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CFA® Program Level I

Equities Cheat Sheet

2027 curriculum · 12 readings · 92 formulas

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Contents

Equities 1

39. Equity Instrument Features 1
40. Equity Jurisdictions, Classes, and the Voting Process 1
41. Equity Issuance and Trading 2
42. Sources of Equity Returns 3
43. Introduction to Equity Valuation 4
44. Discounted Cash Flow (DCF) and Growth Models 5
45. Relative Value Equity Valuation Approaches 7
46. Financial Statement Forecasting in Equity Valuation 9
47. Industry and Competitive Analysis 11
48. Company Analysis: Past, Present, and Future 12
49. Equity Analyst Research Reports 13
50. The Capital Asset Pricing Model, Market Model, and Other Factor-Based Equity Models 14

Keep going at credguild.com 16

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CFA® PROGRAM LEVEL I · CHEAT SHEET

Equities

Exam weight 11–14% · 12 readings · 92 formulas

39 Equity Instrument Features

- Equity is an ownership claim with a residual claim, an indefinite life and discretionary dividends; debt is a creditor claim with contractual payments and a maturity.
- Dividend payments are most associated with the mature phase of the company life cycle.
- Common shareholders have a residual claim, voting rights (which they can exercise by proxy) and variable dividends the company has no obligation to pay.
- Preferred shares pay a fixed percentage of par, rank ahead of common shares and usually carry no voting rights.
- Dividends in arrears on cumulative preferred shares must be paid before any common dividend; missed dividends on noncumulative shares are lost.
- Private equity is less liquid than public equity, with more concentrated ownership and control and more limited financial disclosure.
- Private equity investments fall into four types: venture capital, growth equity, special situations and buyout equity.

EXAM SHORTCUTS

- For a preferred share's embedded option, ask whose right it is: a holder's put or conversion right adds value, and an issuer's call right reduces it.

FORMULAS

Preference shares (preferred stock) $$\text{Annual preferred dividend} = \text{dividend rate} \times \text{par value}$$

40 Equity Jurisdictions, Classes, and the Voting Process

- Direct investing means buying a foreign company's securities in its home market, with obstacles such as account costs, unfamiliar procedures, different tax and reporting rules, foreign exchange risk and a possibly illiquid exchange; indirect vehicles such as depository receipts reduce some of these obstacles.
- A depository receipt represents a set number of a foreign company's shares held by a depository bank and trades in another market in that market's currency, yet its value still changes with the exchange rate, so the holder bears currency risk without exchanging currency.
- To rule out arbitrage, a DR should be priced at the foreign share price converted at the current exchange rate, times the number of shares per DR, although this relationship can break down.
- A GDR is issued neither in the United States nor in the issuer's home country; it is usually denominated in US dollars and, although not listed on US exchanges, can be sold to US institutional investors.
- In a sponsored DR the foreign company takes part in the issue and the voting rights pass to the investor; in an unsponsored DR a bank issues it alone and the depository bank keeps the votes.

- Dual listing puts the same shares on a home exchange and at least one foreign exchange, whereas a dual-class structure gives some classes of common stock more votes (and possibly different economic rights), which can let a group such as the founders keep effective control with less than a majority of the shares.
- Shareholder proposals are typically nonbinding, and a company need not put every one to a vote, although regulations may require management to give reasons for rejecting one.
- Only the shareholder of record on the record date, often 30 days or more before the meeting, may vote, so a holder who sells between the record date and the meeting can still vote and a buyer after the record date cannot vote those shares at that meeting.

EXAM SHORTCUTS

- When two holders of the same company's common shares get different votes, dividends or liquidation priority, the likely explanation is different share classes; cumulative, noncumulative, participating and nonparticipating are preferred-share features and can be eliminated.

