STUDY OF RISING BENCHMARK 10-YEAR BOND YIELD AND ITS RELEVANCE TO ECONOMIC FACTORS

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ABSTRACT

The paper reviews the increasing benchmark10-year bond yield. It mentions the factors which are contributing towards the increase in bond yields and also the impact of rising bond yield on the Indian economy. The bond yield has impact on stock market, debt market and the currency of a country. The government bond yield of a country helps to understand the state of its economy and it is often compared with bond yields of other countries as well.

The health of a country's economy is indicated by inflation, lending rate of the central bank, GDP growth rate, and national income and this can be analysed by an economist through Conventional metrics. The objective of paper isto understand the rising bond yield (benchmark) and factors affecting the Indian economy and study the correlation and influence of economic parameters such as Sensex, Nifty, FII, DII, CPI, India VIX and exchange rate. The secondary data of five years is being used for the study and the data is being further analysed by using statistical tools using SPSS software. The finding shows that for developing country like India how government is among the biggest investors in the economy, so for assessing economic health of the country, bond yields can be a useful parameter.

Economists use conventional matrices for measuring the health of a country's economy which includes inflation, lending rate of the central bank, growth rate, and national income. These are further measured by as Sensex, Nifty, FII, DII, CPI, India VIX and exchange rate. However, bond yields are also a very perceptive means of evaluating the trajectory of an economy. As investors sell government bonds, prices decrease and yields increase. A higher yield indicates greater risk. If the yield offered by a bond is much higher than what it was when issued, there is a chance that the company or government that issued it is financially stressed and may not be able to repay the capital.

1. INTRODUCTION

Bond yield can be defined as the returns which are earned on a bond. Bond yield can be either Nominal yield or Current yield.

Nominal yield = annual interest payment/face value of bond

Current yield = annual interest payment/market value of bond

Benchmark Bond Yield:- The benchmark bond yield is a yield obtained on government bonds that is used as a reference or base for determining the performance of other available bonds in the market. It is used to determine the yield obtained on government's risk-free bonds and therefore can be used as a benchmark to compare with the other non-government or corporate bonds. In India the benchmark bond yield is calculated for a term period of ten years as standard called as the 10-year Benchmark Bond Yield. This yield is then used to determine the risk premium that is expected on the risky corporate bonds. Higher the yield on the benchmark bond, higher is the expected returns on the corporate bonds. But bond yield and bond price are inversely related to each other.

The *Financial Times* defines the yield on a risk-free government bond as being roughly "equal the rate of growth in the economy, plus the rate of inflation." In this case, the bond yields would mirror GDP growth, but the relationship between yields and economic activity is more complex especially in the case of developing countries like India. A whole host of factors including recessions, inflation, and bank rate set by central banks can have an impact on bond yields.

Bond Valuation

The intrinsic value of a bond is based on the expected cash flows. It is calculated by finding the present value (PV) of all the future cash flows. The expected cash flow consists of annual interest payments and principal repayment. The PV of a bond is discounted value of cash flows and maturity value.

$$PV = \frac{CF1}{(1+r)^1} + \frac{CF2}{(1+r)^2} + \frac{CF3}{(1-r)^3} \cdots \frac{CFn}{(1+r)^n}$$

Yield to Maturity (YTM)

YTM is the discount rate which is the PV of expected cash flows to the current market price of bond. It is the expected rate of return earned by an investor when he purchases the bond and holds it till maturity.

$$\text{Yield to Maturity} = \frac{\dfrac{F-P}{n} + C}{\dfrac{F+P}{2}}$$

Relationship between Required Rate of Return and Bond Value

- The Required Rate of Return is equal to the coupon rate i.e. (k_d = I)

A bond has face value or ₹100, coupon rate of 10% and maturity of 4 years. If the required rate of return is also 10%, the Value of bond (V_0) is

V_0 = I * PVIFA (k_d, n) + F * PV = ₹100

If the Required Rate of return on a bond is equal to the coupon rate, the intrinsic value of the bond is equal to its face value.

- The Required Rate of Return is greater than the coupon rate i.e. (k_d> I). A bond has face value of ₹100, coupon rate 10% and maturity of 4 years. If the required rate of return is 12%, the Value of bond (V_0) is

  V_0 = I * PVIFA (k_d, n) + F * PVIF (k_d, n)= ₹93.97

If the Required Rate of return on a bond is greater than the coupon rate, the intrinsic value of the bond is less than its face value.

