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A Study on Financial Derivatives for Hedging Risk Management and Profit Maximization

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Abstract

The derivatives market is gaining recognition around the world as a response to the stock market. The importance of derivatives markets is recognized even by developing countries. The impact of derivatives has also been a source of worry among policymakers, practitioners, and regulators. Derivatives are being developed as more advanced, novel risk management strategies. Banks serve two purposes: maximizing profitability while ensuring sufficient liquidity. To achieve this goal, banks must systematically monitor, maintain, and manage their asset and liability portfolios, taking into account the varied risks that these sectors provide. Liquidity and interest rate risks are the two main categories of substantial risks on the balance sheet (IRR). Interest rate risk refers to the danger that interest rate changes pose to your earnings or investments. To this purpose, size, asset quality, capitalization, profitability, and interest rate risk profile of banks are regressed against the assumed principle of interest rate swaps stated in hedging operations. Large banks (defined as total assets divided by pre-tax profit) and Profitable Banks (defined as pre-tax profit divided by total assets) doesn't seem to have any significant advantage in using more interest rate swaps for the purpose of hedging. Small banks are also more likely to use interest rate swaps if they have a higher share of loans to high net worth assets and a higher exposure to interest rate risk.

Keywords: Derivatives, swaps, options, future, forwards, OTT, interest rate.

Introduction

Risk management has always been a vital topic that has sparked a great deal of study and research in the past. In today's fast-paced financial world, the dangers are exceedingly dynamic and continually changing. Gradual deregulation, globalization, and increased cross- border transactions make the banking environment not only more competitive, but also increasing uncertainty. Banks recognize

the importance of developing sound risk management practices and policies to protect banks from a variety of risks that may result in unexpected losses, depreciation or return of their assets. To stay competitive, banks are launching a slew of new products and swiftly improving existing ones, causing risk and management to evolve at a breakneck pace. Risk management is a popular topic in today's financial world, thanks to the present financial sector turbulence and the global impact of failing to follow sound risk management techniques.

Several sorts of risk management approaches have arisen in the last 30 years. By creating massive markets that create significant rewards by shifting certain types of risk, this strategy has transformed financial services. These tactics not only help the sector grow quicker by freeing up large quantities of cash, but they also help produce more value than competitors. Derivatives are increasingly being used by firms to control market risk by sending derivatives to intermediary market players such as banks.

Banks operate in a variety of economic systems around the world. Because some companies are based in rich countries and others are based in developing ones, the economic environments in which they operate varies. The three types of economic systems examined in this study (EU/US, India, and the Middle East) are highly distinct. The EU and the United States are developed countries, whereas the other two are developing nations. The Middle East, on the other hand, is a wealthy region with high per capita income and savings. In comparison to Indian banks, banks based in the EU/US (also termed as foreign banks in research) and the Middle East (UAE banks) are financially sound. Each economic model has its own set of benefits and drawbacks. In contrast to the more deregulated economy, the deregulated economy was the least harmed if the globe crumbled under the pressures of a recession. India is an example of a developing economy. Capital controls remain in place, and reliance on global demand is dwindling. Domestic demand in India, the world's second most populous country, remains strong, which may be the fundamental cause for the country's economic isolation from the global financial crisis. It is a developed country, an open economy, driven mostly by global supply and demand. During the global financial crisis, this type of economy was the hardest hit. In contrast, the Middle East has a cash-rich economy that is predominantly driven by oil and energy demand. By allowing foreign investors into the economy, it also creates a demand for hedging and risk management in the local market. In terms of market complexity and depth, the local derivatives market still has a long way to go.

Banks participate in the derivatives market in general because their traditional giving and borrowing actions expose them to financial market risk. Interest rate risk is a frequent financial risk in which a bank's profits change depending on the likelihood of market interest rate movements. Derivatives are an effective tool for controlling balance sheet risk because they make hedging residual and tail risks from commercial activity simple.

Data collection

The research was entirely on the secondary information, the analysis has been done with regards to derivative market along with sorted public and privatised banks. The data considered here consisted of data from 2013 to 2019, both included. Here to calculate the default probability of the respective banks financial ratios and other

data is taken into computation and tried to find out the default and non-default probabilities in a year advance. The financial ratios and other basic information were collected from Money control database, NSE, BSE and also RBI official webpages. Accordingly, we carried out the estimation of default probability of banks with respect to their interest rate and is it having significance difference between larger banks and smaller banks with regression models, descriptive statistics, anova test and correlation matrix and other models

