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A Study on Interest Rate Risk of Commercial Banks

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Abstract: From April, 2012-March, 2017, the 5 years Government Bond rised by 200 basis points and is continuing to rise from thereafter. Many banks have profited handsomely from this rise in interest rates. Since, interest rates cannot continue to rise indefinitely, there can be a question. Is the banking system adequately prepared for a scenario with change in interest rates? In this study, investigation has been made on the effects of interest rates volatility on stock market returns using daily returns on stocks of 20 selected commercial banks which includes public sectors and private sector banks over the period from 1st April, 2012 -31st March, 2017. In this study, 'augmented market model' has been used to estimate, the elasticity of returns on the stock against returns on the stock market. To estimate short and long term zero coupon bonds among variables, weekly data for the period ranging from April, 2012 to March, 2017 have been analyzed by applying GARCH Model. The repressors used in this model can be interpreted as the return on a portfolio where the long bond is purchased using borrowed funds at the short rate. The return on selected banks and market return required for the study are obtained from the NSE website. We created time-series of notional bond returns on the 28 days and the 10 year zero coupon bond, priced off the NSE zero coupon yield curve for short term and long term returns, respectively. The results indicate that interest rates have a strong positive power for stock returns and weak predictive power for volatility by using GARCH Model. It has been found that out of 20 banks in our sample would be gained or lost 30% of equity capital in the event of a 200 bps move in the yield curve. The stock market sensitivities suggest that there is strong heterogeneity across banks in India in their interest rate exposure. The stock market is unaware of interest rate risk when valuing bank stocks.

Key words: Interest rates volatility, stock return, market return, return on long term bonds, return on short term, predictive

INTRODUCTION

The fundamental business of lending has brought trouble to individual banks and entire banking system. Increase in interest rate leads to prevent capital outflows which bring about obstruction of economic growth (Babajide *et al*., 2016). In developing countries, interest rate risk plays an imperative and decisive role in the world. Patnaik and Shah (2002) From April, 2012 to March, 2017, the 10 years interest rate on government bonds rised by 200 basis points and is continuing to rise. Many banks have profited handsomely from this rise in interest rates. India has one of the highest levels of interest rate volatility in the world. This interest rate volatility appears to be consistent with the crawling peg currency regime in the context of a capital account that is being slowly liberalized. The predominance of interest rate risk is even reflected in the composition of economic capital which banks are required to keep a side for protection against various risks. In the Indian experience, bank fragility and bank failure has (in the past) been primarily caused by bad loans. A bond that has duration of 10 years suffers a loss of roughly 10% when the long rate goes up by 200 basis points. Hence, the study and the measurement of interest rate risk are essential for the banks. In this study, we use measurement of the interest rate sensitivity of the stock price for judging the interest rate risk of banks. When interest rates fluctuate, stock market speculators are likely to utilize their understanding of the exposure of each bank in forming the share price.

Objectives of the study: The present study attempts to achieve the following objectives:

- To analyze the effects of interest rates risk on market returns
- To analyze the impact of short term and long term interest rate volatility of Nifty Bank index
- To analyze Nifty Bank index on interest rate risk
- To develop a proposed model for the measurement of interest rate risk of commercial banks

Literature review: Ali *et al*. (2015) have found the causes of interest rate risk return have always been a

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subject of interest of micro economists all over the world. Research on interest rate risk began with interest rate risk with a strong positive power for the stock returns and weak predictive power for the volatility. Inflation has positive relation while interest rate and money supply have inverse relationship with exchange rate volatility. This area in India still remains unexplored. Some of the researchers in other country are being presented below in chronological order. Stephan *et al*. low interest rate risk has resulted in decline in past 5 years (Mehra and Sinha, 2016). The drop in interest rate risk has lead to substantial profit or loss in large investment portfolio. India's total revenue and total expenditure of the government are the factors that are expected to rise in the interest rate risk. In addition, to total expenditure of the government and total revenue, there is a possibility of increase in the debt due to monetization that could change the interest rate risk. This interest rate volatility appears to be consistent with the crawling peg currency regime in the context of a capital account that is being slowly liberalized. Narayanarao *et al*. (2012) found that an open interest rate risk helps the basic models which predict the future volatility. It has been reported that out of 32 selected commercial banks which includes private and public sector banks, 10 out of 32 banks in the sample, over 25% of equity capital would be gained or lost. It has also been reported that banks holding similar portfolios of the government securities seem to have rather different interest rate risk exposures. Patnaik and Shah (2004) has found that banks holding similar portfolios of government securities seem to have rather different interest rate risk exposures rate of returns and monthly exchange rate is mainly used in order to calculate interest rate risk returns. It has also been concluded that interest rate risk returns contains information regarding the future interest rate at least to some extent. The predominance of interest rate risk is even reflected in the composition of economic capital which banks are required to keep a side for protection against various risks. Sinan *et al*. has found that banks that engage in both buying and selling of loans are better able to take advantage of positive net-present-value investment opportunities as they are able to increase their C&I and commercial real estate loans and are better able to manage with less liquidity and less capital. Researchers on interest rate risk have proved that increase in money in the bank has lead to decrease in the price level and resultantly the enhancement in the exchange rate volatility. By applying the GARCH (Generated Auto Regressive Heteroscedasticity) Model interest rate risk is persistent and serially correlated.

