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TREASURY BILL YIELDS AND VOLATILITY: EVIDENCE FROM INDIAN TREASURY BILL MARKET

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Abstract- The study is investigating the volatility behaviour of short Treasury bill yields of India by applying GARCH (1, 1) model. The frequency of data used in the study is weekly from 2000 to 2021. The results suggest that Treasury bill yields of 3 months, 6 months and one year in India are highly volatile. The findings provide sufficient evidence that Indian Treasury bill yields are significantly volatile during entire study period. The results also show that corresponding probability value is significant at 1%. That reveals that Treasury bill yields of India are highly volatile at confidence level of 99% during study period i.e. 2000 to 2021.
Keywords: Treasury Bills, volatility, India, Garch (1, 1) model.

1. INTRODUCTION

Indian debt market acts as a useful substitute of the banking institution for finance; it is one of the largest debt markets in Asia. The biggest advantage of debt market is assured return and safety of principle amount, which makes debt market as a safe investment avenue or risk free, the rational investors are always curious and worried about their current and future return of their investment, so debt market attracts the rational investors to make their investment confidently. It leads increase the demand of bonds in the security market. Government debt market has dominated Indian debt market because of its assurance, risk free and liquidity. Indian debt market mainly classified in to two that is government bond market and corporate bond market, certificate of deposit, commercial papers, treasury bills etc. are the major securities traded in the Indian debt market. Volatility of the debt market plays a vital role in investment decisions of investors. The highly volatile debt market may reduce the confidence of investors and it may results the withdrawal of investors from debt market.

2. EXISTING LITERATURE

Manish Kumar (2015): Studied Returns and volatility spill over between stock prices and exchange rates empirical evidence from IBSA countries. The study used VAR framework and the recently proposed Spill over measure of Diebold and Yilmaz to examine the returns and volatility spill over between exchange rates and stock prices of IBSA nations. In addition, the multivariate GARCH with time varying variance-covariance BEKK model is used as a benchmark against the spill over methodology proposed by Diebold and Yilmaz. The results confirm the presence of returns and volatility spill overs within the IBSA nations and, in particular, the stock markets play a relatively more important role than foreign exchange markets in the first and second moment interactions and spill overs.

Pedro Pire's et.al, (6 July 2016): examined Sovereign bond markets and financial volatility dynamics Panel-GARCH evidence for six-euro area countries. This paper explores the integration of the EMU sovereign bond market by examining the dynamics of 10-year government bond yield spreads and their volatility throughout the period 2007.01–2016.06through an original Panel-GJR-GARCH-M model, they find overwhelming evidence of highly persistent volatility processes in these sovereign bond markets as well as positive and relatively high cross-correlations among them. These patterns were particularly significant throughout the turbulent period 2007–2012.

Jack Bao and Jun Pan (2017): a study on excess volatility and its drivers in the corporate bond market. They examine the connection between the return volatilities of credit market securities, equities, and Treasuries using the Merton (1974) model with stochastic interest rates. To calculate model-implied corporate bond and CDS return volatilities, and they use Treasury bond and equity return volatilities as inputs in the Merton model. In Merton model with stochastic interest rates and equity volatility as the primary input. Finally they find that the empirical volatilities of corporate bond and CDS returns are higher than implied by equity return volatilities and the Merton model. This excess volatility may arise because structural models inadequately capture either fundamentals or illiquidity.

Francis A. Longstaff and Eduardo S. Schwartz (1993): studied Interest Rate Volatility and Bond Prices. This paper shows that the price risk inherent in a default free bond has two major sources the risk of changes in the level of interest rates and the risk of changes in the volatility of interest rates. The volatility risk of a bond can be an important component of its total risk, but few managers currently hedge fixed income portfolios against volatility risk. And they prove that changes in the volatility of interest rates can have large effects on the prices and yields of bonds. These effects bear little or no relation to the duration or convexity of the bond. In fact, these

effects have the greatest impact on the prices and yields of intermediate-term bonds. The sensitivity of bond prices to changes in volatility has many important implications for fixed- income portfolio managers.

Jones et al. (1998) found that new information coming from release of macroeconomic announcements is immediately incorporated in bond prices.

Andersen et al. (2003, 2007) investigated the reactions of stock, bond and foreign exchange markets and found that macroeconomic news causes conditional mean jump.

Suk-Joong Kim et al. (2003) found that markets do not respond to the news announcements; rather it is news content of these announcements, which makes markets to react.

The main objective of this study is to evaluate the volatility of Treasury bill yields of 3 months, 6 months and 1 year in India by applying GARCH (1, 1) model, this model was applied because it enables researcher to know whether volatility is internal or it is affected by external factors.

Hypothesis:

H0: There is no volatility in Treasury bill yields of India

H1: Treasury bill yields of India are volatile.

