

# Critical Evaluation of the 5 Year and 10 Year Government of India Bond Investment based on Nifty Benchmark G-sec Indices

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## ABSTRACT

Government of India (GOI) bond investment can be considered as the safest investment by retail investors. Historically, GOI bond investment could be done through indirect avenues like mutual funds, Insurance companies etc. by retail investors. However, with the start of Reserve Bank of India Retail Direct platform in November 2021 retail investors can directly invest in GOI bonds without brokerage. For any financial investment some of the critical aspects are returns, risk and liquidity. GOI 5 year and 10-year bond investment is risk free from the point of view of default risk, however interest rates and bond prices have inverse relations. This inverse relationship might lead to a fall in bond prices and negative returns in the short to medium term. This paper based on data from September 2001 to March 2024 for a 5-year GOI Bond and from January 2011 to March 2024 for a 10-year GOI Bond examines few critical aspects of investment viz. returns, risk and range of minimum holding period to generate assured positive returns, range of returns based on compounded annual growth rates. These calculations were made based on Full or Dirty price of a GOI bond which were taken from The Nifty 5-year Benchmark index and The Nifty 10-year Benchmark index. Dirty price was considered as it is considered in indices and Dirty Price considers the impact of coupon. GOI longer dated bonds are issued at Par, meaning coupon rate equaling Yield to Maturity (YTM). However, coupons are fixed throughout the life cycle of a bond, but YTM could change based on market forces. These market forces could lead to a change in interest rates.

***Key words - Government of India (GOI) bond, Nifty 5-year Benchmark index, Nifty 10-year Benchmark, range of minimum holding period, returns, risk.***

## INTRODUCTION

The Nifty 5-year Benchmark index and The Nifty 10-year Benchmark index are constituted by taking 5 year and 10- year bond issued by the central Government of India. These indices are based on Total return methodology covering the default and interest rate risks of investments in longer dated bonds. There are many risks to Bond investment, however the two key risks for a domestic retail investor are default risk and interest rate risk. In case of GOI bonds issued by central government based on historical evidence and backing of central government default risk can be nullified. However, interest rate risk which is quantified by modified duration needs to be considered by investors who are investing for the short to medium term. Practically bond investors even in the safest bonds issued by GOI might get negative returns in short to medium term.

The Nifty 5-year benchmark index was base to 1000 on January 3<sup>rd</sup>, 2001. So, the data of 23 years was available which considers various interest rate cycles that happened in this period.

The Nifty 10-year benchmark index was base to 1000 on January 3<sup>rd</sup>, 2011. So, the data of 13 years was available which considers various interest rate cycles that happened in this period\*. (\* Even though data was available before January 3<sup>rd</sup>, 2011, it is considered only post 2011 to have uniform base.)

Theoretically, Considering the fact India is growing economy, the YTM on 10-year bond at the time of issuance at par should be higher than the YTM on 5-year bond. However, duration of the 10-year bond would be higher than 5-year bond leading to higher interest rate risk.

Since both bonds do not have default risk, holding them till maturity gives investors assurance of positive returns equal to YTM ignoring the reinvestment risk for periodic cash flows generated by coupons.

## REVIEW OF LITERATURE

Reddy (2002) a former RBI governor and Wells et.al. (2008) in Asian development bank working paper pointed out that GOI bonds and treasury bills dominated the debt market in India which was not as liquid as equity markets in India and suggested evolvement of Indian Bond markets particularly from the point of view of investors in the areas of liquidity and transparency.

Andritzky (2012) studied the investor base for government bonds in the G20 advanced economies and the euro area and found domestic financial institutes tend to invest more in their own bonds during the financial crisis. The data also showed lead-lag relationship between bond yields and investor holdings.

Vinod et al. (2014) concluded that fiscal deficit was not the significant determinant of interest rates in India. Interest rates were affected by changes in reserve currency, expected inflation and the volatility of capital flows and not by the fiscal deficit.

Akram and Das (2019) investigated long term determinants of Indian government bonds (IGBs) and found that short term interest rate is the key driver of long-term government bond yield over the long run. The other key finding was that government debt ratio does not have any obvious negative impact on IGB yields over the long run. This was consistent with John Maynard Keynes' (1930) supposition.

