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A Survey on AI-Powered Mutual Fund Selection System

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ABSTRACT: Mutual fund performance prediction is a crucial aspect of investment decision-making, enabling investors and fund managers to optimize portfolio allocation and risk management strategies. This study employs a non-parametric approach, **Data Envelopment Analysis (DEA)**, to evaluate the efficiency of Indian equity mutual funds based on multiple performance indicators. A sample of **46 mutual funds** is analyzed over three different time horizons—**three years, five years, and ten years (2006–2015)**—to assess their relative efficiency and consistency. Key financial parameters such as **returns, turnover rate, volatility, and expense ratio** are considered to determine the efficiency scores of these funds.

The results from DEA are further compared with widely recognized mutual fund rating systems, such as **CRISIL and ValueResearch**, to validate the proposed methodology. The comparison highlights the effectiveness of DEA in identifying funds that exhibit both **high returns and stable performance** over extended periods. The findings provide valuable insights for investors, asset managers, and policymakers by offering an alternative performance evaluation method that is **data-driven, objective, and robust**. By employing DEA, this research presents a practical framework that can enhance investment decision-making and aid in selecting mutual funds that align with investors' financial goals.

KEYWORDS: Mutual Funds, Data Envelopment Analysis, Quantile.

I. INTRODUCTION

Mutual funds serve as a structured investment vehicle, pooling resources from multiple investors to allocate them across a diversified portfolio of assets such as equities, bonds, and other securities. They offer investors a means to access professionally managed portfolios with risk diversification benefits. In India, mutual funds were first introduced in **1963 through the Unit Trust of India (UTI)**, marking the beginning of the industry's development. Over the decades, the Indian mutual fund sector has witnessed substantial growth, with numerous fund houses offering a wide range of investment options. However, despite this growth, mutual funds remain **underutilized**, with only **10% of Indian households** participating in mutual fund investments as of 2015. The **lack of awareness**, coupled with the perceived **complexity and risks** associated with mutual funds, continues to hinder wider adoption among retail investors.

As of **2015, over 4,300 mutual fund schemes** were available in the Indian market, making fund selection a challenging task for investors. Identifying the most suitable funds requires careful analysis of various performance metrics, such as **returns, risk exposure, turnover ratios, and expense ratios**. Traditional performance evaluation models, including those based on the **Capital Asset Pricing Model (CAPM)**, have long been used to assess mutual fund performance. However, these models suffer from several limitations, such as their reliance on historical returns, assumptions of market efficiency, and the exclusion of cost-related factors. CAPM-based measures, such as the **Sharpe ratio, Treynor ratio, and Jensen's alpha**, focus primarily on return-risk trade-offs but do not comprehensively account for operational efficiency and cost-effectiveness.

To address these limitations, this paper employs **Data Envelopment Analysis (DEA)**, a **non-parametric technique**, to evaluate and predict mutual fund performance in a more **comprehensive and objective** manner. Unlike traditional methods, DEA incorporates multiple input and output variables, allowing for a **multi-dimensional assessment** of fund efficiency. By analyzing **returns, turnover rate, volatility, and expense ratio**, DEA enables a holistic evaluation of

mutual fund performance. The study applies DEA to a sample of **46 Indian equity mutual funds** over three different investment horizons—**three years, five years, and ten years (2006–2015)**—to determine their relative efficiency and stability.

Furthermore, the findings from DEA are compared with well-established mutual fund rating systems, such as **CRISIL and ValueResearch**, to validate its effectiveness. The study aims to provide **practical insights** for investors, fund managers, and policymakers by offering an alternative and **data-driven performance assessment framework**. By leveraging DEA, this research seeks to bridge the gap in mutual fund evaluation methodologies, assisting investors in making **informed and strategic investment decisions** in an increasingly complex financial market.

II. LITERATURE SURVEY

Sr.No	Title	Author	Journal	Description
1.	The performance of mutual funds in the period	M. Jensen	2010	The evaluation of portfolio performance requires understanding and measuring "risk." Risk-averse investors expect higher returns for riskier assets.
2.	The Process of Test the Single-factor Capital Asset Pricing Model	Zhen Wang	2020	This paper also points out whether investors and researchers can continue to use Treasury bonds as risk-free assets based on the high inflation rate in the United States
3.	“Application of multi-criteria decision analysis for investment strategies in the Indian equity market	Sudipa Majumdar	2010	VA outperforms SIP in returns, especially in small-cap and key sectors, with risk factors being crucial.
4.	Mutual fund performance evaluation using data envelopment analysis with new risk measures	Ruiyue Lin	2007	The study improves DEA by adding VaR and CVaR for better risk assessment and evaluating fund performance over different periods.
5.	Package ‘Benchmarking	Peter Bogetoft and Lars Otto	2010	This study uses DEA with various efficiency measures and technology assumptions to evaluate

				performance, including mergers, with support for SFA and STONED methods.
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III. ALGORITHM

Data Collection Algorithm: Collects data from user inputs and external databases.

