On the Determinants of Interest Rate Swap Usage by Indian Banks

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Abstract* - Banks have twin objectives of maximizing profitability and at the same time trying to ensure sufficient liquidity. To achieve these objectives, it is essential that banks have to monitor, maintain and manage their assets and liabilities portfolios in a systematic manner taking into account the various risks involved in these areas. Balance sheet risk can be categorized into two major types of significant risks, which are liquidity risk and interest rate risk (IRR). Interest rate risk is the risk to earnings or capital arising from movement of interest rates. For measuring interest rate risk, banks use a variety of method such as gap analysis, the duration gap method, the basis point value (BPV) method, and simulation methods. The need to manage IRR arises as its management is critical to the overall profitability of banks and they have started using derivative instruments such as interest rate swap, interest rate futures, and forward rate agreements. Hence, the present study entitled "On the Determinants of Interest Rate Swap (IRS) Usage by Indian Banks" has been taken up to model the factors which determine the use of interest rate swap to manage IRR. The sample for this study includes 24 Indian Commercial Banks and it used annual data for the financial year 2007-08. For this purpose, the bank specific characteristics such as size, asset quality, capitalization, profitability, interest rate risk profile are regressed against the notional amount of the interest rate swap reported for hedging activities. It is found that the larger banks (as explained by the total assets) and profitable banks (as explained by the profit before tax to total asset ratio) do not seem to have any comparative advantage to use interest rate swaps for hedging purpose more intensively than smaller banks. Further, it is found that the banks with more exposure to interest rate risk, high net worth, and higher loans to asset ratio tend to be larger users of interest rate swaps.

Index Terms— **Interest Rate Risk, Interest Rate Swap, Hedging, Indian banks.**

I. INTRODUCTION

Banks have twin objectives of maximizing profitability and at the same time trying to ensure sufficient liquidity. To achieve these objectives, it is essential that banks have to monitor, maintain and manage their assets and liabilities portfolios in a systematic manner taking into account the various risks involved in these areas. Balance sheet risk of a bank can be categorized into two major types of significant risks, which are liquidity risk and interest rate risk (IRR). Interest rate risk is the risk to earnings or capital arising from movement of interest rates. The need to manage IRR arises as its management is critical to the overall profitability of banks.

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II. DERIVATIVE MARKET – GLOBAL AND INDIAN SCENARIO

The financial markets, including derivative markets, in India have been through a reform process over the last decade and a half, witnessed in its growth in terms of size, product profile, nature of participants and the development of market infrastructure across all segments - equity markets, debt markets and forex markets. Derivative markets worldwide have witnessed explosive growth in recent past. According to the BIS Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity as of April 2007 was released recently and the OTC derivatives segment, the average daily turnover of interest rate and non-traditional foreign exchange contracts increased by 71 % to $2.1 trillion in April 2007 over April 2004, maintaining an annual compound growth of 20 per cent witnessed since 1995. As regards interest rate derivatives, the inter-bank Rupee swap market turnover, has averaged around USD 4 billion (Rs. 16,000 crore) per day in notional terms. The outstanding Rupee swap contracts in banks' balance sheet, as on August 31, 2007, amounted to nearly USD 1600 billion (Rs. 64,00,000 crore) in notional terms. Outstanding notional amounts in respect of cross currency interest rate swaps in the banks' books as on August 31, 2007, amounted to USD 57 billion (Rs. 2,24,000 crore). The size of the Indian derivatives market is clearly evident from the above data, though from global standards it is still in its nascent stage. Broadly, Reserve Bank is empowered to regulate the markets in interest rate derivatives, foreign currency derivatives and credit derivatives.