Jape and Ambhore (2019) reviewed increasing 10-year bond yield and found that for a developing country like India government was one of the biggest investors, so bond yield were useful parameters for assessing the health of the economy.

## **RESEARCH GAP**

The studies conducted in Indian government bonds did not focus on The Nifty 5-year benchmark index and The Nifty 10-year benchmark index which were based on dirty prices of the bonds considering the accrued interest. Fixed income investments from the point of view of return of capital for GOI bonds was not studied.

## **NEED FOR STUDY**

It is believed by retail investors that investment in government bonds is safe, and it will lead to positive returns. However higher is the duration of GOI bond portfolio, higher is the interest rate risk which could lead to negative returns in intermediate stages if interest rates go up. Reserve Bank of India consumer price inflation target is 4% - / + 2%. Meaning 2 to 6% is the tolerable range. Liquid funds can be considered by extreme short-term investors, but returns could be lower for liquid funds. So, a 5-year or 10-year GOI bond investment with YTM of 6 to 7% can give assured inflation beating returns. So, there is a need to study that investment in detail with respect to risk, return and range minimum holding period for positive returns. Trailing return methodology is considered for the

study which considers entry and exit points. As a some of the investor might not be able to time the interest rate/ YTM cycle currently. YTM is only applicable if investor holds on to the investment till maturity which may not be case all the time. Tax treatment is also favorable for more than 3-year investment in fixed income.

## RESEARCH OBJECTIVES

1. To calculate and compare the risk and return of 5 year and 10-year GOI bond based on t- Test and measures of central tendency.
2. To calculate trailing returns for the period of 1 day to 10 years for 5- year and 10-year bond.
3. Based on these to calculate the range of minimum holding period for investment in 5- year and 10-year bond to generate positive returns.
4. To calculate probability of positive returns based on holding period ranging from 1 day to 10 years.
5. Graphically represent trailing returns to visualize the phases of positive and negative returns of investments in GOI bonds based on benchmark repo rate cycle.

## HYPOTHESIS TESTING

**Null Hypothesis Ho:** There was no significant difference in daily returns of The Nifty 5-year Benchmark index and The Nifty 10-year Benchmark index.

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## RESEARCH METHODOLOGY

Descriptive research was used based on the availability of daily closing values of the Nifty 5-year benchmark index and the Nifty 10-year benchmark index. Measures of Central Tendency such as Minimum, Maximum, Standard deviation (Risk), Average (Return) were used to infer the results. Based on Frequency of the trailing returns for the period of 1 day,1 Month, 3 Months,6 Months,12 Months,24 Months,36 Months,48 Months,60 Months and 120 Months probability of positive returns was calculated. Data was represented in tabular and graphical format to infer the results. Compounded Annual growth Rate (CAGR) was also calculated for the holding period of 24 Months,36 Months,48 Months,60 Months and 120 Months.

## POPULATION AND SAMPLE

Dirty or Full prices of GOI bonds from inception in the form of individual bond or a portfolio of bonds.

The Nifty 5-year benchmark index and the Nifty 10-year benchmark index which were tracking most liquid 5 year and 10-year benchmark securities issued by GOI. Since the data for 5-year security was based to value of 1000 on September 3, 2001, and Since the data for 10-year security was based to value of 1000 on January 3, 2011. The study was carried out from these two dates for the 2 indices. For the t -Test data was taken from September 3, 2011 to have similarity in the datapoints. Comparative Analysis was done graphically with Nifty 5-year benchmark index starting at 1000 on January 3, 2011.

## TOOLS AND DATA ANALYSIS

Trailing Return Calculation

Daily Returns = (Current Day Closing/ Previous Day Closing)-1

1 Month Return = (Current Day Closing/ Closing price 1 month back)-1

3 Months Return = (Current Day Closing/ Closing price 3 months back)-1

6 Months Return = (Current Day Closing/ Closing price 6 months back)-1

12 Months Return = (Current Day Closing/ Closing price 12 months back)-1

24 Months Return = (Current Day Closing/ Closing price 24 months back)-1

36 Months Return = (Current Day Closing/ Closing price 36 months back)-1

48 Months Return = (Current Day Closing/ Closing price 48 months back)-1

60 Months Return = (Current Day Closing/ Closing price 60 months back)-1

120 Months Return = (Current Day Closing/ Closing price 120 months back)-1

For all of the above returns Minimum, Maximum, Standard deviation (Risk), Average (Return) were calculated.

