PREDICTING THE LIKELIHOOD OF HEDGING BY COMPANIES IN INDIA - A LOGIT MODEL APPROACH

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Abstract   *The study has analysed the extent and types of derivatives used for hedging, and the factors that explain the likelihood of hedging through derivatives by companies in India. A total of 349 companies were selected and data for the financial year ending 31 March 2018 was considered for the analysis. Using cross-sectional data, the study found that 74% of the companies were hedging through derivatives and forward contract was the instrument widely used to hedge exposures. To identify the factors that explain the likelihood that a company will hedge exposure, the logit model was employed; the dependent variable is binary ('0' for non-derivative user and '1' for derivative user). The study identified revenues (log of revenue) and international operations (foreign sales/total sales) as the variables that explain the increase (positive impact) in the likelihood that companies will hedge through derivatives. Quick ratio and size (log of enterprise value) explain the decrease (negative impact) in the likelihood that companies will hedge risks through derivatives. Using the Hosmer and Lemeshow test, the accuracy of the model was predicted. Around 73.9% of the users of derivatives could be predicted as 'Derivative Users'. The study would be of immense help to investors, as they understand what foreign exchange exposure is and how they are hedged by companies from the disclosures in annual reports. For the analysts, it is about understanding the variables that explain the motives behind companies deciding to hedge using derivatives. Theories such as hedging substitutes, size, and extent of international operations explain the motivation behind the companies' decision to hedge risks. The study also provides directions for future research.*

Keywords: *Derivatives, Logit Model, Quick Ratio, Revenues, International Operations, Hosmer and Lemeshow Test*

JEL Classification: *F23, F30 and F31*

INTRODUCTION AND RESEARCH ISSUES

The foreign exchange rate exposure of companies in India has been a subject of extensive research, but remains a critical issue. Most studies on firms' sensitivity to exchange rate volatility have failed to identify any significant exposure. Studies have suggested that the lack of significance is due to widespread use of financial and operational hedging to reduce foreign exchange rate exposure (Muff et al., 2007). The instruments used for hedging are financial derivatives. Using derivatives is tantamount to a double-edged sword. It may either benefit an organisation or create havoc in the system (Charumathi et al., 2012).

The management of exposures has attracted a lot of attention in recent years, while identifying value-added activities in the use of derivatives. The hedging of exchange rate risk and other risks may add value to companies because of the presence of imperfections in the capital markets. Examples of imperfections include financial distress, underinvestment problem, hedging substitutes, agency conflicts, and so on. Many studies on the determinants of hedging are based on comparisons between companies using derivatives and those

that do not. A few studies have also identified the derivative instruments widely used by companies (Muff et al., 2007). A study of the financial hedging instruments alone may not reflect the hedging strategies of companies. However, identifying the factors that motivate companies to hedge will add value to the literature and aid future research. The study will be of help to various stakeholders to know the motives behind hedging of risks by companies.

This study is motivated by the aforesaid issues and contributes to the literature in the following ways. First, the study has taken the benefit of the change in the reporting requirements of derivatives use by companies in India (IAS21). This standard requires all companies to provide information on the use of derivatives and the management of exchange rate exposure. Also, in India, standardised derivative products, such as futures and options, are in vogue since 2010. The study becomes significant in analysing and understanding the types of derivatives employed to hedge risk. Secondly, the study considers a broad set of factors that explain the likelihood of companies using derivatives to hedge risk.

The paper is organized as follows: Section II presents the theoretical framework on corporate hedging and the

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associated variables used for the study. Section III is on review of literature. Section IV talks about the data and methodology used for the current research, Section V elaborates on analysis and interpretation, Section VI lays out the findings and conclusion, and Section VII provides directions for future research.

THEORETICAL FRAMEWORK

The theoretical framework underpinning forex hedging practices in corporates is summarised.

Financial Distress

Smith et al. (1985) opined that highly geared firms with cash-flow problems or otherwise nearing bankruptcy will have an incentive to reduce risk in order to mitigate financial distress, and thereby increase shareholder value. Risk management can reduce the probability of a firm's financial distress cost by reducing cash-flow volatility. The benefit one can get by reducing this cost from risk management depends on two factors: the likelihood of encountering distress (if firm does not hedge) and financial distress cost (if it occurs). The greater the possibility of distress, the greater the benefits from risk management. Subsequent researchers have used a slew of measures to proxy for financial distress, primarily based on the borrowing capacity of the firm or leverage. The empirical evidences from Froot et al. (1993) and Smith et al. (1985) provide support to theoretical arguments that higher the probability of financial distress, the greater the financial derivative use.

