Equity

Security Market Indexes

Exam Focus

- How to construct an index
  - Understanding the methods
  - Calculating returns and index values
- Differences between equity and non-equity indices

Weighting Schemes Overview

Method	Calculation Concept	Advantages	Disadvantages
Price weighted	• Assume one share held • Adjust for stock splits	• Simple	• High-value shares bias the index
Equal weighted	• Assume investment split equally across constituent stocks	• Simple	• May not reflect investability • Rebalancing
Market cap weighted	• Assume stocks weighted in line with market cap	• Reflects underlying market	• Biased toward large companies • Momentum bias
Fundamental	• Allows weight according to fundamental factors	• Value tilt • Contrarian	• Not a standard approach

Data for Index: Examples

Share	Shares Outstanding	% Free Float	BOP Price $	EOP Price $	Div $
D	4,000	100	50	55	2
E	10,000	40	25	22	0
F	2,000	80	10	15	1
G	1,000	30	5	6	0.2

- *Before doing each calculation—is one of the stocks going to heavily bias the outcome?*

Index Calculations: Examples

It is key to be able to calculate returns given constituent stocks.
From the data on the preceding slide, calculate:

1. The closing price-weighted index and return, assuming an initial index divisor of 4 and no stock splits (price return)
   - How would a 2-for-1 stock split in Share D impact the calculation?
2. The closing equal-weighted index value and return, assuming a starting index of 1,000 (total return)
3. Market cap (with and without a free-float adjustment) closing index value and return with a starting index value of 1,000 (price return)

Price Weighted: Solution

Price weighted:

Starting value = $\frac{(\$50+\$25+\$10+\$5)}{4} = 22.5$

Price return =

=

Ending value = $\frac{(\$55+\$22+\$15+\$6)}{4} = 24.5$

If Stock D had undertaken a 2:1 stock split immediately after the end of the period (to 8,000 shares @ 27.5), the change in the index divisor would be what?

$\frac{(\$27.50+\$22+\$15+\$6)}{X} = 24.5$ $X = \frac{(\$27.50+\$22+\$15+\$6)}{24.5} =$

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Equal-Weighted Index: Solution

Compute the holding period return for each stock:

$D = \frac{55+2}{50} - 1 = 14\%$ $E = \frac{22+0}{25} - 1 = -12\%$ $F = \frac{15+1}{10} - 1 = 60\%$ $G = \frac{6+0.2}{5} - 1 = 24\%$

Average % change = =

Ending index value = 1,000 ×

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Market Cap Weighting: Solution

Share	Shares Outstanding	BOP Price $	Market Cap $	EOP Price $	Market Cap $
D	4,000	50		55	220,000
E	10,000	25	250,000	22	220,000
F	2,000	10	20,000	15	30,000
G	1,000	5	5,000	6	6,000
		Total	475,000	Total	476,000

Index value =1,000 × =

Index return = =

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Market Cap Weighting Float Adjusted: Solution

Share	% Free Float	Market Cap (BOP) $	Adj' Market Cap (BOP) $	Market Cap (EOP) $	Adj' Market Cap (EOP) $
D	100	200,000	200,000	220,000	220,000
E	40	250,000	100,000	220,000	88,000
F	80	20,000	16,000	30,000	24,000
G	30	5,000	1,500	6,000	1,800
		Total	317,500	Total	333,800

Index value = 1,000 × =

Index return = = or

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Fundamental Weighted Indices

- Uses size measures not related to stock price
- Such as:
  - Book values
  - Cash flow
  - Revenue
  - Earnings . . .
- May use composite of multiple measures
- Each stocks weighting = $W_i^F = \frac{F_i}{\sum_{j=1}^{n} F_j}$

Challenges in Non-Equity Indices

Fixed income

- Larger universe
- Illiquidity
- Turnover
- Variety: market/features/credit/sector

Alternative assets

- No obvious logical weighting choice for commodities
- Futures prices vs. underlying asset
- Real estate illiquid, but REITs traded
- Hedge fund voluntary reporting and survivorship bias

Other Points to Note on Indices

- Rebalancing
  - Usually quarterly
  - Major issue for equal weighted
  - Not required for price weighted
- Reconstitution
  - Particular issue for market cap weighted
  - May distort share prices near the cutoff
- Style/sector indices used as model portfolios for ETFs

Solutions

Price Weighted: Solution

Price weighted:

Starting value = $\frac{(\$50+\$25+\$10+\$5)}{4} = 22.5$

Ending value = $\frac{(\$55+\$22+\$15+\$6)}{4} = 24.5$

Price return = $\frac{24.5}{22.5} - 1 = 0.0889$ or 8.89%

If Stock D had undertaken a 2:1 stock split immediately after the end of the period (to 8,000 shares @ 27.5), the change in the index divisor would be what?

$\frac{(\$27.50+\$22+\$15+\$6)}{X} = 24.5$ $X = \frac{(\$27.50+\$22+\$15+\$6)}{24.5} = 2.8776$

Equal-Weighted Index: Solution

Compute the holding period return for each stock:

$D = \frac{55+2}{50} - 1 = 14\%$ $E = \frac{22+0}{25} - 1 = -12\%$ $F = \frac{15+1}{10} - 1 = 60\%$ $G = \frac{6+0.2}{5} - 1 = 24\%$

Average % change = $\frac{(14\% - 12\% + 60\% + 24\%)}{4} = 21.5\%$

Ending index value = 1,000 × 1.215 = 1,215

Market Cap Weighting: Solution

Share	Shares Outstanding	BOP Price $	Market Cap $	EOP Price $	Market Cap $
D	4,000	50	200,000	55	220,000
E	10,000	25	250,000	22	220,000
F	2,000	10	20,000	15	30,000
G	1,000	5	5,000	6	6,000
		Total	475,000	Total	476,000

$$\text{Index value} = 1{,}000 \times \frac{476{,}000}{475{,}000} = 1{,}002.11$$

$$\text{Index return} = \frac{476{,}000}{475{,}000} - 1 = 0.00211 \text{ or } 0.211\%$$

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Market Cap Weighting Float Adjusted: Solution

Share	% Free Float	Market Cap (BOP) $	Adj' Market Cap (BOP) $	Market Cap (EOP) $	Adj' Market Cap (EOP) $
D	100	200,000	200,000	220,000	220,000
E	40	250,000	100,000	220,000	88,000
F	80	20,000	16,000	30,000	24,000
G	30	5,000	1,500	6,000	1,800
		Total	317,500	Total	333,800

$$\text{Index value} = 1{,}000 \times \frac{333{,}800}{317{,}500} = 1{,}051.34$$

$$\text{Index return} = \frac{333{,}800}{317{,}500} - 1 = 0.05134 \text{ or } 5.134\%$$

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