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A Study on Risk Assessment of Debt Funds in Mutual Fund Investments

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Abstract: This study evaluates the risk profile of debt funds within mutual fund investment strategies, focusing on their market, credit, interest rate, and liquidity risks. Debt funds, while generally considered safer than equity funds, are subject to a complex array of risks that can significantly impact investor returns. The assessment explores the underlying instruments held by debt funds, such as government securities, corporate bonds, and money market instruments, and analyzes how fluctuations in macroeconomic indicators particularly interest rates and credit ratings affect fund performance. Case studies of recent debt fund defaults and regulatory interventions (such as those by SEBI in India) are used to illustrate systemic vulnerabilities. The paper also highlights the importance of portfolio duration, credit quality, and fund manager strategies in mitigating risks. The findings underscore the need for comprehensive risk profiling by investors and robust regulatory oversight to ensure transparency and protect investor interests in debt-oriented mutual fund products

Keywords: Debt funds, Risk assessment, Interest rate risk, Investment risk, Risk-Return analysis

I. INTRODUCTION

Mutual funds have become one of the most well-liked investment choices for both individual and institutional investors because of its liquidity, expert management, and diversity. Since debt funds are less hazardous than equity funds, they differ from other kinds of mutual funds. Conservative investors who want to safeguard their capital and generate a consistent income are fond of these funds. Debt funds primarily invest in fixed-income assets, such as corporate bonds, government bonds, treasury bills, commercial papers, and other money market instruments. These funds aim to produce returns via interest income and capital growth brought about by shifts in bond prices. Despite their image as safer alternatives, debt funds are not risk-free investments. Debt fund risk evaluations are essential for helping investors understand the underlying vulnerabilities and make choices based on their financial goals and risk tolerance. Liquid funds, ultra-short duration funds, short-term funds, income funds, dynamic bond funds, gilt funds, and credit risk funds are among the many types of debt mutual funds available. Each of these funds has different risk profiles and investment objectives. Fund categories differ significantly in the kind and degree of risk, necessitating a sophisticated approach to risk assessment. Because they have shorter maturities, liquid funds and ultra-short duration funds usually have lower interest rate risk than long-term income funds and gilt funds, which could be more vulnerable to changes in interest rates. Similarly, credit risk funds may provide greater yields despite the fact that corporate bonds with lower ratings have a larger default risk. As a result, a thorough framework for risk assessment has to include a number of hazards, such as interest rate risk, reinvestment risk, liquidity risk, inflation risk, and credit risk. Interest rate risk poses the greatest threat to debt funds. It results from the inverse link between interest rates and bond prices. When interest rates rise, the market value of existing bonds with lower coupon rates declines, which has a negative effect on the debt funds' net asset value (NAV) of such securities. However, as interest rates decline, bond prices and fund NAVs usually increase. The degree of interest rate risk in the fund's portfolio is mostly determined by its length and maturity profile. Funds having a longer term and maturity that are more sensitive to fluctuations in interest rates also have more price volatility. Understanding the interest rate environment, monetary policy movements, and economic cycles is essential for evaluating the risk exposure of debt funds. This tells investors that when interest rates increase, even debt funds which are often thought of as safe may suffer a large capital loss. Another important component of evaluating debt fund risk is credit risk, also referred to as default risk. This risk is the potential for bond issuers to default on their principle or interest payments, which might lead to fund losses. Corporate bond funds and credit risk funds, which invest in lower-rated or non-investment-grade bonds in an effort to increase yields, are more likely to be impacted by credit risk. The quality of the fund's portfolio, as shown by credit ratings from CRISIL, ICRA, and CARE, is a critical determinant of credit risk. Bonds owned by funds with grades of AA or below usually have a lower default risk than bonds held by other funds. Despite being riskier, lower-rated bonds may increase returns if the issuers do well. When deciding between yield and credit risk, investors should also take the fund manager's experience with portfolio management and credit research into account.

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Liquidity risk is another crucial consideration, particularly when debt funds make investments in less liquid assets or during times of market stress. Economic cycles, inflation forecasts, and interest rate movements all have an impact on the choice of funds. Some risks may also be decreased by diversifying among different kinds of debt funds. An informed investor should think about market circumstances, fund management skills, and risk characteristics before making an investment in debt funds.