Underinvestment

The underinvestment problem arises when a firm is not able to make capital investments due to high cost of external financing and lack of internally generated funds. Firms reduce their capex by roughly $0.35 for each dollar reduction in cash flow (Lewent et al., 1990). Thus, a firm that is highly geared may be forced to take up sub-optimal investment strategies and forego profitable investment opportunities - the so-called underinvestment problem (Mayers et al., 1987). Froot et al. (1993), Smith et al. (1985), Mayers et al. (1987), and Bessembinder (1991) argue that through effective risk management, the potential problem of underinvestment is reduced. This happens when management want to maximise their wealth at the cost of bondholders and refuse to invest in low-risk projects. The conflict between equity and bond holders arises due to cash-flow variation and high cost of external financing, which can be resolved by hedging (Mello et al., 1995).

Hedging Substitutes

Nance et al. (1993) and Froot et al. (1993) argue that firms can mitigate the expected cost of financial distress and agency cost by maintaining a larger short-term liquidity position or by having a lower dividend pay-out. As a general strategy, holding liquid assets will reduce financial distress. Overall, holding liquidity can be seen as a substitute for hedging activity. This is because the cost of holding liquid assets is lower than the cost of entering into financial hedging contracts.

Size and International Operations

The relationship between firm size and extent fusing derivatives has been discussed in the literature and empirically tested. Studies have found that smaller firms have reported large usage of derivatives compared to larger firms (Dolde, 1993). Smaller firms are more likely to default due to the lower diversified nature of their assets and restricted access to external capital. Other things being equal, this observation indicates that smaller firms have a high demand for derivatives for hedging risks. Alternatively, size also reflects economies of scale, indicating that there exists a positive relationship between size and the likelihood of hedging (Berkman et al., 1988; Nance et al., 1993; Smith et al., 1985; Geczy et al., 1997; Allayannis et al., 2001; Dunne et al., 2004; & Singh et al., 2008)

Managerial Risk Aversion

Tufano (1996) and Schrand et al. (1998) find evidence that hedging increases with managerial shareholding and decreases with managerial option ownership. Graham and Rogers (2000) and Dunne et al. (2004) report evidence that hedging increases with managerial shareholdings only. These conclusions suggest that compensation programmes are important determinants of hedging. Smith et al. (1985) argued that managers with more wealth invested in a firm will have greater incentives to hedge the firm's risk and that the compensation to managers can influence their hedging choices. Haushalter (2000) and Jalilvand (1999) find no evidence that managerial risk aversion or shareholding affect corporate hedging. The relationship between managerial holdings and motivation to hedge remains ambiguous empirically.

Description of Variables

Variable	Symbol	Proxy For
Debt to Total Assets	DTA	Financial Distress
Debt to Net Worth	DNW	Financial Distress
Interest Coverage Ratio	ICR	Financial Distress
Quick Ratio	QR	Hedging Substitutes
Log of Revenue	lnR	Size

Variable	Symbol	Proxy For
Promoter's Holding as a % of total holding	PH	Managerial Risk Aversion
Price to Earnings Ratio	PER	Underinvestment
R&D Expenses to Sales	R&D/S	Underinvestment
Log of Enterprise Value	lnEV	Size
Export/Total Sales	EXS	International Operations

SYNOPTIC VIEW OF LITERATURE

Authors/Year	Title	Methodology/Tool	Key Findings
Ahmed El Mastry Omneya Abdel Salam Amr Alatraby (2007)	The exchange rate exposure of UK non-financial companies	Analysis done at the firm level. Regressing exchange rate exposure on variables such as size, foreign activity. and financial hedging proxies	Firm's foreign operations and hedging variables affect their sensitivity to exchange rate exposure.
Halil Kiyamaz (2003)	Estimation of foreign exchange exposure: An emerging market application	Time series regression	Turkish firms are highly exposed to foreign exchange risks and the degree of exposure is more pronounced in textiles, chemicals, and machinery. Turkish firms pay more attention to foreign exposure in the post-crisis period than the pre-crisis period.
Abdullah Bin Omar Kamarun Nisham Taufil Mohammad (2017)	Exposure of foreign exchange risk: Are view of empirical evidences	Review of earlier studies on management of foreign exchange risk	Most of the developed and developing economies are exposed to higher level of foreign currency. This is due to high level of openness, and imports and exports.
Anupam Mitra (2013)	Comparative analysis of foreign exchange risk management practices among non-banking companies in India	Survey of practicing managers of Indian non-banking companies	Most of the corporates use forward contracts to hedge risk. Very few companies use a mix of futures, options, and swaps.
Manoj Anand K P Koushik (2008)	Currency derivatives: A survey of Indian firms	Survey of practising managers in India	It identifies significant differences in the motivations of firms who either use foreign currency derivatives or have a documented foreign exchange risk management policy vis-à-vis firms that do not.
Charumathi B Hima Bindu Kota (2012)	On the determinants of derivative usage by large Indian non-financial firms	A multiple regression model, where in the variables were financial distress cost, underinvestment, firm size, agency variable, and so on	Size was a major determinant of the derivative usage by large Indian non-financial companies.
Tony Muff Stephen Diacon Margarate Woods (2008)	The management of currency risk: Evidence from UK company disclosures	A probit regression model, wherein the dependent variable was binary and independent variables were financial distress cost, tax structure, and hedging substitutes	Firms with low profitability, high growth opportunities, and higher tax liabilities are more likely to use currency derivatives.
Cigdem Vural Yavas (2016)	Determinants of corporate hedging: Evidence from emerging markets	A panel data logistic regression model	Firm size, foreign sales, profitability, and dividend yield are the predictors that increase the likelihood of hedging. Leverage, interest coverage, and growth opportunities have a negative impact on the likelihood of hedging.