III. CURRENT REGULATORY FRAMEWORK IN INDIA

In the light of increasing use of structured products and to ensure that customers understand the nature of the risk in these complex instruments, RBI after extensive consultations with market participants issued comprehensive guidelines on derivatives in April 2007. The major guidelines include i) Participants have been generically classified into two functional categories, viz., market-makers and users, which would be specific to the position taken by the participant in a transaction. This categorisation was felt important from the perspective of ensuring Suitability & Appropriateness compliance by market makers on users. ii) The guidelines also define the purpose for undertaking derivative transactions by various participants. While **Market-makers** can undertake derivative transactions to act as counterparties in derivative transactions with users and also amongst themselves, **Users** can undertake derivative transactions to hedge - specifically reduce or extinguish an existing identified risk on an ongoing basis during the life of the derivative transaction - or for transformation of risk exposure, as specifically permitted by RBI. The rupee

interest rate derivatives presently permissible are Forward Rate Agreements (FRA), Interest Rate Swaps (IRS) and Interest Rate Futures (IRF). The interest rate swap market in India has grown rapidly with participation from banks and corporates. The market is liquid and bid-offer spreads are narrow.

IV. INTEREST RATE SWAP

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. The most popular interest rate swaps are fixed-for-floating swaps under which cash flows of a fixed rate loan are exchanged for those of a floating rate loan. Among these, the most common use a 3-month or 6-month Libor rate (or Euribor, if the currency is the Euro) as their floating rate. These are called vanilla interest rate swaps. There is also a liquid market for floating-floating interest rate swaps—what are known as basis swaps. To keep things simple (and minimize settlement risk), concurrent cash flows are netted. The principal amount is called the notional amount of the swap. Interest rate swaps are used by a wide range of commercial banks, investment banks, non-financial operating companies, insurance companies, mortgage companies, investment vehicles and trusts, government agencies and sovereign states for one or more of the following reasons: i) To obtain lower cost funding; ii) To hedge interest rate exposure; iii) To obtain higher yielding investment assets; iv) To create types of investment asset not otherwise obtainable; v) To implement overall asset or liability management strategies; vi) To take speculative positions in relation to future movements in interest rates. The advantages of interest rate swaps include the following: i) A floating-to-fixed swap increases the certainty of an issuer's future obligations; ii) Swapping from fixed-to-floating rate may save the issuer money if interest rates decline; iii) Swapping allows issuers to revise their debt profile to take advantage of current or expected future market conditions; and iv) Interest rate swaps are a financial tool that potentially can help issuers lower the amount of debt service.

V. REVIEW OF LITERATURE

There are many studies which deal with the determinants of derivative usage by corporate. Few of the notable studies include George W. Fenn Mitch Post Steven A. Sharpe (1996); Hoa Nguyen & Robert Faff (2002, 2003); Adedeji & Richard Baker (2002); Borokhovich, Kenneth A., Brunarski, Kelly R, Crutchley , Claire E., & Simkins, Betty J. (2004); Ajay Samant (2004). The research studies which specifically deal with the usage of swap by banks include the following: **Sung-Hwa Kim and G. D. Koppenhaver** (1993) considered the characteristics of banks that do and do not report interest rate swaps and found that the long-term interest rate exposure of a bank and the likelihood and extent of swap market participation are positively related. Key to the finding is the inclusion of variables related to the provision of swap market intermediary services, which significantly explain both the likelihood of swap market participation and the notional value of outstanding swaps. The results suggest that the likelihood and extent of swap market participation by low-capitalized banks is less than for other banks. **Katerina Simons** (1995) examined the determinants of banks' use of interest rate derivatives (futures, options and swaps) and estimated a fixed-effect model with four dependent variable and six independent variables. **Beverly Hirtle** (1996) examined the role played by derivatives in determining the interest rate sensitivity of bank holding companies' common stock, controlling for the influence of on-balance sheet activities and other bank-specific characteristics and foundthat the derivatives have played a significant role in shaping banks' interest rate risk exposure. **Julapa Jagtiani** (2004) provided evidence that some banks may have engaged in swap as a means to generate income when their loan activities were constrained by the fixed capital requirements. However, the results also suggest that creditworthiness plays an important role. All money-center banks (too-big-to-fail) and those non-money-center banks that are highly rated by S&P experience higher swap demand and achieve higher swap market shares. This implies some market discipline for non-money-center banks, which may compensate for risk-measurement inadequacies in the current risk-based capital requirements. On the other hand, the results suggest that greater oversight may be required for money-center banks. **David A. Carter , W. Gary Simpson , and Arun Tandon** (2005) investigates the effect of managerial incentives on the use of interest-rate derivatives by U.S. bank holding companies, as end users and found that certain managerial incentives (e.g., insider ownership and option compensation) are important in the decision to use derivatives to hedge. Once managers decide to hedge, compensation is not an important factor in the extent of hedging decision, while ownership and firm-specific risk factors determine the amount of derivatives used.