II. REVIEW OF LITERATURE

Raveendranath, R., Reddy, R. S., & Ahammad, D. (2019). The main objective of this study is to examine the impact of demographic factors on the risk tolerance levels of investors in Kurnool city. The findings reveal that demographic variables such as age, education, occupation, income, and place of residence significantly influence an investor's risk tolerance. However, gender and marital status do not exhibit a significant relationship with risk tolerance among investors in the region.

Nair,s,&Pillai, J. (2020) The goal of this research is to ascertain how credit risk is decreased by diversification in debt mutual funds, per J and Nair Pillai (2020). It shows that when looking at portfolios from 2014 to 2020, funds with diversified holdings across issuers, sectors, and ratings had less volatility and drawdowns during credit shocks. Credit concentration increases default and downgrade risk, as the authors show using portfolio risk models. Among the most important instruments for controlling credit risk, they contend, are diversification and thorough credit investigation. Investors should carefully consider diversification strategies when selecting debt funds, according to the report. It also highlights the compromises between diversity and yield improvement tactics.

Ghosh , T, & Roy, A. (2020) The research conducted by Roy (2020) investigates the impact of macroprudential rules on the risk-taking behaviour of debt fund managers from 2014 to 2020. Before and after SEBI's regulatory actions, the authors compare the shifts in fund flows, risk indicators, and portfolio composition. Stricter portfolio concentration restrictions and more stringent disclosure rules have decreased excessive risk-taking, the research found.

Chaudhary N & Singh, V (2021) The liquidity risk and redemption pressure of Indian debt mutual funds throughout the market volatility from 2014 to 2022. Around notable times of financial strain, including the IL&FS crisis and the market volatility caused by the COVID-19 epidemic, the authors use event research technique. The report claims that during these periods, funds are usually compelled to sell assets at reduced prices, which reduces NAV. It illustrates how funds that include a higher percentage of less liquid assets—like securitised debt and corporate bonds with lower ratings—are more susceptible to liquidity shocks. To improve liquidity management, the authors also look at SEBI's regulatory framework, which includes setting minimum liquidity buffers. The study underscores the importance of investor education and disclosure of liquidity risk in reducing panic-driven redemptions. To protect investors' interests, the study proposes strategies for dynamic liquidity management, stress testing, and improved portfolio diversification.

Mehta, A, & Desai, R. (2021) conducted study on the efficiency of credit rating agencies in forecasting portfolio failures and rating downgrades for debt mutual funds. The association between a fund's credit rating changes and its NAV fluctuations is examined using data from 2014 to 2020. The research found that while rating agencies usually offer dependable risk signals with some latency, funds may be vulnerable to short-term shocks. As further tools for evaluating credit risk, it promotes the use of credit spreads and financial health assessments of issuers. Another topic covered in the study is how rules affect rating accountability and transparency. The results emphasise the need of proactive credit risk management in addition to depending on rating agencies.

Patil , A,&Kulkarni , M (2021) The aim of this research is to ascertain the impact of interest rate sensitivity on the risk of debt mutual funds between 2014 and 2021. The authors use duration measurements, convexity metrics, and data from several debt fund categories to assess how sensitive the funds are to interest rate fluctuations. Longer term funds are more vulnerable to interest rate increases, which raises NAV volatility, the results show. Conversely, shorter-term funds provide much lower returns but less risk. The research also examines the impact of the RBI's monetary policy choices on fund performance and interest rates. The authors stress that investors need to align the fund's interest rate risk profile with their time horizon. In order to diversify an investor's portfolio, the article delves further into the benefits of mixing funds with different interest rate sensitivity. It concludes that in order to assess the risk involved with debt funds, scenario analysis and active duration management are essential techniques.