Authors/Year	Title	Methodology/Tool	Key Findings
Raghavendra R H Velmurugan PS (2014)	The determinants of currency hedging in Indian IT firms	Multiple regression model; Variables such as financial distress cost, underinvestment cost, multi-nationality, firm size is regressed against the notional amount of currency derivatives	Firm's size and underinvestment are the major determinants of currency derivative usage.
Lee Chong Xiao Jun Chang Siow Hooi Tan (2014)	Determinants of corporate foreign exchange risk hedging	Survey of practising managers in Malaysia	The insights of this survey would assist and prepare firms to hedge their exchange rate risk by employing financial derivatives. Knowing the influences of firms adopting currency derivatives would allow policy makers to formulate policies in boosting the liquidity of the Malaysian derivative market.
Ephraim Clarke Amrit Judge (2008)	The determinants of foreign currency hedging: Does foreign currency debt induce a bias	Regression and multi-discriminant analysis	The researchers partitioned the sample into foreign currency hedgers who use foreign currency debt and those who do not use foreign currency debt. Financial distress and leverage are the significant variables that influence foreign currency hedging firms to avail foreign currency debt.
Talat Afza Atia Alam (2011)	Determinants of corporate hedging policies: A case of foreign exchange and interest rate derivative usage	Logit regression	Financial distress, taxes, underinvestment, and managerial risk aversion had a negative effect on firm's hedging policies.
Rashid Ameer (2010)	Determinants of corporate hedging practices in Malaysia	Multiple regression model. Dependent variable: total amount of derivatives contract booked. Independent variables: Long-term debt to total assets, quick ratio, market value of firm, taxes, managerial ownership, size, and foreign sales	Findings suggest that there is a significant relationship between the use of derivatives and foreign sales, liquidity, firm growth, managerial ownership and size. Further, a few listed Malaysian firms have appropriate understanding of the derivatives instruments to mitigate risks in the international business environment.
Joost M.E Pennings (2002)	Pulling the trigger or not: Factors affecting behaviour of initiating a position in derivatives market	Using a questionnaire, interview conducted with 450 managers in the US	The manager's risk attitude, the ratio of the futures price level to the manager's psychological reference price, and the interaction between them appear to explain the manager's behaviour in initiating a futures position.
Lawrence G Velasco (2014)	Factors influencing derivatives usage of companies in Philippines	Panel Data Logistics regression	Results of fixed effects panel data logistic regression indicate firm size and employee stock options as significant factors influencing hedging. Liquidity and existence of growth opportunities were negatively influencing derivative usage.
Numan Khan Khurshid Ali Alina Kiran Zeeshan Khan (2017) Nasir Ali	Factors that affect the financial derivative usage of non-financial firms in Pakistan	Multiple regression model	Companies with high financial distress cost, high export sales, lower managerial holdings, and low interest coverage ratio were using derivatives to manage currency risk.
Mortaza Naghai Mohd. Nagahisarchoghaei Nadia Soleimani Raed M.Jaradat (2018)	Hedging strategies of corporate houses	Multiple regression model	The paper compared the hedge strategies through derivatives of select US and Indian companies. The analysis found no significant relationship between explanatory variables and hedging. The findings do not support any theory behind hedging by companies.