VI. OBJECTIVES OF THE STUDY

To manage interest rate risk, banks use two approaches, viz., on-balance sheet adjustment and off-balance sheet adjustment. On-balance sheet adjustments involves the adjustment of some of the bank's assets and liabilities in such a way that the net effect of an interest rate movement will not adversely affect the market value of equity and profitability. For measuring interest rate risk, banks use a variety of method such as gap analysis, the duration gap method, the basis point value (BPV) method, and simulation methods. Off-balancesheet adjustments allows the banks to insulate from the interest rate risk by altering the portfolio of assets and liabilities. Thus, banks started using derivative instruments such as interest rate swap, interest rate futures, and forward rate agreements. These instruments are off-balance sheet products and they do not appear on the balance sheet. Out of various tools available to manage IRR, Interest Rate Swap is becoming more popular among banks. Hence, this paper aims to model the factors which determine the use of interest rate swap by bank to manage IRR.

VII. RESEARCH METHODOLOGY

This study is an empirical study. Out of 54 (27 public and 27 private) banks operating in India, this study selected only 24 (17 public and 7 private) commercial banks, which use interest rate swap for hedging purposes and for which

swap data are available. It used annual data for the financial year 2007-08 and the data were obtained by using Prowess, which is Centre for Monitoring Indian Economy's (CMIE's) Database, and the annual reports of the banks. This study employs cross-section data multiple linear regression model. For this purpose, the bank specific characteristics such as size, asset quality, capitalization, profitability, interest rate risk profile are regressed against the notional amount of the interest rate swap reported for hedging activities. The proxies used for these characteristics are shown in Table I:

Table - I
Variables chosen for the study

Characteristics	Proxy variable
Size (LOGTA)	Logarithm of Total Assets
Asset Quality (AQ1)	Net Loans & Advances / Total Assets
Asset Quality (AQ2)	Provision for NPA / Total Loans & Advances
Capitalisation (CAP)	Networth / Total Assets
Interest Rate Risk (IRR)	Net Interest Income/ Total Income
Return Performance(ROTA)	Profit Before Tax / Total Assets

The linear multiple regression model developed for this study is as follows:

$$IRS = \beta_0 + \beta_1 LOGTA + \beta_2 AQ1 + \beta_3 AQ2 + \beta_4 CAP + \beta_5 IRR + ROTA\ \beta_6 + \varepsilon_i$$

Wherein, IRS = Interest Rate Swap / Total Assets, is a Dependent Variable. Interest Rate Swap is the notional amount for hedging only (trading is not considered), which is obtained from the notes to account section of the annual report of banks. Six Independent variables considered for this study include LOGTA, AQ1, AQ2, CAP, IRR, and ROTA. This study also tested the assumptions of the linear multiple regression model, viz., multicollinerity and homoscedasticity. None of the two independent variables are highly correlated and hence, there is no multicollinearity problem exist. Further, the residuals are identically distributed with mean zero and equal variances and hence, the model does not face a problem of heteroscedasticty.

VIII. HYPOTHESES

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

H_{01} : There is no relationship between bank's size and usage of interest rate swap as a hedging tool.

H_{02} : There is no relationship between loan to asset ratio of a bank (AQ1) and usage of interest rate swap as a hedging tool.

H_{03} : There is no relationship between provision for NPA to total loans and advances ratio and usage of interest rate swap as a hedging tool.

H_{04} : There is no relationship between net worth to assets ratio and usage of interest rate swap as a hedging tool.

H_{05} : There is no relationship between net interest income to total income ratio and usage of interest rate swap as a hedging tool.

H_{06} : There is no relationship between profit before tax to total assets ratio and usage of interest rate swap as a hedging tool.

