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Evaluating The Effectiveness Of The Piotroski F-Score In The Indian Equity Market : Evidence From Nifty100(2007–2024)

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***Abstract*:**
This study explores the effectiveness of the Piotroski F-score as a valuation and screening tool for companies within India's Nifty 100 index over the period 2007 to 2024. The Piotroski F-score, which ranges from 0 to 9, measures a firm's financial strength by combining signals from profitability, leverage, liquidity, funding decisions, and operational efficiency. In simple terms, a higher score reflects stronger financial health and resilience, while a lower score can be seen as an early warning sign of potential distress. By analysing nearly two decades of historical data, the study finds that firms with higher F-scores not only delivered stronger returns over time but also provided a cushion during market downturns when broader indices underperformed. This suggests that the F-score is not just a measure of value but also a practical tool for managing risk and identifying robust companies in uncertain environments. The findings reinforce the importance of continuously tracking the F-score to capture early distress signals while uncovering attractive investment opportunities in the Indian equity market.

Keywords: Piotroski, Nifty 100, F-score, Valuation, Risk Management

1. Introduction

The Indian stock market offers immense opportunities, but presents challenges to investors seeking to identify fundamentally strong companies. Broad indices such as the Nifty 100 reflect general market trends, but provide limited information on the financial health of individual firms. In this context, the Piotroski F-score serves as a valuable tool, evaluating companies through nine financial indicators related to profitability, leverage, liquidity, and efficiency. Higher scores signal a stronger growth potential, while lower scores may indicate underlying risks. Originally introduced as an academic model, the F-score has evolved into a practical framework for building sound and fundamentally driven investment portfolios. This study applies the Piotroski F-score to firms within India's Nifty 100 index from 2007 to 2024, selecting the top 10 companies each quarter and comparing their performance with the broader index. Although the model has proven effective worldwide, its use in India remains less explored, especially considering the unique economic cycles, regulatory shifts, and sector specific dynamics of the country. The research further enhances this approach through a component-wise sensitivity analysis by removing individual F-score factors to determine their specific impact. Findings suggest that key indicators like Return on Assets and Accruals are crucial drivers of performance, while factors such as equity issue and changes in Asset Turnover play a lesser role. Furthermore, the study emphasizes the importance of quarterly portfolio rebalancing to maintain alignment with the latest financial data. This adaptability ensures that the portfolio remains responsive to evolving company fundamentals and broader economic changes in the dynamic market environment of India. In conclusion, the Piotroski F score has been shown to be an effective and practical tool for stock selection in India, offering retail and institutional investors a reliable, evidence-backed method to construct resilient high-performing portfolios tailored to local market conditions.

2. Literature Review

Stock market indexes such as the Nifty 100 play a critical role in reflecting economic health and providing a benchmark for equity market performance. Evaluating the financial health of companies listed in these indexes is essential for investors aiming to optimize returns while managing risks. The Piotroski F-score developed by Joseph Piotroski in '2000' is a financial screening model designed to assess the financial strength of firms based on their accounting fundamentals. Although extensively studied in global markets, its application within the Indian equity market, particularly in relation to major indexes such as Nifty 100, remains underexplored.

Existing Research on Financial Screening Models :

Many models assess a company's financial health, such as the Altman Z score for bankruptcy risk, the Beneish M score to detect earnings manipulation, and the Ohlson O score to predict default. Although these offer valuable insights they focus mainly on distress signals or fraud detection. The Piotroski score stands out for its simplicity and effectiveness in spotting undervalued, yet fundamentally strong companies. It helps investors filter out weak firms from low price-to-book stocks, improving stock selection without complexity. Its practical use in markets makes it ideal for building reliable and high-quality portfolios.

2.1. Altman Z-Score

The Altman Z-Score is a financial model used to predict corporate bankruptcy by assessing the financial health of a company based on key metrics of the balance sheet and income statement. It combines profitability, leverage, liquidity, solvency, and efficiency ratios into a single score with higher values indicating financial stability and lower values signalling distress.

Formula:

$$Z = 1.2X1 + 1.4X2 + 3.3X3 + 0.6X4 + 1.0X5 \qquad (1)$$

Where:

- *X1 =Working Capital / Total Assets*
- *X2 =Retained Earnings / Total Assets*
- *X3 =1EBIT/Total Assets*
- *X4 =Market Value of Equity / Total Liabilities*
- *X5 =Sales / Total Assets*

Research Studies and Literature:

• This [2] paper introduced the Altman Z-score, a model that uses discriminant analysis to predict corporate bankruptcy. It combines five financial ratios: profitability, leverage, liquidity, solvency and efficiency; into a single score to assess distress risk. The model was widely applied in the evaluation of credit risk and in the evaluation of corporate stability.

Limitations : While being effective in detecting financially distressed firms, the Z-Score mainly predicts bankruptcy rather than assessing general financial strength. It suits manufacturing firms more than service-based industries, where Piotroski's broader evaluation is more effective.

