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On The Determinants of Interest Rate Swap Usage by Large Indian Companies

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Abstract

Corporations in India, as in the rest of the world, use hedges to protect themselves against a quartet of exposures: swings in interest rates, commodity prices, foreign exchange rates and equity values. In the wake of the global financial crisis and significant losses on derivatives transactions announced by Indian companies recently, a study on the determinants of derivative usage by these companies is especially significant. An Interest Rate Swap (IRS) is one of the financial derivative instruments in which one party exchanges a stream of interest payments for another party's stream of cash flows, without exchanging the underlying debt. Since 1980s, interest rate swaps have been used by hedgers to manage their fixed and floating assets and liabilities. This paper models the factors which determine the Interest Rate Swap usage by large Indian companies. It is found that a total of 121 large Indian non-financial firms use derivatives. Out of these only 84 companies have disclosed the derivatives data. The companies which have disclosed IRS notional values are considered as sample for this study. This study uses cross sectional panel data for three years from 2007 to 2009 and applies multiple regression models. For this purpose, the firm specific characteristics such as financial distress cost, underinvestment cost, multinationality, economies of scale, firm size and agency variables are regressed against the notional amount of interest rate swap reported for hedging activities. It is found that R&D expenses, size of the firm, current ratio and revenues determine the usage of Interest rate swap, when it is scaled by size. It is also found that current ratio, revenues, debt equity ratio and size of the firm determine the usage of interest rate swap, when it is scaled by revenue. In the Indian context, this study has found support for the financial distress hypothesis, underinvestment hypothesis and economies of scale hypothesis.

Keywords: *Derivative Usage, Interest rate swaps, Financial Distress, Underinvestment, Size, Multinationality.*

Introduction

Corporations in India, as in the rest of the world, use hedges to protect themselves against a quartet of exposures: swings in interest rates, commodity prices, foreign exchange rates and equity values. In addition, businesses are increasingly hedging against credit risk — exposures arising from a drop in the value of another. One of the instruments used for hedging is the financial derivatives. An interest rate swap

(IRS) is one of the financial derivative instruments in which one party exchanges a stream of interest payments for another party's stream of cash flows, without exchanging the underlying debt. One of the major financial innovations since 1980s, interest rate swaps can be used by hedgers to manage their fixed and floating assets and liabilities. These instruments are highly popular and highly liquid.

Overview of the Indian Derivatives Market

Though derivative trading has been in existence in India in commodity markets since ancient times, the financial derivatives came into existence in the late 1990s. The first step was the promulgation of the Securities Laws (Amendment) Ordinance, 1995, which withdrew the prohibition on option trading in securities. The L.C. Gupta panel, appointed by Securities and Exchange Board of India (SEBI) to develop appropriate regulatory framework for derivatives trading played a crucial role in the introduction of equity derivatives in the Indian capital market. Later, the J. R. Verma Committee brought out extensive risk containment measures which facilitated the launching of stock derivatives and index derivatives in India. The trading on index futures was commenced on 12 June 2000, followed by index options on 4 June 2001, options on individual securities on 2 July 2001, and individual stock futures on 2 November 2001. The two major indices traded in the Indian capital market are Sensex of Bombay Stock Exchange (BSE) of 30 scrips and Nifty of National Stock Exchange (NSE) with 50 stocks. Simultaneously, the derivatives were introduced in foreign currencies (USD/INR).

Table 1: Outstanding volume in IRS for various benchmarks

	MIBOR1[a]			*MIFOR*[b]			*INBMK*[c]		
	Notional Sum		*No. of trades*	*Notional Sum*		*No. of trades*	*Notional Sum*		*No. of trades*
	INR (bn)	*USD (bn)*		*INR (bn)*	*USD (bn)*		*INR (bn)*	*USD (bn)*	
Mar-08	36556	838.63	61665	6116	140.31	16528	137	3.14	368
Mar-09	13940	348.76	23732	4680	117.09	11803	187	4.68	461
Mar-10	17488	343.24	29853	3269	64.16	8201	204	4	450

Note:

[a] MIBOR: Mumbai Inter-bank Offered Rate: the benchmark rate published by NSE/FIMMDA based on polled rates from a panel of representative banks.

[b] MIFOR: Mumbai Inter-bank Forward Offered Rate: implies forward rupee rate derived from USD LIBOR and the USD/INR forward premia.

[c] Indian Benchmark Rate published by Reuters. This effectively presents a yield for government securities of a specific tenor.

Although Reserve Bank of India permitted banks to use credit derivatives for managing their credit risk and interest rate derivatives for managing the interest rate risks, these instruments did not pick up as expected. The derivative trading in

commodity market also became active with the initiative of three major exchanges, viz. National Multi Commodity Exchange of India, Multi Commodity Exchange of India and National Commodity and Derivative Exchange. The over-the-counter (OTC) markets in India where the interest rate swaps are traded have evolved within a regulated space. Banks and primary dealers were allowed in 1999 to offer interest rate swaps to corporate for hedging interest rate risk and also to deal in them for their own balance sheet hedging and trading activities. Table 1 shows the outstanding volume in interest rate swaps.

Literature Review

Hedging is the main motive of firms using financial derivatives rather than as a tool for speculation (Henstchel and Kothari, 1995). Hedging is basically reducing exposure to risk of loss resulting from fluctuations in exchange rates, commodity prices and interest rates changes through usage of off-balance sheet financial instruments (i.e., derivatives) such as interest-rate or foreign-exchange forwards, futures, swaps and options. Almost all non-financial derivatives hedge or reduce risk exposure to random exchange-rate and interest-rate changes (Goldberg, Tritschler and Godwin, 1995). However, according to Modigliani and Miller (1958), the perfect capital market assumption presumes that hedging does not alter firm value. They show that corporate financing policy is irrelevant with fixed investment policy and with no contracting costs or taxes. The MM assumptions include the absence of taxes, financial distress costs, contracting costs, information costs and capital market imperfections.

On the other hand, relaxing the capital market assumption can lead to circumstances where hedging adds value. Smith and Stulz (1985) develop a value-maximising theory in which hedging is a part of overall corporate financing policy. Recent theoretical studies, however, argue that risk management can add value to a firm if there are capital market imperfections such as costs of financial distress, progressive tax rates, and conflicts of interest between shareholders and senior claimholders (Stulz, 1984; Smith and Stulz, 1985; Bessembinder, 1991 and Froot, Scharfstein and Stein, 1993). In addition, several other empirical studies have examined the relevance of hedging to firm value. The majority of these studies found that hedging is a value-enhancing exercise for a firm through alleviating costs (e.g., Bessembinder, 1991; Nance et al., 1993; Froot et al., 1993; Tufano, 1996; Berkman & Bradbury, 1996; Géczy et al.,1997; Howton & Perfect, 1998; Haushalter, 2000; Di Iorio & Faff, 2002, 2003; Hagelin, 2003; Heany & Winata, 2005; El-Masry, 2006). The above studies have analysed the purpose and incentives for using derivatives. Derivatives have been used to minimize risks, as it is assumed that reducing or eliminating this type of risk is more likely to enhance firm value.