- The Required Rate of Return is less than the coupon rate i.e. (k_d<I) A bond has face value of ₹100, coupon rate 10% and maturity of 4 years. If the required rate of return is 8%, the Value of bond (V_0) is

  V_0 = I * PVIFA (k_d, n) + F * PVIF (k_d, n)= ₹106.62

If the Required Rate of return on a bond is less than the coupon rate, the intrinsic value of the bond is greater than its face value.

Table 1.1

Relationship between k_d and Coupon rate	Bond value
k_d< Coupon rate	Bond value > Face value
k_d = Coupon rate	Bond value = Face value
k_d> Coupon rate	Bond value < Face value

Thus, it can be concluded that there is a negative relationship between Required rate of Return and Bond value.

2. REVIEW OF LITERATURE

Rajendra Pandit (2005); studied the relationship between budget deficit variables and long-term interest rates for Nepal. The study showed that there is a positive relationship between long term interest rates and budget deficit variables.

Isaac Linus Ochieng, Dr. Tobias Olweny(2015);studied the relationship between face value of gilt-edge treasury bonds and interest rates at Nairobi Securities Exchange. The main reason behind the study was to find a relationship between the given variables. They studied the effect of interbank rate, central bank rate and repo rate on the face value of gilt-edge

treasury bonds at Nairobi Securities Exchange. It was found that all the three factors affected the face value of treasury bonds.

Dr. R. Himachalapathy and Rakshitha V. (2016); in their research paper titled "A study on bond market and its relevance in the Indian context" studied the status of Indian bond market. They studied the relationship between the yield on government bond and various monetary and fiscal variables like bank rate, repo rate, reverse repo rate, WPI, IIP, GFD, and GDP. They checked the impact of economic growth of the country on the yield rates. Statistical measures like regression and correlation were used to answer the objectives.

Shariq Ahmad Bhat and Fahad (2016); have studied the effect of interest rate volatility on the sovereign bond yields of India. They found that there is a positive correlation between the sovereign bond yields and interest rate volatility. The findings also shown that the impact of interest rate volatility reduces as the maturity period of sovereign bond increases.

Conceptual Theory behind the bond yield

The international rating agency Moody elevated India's sovereign bond rating to Baa2 from Baa3 in November 2017 with a steady outlook. But they have also cautioned India about high debt.

Government bonds were bought and sold on the secondary market only by institutional investors like provident funds, mutual funds, insurance companies and banks till recently. However, in 2017, the RBI changed the rules to allow retail investors, to buy government bonds in the primary market. The RBI has authorized for selling sovereign debt securities, or government bonds.

For example, a bond issued by a company or government for Rs.100 with a coupon of 7% for a period of five years shows that every year, the issuing party will pay interest of 7%, while the amount of principal will be returned after the maturity of bond. The fact that bondholders are free to sell their bonds before maturity drives the bond market.

The face value of a bond is price at which the bond is purchased initially; bond value fluctuates as these are transferable in the market. Yield is the rate of interest paid as coupons along with the accumulated return which bond holder receives in future

The coupon divided by the value of the bond gives yield. It is always expressed in percentage.

In above example if the face value of the bond fell to Rs.80, the yield would rise to 8.75%, similarly if the value rose to Rs.120, the yield would drop to 5.83%, It should be noted that even if the value of a bond fluctuates, the amount that can be redeemed after the maturity period is the face value, which is Rs.100 in this case. The current value is inversely proportional to its bond yield. The larger the yield, the lower the current market price of the bond.

Bond yield as an economic indicator

Economists use conventional matrices for measuring the health of a country's economy include inflation, lending rate of the central bank, growth rate, and national income. These are further measured by as Sensex, Nifty, FII, DII, CPI, India VIX and exchange rate. However, bond yields are also a very perceptive means of evaluating the trajectory of an economy. As investors sell government bonds, prices decrease and yields increase. A higher yield indicates greater risk. If the yield offered by a bond is much higher than what it was when issued, there is a chance that the company or government that issued it is financially stressed and may not be able to repay the capital.