• This [3] paper assessed the financial health of NIFTY 50 companies (excluding banking and financial firms) using the Altman Z-Score. Firms were categorized into safe, Gray, and distress zones according to the likelihood of bankruptcy.

Limitations : Although the study provides solvency insights, its focus on distress prediction limits its use for long-term investment strategies The exclusion of financial firms also narrows the Z-Score, while Piotroski's model suits diverse sectors, highlighting fundamentally strong stocks with investment potential.

• This [4] paper reevaluated the Altman Z-Score to predict financial stability in select BSE-30 companies over five years. Firms were classified as healthy or unstable based on Z-Scores with statistical tests applied to track changes in financial stability.
Limitations : Though validating the Z-Score's effectiveness in assessing stability, the model's dependence on historical data limits its relevance for long-term stock selection. The Z-Score focuses on short-term distress. Piotroski's model supports value investing and long-term performance analysis that adjusts to fundamental changes, providing broader insights into firm strength.

2.2. Graham Number

The Graham Number, also called the Graham Score, is a valuation metric used in value investing to find the maximum fair price that an investor should pay for a stock based on its earnings and book value. It offers a conservative estimate of intrinsic value to help investors avoid overpaying for weak companies.
Formula:

$$Graham\ Number = \sqrt{22.5\ \times\ Earnings\ Per\ Share\ \times\ Book\ Value\ Per\ Share} \qquad (2)$$

Research Studies and Literature:
• The book [5] Graham's Number, explained in The Intelligent Investor serves as a practical tool for value investors to determine the fair price of a stock using earnings and the book value per share. This conservative formula-driven approach makes value investing more systematic and accessible. *Limitations* : Graham's Number ignores trends, leverage, liquidity, and efficiency. It also assumes static conditions, while Piotroski uses broader financial indicators that reflect changes in the fundamentals of a company, making it more adaptable to modern investing.
• This [6] study evaluated Graham's formula by applying it to 2Dow Jones Industrial Average (DJIA) stocks over 17 years. The study found that portfolios based on this formula earned higher returns, especially when a larger margin of safety was applied.
Limitations : Though effective in finding undervalued stocks, Graham's formula relies on static inputs and cannot adjust to market changes. It lacks depth in evaluating profitability and financial strength. The study's annual rebalancing assumption also limits flexibility, while Piotroski allows more responsive strategies using multiple dynamic indicators.
• This [7] study tested Graham's approach in the Indian stock market by analysing the price-to-book ratios (P/B) of NSE-listed stocks in the Automotive, Pharmaceutical, IT and Energy sectors over ten years. The study found that low P/B stocks did not always outperform sector averages raising doubts about Graham's method in this market.
Limitations : Relying solely on the P/B ratio limits financial evaluation, while Piotroski's multifactor model better identifies strong firms. This study misses aspects such as growth and distress risk that affect its ability to find undervalued stocks.

2.3. Beneish M-Score

The Beneish M-Score detects earnings manipulation in 2 companies by analysing key accounting ratios. It helps spot firms that may be misrepresenting financial results based on unusual changes in revenues, expenses, and assets. A higher score suggests a greater risk of manipulation.
Formula:

$$M= -4.84+0.92\times DSRI +0.528\times GMI +0.404\times AQI +0.892\times SGI$$
$$+0.115\times DEPI -0.172\times SGAI +4.679\times TATA-0.327\times LVGI \qquad (3)$$

Where:
• *DSRI=Days' Sales in Receivables Index*
• *GMI=Gross Margin Index* • *AQI=Asset Quality Index*
• *SGI =Sales Growth Index*

• *DEPI =Depreciation Index*
• *SGAI = Sales, General & Administrative Expenses Index*
• *TATA=Total Accruals to Total Assets*
• *LVGI =Leverage Index*

Research Studies and Literature:
• This [8] paper introduced the Beneish M-Score to detect earnings manipulation by examining financial ratios and accruals. It proved useful in identifying companies that violate accounting standards, offering an early warning system for fraud detection.
Limitations : The M-Score highlights potential fraud but does not assess a firm's financial strength or long-term investment quality. Unlike the Piotroski score, it focuses only on manipulation risk and was tested mainly on US companies, limiting its relevance to Indian markets without adaptation.
• This [9] study applied the M-Score to five Indian telecom firms between 2018 and 2022 to detect financial fraud. Most of the companies showed no signs of manipulation except one suspected case.
Limitations : While effective for spotting manipulation, the model ignores broader factors such as profitability, leverage, and stability that the Piotroski score covers. Limiting research to telecom reduces its usefulness for other sectors.
• This [10] study tested the M-Score in transport firms in Slovakia and the Czech Republic finding high levels of earnings manipulation driven by tax and regulatory factors.
Limitations : The focus on fraud detection misses long term financial health and investment potential. Unlike the Piotroski score, which evaluates overall strength, this study only looks at manipulation and is confined to a single sector