Bartram, Brown and Fehle (2009) find that traditional tests of the theories have little power to explain the determinants of corporate derivatives usage. They show that derivative usage is determined endogenously with other financial and operating decisions in ways that are intuitive but not related to specific theories for why firms hedge. Derivative usage helps determine the level and maturity of debt, dividend policy, holdings of liquid assets, and international operating hedging.

Empirically, two distinct approaches: survey-based and statistical, have been used to examine corporate use of derivatives for hedging decisions. Recent surveys provide useful descriptive information on the risk-management practices and policies of American, Canadian, and European corporations. (Bodner et al, 1996, 1998; Bodner, Hayt, Marston and Smithson, 1995; Dolde, 1994; Downie, McMillan and Nosal, 1995, Jalilvand et al (1999) and Price Waterhouse (1995). Above all, these studies find risk-management activities to be selective and not well integrated with the firm's overall strategic plan. The second group of studies draws on the predictions of financial economic theory, providing empirical evidence on the impact of taxes, bankruptcy, and agency-related costs on corporate hedging decisions. Hedging theories suggest that the decision to hedge depends on firm – level attributes that determine the benefits to either shareholders or managers arising from hedging. Some of these attributes and their relation to hedging decisions are discussed.

1. **Reduction in costs of financial distress**

   A corporation is said to be in the state of financial distress when a fall in its earning power creates a trivial probability that it will not be able to pay interest and principal on its debt. It has also been noted that bankruptcy impairs the value of the firm. (Baxter, 1967; Altman, 1984). The financing problems, the costs of bankruptcy and other market imperfections make financial distress an undesirable state of affairs.

   a) Financial Distress and Corporate Performance

      Studies relating financial distress and firm performance have shown mixed evidence. Geroski, Kretschmer and Walters (2009) examined the relative productivity growth performance of a sample of large UK firms between 1986 and 1995 and found that innovative firms carrying low debt which are relatively free from financial distress are likely to display persistently superior performance and outperform their peers. Studies have shown that there is a positive relationship between financial condition and firm performance in industry downturns. During these downturns, more highly levered firms tend to lose market share and experience lower operating profits than their competitors. (Opler and Titman; 1994). Samad, Yusof and Shaharuddin (2009) in a study to find out whether distress risk is a systematic risk or not in Malaysian stock market found that the distress listed companies under-performed as indicated by the negative mean and median value of the returns for 3 years. However, some studies argue that financial distress can improve corporate performance and advocate changes in corporate form (e.g., leveraged buyouts) that are financed primarily with debt. These articles point out that financial distress can improve firm values by forcing managers to make difficult value-maximizing choices, which they would otherwise avoid (Jensen, 1989 and Wruck, 1990).

   b) Hedging to reduce financial distress

      Since previous studies show that financial distress proves costly to any firm, it is imperative for the firm to reduce the costs of financial distress. Hedging

is one of the ways. A firm can hedge to reduce the expected costs of financial distress. Diamond (1984) argues that bankruptcy costs lead to hedging. Smith and Stulz (1985) argue that hedging is one method by which a firm can reduce the volatility of its earnings. The lower are the expected bankruptcy costs, the higher the expected payoffs to the firm's claimholders. Therefore, it can be said that probability of hedging is higher for firms with higher expected costs of financial distress. Nance, Smith and Smithson (1993) argue that if there is a fixed cost component to financial distress costs, then smaller firms are more likely to hedge.

Warner (1977) found that direct costs of financial distress were less than proportional to firm size. For this reason small firms are more likely than large firms to employ derivative hedges (Ang, Chua and McConnell, 1982). However, empirical evidence suggests a positive relationship between size and use of derivatives (Nance et al, 1993). There are several explanations for this result. First, indirect costs of financial distress are likely to be much larger than the direct costs associated with bankruptcy (Altman, 1984). If there is no scale effect for indirect costs of bankruptcy, then firm size might not be a useful proxy for the costs of financial distress. Second, larger firms have more sophisticated financial management practices and are therefore more likely to use derivatives. Jalilvand (1999) finds that firms with the higher debt ratio are prone to use more derivatives in hedging risk.

The findings of Goldberg, Goldwin, Kim & Tritschler (1998) and Singh & Upneja (2008) are consistent with firms using derivatives to hedge. According to them, firms hedge with derivatives to reduce the costs associated with financial distress. On the contrary, Shu & Chen (2003) find that firms with low debt ratio are prone to use derivatives, which contradicts the financial distress hypothesis that financially risky firms demand more derivatives for use in hedging risk. However, the users have the higher long-term-debt-to-total-debt ratio than non-users, which corroborates with the prediction of the financial distress hypothesis. They conclude that firms with low debt ratio are more capable in using derivatives than higher ones, and these firms will be more willing to use derivatives when their debt structure is mainly composed of long-term debt. In a nutshell, the empirical results lend little leniency to the financial distress hypothesis.

Hagelin (2003) examines the use of currency derivatives of Swedish firms and finds no significant positive association between leverage and use of derivatives. The finding is in accordance with earlier studies on use of currency derivatives. Mian (1996) also finds that hedging is uncorrelated with leverage. Berkman and Brady (1996) used leverage and interest-coverage ratio as measures of the probability of financial distress and got mixed results. Corporate derivative use increases with leverage but decreases with interest coverage. Fang (2001) finds weak evidence supporting positive correlation between leverage and hedging level

High cash flow fluctuation can substantially raise the cost of financial distress for firms with high level of debt as the probability of payment default

increases. Even without going into bankruptcy, firms under such distress can suffer underinvestment problems by forgoing positive NPV projects. Hedging from the use of derivatives therefore not only reduces the expected bankruptcy costs by lowering cash flow variation but also serves as a substitute for equity capital. Numerous researchers have investigated empirical implications of this theory but results are mixed. Mian (1996) and Nance, Smith and Smithson (1993) report no evidence to support the relationship between the decision on derivative usage and capital structure. Sinkey and Carter (1994), Gunther and Siems (1995), Cummings, Phillips and Smith (1997) find weak evidence suggesting the relation. Dolde (1996), Love and Argawa (1997) confirm that high leverage firms are more likely to use derivatives.