Section I: Methodology used in the study

Variables chosen for the study

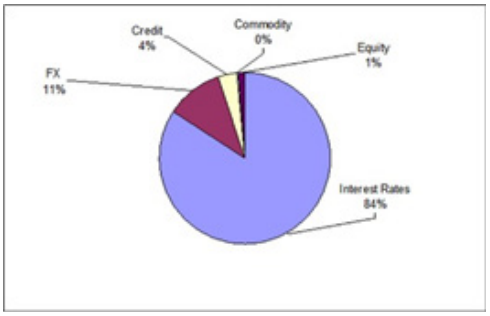
Characteristics	Proxy variable
Size (LOGTA)	Logarithm of Total Assets
Asset Quality (AQ1)	Net Loans & Advances / Total Assets
Asset Quality (AQ2)	Provision for NPA / Total Loans & Advances
Capitalisation (CAP)	Networth / Total Assets
Interest Rate Risk (IRR)	Net Interest Income/ Total Income
Return Performance(ROTA)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

Global Over the counter Derivatives Market – Amount outstanding in US$ billions

	Notional amount outstanding			Gross market value		
	end-June	end-June	end-June	end-June	end-June	end-June
	2012	2015	2018	2012	2015	2018
GRAND TOTAL	**507,907**	**582,655**	**692,908**	**11,118**	**24,673**	**20,158**
A. Foreign exchange contracts	**57,604**	**62,933**	**81,025**	**1,613**	**3,158**	**2,613**
Forwards and swaps	29,775	31,935	39,575	668	1,330	1,082
Currency swaps	14,130	18,890	26,318	666	1,372	1,170
Total options	13,662	12,107	15,077	279	456	362
Other	37	1	56	....	....	....
B. Interest rate contracts	**381,359**	**478,093**	**577,269**	**6,730**	**18,508**	**15,683**
Forward rate agreements	25,607	60,028	89,434	145	204	276
interest rate swaps	299,155	367,541	437,066	5,818	16,703	14,054
Total options	56,587	50,519	50,191	767	1,600	1,352
Other	7	5	579	....	....	....
C. Equity-linked contracts	**9,518**	**6,868**	**6,963**	**1,212**	**796**	**707**
Forwards and swaps	2,668	1,854	2,350	262	202	209
Total options	6,850	5,013	4,614	950	595	498
D. Commodity contracts	**8,255**	**3,273**	**2,727**	**656**	**492**	**394**
Gold	1,051	669	610	56	52	83
Other	7,204	2,604	2,117	600	439	312
Forwards and swaps	3,481	1,686	1,403	....	....	....
Options	3,724	918	715	....	....	....
E. Credit derivatives	**51,095**	**31,416**	**24,845**	**906**	**1,708**	**732**
Forward and swaps	49,974	31,331	24,497	....	....	....
CDS	45,179	31,059	24,470	768	1,694	728
Single name instruments	25,104	18,806	13,211	430	1,012	432
Multi name instruments	20,075	12,251	11,259	338	682	296
Index products	-	7,614	10,170	....	....	....
Options	1,121	85	348	....	....	....
F. Other derivatives	**78**	**72**	**78**	**1**	**12**	**29**
Forwards and swaps	73	38	63	....	....	....
Options	6	34	15	....	....	....
GROSS CREDIT EXPOSURE	....	....	....	**2,672**	**3,578**	**3,900**
Memo: Exchange traded contracts	*95,097*	*75,418*	*66,311*	....	....	....

Source: BIS Semiannual OTC Derivatives Statistical release

At the end of June, the nominal balance of over-the-counter derivatives was $ 693 trillion (Table 1). Dealers who took part in the Semi-Annual Survey reported $668 trillion, whereas dealers who only took part in the Triennial Survey reported $25 trillion. These decreases are partly attributable to exchange rate swings, which affect the value of dollars in yen-denominated contracts. Between the end of December and the end of June, they increased to $ 8.9 trillion. The greatest proportion attained by growing to 19 percent exposure in respect to overall market value. In terms of geographic distribution of OTC derivatives sales, the United Kingdom has cemented its position as a major financial centre for OTC interest rate derivatives trading. Sales in the United Kingdom increased by 9% to $1.348 trillion, accounting for less than half of the global total. Revenues in the United States fell 2% to $628 billion, or 23% of total revenues, reflecting a drop in dollar interest rate contract share.



Outstanding value of OTC Derivatives by asset types (in US$ trillions)

Turnover in Indian Derivatives Market in Rs. billion

Year/ Month	Equity Derivatives				Currency Derivatives			Interest Rate Derivatives
	Index Futures	Index Options	Stock Futures	Stock Options	Forward	Swap	Exchange Traded Currency Options and Futures	Interest Rate Swap
1	2	3	4	5	6	7	8	9
2014-15	43,569	172,694	54,958	10,303	28,902	41,125	84,153	47,464
2015-16	37,564	233,384	40,849	9,786	24,134	46,876	98,964	51,238
2016-17	26,496	298,091	42,273	20,107	53,185	50,616	87,105	41,953
Q1-18	7,216	88,264	11,354	6,349	6,291	10,451	30,086	14,543

Source: RBI, BSE, NSE, CCIL, USE and SEBI.