Research Gap

There have been several studies on managing currency risk, both in the global and the Indian context. Several studies in the global context have analysed the determinants of hedging policies and identified variables that significantly influence hedging decisions. In the Indian context too, Charumathi et al. (2012) and Raghavendra et al. (2014) used multiple regression approaches to determine what factors influence the dependent variable, the dependent variable being the total value of derivative contracts used by the companies under study. However, the studies have not focussed on the ratio between the probability of companies hedging to not hedging and they have not tested the theories behind companies hedging the risks. The present study is an attempt to address the gap. Developing a logit model will be imperative to identifying companies that are likely to hedge, compared to those that are not.

DATA AND METHODOLOGY

The data for the present study is from secondary sources. Major sources for the secondary data include annual reports of the companies and Capital Line database. Companies selected for the study belong to S&P CNX 500, which is India's first broad-based index. S&P CNX 500 represents 96% of the total market capitalisation in India. A sample of 349 companies was finally considered for the analysis. The sample was arrived at after excluding banking companies and those companies for which complete data was not available. The study was conducted for the year ending 31 March 2018 (FY 2017-18). The number of year(s) for the present study is on lines similar to those of Linsley et al. (2006), Nguyen et al. (2003), and Tony Muff et al. (2007). It is to be mentioned that the number of samples considered for the present study is much higher than the samples of previous studies.

The study employs logistic estimation method to model the probability of hedging decisions against non-hedging decisions (Pennings, 2002; Whidbee, 1999). The dependent variable takes a binary form, where '1' is assigned to companies that use derivatives and '0' to companies not using derivatives. The independent variables are Debt/Total Assets, Debt/Net Worth, Promoter's Holdings as a % of total holdings, PE Ratio, Interest Coverage Ratio, Quick Ratio, R&D Expenses to Sales, ln (Enterprise Value), ln (Revenue),

and Exports to Sales. The following is the logit model used for the study.

$$ln\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 X1 + \beta_2 X2 + \beta_3 X3 + \cdots + \beta_k Xk$$

$ln\left(\frac{p}{1-p}\right)$ = Log odds of companies using derivatives against not using derivatives

$X1$ $X2$ $X3$……. Xk are the independent variables used for the study. The probability of a company using derivatives/ raising funds through foreign currency loans is modelled as follows:

$$p = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X1 + \beta_2 X2 + \beta_3 X3 + \cdots + \beta_k Xk)}}$$

The logistic regression estimates the parameters β1, β2, and β3 in the model, such that the likelihood of the data used in the model is maximised. The parameters can be interpreted as the change in the log odds associated with one-unit change of the independent parameter. In our case, the odds are defined as the ratio between the probability that a company may use derivatives and the probability that a company may not use derivatives. The model exhibits the likelihood ratio statistics and Wald statistics (the square of the parameter estimate divided by the standard error). For the optimal model, two tests for goodness of fit statistics, namely Nagelkerke's R2, which is similar to the R^2 in linear regression (Hair et al., 1995) and Hosmer and Lemeshow test have been employed. The tests examine the substantive significance of thevariables in the model.

β > 1 (Likelihood of a company using derivatives than not using derivatives. In other words, positive impact on the likelihood of hedging).

β < 1 (Likelihood of a company using derivatives decreases by 1 − β times than not using derivatives).

Tools for Analysis

The data collected has been analysed using R 3.6.1 and appropriate packages are used. For instance, the package "caret" was used for logistic regression analysis and classification. SPSS 23 was also simultaneously run for the analysis.

ANALYSIS AND INTERPRETATION

Table 1: Descriptive Statistics

	D/TA	D/NW	ICR	QR	lnR	PH	PE Ratio	R&D Exp/ Sales	Export to Sales	lnEV
Mean	0.191	0.837	464.495	1.408	24.546	0.550	25.255	0.020	0.149	25.448
Median	0.151	0.317	26.981	1.006	24.390	0.561	26.557	0.000	0.041	25.256
Standard Deviation	0.228	3.222	3881.082	1.399	1.298	0.175	193.435	0.213	0.232	1.209
Range	2.986	55.532	68797.88	15.614	8.538	1.000	1464.304	3.947	1.631	9.758
Minimum	0.000	0.000	0	0.101	20.539	0.000	0	0.000	0.000	19.865
Maximum	2.986	55.532	68797.889	15.714	29.078	1.000	1464.304	3.947	1.631	29.624
Count	349	349	349	349	349	349	348	349	349	349

