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AN ANALYSIS OF GOVERNMENT BONDS YIELD CONCERNING SELECTED MATURITY PATTERNS

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ABSTRACT

Government bonds play a crucial role in financial markets, serving as a primary instrument for governments to raise capital. The maturity pattern of government bonds, categorized based on their duration until maturity, is an essential aspect that influences investment decisions and market dynamics. Understanding the performance of government bond yield with different maturity durations is vital for investors to assess risk, predict market trends, and optimize investment portfolios. This study investigates government bond yields across various maturity pattern (3-year, 5-year, and 10-year) and conducts comparative analyses among bond yields of selected BRICS countries. Our findings suggest stability in bond yields across maturity periods, offering governments a predictable financing environment for debt management and fiscal planning. For investors, the uniformity in yields implies a minimal impact on potential retunes based on maturity choice, allowing for diversified portfolio strategies. Comparative analyses reveal distinct yield (10-year, maturity pattern only) performance among BRICS countries, providing valuable insights for policy decisions and investment strategies. The analysis focuses on understanding the trends, variability, and growth rates of government bonds with different maturity duration and selected BRICS countries. Various statistical measures are employed to assess the yield performance of these bonds, providing insights into their stability and potential for investment.

INTRODUCTION

Government bonds, also known as sovereign bonds or G-Secs, represent debts securities issued by the Government of India to finance its developmental activities, including infrastructure development, social welfare programs, and budgetary requirements. In the landscape of global finance, government bonds stand as pillars of stability and security, offering investors a reliable avenue to preserve capital and generate income. Among the array of sovereign debt markets, the Indian government bond market holds particular significance, reflecting the economic prowess and policy dynamics of one of the world's fastest-growing economies. These bonds embody the sovereign creditworthiness of the Indian government, underpinning investor confidence through their backing by the full faith and credit of the state.

Understanding the Indian government bonds necessitates an exploration of their key characteristics. These bonds typically exhibit fixed tenures, ranging from short-term to long-term maturities, catering to diverse investors preferences and risk appetites. Additionally, Indian government bonds offer varying coupon rates, providing investors with periodic interest payments, and thereby serving as an income-generating asset class.

This study aims to analyze the performance of government bond yields across various maturity patterns and to explore the implications for both government and investors. By conducting statistical analyses and comparative evaluations, we seek to uncover patterns, trends, and insights that can inform decision-making processes in the financial markets. Furthermore, we extend our analysis to include comparative studies among selected BRICS countries - Brazil, Russia, India, China, and South Africa to identify unique yield patterns and variations.

Review of Literature

Sahana Rajaram and Payal Ghose (2012) emphasize the importance of issuing benchmark securities with fixed tenors, especially 10-year securities. These benchmarks help maintain liquidity in the market and provide a standard for pricing other securities. Overall, these strategies aim to enhance market stability and efficiency.

Davide Debortoli et al. (2014) examine the optimal government debts maturity in a scenario where the government lacks commitment to fiscal policy and cannot issue state-contingent bonds. It finds a trade-off between funding costs and hedging benefits, borrowing long- term hedges against economic shocks but reduces future fiscal discipline. Consequently, optimal debt maturity is skewed towards longer terms but more evenly distributed compared to full commitment scenarios.

Sophia Chen et al. (2018) reveal that debt maturity structures significantly impact borrowers, including sovereigns and firms. Short-term debt exposes borrowers to rollovers risks, which can exacerbate financial crises. Debt maturity also influences a firm's ability to undertake long-term investment and affects overall economic activity.

Hima Vincent (2019) explores the relationship between liquidity and returns of selected government bonds in the India bond market. By analyzing data from 2013 to 2016, the research highlights the positive correlation between liquidity and bond returns, emphasizing the importance of liquidity in influencing bond performance. The study suggests that higher liquidity levels are associated with better returns on government bonds, with practical implication for investors to consider when selecting bonds.