IX. RESULTS AND DISCUSSION

Table II portrays the descriptive statistics for the variables used in this study. The variable Interest Rate Swap (Notional amount of Interest Rate Swap used for hedging purpose / Total Assets) averaged 17.20% and ranged from 0.035% (Indian Bank – Public Sector Bank) to 356% (Kotak Mahindra Bank – Private Sector Bank). The ratio of Asset Quality 1 (Net Loans and Advances / Total Assets) had an average of 57.84% and ranged from 46.69% (HDFC Bank Ltd) to 62.96% (Bank of India – Public Sector Bank). The ratio of Asset Quality 2 (Provision for Non-Performing Assets/ Total Loans and Advances) had an average of 0.75% and ranged from 0.22% (IDBI Bank Ltd. – Private Sector Bank) to 1.91% (HDFC Bank Ltd.- Private Sector Bank).

The bank size as measured by the total asset size had an average of INR 1363589.47 million. The largest bank in the sample was State Bank of India (First Largest Bank in India and Public Sector Bank) with a total asset size of INR 7221250.9 million while the smallest bank was Karnataka Bank Ltd. (Private Sector Bank) with a total asset size of INR 193552 million. The capital position (Networth/Total Assets) of the banks averaged to 6.36% and ranged from 3.25% (UCO Bank – Public Sector Bank) to 12.69% (Kotak Mahindra Bank – Private Sector Bank). The measure of Interest Rate Risk (Net Interest Income/Total Income) averaged 26.54% with a minimum of 6.54% for IDBI Bank which is exposed to very low interest rate risk and a maximum of 41.37% for HDFC Bank. The return performance (Profit Before Tax/Total Assets) averaged to 1.26% and ranged from 0.49% (Indusind Bank – Private Sector Bank) to 2.14% (Indian Bank).

Table III shows the model summary of the regression for the sample banks. The R-Square of the model equal to 86.4% and the R-Square adjusted of the model equals to 81.6, both of which are consistent. This means that 81.6% of the changes in the dependent variable (IRS/TA) are due to the variations of the independent variables used in this model besides supporting the appropriate selection of proxies. Adjusted R-Square is consistent and higher than the values found by many empirical studies done by Simons (1995), Kim and Koppenhaver (1992), Jagtiani (1996) and Gorton (1998). The difference among the R-Square value of these studies was elucidated by the different period of times and the type of regression, viz., cross sectional or time series or both. Though, this study found a high R-Square value, few other factors which have influence on the use of interest rate swap such management preferences, and degree of sophistication of banks were not included. Table IV shows the result of ANOVA. By using the analysis of variance, it is found that F test of the model is equal to 18.050. This F value is largely higher than the critical value at 1% level of significance for degrees of freedom of 6, which is equal to 2.79. Thus, it can be concluded that at least three independent variables have significant effect on the dependent variable.

Table – II Descriptive Statistics – Variables of Analysis

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Asset Quality Ratio 1(AQ1)	24	.4668697820	.6296163460	5.784154383333E-1	.0341469999709
Asset Quality Ratio 2(AQ2)	24	.0022056210	.0191721490	7.447943250000E-3	.0039541757219
Capitalisation Ratio (CAP)	24	.0325889150	.1269172500	6.366299191667E-2	.0222589804244
Interest Rate Risk Ratio (IRR)	24	.0654801510	.4137191180	2.654839117500E-1	.0729129294245
Interest Rate Swap Ratio (IRS)	24	.0003545710	3.5678166930	1.720045171667E-1	.7238584285125
Log of Total Assets (LOGTA)	24	4.2867976630	5.8586124350	4.977301121208	.3664041697235
Return Performance Ratio (ROTA)	24	.0049006550	.0214057470	1.268996141667E-2	.0044326368419
Valid N (listwise)	24				

Results obtained by using SPSS 17.0.

