unexpected changes in exchange rates for estimating exposure. His study provides a model in the form of a general specification of macroeconomic exchange rate dynamics which includes essential elements of various macro or monetary models.

This model is as follows:

$$R_{it} = \beta_{0i} + \beta_{mt}. R_{mt} + \beta_{ui}. UR_{st} + \omega_{it} \quad (3)$$
where the unanticipated change in exchange rate $UR_{st}$ is captured by taking as a residual of regression of the actual exchange rate changes on the macroeconomic variables by the following equation:

$$UR_{st} = R_{st} - \left( \alpha + \sum_{j=1}^{n1} \beta_{rj} r_{t-j} + \sum_{j=1}^{n2} \beta_{mj} m_{t-j} + \sum_{j=1}^{n3} \beta_{yj} y_{t-j} + \sum_{j=1}^{n4} \beta_{\pi j} \pi_{t-j} \\
+ \sum_{j=1}^{n5} \beta_{TBj} TB_{t-j} \right)$$

(4)

where $r_t$ is the interest rate, $m_t$ is the money supply, $y_t$ is industrial production, $\pi_t$ is the rate of inflation, $TB_t$ is the trade balance.

The selection of macroeconomic variables in this model is based on economic theories or monetary models. However, model of Gao (2000) is not appropriate for countries that follow managed float exchange rate regime and needs to be extended. As discussed earlier, the information on central bank intervention has a significant influence on exchange rates, and it should be added to the forecast model to generate unexpected exchange rate changes. Therefore, unanticipated changes are estimated by introducing a variable, which captures central bank’s intervention, into the forecast model along with other macroeconomic variables as follows:

$$UR_{st} = R_{st} - \left( \alpha + \sum_{j=1}^{n1} \beta_{rj} r_{t-j} + \sum_{j=1}^{n2} \beta_{mj} m_{t-j} + \sum_{j=1}^{n3} \beta_{yj} y_{t-j} + \sum_{j=1}^{n4} \beta_{\pi j} \pi_{t-j} \\
+ \sum_{j=1}^{n5} \beta_{TBj} TB_{t-j} + \sum_{j=1}^{n6} \beta_{FIj} FI_{t-j} + \sum_{j=1}^{n7} \beta_{NFIj} NFI_{t-j} \right)$$

(5)
where $FI_t$ is the intervention by central bank directly into the foreign exchange transactions and $NFI_t$ is the intervention by central bank in the form of non-foreign exchange transactions or by indirect policy changes. All these are domestic variables.

Since there is a simultaneous relationship between exchange rates and macroeconomic variables, it is better to combine a set of variables that can be determined simultaneously by the remaining set of variables (Gujarati, 2002). Unlike single-equation models, in the simultaneous-equation models one may not estimate the parameters of a single equation without taking into account the information provided by other equations in the system. If the parameters of each equation are estimated by applying the method of Ordinary Least Square (OLS) disregarding other equations, the least-squares estimators are not only biased but also inconsistent because the crucial assumption of the method of OLS, that the explanatory variables that are either nonstochastic or, if stochastic (random), are distributed independently of the stochastic disturbance term, is violated (Gujarati, 2002).

Therefore, equation (5) is estimated in the framework of Vector Autoregression (VAR). Tests for nonstationarity are first conducted followed by tests for cointegration. All macroeconomic variables, except intervention by central bank, were found to be integrated of order one. The significant cointegrating relationships are developed by Johansen cointegration approach. Finally, a Vector Error Correction Model (VECM) at lag length of 3 is selected on the basis of Akaike Information Criterion (AIC) and other diagnostic tests. The detailed explanation of econometric methodology for modelling exchange rate is presented in Appendix B. The individual vector error correction equation with dependent variable as actual exchange rate is used to predict the changes in exchange rate and the residuals $UR_{st}$ are extracted. The market portfolio return that is orthogonal to the unanticipated exchange rate changes $UR_{st}$ was obtained by the following regression:
Now $UR_{st}$ estimated from equation (5) and $v_{mt}$ from equation (6) can be used to estimate the ‘total unanticipated exposure’ of firms as follows:

$$R_{mt} = \alpha_0 + \gamma_1 UR_{st} + v_{mt}$$ (6)