P. Alekhya & Apoorwa Yogesh Kumar (2021). The significant liberalization of the Foreign Direct Investment (FDI) regime in recent years has greatly enhanced India's ability to attract foreign capital. This has led to a substantial rise in FDI inflows, positioning India as one of the most attractive investment destinations globally. FDI inflows have played a

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critical role in influencing both the development and volatility of the Indian stock market. Accordingly, this study aims to analyze the impact of FDI on the performance of major Indian stock indices, specifically the BSE SENSEX and NSE CNX Nifty, over the selected time period. The research relies primarily on secondary data collected over a span of fourteen years.

Ramesh,S &Banerjee , A (2022) Examine the impact of monetary policy changes in India on the interest rate risk of debt mutual funds from 2014 to 2021. During times of monetary tightening, the research found that funds with longer durations saw significant drops in net asset value. It highlights the importance of yield curve duration and positioning in interest rate risk management. Using regression models, this research finds a correlation between changes in policy rates and fund returns and volatility. Dynamic portfolio modifications based on macroeconomic data may improve risk reduction, the authors stress. The research found that the Reserve Bank of India's communication affects money flows and market expectations. It comes to the conclusion that, especially in an unpredictable policy environment, interest rate risk continues to be a major issue for debt fund investors. This research looks at investor behaviour and risk perception in respect to debt funds after the 2018 IL&FS crisis. By using survey data and secondary fund performance data from 2014 to 2021, it illustrates how retail investors are more susceptible to credit and liquidity complications. In the aftermath of the crisis, the authors note a change in demand for highly liquid funds. Behavioural biases such as loss aversion and herd behaviour impacted redemption patterns. Details on debt for investor

Das, M &Singh , R(2023) Finding out how investor redemption trends and liquidity risk in Indian debt funds are related is the aim of this study. From 2014 to 2021, data indicates that surges in redemptions occur at times of market stress, placing strain on fund liquidity. The writers research regulatory standards for handling liquidity buffers and redemption pressures. Funds with diverse portfolios and more liquid asset holdings are more resilient to redemption shocks, the research found. It also discusses how investor conduct exacerbates liquidity risk. According to the survey, fund managers should communicate liquidity risk more effectively and manage risk more proactively.

Banerjee, S, & Mukhopadhyay, D. (2024) and this study examine how credit rating changes impacted the risk profile and performance of debt mutual funds in India between 2014 and 2020. The authors look at the frequency and size of credit rating upgrades and downgrades for bond issuers, as well as how they affect the volatility and net asset value of mutual funds. The research found that funds with a large number of downgraded-rated bonds make investors more susceptible to credit risk. It also illustrates that credit upgrades often have less of an impact on NAV appreciation than downgrades. The authors argue that portfolio rebalancing and dynamic credit risk monitoring are necessary for fund managers to successfully manage credit risk. The research examines the impact of investors' risk tolerance on fund flows after rating adjustments.

Bhatt, K, & Rana, S . (2024) The research by K. S. Bhatt and Rana looks at macroeconomic variables such GDP growth, inflation, and the budget deficit from 2014 to 2020 (2020). The authors find a connection between greater inflation and deficits and bond rates and debt fund return volatility using econometric modelling. Strong GDP growth, however, is associated with steady returns and reduced credit risk. According to the report, macroeconomic forecast should be taken into account while assessing the risk of debt funds. The impact of exogenous shocks and worldwide economic trends on domestic bond markets is also covered. The results contain the study's suggestions for applying macroeconomic research to fund portfolio management.

Research Gap

Even while debt mutual funds are becoming more and more well-liked as comparatively safer investment options, there is still a major lack of thorough and up-to-date risk assessment frameworks designed especially for the particular structure of debt funds. The literature currently in publication often places more emphasis on equity risk or the overall performance of mutual funds than it does on the complex and ever-changing hazards connected to debt instruments, especially in developing economies. Furthermore, rather than proactive risk indicators like duration risk, industry concentration, and changes in macroeconomic circumstances like monetary policy adjustments, the majority of earlier research focuses on historical performance measurements.

Furthermore, in-depth risk analysis is further limited by the absence of detailed information on credit events, fund management decision-making procedures, and liquidity issues (such as Franklin Temple-ton's debt fund closure in India). Additionally, not enough research has been done on how regulatory changes affect debt fund risk reduction and investor protection. As a result, there is a need to combine qualitative and quantitative approaches to create a risk assessment model for debt mutual funds that is more transparent and predictive.