Table – III Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.930[a]	.864	.816	.3101306527514

a. Predictors: (Constant), ROTA, LOGTA, AQ2, CAP, AQ1, IRR
b. Dependent Variable: IRS

Table – IV Analysis of Variance

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	10.416	6	1.736	18.05	.000[a]
Residual	1.635	17	.096		
Total	12.051	23			

a. Predictors: (Constant), ROTA, LOGTA, AQ2, CAP, AQ1, IRR
b. Dependent Variable: IRS

Table – V(a) Regression Summary

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-4.721	1.854		-2.546	.021
	Log of Total Assets	-.770	.184	-.390	-4.173	.001
	Asset Quality Ratio 1	10.508	2.811	.496	3.738	.002
	Asset Quality Ratio 2	-4.196	22.817	-.023	-.184	.856
	Capitalisation Ratio	31.051	3.758	.955	8.263	.000
	Interest Rate Risk Ratio	8.238	1.382	.830	5.963	.000
	Return Performance Ratio	-117.173	21.684	-.718	-5.404	.000

Table – V(b) Residual Statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-.4144869446754	3.085034370422	.1720045171667	.67296411797762	24
Std. Predicd Value	-.872	4.329	.000	1.000	24
Residual	-.5144362449646	.48278221487999	-5.4932910072599E-17	.26662768131450	24
Std. Residual	-1.659	1.557	.000	.860	24

Results computed by using SPSS 17.0 version.

Bank Size: From the Table V(a), it is clear that there is a negative relationship between the use of interest rate swap and bank size. The coefficient for the logarithm of assets is negative and significant for both 1% and 5% confidence level. Its t-test value is -4.173 and its absolute value is greater than the table value. Hence, the null hypothesis H_{01} is rejected. Thus, there is significant relationship between the size of the bank and the usage of interest rate swap as a hedging tool. Further, it is found that there exists a negative relationship between the asset size of a bank and the usage of the interest rate swap. The Beta value is -0.39. Using the standardised coefficient and keeping all the other variables constant, if the log of total asset size increases by 100, interest rate swap ratio (Swap/Total Assets) will reduce by 39. Thus, it can be concluded that the large banks (which are big in size, good in expertise and skill) are not having any comparative advantage over the small banks, in using interest rate swap for hedging purposes.

Asset Quality 1: From the Table V(a), it is clear that there is a positive relationship between the use of interest rate swap and the Asset Quality Ratio 1 (Net Loans and Advances/Total Assets). The Beta coefficient for this variable (AQ1) is positive and significant for both 1% and 5% confidence level with a P-Value of 0.002. Its t-test value is 3.738 which is greater than the table value. Hence, the null hypothesis H_{02} is rejected. Thus, there is significant relationship between the loan to asset ratio and the usage of interest rate swap as a hedging tool. The coefficient of asset quality 1 equals to 10.508 and its standardised coefficient Beta value is 0.496. Using the standardised coefficient and keeping all the other variables constant, if the loan to asset ratio increases by 100, interest rate swap ratio (Swap/Total Assets) will increase by

49.6. Thus, it can be concluded that the banks with high loan to asset ratio tend to be the bigger users of interest rate swaps. It means the banks with more loans and advances portfolio are exposed to more interest rate risk and hence, the tendency of banks to use interest rate swap is more. Further, that the regulators perceive swaps as risky ones and banks with weak asset quality are subject to rigorous scrutiny while they attempt to use swap.

Asset Quality 2: Another measure of asset quality taken for this study is the ratio of Provision for Non-Performing Assets to Total Loans and Advances. The regression result in Table IV clearly shows that there is no consistent relationship between the use of interest rate swap and the Asset Quality Ratio 2 (Provision for NPA/Total Loans and Advances). The Beta coefficient for this variable (AQ2) is negative and is not significant for both 1% and 5% confidence level with a P-Value of 0.856. Its t-test value is -0.184 which is lesser than the critical value. Hence, the null hypothesis H_{03} is accepted. The coefficient of of this variable (AQ2) equals to -4.196 and its standardised coefficient Beta value is -0.023. Using the standardised coefficient and keeping all the other variables constant, if the provision for NPA to Total Loans and Advances ratio increases by 100, interest rate swap ratio (Swap/Total Assets) will decrease only by 2.3. Thus, it is concluded that there is no significant relationship between the asset quality ratio 2 (provision for non-performing assets to total loans and advances) and the usage of interest rate swap as a hedging tool. Further, this variable (AQ2) may not be a good proxy of asset quality.