$$R_{it} = \beta_{0i} + \beta_{omi}.v_{mt} + \beta_{ui}.UR_{st} + \omega_{it}$$ (7)

where $\beta_{ui}$ denotes the unanticipated exchange rate exposure coefficients and $\beta_{omi}$ represents the coefficients of orthogonal market portfolio returns for different firms. Equation (7) is estimated by OLS method for all sample firms separately after checking for main econometric problems of stationarity, multicollinearity, autocorrelation and heteroskedasticity. When all equations have the same regressors, single equation-by-equation ordinary least squares is the efficient estimator (Greene, 2002). Greene (2002) mentions that if the equations have identical explanatory variables, generalized least square (GLS) is equivalent to OLS and maximum likelihood estimation does not have any advantage compared to OLS. Therefore, equation (7) is estimated by OLS.

The stock returns of all firms, exchange rate changes and market portfolio returns are checked by Augmented Dickey-Fuller (ADF) unit root test and are found to be stationary. The multicollinearity problem is resolved by orthogonalization procedure. Autocorrelation and heteroskedasticity are eliminated by correcting the OLS standard errors using Newey & West (1987) 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 (Gujarati, 2002). Also estimation through OLS and using adjusted robust errors is cited as a common practice in finance studies for time series models.
(Chow et al., 1997; Petersen, 2009). The regression analysis is conducted using programming in Eviews Software.

4.2.2 Cross-sectional regression model

The study uses cross-sectional regression model to examine the impact of firm-level internal governance factors on exchange rate exposure by controlling for individual firm characteristics known to affect firm’s exposure to exchange rate risk. These characteristics include firm’s export sales scaled by total sales, size, hedging activities and industry. A firm with greater foreign involvement is expected to be exposed to greater currency risk before any hedging activities are taken into account. Several studies have found a strong positive relation between firm’s foreign exchange exposure and its foreign involvement (Choi & Prasad, 1995; Dominguez & Tesar, 2006; He & Ng, 1998; Jorion, 1990). This study also follows prior studies and uses export sales, scaled by total assets to represent the firm’s foreign involvement. A firm may reduce its exchange rate exposure by engaging in financial hedging. To measure financial hedging, a foreign currency derivative usage dummy is used that assigns a value of one if the firm uses foreign currency derivatives or zero otherwise. These data were hand-collected from the firms’ annual reports. Previous studies have detected conventional negative relationship between currency derivative usage and foreign exchange exposure (Allayannis & Ofek, 2001).

Natural logarithm of firm’s total assets is used to control for possible firm’s size effects on exchange rate exposure. It is well established by literature that small firms tend to be more exposed to exchange rate risk than large firms (Bodnar & Wong, 2003; F.-Y. Chang et al., 2013; Chow et al., 1997; Dominguez & Tesar, 2006). Larger firms are more likely to hedge exchange exposure as a result of their economies of scale and therefore face lower exposure.
Several studies have found that industries are affected differentially by exchange rate movements. Industries differ in terms of pass through and markups (Allayannis & Ihrig, 2001; Bodnar, Dumas, & Marston, 2002), competitive structure (Marston, 2001) or industry concentration (Bartram & Karolyi, 2006) and hence may face different levels of exposure. Also, firms in some industries with a greater quantity of international transactions are more likely to hedge and have different levels of exposure (Dominguez & Tesar, 2006). The industry categories for this study follow the industrial categorization codes of (NIC) National Industrial Classification (see Table 4). Industry effect is controlled using dummies in all specifications of cross-sectional regressions.