2.4. The Piotroski score
The Piotroski score is a financial model that gives a score from 0 to 9 based on profitability, leverage, liquidity, and efficiency to identify strong companies. A higher score indicates better financial health and potential for investment.
Formula :

$$F = P1+P2+P3+P4+L1+L2+L3+E1+E2 \quad (4)$$

Where:
• *Profitability (P) : ROA, CFO, ΔROA, Accruals*
• *Leverage, Liquidity & Funding (L) : ΔLeverage, ΔLiquidity, Equity Issuance*
• *Efficiency (E): ΔMargin, ΔTurnover*

Research Studies and Literature :
• This[11] study applied the Piotroski F-Score to high book to-market Indian stocks over six years. It found that firms with high scores performed better in future valuations than low-score firms, especially in stock pricing.
Limitations : The study focuses only on high book-to-market stocks, unlike this research, which covers all Nifty 100 firms. It also lacks quarterly rebalancing that reduces adaptability compared to the dynamic approach of this study.
• This study [12] modified the Piotroski score by removing ROA and CFO, adding ratios such as P/E, P/B, and EV / EBITDA. When applied to Nifty 50 stocks for two years, the modified score gave better returns; lower beta and higher 3 Sharp ratio.

Limitations : The modified score uses sentiment-influenced market-based metrics unlike this research, which sticks to fundamental measures in Nifty 100. It also uses a two-year rebalancing period that is less responsive than the quarterly reallocation in this study.

Research Gaps :

Despite extensive research on financial screening models, significant gaps remain in the evaluation of firms within Indian market indexes such as Nifty 100. Existing models such as Altman's Z Score [2] and its applications in Indian markets [3] [4] focus primarily on bankruptcy prediction, but fail to provide a holistic financial assessment essential for value investment. Similarly, the Beneish M-Score [8] has been widely used to detect earnings manipulation, including studies applying it to specific sectors such as Indian telecom [9] and global markets [10]. However, such models are designed primarily to detect financial distress rather than identify strong investment opportunities. Graham's number based on the value investing principles of The Intelligent Investor [5] is another widely used metric, but its reliance on static financial indicators limits its adaptability to dynamic market conditions. Further analysis [6] has questioned its effectiveness in stock selection, suggesting the need for 4 more comprehensive evaluation frameworks. Studies on intrinsic value assessment using value investing principles in Indian markets [7] also indicate that traditional valuation methods require refinement to improve accuracy. Moreover, while these models have been extensively studied in global markets [8][10]; their empirical validation within the Indian equity market remains underexplored. Most existing studies rely on models developed in the western world without considering the dynamics of the local market, reducing their effectiveness in emerging economies. In addition, many screening methodologies focus on isolated financial metrics rather than integrating trends in profitability, leverage / liquidity, and operational efficiency over time, leading to a fragmented assessment of financial health. The Piotroski score [1] overcomes these limitations by offering a comprehensive, adaptable, and industry-agnostic approach. Empirical evidence suggests that it effectively improves stock performance [11] and can be refined further to produce higher returns [12]. By systematically filtering out weak firms among undervalued stocks; the Piotroski Score provides a powerful and practical tool for long-term value investors in the Indian stock market addressing key limitations of existing screening methodologies.

Criteria	*Piotroski Score*	*Altman Z-Score*	*Graham Score*	*Beneish M-Score*
Purpose	Identifies strong companies among value stocks	Predicts bankruptcy risk	General financial strength evaluation	Detects earnings manipulation
Key Focus	Profitability, leverage, liquidity, efficiency	Solvency & default risk	Determines the maximum fair price to pay for a stock	Fraud & accounting red flags
Scoring Range	0–9 (Higher is better)	Above 2.99 (Safe), Below 1.8 (Distressed)	Varies by stock (Higher suggests undervaluation)	Above –2.22 (Possible Fraud)
Key Metrics	9 fundamental factors (ROA, CFO, Leverage, etc.)	Liquidity, profitability, leverage ratios	EPS, Book Value Per Share	Accruals, leverage, sales growth
Best For	Long-term value investors	Credit analysts & distressed debt investors	Conservative value investors	Fraud detection

Table 1. Comparison of Fundamental Financial Scoring Models

3. Proposed Methodology

Why Should Piotroski Score Be Preferred?

The Piotroski Score is often preferred over other fundamental screening methods because it is:

1. Simple Yet Effective : A 9-point scoring system that evaluates financial strength using only historical accounting data.
2. Focused on Value Stocks : It enhances the selection process for low price-to-book (P/B) ratio stocks, which often outperform when financial strength is verified.
3. Empirical Backing : Piotroski original research found that a high Piotroski Score portfolio outperformed low-scoring stocks by 7.5% annually.
4. Useful for Conservative Investors : Since it focuses on financial stability, it helps mitigate downside risk in investments.