Mohammed Abdulhussien Alwan et al. (2022) have suggested that Indian government bonds with maturities of 10-year or 20-year can be considered risk-free rates due to their lower variability in yield to maturity (YTM). Investors looking for stable long-term returns may consider allocation funds to these securities.

Need of the study

Government bonds are widely regarded as safe investments due to their backing by the government and guaranteed returns. However, the yield performance of government bonds can vary significantly based on their maturity duration. Understanding the yield performance of government bonds with different maturity patterns is essential for investors seeking to diversify their portfolios and manager risk effectively. Additionally, comparative analyses of government bond yields among different countries offers insights into global market dynamics, risk factors, and investment opportunities. However, there is a lack of comprehensive

studies that systematically analyze the yield performance of selected maturity patterns of government bonds over time. This study seeks to address this gap by conducting a detailed analysis of the trends, variability, and growth rates of the yield of government bonds with different maturity durations, providing valuable insights for investors. Therefore, there is a pressing need for a comprehensive study to analyze the yield performance of selected maturity patterns of government bonds.

Objectives of the study

1. To analyse the performance and investment potential of government bonds with varying maturities.
2. To conduct comparative analyses of government bond yield among selected BRICS nations (Brazil, Russia, India, China, and South Africa.) to identify unique yield pattern variations.

Hypothesis: 1

H_0: There is no significant difference in yields of 3-year, 5-year, and 10-year government bonds.

H_1: There is a significant difference in yield at least in one of the government bonds under review

Hypothesis: 2

H_0: There is no significant difference in yields of 10-year government bonds issued by BRICS countries.

H_1: There is a significant difference in yields of 10-year government bonds issued by BRICS countries.

Research Methodology

The study has been carried out based on secondary data. The study adopts a quantitative approach to analyze the yield performance of selected maturity patterns of government bonds, over a period of 10 years i.e., from 2015 to 2024. Data on yield of government bods across various maturity categories (3-year, 5-year, and 10-year maturity) and conduct comparative analyses of government bond yields among selected BRICS countries (Brazil, Russia, India, China, and South Africa) to identify yield pattern of 10-year bonds. Statistical measures including average yield, standard deviation, skewness, kurtosis, compound annual growth rates (CAGR), Year-over-Year (Y-o-Y) growth rate (in percentage), and ANOVA test are calculated to assess the yield performance of selected maturity patterns of government bonds and government bond yields among selected BRICS nations. The findings are then analyzed and interpreted to provide insights into the dynamics of selected maturity patterns of government bonds for investment decisions.

Data Analysis and Interpretation

Bond yield is the measure of returns an investor earns from a bond investment, expressed as a percentage of the bond's current market price. Significantiy, bond yield aids investors in decision-making, serving as a yardstick to assess investment attractiveness against alternative options like stocks or savings accounts and offers insights into market sentiment and risk perception. Higher yields often correlate with higher risk bonds, while falling yields may signal increased demand for safe-haven assets during economic uncertainty. Thus, bond yield acts as a multifaceted tool for investors, guiding investment strategies, assessing risk, and interpreting market dynamics.

Yield on Bond = Annual Interest Earned/Market Price or purchase price of the Bond.

Table 1: Government of India Bond Yield (in %) of Selected Maturity Pattern

Date	10-year bond	5-year bond	3-year
2015	7.738	7.746	7.791
2016	7.459	7.524	6.569
2017	6.658	6.861	7.372
2018	7.398	7.315	7.086
2019	7.346	6.933	6.659
2020	6.138	5.578	5.396
2021	6.177	5.705	4.929
2022	6.843	6.101	5.674
2023	7.315	7.167	7.155
2024	7.052	7.051	7.053

Source: https://www.investing.com/rates-bonds/world-government-bonds

Note: Finacial year-end data is considered.

