



Portfolio Management



Index-Based Equity Strategies



Exam Focus

- Compare factor-based strategies and indexing strategies
- Different approaches to index-based equity strategies
- Compare full replication, stratified sampling and optimization
- Potential causes of tracking error and methods to control it
- Sources of return and risk to an index-based equity portfolio

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Passive Factor-Based Strategies

Portfolio with same exposures as index to a set of risk factors that tracks the risk/return performance of the index

- Also known as “smart beta”
- Compared to passive cap-weighted investing:
 - Higher fees and trading commissions
 - More flexible as they don’t hold all of the constituent stocks

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Common Equity Risk Factors

Factors

- *Growth* factor: high P/E, high P/B
- *Value* factor: low P/E, low P/B
- *Size* factor: low float-adjusted market caps
- *Yield* factor: high dividend yield
- *Momentum* factor: recent above-average returns
- *Quality* factor: stable earnings and dividend growth, high CF-to-earnings, low D/E
- *Volatility* factor: low-volatility stocks

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Passive Factor-Based Strategies

- *Return-oriented*: dividend yield, momentum, fundamentally weighted
- *Risk-oriented*: volatility weighting, minimum-variance investing
- *Diversification-oriented*: equally weighted portfolios and maximum diversification strategies

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Passive Factor-Based Strategies

Advantage

- Less costly than active management, yet still allows factor exposure based on market view

Disadvantage

- Higher management fees and trading commissions than passive cap-weighted investing

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Approaches to Passive Equity Investing

Pooled investments: open-end mutual funds, ETFs

- Open-end mutual funds have a convenient fund structure and generally lower costs.
- ETFs can handle redemptions more cheaply and efficiently (e.g., in-kind stock delivery).
- ETFs generally have higher transaction costs and illiquidity in some secondary markets.

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Approaches to Passive Equity Investing

Derivatives-based: adjust existing return and risk exposures through overlays

- Efficient, trade in liquid markets, easy to leverage portfolio
- Finite expirations require rollover, potential position limits, specialty investment needs might not be met, counterparty risk (OTC derivatives), basis risk increases tracking error
- Completion overlay, rebalancing overlay, currency overlay

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Approaches to Passive Equity Investing

Separately managed equity index-based portfolios

- Requires a set of capabilities and tools
- Index data subscription: returns, dividends, corporate actions
- Robust trading and accounting system
- Broker relationships to trade cheaply and efficiently
- Compliance systems to meet laws and regulations
- Program trade to establish the portfolio

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Portfolio Construction Methods

Full replication

- Closely matches index return (before transaction costs)
- Costly when large number of stocks and limited liquidity; regular reconstitution and rebalancing required

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Portfolio Construction Methods

Stratified sampling

- Initially less costly than full replication as only a subset of all stocks is used
- Sampling could be based on dimensions such as industry, style, or country
- As more stocks added (e.g., less liquid stocks), transaction costs and tracking error increase

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Portfolio Construction Methods

Optimization

- Lower tracking error
- Explicitly consider covariance between constituent stocks
- Based on historical relationships, and those can change
- Can create portfolios that are not mean-variance efficient

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Portfolio Construction Methods

Blended approach

- Full replication best if small number of stocks or liquid stocks
- Stratified sampling or optimization best if large number of stocks or illiquid stocks
- Large indices that have all of the above characteristics could use a combination of approaches

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Question: Passive Equity Investing

A portfolio manager is asked by a high-net-worth client to build an index portfolio that tracks the S&P 500 Value Index, which has more than 300 constituents. The manager and the client agree the minimum account size will be USD750,000.

The manager explains to the client that full replication is not feasible at a reasonable cost because of the mandate size.

Explain how the manager can use stratified sampling to achieve the client's goal of tracking the S&P 500 Value Index.

Solution: Passive Equity Investing

The portfolio manager can use a stratified sampling approach to closely match the S&P 500 Value Index at a reasonable cost.

1. the number of holdings, for example from to to create a . This will significantly reduce costs.
2. Identify the index holdings with the . This will ensure the holdings chosen have the exposure to the index.
3. Ensure the sampled portfolio also matches the .

This approach will still closely match the S&P 500 Value Index but at a lower cost than .