5. Risk Management Advantage : Helps investors avoid financially weak companies reducing exposure to potential value traps.
6. Simplicity in Application : Unlike complex models it requires only fundamental financial statements making it easy to use across industries.
7. Enhances Traditional Value Investing : Acts as a refinement tool for traditional value strategies improving selection criteria.
8. Adaptability for Portfolio Strategies : Can be integrated with other investment models enhancing portfolio diversification and returns.

3.1. Fundamentals of Piotroski F-Score

The Piotroski F-score is a widely recognized financial metric designed to evaluate the fundamental health of companies using data derived from their financial statements. Introduced by Joseph Piotroski in 2000 this score assesses a company's financial strength based on nine criteria spread across three key dimensions: profitability, liquidity and operating efficiency. These dimensions provide a holistic view of a firm's financial performance making the F-score a valuable tool for investors particularly those focusing on value investing.

3.1.1. Profitability signals:

Profitability is a key indicator of a firm's financial health and ability to generate returns. The Piotroski F-score assesses profitability through four criteria.

• Return on Assets (ROA): A measure of net income relative to total assets, where a positive ROA signals that the company is effectively generating profit.

ROA = $\frac{Net\ Income}{Total\ Assets}$

• Operating Cash Flow (OCF): Positive cash flow from operations indicates that the firm's core business activities 5 generate sufficient cash.

OCF =Cash Flow from Operations

• Quality of Earnings: This criterion checks whether the OCF exceeds the signalling that the reported earnings are sustainable and not overly influenced by accounting adjustments.

$Quality\ of\ Earnings\ = \{\ 1, if\ OCF\ >\ Net\ Income$

$=\{\ 0, otherwise$

• Change in Return on Assets (ΔROA): An improvement in ROA compared to the previous year suggests increased profitability and operational performance.

ΔROA=ROA(current-year) – ROA(previous-year)

Where:

ROA = $\frac{Net\ Income}{Total\ Assets}$

3.1.2. Leverage, Liquidity, and Funding:

This dimension evaluates the firm's ability to manage debt, maintain liquidity, and fund operations without overreliance on external financing.

• Change in Leverage (ΔLeverage): A decrease in long term debt as a percentage of total assets indicates improved financial stability and reduced dependence on borrowed capital. ΔLeverage = Leverage(current-year) – Leverage(previous-year)

Where:

$$\text{Leverage} = \frac{Long\text{–}Term\ Debt}{Total\ Assets}$$

• Change in Liquidity (ΔLiquidity): Improvement in the current ratio which measures current assets relative to current liabilities reflects the firm's ability to meet short term obligations.

ΔLiquidity = Current Ratio(current-year) − Current Ratio(previous-year)
Where:

$$\text{Current Ratio} = \frac{Current\ Assets}{Current\ Liabilities}$$

• Equity Issuance: A firm that has not issued new equity in the reporting year scores positively, signalling that it is funding operations and growth internally rather than diluting shareholder value.
Equity Issuance ={ 1, if no new equity issued
= { 0, if new equity issued

3.1.3. Operating Efficiency:
Efficiency metrics reflect a firm's ability to optimize resource utilization and maintain competitive margins:
• Change in Gross Margin (ΔMargin): An increase in the percentage of gross margin suggests improved cost control or pricing power, which contributes to higher profitability.
ΔMargin = Gross Margin(current-year) − Gross Margin(previous-year)

$$\text{Where: Gross Margin} = \frac{\text{Revenue} - \text{Cost of Goods Sold (COGS)}}{Revenue}$$

• Change in Asset Turnover (ΔTurnover): Growth in revenue relative to assets indicates enhanced operational efficiency and better use of company resources.
ΔTurnover = Asset Turnover(current-year) − Asset Turnover(previous-year)

$$\text{Where: Asset Turnover} = \frac{\text{Revenue}}{Total\ Assets}$$

3.2. Implementation
This study employs a systematic methodology to evaluate the performance of companies listed in the Nifty 100 index using the Piotroski F-score as a screening tool. The approach spans data extraction, company selection, and investment simulations over a longitudinal period from 2006 to 2024.

3.3. Data Collection and Extraction
3.3.1. Data extraction:
The financial data required for this study was sourced from:
• Historical Data of Income Statements, Balance Sheet and Cash Flow (2005- 2024): Collected from the Center for Monitoring Indian Economy (CMIE Express).
• Yahoo Finance: Provided comprehensive historical records of companies listed in the Nifty 100 index.

3.3.2. Data scope:
• The study focuses on the best performing companies in NIFTY 100 to identify trends and patterns in financial health over time.
• The financial statements were analysed to calculate the nine components of the Piotroski F-score, covering metrics of profitability, leverage, liquidity, and operational efficiency.

3.3.3. Data Preprocessing:
• The data collected was cleaned to address missing values and discrepancies in the reporting standards.
• The standardization of financial metrics ensured consistency in the calculation of the Piotroski F-score in all companies and time periods.