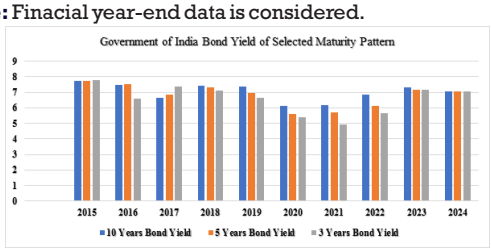

Figure 1

Table 1 and Figure 1 shows the government of India bond yields across selected maturity pattern during 2015-2024. Notably, the 10-year bond yield demonstrates a trajectory marked by peaks and troughs, where 7.738% in 2015, decreases to 6.138% in 2020, before ascending to 7.052% by 2024. Similarly, the 5-year bond yield mirrors this pattern but with higher volatility, ranging from 7.746% in 2015 to 7.051% in 2024. Conversely, the 3-year bond yield deviates from this trend, 7.791% in 2015, and go down to 4.929% in 2021, and experiencing a modest uptick to 7.053% by 2024.

Table 2: Year-over-Year Growth Rate of Government Bonds Yield (in %) of Selected Maturity Pattern

Date	Selected Maturity Pattern of Government Bonds Yield					
	10 Year Bond		5 Year Bond		3 Year Bond	
	Yield in %	Y-o-Y Growth rate in %	Yield in %	Y-o-Y Growth rate in %	Yield in %	Y-o-Y Growth rate in %
2015	7.738	NA	7.746	NA	7.791	NA
2016	7.459	-4%	7.524	-3%	6.569	-16%
2017	6.658	-11%	6.861	-9%	7.372	12%
2018	7.398	11%	7.315	7%	7.086	-4%
2019	7.346	-1%	6.933	-5%	6.659	-6%
2020	6.138	-16%	5.578	-20%	5.396	-19%
2021	6.177	1%	5.705	2%	4.929	-9%
2022	6.843	11%	6.101	7%	5.674	15%
2023	7.315	7%	7.167	17%	7.155	26%
2024	7.052	-4%	7.051	-2%	7.053	-1%

Source: Calculated based on secondary data gathered from www.investing.com

Note: Financial year-end data is considered.

Table 2 offers a detailed perspective on the year-over-year growth rates of government of India bond yields across various maturity patterns spanning from 2015-2024. The analysis reveals notable fluctuations in growth rates, reflecting the dynamic nature of the bond market and the evolving economic landscape. The 10-year bond yield demonstrates varied growth rates over the period, with significant declines observed in the year 2020, later it takes positive growth till 2023. Similarly, the growth rates of the 5-year bond yield exhibit volatility, with substantial decreases noted in the year 2020 and 3-year bond yield also substantial decreases in the year 2020 it might be the effects of pandemic COVID-19. In contrast, the growth rate of 3-year bond yield display more pronounced fluctuations, including notable increases suggesting heightened market activity or changing risk perception.

Table 3: Descriptive Statistics Results of Government of India Bond Yield (in %) of Selected Maturity Patterns

Measures	Selected Maturity Patterns		
	10-year bond	5-year bond	3-year bond
Mean	7.01	6.80	6.57
Sd	0.55	0.75	0.93
CV	7.80	11.06	14.23
Skew	-0.60	-0.66	-0.67
Kurtosis	-0.82	-0.88	-0.72
CAGR	-0.009	-0.009	-0.010

Source: Calculated based on secondary data gathered from www.investing.com

Table 3 shows the descriptive statistics results of the government of India bond yields across selected maturity patterns. Despite relatively high mean yields, particularly evident in the 10-year bonds at 7.01%, it displays the lowest standard deviation (0.55) and coefficient of variation (7.80), suggesting comparatively lower variability around mean yield. The 3-year bond exhibit the highest variability, indicating potential risk associated with shorter-term investments. Negative skewness values across all maturity patterns imply a leftward skew in yield distribution, signifying asymmetry where the tail of the distribution extends towards higher yields. Additionally, negative kurtosis values indicate flatter distribution, potentially implying a lack of extreme yield fluctuations. However, the negative compound annual growth rate (CAGR) values across all maturity patterns suggest a declining trend in bond yields over the observed period. This interpretation underscores the need for investors to carefully balance high returns with volatility and asymmetry when making investment decision in the government of India bond market, considering factors such as risk tolerance, investment horizon, and portfolio diversification strategies.