(D/TA: Debt to Total Assets, D/NW: Debt to Net Worth, ICR: Interest Coverage Ratio, AR: Quick Ratio, lnR: Log of Revenue, PH: Promoter's Holdings as a % of total holdings, PE Ratio: Price/Earnings Ratio, R&D Exp/Sales: Research & Development Expenses/Sales, and Export/Total Sales lnEV: Log of Enterprise Value). Table 1 provides the descriptive statistics of all variables considered for the study. The average debt employed by companies under study was 19.1% of the total assets. There were a few companies which did not employ any debt. The maximum value was 2.986, indicating that around three times the total assets were in the form of borrowings. The average debt in proportion to equity was 0.837. The companies had adequate earnings to meet interest obligations. The average interest coverage ratio was 464.95 times. The short-term liquidity position of the companies was comfortable. The average quick ratio was 1.408, which indicates that the companies had liquid assets which are 1.4 times more than their short-term liabilities. The promoter's holdings were, on an average, 55% of the total holdings. The companies on an average were spending 2% of the total sales towards research and development. On an average, 14.9% of the total sales was in the form of exports. Overall, the table indicates that the companies were highly leveraged and had adequate liquidity to meet their obligations.
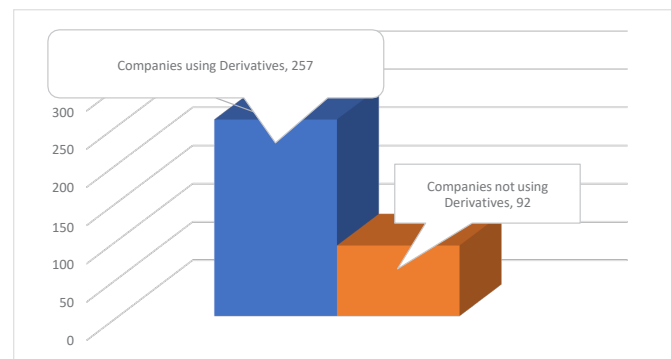

Fig. 1

Table 2 provides the number of companies using currency derivatives for managing currency risk, as well as the number of companies not employing derivatives. From the table, it is found that a majority of the companies (257/349 = .74/74%) use derivatives to manage currency risk. Around 26% of the companies do not employ any derivative instruments in managing currency risks.

Table 3 shows that a majority of companies (180/257 = .70/70%) use forward contracts to hedge currency risks. Around 30% of the companies employ a combination of futures, options, swaps, and other exotic derivative products to manage currency risks.

Table 2: Number of Companies Using/Not using Derivatives

Companies Using Derivatives	257
Companies Not Using Derivatives	92
Total	349

(Source: Author's classification)

Table 3: Types of Derivatives used by Companies

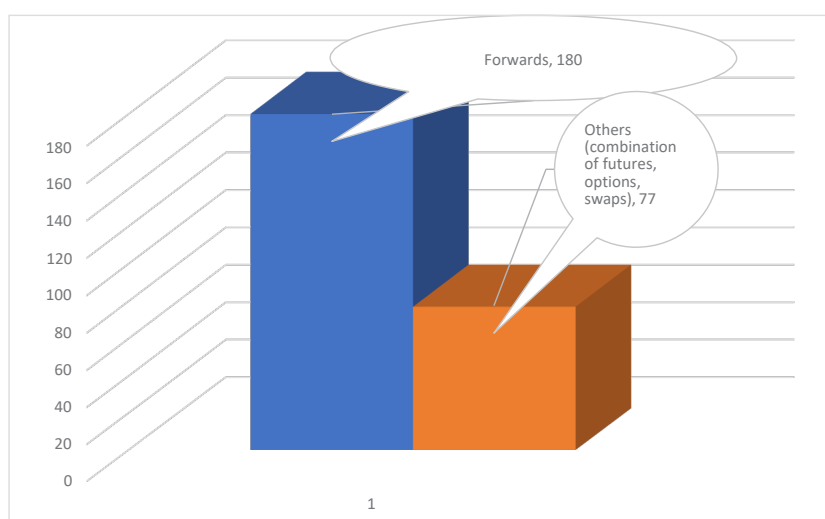| Forward Contracts	180
Others (Combination of Futures, Options, and Swaps)	77
Total	257

(Source: Author's classification)

Fig. 2

Table 4: Results of Univariate Analysis (Difference between Means of Users vs. Non-Users of Derivatives)

Variables	Users of Derivatives		Non-Users of Derivatives		t-statistic	p value	Theory
	Mean	Variance	Mean	Variance			
D/TA	0.209	0.058	0.14	0.0333	−2.465	0.007*	U>NU**
D/NW	0.971	14.25	0.46	0.7	−1.2725	0.1	U>NU**
ICR	188.95	985663	1228.6	546558	2.158	.015*	U>NU**
QR	1.296	2.435	1.72	1.805	2.45	.007*	NU>U**
lnR	24.709	1.787	24.117	1.331	−3.74	.00*	U>NU**
PH	0.5829	0.0318	0.532	0.0271	2.26	.012*	U>NU**
PER	23.66	17094	54.733	29078	1.76	.03*	U>NU**
R&D/Sales	0.0067	0.0003	0.0554	0.172	1.83	.03*	U>NU**
Export/Sales	0.175	0.062	0.073	0.026	−3.64	.001*	U>NU**
lnEV	25.465	1.68	25.428	0.934	−0.24	0.405	U>NU**