Minimum = Least Value in the data set

Maximum = Highest Value in the data set

Average (Return  $\times$  <sub>Average</sub>) = (Addition of all the returns based on the frequencies mentioned above/ Number of Observations)

Standard deviation (Risk) = Square Root (  $\sum_{i=1}^n ((X_i - X_{Average})^2) / (n-1)$  )

Risk was multiplied by square root of time based on various timeframes.

Returns were multiplied or divided based on time frame.

CAGR= ((Current Index Close Value/ Index Close Value n years back)<sup>(1/n)</sup>-1

Paired Two Sample for means t-Test was used to test the Hypothesis. Paired t-Test was used as both the yields and hence the bond prices should move in tandem.

## FINDINGS

**Table 1**

The Nifty 5-year benchmark index

<b>Holding Period</b>	<b>1 Day</b>	<b>1 Month</b>	<b>3 Months</b>	<b>6 Months</b>	<b>12 Months</b>	<b>24 Months</b>	<b>36 Months</b>	<b>48 Months</b>	<b>60 Months</b>	<b>120 Months</b>
<b>Minimum</b>	-4.8%	-4.1%	-6.8%	-4.6%	-2.2%	3.8%	9.3%	12.9%	22.3%	82.1%
<b>Maximum</b>	3.0%	7.6%	16.7%	20.6%	22.7%	42.4%	45.2%	56.2%	69.1%	146.7%
<b>CAGR</b>										
<b>Minimum</b>						1.86%	3.02%	3.07%	4.11%	6.18%
<b>Maximum</b>						19.32%	13.23%	11.80%	11.08%	9.45%
<b>Risk</b>	0.2%	1.2%	2.2%	3.2%	4.6%	6.6%	7.4%	8.1%	9.6%	16.8%
<b>Annualized Risk</b>	3.84%	4.03%	4.35%	4.48%	4.55%	4.68%	4.27%	4.07%	4.28%	5.32%
<b>Average Return</b>	0.03%	0.66%	2.00%	4.02%	8.20%	16.77%	26.20%	37.04%	48.80%	121.40%
<b>Annualized Return</b>	7.79%	7.89%	7.99%	8.04%	8.20%	8.38%	8.73%	9.26%	9.76%	12.14%
<b>Return/Risk</b>	2.03	1.96	1.84	1.79	1.80	1.79	2.05	2.27	2.28	2.28

**Table 2**

The Nifty 5-year benchmark index

<b>Tenure of Holding</b>	<b>1 Day</b>	<b>1 Month</b>	<b>3 Months</b>	<b>6 Months</b>	<b>12 Months</b>	<b>24 Months</b>	<b>36 Months</b>	<b>48 Months</b>	<b>60 Months</b>
<b>No of observations</b>	5598	5578	5535	5470	5339	5078	4817	4556	4295
<b>Positive returns</b>	3474	4284	4776	5021	5260	5078	4817	4556	4295
<b>Probability of Positive Returns</b>	62.1%	76.8%	86.3%	91.8%	98.5%	100.0%	100.0%	100.0%	100.0%

**Table 3**

The Nifty 10-year benchmark index

<b>Holding Period</b>	<b>1 Day</b>	<b>1 Month</b>	<b>3 Months</b>	<b>6 Months</b>	<b>12 Months</b>	<b>24 Months</b>	<b>36 Months</b>	<b>48 Months</b>	<b>60 Months</b>	<b>120 Months</b>
<b>Minimum</b>	-3.4%	-7.6%	-11.4%	-8.9%	-5.0%	-1.6%	7.6%	16.4%	21.0%	76.5%
<b>Maximum</b>	3.3%	6.0%	9.2%	12.1%	17.9%	28.7%	45.0%	51.7%	62.0%	109.0%
<b>CAGR</b>										
<b>Minimum</b>							2.5%	3.9%	3.9%	5.8%
<b>Maximum</b>							13.2%	11.0%	10.1%	7.6%
<b>Risk</b>	0.3%	1.31%	2.47%	3.60%	5.57%	7.21%	7.77%	6.14%	9.15%	9.15%
<b>Annualized Risk</b>	4.93%	4.55%	4.94%	5.09%	5.57%	5.10%	4.49%	3.07%	4.09%	2.89%
<b>Average Return</b>	0.03%	0.53%	1.62%	3.30%	6.87%	13.91%	22.10%	31.96%	41.72%	92.04%
<b>Annualized Return</b>	6.33%	6.41%	6.49%	6.60%	6.87%	6.96%	7.37%	7.99%	8.34%	9.20%
<b>Return/Risk</b>	1.28	1.41	1.31	1.30	1.23	1.36	1.64	2.60	2.04	3.18

