

Quantitative Scoring Model

Scoring Model - Introduction

Methodology Framework

Research Team

research@msec.com.my

Factor Investing

- A factor refers to the characteristics of stocks that play a significant role in explaining the returns of those stocks. Factors are typically classified into three main types: (i) Macroeconomic, (ii) Statistical, and (iii) Fundamental.
- **Macroeconomic factor** models consist of factors such as changes in the unemployment rate, interest rates, or other relevant macroeconomic indicators that influence stock returns.
- **Statistical factor** models utilize techniques like Principal Component Analysis (PCA) to discover factors that have not been predetermined.
- **Fundamental factor models**, on the other hand, incorporate stock attributes such as sector classification, financial ratio analysis, and technical signals.

Factor Premia and Definitions

Factor	Description	Measurement
Value	<p>The Value Premium: Cheap stocks tend to outperform expensive stocks.</p> <p>Value tilts: To identify stocks with significant exposures that are priced fairly compared to their intrinsic market value.</p>	P/E, P/B, Enterprise Value to EBITDA, Price to Sales, Cash Flow Yield, Payout Ratio, Price to Operating Income, Price to Earnings to Growth, Earnings Yield
Quality	<p>The Quality Premium: High-quality stocks tend to outperform low-quality stocks.</p> <p>Quality tilts: To identify profitable stocks with good leverage and potential for generating future cash flow.</p>	Gross Profit Margin, Operating Profit Margin, Return on Equity, Earnings Before Interest and Taxes Margin, Operating Cash Flow Margin, Cash Return on Assets, Fixed Charge Coverage Ratio, Quick Acid Ratio
Momentum	<p>The Momentum Premium: Stock performance tends to persist, either by continuing rising or decline.</p> <p>Momentum tilts: To capture stock's recent strong performance, with the expectation that it will continue to produce short-term excess returns in the future.</p>	Relative Strength Index, Balance of Power, Average Directional Index, On-Balance Volume, Moving Average Convergence Divergence

Factors Diversification

- For well-diversified portfolios, factor diversification may become more important than sector and geographic considerations. Different assets have different degrees of risk and return, the returns related to individual stock characteristics can also be considered distinctive, fluctuating depending on economic cycles and market conditions.
- The value and momentum factor are typically viewed as showing pro-cyclical characteristics, displaying strength during periods of significant economic expansion and increased risk



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appetite. On the other hand, quality performance tends to show counter-cyclical patterns.

Factors Scores Construction

- Constructing factor scores can be performed by using the information ratio and standardizing the data sets. This approach first involves in standardizing the raw factor data to obtain a distribution with a mean of 0 and a standard deviation of 1. This is achieved by the calculation of factor Z-Scores. The Z-Score is derived using the following method:

$$Z = \frac{X - \mu}{\sigma}$$

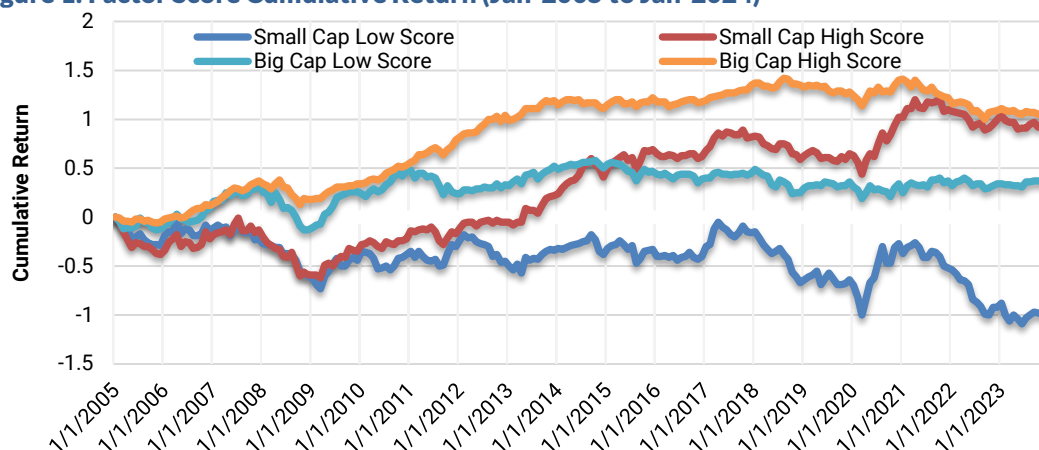
where X , μ and σ represent the raw factor score, mean factor scores and standard deviation respectively. Below is an overview of 3-step process of building factor scores.