ANOVA: Single Factor						
SUMMARY						
Groups	Count	Sum	Average	Variance		
10 Year Bond Yield	10	70.124	7.0124	0.299535822		
5 Year Bond Yield	10	67.981	6.7981	0.564921211		
3 Year Bond Yield	10	65.684	6.5684	0.873076044		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	0.986075267	2	0.493037633	0.851271794	0.438011605	3.354130829
Within Groups	15.637 7977	27	0.57917 7693	-	-	-
Total	16.623 87297	29				

The ANOVA results indicate that there is no statistically significant variance in mean of bond yields among the different maturity patterns. Specifically, the calculated F-statistic of 0.851 falls below the critical F-value of 3.354 at a significance level of 0.05. Additionally, the P-value of 0.438 further supports this conclusion, suggesting that the observed differences in mean yields are not statistically significant. These findings imply that investors may not accept significantly different yields when investing in bonds with different maturity patterns. Therefore, investors may consider these bonds as comparable investments options in terms of yield, without significant preference or disadvantage based solely on maturity duration. However, it is essential to note that other factors, such as risk profiles, liquidity and investment objectives, should also be carefully considered when making investment decision in the government of India bond market.

Table 4: BRICS Countries 10-year Government Bonds Yield (in %)

Year	Brazil	Russia	India	China	South Africa
2015	13.055	12.12	7.738	3.623	7.815
2016	14	9.1	7.459	2.886	9.115
2017	10.11	7.93	6.658	3.31	8.85
2018	9.455	7.05	7.398	3.778	7.98
2019	8.985	8.42	7.346	3.075	8.61
2020	7.65	6.81	6.138	2.663	10.965
2021	8.89	7.13	6.177	3.201	9.485
2022	11.25	11.1	6.843	2.817	9.6
2023	12.822	10.31	7.315	2.861	9.83
2024	10.977	13.925	7.052	2.301	10.615

Source: https://www.investing.com/rates-bonds/world-government-bonds

Note: Finacial year-end data is considered.

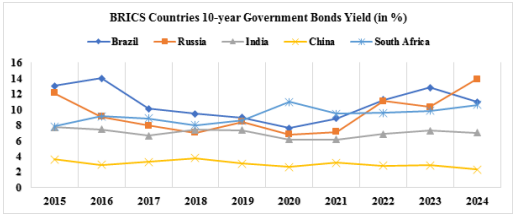

Figure 2

Table 4 and figure 2 demonstrates the yield of 10-year Government Bonds among BRICS countries over the specified period. Brazil consistently had the highest yields, with rates ranging from 8.985% in 2019 to 14% in 2016, indicating potentially higher perceived risk or market conditions demanding higher returns for investors. Russia and South Africa exhibited notable fluctuations, with yields ranging from 6.81% to 13.925% and 7.815% to 10.965% respectively, reflecting the influence of economic factors and geopolitical developments on bond markets. India's yields remained relatively stable as compared to other countries, hovering around 7% throughout the period, suggesting a more consistent investment environment. China consistently maintained the lowest yields among BRICS countries, reflecting its relatively stable economic conditions.

