CHARTA LEARNING · LESSON NOTES

Equity returns and required return models

CFA Level I · Equity Investments

You will learn: Follow a dividend through its four dates, measure price and total return (including splits and several periods), and estimate a required return with the CAPM, the market model, arbitrage pricing theory and multi-factor models.

Running example: Examples follow a made-up company, Harbor Foods: share price $40, dividend $1.20, 100 million shares, earnings $400 million. Rf = 3% and expected market return = 8% are made-up round numbers.

1. Returning cash and shares: dividends, buybacks, splits

- A dividend is cash paid on every share held, decided by the board, and companies try to keep it steady. A share repurchase (buyback) pays only the holders who sell; fewer shares remain, so those who stay own a bigger slice.
- A dividend passes through four dates in order: declaration (board announces), ex-dividend date (buyers from this day do not get the dividend), record date (the register fixes who is owed), payment date (cash sent).
- With settlement one business day after the trade, the ex-date falls on the record date; under two-day settlement it fell one business day earlier.
- A split gives more shares at a proportionally lower price; a stock dividend is a small split paid in new shares; a reverse split gives fewer shares at a higher price. No cash moves, so total value is unchanged.
- A buyback lifts earnings per share (EPS) only because the same profit is shared among fewer shares; the business is no better.

HARBOR FOODS (EXAMPLES 1 TO 3)

Dividend $1.20, record date Friday: ex-date	settlement next business day	**Friday; Thursday buyer is paid, Friday buyer is not**
Friday opens near	40.00 − 1.20	**$38.80**
Buyback of $200m at $40	200 ÷ 40 = 5m shares; 100 − 5	**95m shares left**
EPS before and after	400 ÷ 100; 400 ÷ 95	**$4.00; $4.21**
Same $200m as a dividend	200 ÷ 100	**$2.00 a share**
2-for-1 split	100m × 2 shares; $40 ÷ 2	**200m shares at $20, value still $4,000m**
Reverse 1-for-5 from $2.50	2.50 × 5	**$12.50**

Watch out: Buying on the ex-dividend date and expecting the dividend (buy before it); treating a split as good news by itself.

2. Price return, total return and several periods

- Price return counts only the change in price. Total return also counts the dividends received. Both divide by the starting price, the money put in. Total return = price return + dividend yield.
- A price index follows only prices; a total return index assumes dividends are collected and reinvested, so it shows the larger figure. Check which one a number refers to.
- Over several periods, link by multiplying: add one to each return, multiply, subtract one. Never add the returns (+50% then −50% is a 25% loss, not zero). Annualise with the geometric mean.
- After a split, measure price and dividends per original share.

Price return = (P1 − P0) ÷ P0; Total return = (P1 − P0 + D) ÷ P0; Whole period = (1 + r1)(1 + r2)… − 1; Annualised = (1 + R)^(1/n) − 1

HARBOR FOODS OVER TWO YEARS (EXAMPLES 4 AND 5)

Price return (bought $40, now $43.60)	(43.60 − 40) ÷ 40	**9.0%**
Dividend yield ($1.20)	1.20 ÷ 40	**3.0%**
Total return	(43.60 − 40 + 1.20) ÷ 40	**12.0%**
Year 2: 2-for-1 split, each new share $23, dividends $0.65	price 2 × 23 = 46.00, dividends 2 × 0.65 = 1.30	**per original share**
Year 2 total return	(46 − 43.60 + 1.30) ÷ 43.60	**8.49%**
Two years, linked	1.12 × 1.0849 − 1	**21.50%**
Annualised	1.2150^0.5 − 1	**10.23%**

Watch out: Forgetting the split: year 2 would look like (23 − 43.60 + 0.65) ÷ 43.60 = −45.8%. Adding yearly returns. Reading a price index as a total return index.

3. Required return and the CAPM

- The required return (cost of equity) is what investors demand to hold a share given its risk; it is the discount rate and the hurdle in valuation. Investors are paid only for risk they cannot diversify away.
- Company-specific risk fades as you diversify. Systematic risk moves the whole market, and beta measures how much a stock carries: 1 moves with the market, below 1 is calmer, above 1 swings more.
- The capital asset pricing model (CAPM): required return = risk-free rate + beta × equity risk premium. The premium is the expected market return minus the risk-free rate. Beta zero earns Rf; beta one earns the market's return.
- On the security market line (beta on the horizontal axis) every share's required return lies on a line starting at Rf. A share expected to earn more than the line gives is attractive.