Tracking Error and Causes

Tracking error (TE) equals the standard deviation of portfolio excess returns versus the index. This is caused by the following:

- Management fees charged to investor
- Sampled portfolios have higher TE than fully replicated portfolios
- Index based on end-of-day stock prices
- Brokerage commissions
- Cash drag: cash held for redemptions, dividends, and sale proceeds, but does not earn a return

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Controlling Tracking Error

- Full replication has lower TE, but more costly to manage
- Minimize cash balances using futures contracts or careful netting of cash inflows and redemptions

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Return and Risk Sources in Passively Managed Equity Portfolios

- Use attribution analysis to identify sources of tracking error.
- Securities lending enables passive investors to earn a return and offset costs by lending shares to short investors.
- Corporate governance and investor activism is important, even for passive investors.

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Solutions

Solution: Passive Equity Investing

The portfolio manager can use a stratified sampling approach to closely match the S&P 500 Value Index at a reasonable cost.

1. Reduce the number of holdings, for example from 300 to 200 to create a **sampled portfolio**. This will significantly reduce costs.
2. Identify the index holdings with the **largest capitalizations**. This will ensure the 200 holdings chosen have the largest exposure to the index.
3. Ensure the sampled portfolio also matches the **index sector weights**

This stratified sampling approach will still closely match the S&P 500 Value Index but at a lower cost than full replication.

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Active Equity Investing: Strategies



Exam Focus

- Fundamental vs. Quantitative Approaches
- Types of Active Management strategies
- Other strategies
- Equity investment style classification

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Fundamental Approach for Active Management

Fundamental

- Use research, skill, and experience to estimate intrinsic value of securities—**subjective**
- Larger positions in fewer holdings
- Higher manager conviction ideas receive higher weight
- Continuous monitoring and rebalancing
- Risk if misestimated intrinsic value or market fails to recognize mispricing

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Quantitative Approach for Active Management

Quantitative

- Relies on models to select investments—**objective**
- Requires large amounts of historical data to identify those variables (e.g., valuation, size) that have a statistically significant relationship with stock returns
- Spread factor bets across smaller positions in larger number of holdings; portfolio optimizer sets weights
- Automatically rebalances according to strategy rules
- Risk if factors do not perform as predicted

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Bottom-Up Strategies

Value-based approaches identify securities trading below estimated intrinsic value (find “cheap” stock)

Substyles

- Relative value (low price multiples vs. industry average)
- Contrarian investing (buy “losers”)
- High-quality value
- Income investing (high dividends)
- Deep value investing (more extreme than RV)
- Restructuring/distressed debt investing

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Bottom-Up Strategies

Growth-based approaches identify companies with revenues, earnings, and/or cash flows that are expected to grow faster than their industry or the overall market.

- Managers may focus on:
 - consistent long-term growth,
 - short-term earnings momentum, and
 - growth at a reasonable price (GARP).

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Question: Bottom-Up Strategies

Company	Share Price	Price-to-Book Ratio	Price to 12-Month Forward EPS	5-Year EPS Growth Forecast	Dividend Yield	Sector Average P/E
TW	3	0.75	1.50	-10%	0%	8
NB	15	7.50	15.00	10%	1%	12
SO	30	10.00	20.00	2%	2%	30
RX	12	3.00	13.55	4%	9%	14

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Question: Bottom-Up Strategies

Based on the information in the table, **determine** which of the following strategies would *most likely* select each security. **Justify** each of your responses with *one* reason. Each choice may only be used once.

- Deep value investing
- Growth at a reasonable price (GARP)
- Income investing
- Relative value investing

Solution: Bottom-Up Strategies

- TW has the lowest P/B ratio of 0.75. The low valuation of assets suggests that a investing strategy would be appropriate, provided the analyst addresses reasons for the low valuation.
- NB has the lowest PEG ratio of 1.5 ($15 / 10$), which is substantially lower than the PEG ratio of the other stocks with positive earnings. That suggests a strategy might select the security.

Solution: Bottom-Up Strategies

- SO has the lowest P/E ratio of 20 versus its sector average of 30 with a ratio of only 0.67.
- Thus, a _____ investing strategy might select the security, assuming no obvious reasons why the valuation discount might exist.
- *Note: TW has an even lower P/E versus its sector average P/E at 0.188 ($1.5 / 8$), and it would appeal to a relative value strategy. But, TW is the only security trading at a P/B below 1 and would be the only security likely to appeal to a _____ strategy.*

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Solution: Bottom-Up Strategies

- RX has the highest dividend yield of 9% ($1.08 / 12$), which is substantially higher than the other securities.
- Thus, RX is a good candidate for an _____ investing strategy.

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Top-Down Strategies

Top-down strategies focus on overall macroeconomic and broad market variables.