Capitalistion: From the Table V(a), it is clear that there is a positive relationship between the use of interest rate swap and the capitalisation ratio (Networth/Assets). The Beta coefficient for the capitalisation ratio is positive and significant for both 1% and 5% confidence level with a P-Value of 0.000. Its t-test value is 8.263 which is greater than the table value. Hence, the null hypothesis H_{04} is rejected. Thus, there is significant relationship between the capitalisation ratio and the usage of interest rate swap as a hedging tool. Further, it is found that there exists a positive relationship between the capitalisation ratio and the usage of the interest rate swap. The unstandardised coefficient Beta value is 31.051 and the standardised Beta value is 0.955. Using the standardised coefficient and keeping all the other variables constant, if the capitalisation ratio increases by 100, interest rate swap ratio (Swap/Total Assets) will also increase by 95.5. Thus, it can be concluded that the banks with high net worth tend to be bigger users of interest rate swaps.

In line with the view that the level of use of interest rate swap activities are primarily decided by the capital requirements, capitalisation significantly enhances the swap participation in the sample while having clear effect on the decision of whether to enter the swap market. These findings emphasize the importance of distinguishing the determinants of swap participation from the factors influencing the extent of swap participation. The findings related to capitalisation ratio variable support the view that the market discipline, regulatory constraints, or both generally offset the potential moral hazard and results in positive relationship with the capital level and hedging through swap activities. Thus, it is concluded that maintaining the swap market less risky presupposes strict regulation on capital requirements.

Interest Rate Risk Exposure: From the Table V(a), it is clear that there is a positive relationship between the use of interest rate swap and the Interest Rate Risk Ratio (Net Interest Income/Total Income). The Beta coefficient for IRR ratio is positive and significant for both 1% and 5% confidence level with a P-Value of 0.000. Its t-test value is 5.963 which is greater than the table value. Hence, the null hypothesis H_{05} is rejected. Thus, there is significant relationship between the net interest income to total income ratio and the usage of interest rate swap as a hedging tool. The coefficient of IRR ratio equals to 8.238 and its standardised coefficient Beta value is .830. Using the standardised coefficient and keeping all the other variables constant, if the IRR ratio increases by 100, interest rate swap ratio (Swap/Total Assets) will increase by 83. Thus, it can be concluded that the banks with high net interest income to total income ratio tend to be bigger users of interest rate swaps. It means the banks with more net interest income are exposed to more interest rate risk and hence, the tendency of banks to use interest rate swap is more.

Return Performance: From the Table V(a), it is clear that there is a negative relationship between the use of interest rate swap and return performance (measured by Profit Before Tax to Total Assets Ratio) of banks. The coefficient for the return performance is negative and significant for both 1% and 5% confidence level. Its t-test value is -5.404 and its absolute value is greater than the critical value. Hence, the null hypothesis H_{06} is rejected. Thus, there is significant relationship between the the profit before tax to total asset ratio and the usage of interest rate swap as a hedging tool. Further, it is found that there exists a negative relationship between the return performance ratio and the usage of the interest rate swap. The standardised coefficient Beta value is -0.718. Using the standardised coefficient and keeping all the other variables constant, if the return performance ratio increases by 100, interest rate swap ratio (Swap/Total Assets) will reduce by 71.8. Thus, it can be concluded that the profitable banks are not having any comparative advantage over the lesser or non-profitable banks, in using interest rate swap for hedging purposes.

Multicollinearity Test: From the table VI, it is clear that no two independent variables are highly correlated.

Table- VI Pearson Correlation Matrix

	LOGTA	AQ1	CAP	AQ2	ROTA	IRR	IRS
LOGTA	1	.043	.100	.140	.082	-.017	-.298
AQ1	.043	1	.463	-.643	.313	.471	.249
CAP	.100	.463	1	-.529	.391	.302	.613
AQ2	.140	-.643	-.529	1	-.245	-.431	-.231
ROTA	.082	.313	.391	-.245	1	.694	.070
IRR	-.017	.471	.302	-.431	.694	1	.402
IRS	-.298	.249	.613	-.231	.070	.402	1

X. LIMITATIONS OF THE STUDY

Following are the limitations of this study:

1. Lack of disclosure of interest rate swap data in a detailed form made this study challenging.
2. Difficulty in identifying the different forms of swaps such as plain vanilla fixed for floating swaps, index-amortizing swaps and other exotic types of swap contracts.