*p < .05, ** U: User Group, NU: Non-User Group

Table 4 shows the results of the univariate analysis for derivative users and non-users of derivatives as groups. As indicated by the p values, users were statistically significant, compared to non-users, with respect to D/TA (Debt to Total Assets), lnR (Natural Logarithm of Revenue), Export/Sales, and PH (Promoters Holdings as a % of total holdings). The p values of non-users were statistically significant with respect to PER (Price/Earnings), ICR (Interest Coverage Ratio), QR (Quick Ratio), and R&D/Sales. The mean values for the variables, namely D/NW (Debt to Net Worth) and lnEV (Natural Logarithm of Enterprise Value) were not statistically significant between the groups. The prediction for difference in means was consistent for all variables, except for PER and R&D/Sales.

Table 5: Variables in the Equation

	β	S.E.	Wald	df	Sig.	EXP (β)	95% C.I. for EXP(β)	
							Lower	Upper
QR	−.173	.103	2.834	1	.042**	.841	.688	1.029
lnR	.819	.196	17.469	1	.000*	2.268	1.545	3.329
PER	−.001	.001	1.140	1	.286	.999	.997	1.001
RDS	−5.894	4.127	2.040	1	.153	.003	.000	8.975
EXS	1.848	.666	7.701	1	.006*	6.347	1.721	23.408
lnEV	−.653	.198	10.876	1	.001*	.521	.353	.767
Constant	−2.109	3.149	.449	1	.503	.121		

* significant @ 1%, significant @ 5% Nagelkerke's R .362

The total variables for the study is reduced to six, from ten. The decision to select six variables for the study is based on Akaike Information Criterion (AIC). AIC estimates the relative amount of information lost by a given model, and the lesser the value, the better the model. The details are provided in Appendix I.

Positive Influence on Derivative Use

Results from Table 5 show that firm size, measured by revenue, has a positive influence on derivatives use. This suggests that scale determines the derivatives usage of Indian companies. The results from the table show that the proxy variable for 'Scale' is lnR (Natural Log of Revenue) and the Exp (β) [Exponential Beta] of 2.268 is statistically significant @ 1% ($p < 0.01$). As the 'β' is more than one, it can be inferred that the chance of a firm using derivatives is high if the size, in terms of economies of scale, is large. In other words, for every unit change in the lnR variable, there is a 2.268 times higher chance of using derivatives. The results are understandable because of the relatively new derivatives market in India. The OTC markets may require higher notional principals for taking derivatives positions, and thus, scale is an important variable for determining derivatives usage. Another variable which has a positive influence on derivatives usage is Export/Sales (EXS). The results in the table indicate the Exp (β) value to be 6.347, which is statistically significant @ 1% ($p < .01$). This shows that companies with export sales are most likely to use derivatives to hedge forex risks. Since the 'β' is more than one, it can be inferred that the chance of a firm using derivatives is high if the company has international operations. In other words, for every unit change in the EXS variable, the chance of using derivatives is 6.347 times higher than the chance of not using derivatives.

Negative Influence on Derivative Usage

The results from Table 5 indicate that Quick Ratio (QR) and lnEV (Natural Log of Enterprise Value) have a negative impact on the likelihood of companies using derivatives to hedge risks. The Exp (β) value of QR is 0.841 and is statistically significant @ 5% ($p < 0.05$). This indicates that the chance of using derivatives to hedge decreases by (1 − .0841) 0.159 times compared to not using derivatives to hedge. The negative association indicates that having a larger short-term liquidity acts as a substitute for hedging activities using derivatives. Thus, higher the quick ratio, lower the incentive to hedge risks with derivatives. The Exp (β) of lnEV is 0.521 and the parameter is statistically significant @ 1% ($p < 0.01$). The results show that the chance of using derivatives to hedge decreases by (1 − .521) 0.479 times compared to not using derivatives to hedge. The negative association indicates that larger the firm size, lesser the chance of derivatives usage. Thus, small firms are likely to use derivatives for hedging risks.