**Table 4**

The Nifty 10-year benchmark index

<b>Tenure of Holding</b>	<b>1 day</b>	<b>1 Month</b>	<b>3 Months</b>	<b>6 Months</b>	<b>12 Months</b>	<b>24 Months</b>	<b>36 Months</b>	<b>48 Months</b>	<b>60 Months</b>	<b>120 Months</b>
<b>No of observations</b>	3365	3345	3302	3237	3106	2845	2584	2323	2062	801
<b>Positive returns</b>	1946	2348	2535	2701	2609	2829	2584	2323	2062	801
<b>Probability of Positive Returns</b>	57.8%	70.2%	76.8%	83.4%	84.0%	99.4%	100.0%	100.0%	100.0%	100.0%

**Table 5**

t-Test: Paired Two Sample for Means		
	<i>5 Y</i>	<i>10 Y</i>
Mean	0.032%	0.026%
Variance	0.00%	0.00%
Observations	3267	3267
Pearson Correlation	0.863	
Hypothesized Mean Difference	0	
Df	3266	
t Stat	1.90	
P(T<=t) one-tail	0.03	
t Critical one-tail	1.65	
P(T<=t) two-tail	0.06	
t Critical two-tail	1.96	

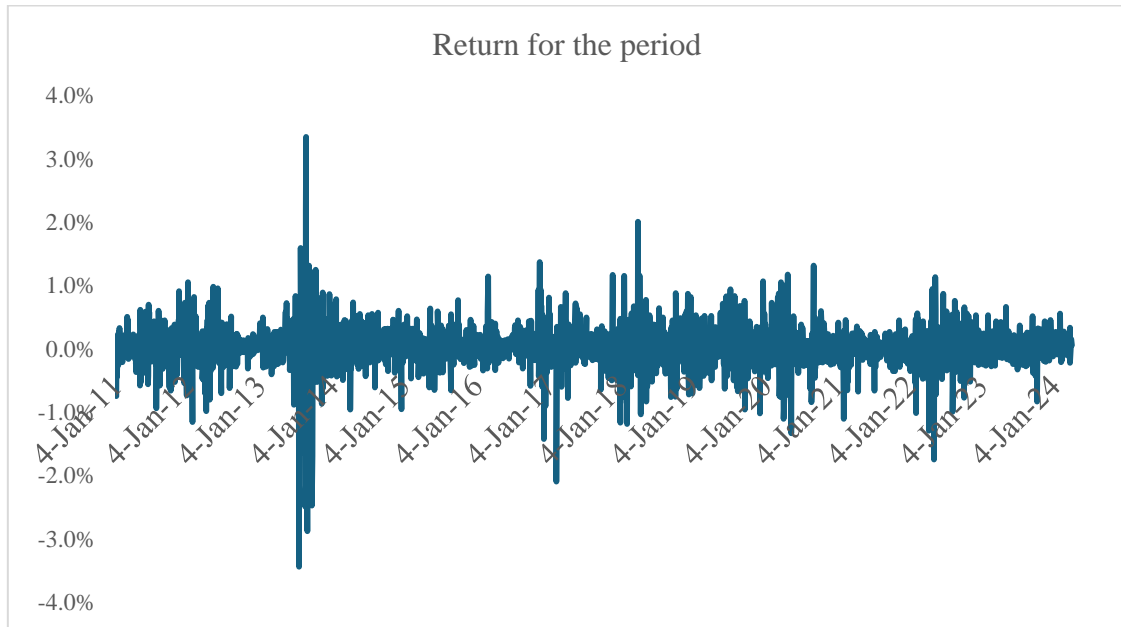
Based on p value null hypothesis could be rejected. Nifty 5 – year bond index is performing better as compared to Nifty 10 – year bond index based on daily returns.