Based on previous literature, the following cross-sectional regression model with its variations is estimated to control for factors known to affect exchange rate exposure as well as specifications that test for the potential effect of firm-level internal governance factors on exposure. The standard errors are corrected for heteroskedasticity by the method suggested by White (1980).

\[ |\beta_{si}| = \gamma + \gamma_1 ER_i + \gamma_2 SIZE_i + \gamma_3 HEDGE_i + \gamma_4 GM_i + \sum_{k=1}^{18} \gamma_k INDDUM_i^k + \mu_i \]  \hspace{1cm} (8)

where \( |\beta_{si}| \) is the absolute value of foreign exchange rate exposure coefficient of firm \( i \) estimated from equation (7). Following prior literature which argues that firm-level traits can assist only in explaining the magnitude rather than the direction of the exchange rate exposure (Aggarwal & Harper, 2010; Aysun & Guldi, 2011; S. M. Bartram, 2004; Choi & Prasad, 1995; Doukas et al., 2001; Faff & Marshall, 2005), the absolute value of exposure coefficient is taken as a dependent variable. All independent variables are operationalized by taking the average of year-end figures for the sample period of 12 years, i.e. March 2002-March 2013. \( ER_i \) denotes export sales scaled by total sales (export ratio) for firm \( i \), \( SIZE_i \) is
the logarithm of the firm’s total assets, \( HEDGE_i \) is the dummy variable having value 1 if the firm \( i \) uses currency derivatives for hedging purposes, zero otherwise, and \( INDDUM_i^k \) are 18 industries dummies with Chemical, Plastic and Petroleum industry as the reference category for dummy variables. \( \mu_i \), the error terms, are assumed to be normally distributed. Data for currency derivative usage is hand collected from the annual reports of firms. \( GM_i \) denotes various firm-level internal governance factors measuring the degree of agency costs and monitoring of managerial activities for firm \( i \).

The six measures of firm-level internal governance applied in this study are summarized as follows (see Table A.1 in Appendix A). First measure, LARGE, denotes the shareholding by the largest shareholder in the firm. Largest shareholding reflects the degree of ownership concentration in the firm.

A second measure, PROMOTER, is the shareholding by promoter and promoter group in the firm. Promoter may be an individual, group of individuals, a family or a company who are in overall control of the company, are instrumental in the formulation of a plan and are named in the prospectus as promoters. A promoter group includes a promoter and an immediate relative of the promoter. Following the existing literature on Indian firms (Jackling & Johl, 2009; Pant & Pattanayak, 2007), promoter shareholding is considered as family ownership in the firm. The third measure, FOREIGN, is the shareholding by foreign promoter in the firm. Similarly, FII and DFI denote the shareholding by foreign and domestic institutional investors respectively. DFI is the total shareholding by non-promoter mutual funds/Unit Trust of India (UTI), banks, financial institutions and insurance companies. INDIVIDUAL is the shareholding by non-promoter individuals and represents the dispersed ownership in the firm. Lastly, INDEX is the corporate governance index constructed from the aforementioned six measures of governance and denotes the overall aggregate measure of firm-level internal governance.
4.3 Data and Sample Selection