2. **Reduction in incentives to under-invest and ensuring availability of funds for investment opportunities**

   An underinvestment problem results when firms find that external financing is so expensive that they must reduce investment spending during times when internally generated cash flows are not sufficient to finance growth opportunities. Companies reduce their capital expenditures roughly by $0.35 for each dollar reduction in cash flow (Lewent and Kearney, 1990). This situation is considered an indirect cost of financial distress. Firms with abundant growth opportunities may suffer from an underinvestment problem due to the managers' discretion of not investing in positive NPV projects. This can happen due to a variety of reasons like managerial risk aversion, lack of effort, prerequisite consumption or insufficient internally generated cash flows coupled with an aversion to raising external capital. Growth firms with low levels of internally generated funds may be especially susceptible to the underinvestment problem due to a growth resource mismatch. Information asymmetry also plays a major role while trying to understand the reason for underinvestment. Some of the reasons are given below.

   a) ***Asset Substitution***: This situation occurs when shareholders encourage a company to invest in assets that are riskier than what bondholders agreed for. The newer, riskier investment potentially increases the return that shareholders see from their stock, while the bondholders have to bear the increased risk of bankruptcy. In a one-period arrangement, Jensen and Meckling (1976) argue that once a debt is in place, the value of the equity is like an option due to the limited liability of the equity holders. Consequently, they conclude that equity holders will have incentives to increase the risk of the firm so as to increase the equity value at the expense of debt holders.

   b) ***Moral Hazard***: Also in a one-period relationship, Myers (1977) argues that equity holders may not undertake certain positive net-present-value projects because they bear the full costs of the projects while sharing the benefits with debt holders. In particular, when the firm value is low, additional firm value-enhancing investments may mostly benefit debt holders whereas equity holders bear all of the costs. Consequently, underinvestment arises.

c) ***Adverse Selection***: Additionally, the conflict between shareholders and bondholders also gives rise to a problem of underinvestment by adverse selection. This problem arises from the higher premium required by bondholders, since they do not have enough information to distinguish the quality of the different investment projects of the firm (Stiglitz and Weiss, 1981). Thus, if the investment outlay of all positive NPV projects is higher than the internal funds available, the firm might forgo those investment projects rather than issue risky debt. Myers and Majluf (1984) proved that the firm might forgo positive NPV projects because of pre-contract asymmetric information about the investment projects and the assets in place. Owing to informational asymmetries the prospective shareholders are unaware of the firm value and raise the price at which they offer funds. With this price the existing shareholders may lose more if the investment projects are undertaken than they would if the investment projects are abandoned.

In summary, the conflicts between bondholders and shareholders and the current and prospective shareholders may lead to underinvestment processes. Consequently, firms that are associated with relatively more informational asymmetries are also more likely to hedge.

Hedging or risk management in such a situation may add value because it helps ensure that the corporation has sufficient funds available to take advantage of attractive investment opportunities. Lessard (1991) and Froot, Scharfstein and Stein (1993) describe costly external financing as a market imperfection that makes hedging a value-enhancing strategy if it more closely matches inflow with outflow of funds, thereby lowering the likelihood that a firm needs costly external financing for future investments. Bessembinder (1991) concludes that hedging increases value of firm by improving contracting terms. Hedges improve net cash flows in those states where the firm's cash flows are low, bonding its ability to meet commitments in additional states. Hedging can secure value-increasing changes in contracting terms with creditors, customers, employees, and suppliers if the contracts with these parties are initially positive NPV. Géczy, Minton and Schrand (1997) suggest that underinvestment might be more severe for highly levered firms with significant growth opportunities.

Contrary to MM framework, there are interactions between a company's capital structure and its investment decision. This is because internal finance is not a perfect substitute for external finance. Myers and Majluf (1984) and Fazzari, Hubbard & Peterson (1988) postulate that a pecking order exists for the three types of financing due to information asymmetry between firms and investors. According to the theory, information asymmetry leads to cost disadvantage for external finance, particularly equity and internal finance is the most preferred method of financing. Goldberg et al (1998) find that firms hedge with derivative to reduce risk exposure to ensure the availability of internal funds for value enhancing investments, to reduce the costs associated with financial distress, to reduce the underinvestment problem resulting from shareholder-debtholder conflicts, to reduce managers' exposure to employment risk, and to adjust capital structure.

3. **Reduction of Managers' Risk**

Managerial risk aversion as a driving force of hedging is based on the premise that substantial amount of managers' human capital and wealth is tied to the performance of the firm. Thus, managers have strong incentives to reduce firm's risk more than well diversified shareholders desire. Managers have incentives to reduce firm's cash flow variability when their compensation is a concave function of firm's value. Hence, such managers might reject variance-increasing positive net present value (NPV) projects, if hedging costs are high. Corporations can have a value-maximising view instead of being risk-averse (Smith and Stulz,1985). They find that reducing the variability of the firm's value by hedging increases the firm's value if the cost of hedging is smaller than the reduction in extra compensation of contracting parties. Hedging removes the valuable discipline that obtaining new external capital imposes on managers (Tufano, 1998). Amihud and Lev (1982) and Stulz (1984) develop a risk-reduction rationale based on personal risk avoidance by managers and find that risk-averse managers can be expected to reduce employment risk by reducing the possibility of adverse business results.

Stulz (1984) and Smith and Stulz (1985) argue that managers are often unable to diversify firm-specific risks. For this reason, risk averse managers often choose to take actions that reduce the variability of the firm's returns. These arguments imply that, all things being equal, managers with more wealth invested in a firm's equity will have greater incentives to manage the firm's risks. Smith and Stulz (1985) contend that managers' compensation plans can influence their hedging choices. Specifically, the incorporation of option-like provisions in managers' compensation increases the incentives for managers to take risks. Consequently, the more option-like features there are in the compensation plans, the less managers will hedge. A very different managerial theory of hedging, based on asymmetric information is put forward by Breeden and Viswanathan (1990) and DeMarzo and Duffie (1992). In both of these models, the labour market revises its opinions about the ability of managers based on their firms' performance. This can lead some managers to undertake hedges in an attempt to influence the labour market perception.

Many theoretical models (e.g., Merton, 1974) show that equity value is an increasing function of asset volatility, so managers who are acting on behalf of the stockholders might have an incentive not to hedge. However, most employees, including directors and senior managers who have substantial portion of wealth in the firm, may be over-invested and not very diversified. Consequently, risk aversion may cause managers to deviate from acting purely in the best interest of shareholders and make them more motivated to hedge, expending resources to hedge diversifiable risk (Smith and Stulz, 1985; Stulz, 1984; Stulz, 1990, Mayers and Smith, 1982; Tufano, 1998 and May, 1995). Tufano (1996), Schrand and Unal (1998) and Singh and Upneja (2008) find evidence that hedging increases with managerial shareholdings and decreases with managerial option ownership, consistent with the hypothesis outlined above. Gécky et al (1997); Haushalter (2000) and Jalilvand (1999) find no evidence that managerial

risk aversion or shareholdings affect corporate hedging.