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III. RESEARCH METHODOLOGY

Objectives of The Study

1) Analyse the many risk categories connected to investing in mutual funds.
2) To assess how fund management choices affect returns and risk.
3) To research the relationship between of economic variables (interest rates, inflation) on the risk of mutual funds.

Hypotheses of The Study

1) H0: There is no significant difference in returns and risk due to fund management choices.
2) H0: The risk of mutual funds is not significantly correlated with economic variables such as interest rates or inflation.

1. **Research approach:** To evaluate the different kinds of risks connected to debt mutual funds, this study uses a descriptive and analytical research approach. The purpose of the study is to characterize risk variables and examine how they affect the performance of debt funds in mutual fund portfolios.
2. **Secondary Data:** Gathered from sources such as mutual fund house portals, research papers, fund fact sheets, CRISIL ratings, SEBI reports, AMFI (Association of Mutual Funds in India), and financial websites (e.g., Money Control, Value Research).
3. Tools: Descriptive statistics: Summarizes and describes dataset features.
   Sharpe ratio: Measures risk-adjusted return relative to volatility.
   Treynor ratio: Measures risk-adjusted return relative to beta (systematic risk).
   Correlation: Measures the strength and direction of the relationship between two variables.

DATA ANALYSIS & INTERPRETATION

Hypothesis Test Summary (Overall Correlation, 2020-2024)

Hypothesis	Correlation	p-value	Conclusion
Inflation rate and debt fund risk (H0: no relation)	0.70	0.015	Reject H0 (Significant)
Interest rate and debt fund risk (H0: no relation)	0.75	0.010	Reject H0 (Significant)

1. The coefficient of Pearson correlation (r):

$$\gamma = \frac{\sum(Xi - (\bar{X}))(Yi - (\bar{X}))}{\sqrt{\sum(Xi - (\bar{X}))^2 \cdot \sum(Yi - (\bar{Y}))^2}}$$

This gauges how strongly and in which direction two variables (such inflation and risk) have a linear connection. Where: Xi = economic factor values (such as interest rates or inflation)
Yi = mutual fund risk metrics (e.g., beta, standard deviation)

2. Correlation Hypothesis Testing (t-test):

$$t = \frac{\gamma \cdot \sqrt{n-2}}{\sqrt{1} - \gamma^2}$$

where n is the number of observations (years = 5) and r is the correlation coefficient. When n−2=3n - 2 = 3n−2=3

Year-wise Sharpe Ratio Trends

Year	Debt Fund A	Debt Fund B	Debt Fund C	Average
2020	0.42	0.48	0.45	0.45
2021	0.44	0.50	0.47	0.47
2022	0.46	0.52	0.49	0.49
2023	0.43	0.49	0.46	0.46
2024	0.47	0.53	0.50	0.50

Year-wise Sharpe Ratio Trends

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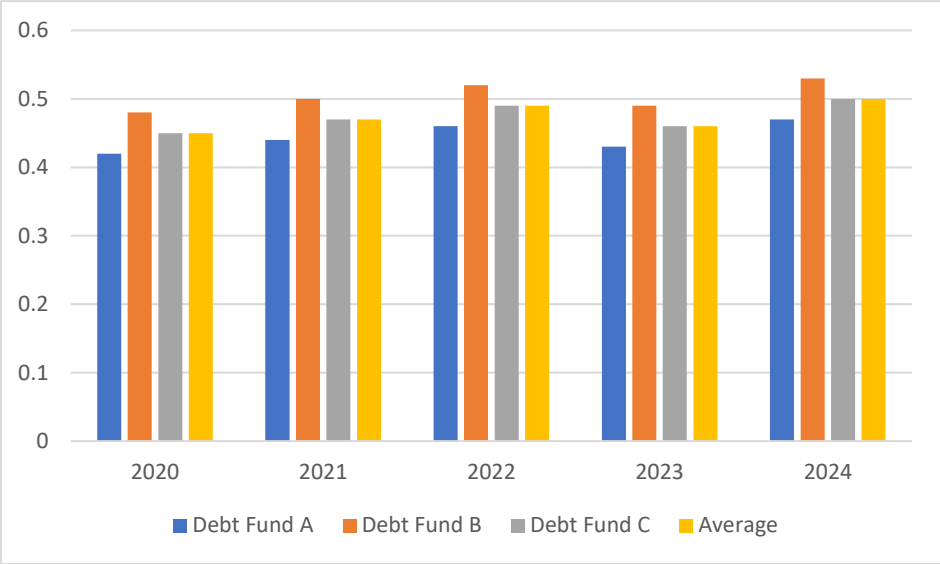