Interest Rate Swap Trade Summaries in Rs. Billion

	MIBOR		MIFOR		INBMK		Total	
Period	Trades	Notional Amount	Trades	Notional Amount	Tra des	Notional Amount	Trades	Notional Amount
	79,495	47,281	181 39	6,476	385	144	980 19	53,901
2012-13	81.10 %	87.72%	18.51 %	12.01%	0.39%	0.27 %		
2013-14	40,912	26,448	4,799	2,237	132	66	458 43	28,751
	89.24 %	91.99%	10.47 %	7.78 %	0.29%	0.23 %		
2014-15	20,352	14,521	1,050	539	77	51	214 79	15,111
	94.75 %	96.10%	4.89%	3.56 %	0.36%	0.34 %		
2015-16	33,057	23,597	1,291	749	150	88	344 98	24,434
	95.82 %	96.58%	3.74%	3.07 %	0.43%	0.36 %		
2016-17	33,642	24,510	2,101	1,100	14	9	357 57	25,619
	94.09 %	95.67%	5.88%	4.29 %	0.04%	0.03 %		
2017-18	22,713	20,216	1,252	754	11	6	239 76	20,977
	94.73 %	96.37%	5.22%	3.60 %	0.05%	0.03 %		

Source: RBI, BSE, NSE, CCIL, USE and SEBI

1.2 Research Methodology

Data has been analysed using statistical tool JMP software, Descriptive statistics, Pearson co-relation, KMO and Bartlett's test, and Correlation Hypothesis.

1.3 Tools and Techniques

The reliability analysis is the statistical tool in the JMP software which is used to verify the collected data is valid or not. Descriptive analysis is done to understand the mean response of the end users for the variables. Factor analysis is done to scale the variables. This will reduce and group the variables into factors. All dependent and independent variables used in this analysis.

Analysis of the Data

Interest rate swaps 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				

Descriptive Statistics - Variables of Analysis

The variables employed in this study's descriptive statistics. The average floating rate swap (nominal amount / total assets of interest rate swaps used for hedging purposes) is 17.20%, with a range of 0.035 percent (Banks of India-Public Sector Banks) to 356 .The asset health 1 ratio (net lending and prepaid / total assets) averaged 57.84 percent (Bank of India —Public Sector Bank), ranging from 46.69 percent (HDFC Bank Ltd) to 62.96 percent (Singapore Banking Corporation). The average asset health 2 ratio (provision for non-performing assets / total loan and prepayment) was 0.75 percent, ranging from 0.22 percent to 1.91 percent (Private sector bank). The average bank's total assets are INR 1363589.47 million. The state- owned bank of India (India's main banking and public sector banks) was the largest bank in the sample, with a total worth of 7221250.9 million INR, while the smallest is Karnataka Bank, with INR 193552 million (it was a department bank). Bank capital ratios (net / total assets) range from 3.25 percent to 12.69 percent. Interest rate risk (net interest) is a metric used to assess the risk of interest rates rising. / gross profit) ranged from 6.54 percent for IDBI Bank to 41.37 percent for HDFC Bank, indicating that both banks are exposed to relatively low interest rate risk, averaging 26.54 percent. The average rate of return (profit before taxes / total assets) is 1.26 percent, with a range of 0.49 percent (Indusind Bank) to 2.14 percent (State Bank of India) (Indian Bank).

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

Model Summary

The model's RSquare is 86.4 percent, and the model's modified RSquare is 81.6 percent. This suggests that changes in the independent variable (IRS / TA) account for 81.6 percent regarding to dependant variables variations (IRS / TA).

However, while RSquare value in this study appeared to be high, it did not account for other factors that influence the adoption of interest rate swaps, such as bank operational evaluation and complexity. Aside from assisting with effective proxy selection,

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

Analysis of Variance

Using ANOVA, we can find that the model's F-test is equal to 18.050. With 6 degrees of freedom, this F-number is more than the threshold at the 1% significance level, which is 2.79. As a result, we can deduce that at least three independent factors influence the dependent variable in a meaningful way.