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3.3.4. Data frequency:

• Quarterly data points were extracted to facilitate dynamic evaluation and enable timely adjustments to the portfolio.

3.4. Selection of Top 10 Companies

Once the Piotroski F-scores were calculated for all companies in the index:

3.4.1. Ranking Process:

• The companies were ranked according to their F scores for each quarter.
• The top 10 companies with the highest F-scores were selected for potential investment.

3.4.2. Handling Ties:

In cases where multiple companies achieved the same F-score, a tie-breaking mechanism was implemented.
• Market Capitalization and Enterprise Value: Companies were further ranked based on their size and valuation.
• Performance Consistency: Firms demonstrating stable or improving F-scores over time were prioritized.

3.5. Investing Process

The investing process systematically allocates funds across companies, tracks investments, and reinvests residuals to maximize portfolio efficiency. It follows a structured approach by maintaining detailed records, adjusting for market fluctuations, and optimizing fund distribution based on predefined criteria. The flowchart visually represents key steps, such as calculating market values, managing previous holdings, and reinvesting unallocated funds.

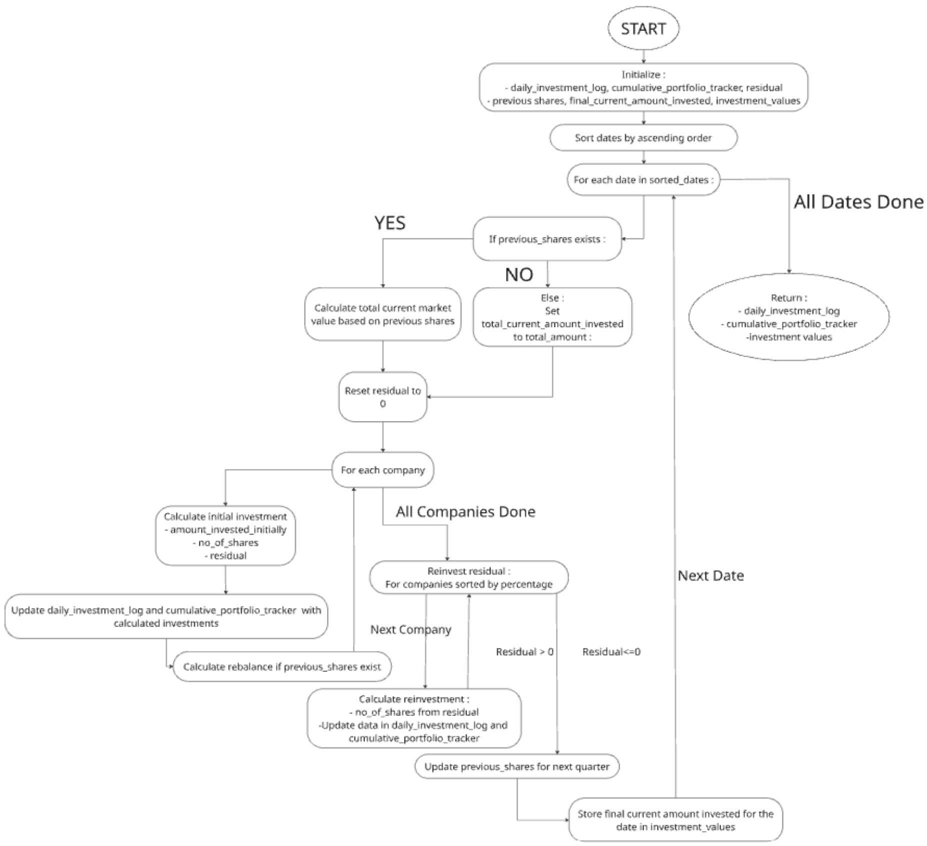

Figure 1. Investment Process Flowchart

3.6. Function Signature and Process Description

This section outlines the process flow and the use of variables for the investment simulation function.

3.6.1. Function signature:

Input Arguments:

• Date to company values: Dictionary mapping dates to company data such as market value and investment percentage.
• Total amount: Total capital available for investment in all companies.
• Company ticker: Dictionary mapping company names to their corresponding stock ticker symbols.
• Extract present MV: Function to extract the market value of a company stock for a specific date.

3.6.2. Initialize Variables:

• daily investment log: Tracks investments per date and company.
◦ Format: {date: {company: {'amount invested': value, 'no of shares': value, 'rebalance': value}}}
• cumulative portfolio tracker: Tracks cumulative investment and share details for each company.
◦ Format: {company: {'invested money': total value, 'share details': {shares: value}}}
• residual: Tracks leftover money after investments on a given date.
• previous shares: Tracks the number of shares held for each company from the previous date.
◦ Format: {company: shares}
• final current amount invested: Total amount invested at the end of the process. • investment values: List of tuples tracking total investment for each date.
◦ Format: [(date, invested amount)]

3.6.3. Sort Dates:

• Dates from date to company values are sorted in ascending order to process investments sequentially.