**Graphical representation of The Nifty 10-year benchmark index \***

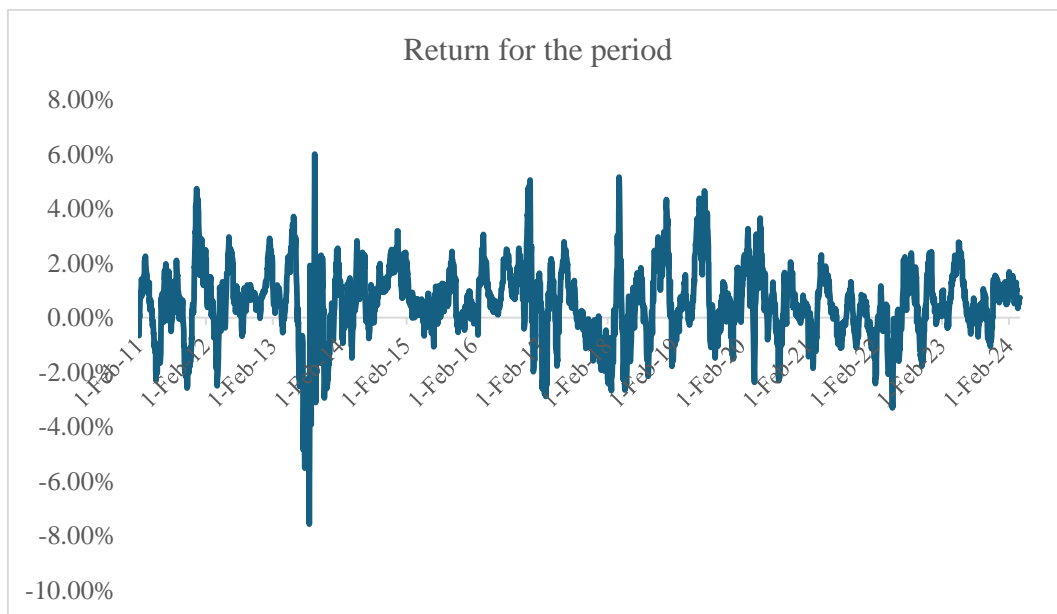
*\*For graphical representation 10-year benchmark index was only used as it is considered to be the benchmark index for various policy makers and the financial market.*

**Graph 1: 1 Day Return**



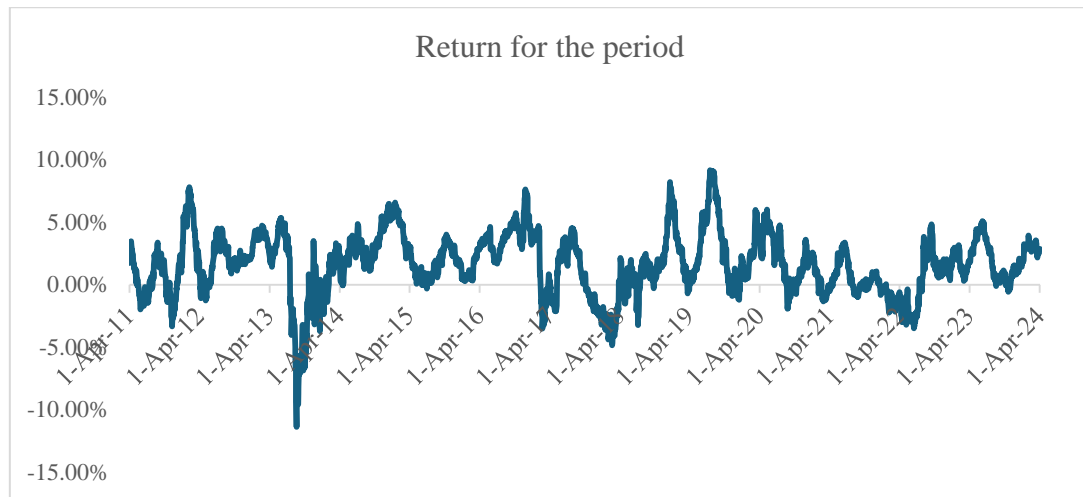
As can be seen in Graph 1 along with Table 3 and Table 4 returns can range from -3.4% to 3.3% with 57.8 % probability of positive returns from 1 day investment in 10 Year GOI Bond.

