Information needed to calculate screening criteria

Investment System Project

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Value Criteria 1

1.1 Enterprise Multiple

Justification:

• Neutrality to Capital Structure - EV/EBITDA reflects a company's val-

uation independent of its financing decisions, providing a clearer view of

operational efficiency and value generation.

• Cash Flow Proxy - EBITDA serves as an approximation for cash flow from

operations by excluding non-cash charges, such as depreciation and amor-

tization, which enhances comparability across industries.

• Empirical Support - Academic research (e.g., Loughran & Wellman, 2011;

Gray & Vogel, 2012) has demonstrated that companies with lower EV/EBITDA

ratios historically outperform those with higher ratios, supporting its effec-

tiveness as a value indicator.

Needed Information:

• Market Capitalization

• Total Debt

• Cash and Cash Equivalents

• EBITDA

• Optional: EBITDA (1-year forward)

Enterprise Multiple = $\frac{\text{enterprise value}}{\text{ERITDA}}$

market cap + total debt - cash and cash equivalents

EBITDA

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Price to Earnings ratio (1 year TTM) 1.2

Justification:

• Investor Sentiment Indicator - The P/E ratio reflects how much investors

are willing to pay for each dollar of earnings, providing insight into market

expectations and sentiment toward a company's growth and risk profile.

• Ease of Use and Interpretation - It's widely understood, easy to calculate,

and available across most financial platforms, making it a go-to metric for

quick relative valuation.

• Empirical Support - Numerous studies (e.g., Basu, 1977; Fama & French,

1992) have shown that low P/E stocks tend to outperform high P/E stocks

over the long run, indicating that P/E can help identify undervalued com-

panies with potential for excess returns.

Needed Information:

• Share Price

• EPS (diluted) for last 4 quarters

• Optional: EPS prediction (1-year forward)

 $\frac{P}{E}$ ratio = $\frac{\text{share price}}{\text{TTM earnings per share}}$

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1.3 Price to Earnings to Growth Ratio (1-year forward)

Justification:

- Cross-Sector Comparability By accounting for growth, PEG enables better comparisons between companies or sectors with varying growth rates, improving investment decisions beyond static valuation metrics.
- Empirical Support Research (e.g., Easton, 2004; Fairfield, 1994) supports the PEG ratio's predictive power for future returns, especially when growth expectations are accurately estimated, making it a valuable tool for identifying GARP (Growth At a Reasonable Price) opportunities.

Needed Information:

Depending on whether calculated using extrapolated earnings/earnings growth estimates from past data or actively predicting using models, i.e. using rolling historical CAGR for earnings growth prediction and rolling 4 quarter window for calculating EPS versus using EPS (forward 1-year prediction) predicted by regression and EPS growth (forward 1-year prediction) predicted by regression also.

- Share Price
- EPS (diluted) for last 4 quarters or EPS (forward 1-year estimate)
- Estimate for EPS Growth in one year (linear regression based prediction module, extrapolation based ratio calculation module)

$$PEG \text{ ratio} = \frac{\frac{P}{E}}{\text{Earnings Growth Estimate}}$$

$$PEG(\text{example}) = \frac{\left(\frac{P}{\hat{E}_{t+1}}\right)}{\left(\frac{\hat{E}_{t+1} - E_t}{E_t}\right) \times 100}$$

2 Growth Criteria

2.1 TTM QoQ EPS Growth % (Diluted)

Justification:

- TTM EPS captures the most recent earnings performance, making it highly relevant for short-term (1-year ahead) forecasts where current momentum is a strong driver of near-term growth.
- It includes the effects of the latest changes in margins, cost structure, and revenue strategies—things that are most likely to persist or influence near-term growth.
- Investors and analysts often react strongly to the most recent earnings, meaning that TTM growth tends to drive short-term price movements and expectations.
- Empirical Evidence: Studies like Hou, Xue, and Zhang (2015) ("Digesting Anomalies") show that short-term earnings growth—particularly recent changes in profitability—is a strong predictor of near-term stock returns and business performance.

- net income
- preferred dividends
- weighted average shares outstanding
- conversion of dilutive securities

2.2 Dividend Consistency Score (3-year window)

Justification:

- Predictability and Investor Appeal: Companies with a track record of consistent dividends are often more attractive to investors seeking predictable income streams. This predictability can lead to a more stable investor base and potentially lower stock price volatility.
- Management's Confidence Signal: Regular dividend payments can signal management's confidence in the company's future earnings and cash flow stability. It demonstrates a commitment to shareholder returns and may indicate positive future performance expectations.
- Indicator of Financial Stability: Consistent or growing dividends suggest that a company has stable earnings and robust cash flows, enabling it to return value to shareholders regularly. This consistency often reflects prudent financial management and a resilient business model.
- Empirical Support Hartford Funds Study: A study by Hartford Funds emphasizes that corporations consistently growing their dividends have historically exhibited strong fundamentals and solid business plans. This consistency in dividend growth is associated with long-term capital appreciation and shareholder value.

- last 12 dividend payments per share (if quarterly)
- dividend payment dates

```
dividends = [list, of, last, 12, dividend, payments, ...]
consistency_score = sum(
    dividends[i] >= dividends[i-1]
    for i in range(1, len(dividends))
)
```

3 Quality Criteria

3.1 Cash Return on Capital Invested Ratio (QoQ)

Justification:

- Reflects true cash profitability: CROCI measures the actual cash return
 a company generates on its capital base, unlike ROIC or ROE which rely
 on accounting earnings. This makes it less susceptible to non-cash adjustments (like goodwill impairments or depreciation policies), offering a clearer
 picture of operational performance.
- Capital-efficiency focus: By comparing cash flows to gross capital invested,
 CROCI highlights how efficiently a company converts invested capital into cash. This is especially useful for comparing companies across sectors with different depreciation, capex, or capital structures.
- Deutsche Bank Quant Research The CROCI framework (originally developed in-house) underpinned their CROCI Economic Price to Book strategy, which outperformed traditional P/B and P/E models in cross-sector stock selection over multiple decades.