3.6.4. Iterate through Sorted Dates:

For each date:
• Format Date: Convert the date to a standardized format.
• Calculate: − Current Market Value:
◦ If previous shares exists: − Calculate total current market value based on shares held.
◦ Else: − Use total pool amount as the initial investment
• Reset Residual: Set leftover money to zero for the new date.

3.6.5. Iterate Through Companies:

For each company on the current date:
• Extract Data:
◦ market value: Stock price of the company on the current date.
◦ percentage: Allocation percentage for the company.
• Calculate Initial Investment: Compute the number of shares to buy and adjust residual for any leftover money.
• Update Dictionaries: Add investment details to daily_investment_log and cumulative portfolio_tracker.
• Calculate Rebalance: Compare the current number of shares with previous_shares and compute the change.

3.6.6. Reinvest Residual:

• Distribute the leftover money among companies in descending order of percentage of investment.

3.6.7. Update Previous Shares:
• Save the number of shares held for each company for use on the next date.
3.6.8. Store Investment Value:
• Record the total investment value for the current date in investment_values.
3.6.9. Return Results:
• daily_investment_log : Per-date investment details.
• cumulative_portfolio_tracker : Cumulative company investment details.
• investment_values : Total investments per date.

Summary of Key Concepts :
1. Dictionary Definitions:
• daily investment log: Tracks daily investments at a company level.
• cumulative portfolio tracker: Tracks cumulative investment details on all dates.
2. Residual Reinvestment:
• Leftover money is reinvested, prioritizing companies with higher percentages.
3. Share Calculations:
• The number of shares is calculated by flooring the investment amount divided by the stock price.

3.7. Component-Wise Sensitivity Analysis of the Piotroski Score
This study performed a component-wise sensitivity analysis to understand the importance of each Piotroski F-score factor. One factor was removed at a time; the scores were recalculated using the remaining eight and the investment portfolio was adjusted accordingly. This process was repeated for all nine components over the full period from 2007 to 2024, keeping other variables constant such as the NIFTY 100 stock universe, quarterly rebalancing, and a fixed capital allocation strategy. For each case, the top 10 companies were selected based on the revised score, investment amounts were allocated, and portfolio performance was tracked. The aim was to isolate the effect of each factor and assess its influence on portfolio selection and weighting within the Piotroski model.

4. Results
Exploring the application of the Piotroski Score, a fundamental analysis tool to identify and compare the performance of a portfolio of selected companies with Nifty 100. The analysis is carried out over a significant timeframe, from 2007 to 2024, using quarterly investment data. The main objective of this research is to evaluate the effectiveness of the Piotroski score as a robust selection criterion for portfolio investments in the Indian stock market. By comparing the growth and returns of a portfolio constructed using the top 10 companies with the highest Piotroski scores against the Nifty 100, the study aims to ascertain the score's predictive accuracy in maximizing returns.

4.1. Gross Merchandise Value (GMV) Over Time (Figure 2)

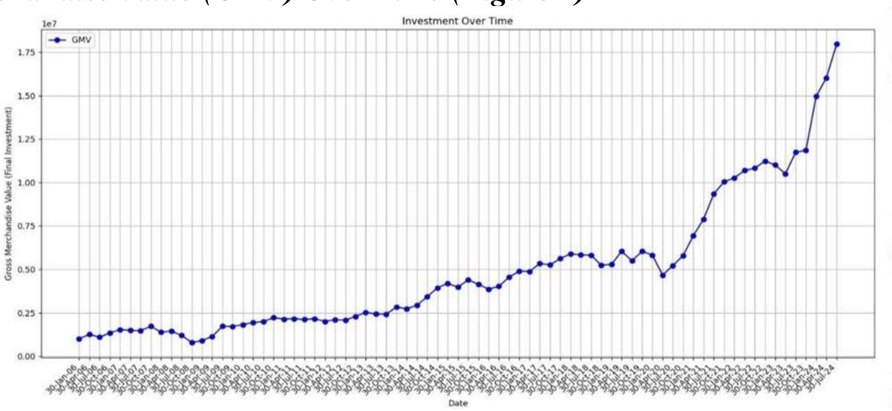

Figure 2. Investment Growth(GMV) over Time

The graph (Figure 2) depicts the GMV progression of the portfolio over the quarters. GMV is represented in crores and demonstrates steady growth:
1. From 2007 to around 2014, the GMV shows modest growth aligning with slower economic recovery phases post the 2008 global financial crisis.
2. Post-2014, the GMV shows significant growth, particularly after 2017, aligned with economic reforms in India and market optimism.
3. By 2024, the GMV will reach approximately 1.8 crore (assuming that the initial investment is 10-lakh rupees only), reflecting the compound growth impact of consistent reinvestments based on quarterly evaluations.