DeMarzo and Duffe (1995) also stress that the effect of compulsory disclosure of hedging is to motivate risk averse managers not to fully hedge against the risk exposure of the investment project, whereas Rebello (1995) and Huberman (1997) point out that, because managers pursue the objective to signal the quality of the firm to the market, the hedging strategy strongly affects the security design and the firm's capital structure. Firms with more executive stock options in their remuneration schemes hedge less than firms whose managers own common stocks, as stock options create a convexity in remuneration that offsets risk aversion (Tufano, 1996; Géczy et al., 1997; Schrand et al., 1998; Guay, 1999; and Knopf et al., 2002).

Spanco (2007) examined the relationship between managerial ownership and corporate hedging from a different perspective. He focused on the weaker hypothesis that managerial risk aversion is an incentive to deviate from the optimal hedging position and found that companies with higher percentage of managerial stock ownership (above 26% of the stock) exhibit a stronger link between expected performance and hedging, suggesting that managers with higher stock ownership are more likely to act in the interests of the shareholders, partially mitigating the aforementioned risk aversion effect.

Wysocki (1998) provides empirical evidence on the link between a firm's use of derivatives and its compensation policy, ownership structure and organizational structure. Agency theory indicates that top management may have incentives to use derivatives to reduce personal risk if CEO cash compensation is risky, insiders have high levels of wealth vested in firm equity, the CEO is about to retire, or equity ownership is diffuse. Consistent with the division manager hypothesis, he finds that the use of derivatives is increasing in a number of lines of business and the number of overseas operations. Derivative use is found to be decreasing in insider ownership, but is unaffected by the riskiness of CEO compensation, the level of insider wealth vested in equity or CEO retirement. These results are consistent with the notion that shareholders write optimal contracts with top management to mitigate opportunistic use of derivatives. He also finds that the use of derivatives is increasing with firm size and decreasing with regulation.

Knopf et al. (2002), Rogers (2002) and Rajgopal and Shevlin (2002) are among the studies that examine managerial incentives and risk management. Knopf et al. (2002) analyze 260 non-financial S&P 500 companies and Rogers (2002) uses a sample of 524 firms randomly selected from 3,200 10-K filings. At the industry level, Rajgopal and Shevlin (2002) employ 116 firm-year observations from the oil and gas industry to analyze whether executive stock options encourage managers to invest in risky projects and hedge less oil price risk.

4. **Multinationality**

The recent empirical research which focuses on the relationship between the use of derivatives and a firm's exposure to foreign exchange rate risk is mixed in its results, with one group reporting that the use of derivatives is value-

destructive and a second group reporting that the use of derivatives is a beneficial and value-enhancing exercise. In relation to the first group of studies, Copeland and Joshi (1996), using a sample of 198 U.S. corporations which had the highest sales in 1994, investigated the effect of hedging with derivatives on the volatility of cash flows, which was induced by changes in exchange rates. Therefore, their findings indicated that hedging activities using derivatives produced only small reductions in the volatility of cash flows suggesting low potential benefits. This means that hedging activities were wasteful to the firm's shareholders and carried the potential to actually increase foreign exchange exposure. This finding was confirmed by Hentschel and Kothari (1997) who investigated the effect of the use of derivatives (in general) in firms' exposures, as measured by the volatility of the firm's stock returns for a sample of 325 large U.S. non-financial firms, and 100 U.S. financial firms in April 1998.

Tsakumis, Doupnik and Seese (2006) investigated how the more detailed disclosure of the foreign operations across geographical areas, for the 500 fortune U.S firms in 1998, harms the competitive positions of firms differently. They argued that disclosing more information, under disclosure requirements may impact the competitive position of firms. They indicated that the potential competitive harm associated with country specific disclosures provides an incentive for management to avoid disclosing information about foreign operations hedging strategies. Therefore, disclosing more information about the firm's foreign revenues and hedging programmes may have an impact on firm's value through its competitive position. However, support for hedging with derivatives is provided by a second group of empirical research works (e.g., Simkins & Laux, 1997; Hagelin & Pramborg, 2004; Chaing & Lin, 2005; Nguyen & Faff, 2003, 2006; Nguyen et al., 2006). Simkins and Laux (1997) find weak evidence that hedging with foreign currency derivatives reduces foreign currency exposure.

5. **Size**

Warner (1977) found that smaller firms are more likely to experience default, possibly due to the less diversified nature of their assets and restricted access to external capital. Other things being equal, this observation implies that smaller firms should have a higher demand for derivatives in order to hedge their risk. Focusing on firms that did take a view on the market, Dolde (1993) found that smaller firms report relatively larger derivatives activities than larger firms. Alternatively, size may also reflect a firm's scale economies for maintaining an effective hedging programme, implying a positive correlation between a firm's size and the magnitude of its hedging activities (Berkman & Bradbury, 1996; Mian, 1996; Nance et al, 1993; Jalilvand, 1999; Goldberg et al, 1998; Singh and Upneja, 2008). O'Brien and Bhushan (1990) document that analysts' following and institutional ownership, which proxy for information asymmetry, are positively and negatively related to firm's size, respectively in multivariate setting.

Motivation for the Study

Using derivatives is like using a double edged sword. If the manager has expertise in using them, then they are beneficial for the organization or else, they can cause havoc. This is evident from the recent and ongoing heavy losses on derivatives transactions announced by Indian companies. Feeling the heat of the global economic recession, a large number of companies with higher debt have approached the Corporate Debt Restructuring Cell in fiscal year 2010 than in 2009. Apart from other reasons, derivative contracts backfiring during the past year was one of the main reasons. Further in the Indian context, none of the studies has dealt with the determinants of derivative usage in general and interest rate swap usage in particular. Therefore, the ensuing fears for systemic risk highlight the need for focused research on corporate risk management activity in general and the determinants of derivative usage in particular.

Objectives of the Study

A swap is a cash-settled over the counter derivative under which two counterparties exchange two streams of cash flows. It is called an interest rate swap if both cash flow streams are in the same currency and are defined as cash flow streams that might be associated with some fixed income obligations. This study aims to model the factors which determine interest rate swap usage by large Indian non-financial firms.