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

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

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

Clearly, the use of interest rate swaps and the scale of banks have a negative relationship. It's worth noting that the asset log factor is negative at both the 1% and 5% confidence levels. The ttest value is 4.173, which is bigger than the absolute value in the table. As a result, the size of a banks and its utility of interest rate swaps as a hedging strategy are strongly linked. It was also revealed that the amount of assets held by a bank and the use of interest rate swaps have a negative relationship. The beta value is 0.39. If you apply a standardized factor and maintain all other factors constant, the rate of interest rate swaps (Swap / Total Assets) decreases by 39 as the total asset size log increases by 100. As a result, there is no comparative advantage over small banks when using interest rate swaps for hedging purposes (larger, better at expertise and technology).

TRADES

ANOVA[a]

MIBOR		Sum of Squares	df	Mean Square	F	Sig.
1	Between Groups	.011	1	.011	8.626	.043[b]
	Within Groups	.005	4	.001		
	Total	.016	5			

a. Dependent Variable: Trades

b. Predictors: (Constant), Time_frame

ANOVA[a]

MIFOR		Sum of Squares	df	Mean Square	F	Sig.
1	Between Groups	.004	1	.004	9.996	.034[b]
	Within Groups	.002	4	.000		
	Total	.006	5			

a. Dependent Variable: Notional_amount

b. Predictors: (Constant), Time_frame

Notional Amount

ANOVA[a]

MIBOR		Sum of Squares	df	Mean Square	F	Sig.
1	Between Groups	.004	1	.004	8.742	.042[b]
	Within Groups	.002	4	.000		
	Total	.006	5			

a. Dependent Variable: Notional_amount

b. Predictors: (Constant), Time_frame

ANOVA[a]

MIFOR		Sum of Squares	df	Mean Square	F	Sig.
1	Between Groups	.011	1	.011	9.372	.038[b]
	Within Groups	.005	4	.001		
	Total	.016	5			

a. Dependent Variable: Trades

b. Predictors: (Constant), Time_frame

Correlation Analysis for Mibor and Mifor with Inbmk

Correlations

		Inbmk	Mifor
Inbmk	Pearson Correlation	1	.790
	Sig. (2-tailed)		.000
	N	6	6
Mifor	Pearson Correlation	.790	1
	Sig. (2-tailed)	.000	
	N	6	6

Correlations

		Inbmk	Mibor
Inbmk	Pearson Correlation	1	.762
	Sig. (2-tailed)		.000
	N	6	6
Mibor	Pearson Correlation	.762	1
	Sig. (2-tailed)	.000	
	N	6	6

We may deduce from the analysis that the qualities have a favourable relationship. This indicates that the dependent variable and the independent variable have a strong association. This is a positive indication that swap derivative implementations in the Indian market are progressively expanding in comparison to the Indian benchmark. Interest rates will be dramatically boosted as well.

Section II: Conclusions and research implications, suggestions for further research and limitations of this research:

This research led us to the conclusion that when it comes to using interest rate swaps for hedging, There does not appear to be a comparative advantage between major banks (measured by total assets) and profitable banks (measured by pre-tax profit to total assets). Smaller banks have a higher asset concentration than larger banks. Banks with a significant credit exposure to high net worth assets and interest rate risk, on the other hand, are more likely to adopt interest rate swaps. Given that the Indian interest rate swap market's rapid growth and falling bid-offer spreads, banks' participation in the swap market is projected to be higher than before. Interest rate swaps are commonly used by banks that are substantially exposed to interest rate risk and lend heavily to affluent assets. Derivatives markets and products are very dynamic and have been growing rapidly as one of the most important segments of capital markets. Derivative implementation is gradually increasing. Option strategies are always considered based on attributes and factors such as risk, rewards, premium value, and time corrosion, and technical analysis and proper timing and knowledge strategies improve profitability. Consideration of the Indian benchmark standards INBMK, MIBOR and MIFOR confirms that the utility of products derived from India has increased significantly in relation to the positive correlation.

Future Directions

Only six independent factors were evaluated in this study to determine the determinants of Indian banks' adoption of interest rate swaps. Factors, such as board structures, sophistications, and management evaluation, are also factors to consider. Should be considered in future studies. Consider additional factors such as the structure of the board of directors, the level of complexity, and management evaluation. Risk management and derivatives can be learned from a great variety of angles. It is difficult to limit derivatives to specific topics of research. New regulations around the world are increasing the transaction costs of derivatives that will affect banks. Cost-benefit studies highlighting the same can

be undertaken to understand the future of derivatives in risk management and trading policy.

Limitations of the study

- Lacking in research of complete disclosure of interest swap rate data and its not been easy.
- Different sorts of swaps, such as basic vanilla index amortization, swaps, pegged to floating swaps and other complex types of swap contracts, are difficult to specify.
- Assumed that the most widely utilised volume indicator in the futures market is Assume Original, and that there is no reliable indication of credit risk.

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