Factors with no Significant Influence on Derivatives Usage

RDS (R&D Expenses/Sales) and PER (Price to Earnings Ratio) are the variables which do not have any significant influence on the likelihood of companies using derivatives. The Exp (β) of 0.999 is not statistically significant @ 1% ($p > 0.01$). Similarly, the Exp (β) of PER is also not statistically significant @ 1% ($p > 0.01$). The results are contrary to the earlier findings that R&D Expenses/Sales is positively related to derivatives usage. The results are on expected lines as the R&D Expenses/Sales is minor among the Indian companies (refer Table 1). On an average, companies spend 2% of the sales on R&D.

Table 6

Classification Table				
Observed	**Predicted**			
	Derivatives (1/0)		**Percentage Correct**	
	0	**1**		
Derivatives (1/0)	0	1	90	1.1
	1	1	256	99.6
Overall Percentage				73.9

a. The cut value is .200

Hosmer and Lemeshow Test Chi-Square-7.562 (sign 0.477)

Table 6 shows the classification table. The classification table presents whether the predicted values match the observed values in terms of classifying companies as 'Derivatives User'and 'Non-Derivatives User'. The model is accurate, as 73.9% of the total sample could be predicted as 'Derivatives User'. The Hosmer and Lemeshow test shows that the observed values and predicted values are similar. Thus, the model is a good fit for the given data.

FINDINGS AND CONCLUSION

The study found that around 74% of the sample companies use derivatives to hedge currency exposure. Forward contract is a major derivative instrument used by companies in their hedging activities. Around 70% of the companies employ forward contracts as a hedging tool to manage currency exposure. Other derivatives used by companies include a combination of futures, options, and swaps. The descriptive statistics, as shown in Table 1, indicates that the sample companies were highly levered and maintained adequate liquidity to meet their short-term obligations. Results of the univariate analysis indicate that values of 'Users of derivatives'for variables such as Debt/Total Assets, log of revenue, export/total sales and promoters' holding were significant, compared to 'Non-users of derivatives'.

The study focussed on the factors and their probable impact on the likelihood of companies using derivatives to hedge risk. The study explored whether revenues and extent of internationalisation had a positive impact on the likelihood of companies using derivatives to hedge risk. The findings show that both the variables, viz., revenue and extent of international operations (export/total sales), have a significant impact on the likelihood of companies employing derivatives to hedge exposure. The findings were consistent with the results of Nance et al. (1993), Allayannis et al. (2001), and Velasco (2014). Alternatively, size, measured in terms of enterprise value, had a negative impact on the likelihood of using derivatives in hedging activities. The findings are

consistent with the study by Dolde (1993), thereby indicating that smaller companies with less diversification and limited access to capital are likely to hedge risks using derivatives. However, the present findings contradict the results of Charumathi et al. (2012); that is, bigger companies are likely to hedge risks using derivatives. This anomaly needs further testing empirically. Hedging substitutes measured by a quick ratio also had a negative impact on the likelihood of hedging using derivatives by companies. The results were consistent with the findings of Nance et al. (1993) and Froot et al. (1993), thereby concluding that companies with more liquidity, such as cash and cash equivalents, are not likely to use derivatives for managing currency risks. To test the accuracy of the model in identifying the 'Derivative Users' as users, Hosmer and Lemeshow test was employed. The results indicated that 73.9% of the sample could be predicted as 'Derivatives Users'.

The present findings however contradict the findings of Mortaza Naghai et al. (2018). Their study, which compared the hedging strategies of the US and Indian companies, concluded that no theory supports the motives behind the companies' decision to hedge. However, the current study supports theories such as hedging substitutes, size, and extent of international operations as probable motives behind using derivatives to manage currency exposure.

The study has practical implications for the investors and financial analysts. The investors understand what currency exposure of a company is and how it is managed and reported in the annual reports. Thanks to IFRS, there is uniformity in disclosing reports on currency exposure. This reduces ambiguity in understanding the gravity of currency risks. For the analysts, this model helps in understanding about all those companies which are likely to hedge currency exposure, as evidenced from the Table 6 results. The directions for future research are discussed in the ensuing paragraph.

DIRECTIONS FOR FUTURE RESEARCH

The study provides the following directions for future research.

- A qualitative research/survey of practising managers on what motivates them to use derivatives can add value to the existing literature. The study is essential, because a majority of the companies in the present study have used forward contracts as a major derivative tool. The reasons behind the skewed choice may add value to the existing literature.
- Future studies may include variables such as tax rates, growth opportunities, profitability, stock options of employees, and so on, in studying their impact on the usage of derivatives by companies.

- Future studies may explore whether the current model (including the factors) can also explain the likelihood of companies borrowing foreign currency loans. This will add a new dimension to the existing literature and provide a truly global overview.