Table 5: BRICS Countries 10-year Inflation Rate (in %)

Year	Brazil	Russia	India	China	South Africa
2015	9.03	15.53	4.9	1.54	4.59
2016	8.74	7.04	4.5	2.12	6.33
2017	3.45	3.68	3.60	1.52	5.28
2018	3.67	2.88	3.43	1.93	4.61
2019	3.73	4.47	4.76	2.9	4.12
2020	3.21	3.38	6.18	2.49	3.28
2021	8.3	6.69	5.51	0.85	4.56
2022	9.28	13.77	6.66	1.88	6.87
2023*	4.73	5.28	5.46	0.66	5.84
2024*	4.45	6.34	4.55	1.69	4.78

Source:https://www.statista.com/statistics/741754/inflation-rate-in-the-bric-countries/

Note: * indicates estimated

Table 4 and Table 5 helps to compare BRICS countries 10-year Government Bond Yield (in %) with BRICS Countries 10-year Inflation Rate (in %). When comparing government bond yield with inflation rates across BRICS counties, India emerges as a more favourable option for investment. Over the years, India has exhibited positive real returns, indicating that its government bond yield have generally outpaced inflation. This consistent trend suggests that investors in Indian government bonds have been able to preserve and even enhance their purchasing power over time. In contrast, countries like Brazil and Russia have experienced fluctuating real returns, with periods of negative returns, making them less attractive investment options. While China and South Africa have also offered positive real returns, India stands out due to its relatively higher and more stable real returns as compared to its BRICS counterparts.

Table 6: Year-over-Year Growth Rate of 10-year Government Bonds Yield (in %) of BRICS Countries

Date	Brazil		Russia		India		China		South Africa	
	Yield in %	Y-o-Y Growth rate in %	Yield in %	Y-o-Y Growth rate in %	Yield in %	Y-o-Y Growth rate in %	Yield in %	Y-o-Y Growth rate in %	Yield in %	Y-o-Y Growth rate in %
2015	13.055	NA	12.12	NA	7.738	NA	3.623	NA	7.815	NA
2016	14	7%	9.1	-25%	7.459	-4%	2.886	-20%	9.115	17%
2017	10.11	-28%	7.93	-13%	6.658	-11%	3.31	15%	8.85	-3%
2018	9.455	-6%	7.05	-11%	7.398	11%	3.778	14%	7.98	-10%
2019	8.985	-5%	8.42	19%	7.346	-1%	3.075	-19%	8.61	8%
2020	7.65	-15%	6.81	-19%	6.138	-16%	2.663	-13%	10.965	27%
2021	8.89	16%	7.13	5%	6.177	1%	3.201	20%	9.485	-13%
2022	11.25	27%	11.1	56%	6.843	11%	2.817	-12%	9.6	1%
2023	12.822	14%	10.31	-7%	7.315	7%	2.861	2%	9.83	2%
2024	10.977	-14%	13.925	35%	7.052	-4%	2.301	-20%	10.615	8%

Source: Calculated based on secondary data gathered from www.investing.com

Table 6 provides the year-over-year growth rate of 10-year government bond yield (in%) for BRICS counties over the period from 2015 to 2024. Brazil experienced significant fluctuations in its bond yield growth rate throughout the period. While the yield growth rate peaked at 27% in 2022, indicating a substantial increase in bond yields as compared to the previous year, it decreased to -14 % in 2024, signifying a notable decline in yield growth. Russia also exhibited notable variations in yield growth rate, with peaks and troughs reflecting changes in market conditions. For instance, Russia saw a significant increase in yield growth rate from -19% in 2020 to 35% in 2024, indicating a turnaround in bond market performance and potentially reflecting shifts in investors confidence or economic outlook. Indian's bond yield growth rate remained relatively stable as compared to other BRICS countries with minor fluctuations around the mean. The consistency in growth rate suggests a, more predicable investment environment or monetary policy framework, potentially contributing to investor confidence and market stability. China consistently maintained moderate growth rates in bond yields throughout the period. Similarly, South African bond yield growth rate fluctuated within a narrower range as compared to others BRICS countries, indicating relative stability in its bond market despite occasional shifts in economic conditions.