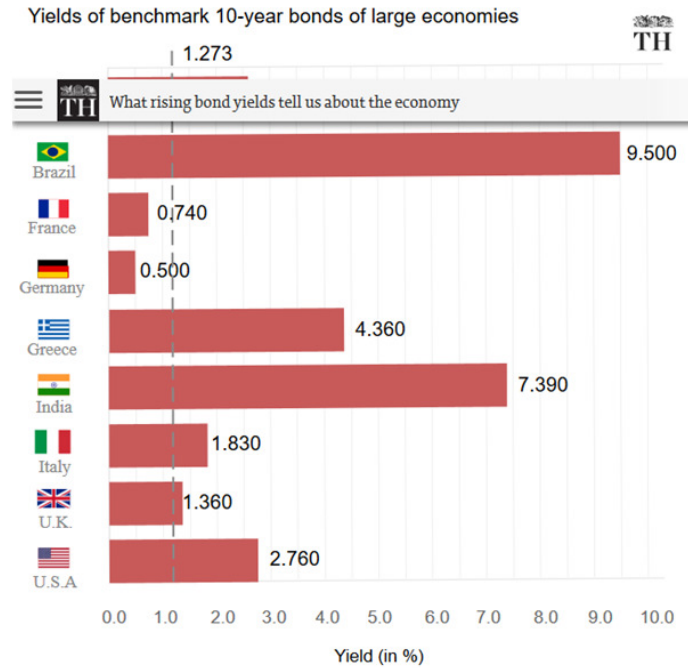The increase in risk with such bonds isneutralised by greater returns, which encourages the bondholders.

Fig. 2.1

Government bonds are relatively more stable but low demand at auctions indicate low investor confidence in the country's economy. India's benchmark 10-year government bond has a yield of 7.39%, higher than that of Greece's 4.36%. The Greek government is currently rebuilding its economy after a sovereign debt crisis wiped out liquidity in the aftermath of the 2008 financial crisis. The long-term bond yields in the U.S. and the U.K. are 2.76% and 1.36%, while that of the Euro area 10-year government benchmark is 1.27%.

3. RESEARCH DESIGN

Objectives

- To study the rising bond yield (benchmark)and its impact.

- To understand the factors affecting the Indian economy.

- To analyse the reasons behind rising bond yield and its implications.

- To analyse the correlation and influence of economic parameters such as Sensex, Nifty, FII, DII, CPI, India VIX and exchange rate.

- To create a regression model for determining the internal consistencies between the selected economic variables.

Research Methodology

Secondary data was used for the research. The data related to the variables taken into consideration was collected from various sources like RBI, OECD library, Investopedia etc.

The bond yield data along with data of Sensex, NIFTY, DII, FII, inflation (CPI), India VIX and exchange rate (USD/INR) was taken for period of five years to understand the yield curve and correlations effects of bond yield on economy.

Statistical tools used for analysis are

- Linear Regression
- Correlation

4. DATA ANALYSIS

Secondary data of last 5 years from period of 2014 to 2018 i.e. FY 2013-14 to FY 2017-18 has been used for the study.

Number of variables = 7 (excluding bond yield)

Observations per variable = 60

4.1. Correlation between economic variables and bond yield

Correlations

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Correlations

		Sensex	Nifty	FII	DII	CPI	India_VIX	USDINR	Bond_Yield
Sensex	Pearson Correlation	1	.971**	.786**	.442**	-.814**	-.585**	.439**	-.580**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000
	N	60	60	60	60	60	60	60	60
Nifty	Pearson Correlation	.971**	1	.823**	.582**	-.828**	-.550**	.480**	-.633**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	.000
	N	60	60	60	60	60	60	60	60
FII	Pearson Correlation	.786**	.823**	1	.581**	-.712**	-.352**	.426**	-.573**
	Sig. (2-tailed)	.000	.000		.000	.000	.006	.001	.000
	N	60	60	60	60	60	60	60	60
DII	Pearson Correlation	.442**	.582**	.581**	1	-.529**	-.223	.381**	-.518**
	Sig. (2-tailed)	.000	.000	.000		.000	.087	.003	.000
	N	60	60	60	60	60	60	60	60
CPI	Pearson Correlation	-.814**	-.828**	-.712**	-.529**	1	.527**	-.604**	.689**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000	.000
	N	60	60	60	60	60	60	60	60
India_VIX	Pearson Correlation	-.585**	-.550**	-.352**	-.223	.527**	1	-.126	.434**
	Sig. (2-tailed)	.000	.000	.006	.087	.000		.338	.001
	N	60	60	60	60	60	60	60	60
USDINR	Pearson Correlation	.439**	.480**	.426**	.381**	-.604**	-.126	1	-.545**
	Sig. (2-tailed)	.000	.000	.001	.003	.000	.338		.000
	N	60	60	60	60	60	60	60	60
Bond_Yield	Pearson Correlation	-.580**	-.633**	-.573**	-.518**	.689**	.434**	-.545**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.001	.000	
	N	60	60	60	60	60	60	60	60

