**A REPORT**

**ON**

**Analysis of Bond Yields and Macroeconomic Data Over the Past Decade**

BY

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# **Introduction**

A bond yield represents the annual return an investor can expect from holding a bond until maturity, serving as a crucial indicator in economic analysis as it reflects market sentiment about future interest rates, inflation expectations, and overall economic health.

In this report we will focus on the significance of bond yield in reflecting crucial indicators like GDP growth rate, inflation rate (CPI), repo rate, and unemployment rate. This report will focus on how government and corporate bond yields reflect the interest rates, and provide insights into monetary policy effectiveness, market risk perception, and future economic trends.

Changes in bond yields influences decision making, investment decision, and economic conditions. Increase in bond yield reflects high inflation, while a decrease in bond yield reflects economic slowdown.

A spread, which is difference in bond yields of a bond with different maturities helps in analyzing the changing recession risks and market stability.

This study aims to analyze the historical trends of bonds, GDP growth rate, unemployment rate, inflation rate (CPI), and repo rate and understand how monetary policies and economic conditions influence Indian bond market. This analysis provides a deeper understanding of bond yield dispersion to policymakers, decision makers, investors to make right decisions.

**Excel is also submitted along with the report.**

# **Objective**

The objective of this report is to analyse historical trends (past decade) of monthly government bonds with maturity (1Y,5Y,10Y,30Y), 10Y AAA rated corporate bonds, GDP Growth Rate (Quarterly), Inflation Rate (CPI, Monthly), Repo Rate (Monthly), Unemployment Rate (Annual)

This report aims to:

* Identify trends and patterns in bond yield fluctuations with line charts.
* Analyse the impact of key economic events on bond yields with the help of summary statistics, and key policy decisions.
* Evaluate the relationship between bond yields and economic indicators with correlation matrix and charts.
* Understand the spread between government and corporate bond yields.

# **Data Collection and Cleaning**

## **Data Collection**

To conduct this analysis, data was collected on various bond yields and key economic indicators for last decade. Sources are linked in the references section.

The historical dataset includes:

1. **Government Bond Yields**: 1-year, 5-year, 10-year, and 30-year yields (Monthly data). [References- 1,2,3,4]
2. **Corporate Bond Yields**: 10-year AAA-rated corporate bond yields (Annual data).
3. **Macroeconomic Indicators:** GDP Growth Rate (Quarterly data), Inflation Rate (Consumer Price Index – CPI, Monthly data), Repo Rate (Monetary Policy Rate, Quarterly data), Unemployment Rate (Annual data). [References- 5,6,7,8]
4. **Time Period Covered:** 1-01-2014 to 31-12-2024
5. **Monetary Policy Decisions & Major Economic Events:** Demonetisation (2016), GST (2017), Rate Hikes (2018), Covid 19 (2020,2021), Russia-Ukraine War (2022), Post Covid Rate Hikes (2022).

## **Data Cleaning**

To ensure consistency in the data in the correlation matrix, we have converted all the data points into monthly frequency that is from 1-01-2014 to 31-12-2024.

GDP growth rate is considered same for each month of the particular quarter. Repo rate is considered same for each month of the particular quarter. Unemployment rate is considered same for each month of the particular year. 10Y AAA rated corporate bond yield is also considered same for each month of a particular year for making the correlation matrix.

We have focused on using the actual correct data wherever required but still the analysis that required monthly data for that cleaned data is used.

Standardised format is used which is **percentage values for rates**.

# **Summary Statistics**

Analysis of the historical data was performed to understand the distribution and variability of bond yields and macroeconomic indicators. Key statistical measures include:



Figure shows key statistical measures

Key insights from statistics:

1. Standard deviation is decreased with increase in maturity of the bond, which shows **less volatility** in bonds with longer periods to compensate for **higher risk premiums**.
2. The Range also reflects the same that 1Y bond with short maturity period has shown high volatility, while the 10Y and 30Y bonds with longer maturity period are relatively stable.
3. Average and Median returns of the bonds **increase with increasing maturity** to compensate for the higher risk premiums.
4. AAA rated corporate bond has a **higher average and median return** compared to the government bond due to the credit risk involved. There is a higher return of approximately 0.66 basis points.

# **Data Visualisation**

## **Government Bond Yield Trends Over Time**

Multi-line charts were created for 1-year, 5-year, 10-year, and 30-year government bond yields to observe how they fluctuate over time.

Figure shows multi line chart which shows bond yields time series analysis.