Table 7: Descriptive Statistics Results of 10-Year Government Bonds Yield (in %) of BRICS Countries

Measures	10-year Government Bonds of BRICS Countries				
	Brazil	Russia	India	China	South Africa
Mean	10.72	9.39	7.01	3.05	9.29
Sd	2.07	2.41	0.55	0.44	1.03
CV	19.35	25.65	7.80	14.56	11.10
Skew	0.23	0.74	-0.60	0.13	0.18
Kurtosis	-1.08	-0.49	-0.82	-0.22	-0.67
CAGR	-0.017	0.014	-0.009	-0.044	0.031

Table 7 shows the descriptive statistics results of 10-year government bond yields across BRICS countries. Brazil emerges with the highest mean yield among the BRICS nations at 10.72%, suggesting potentially higher returns for investors as compared to other member countries. Russia follows closely with a mean yield of 9.39%, but exhibiting higher variability as indicated by its relatively high stranded deviation and coefficient of variation. India demonstrates a lower mean yield of 7.01%, but with a notably lower standard deviation, indicating more stable bond yields as compared to its counterparts. China presents the lowest mean yield at 3.05%, suggesting relatively lower returns on government bonds. Across the board, Russia displays the highest variability in bond yields, while India shows the most consistent yields relative to the mean. additionally, while Russia and South Africa exhibit positive compound annual growth rates, indicating overall growth in bond yield overtime, Brazil, India, and China display negative growth rates, suggesting a slight decline in bond yields. These insights provide investors with valuable information to assess risk and potential returns, guiding their investment decision within the diverse landscape of the BRICS bond markets.

ANOVA: Single Factor						
SUMMARY						
Groups	**Count**	**Sum**	**Average**	**Variance**		
Brazil 10 Year Bond Yield	10	107.194	10.7194	4.303592		
Russia 10 Year Bond Yield	10	93.8 95	9.38 95	5.798 425		
India 10 Year Bond Yield	10	70.1 24	7.01 24	0.299 536		
China 10 Year Bond Yield	10	30.5 15	3.05 15	0.197 444		
South Africa 10 Year Bond Yield	10	92.8 65	9.28 65	1.062 8		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	363.8546	4	90.9 6366	39.00 071	4.3805 6E-14	2.578 739
Within Groups	104.9562	45	2.33 2359			
Total	468.8108	49				

The ANOVA result provides valuable insights into the difference in 10-year government bond yields among BRICS countries. The analysis indicates that there is a statistically significant variance in bond yields between the BRICS countries, as evidenced by computed F-statistics of 39.00071 and the associated p-value of approximately 4.38E-14, which is well below conventional significance level of 0.05. this implies strong evidence against the null hypothesis, suggesting that there are significant differences in mean bond yields among BRICS countries. The between-groups variance, representing the differences in bond yields among the BRICS countries, is estimated to be 363.8546, 4 degrees of freedom. This between-groups variance is substantially larger than the within-groups variance of 104.9562, indicating that the variability in bond yields across countries is greater than the variability within each country.

CONCLUSION

The analysis of government bond yields across various maturity patterns and among selected BRICS countries provides valuable insights for investors seeking to optimise their investment portfolios. Within the government of India bond market, no statistically significant differences was found in yields among different maturity patterns (3-year, 5-year, and 10-year), suggesting that investors may not expect significantly different returns solely based on maturity duration. However, all maturity patterns exhibited negative compound annual growth rates over the analysis period, indicating a declining trend in bond yields and highlighting the need for investor to balance potential returns with volatility. Among BRICS countries, Brazil consistently offered the highest mean yield, appealing to investors willing to

accept the higher risk for potential higher returns. Conversely, India's relatively stable bond yields may attract investors prioritizing stability, while Russia's fluctuating yields present opportunities for higher returns but with increased volatility. China's low yields may suit investor seeking stability, while South Africa bond market, with fluctuating yields may be suitable for those with a high-risk tolerance. Ultimately, investors should carefully consider their risk tolerance, investment objectives, and market conditions when making investment decision in government bonds, diversifying across different maturity patterns and countries to mitigate risk and optimise returns in the global financial landscape. Consequently, investors seeking stable and potentially rewarding investment opportunities may find Indian government bonds to be a prudent choice, considering their ability to deliver consistent real returns over the time.

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