**Graph 2: 1 Month Trailing Return**



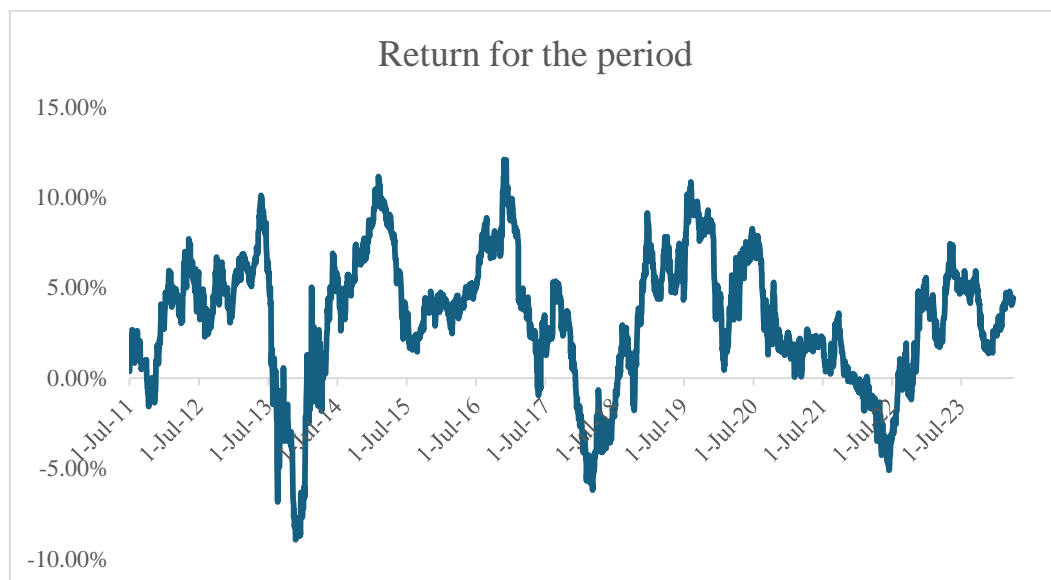
As can be seen in Graph 2 along with Table 3 and Table 4 returns can range from -7.6 % to 6.0% with 70.2 % probability of positive returns from 1 month investment in 10 Year GOI Bond.

### **Graph 3:3 Months Trailing Return**



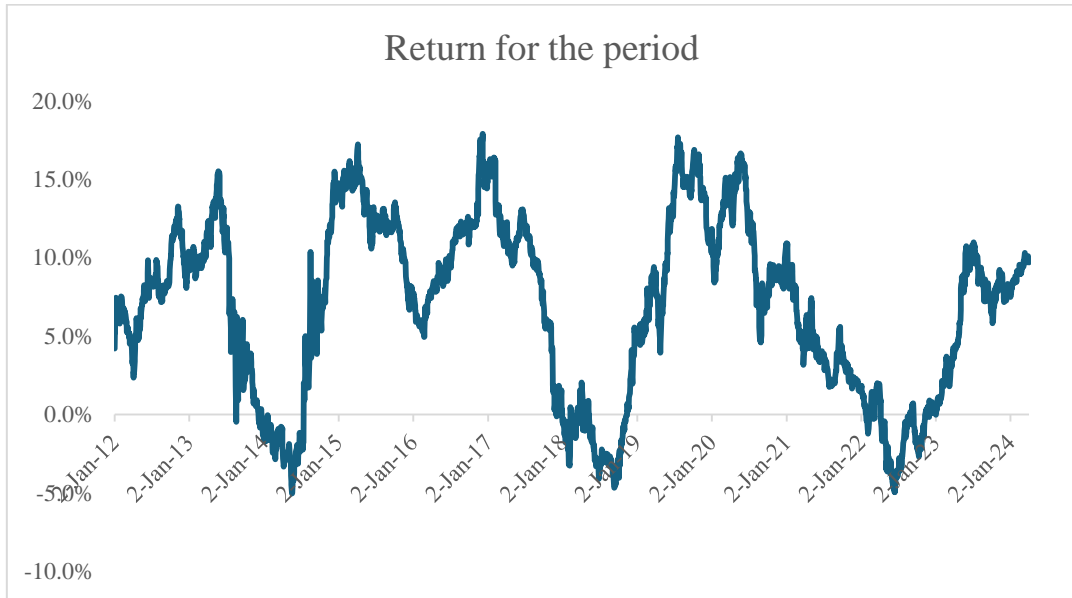
As can be seen in Graph 3 along with Table 3 and Table 4 returns can range from -11.4% to 9.2% with 76.8% probability of positive returns from 3-months investment in 10 Year GOI Bond.