3. DATA AND METHODOLOGY

The data used in the study is secondary in nature and has been collected from BSE of India. The frequency of data used in the study is weekly from 2000 to 2021 covering a period of 22 years. The data used in the study is stationary at First Difference.

3.1 Analysis of Data

Table-3.1 Unit Root Test or Stationarity of Data

Variable	ADF test (prob. value)	
	Level	First diff.
One year	0.4837	0.0000
6 months	0.2136	0.0000
3 months	0.2552	0.0000

The results in the table 3.1 shows that the data of all the three Treasury bills are not stationary or is having unit root at level but the data is stationary at first difference. So we used data at first difference for further analysis.

Table-3.2 Descriptive Statistics

Variable	Mean	Std. deviation	Skewness	Kurtosis	N. stat.
One year	0.0000	1.392	-.252	.088	779
6 months	0.0000	1.572	-.175	-.815	779
3 months	0.0000	1.648	-.144	-.697	779

The results in the table 3.2 show that the mean value of all the three Treasury bill yields of India are same during study period. The standard deviation also does not vary significantly in all three Treasury bill yields. The value of kurtosis as well as skewness also shows value less than one in all the three maturities which means the data is normally distributed and we can use it for further analysis.

Table-3.3 Volatility Behaviour of Sovereign Bond Yields Over the Excess of Their Average

Variable	One year	6 months	3 months
Arch(1)	0.0000	0.0000	0.0000
Garch (1)	0.0000	0.0000	0.0000

The results in the table 3.3 reveal that 3 months Treasury bill yields, six months Treasury bill yields and one-year Treasury bill yields over the excess of average yields of 3 months treasury bill are significantly volatile during study period i.e. 2002 to 2016. The value of both Arch and Garch tests are significant at 1% level. Therefore, we can conclude that Treasury bill yields of India are highly volatile. Therefore, we reject null hypothesis in favour of alternative hypothesis, means that all the three Treasury bill yields of India are highly volatile.

Table-3.4 Volatility Behaviour of Sovereign Bond Yields Without Deducting Average Yields

Variable	One year	6 months	3 months
Arch(1)	0.0000	0.0000	0.0000
Garch (1)	0.0000	0.0000	0.0000

The results in the table 3.4 reveal that 3 months Treasury bill yields, six months Treasury bill yields and one-year bond yields are significantly volatile during study period i.e. 2002 to 2016. The value of both Arch and Garch tests are significant at 1% level. Treasury bill yields of India are highly volatile. So we reject null hypothesis rather we accept alternative hypothesis, means that sovereign bond yields of India are significantly volatile.

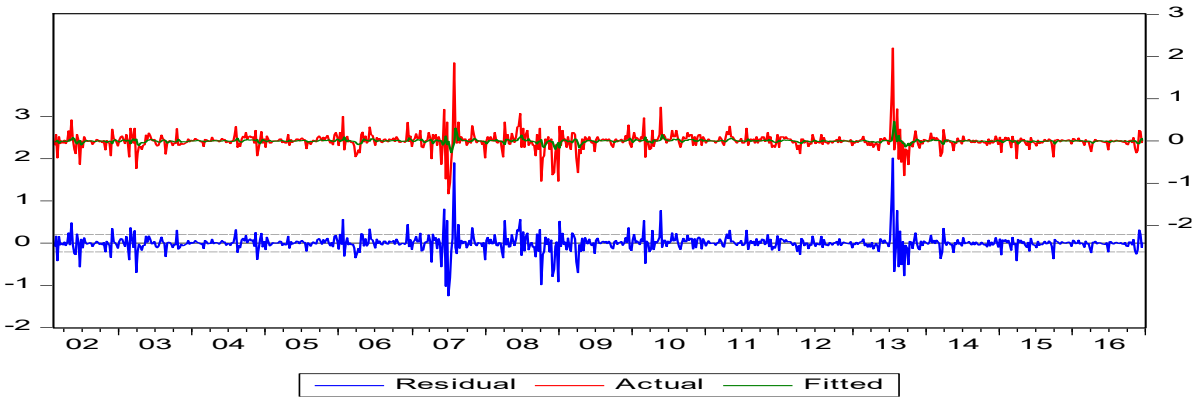

Fig. 3.1 The Volatility of Three Month Treasury Bill of India

The Fig. 3.1 shows that three months Treasury bill yields are volatile during entire study period. However, the three months Treasury bill yield were showing significantly high volatility during 2007, 2008 and 2014.