**. Correlation is significant at the 0.01 level (2-tailed).

Fig. 4.1

Interpretation:

A moderately positive correlation can be seen between CPI and Benchmark bond yield. While a moderately negative correlation can be seen between Nifty and Benchmark bond yield. The CPI and India VIX have a positive correlation with Benchmark bond yield therefore have a positive effect on yield. While Sensex, Nifty, FI, DII and exchange rate (USD/INR) have a negative correlation with Benchmark bond yield therefore have a negative effect on yield.

4.2. Multiple Regression Analysis

Model Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.751a	.564	.505	.53410

a. Predictors: (Constant), USDINR, India_VIX, DII, FII, CPI, Sensex, Nifty

Fig. 4.2

R^2 = 0.564, it means the independent variables can explain 56.4% of the variation in the dependent variable. Thus, the given seven variables are responsible for 56.4% variation in Bond yield.

Multiple R =0.751. Multiple R is Karl Pearson's coefficient of correlation. Number can be between -1 to +1. A number close to +1 as in the above case indicates very strong correlation between dependent and independent variable. R Square =0.564 and Adjusted R Square =0.505. Adjusted R-square is a modification of R-square that adjusts for the number of terms in a model. R square always increases when a new term is added to a model, but adjusted R-square increases only if the new term improves the model more than would be expected by chance. Since this a multiple linear regression adjusted R square would be considered. Significance of Adjusted R Square =0.564. R square can take any value between 0 to 1 (i.e.0 to 100%). R square is explained variation in dependent variable due to independent variable. Adjusted R Square =0.505 indicates 51% of the variation in Y i.e. bond yield is explained by the independent variables considered. i.e. Sensex, Nifty, FII, DII, CPI, India VIX and exchange rate. Standard Error = 0.01. The smaller the standard error, the more representative the sample will be of the overall population. The standard error is also inversely proportional to the sample size; the larger the sample size, the smaller the standard error because the statistic will approach the actual value. Since the standard error is 0.01 sample of 60 observations can be considered to be consistent with the population. Sample size = 60 observations per variable. Number of variables = 7. More the number, better is the predictability towards the population.

Anova

ANOVAb

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.181	7	2.740	9.606	.000a
	Residual	14.834	52	.285		
	Total	34.015	59			

a. Predictors: (Constant), USDINR, India_VIX, DII, FII, CPI, Sensex, Nifty

b. Dependent Variable: Bond_Yield

Fig. 4.3

The significance (p-value) = 0.00, which means that the regression model predicts the dependent variable statistically. The regression equation is a good fit.

Regression df =7 df indicates degrees of freedom. In this case there are seven independent variables which can take the values independent of each other hence degrees of freedom is seven   Residual df = 52 Residual = Sample size - 1 – df R square = 1- (Residual Sample Square / Total Sample Square) Regression SS =0.04 These are the sum of squares of values of Y calculated using Y= α+β1X1+ β2X2+ β3X3 as per the model. Residual SS =0.002 (close to 0) It is the difference between calculated value and actual value of Y. Regression MS = .285

Regression Coefficients

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	10.163	2.326		4.370	.000
	Sensex	9.943E-5	.000	.553	1.057	.295
	Nifty	.000	.000	-.535	-.949	.347
	FII	-4.060E-6	.000	-.124	-.730	.469
	DII	-6.859E-6	.000	-.076	-.503	.617
	CPI	.105	.063	.320	1.674	.100
	India_VIX	.040	.024	.205	1.692	.097
	USDINR	-.057	.030	-.229	-1.896	.063

a. Dependent Variable: Bond_Yield

Fig. 4.4

The regression equation is:

Benchmark Bond Yield = 10.163 + 9.943E-5(Sensex) – 4.06E-6(FII) – 6.859E-6(DII) + 0.105(CPI) + 0.04(India VIX) – 0.057(USDINR)

The seven independent variables explain bond yield up to 56.4%; R^2 being 0.564.Therefore,change in bond yield can be estimated using these seven variables as the model is a good fit.