- Cash flow from operations
- Δ working capital (QoQ)
- net interest income (or expense)
- Total assets
- Invested capital
- working capital

Cash flow from operations

-increase or decrease in working capital

$$CROCI = \frac{-((1 - \text{tax rate}) \times \text{net interest income or expense})}{\text{gross tangible and intangible assets}}$$

gross tangible and intangible assets

- + investments in associates
- +working capital

4 Momentum Criteria

4.1 Price % Increase (6 month)

Justification:

- Captures short to medium-term trend strength: A 6-month price increase reflects recent investor sentiment and market momentum, which often persist due to behavioural biases like herding and underreaction to information.
- Balances signal freshness with noise reduction: Compared to shorter windows (e.g., 1-month), the 6-month period offers a more stable signal while still being responsive enough to current market dynamics.
- Jegadeesh & Titman (1993) found that stocks with strong past 3–12 month returns tend to outperform over the following 3–12 months, with 6-month momentum being a strong performer. This supports the idea that recent price momentum is predictive of future returns due to delayed price adjustments and investor behaviour.

- Share Price latest quote
- share price 6 months ago

6 month price % increase =
$$\frac{P_t - P_{t-6}}{P_{t-6}} \times 100$$

4.2 Moving Average Convergence Divergence

Justification:

- Identifies Long-Term Momentum Shifts: Monthly MACD smooths out shortterm noise and helps detect sustained changes in a stock's trend, providing clearer signals for longer-term investment decisions.
- Enhances Timing for Entry/Exit: By highlighting bullish or bearish momentum crossovers on a monthly scale, it supports better timing for buying into upward trends or exiting weakening positions, complementing fundamental analysis.
- Momentum Persistence: Research indicates that momentum tends to persist over time. A study published in ScienceDirect analyzed 88 technical indicators and found that momentum-based indicators, including MACD, are effective in forecasting stock price trends over longer horizons.

- time series of prices enough to actually calculate the EMAs
- hyperparameters (lookback periods)

$$MACD_t = EMA_{fast}(P_t) - EMA_{slow}(P_t)$$
 where,
$$EMA_t = \frac{2}{N+1} * P_t + \left(1 - \frac{2}{N+1}\right) * EMA_{t-1}$$
 Signal line_t =
$$\frac{2}{s+1} * MACD_t + \left(1 - \frac{2}{s+1}\right) * \text{Signal line}_{t-1}$$

5 Risk Criteria

5.1 Sortino Ratio (WoW TTM)

Justification:

- Focuses on downside risk: Unlike the Sharpe ratio, the Sortino ratio only penalises downside volatility (returns below a target or required rate), which makes it more relevant for investors who are primarily concerned with losses rather than overall volatility.
- Improves risk-adjusted decision-making: By isolating harmful volatility, the Sortino ratio helps identify companies that consistently deliver positive returns with minimal downside risk—ideal for building a more resilient portfolio.
- Backed by empirical research: A 2010 study published in The Journal of Investing ("Revisiting the Sortino Ratio: A More Robust Measure of Risk-Adjusted Performance") found that portfolios selected using the Sortino ratio outperformed those chosen using traditional Sharpe ratio methods, particularly during volatile market conditions. This suggests that targeting companies with high Sortino ratios can lead to better long-term riskadjusted returns.

- Last 53 weekly close prices (chosen asset)
- Last 53 weekly close prices (chosen index)
- average weekly % return for last 52 weeks (asset and index)
- downside deviation (calculated only on the weeks where the assets return is below the index return)

sortino ratio =
$$\frac{\bar{R}_{p} - \bar{R}_{MAR}}{\sigma_{d}}$$
 where, $\sigma_{d} = \sqrt{\frac{1}{|D|} \sum_{i \in D} \left(R_{p,i} - \bar{R}_{MAR}\right)^{2}}$, $D = \left\{i \mid R_{p,i} < \bar{R}_{MAR}\right\}$

5.2 Alpha Ratio (WoW TTM)

Justification:

- Alpha quantifies a company's risk-adjusted performance relative to the market, helping investors identify firms that consistently outperform their expected returns. A positive alpha suggests superior management or hidden value, which may not be reflected in traditional valuation ratios.
- Using alpha as a filter helps investors isolate firms whose returns are driven
 by fundamental strength rather than market noise, which is especially useful when combined with other quality and valuation metrics like PEG or
 CROCI.
- Empirical Support Academic research, such as that published in The Journal of Finance (e.g., Fama and French, 1993; Carhart, 1997), has shown that portfolios formed using alpha—particularly when adjusted using multifactor models like Fama-French 3-factor or Carhart 4-factor—can generate statistically significant excess returns. These studies demonstrate that investors who identify and hold high-alpha stocks can consistently outperform the market on a risk-adjusted basis.

- last 52 weeks of close prices for market index and chosen stock
- risk free rate

Jensen's
$$\alpha = (R_p - R_f) - \beta_p (R_m - R_f)$$

where, $\beta_p = \frac{COV(R_p, R_m)}{V(R_m)}$