- Factor Data Processing.** Assign a 'raw' value for a given factor to each stock in the underlying universe. Remove outliers and normalize results using the Z-Score approach.

	Stock 1	Stock 2
Book Value Yield	1.2	15.3
Sector	Consumer	Information Technology
Sector standard	0.9	12.5
Difference	+ 0.3	+ 2.8
Sector Standard Deviation	0.2	2
Standardized Score	0.3/0.2=+1.5	2.8*1/2=+1.4

- Factor Score.** After calculating the raw factor z-score, it is transformed into a cumulative distribution function (CDF) to scale the score from 0 to 1, where 0 represents the least favorable stocks and 1 represents the most favorable stocks. The factor score is then calculated using an equal weighted approach.
- Verifying Results.** The effectiveness of factor scores needs to be evaluated. And one technique is to sort stocks based on their individual factor scores and divide them based on their quantile. Afterwards, the cumulative monthly returns of each group can be visualized and compared across different quantile portfolios across time. Figure 1 displays an ideal outcome.

Figure 1: Factor Score Cumulative Return (Jan-2005 to Jan-2024)



Source: Malacca Securities Research

Portfolio Construction

- Calculate factor scores.** The factor scores produced during the construction phase will be used in portfolio construction. The factor score of each stock will be transformed to a score between 0 to 1 by mapping with cumulative normal distribution function. Stocks exhibiting



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the most robust factor characteristics will be assigned scores closer to 1.

- **Factors tilting.** Factor Z-scores for Value, Quality and Momentum are multiplied by their respective market capitalization weights to determine unadjusted weights, which are then normalized to sum to 100%; stocks with higher weightage are prioritized for inclusion in model portfolio. A set of tilt strengths (x, y, z) can be found by solving a system of equations.

$$\text{Market Capitalization Weight} \times e^{x \cdot \text{Value}} \times e^{y \cdot \text{Quality}} \times e^{z \cdot \text{Momentum}} \\ = \text{Unadjusted Weight} \rightarrow \text{Final Weight}$$

- In other words, choosing stocks or constructing a portfolio is like baking a cake. We look at how much of each ingredient (Value, Quality, and Momentum) we need, adjust based on how important each one is, make sure everything adds up correctly, and then pick the stocks with the best mix of ingredients for our portfolio.

Factor Score - March Stock Rating Example

Ticker	Sector	Quality Score	Momentum Score	Score	Rating
T*****	Consumer Staples	0.94	0.99	0.93	5
HU***	Materials	0.95	0.97	0.92	5
D**	Information Technology	0.7	0.61	0.43	4
UNJ***	Industrials	0.47	0.9	0.43	4
I**	Real Estate	0.70	0.41	0.29	3
MO***	Consumer Discretionary	0.66	0.44	0.29	3
M***	Consumer Staples	0.18	0.99	0.18	2
H***	Financials	0.64	0.28	0.18	2
S**	Information Technology	0.14	0.56	0.08	1
T**	Industrials	0.31	0.25	0.08	1

Source: Malacca Securities Research

- The scoring model assigns stocks to five groups based on their favorability. Each group represents a different level of attractiveness, ranging from most favorable (Group 5) to least favorable (Group 1). To ensure a balanced distribution, the model assigns an equal number of stocks to each group.

Simulation Portfolio - March Stock Picks

- The 'Factor Tilting' approach generates weights for portfolio constituents by utilizing Factor Z-scores in conjunction with the market capitalization weight. These Factor Z-scores contribute to determining the factor weight for each constituent. These weights are then adjusted to ensure they sum up to 100%, and constraints are applied to finalize the weights in the portfolio. Below are the top ten companies within our simulation portfolio:

Stock Name	Sector	Quality Z-Score	Momentum Z-Score	Size Weightage	Portfolio Weightage	Adjusted Weight
UTDPLT	Consumer Staples	1.34	2.05	0.21	1.12	0.28
HUMEIND	Materials	1.64	1.88	0.04	0.25	0.06
ITMAX	Information Technology	0.88	1.88	0.05	0.21	0.05
DAYANG	Energy	0.55	1.75	0.06	0.19	0.05
UCHITEC	Information Technology	2.05	0.77	0.04	0.18	0.05
KGB	Industrials	0.88	2.33	0.04	0.18	0.04
KERJAYA	Industrials	0.58	1.88	0.05	0.16	0.04
KSL	Real Estate	0.84	2.05	0.04	0.15	0.04
AHEALTH	Health Care	0.77	0.99	0.05	0.11	0.03
JTIASA	Materials	0.99	1.88	0.03	0.11	0.03

Source: Malacca Securities Research

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