- Managers can use ETFs and derivatives to overweight best markets and underweight worst markets according to:
 - country/geography,
 - industry/sector,
 - volatility, and
 - thematic investment strategies.

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Factor-Based Strategies

- A **factor** is a variable or characteristic with which asset returns are correlated:
 - Example: size and value factors introduced by Fama and French
- “Rewarded” factors have positive association with long-term positive risk premiums.
- Managers must avoid unrewarded factors that do not offer a persistent return.

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Implementing Factor-Based Portfolios

Hedged portfolio approach

- Rank investable stock universe by factor
- Divide stock universe into quantiles
- Construct long/short portfolio by going long best quantile and short worst quantile
- Hedged portfolio returns are tracked over time and represent factor performance

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Implementing Factor-Based Portfolios

Drawbacks to hedged portfolio approach

- Information in middle quantiles is lost
- Assumed linear relationship of factor and stock returns
- Reduced diversification if factors highly correlated with each other
- Assumed ability to short stocks
- Hedged portfolio typically has large exposures to other risk factors

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Equity-Style Factors

- **Size:** long small-cap stocks; short large-cap stocks
- **Value:** long cheap stocks; short expensive stocks
- **Price momentum:** long recent outperformers; short recent underperformers

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Equity-Style Factors

Growth: buy stocks with high historical/expected growth rates; sell stocks with opposite prospects

Quality: buy stocks with high-quality earnings; sell stocks with low-quality earnings

Unstructured data

- Buy stocks with largest customers having best trailing 1-month stock price return
- Sell stocks with largest customers having worst trailing 1-month stock price return

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Factor Timing

- Subcategory of factor investing is **equity style rotation**
 - Different factors work at different times
- Could investigate market conditions that lead to factor outperformance
 - Regress factor performance against a variable suspected to be key driver of factor performance

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Question: Factor Timing

A quantitative manager is investigating whether central bank interest rate decision surprises are a key variable in driving equity style factor performance.

- Three style factors are considered from the Fama and French model: market risk, size (e.g., small-large), and value.
- The manager collects monthly performance data for the style factors and regresses those factor returns against a custom defined variable, $ISurprise_t$:
 - If $ISurprise_t$ is high, then the central bank targeted higher-than-expected rates.
 - If $ISurprise_t$ is low, then it targeted lower rates.

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Question: Factor Timing

The manager looks for possible relationships by performing two regressions using current-month and next-month factor returns against ISurprise_t:

- $f_{i,t} = \beta_{i,0} + \beta_{i,1} \text{ISurprise}_t + \varepsilon_{i,t}$
- $f_{i,t+1} = \beta_{i,0} + \beta_{i,1} \text{ISurprise}_t + \varepsilon_{i,t}$

Here are the regression coefficients for current and subsequent months:

- Beta: -0.5, +0.7
- Size: +0.05, -1.0
- Value: -0.04, -0.5
- **Discuss** the main factor rotation timing implications from the regression.

Solution: Factor Timing

Current month:

- -0.5 coefficient for beta indicates that higher-beta stocks in the month of an upward surprise in interest rates, or for a downward surprise
- +0.05 and -0.04 coefficients for size and value suggest meaningful signal

Solution: Factor Timing

Subsequent month:

- -1.0 coefficient for size indicates small companies the month after higher-than-expected interest rates
- -0.5 coefficient for value indicates value companies for upward surprise in rates
- +0.7 coefficient for beta indicates high-beta stocks for surprise in rates

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Activist Strategies

Activists specialize in taking stakes in companies and pushing for change to enhance value.

- The investing process involves identifying opportunities, buying a stake in a target company, submitting a public proposal for change, and threatening (and launching) a proxy contest if no agreement reached.
- Activists use tactics to increase shareholder value:
 - Seek board representation
 - Propose financial restructuring
 - Reduce management compensation

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Management Defenses Against Activists

- Use multi-class share structures
 - Grant multiple votes to founders
- “Poison pill” clauses
 - Dilute activist stake
- Staggered board provisions
 - Board members cannot be replaced simultaneously

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Activism

Target companies

- Slower earnings and revenue growth
- Negative share price momentum
- Weak corporate governance

Impact

- Evidence suggests activism improves growth, profits, and corporate governance, but with higher debt levels
- Positive reaction to activism announcements

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Other Strategies

Statistical arbitrage

- Example: pairs trading—long/short two securities that have historically had a high correlation but have deviated from this long-term relationship