### **Graph 4:6 Months Trailing Return**



As can be seen in Graph 4 along with Table 3 and Table 4 returns can range from -8.9% to 12.1% with 83.4% probability of positive returns from 6 months investment in 10 Year GOI Bond.

**Graph 5:12 Months Trailing Return**



As can be seen in Graph 5 along with Table 3 and Table 4 returns can range from -5.0% to 17.9% with 84% probability of positive returns from 12 months investment in 10 Year GOI Bond.

**Graph 6:24 Months Trailing Return**



As can be seen in Graph 6 along with Table 3 and Table 4 returns can range from -1.6% to 28.7% with 99.4% probability of positive returns from 24 months investment in 10 Year GOI Bond.

**Graph 7:36 Months Trailing Return**

As can be seen in Graph 7, along with Table 3 and Table 4 returns can range from 7.6% to 45% with 100% probability of positive returns from 36 months investment in 10 Year GOI Bond.

**Graph 8:48 Months Trailing Return**

As can be seen in Graph 8, along with Table 3 and Table 4 returns can range from 16.4% to 51.7% with 100% probability of positive returns from 48 months investment in 10 Year GOI Bond.

**Graph 9:60 Months Trailing Return**

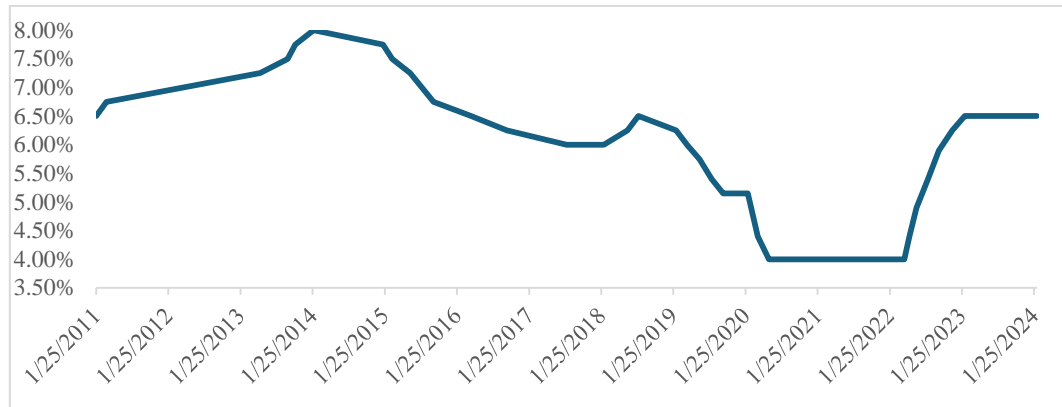


As can be seen in Graph 9, along with Table 3 and Table 4 returns can range from 21.0% to 62.0% with 100% probability of positive returns from 60 months investment in 10 Year GOI Bond.

