

Fundamental Growth Scoring Algorithm Overview (v4 - Turnaround Bonus)

Objective: To assess the growth potential and quality of S&P 500 companies by calculating a composite fundamental score for ranking purposes, incorporating a bonus for positive earnings turnarounds.

I. Core Indicator Dimensions & Calculation Concepts:

The algorithm evaluates companies based on the following key financial dimensions:

A. Growth Dimension

1. Revenue CAGR (Revenue_CAGR):

- **Concept:** Calculates the compound annual growth rate of historical annual revenue using the last N+1 available data points (N defined in config, e.g., 3 years). Uses the actual period covered by available data (min 2 points) if less than N+1 points are valid, logging a warning.
- **Purpose:** Measures the historical average annual top-line growth rate.

2. EPS CAGR (EPS_CAGR):

- **Concept:** Calculates the compound annual growth rate of historical annual diluted EPS using the last N+1 available data points. Uses the actual available period (min 2 points). Returns NaN if starting EPS is non-positive. Logs a warning if the calculated period differs from N.
- **Purpose:** Measures the historical average annual growth rate of profitability per share.

3. Revenue Momentum (Slope_Revenue):

- **Concept:** Calculates the slope of the linear regression line fitted to the most recent (up to 4) valid quarterly revenue growth rates (QoQ%). Treats infinite rates as NaN. Requires min 2 valid QoQ rates.
- **Purpose:** Assesses the recent acceleration/deceleration trend in revenue growth.

4. EPS Momentum (Slope_EPS):

- **Concept:** Calculates the slope of the linear regression line fitted to the most recent (up to 4) valid quarterly EPS growth rates (QoQ%). Handles zero/negative prior EPS based on config. Treats infinite rates as NaN. Requires min 2 valid QoQ rates.
- **Purpose:** Assesses the recent acceleration/deceleration trend in profitability growth.

B. Profitability & Efficiency Dimension

5. TTM Operating Margin Level (TTM_OpMargin_Level):

- **Concept:** Calculated as Trailing Twelve Month (TTM) Operating Income divided by TTM Revenue. Requires 4 consecutive valid quarters of data for TTM sums.
- **Purpose:** Measures core business profitability over the past year.

6. TTM Return on Equity Level (TTM_ROE_Level):

- **Concept:** Calculated as TTM Net Income divided by the average Shareholder Equity over the past 5 quarters. Requires 4 valid quarters of net income and 5 valid quarters of equity.
- **Purpose:** Measures the efficiency of using shareholder equity to generate profit over the past year.

C. Cash Flow Dimension

7. Annual FCF Growth Slope (Annual_FCF_Growth_Slope):

- **Concept:** Calculates the slope of the linear regression line fitted to the last N+1 available years of annual Free Cash Flow (FCF = OCF - CapEx). Requires min 2 valid FCF data points.
- **Purpose:** Measures the growth trend in generating discretionary cash flow.

D. EPS Turnaround Dimension

8. EPS Turnaround Flag (EPS_Turnaround_Flag):

- **Concept:** A binary flag (1 or 0) set to 1 if the company's annual EPS transitioned from non-positive ($\leq \text{config min_eps_for_cagr}$) to positive over the N+1 year period used for CAGR calculation. Requires at least 2 valid EPS data points.
- **Purpose:** To specifically identify and potentially reward companies showing a positive earnings turnaround.

E. Financial Health Dimension (Used for Screening Only)

9. Debt-to-Equity Ratio (Latest Quarter):

- **Concept:** Latest Quarter Total Debt / Latest Quarter Equity.
- **Purpose:** Measures financial leverage for screening.

10. Interest Coverage Ratio (TTM):

- **Concept:** TTM EBIT / TTM Interest Expense. Requires 4 valid quarters of data. Handles zero/negative interest expense.
- **Purpose:** Measures debt servicing ability for screening (current code ignores NaN ICR during screening).

II. Scoring & Ranking Process Outline:

1. Calculate Indicators: Compute all raw indicators, including the EPS_Turnaround_Flag.

2. Screening (Optional): Filter out companies failing financial health checks (D/E, ICR) based on config.

3. Standardization: For screened-in companies, convert performance indicators (CAGRs, Slopes, TTM Margin/ROE, FCF Slope - **excluding** the Turnaround Flag) into percentile ranks (0-100) relative to peers ('overall' or 'industry').

4. Composite Score:

- Impute any missing standardized scores (NaNs) with 50.
- Calculate fused growth scores (combining CAGR and Slope scores).
- Calculate the final Overall_Score by applying weights (from config) to the fused growth scores, standardized Profitability, Efficiency, and Cash Flow scores, **PLUS** an additional score component calculated as $\text{EPS_Turnaround_Flag} * (\text{w_eps_turnaround} * 100)$.
- Reset scores to NaN for screened-out companies.

5. Ranking: Rank companies based on the final Overall_Score (descending).

Note: This version explicitly incorporates a potential bonus score for companies demonstrating an EPS turnaround from non-positive to positive, based on the w_eps_turnaround weight in the configuration.