For every rise in bond yield Sensex will show negative impact of five times in the market similarly FII, USD/INR and DII also showed negative effect with respect to rise in bond yield. The CII and VIX are the two variables that showed the positive impact of rise of bond yield in the country. Standard error is close to zero indicating close to 100% fit. t-stat is coefficient divided by standard error. It is compared with p value close to 0 indicates that with close to 100% confidence one can say dependent variable is dependent on each of the seven independent variables. i.e. With very close to 100% confidence bond yield is dependent on Sensex, Nifty, FII, DII, USDINR and more on CPI inflation, India VIX.

5. OBSERVATIONS AND CONCLUSION

5.1. Observations

- From the regression equation it can be concluded that CPI inflation has a major impact on the bond yield out of the seven variables.

- An increase in CPI inflation will lead to an increase in the bond yield. This is because the government will have to increase the interest on government bonds to attract more investors during a rising inflation rate.

- An increase in India VIX will lead to increase in bond yield as high VIX will demote investment in the stock market.

- Sensex, FII, DII, USD/INR do not have a major impact on bond yield as per the regression equation.

- Nifty does not have significant impact on the bond yield.

- CPI and India VIX have a moderately positive correlation with the bond yield; therefore, an increase in these two variables will increase the bond yield.

- Sensex, Nifty, FII, DII, USD/INR have a moderately negative correlation with the bond yield; therefore, an increase in these variables will decrease the bond yield and vice-versa.

5.2. Conclusion

- The investor's confidence in the government is strongly shown and indicated by bond market. The recent increase in number and frequency of the frauds in public sector banks had increased the burden and issues of non-performing assets in the banking sector Governments ambitious plans and programmes like the National Health Protection Scheme – plan to double farmers' incomes by increasing the minimum support price to 1.5 times of production which will all add to the debt of government which will further create burden on Indian economy. Economists, policy makers, mutual fund manager's, traders in equities and commodities always keep watch on the bond market. Personal finances may not directly get affected by the bonds or government securities, but the yield curve always give the path in which a country's economy is directed.

During the recession of 2008, the economy grew at only 3.89% while the yield on the benchmark 10-year government bond was 7.529%. This suggests that for FY2018, bond prices took a thrashing, but the government borrowed more in the form of bond issuance to tide over the fall in economic activity. However, in the following years the trend of loose correlation between economic growth and bond yield was seen.

In other countries private companies drives the engine of growth, but it's not so in India and hence the trend of increase in bond yields is disturbing as it clearly affects the investors sentiment that is not entirely complimentary to the vision of the government taking on more debt.

The fiscal deficit is expected to expand even if the government issues new bonds to finance the majority schemes declared in the Budget. With banks facing challenges of growing pile of NPAs, the Reserve Bank of India (RBI) will have to raise liquidity in the market.

Banks have to invest 19.5% of their total deposits in government bonds as per RBI norms but most of the banks invest over and above the mandatory amount in government securities, or bonds. Bond yields have improved over the past 18 months and consequently bond prices have fallen. Yield for the 10-year bond has increased from 6.246% in November 2016 to 7.39% in March 2018.

Despite improving by about 25 basis points, the yield of India's benchmark long-term government bond remains higher than peers in developing economies.

It is expected that government spending would increase till the general elections. Inflation or expectation of inflation can drive up bond yields since any gains made by securities will be eroded by an increase in prices. With greater government spending plans in this financial

year, the path that the yield curve will take up in the coming months will have the key to predict what the future holds till the general elections.

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APPENDIXES

Nifty – The Nifty 50 is a benchmark index of the National Stock Exchange of India (NSE) which is based on the top 50 companies with highest market capitalization listed on NSE.

Sensex – The Sensex is the benchmark index of the Bombay Stock Exchange of India (BSE) which is based on the top 30 companies with highest market capitalization listed on the BSE.

CPI – The Consumer Price Index (CPI) is an index which measures the weighted average price of a basket of consumer goods and services.

FII – Foreign Institutional Investors (FII) are investors registered outside the country in which it is investing.

DII – Domestic Institutional Investors (DII) are investors who invest in financial assets of their own country.

India VIX – The Volatility Index is a measure of markets expectations of volatility during the current period.

USD/INR – It indicates the foreign exchange rate of Indian rupee against the US Dollar.