The key trends observed are:

1. From 2015 to 2019, bond yields across all maturities remained relatively **stable**, fluctuating within a small range.
2. The 30-year bond yield (yellow line) remained the **highest**, reflecting the risk premium for longer maturities while bonds with shorter maturities showed less returns as well as more fluctuations.
3. During Covid 19 (2020-2021), bond yields showed a **sharp decline**, especially for shorter maturities, due to an economic slowdown. Long-term yields were relatively stable, while short-term yields showed sharp decline.
4. Post Covid Recovery (2022-2023), bond with 1Y maturity recovered the fastest because of improving economic policies. Bonds with longer maturity recovered gradually.

## **Corporate Bond Yield Trends Over Time**

Figure shows 10Y AAA rated Corporate Bond yield over time

The key trends observed are:

1. Corporate bond yields are remained **higher** than government bond yields due to credit risk involved.
2. It showed a **decline** in covid 19 from 2020 to 2021, and then **gradually recovered** to the pre covid era.
3. The decline in 2016 could be due to the **effect of demonetisation** as it decreased the liquidity in the market.

## **Macroeconomic Trends**

1. **GDP growth rate:** GDP growth rate showed a sharp decline during covid due to economic slowdown, and then showed a sharp increase in the post covid era due complement the less consumption during covid.

Figure shows GDP growth rate time series analysis

1. **Inflation rate:** Inflation increased during the covid era, and then later remained the same due to rate hikes imposed by the central bank.

Figure shows Inflation rate time series analysis

1. **Repo Rate:** This reflects policy adjustments, less during economic crises, and increased during high inflation period.

Figure shows Repo rate time series analysis

1. **Unemployment Rate:** It is **inversely correlated** with GDP growth, peaking during recessions and declining during expansions.

Figure shows Unemployment rate time series analysis

# **Correlation Analysis**

A correlation matrix was created to identify relationships between bond yields and macroeconomic variables.



Figure shows correlation matrix

Key Insights include:

1. Bonds with different maturities show **high correlation** showing that bonds with different maturities tends to move together. (Correlation of 1Y-5Y is 0.945. 1Y-10Y is 0.87)
2. Repo rate is **highly correlated** with the bond yield. Bond is shorter maturity is **highly sensitive** to change in repo rate than bonds the longer maturity. (Correlation of Repo rate with 1Y is 0.971, 5Y is 0.892, 10Y is 0.798, it decreases)
3. GDP growth rate and bond yield show a **moderate positive stable correlation** (~0.4-0.46).
4. Rising inflation has **negative correlation** with bond yields as investors demand higher returns to offset purchasing power loss. Short term bonds are affected more. (-0.31 for 1Y, and -0.145 for 10Y).
5. 10Y Corporate bond yield is **highly correlated** with 10Y government bond yield.

# **Bond Yield Spread and Its Implications**

Key insights include that during the covid 19 economic slowdown, the dispersion between bonds with short and long-term maturity was much more than the dispersion between bonds with similar maturities. Post covid the spread stabilized again, however the spread of bonds with long-short maturity still remained significantly more than long-long maturity bonds.

However corporate and government bond yield spread showed sharp decline during **demonetization and covid 19**.

Figure shows bond yield spread time series analysis

Figure shows corporate – government bond yield spread time series analysis

**Implications of Bond Yield Dispersion in Predicting Economic Conditions:**

Bond yield spread clearly shows the predictive nature of the bond yields during the economic downturns, the difference in bond yields of bonds with long maturity and bonds with short maturity increases drastically because of stable nature of long-term bonds, and sensitive nature of short-term bonds.

During economic downturns, dispersion between spreads increases. During good economic times, dispersion between spreads decreases.

# **Conclusion and Key Insights**

The major conclusions of the report were that bonds with short term maturities showed **more volatility** compared to bonds with long term maturity. This is mainly because of there reactive nature towards the monetary policies.

Major economic events and policy decisions that influence bond yields identified were **Demonetisation (2016), GST (2017), Rate Hikes (2018), Covid 19 (2020,2021), Russia-Ukraine War (2022), Post Covid Rate Hikes (2022).**

The correlation analysis showed that there is **high positive relationship** between bond yields and repo rate. It also showed that bond yields and inflation rate have a **negative correlation** to meet inflation expectations. **Repo rate policy is a key determinant of short-term bond prices.**

Corporate bonds tend to move in sync with government bonds but with a **slight lag**.

**Bond yield spread concluded key takeaway:**

**Economic Downturns:** Bond Yield Dispersion **increases** between bonds of different maturities.

**Economic Expansion:** Bond Yield Dispersion **decreases** between bonds of different maturities.

For Investors, Bond yield spreads offer signals to allocate the assets to distribute the risk between long-term maturity bonds and short-term maturity bonds. Thus doing a strategic asset allocation.

# **References**

**References are formatted in the APA 7 style**

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