Research Methodology

Sample

The sample is constructed by studying the annual reports of the large cap (market capitalization over 10 billion Indian Rupees) companies that are listed on the National Stock Exchange (NSE) for the financial years of 2007 through 2009. The annual reports are available on the National Stock Exchange website or company websites. There is no regulation in India to disclose the derivative position by a company, so there are not many companies which have disclosed the details of derivative usage in their annual reports. To qualify for the analysis, the company's annual report should mention at least once that it uses interest rate swap to hedge risk and disclose the notional values of interest rate swap.

Since this study intends to investigate the determinants of interest rate swap usage by large Indian companies, all foreign companies were excluded from the sample. Furthermore, consistent with most studies, firms belonging to the banking sector were deleted from the sample due to specific nature of their business that often requires them to use derivatives for trading purposes or for performing dealer activities for their clients.

Method of data collection

CMIE database generated a list of 334 large cap companies. Out of these, 165 companies which were either foreign companies or financial services companies were removed. The remaining companies constituted the sample frame for the study. The remaining 169 companies were classified either as a derivative user or non-user. A total of 121 companies use derivatives. Out of these 121 companies, 84

companies have disclosed derivative activities in their annual report from 2007-2009. Of these 84 companies which disclosed derivative usage, 14 companies in 2007, 16 companies in 2008 and 20 companies in 2009 disclosed *interest rate swap notional values,* which are considered for examining the determinants of interest rate swap. As shown in Table 2, the large cap sample spreads across 16 industries and is most heavily represented by diversified, miscellaneous manufacturing, non-metallic minerals and textiles. Other industries that are heavy derivative users are drugs and pharmaceuticals, food & beverages, metal & metal products and petroleum products.

Table 2 : Industry Breakdown of Derivative Use

Industry	*Number of users*	*Sample Frame*	*% Derivative users*
Automobile & auto ancillaries	6	7	85.71
Cement	5	6	83.33
Chemicals	11	14	78.57
Construction	9	19	47.37
Diversified	1	1	100.00
Drugs & Pharmaceuticals	12	13	92.31
Electricity	3	9	33.33
Food & Beverages	9	10	90.00
Machinery	7	12	58.33
Metal & Metal Products	15	17	88.24
Mining	2	4	50.00
Miscellaneous Manufacturing	1	1	100.00
Non-metallic Minerals	2	2	100.00
Petroleum Products	8	9	88.89
Services	29	44	65.91
Textiles	1	1	100.00
Total	121	169	

Source: CMIE Database-Prowess

Dependent Variables

To understand the determinants of interest rate swap by large cap companies in India, two Regression Models are used. In these models, the dependent variable, viz., the total notional value of the interest rate swap is scaled by a) firm size, and b) revenue as shown below:

Variables of the Study

Table 3 : Variables chosen for the study

Factors	*Proxy Variables*	
Financial Distress	DRATIO (Debt Ratio)	Total debt divided by the book value of assets
	INTCOVER (Interest Coverage Ratio)	Log of the earnings before interest and tax over the interest expense
	DER (Debt-equity Ratio)	Ratio of long-term debt to shareholders' equity
Under Investment	PE (Price-Earnings Ratio)	Ratio of Price per share to the annual earnings per share
	RDEXP (R&D Expenses/ sales)	Ratio of R& D expenses to total sales
Multinationality	FE (Foreign exchange sales/ total sales)	Ratio of foreign exchange sales by total sales
Size	REV (Revenue)	Natural logarithm of the total revenue
	SIZE OF THE FIRM	Book value of debt and preferred stock plus market value of common equity
Agency Variable	MANGINC (Managerial incentive)	Number of shares held by promoters and managers scaled by the total number of shares
Control Variable	CURR (Current Ratio)	Ratio of the current assets to current liabilities

Dependent Variables

To understand the determinants of interest rate swap by large cap companies in India, two Regression Models are used. In these models, the dependent variable, viz., the total notional value of the interest rate swap is scaled by a) firm size, and b) revenue as shown below:

IRS/Size = Notional value of interest-rate derivatives/Size and

IRS/Rev = Notional value of interest rate derivatives/Revenue.

Independent Variables

Following are the independent variables chosen for the study:

1. **Financial Distress Costs:** There are several reasons to expect firms with higher levels of debt to use more derivatives. First, interest-rate contracts are a low cost means to adjust debt to a preferred maturity or basis. Firms which use more

debt are expected to adjust debt characteristics more frequently with interest-rate derivatives. Second, more highly levered firms have greater exposure to financial distress and thus more incentive to reduce risk with derivatives to improve debt terms and capacity. To proxy for financial distress costs, we use three variables: Debt Ratio (DRATIO), Interest Cover (INTCOVER) and Debt-Equity Ratio (DER). Debt Ratio, defined as total debt divided by the book value of assets. Interest cover is defined as the log of the earnings before interest and tax over the interest expense. Debt-Equity Ratio, a measure of a company's financial leverage calculated by dividing its total liabilities by stockholders' equity. We expect a positive relationship between proxies of financial distress costs and interest rate swaps.

2. **Underinvestment Costs/Investment Opportunities:** Previous studies have shown that firms with greater growth opportunities use financial derivatives (i) to ensure the availability of internal funds for future investment, (ii) to reduce agency conflicts resulting from greater growth opportunities, and (iii) to reduce managerial employment risk. To proxy for investment opportunities, we again use two variables: PE Ratio (PE) and R&D Expenses/Sales (RDEXP). A firm with more growth opportunities suffers from a larger extent of underinvestment and is more inclined to use derivatives to hedge. Accordingly, a positive relationship is predicted between interest rate swaps and proxies of underinvestment.
3. **Sources of Cashflow Volatility/Multinationality:** Firm disclosures indicate that foreign-exchange derivatives are used to hedge foreign investments as well as exports and other inter-currency transactions (GTG, 1995). To proxy for multinationality, we use one variable: Foreign Sales/Total Sales (FE). Firms with higher levels of multinationality have higher levels of risk exposure and, thus, receive greater benefit from hedging. We predict a positive relationship between multinationality and interest rate swap usage.
4. **Economies of Scale and Firm Size:** There are several reasons for size to be associated with hedging activity. Some reasons indicate small firms are more likely to hedge, while others indicate the opposite. To proxy for economies of scale and size, we use two variables: Revenue (natural logarithm of the total revenue) (REV) and Size (SIZE) which are measured by the book value of debt and preferred stock plus market value of common equity. Larger firms can employ managers with the specialized information to manage a hedging programme employing derivative instruments. Also, derivative markets exhibit significant scale economies in the structure of transaction costs, which make hedging more attractive for large firms. Ultimately, the relationship between use of derivatives and size is an empirical question.
5. **Agency Variables:** Given risk aversion, the activity of derivative usage may increase in a firm where the managers' stake in the firm is high. According to Smith and Stulz (1985), the decision to use derivatives may be influenced by managers who prefer to reduce the risk they are exposed to due to wealth invested in the firm. To measure managerial stockholding (MANGINC), we use the number of shares held by promoters and managers scaled by the total

number of shares. A positive relationship is predicted between managerial stock holdings and interest rate swaps.