Market microstructure-based arbitrage

- Example: imbalances between buy/sell orders may trigger temporary (milliseconds) spikes in share price, which can be exploited

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Other Strategies

Event driven

- Exploit market inefficiencies around corporate events
 - Example: during a merger/acquisition involving a share for share exchange, risk arbitrage involves shorting shares of acquirer, buying shares of target

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Fundamental Active Investment Process

1. Define investment universe according to fund mandate
2. Prescreen universe for a manageable set of securities
3. Analyze industry, competitive position, financial reports
4. Forecast performance (e.g., based on earnings)
5. Convert forecasts to valuations
6. Construct portfolio with desired risk profile
7. Rebalance portfolio with buy and sell disciplines

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Fundamental Investing Pitfalls

- **Behavioral biases** affect human judgment
 - Examples: confirmation bias, illusion of control, availability bias, loss aversion, overconfidence, and regret aversion bias
- **Value trap**: stock appears to be attractive because of a significant price fall, but may still be overvalued
- **Growth trap**: stock has above-average future growth already priced into valuation

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Quantitative Active Investment Strategy Process

1. Define market opportunity (investment thesis)
2. Acquire and process data (e.g., company fundamentals)
3. Backtest strategy (apply to historical data)
4. Evaluate strategy (out-of-sample testing)
5. Construct portfolio (apply risk models and trading costs)

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Backtesting Strategy

Backtesting

- High predictive power if a strong relationship between factor exposure and subsequent performance
- Backtest involves ranking stocks by earnings yield (E/P) and computing factor score (standardized distance away from average earnings yield)
- Pearson IC is correlation between factor exposure and holding period return
- Spearman Rank IC is the correlation of the rank of factor scores and rank of subsequent performance; used to correct Pearson IC if there are large outliers

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Question: Backtesting Strategy (1)

Stock	E/P Factor Score	Subsequent Month's Return (%)	Rank of Factor Score	Rank of Return
A	-1.57	10.06%	9	1
B	-1.01	-0.60%	8	9
C	-0.73	-0.50%	7	8
D	-0.40	-0.48%	6	7
E	-0.01	1.20%	5	6
F	0.65	3.00%	4	5
G	0.75	3.02%	3	4
H	0.90	3.05%	2	3
I	1.43	5.20%	1	2

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Question: Backtesting Strategy

	E/P Factor Score	Subsequent Month's Return (%)	Rank of Factor Score	Rank of Return
Mean	0.00	2.66%		
Standard deviation	1.00	3.43%		
Pearson IC		-0.99%		
Spearman Rank IC				40%

Discuss whether the earnings yield factor exhibits predictive power for this dataset. In your discussion, **comment** on both the Pearson and Spearman Rank IC.

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Solution: Backtesting Strategy

- Pearson IC of -0.99% is very small; not a significant negative relation between
- Pearson IC distorted by a nonlinear relationship between factor and subsequent return in Stock A (score and return)
- Spearman Rank IC shows a $+40\%$ IC and that high E/P is associated with strong subsequent performance

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Quantitative Investing Pitfalls

- **Survivorship bias:** backtests may overlook failed firms
- **Look-ahead bias:** use previous trading signals for times when information is not available
- **Data-mining/overfitting:** excessive search analysis of past data to find data that shows strategy is working
- Constraints on **turnover**
- **Lack of availability of stock to borrow** for short selling
- **Transaction costs** change backtesting conclusions
- **Quant overcrowding:** everyone using similar strategy

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Equity Investment Style Classification

- Segment stock universe (e.g., size and style)
- Groups contain stocks that have high correlations
- Correlation between groups should be lower, indicating distinct styles
- Useful for classifying portfolio style and benchmarking managers

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Holdings-Based Style Analysis

- Aggregates attributes of each stock in a portfolio to conclude overall style
- Example: *Morningstar Fund Style Box*
- In a style box, size and style are split into groups:
 - Large-cap, mid-cap, or small-cap
 - Value, blend/core, or growth

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Holdings-Based Style Analysis

Each security is given a value score and a growth score between 0 and 100 using relevant factors:

- Example: dividend yield for value score, and earnings growth for growth score
- Difference between growth and value score = net style score
- Strongly – score = value; strongly + score = growth; zero score = core

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Holdings-Based Style Analysis

Advantages

- Generally more accurate, given actual holdings
- Assesses individual holding style contributions

Disadvantages

- Requires availability of all portfolio attributes
- Limited derivatives data
- Style definitions may differ for similar portfolios

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