XI. SCOPE FOR FUTURE RESEARCH

This study has considered only six independent variables to know the determinants of interest rate swap usage by Indian banks. Future research studies may consider more variables such as board composition, degree of sophistication, and management preferences.

XII. CONCLUSION

This study led to the conclusion that the larger banks (as explained by the total assets) and profitable banks (as explained by the profit before tax to total asset ratio) do not seem to have any comparative advantage to use interest rate swaps for hedging purpose more intensively than smaller banks. But, the banks with more exposure to interest rate risk, high net worth, and higher loans to asset ratio tend to be larger users of interest rate swaps. In view of rapid growth of interest rate swap market in India and narrowing of bid-offer spreads, it is expected that the participation of banks in the swap market is going to be substantial than ever before.

REFERENCES

[1] Ahmed, A.S. Beatty, A. Takeda, C., (1997), Evidence on Interest risk management and derivatives usage by commercial banks, working paper, University of Rochester, NY.

[2] Arnold, t.S., 91984), How do to Interest Rate Swaps, *Harvard Business Review,* September/October, pp.96-101.

[3] Annual Reports of select Indian banks for the year 2007-08.

[4] Bicksler, J. and Chen, A.H., (1986), An Economic Analysis of Interest Rate swaps, *Journal of Finance,* Volume 41, July, pp.645-655.

[5] Borokhovich, Kenneth A. ; Brunarski, Kelly R. ; Crutchley, Claire E. ; Simkins, Betty J., (2004), Board Composition and Corporate use of Interest Rate Derivatives, *Journal of Financial Research.*

[6] Carter .D.A., & Sinkey, J.F., (1998), The use of interest rate derivative by end users: The case of large community banks, *Journal of Financial services Research,* pp.17-34.

[7] Colquit, L.L. & Hoyt, R.E., (1997), determinants of corporate hedging behavior, *Journal of Risk and Insurance,* Volume 64, pp.649-671.

[8] Gunther, J.W., & Siems, T.F., (1996), The likelihood and extent of bank participation in derivative activities, *Financial Industry Studies,* Federal Reserve Bank of Dallas, Dallas, TX.

[9] Haight, T.G., and Kehly, J.C.Jr.(1995), The role of derivatives as an Asset Management Tool, *Bankers Magazine,* Volume 178, No.3, May/June, pp.22-26.

[10] Hoa Nguyen, Robert Faff, (2002) On Determinants of derivate usage by Australian Companies, *Australian Journal of Management,* Volume 27.

[11] Julapa Jagtiani (1996), Characteristics of banks that are more active in swap market, *Journal of Financial Services Research,* Volume 10, N0.2, pp.131-141.

[12] Kangis, P, Elgar, J and Haar , L., (1998), The use of derivatives Instruments for Hedging Purposes, *Journal of Financial Services Marketing,* Volume 3,No.1, p.81.

[13] Nance, D., Clifford, W., Smith, Jr & C.W. Smithson, (1993), On the Determinants of corporate hedging, *Journal of Finance,* (March), pp.267-284.

[14] Prowess, Centre for Monitoring Indian Economy's data base, www.cmie.org.

[15] RBI Guidelines on Asset Liability Management Practices in Banks, http://www.rbi.org.

[16] Sung-Hwa Kim and G. D. Koppenhaver (1993), An Empirical Analysis of bank interest rate swap, *Journal of Financial Services Research,* Volume 7, No.1, pp.57-72

[17] Sun, T.S., Sundaresan, S., and Wang, C., (1993), Interest Rate Swaps: An Empirical Investigation, *Journal of Financial Economics,* Volume 34, No.1, pp.77-99.

[18] Simons, K., (1995), Interest Rate Derivatives and Asset Liability Management by commercial banks, *New England Economic Review,* January February, pp.17-28.

[19] Shanker, L. (1996), Derivatives Usage and Interest Rate Risk of Large Banking Firsts, *The Journal of Futures Markets,*Volume 16, No.4, pp.459-474.

[20] Valentine, T. (1995). "Banks' Management of Interest Rate Risk", University of Western Sydney Working Papers in Economics no. WP95*/04.*