MATERIALS AND METHODS

Theoretical model: The model composes of four variables which depict the interest rate risk returns on stock market returns of commercial banks (Patnaik and Shah, 2004):

$$(R_{st}-R_{stb}) = \alpha+\beta_1(R_{mkt}-T_{stb})+€$$

Where:
R_{stb} : The return on short term bond
R_{st} : The return on stock
R_{mkt} : The return on market value

GARCH Model: The ARCH Model is appropriate when the error variance in a time series follows an Autoregressive (AR) Model if an Aautoregressive Moving Average Model (ARMA) model is assumed for the error variance, the model is a Generalized Autoregressive Conditional Heteroscedasticity (GARCH) Model.

Table 1 shows the volatility clustering of the daily return series of the twenty commercial banks which shows that there are long and short periods of low and high fluctuations and variations in the particular periods followed by respective high/low volatility. We also find residuals in the pattern this is the justification of the ARCH family models. The best tool to measure the volatility is GARCH Model which is use to find the volatility of the spot market. GARCH Model is widely used in financial markets researches but have many versions. It encompasses a broad class of models that estimate and predict the volatility and the correlations between different assets:

$$\sigma_t^2 = ¥+\beta.\sigma^2_{t-1}+\alpha.X^2_{t-1}$$

where γ, α and β are the predicted parameters.

Data: The weekly data of all the variables from 2012-2017 has been collected from NSE database and the sample of these consists of 262 observations. The close price of 13 private sector banks and 7 public sector banks has been taken in order to calculate the returns. When this model is estimated using data over a given period, it gives us an estimate β_2 of the average interest rate sensitivity over this period.

The GARCH Model can be estimated using daily or weekly data. In an ideal efficient market, information that impacts upon interest rates should get absorbed into the equity price on the very same day. In our study weekly data is considered for the study.

In an ideal efficient market, the R_{mkt}, R_{ltb} and R_{st} time-series should be free of serial correlations. In the real world, many market imperfections may exist, particularly in the case of the government bond market which suffers from non-transparency, barriers to access, regulatory constraints on short selling, etc. Hence, we find strong serial correlations in the time-series of R_{ltb} and R_{st} stock market returns at time t are likely to respond to the

Table 1: Results of estimated GARCH Model, ARCH (1, 1) Model, Equation: $\sigma^2_t = ¥+\beta.\sigma^2_{t-1}+\alpha.X^2_{t-1}$

	Mean equation			Variance equation		
Company	A_0	A_1	A_2	α_0	α_1	β_1
Axis Bank	-0.9894	8.0645 **	-1.5294**	0.7018	-30.9841**	0.9226
	0.3224	0.0000	0.1262	0.4828	0.0000	0.3562
HDFC Bank	2.3032	36.4984**	4.3274**	0.7174	1.1569	18.3059**
	0.0213	0.0000	0.0000	0.4731	0.2473	0.0000
SBI Bank	-1.3991	6252.7*	*0.0230	-0.2382	-20.6801**	188.62**
	0.1618	0.0000	0.9816	0.8117	0.0000	0.0000

**Indicates statistical significance at 1% level

volatility in interest rates at time t and not the raw returns seen on the short and long government bond. Mathematically, we estimate a 'GARCH Model' of the form:

$$(R_{st}-R_{stb}) = \alpha+\beta_1(R_{mkt}-R_{stb})+\beta_2(R_{ltb}-R_{stb})€$$

Where:
R_{stb} : The return on short term bond
R_{st} : The return on stock
R_{mkt} : The return on market value and
R_{ltb} : The return on long term bond

An example; SBI: As explained in earlier, we estimate the model:

$$(R_{st}-R_{stb}) = \alpha+\beta_1(R_{mkt}-R_{stb})+€$$

One example of these estimates for SBI is shown, here. We report weekly data. In all cases, we find that H_0: Ц = 0 is not rejected.