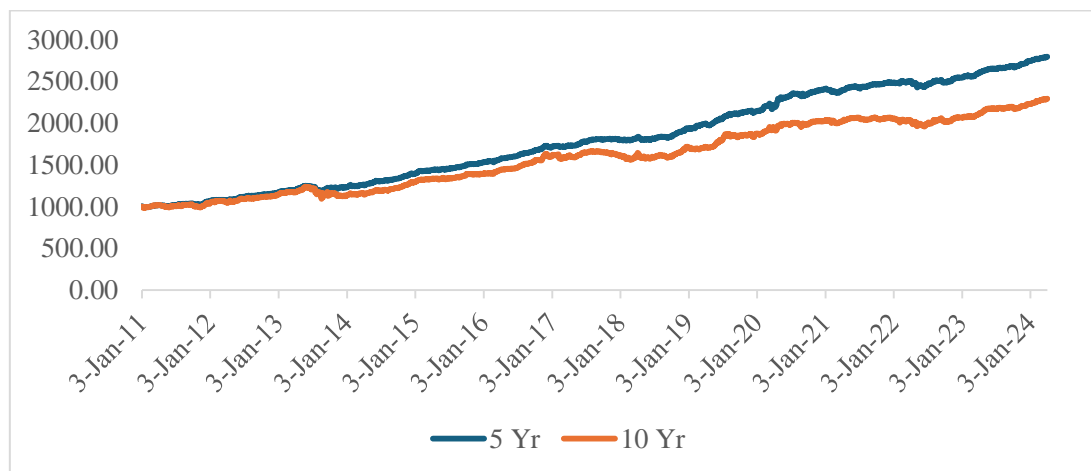
**Graph 10:120 Months Trailing Return**



As can be seen in Graph 10, along with Table 3 and Table 4 returns can range from 76.5% to 109% with 100% probability of positive returns from 120 months investment in 10 Year GOI Bond.

**Graph 11: Benchmark Repo rate since January 2011**

As can be seen in Graph 11, benchmark repo rate which determines the interest rates in the economy and financial markets rose from 2011 to 2014. It came down 2015 onwards and was least in 2020 to 2021 (i.e. during the COVID-19 pandemic) to increase the borrowings and the expenditure. During 2022 it went up to curtail the inflation in India and to align with the increase in interest rates across the globe.

**Graph 12: Comparative Investment in GOI The Nifty 5-year Benchmark index and The Nifty 10-year Benchmark index**

CAGR for the GOI The Nifty 5-year Benchmark index investment = 8.07%

CAGR for the GOI The Nifty 10-year Benchmark index investment = 6.46%

## LIMITATIONS AND FUTURE SCOPE OF FURTHER STUDY

The study did not consider exact bond prices or a sample portfolio of bonds, but the data was taken from National Stock Exchange (NSE) website which considers 5 year and 10-year liquid and on the run GOI securities for the respective indices. A similar study could be carried out for GOI indices of other tenures or for corporate bond indices. This study could be extended to other countries' government bond indices for the same maturities of 5 and 10 years. The study was focused on domestic investors. It did not consider the foreign investors and the impact of exchange rates on the returns from the point of view of foreign investors.

## CONCLUSION AND IMPLICATIONS

Investment in GOI bonds is risk free from the point of view of default risk, however it still has one other major risk from the domestic investors point of view. i.e. interest rate risk. As per the study, a minimum of 2 years and 3 years of holding is required in 5-year bonds and 10- year GOI bonds to ensure positive returns. Mathematically exact holding period would be between 12 to 24 months in case of 5-year GOI bond and between 24 to 36 months in case of 10 year GOI bond. Like most other investment avenues long term Return/ Risk ratio improves in case of investments in bonds as well (i.e. longer is the tenure of the investment greater is assurance of positive returns and higher return per unit of risk taken). If held till maturity, Minimum returns in both these tenure bonds even during unfavorable interest rate cycles (i.e. rising interest rates cycle) do beat inflation of 4% targeted by RBI. Interest rates and Bond prices have an inverse relationship which could impact higher duration bond portfolios badly. As it can be seen during the rising interest rates scenarios of 2013 to 2014 and more recently in 2022 to early 2023 bond returns were reduced or turned negative in some cases for trailing returns up to 24 months or 2 years.

As proposed by John Maynard Keynes in 1930 and endorsed by subsequent researchers like Akram and Das (2019) short term interest rate (repo rate) was the key driver of long-term government bond yield over the long run. Repo rate was affected by changes in reserve currency, expected inflation and the volatility of capital flows and not by the fiscal deficit as pointed out by Vinod et al.

Retail investors must check bond duration of bond portfolio duration before investing in longer dated GOI securities. They could consider investing in 5-year

GOI bonds along with 10-year GOI bonds as for the period under study 5-year bonds have outperformed 10-year bonds.

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