Models Used

The two linear multiple regression models developed for this study are as follows:

IRS/Size = $\beta 0 + \beta 1$ DRATIO + $\beta 2$ INTCOVER + $\beta 3$ DER + $\beta 4$ PE + $\beta 5$ RDEXP + $\beta 6$ CURR + $\beta 7$ ASSETS + $\beta 8$ REV+ $\beta 9$ MANGINC + $\beta 10$ SIZE + $\beta 11$FE + ei

IRS/Rev = $\beta 0 + \beta 1$ DRATIO + $\beta 2$ INTCOVER + $\beta 3$ DER + $\beta 4$ PE + $\beta 5$ RDEXP + $\beta 6$ CURR + $\beta 7$ ASSETS + $\beta 8$ REV+ $\beta 9$ MANGINC + $\beta 10$ SIZE + $\beta 11$FE + ei

Hypotheses

To achieve the objectives, the study tested the following null hypotheses:

H01: There is no significant relationship between interest rate swap usage (when scaled by size) and

H01a : Debt Ratio as a proxy for financial distress.

H01b : Interest cover as a proxy for financial distress.

H01c : Debt equity ratio as a proxy for financial distress.

H01d : PE ratio as a proxy for under-investment.

H01e : R & D Expenses/sales as a proxy for under-investment.

H01f : Current ratio as a proxy for control variable.

H01g : Foreign sales/total sales as a proxy for multinationality.

H01h : Revenue as a proxy for size.

H01i : Book value of debt and preferred stock plus market value of equity as a proxy for size.

H01j: Managerial stock holding as proxy for agency variable.

H02: There is no significant relationship between interest rate swap usage (when scaled by revenue) and

H02a : Debt Ratio as a proxy for financial distress.

H02b : Interest cover as a proxy for financial distress.

H02c : Debt equity ratio as a proxy for financial distress.

H02d : PE ratio as a proxy for under-investment.

H02e : R & D Expenses/sales as a proxy for under-investment.

H02f : Current ratio as a proxy for control variable.

H02g : Foreign sales/total sales as a proxy for multinationality.

H02h: Revenue as a proxy for size.

H02i : Book value of debt and preferred stock plus market value of equity as a proxy for size.

H02j : Managerial stock holding as proxy for agency variable.

Results and Discussion

1. Determinants of the interest rate swap usage when it is scaled by size

Table 4 portrays the descriptive statistics for the variables chosen for the study. Table 5 shows the model summary of the regression for the sample firms. The R-Square of the model equals to 51.6% and the R-Square adjusted of the model equals to 51.2%. This means that 51.2% of the changes in the dependent variable (IRS/Size) are due to the variations of the independent variables used in this model. Some other factors which influence the usage of interest rate derivatives, if included, may improve the model fit better. Table 6 shows the result of ANOVA. By using the analysis of variance, it is found that F test of the model is equal to 4.099 and it is significant at 1% level of significance.

Table 4 : Descriptive Statistics

	Mean	*Std. Deviation*	*N*
IRS/SIZE	.0335	.04640	50
DRATIO	.6020	.18897	50
INTCOV	8.6880	9.34973	50
DERATIO	.9420	3.15796	50
PE RATIO	31.9016	123.83586	50
R&DEXP	.0080	.02740	50
CURR	1.2510	1.03347	50
REV	8.5940	1.70011	50
MANGINC	13.0140	7.22905	50
SIZE	69619.849	107207.70049	50
FE	.0585	.06797	50

Note: Results obtained by using SPSS 17.0

Table 5 : Model Summary[b]

Model	*R*	*R Square*	*Adjusted R Square*	*Std. Error of the Estimate*	*Durbin-Watson*
1	.716a	.512	.387	.03632	2.008

a. Predictors: (Constant), FE, INTCOV, PE, RDEXP, CURR, MANGINC, DER, SIZE, DRATIO, REV

b. Dependent Variable: IRS/SIZE

Note: Results obtained by using SPSS 17.0

Table 6 : ANOVA[b]

	Model	*Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
1	Regression	.054	10	.005	4.099	.001a
	Residual	.051	39	.001		
	Total	.106	49			

a. Predictors: (Constant), FE, INTCOV, PE, RDEXP, CURR, MANGINC, DER, SIZE, DRATIO, REV

b. Dependent Variable: IRS/SIZE

Note: Results obtained by using SPSS 17.0

Table 7(a) : Coefficients[a]

Model	*Unstandardized Coefficients*		*Standardized Coefficients*	*t*	*Sig.*		*Collinearity Statistics*	
		B	*Std. Error*	*Beta*			*Tolerance*	*VIF*
1	(Constant)	.269	.055		4.857	.000		
	DRATIO	.017	.035	.068	.472	.639	.610	1.640
	INTCOV	.000	.001	-.039	-.271	.788	.608	1.645
	DERATIO	.004	.002	.267	1.937	.060	.659	1.518
	PE RATIO	-6.50E-005	.000	-.173	-1.492	.144	.926	1.079
	R&DEXP	.589	.199	.348	2.961	.005	.906	1.104
	CURR	-.019	.007	-.430	-2.761	.009	.516	1.939
	REV	-.029	.006	-1.068	-4.950	.000	.269	3.720
	MANGINC	.000	.001	.029	.239	.812	.864	1.158
	SIZE	2.60E-007	.000	.601	3.355	.002	.390	2.565
	FE	.063	.089	.093	.710	.482	.733	1.364

Table 7 (b) : Residuals Statistics[a]