As with stock betas, β_2 is interpreted as elasticity. For example, in the results for raw weekly returns, it appears that in a week where the long bond (R_{ltb}-R_{st}) lost 1%, SBI shares changes by 0.8561% on average.

RESULTS AND DISCUSSION

We obtain estimates using weekly data for the GARCH Model. We research via. the raw returns. This gives sets of estimates for each bank. Table 2 and 3 shows the coefficient β_2 and the t statistic for this coefficient. The table is sorted by the coefficient value with weekly data using the raw (R_{ltb}-R_{st}) as an explanatory variable.

In the case of SBI which is the most liquid bank stock in the country, we see strong t statistics of 1.07 with weekly data (Vaz *et al*., 2008). Apart from this, most of the banks show stronger coefficients with weekly data. This suggests that the stock market is not able to rapidly absorb information about interest rates in forming bank stock prices.

For roughly one third of the banks in our sample, the null H_0: $\beta_2 = 0$ can be rejected at a 95% level of significance, for one or more variants of the augmented market model. The coefficients seen here are economically significant, suggesting significant interest-rate exposure on the part of these banks.

Our results suggest that in addition to credit risk, interest rate risk is also important in India's banking system. The potential impact of interest rate shocks, upon equity capital of many important banks in the system, seems to be economically significant.

Table 2: Private bank

Name of the banks	α	β_1	t-values	R^2
Axis Bank	-0.4345	1.2815	-1.20	34.1
			11.32	
Federal Bank	-0.4987	0.8502	-1.11	13.0
			6.08	
HDFC Bank	0.1567	0.67258	1.56	64.9
			21.41	
ICICI Bank	-0.5654	1.2172	-1.59	32.6
			10.94	
Karnataka Bank	-0.1954	1.26563	-0.67	43.9
			13.94	
Kotak Bank	-0.0099	0.81437	-0.04	29.5
			10.18	
Yes Bank	0.1391	1.39158	0.64	62.6
			20.36	

Table 3: Public bank

Name of the bank	α	β_1	t-values	R^2
Alahabad Bank	-0.3506	1.00748	-1.61	66.10
			22.01	
Andhra Bank	-0.2390	0.95150	-1.11	64.10
			21.04	
Baroda Bank	-0.2511	0.95305	-0.66	36.10
			11.84	
Bank of India	-0.3341	1.09050	-1.63	72.20
			25.39	
Canara Bank	-0.1292	1.10268	-0.63	72.80
			25.39	
Central Bank	0.0731	0.72522	0.27	39.30
			12.66	
City Union Bank	0.4677	0.35663	2.19	20.30
			7.94	
Corporation Bank	-0.5203	0.68824	-1.34	22.40
			8.45	
DCB Bank	0.6056	0.55456	2.07	24.80
			9.04	
Dena Bank	-0.2922	0.82547	-1.24	52.70
			16.63	
IDBI Bank	-0.0647	0.95572	-0.28	60.50
			19.50	
SBI	-0.2682	0.85619	-0.70	10. 5 7
			10.57	
Vijaya Bank	0.0810	0.72776	0.36	48.40
			15.27	

Our results highlight the consequences of stretching out the yield curve for banking system fragility. While stretching out the yield curve is a sound strategy for public debt management, it can generate vulnerabilities in the banking system. If there is a sense that the banking system is vulnerable in the event of an increase in interest rates, it could have deleterious consequences by constraining the conduct of monetary policy at RBI.

Finally, the techniques used in this study can be effective in throwing up names of banks in the top quartile by the vulnerability to interest-rate fluctuations. Our results suggest that all banks except Allahabad Bank appear to be much more vulnerable to interest rate risk. These techniques could be used by banking supervisors in identifying the most vulnerable institutions and putting a special focus on their risks.

CONCLUSION

Interest is the primary wellspring of salary for a bank. Estimating loan cost chance is a testing assignment and is made much more troublesome for safe establishments in light of the vulnerability with respect to center store conduct and the alternatives inserted all through their accounting reports. An unfavorable development in loan fee hazard may possibly: increment getting costs for borrowers, decrease returns for speculators, lessen benefit of banks and diminish the Net Present esteem (NPV) of associations because of the impact of changes in the rebate rate (financing cost) on the estimation of money related instruments, supports and the arrival on ventures. So, we can see that an antagonistic development in the financing cost may cause misfortune for the bank if the bank neglects to make legitimate strides for the administration of loan fee chance. Financing cost risk management is essential for any bank. On the basis of empirical evidence it is concluded that interest rate have increase relationship with exchange rate volatility. Short term and long term a bond exists between exchange rate volatility. Increase in interest rate leads to increase in output, so, price level also increases.

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