Uses APIs or data pipelines for real-time integration.

Feature Extraction Algorithm: Implements techniques like Principal Component Analysis (PCA) or TF-IDF for text data. Focuses on dimensionality reduction to enhance model performance.

Classification Algorithm: Utilizes algorithms like Decision Trees, Support Vector Machines (SVM), or Neural Networks. Selects the model based on data type and prediction requirements.

Prediction Algorithm: Predicts outcomes using trained models. Applies regression for continuous data or classification for categorical data.

Optimization Algorithm: Uses gradient descent, hyperparameter tuning, or genetic algorithms to refine models. Continuously learns from system feedback for performance improvement.

Architecture

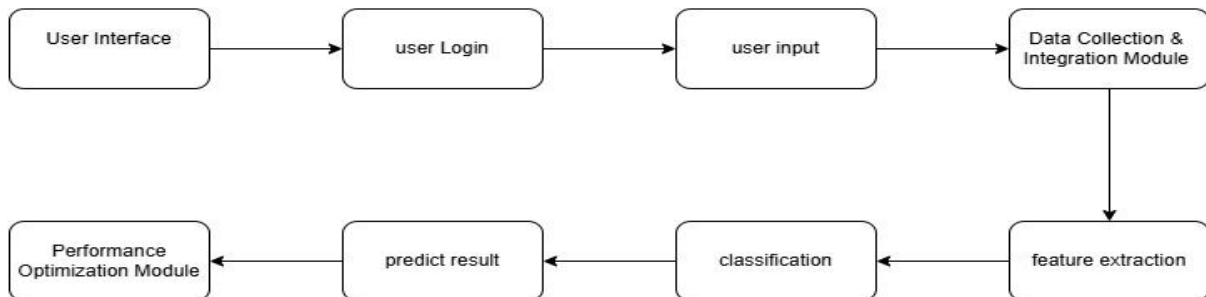


Fig: mutual fund prediction.

User Interface: Acts as the front-end for user interaction. Allows users to access the system and initiate processes.

User Login: Authenticates users to ensure secure access. Manages user sessions and credentials.

User Input: Collects data or parameters required for system processing. Sends this data to the next module for integration.

Data Collection & Integration Module: Gathers and consolidates data from multiple sources. Ensures data is clean, formatted, and ready for analysis.

Feature Extraction: Identifies key attributes from the collected data. Reduces data complexity while preserving essential information.

Classification: Applies machine learning or statistical algorithms to categorize data. Helps in identifying patterns or making decisions based on extracted features.

Predict Result: Generates predictions based on the classification output. Provides insights or forecasts relevant to the user's input.

Performance Optimization Module: Analyzes system performance and prediction accuracy. Implements optimization techniques to improve efficiency and reliability.

IV. EXISTING SYSTEM

Traditional methods for evaluating mutual fund performance, such as the Capital Asset Pricing Model (CAPM) and its extensions like the Sharpe ratio and Jensen's alpha, primarily focus on risk-adjusted returns relative to a benchmark index. While these models provide useful insights, they have several limitations, including reliance on predefined benchmarks, assumptions of market efficiency, and inability to incorporate multiple cost factors such as expense ratios

and turnover rates. Moreover, these models are rigid in handling complex data and often fail to capture the true efficiency of mutual funds. To overcome these challenges, Data Envelopment Analysis (DEA) has emerged as a superior alternative. DEA is a non-parametric technique that evaluates mutual fund efficiency without requiring assumptions about data distribution or functional relationships. It allows for a multi-input, multi-output assessment by incorporating expenses, volatility, returns, and capital inflows, making it a more comprehensive performance evaluation tool. Unlike traditional models, DEA does not rely on external benchmarks but instead constructs an efficiency frontier based on actual fund performance, enabling fair peer comparisons. This study applies DEA to assess the efficiency of 46 Indian equity mutual funds over different time horizons—three, five, and ten years (2006–2015)—providing a more nuanced evaluation compared to conventional methods. Additionally, the findings are compared with industry-recognized ratings from CRISIL and Value Research to ensure validity. By addressing the shortcomings of traditional evaluation methods, this research offers a more effective framework for investors, fund managers, and policymakers, ultimately aiding in better fund selection and investment decision-making.

Existing System Advantages:

- 1] Efficient data processing
- 2] Accurate predictions
- 3] Optimized performance

Existing System Disadvantages:

- 1] High computational cost
- 2] Complex implementation
- 3] Limited adaptability to new data without retraining

V. CONCLUSION

The study demonstrates the effectiveness of DEA in predicting mutual fund performance. By analyzing 46 Indian equity funds over various timeframes, the proposed approach identifies funds that not only deliver high returns but also exhibit stability. Approximately 74% of the analyzed funds outperformed the category average, emphasizing their reliability. These findings offer valuable guidance for investors seeking optimal fund selection and for fund managers aiming to enhance portfolio efficiency. DEA proves to be a robust tool for overcoming traditional model limitations, making it a significant contribution to mutual fund performance analysis.

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