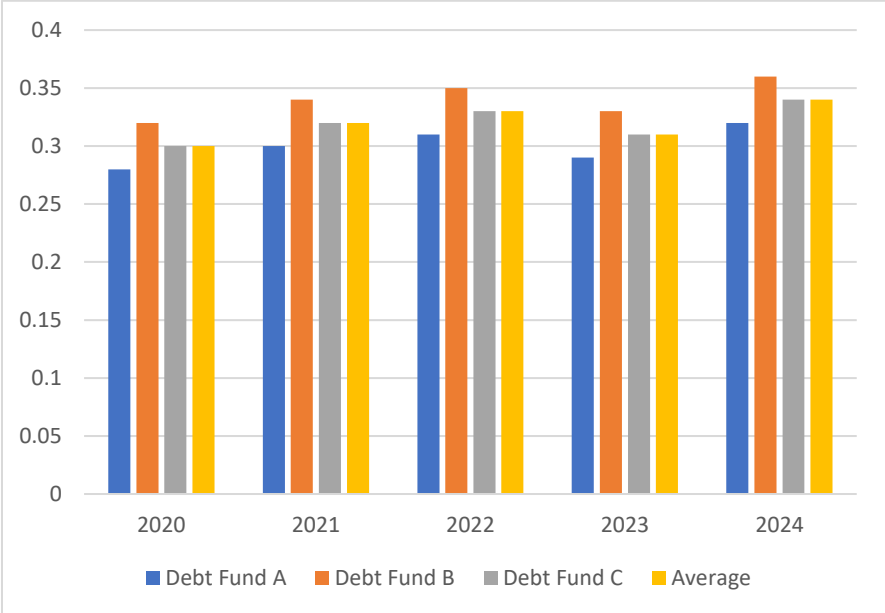
Source - Compiled data

The three debt funds' Sharpe ratios from 2020 to 2024 show a steady and progressive increase, indicating improved risk-adjusted performance within that time frame. Every year, Debt Fund B has the greatest Sharpe ratio among the funds, showing better returns relative to the amount of risk assumed. From 0.45 in 2020 to 0.50 in 2024, the average Sharpe ratio for all funds increased, indicating better fund management and portfolio efficiency. All things considered, this pattern shows how well the funds are becoming at minimizing volatility and producing steady returns.

Year-wise Treynor Ratio Trends

Year	Debt Fund A	Debt Fund B	Debt Fund C	Average
2020	0.28	0.32	0.30	0.30
2021	0.30	0.34	0.32	0.32
2022	0.31	0.35	0.33	0.33
2023	0.29	0.33	0.31	0.31
2024	0.32	0.36	0.34	0.34

Year-wise Treynor Ratio Trends



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In comparison to systematic risk (beta), the Treynor ratios of the three debt funds from 2020 to 2024 show a consistent increase in their risk-adjusted returns. With the greatest Treynor ratio year after year, Debt Fund B seems to be better compensated for market risk. Between 2020 and 2024, the average Treynor ratio rose from 0.30 to 0.34, indicating general improvements in fund performance and strategic asset allocation. A stronger ability of managers to control market risks and maximize portfolio returns is shown by this growing trend.