The sample of firms for the study is primarily sourced from Centre for Monitoring the Indian Economy (CMIE) database, Prowess. There were 27,445 firms on the database as on January 1, 2014. Elimination of financial firms from total firms reduced the sample to 20,704 firms. The decision to examine only non-financial firms was based on the complexity of foreign exchange rate exposure and risk management techniques used by financial firms. Since the exposure is measured based on the market value of firms’ stock returns, only listed firms are considered for analysis. The non-financial firms which are listed either on Bombay Stock Exchange (BSE) or National Stock Exchange (NSE) were 4308. The non-financial listed firms with international transactions (exports or imports) in each of the years of the sample period were 1255, out of which 651 firms had no instances of missing stock return data. Therefore, the final sample consists of 651 firms (see Appendix C). Out of 651 firms, 16 firms are pure importers and two firms are pure exporters. Firms with net import and net export transactions are 307 and 326 respectively. The average value of imports (₹ 6823.37 million) for sample firms is almost twice of the average value of exports (₹ 3891.31 million). Also, the average net value of international trade of firms that are net importers (₹ 8692.66 million) is almost three times of that of firms which are net exporters (₹ 2328.52 million). Overall, it can be observed that sample firms are import-oriented. The industrial classification and international trade pattern of sample firms collected from Prowess database is presented in Table 4.
<table>
<thead>
<tr>
<th>Industry Group</th>
<th>Industry Sub Group</th>
<th>No. of Firms</th>
<th>Percentage of Total Firms</th>
<th>Average Exports (₹ million)</th>
<th>Average Imports (₹ million)</th>
<th>Average Exports/Total Sales (%)</th>
<th>Average Import ratio (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
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<td>45</td>
<td>6.90</td>
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<td>1523.96</td>
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<td>1069.80</td>
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<td>Metal and Metal products</td>
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<td>595.06</td>
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<td>Diversified</td>
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<tr>
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<td>2831.55</td>
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<tr>
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<td>1170.08</td>
<td>96.91</td>
<td>42.00</td>
<td>7.00</td>
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<tr>
<td>Wholesale and Retail trading</td>
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<td>3.07</td>
<td>1907.50</td>
<td>3342.72</td>
<td>13.00</td>
<td>30.10</td>
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<tr>
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<td>1.07</td>
<td>2423.43</td>
<td>4083.13</td>
<td>14.50</td>
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<td>4796.88</td>
<td>2726.13</td>
<td>13.98</td>
<td>17.29</td>
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<tr>
<td>IT</td>
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<td>38</td>
<td>5.83</td>
<td>9135.84</td>
<td>386.47</td>
<td>71.50</td>
<td>7.76</td>
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<tr>
<td>Miscellaneous Services</td>
<td></td>
<td>16</td>
<td>2.45</td>
<td>322.36</td>
<td>330.66</td>
<td>7.30</td>
<td>26.23</td>
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<tr>
<td>Construction and Real Estate</td>
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<td>19</td>
<td>2.91</td>
<td>3379.69</td>
<td>2733.86</td>
<td>12.80</td>
<td>10.71</td>
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<tr>
<td>Total</td>
<td></td>
<td>651</td>
<td>100</td>
<td>3891.31</td>
<td>6823.37</td>
<td>22.20%</td>
<td>24.77%</td>
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</table>
In India, listed firms have to make mandatory disclosure about their ownership structure under Clause 35 of the equity listing agreement. These ownership disclosure requirements have undergone important changes with effect from March 2001. In light of this, the sample period selected in this study is from April 2001 to March 2013.

Monthly data is obtained for estimating firms’ exposure coefficients at the first stage. Month-end closing prices of firm’s stock are extracted from Prowess database and are used to calculate the stock returns of firms. Market portfolio monthly returns were calculated from BSE Sensitive Index (Sensex) of 30 firms. The index value is available on the website of Bombay Stock Exchange. The monthly averages of 36 countries’ nominal effective exchange rate index (36 NEER; Base: 1985=100) published in Reserve Bank of India (RBI) monthly bulletin is used for the purpose of calculating monthly exchange rate changes. Data is collected at monthly frequency instead of daily or weekly, since daily and weekly exchange rate indices are noisier and usually suffer from non-synchronicity problem which is the nonalignment of stock-return and exchange-rate series (Allayannis & Ofek, 2001).

Examining exposure to the trade-weighted exchange rate index is a standard practice followed in literature (Bodnar & Gentry, 1993; Choi & Prasad, 1995; Dominguez & Tesar, 2006; Jorion, 1990). Schnabel (1989) points out that 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 different exchange rates. The decision to select the nominal exchange rate index is based on the studies (Choi & Prasad, 1995; Allayannis & Ofek, 2001) which say that real and nominal exchange rates are highly correlated and produce similar results.

The stock returns of all firms, exchange rate changes and market portfolio returns are checked by ADF unit root test and are found to be stationary. Table 5 summarizes the
descriptive statistics of monthly returns on BSE Sensex, and monthly changes in spot and unanticipated NEER index. For the purpose of forecasting exchange rates and estimating unanticipated changes, data for macroeconomic variables was obtained from RBI publications. Month-wise index numbers of Industrial Production General (Base 1993-94=100) are used for Industrial output. Monthly Consumer Price Index for Industrial Workers General Index (Base: 1982=100) was collected to serve as a proxy for inflation rate. The data for money supply (M3), interest rates (91-days Treasury bill rate) and trade balance were collected from RBI monthly bulletin. The intervention into foreign exchange market by the central bank is measured by two variables. First is a net purchase of US Dollar by RBI, which represents the intervention by central bank in foreign exchange transactions. The second is a dummy variable having value 1 if RBI indirectly intervenes in the foreign exchange market by non-foreign exchange transactions, zero otherwise. Policy related announcements are available in the press release section of the website of RBI. Appendix D presents the construction of a dummy variable which captures indirect intervention by RBI.