4.2. Growth percentage: GMV Portfolio vs. Nifty 100 (Figure 3)

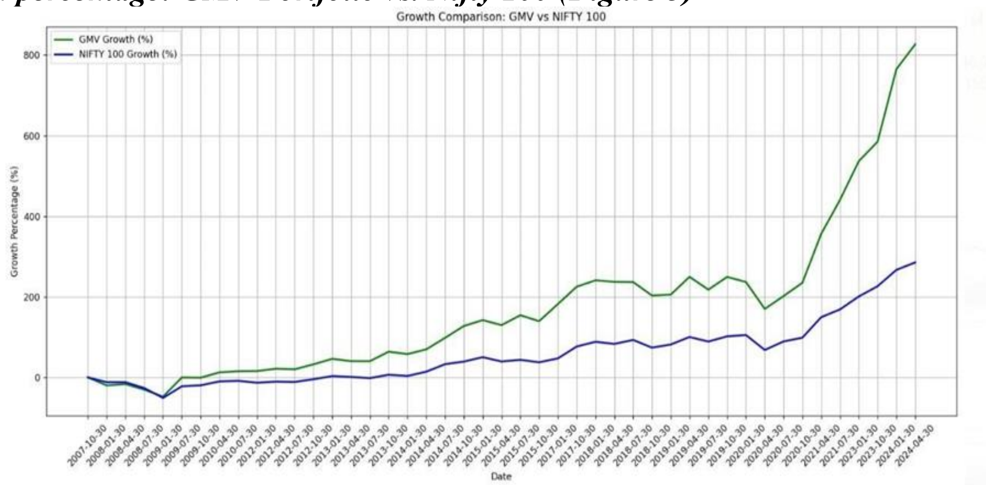

Figure 3. Percentage Growth Comparison (GMV v/s NIFTY100) over Time

The graph (Figure 3.) depicts the growth percentage of the GMV portfolio compared to the Nifty 100 index over time:
1. Initially, both the portfolio and Nifty 100 exhibit minimal or negative growth until around 2012.
2. The portfolio begins to noticeably outperform the index from around 2016 onward.
3. After 2020 the divergence becomes substantial, with the GMV portfolio surpassing 800% growth, while the Nifty 100 achieves around 250% growth.
4. This significant outperformance underscores the potential effectiveness of the Piotroski score-based strategy in identifying high-growth stocks over the long term.

4.3. Impact of Removing Individual Piotroski Factors

The experiments demonstrated that not all nine factors contribute equally to the investment outcome. During the entire investment period, the baseline portfolio using all nine Piotroski factors grew by approximately 1695.86% (from 10,00,000 to 1,79,58,561.61). This performance served as a reference for evaluating the effect of removing each individual factor from the scoring model.

Excluded Factor	Portfolio Value (₹)	Percentage Growth
ROA	1,53,92,106.27	1439.21%
ΔROA	1,62,16,426.44	1521.64%
Scaled CFO	1,83,44,698.33	1734.47%
Accrual	99,24,175.26	892.42%
ΔLeverage	1,72,96,236.72	1629.62%

Excluded Factor	Portfolio Value (₹)	Percentage Growth
ΔLiquidity	1,55,91,882.47	1459.19%
ΔGross Margin	1,84,49,537.53	1744.95%
ΔAsset Turnover	1,90,12,359.39	1801.24%
Equity Issuance	1,79,59,208.68	1695.92%

Table 2. Impact of Excluding Individual Piotroski Score Factors

5. Discussion

5.1. Superiority of Piotroski-Based Investment :

The portfolio constructed using Piotroski Scores consistently outperforms the Nifty 100 index in terms of GMV, growth percentage, and cumulative returns. This underscores the efficacy of the score in identifying undervalued and high-performing companies.

5.2. Dynamic Portfolio Management :

By reevaluating the top 10 companies based on Piotroski Scores each quarter; the study emphasizes the importance of adaptive investment strategies. This approach captures market shifts and ensures optimal allocation to companies with strong fundamentals.

5.3. Significance of Fundamental Analysis :

The Piotroski Score evaluates financial health through metrics like profitability, leverage, liquidity and efficiency. This rigorous selection criterion leads to higher growth potential compared to passive index investing.

5.4. Investment Horizon Matters :

The substantial outperformance becomes evident over the long term. Short-term investors may not see similar results due to market volatility and shorter compounding periods.

5.5. Practical Application for Investors :

Indian investors seeking an alternative to index funds or sector-based investments can leverage the Piotroski Score to create customized portfolios, offering potentially higher returns at comparable risk levels.