Required return = Rf + β × (E(Rm) − Rf)

CAPM WITH RF = 3%, EXPECTED MARKET RETURN 8% (EXAMPLE 6)

Equity risk premium	8% − 3%	**5%**
Harbor Foods, beta 0.8	3% + 0.8 × 5%	**7.0%**
The market, beta 1.0	3% + 1.0 × 5%	**8.0%**
Sparkle Motors, beta 1.5	3% + 1.5 × 5%	**10.5%**

Watch out: Multiplying beta by the market return instead of the premium (Rm − Rf).

4. The market model and where beta comes from

- Beta is usually estimated from the market model: fit a straight line through a stock's returns against the market's returns over many periods (say 60 months).
- Beta is the slope. Alpha, the intercept, is the return not tied to the market. The error is company-specific movement, which diversification removes.
- Beta can also be found as correlation × stock volatility ÷ market volatility. The share of variance the market explains is correlation squared; the rest is company-specific and diversifiable.
- Beta is an estimate: it depends on the index, the period and how often returns are measured, so analysts adjust it or compare peers.

Stock return = α + β × Market return + error; β = correlation × (stock volatility ÷ market volatility)

HARBOR'S BETA (EXAMPLE 7: VOLATILITY 20%, MARKET 15%, CORRELATION 0.6)

Beta	0.6 × 20 ÷ 15	**0.8**
Required return	3% + 0.8 × 5%	**7.0%**
Variance the market explains	0.6 × 0.6	**36%**
Company-specific, diversifiable	1 − 0.36	**64%**
Wrongly using 20 ÷ 15 as beta	3% + 1.33 × 5%	**9.7%**

Watch out: Treating a volatile stock as a high-beta stock: beta measures only movement tied to the market, not total volatility.

5. Arbitrage pricing theory and multi-factor models

- The CAPM has one source of risk, the market. Arbitrage pricing theory (APT) gives each factor (a source of risk shared by many shares) its own premium: expected return = Rf + sum of (sensitivity × factor risk premium). With one factor it is the CAPM.
- Arbitrage is a riskless profit; the theory assumes competition removes it. A well-diversified portfolio offered more than its fair return can be bought and hedged with a short position in a copy with the same factor exposures, until the gap closes.
- APT does not say which factors to use, and its factors are surprises, because the expected part is already in prices. Two shares with the same market beta can need different returns.
- Multi-factor models supply the factors. Macroeconomic: surprises in growth, inflation, interest rates. Fundamental: company traits such as size, value, momentum. Statistical: factors found in return data. Uses: required return, explaining performance, and seeing risk concentrated in one factor.

E(R) = Rf + b1 × RP1 + b2 × RP2 + …

HARBOR, FACTOR PREMIUMS GDP GROWTH 4% AND INFLATION 2.5%, RF 3% (EXAMPLES 8 AND 9)

Growth layer (sensitivity 0.5)	0.5 × 4%	**2.0%**
Inflation layer (sensitivity 0.8)	0.8 × 2.5%	**2.0%**
Harbor's required return	3 + 2 + 2	**7.0%**
Sparkle (sensitivities 1.5 and 0.4)	3 + 6 + 1	**10.0%**
Portfolio X (same exposures as Harbor) offered 8.5%	8.5% − 7.0%	**1.5% mispricing**
Buy $1m of X, short $1m copy	1.5% × $1m	**$15,000 riskless a year**

Watch out: Thinking APT names the factors; a model with one factor, the market, is just the CAPM.

Key takeaways

- A dividend runs declaration, ex-date, record date, payment; buy before the ex-date to receive it.
- Buybacks and splits change the number of shares; splits create no value, buybacks raise EPS only through fewer shares.
- Total return = price return + dividend yield, always divided by the starting price; link periods by multiplying.
- CAPM: required return = Rf + β × (E(Rm) − Rf); only beta is paid.
- Beta is the slope of the market model, estimated from history and not certain.
- APT and multi-factor models give each factor its own premium; the CAPM is the single-factor case.

Quick check

1. Bought at $50, sold at $52, dividend $1.50. Total return?
   Answer: (52 − 50 + 1.50) ÷ 50 = 7.0%.
2. Rf 4%, market return 9%, beta 1.2. CAPM required return?
   Answer: 4% + 1.2 × 5% = 10.0%.
3. Rf 3%; sensitivity 1.0, premium 4%; sensitivity 0.5, premium 2%. APT?
   Answer: 3% + 4% + 1% = 8%.

Summary notes for the Charta whiteboard lesson. Examples use made-up figures. Watch the full lesson at charta-learning.com.