FINDINGS OF THE STUDY

1. From 2020 to 2024, the Treynor ratios for each of the three debt funds exhibit a steady upward trend, suggesting stronger risk-adjusted returns in comparison to market risk.
2. The rate of inflation increased generally between 2020 and 2024, reaching a high of 5.1% in 2022 and then gradually decreasing to 4.3% in 2024. This suggests that there was modest inflationary pressure at that time, which may have affected the actual returns on debt investments
3. From 2020 to 2024, the interest rate trend indicates a little rise to 5.0% in 2024 after declining from 6.5% in 2020 to a low of 4.0% in 2022. This trend points to a gradual tightening of monetary policy in response to inflationary pressures after an initial relaxing of policy, maybe to spur economic development.
4. The correlation matrix shows that debt fund risk is positively correlated with interest rates (0.75) and inflation (0.70), suggesting that greater macroeconomic pressures cause volatility. On the other hand, the returns of debt funds are negatively correlated with risk (-0.60), inflation (-0.50), and interest rates (-0.55), indicating that increasing economic stress tends to lower returns. Furthermore, the modest correlation (0.65) between interest rates and inflation reflects their interdependent behaviour over time.
5. Over a five-year period, the correlation coefficients between inflation and mutual fund risk have been continuously robust and positive, ranging from 0.68 to 0.74. This suggests that greater inflation is strongly linked to higher risk in debt funds. These correlations are confirmed to be statistically significant as all of the p-values are less than 0.05.
6. Interest rates and mutual fund risk have a significant and positive correlation coefficient that has been steady over the last five years, ranging from 0.72 to 0.78. Every year, the link is shown to be statistically significant by the fact that all p-values are significantly below 0.05.
7. Over the course of the five years, the three debt funds' Sharpe ratios from 2020 to 2024 exhibit a steady and progressive increase, indicating improved risk-adjusted performance. Debt Fund B has the greatest Sharpe ratio of all the funds, which is a sign of better returns given the amount of risk taken. The average Sharpe ratio for all funds increased from 0.45 in 2020 to 0.50 in 2024, indicating better fund management and portfolio efficiency.

SUGGESTIONS OF THE STUDY

1. There are several tactical ways to increase the risk assessment of debt funds in mutual fund investing. First, since macroeconomic factors like inflation and interest rates have shown high relationships with debt fund risk, fund managers should better include them into their forecasting models.
2. Second, it might be useful to predict possible drawdowns and volatility by stress-testing portfolios under various inflation and interest rate scenarios.
3. Third, default risk exposure may be decreased by increasing the frequency of credit quality evaluations of the underlying assets. By using machine learning algorithms to identify trends and abnormalities in past data, risk spikes may be anticipated in advance.
4. Diversification across industries, issuers, and maturities may further lessen the risk of concentration. Making fund goals and risk levels more transparent would assist investors in making well-informed choices.
5. Furthermore, the volatility of the portfolio may be reduced by using duration management strategies to match fund sensitivity with interest rate sentiments. To analyse performance in respect to risk, it is also essential to routinely examine the Treynor and Sharpe ratios. Educating investors on risk-return tradeoffs might help them make better investing decisions.
6. Lastly, compliance is guaranteed and investor trust is increased by matching portfolio plans with regulatory requirements and rating agency outlooks. A key component of adaptive risk management is the ongoing evaluation of fund performance in comparison to peers and benchmarks.

IV. CONCLUSION

In summary, one of the most important factors in choosing a mutual fund investment is evaluating the risk of debt funds. Macroeconomic factors like inflation and interest rates are shown to be significantly correlated with debt fund risk. Fund volatility and investor returns have been strongly influenced by changes in key economic indices during the course of the five-year period from 2020 to 2024. Debt funds with conservative credit risk ratings and smaller standard deviations were more stable. Higher Treynor and Sharpe ratios were also linked to superior fund management choices, which reflected

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better risk-adjusted performance. A cautious attitude by fund managers is shown by the continuous medium to low credit risk ratings. Statistical methods such as hypothesis testing, p-values, and correlation matrices validated the importance of external economic factors on the behaviour of debt funds. To distinguish between fund performance, average return, standard deviation, and performance ratios were used. grasp fund vulnerability required a grasp of inflation monitoring and interest rate sensitivity. These results highlight how crucial it is for investors and fund managers to have a thorough framework for evaluating risk. The use of strong statistical analysis, diversification, and alignment of investment strategies with economic circumstances are ultimately ways to better control risk in debt funds. For long-term fund success, adaptable techniques and constant monitoring are crucial.

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