5.6. Impact and Interpretation of the Excluded Factors:

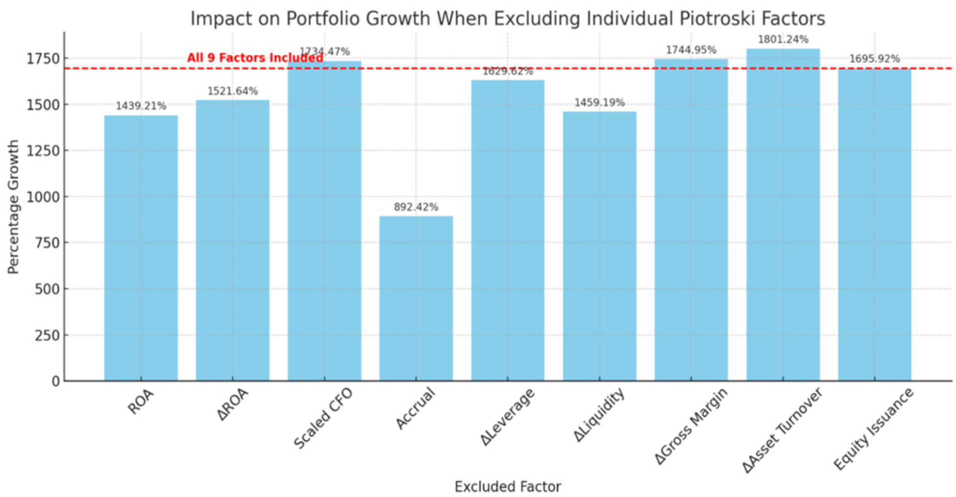

Figure 4. Comparative Impact of Excluding Individual Piotroski Factors on Portfolio Growth

5.6.1. ROA (Return on Assets):
Portfolio return fell to 1439.21%. ROA is key for profitability and asset efficiency. Without it; firms with poor asset use may slip into the portfolio.
5.6.2. ΔROA (Change in ROA):
Portfolio return reached 1521.64%. Though less critical than ROA; this factor captures improving profitability trends. Its absence can miss turnaround companies.
5.6.3. Scaled CFO (Cash Flow from Operations):
Return rose to 1734.47% when excluded. Omitting CFO can favour high-growth firms with temporary negative cash flows like early-stage companies.
5.6.4. Accruals (CFO > Net Income):
Return dropped to 892.42%; the lowest. Excluding this allows firms with weak cash-backed profits risking manipulation or unsustainable performance.

5.6.5. ΔLeverage:
Return reached 1629.62%. A slight dip shows reducing debt remains a positive signal especially for capital-heavy sectors.
5.6.6. ΔLiquidity (Change in Current Ratio):
Return was 1459.19%. Without this, firms struggling with short-term liquidity could enter the portfolio raising risk in uncertain times. 10
5.6.7. ΔGross Margin:
Return slightly improved to 1744.95%. Indicates gross margin growth is not always tied to better returns possibly due to pricing or expansion strategies.
5.6.8. ΔAsset Turnover:
Return peaked at 1801.24%. Shows that asset turnover may not heavily influence performance for large Indian firms where returns stay strong despite fluctuations.
5.6.9. Equity Issuance:
Return stayed near baseline at 1695.92%. Suggests equity dilution is not a major issue for Nifty 100 firms as raised funds often support growth.

6. Conclusion

This study reaffirms the Piotroski Score as a powerful and reliable tool for equity investment in the Indian market, especially when applied to the NIFTY 100 index. By focusing on companies with strong financial fundamentals, the strategy turned an initial investment of 10,00,000 into approximately 1.8 crore over a 17 year period clearly outperforming the NIFTY 100 benchmark.
A unique feature of this research is the component wise sensitivity analysis, which revealed the varying importance of each Piotroski factor. Indicators such as Accruals and ROA proved essential for maintaining portfolio quality while factors like Equity Issuance and ΔAsset Turnover had lesser or even slightly positive effects when omitted. These findings offer meaningful guidance for refining the Piotroski model for Indian equities.

The study also highlights the value of quarterly rebalancing allowing the portfolio to remain adaptive to market shifts while grounded in fundamental analysis. This dynamic yet disciplined approach provided resilience during volatile periods and helped achieve steady long-term growth.
In an evolving economic environment marked by regulatory changes and market uncertainties having a structured, data-driven investment strategy becomes even more critical. The Piotroski Score, with its balanced focus on profitability, leverage, liquidity and efficiency stands out as a practical framework for both individual and institutional investors aiming to enhance returns beyond passive index strategies.

Data Accessibility Statement :

The dataset used in this study comprises historical financial statement data for Nifty 100 firms from 2004–2024, which were employed to construct Piotroski F-scores, along with historical share price data obtained via the Yahoo Finance API. Data for firms that were delisted, acquired, or merged during the sample period were also incorporated to ensure completeness and replicability.

Disclaimer

Investments in securities market are subject to market risks, read all the related documents carefully before investing.

This article is for informational and educational purposes only. It does not constitute financial, investment, or trading advice and should not be relied upon as such. There is no guarantee of any investment gains, and readers are encouraged to conduct their own research before making any investment decisions.

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