	Minimum	*Maximum*	*Mean*	*SD*	*N*
Predicted Value	-.0230	.1493	.0335	.03332	50
Residual	-.05130	.12356	.00000	.03240	50
Std. Predicted Value	-1.700	3.486	.000	1.000	50
Std. Residual	-1.412	3.402	.000	.892	50

a. Dependent Variable: IRS/SIZE

Note: Results obtained by using SPSS 17.0

From Table 7(a), it is clear that there is a positive relationship between the use of interest rate swaps and a) debt ratio, b) debt equity ratio, c) managerial incentives, and d) foreign exchange sales. The coefficients of these variables viz., 0.472, 1.937, 0.239 and 0.710 respectively are positive but not significant at both 1% and 5% confidence level. Hence, the null hypotheses H_{01a}, H_{01c}, H_{01h} and H_{01j} are accepted. Thus, there is no significant relationship between the interest rate swap usage and debt ratio, debt equity ratio, managerial incentives and foreign exchange sales. There is a negative relationship between the use of interest rate swaps and a) interest coverage ratio, and b) PE ratio. The coefficients of these variables, viz., -0.271 and -1.492 are negative but not significant at both 1% and 5% confidence level. Hence, the null hypotheses, H_{01b} and H_{01d} are accepted. Thus, there is no significant relationship between the interest rate swap usage and interest coverage ratio and PE ratio. However, there is a positive relationship between the interest rate swap usage and a) research and development expenses and b) size; and negative relationship between the interest rate swap usage and a) current ratio, and b) revenues. The coefficients of R&D Expenses and size are positive at 2.961 and 3.355 respectively and that of current ratio and revenue are negative at -2.761 and -4.950 respectively and they are significant at 1% and 5% confidence level. Hence, the null hypotheses H_{01e}, H_{01f}, H_{01g} and H01i are rejected. Thus, there is a significant relationship between the interest rate swap usage and R&D expenses, size, current ratio and revenues. The values of VIF for all the independent variables have also been checked and none indicates any presence of a serious multicollinearity problem. It is also clear from Table 8 that no two independent variables are highly correlated.

Table 8 : Correlation Matrix

	FE	*INT COV*	*PE*	*RDEXP*	*CURR*	*MAN GINC*	*DER*	*SIZE*	*DRA TIO*	*REV*
FE	1.00	.086	.060	-.173	-.040	.027	-.255	-.064	-.031	-.234
INTCOV	.086	1.000	-.009	.104	-.076	.161	.233	-.007	.437	-.212
PE	.060	-.009	1.000	.066	.025	.049	-.175	-.102	-.090	.130
RDEXP	-.173	.104	.066	1.000	-.025	.135	.091	.136	.119	.009
CURR	-.040	-.076	.025	-.025	1.000	-.165	-.375	-.436	.012	.650
MANGINC	.027	.161	.049	.135	-.165	1.000	.152	.119	-.121	-.175
DER	-.255	.233	-.175	.091	-.375	.152	1.000	.321	.275	-.306
SIZE	-.064	-.007	-.102	.136	-.436	.119	.321	1.000	.206	-.670
DRATIO	-.031	.437	-.090	.119	.012	-.121	.275	.206	1.000	-.033
REV	-.234	-.212	.130	.009	.650	-.175	-.306	-.670	-.033	1.000

Note: Results obtained by using SPSS 17.0

It is found that firms that have higher R&D expenditures have significantly higher use of interest-rate swaps. This basically suggests that firms where the extent of derivative usage is more have more growth options. Hedging adds value to the

extent that it helps ensure that a corporation has sufficient internal funds available to take advantage of attractive investment opportunities. This observation is further supported by the findings by Nance, Smith & Smithson,1993; Lewent & Kearney, 1990; Géczy, Minton and Schrand, 1997; Suriawinata, 2005; Bessembinder, 1990; Goldberg, Godwin, Kim and Tritschler, 1998; Froot, Scharfstein & Stein, 1993; Gay and Nam, 1998; and Spano, 2007. It is also evident that large profitable firms with more revenues do not have any comparative advantage over the non-profitable firms in using interest rate derivatives for hedging purposes. Similar results were found by Warner (1977) and Dolde (1993).

The final results are tabulated and shown in Table 9. Results also show that current ratio is a very important factor in determining the extent of interest rate swaps use. Companies with a lower current ratio and therefore having liquidity problems may use interest rate swaps more. Similar results were found by Mian 1996; Marsden and Prevost, 2005; Nguyen and Faff, 2002. It is also evident that larger firms use more interest rate swaps. This evidence supports the hypothesis that there are economies of scale in hedging. Similar results were found by Mian, 1996; Shu & Chen, 2003; Marsden and Prevost, 2005; Jalilvand, 1999; Nguyen and Faff, 2002; Wysocki, 1998; and Ameer, 2010.

Table 9 : Results when IRS is scaled by Size

Variables	*Relationship*	*Sig. at 1% & 5%*	*Hypothesis*	*H0 Accepted/ Rejected*
DRATIO	Positive	No	H02a	Accepted
INTCOV	Negative	No	H02b	Accepted
DER	Positive	No	H02c	Accepted
PE	Negative	No	H02d	Accepted
RDEXP	Positive	Yes	H02e	Rejected
CURR	Negative	Yes	H02f	Rejected
REV	Negative	Yes	H02g	Rejected
MANGINC	Positive	No	H02h	Accepted
SIZE	Positive	Yes	H02i	Rejected
FE	Positive	No	H02j	Accepted

Note: Results compiled from the analysis.

2. Determinants of the interest rate swap usage when it is scaled by Revenue

Table 10 portrays the descriptive statistics for the variables chosen for the study. Table 11 shows the model summary of the regression for the sample firms. The R-Square of the model equal to 67.1% and the R-Square adjusted of the model equals to 45.1%. This means that only 45.1% of the changes in the dependent variable (IRS/Revenue) are due to the variations of the independent variables used in this model and it supports the appropriate selection of proxies for the variables. Table

12 shows the result of ANOVA. By using the analysis of variance, it is found that F test of the model is equal to 3.198 and it is significant at 1% level of significance.

Table 10 : Descriptive Statistics

	Mean	*Std. Deviation*	*N*
IRS/REV	.4001	1.55152	50
DRATIO	.6020	.18897	50
INTCOV	8.6880	9.34973	50
DER	.9420	3.15796	50
PE	31.9016	123.83586	50
RDEXP	.0080	.02740	50
CURR	1.2510	1.03347	50
REV	8.5940	1.70011	50
MANGINC	13.0140	7.22905	50
SIZE	69619.849	107207.70049	50
FE	.0585	.06797	50

Note: Results obtained by using SPSS 17.0

Table 11 : Model Summary[b]

Model	*R*	*R Square*	*Adjusted R S quare*	*Std. Error of the Estimate*	*Durbin-Watson*
1	.671a	.451	.310	1.28906	1.631

a. Predictors: (Constant), FE, INTCOV, PE, RDEXP, CURR, MANGINC, DER, SIZE, DRATIO, REV

b. Dependent Variable: IRS/REV

Note: Results obtained by using SPSS 17.0

Table 12 : ANOVA[b]

	Model	*Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
1	Regression	53.148	10	5.315	3.198	.004a
	Residual	64.805	39	1.662		
	Total	117.953	49			

a. Predictors: (Constant), FE, INTCOV, PE, RDEXP, CURR, MANGINC, DER, SIZE, DRATIO, REV

b.]Dependent Variable: IRS/REV

Note: Results obtained by using SPSS 17.0

Table 13(a) : Coefficients[a]