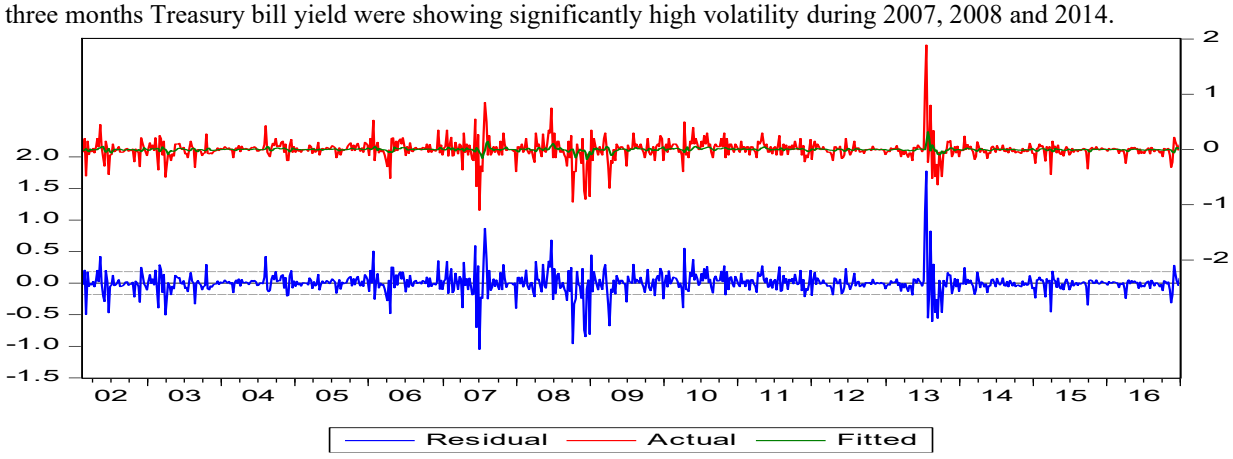

Fig. 3.2 The Volatility of Six-Month Treasury Bill of India

The Fig. 3.2 shows that six months Treasury yields are volatile during entire study period. But the six months Treasury bill yield were significantly high volatile during 2007, 2008 and 2013

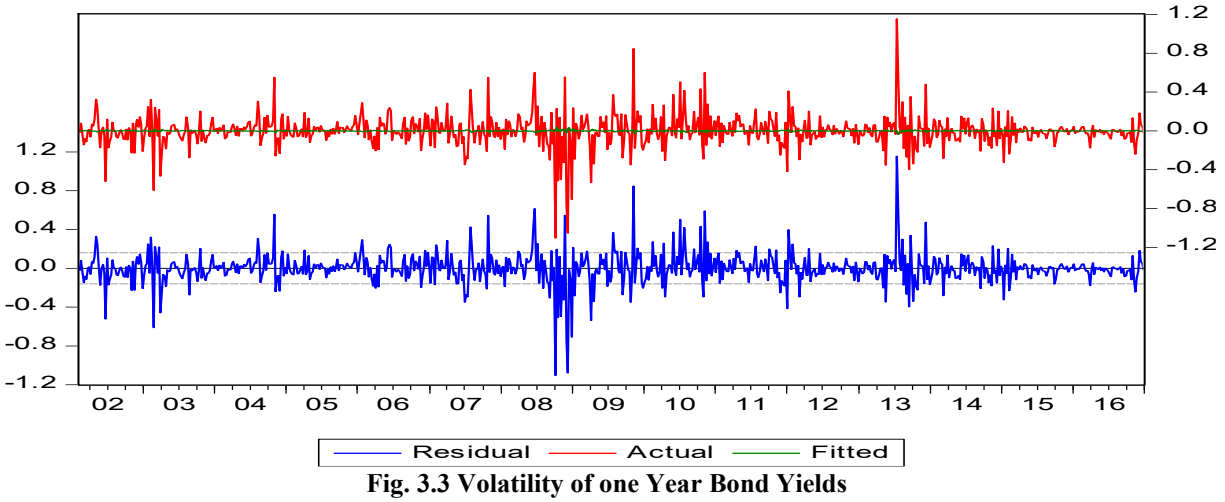

Fig. 3.3 Volatility of one Year Bond Yields

The Fig. 3.3 shows that one-year bond yields are volatile during entire study period. But the one year sovereign yield were significantly high volatile during 2008 and 2013

CONCLUSION

The main objective of the study was to investigate the volatility behaviour of Treasury bill market of India by taking three different maturities of Treasury bill yields as a proxy of treasury market of India. We used GARCH (1, 1) model to check the volatility of Treasury bill market of India. The findings show that Indian Treasury Bill market was significantly volatile during entire study period. The results show that corresponding probability value is significant at 1%. Therefore, this study reveals that Treasury bill market of India are highly volatile during study period i.e. 2010 to 2021. So we reject null hypothesis rather we accept research hypothesis that Indian short-term sovereign bond yield significantly volatile.

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