Data for cross-sectional regression analysis was collected from database Prowess. The data for currency derivative usage is obtained from the notes to financial statements within each firm’s annual report. The annual reports are available online from the ACE Knowledge Portal database by Accord Fintech Pvt. Ltd. and Dion Insight database by Dion Global Solutions Ltd. Additional information is obtained directly from the annual reports on the company’s website. For each year in the sample, notes from annual reports are used to categorize users of currency derivatives (forwards, futures, options or swaps). A firm is identified as a currency derivative user during fiscal year $t$ if the firm discloses year end outstanding number and notional amount of currency derivative contracts in the footnotes or loss/gain on derivatives in the profit and loss account. Data for firm-level internal governance factors and control variables is collected from Prowess database.
Table 5: Summary statistics for market portfolio returns and exchange rate changes

<table>
<thead>
<tr>
<th></th>
<th>Changes in market portfolio $R_{mt}$</th>
<th>Actual changes in exchange rate $R_{zt}$</th>
<th>Unanticipated changes in exchange rate $UR_{zt}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.0115</td>
<td>-0.0016</td>
<td>0.0004</td>
</tr>
<tr>
<td>Median</td>
<td>0.0114</td>
<td>-0.0016</td>
<td>-0.0003</td>
</tr>
<tr>
<td>Max</td>
<td>0.2489</td>
<td>0.0983</td>
<td>0.0939</td>
</tr>
<tr>
<td>Min</td>
<td>-0.2730</td>
<td>-0.0464</td>
<td>-0.0436</td>
</tr>
<tr>
<td>S.D.</td>
<td>0.0736</td>
<td>0.0180</td>
<td>0.0167</td>
</tr>
<tr>
<td>ADF</td>
<td>-10.7819***</td>
<td>-10.6259***</td>
<td>-12.4012***</td>
</tr>
</tbody>
</table>

This table presents summary statistics including mean, median, maximum, minimum and standard deviation of monthly returns on BSE Sensex and changes in Nominal effective exchange rate index. ADF represents Augmented Dickey Fuller test statistics showing the stationarity of the series and *** indicates statistical significance at 1%.

4.4 Data on disclosure of ownership structure in the Indian context

Firm-level internal governance of firms is measured in this study by various ownership structure variables. In India, all the listed firms are required to give mandatory disclosure of their shareholding pattern for each quarter in the format outlined in Clause 35 of the equity listing agreement. The shareholding pattern is indicated under three categories, viz., “shares held by promoter and promoter group”, “shares held by public” and “shares held by custodians and against which Depository Receipts have been issued,” (see Appendix E).

The ownership disclosure requirements under Clause 35 have undergone several important changes from March 2001, one from June 2006 and another from February 2009. The clause requires firms to report shareholding of promoter and promoter group following the definition under Explanations I, II and III to sub-clause (m) of clause 6.8.3.2 of the Securities and Exchange Board of India (SEBI) Disclosure and Investor Protection Guidelines, 2000. Promoter may be an individual, group of individuals, a family or a company who are in overall control of the company, are instrumental in the formulation of a plan and named in
the prospectus as promoters. A promoter group includes a promoter and an immediate relative of the promoter. Promoter and promoter group is further classified under Indian and Foreign promoters. The data from June 2006 on promoter ownership is directly obtained for this study from Prowess database. However, from March 2001 to June 2006, individuals, companies or other legal entities who are acting together with the promoters for a common objective were separately reported under Persons acting in concert (PACs), which is now included under the purview of promoter groups. From 2001 to 2006, the promoter ownership is obtained from the sum of the shareholding of promoters and the persons acting in concert. The disclosure under Public shareholding is ownership by non-promoters which includes institutional non-promoters and non-institutional non-promoters. Holdings by financial institutions, commercial banks, insurance companies, mutual funds, foreign institutional investors, venture capital funds, foreign venture capital investors, central and state governments and others, fall under institutional public shareholdings. Under non-institutional public shareholdings are corporate bodies, individuals and others. This data is directly obtained from Prowess database.