Model		Unstandardized Coefficients	rdized	Standa- Coeffi- cients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tole- rance	VIF
1	(Constant)	9.112	1.967		4.632	.000		
	DRATIO	.483	1.248	.059	.387	.701	.610	1.640
	INTCOV	.006	.025	.036	.234	.816	.608	1.645
	DERATIO	.158	.072	.321	2.195	.034	.659	1.518
	PE RATIO	-.003	.002	-.231	-1.871	.069	.926	1.079
	RDEXP	-.604	7.061	-.011	-.085	.932	.906	1.104
	CURR	-.628	.248	-.418	-2.531	.016	.516	1.939
	REV	-1.058	.209	-1.159	-5.062	.000	.269	3.720
	MANGINC	.011	.027	.049	.385	.703	.864	1.158
	SIZE	9.32E-006	.000	.644	3.387	.002	.390	2.565
	FE	-.276	3.164	-.012	-.087	.931	.733	1.364

a. Dependent Variable: IRS/REV

Note: Results obtained by using SPSS 17.0

Table 13 (b) : Residuals Statistics[a]

	Minimum	Maximum	Mean	SD	N
Predicted Value	-1.1796	4.9254	.4001	1.04147	50
Residual	-1.86398	6.08342	.00000	1.15002	50
Std. Predicted Value	-1.517	4.345	.000	1.000	50
Std. Residual	-1.446	4.719	.000	.892	50

a. Dependent Variable: IRS/REV

Note: Results obtained by using SPSS 17.0

Table 14 : Correlation Matrix

	FE	*INT COV*	*PE*	*RDEXP*	*CURR*	*MAN GINC*	*DER*	*SIZE D*	*RATIO*	*REV*
FE	1.00	.086	.060	-.173	-.040	.027	-.255	-.064	-.031	-.234
INTCOV	.086	1.000	-.009	.104	-.076	.161	.233	-.007	.437	-.212
PE	.060	-.009	1.000	.066	.025	.049	-.175	-.102	-.090	.130
RDEXP	-.173	.104	.066	1.000	-.025	.135	.091	.136	.119	.009
CURR	-.040	-.076	.025	-.025	1.000	-.165	-.375	-.436	.012	.650
MANGINC	.027	.161	.049	.135	-.165	1.000	.152	.119	-.121	-.175
DER	-.255	.233	-.175	.091	-.375	.152	1.000	.321	.275	-.306
SIZE	-.064	-.007	-.102	.136	-.436	.119	.321	1.000	.206	-.670
DRATIO	-.031	.437	-.090	.119	.012	-.121	.275	.206	1.000	-.033
REV	-.234	-.212	.130	.009	.650	-.175	-.306	-.670	-.033	1.000

Note: Results obtained by using SPSS 17.0

From Table 13(a), it is clear that there is a positive relationship between the use of interest rate swaps and a) debt ratio, b) interest coverage ratio, and c) managerial incentives. The coefficients of these variables viz., 0.387, 0.234 and 0.385 respectively are positive but not significant at both 1% and 5% confidence level. Hence, the null hypotheses H_{02a}, H_{02b} and H_{02h} are accepted. Thus, there is no significant relationship between the interest rate swap usage and debt ratio, interest coverage ratio and managerial incentives. There is a negative relationship between the use of interest rate swaps and a) PE ratio, b) R & D expenses, and c) foreign sales. The coefficients of these variables viz., -1.871, -0.085 and -0.087 respectively are negative but not significant at both 1% and 5% confidence level. Hence, the null hypotheses H_{02d}, H_{02e}, and H_{02j} are accepted. Thus, there is no significant relationship between interest rate swap usage and PE ratio, R&D expenses and foreign sales. However, there is a negative relationship between the interest rate swap usage and a) current ratio, and b) revenues; and positive relationship between the interest rate swap usage and a) debt-equity ratio, and b) size. The coefficients of current ratio and revenue are negative at -2.531 and -5.062 respectively and that of debt-equity ratio and size are positive at 2.195 and 3.387 respectively and they are significant at 1% and 5% level confidence level. Hence, the null hypotheses H_{02c}, H_{02f}, H_{02g}, and H_{02i} are rejected. Thus, there is a significant relationship between the interest rate swap usage and current ratio, revenues, debt equity ratio and size. The values of VIF for all the independent variables have also been checked and none indicates any presence of a serious multicollinearity problem. It is also clear from Table 14 that no two independent variables are highly correlated.

Table 15 : Results when IRS is scaled by Revenue

Variables	*Relationship*	*Sig. at 1% & 5%*	*Hypothesis*	*H0 Accepted Rejected*
DRATIO	Positive	No	H03a	Accepted
INTCOV	Positive	No	H03b	Accepted
DER	Positive	Yes	H03c	Rejected
PE	Negative	No	H03d	Accepted
RDEXP	Negative	No	H03e	Accepted
CURR	Negative	Yes	H03f	Rejected
REV	Negative	Yes	H03g	Rejected
MANGINC	Positive	No	H03h	Accepted
SIZE	Positive	Yes	H03i	Rejected
FE	Negative	No	H03j	Accepted

The final results are tabulated and shown in Table 15. These results show that debt-equity is a very important factor in determining the extent of derivative use. This means that firms tend to use more interest rate derivatives, the more debt they have in the capital structure. This finding supports the hypothesis that a hedging programme reduces the probability of encountering financial distress. Similar results were found by Nguyen and Faff, 2002; Graham and Rogers, 2002; Suriawinata, 2005; Goldberg, Godwin, Kim and Tritschler, 1998; Hagelin, 2003; Haushalter, 2000; Jalilvand, 1999 and Smith and Stulz, 1985. It is also evident that large firms measured by size (value of firm) use more interest rate derivatives. Similar results were found by Jalilvand, 1999; Nguyen and Faff, 2002; Wysocki, 1998; and Ameer, 2010. Further, as supported by the findings by Shu & Chen (2003), the large firms with more debt capital (in terms of interest cover) seem to use lesser interest rate derivatives than firms without debt capital.

Conclusion

In this paper, we have studied the determinants of interest rate swap usage by large cap companies in India. This study is particularly important due to huge mark-to-market losses undergone by Indian companies and an imperative need to study the derivative usage by them. The results show that R&D expenses, size of the firm, current ratio and revenues determine the usage of interest rate swap, when it is scaled by size. Current ratio, revenues, debt equity ratio and size of the firm determine the usage of interest rate swap, when it is scaled by revenue. In the Indian context, this study has found more support for the financial distress hypothesis, underinvestment hypothesis and economies of scale hypothesis. If the large cap companies take into account the determinants of the interest rate swap, they can use the same more effectively and optimally than ever before.

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