- The findings may vary from the present study if future studies can focus on industry-specific factors and their impact on the likelihood of hedging by companies using derivatives. Certain characteristics applicable to industries may probably explain the motives behind corporate hedging practices in India.

- Size, measured in terms of enterprise value, must be tested further, empirically, to resolve the issue of contrasting results. Future studies may address this issue by classifying companies in terms of diversification and explore the likely impact on hedging risks.

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APPENDIX I DERIVATIVES USAGE

Start: AIC=253.39

.outcome ~ `\`Debt to Total Asset\`` + `\`Debt to Networth\`` +

`\`Interest Coverage Ratio\`` + `\`Quick Ratio\`` + `\`Natural log of Revenue\`` +

`\`Promoters holdings as a% of total holdings\`` + `\`PE Ratio\`` +

`\`R&D Expenses to Sales\`` + `\`Export to Sales\`` + `\`Natural Log o

f   EV\``

			Df	Deviance	AIC
-	`\\`Debt to Total Asset\\``		1	231.51	251.51
-	`\\`Debt to Networth\\``		1	231.78	251.78
-	`\\`Promoters holdings as a% of total holdings\\``		1	232.04	252.04
-	`\\`PE Ratio\\``		1	233.04	253.04
<none>				231.39	253.39
- `\\`Interest Coverage Ratio\\``		1		233.90	253.90
- `\\`Quick Ratio\\``		1		234.65	254.65
- `\\`R&D Expenses to Sales\\``		1		235.08	255.08
- `\\`Natural Log of EV\\``		1		235.66	255.66
- `\\`Natural log of Revenue\\``		1		238.94	258.94
- `\\`Export to Sales\\``		1		250.76	270.76

Step: AIC=251.51

.outcome ~ `\`Debt to Networth\`` + `\`Interest Coverage Ratio\`` +

`\`Quick Ratio\`` + `\`Natural log of Revenue\`` + `\`Promoters holdings as a% of total holdings\`` +

`\`PE Ratio\`` + `\`R&D Expenses to Sales\`` + `\`Export to Sales\`` +

`\`Natural Log of EV\``

	Df	Deviance	AIC
- `\\`Promoters holdings as a% of total holdings\\``	1	232.16	250.16

- `\\`Debt to Networth\\``	1	232.38	250.38
- `\\`PE Ratio\\``	1	233.33	251.33
\<none\>		231.51	251.51
- `\\`Interest Coverage Ratio\\``	1	234.20	252.20
- `\\`Quick Ratio\\``	1	235.33	253.33
- `\\`R&D Expenses to Sales\\``	1	235.46	253.46
- `\\`Natural Log of EV\\``	1	235.76	253.76
- `\\`Natural log of Revenue\\``	1	239.16	257.15
- `\\`Export to Sales\\``	1	251.09	269.09

Step: AIC=250.16

.outcome ~ `\\`Debt to Networth\`` + `\\`Interest Coverage Ratio\`` +

`\\`Quick Ratio\`` + `\\`Natural log of Revenue\`` + `\\`PE Ratio\`` +

`\\`R&D Expenses to Sales\`` + `\\`Export to Sales\`` + `\\`Natural Log of EV\``

	Df	Deviance	AIC
- `\\`Debt to Networth\\``	1	233.04	249.04
- `\\`PE Ratio\\``	1	233.76	249.76
\<none\>		232.16	250.16
- `\\`Interest Coverage Ratio\\``	1	235.12	251.12
- `\\`Quick Ratio\\``	1	235.74	251.74
- `\\`R&D Expenses to Sales\\``	1	236.04	252.04
- `\\`Natural Log of EV\\``	1	236.88	252.88
- `\\`Natural log of Revenue\\``	1	240.72	256.72
- `\\`Export to Sales\\``	1	253.05	269.05

Step: AIC=249.04

.outcome ~ `\\`Interest Coverage Ratio\`` + `\\`Quick Ratio\`` +

`\\`Natural log of Revenue\`` + `\\`PE Ratio\`` + `\\`R&D Expenses to Sales\`` +

`\\`Export to Sales\`` + `\\`Natural Log of EV\``

Df Deviance   AIC

\<none\> 233.04 249.04

- `\\`PE Ratio\\``	1	235.21	249.21
- `\\`Interest Coverage Ratio\\``	1	236.10	250.10
- `\\`Natural Log of EV\\``	1	237.34	251.34
- `\\`R&D Expenses to Sales\\``	1	237.35	251.35
- `\\`Quick Ratio\\``	1	237.58	251.58
- `\\`Natural log of Revenue\\``	1	241.24	255.24
- `\\`Export to Sales\\``	1	253.88	267.88