41 Equity Issuance and Trading

MODULE 41.1 · EQUITY MARKETS AND EXCHANGES

- In the primary market newly issued shares are sold and the issuer receives the cash, and it is most active when share prices are rising overall; in the secondary market investors trade shares already issued, and it is active whether prices rise or fall.
- Underwriters may gain more over time by placing underpriced shares with institutional clients than from the higher fees of a higher offer price, a conflict with the issuer's owners that helps explain why IPOs are often underpriced and jump on the first trading day.
- Exam convention: a direct listing admits a private company's existing shares to trading without an underwriter and raises no new capital; current practice: that describes the traditional direct listing, and some exchanges, the NYSE among them, also permit a primary direct listing of new shares.
- A SPAC raises cash in its own IPO, holds it in a trust account and must buy a shareholder-approved private company within a set period or return the cash, while a back-door listing has a private company acquire an already listed company to use its listing.
- A primary follow-on offering sells new shares and dilutes each existing share's claim on net income and assets; a secondary follow-on sells existing privately held shares, creates no new shares and brings the company no proceeds.
- The bid-ask spread is the lowest ask minus the highest bid (as a percentage, divided by the lowest ask), and an investor buys at the ask and sells at the bid; OTC dealers post firm quotes, yet OTC markets are less transparent than exchanges.

EXAM SHORTCUTS

- Of the two follow-on offerings, only the primary one creates new shares, so a secondary follow-on can be ruled out whenever a question asks which offering is dilutive or brings the company cash.

MODULE 41.2 · EQUITY INDEXES AND LIQUIDITY MEASURES

- Market float is shares outstanding less restricted or otherwise untradeable shares, so shares of controlling shareholders and restricted shares are excluded while holdings of institutions such as mutual funds, pension funds and ETFs stay in.
- Average daily volume is total shares traded over a period divided by the number of days, and the turnover ratio is average daily volume divided by market float.
- The days needed to exit a position equal the position divided by the volume allowed per day (the permitted share of ADV times ADV), with a fractional result rounded up.

- Market depth is the relative size of orders at or near the best bid and offer, market breadth is the number of orders at prices close to them, and market resiliency is the ability to hold a stable market-clearing price, a more resilient market reaching its new clearing price sooner after a shock.
- Broad-based equity indexes hold the largest listed companies, weighted by float-adjusted market capitalization, and a composite market index usually covers over 90% of the total value of the market.
- A fund confined to one industry is benchmarked against a sector index, a fund built on a cross-industry trend against an investment theme index, and a fund selecting on value or quality against a factor-based index; multi-market indexes combine national indexes for a region, a development stage or the world.

EXAM SHORTCUTS

- When an equal-weighted index outperforms a cap-weighted index with the same constituents, the smaller constituents have done better on average than the larger ones, so no weight calculation is needed to answer which group drove the gap.

FORMULAS

Quotes and the spread	$\text{bid-ask spread} = \text{lowest ask} - \text{highest bid}$ $\text{bid-ask spread}(\%) = \dfrac{\text{lowest ask} - \text{highest bid}}{\text{lowest ask}}$ $\text{mid-market price} = \dfrac{\text{lowest ask} + \text{highest bid}}{2}$
VWAP	$\text{VWAP} = \dfrac{\sum_i (\text{price}_i \times \text{volume}_i)}{\sum_i \text{volume}_i}$
Float, trading volume and other liquidity measures	$\text{market float} = \text{shares outstanding} - \text{restricted shares or shares not available for trading}$ $\text{average daily volume} = \dfrac{\sum_{i=1}^{n} (\text{shares traded on day } i)}{n}$ $\text{turnover ratio} = \dfrac{\text{average daily volume}}{\text{market float}}$

42 Sources of Equity Returns

MODULE 42.1 · DIVIDENDS, STOCK SPLITS, AND SHARE REPURCHASES

- A share repurchase has the same effect on total shareholder wealth as a cash dividend of the same amount, but each holder decides whether to sell, and among cash distributions only a repurchase reduces the number of shares outstanding.
- A special cash dividend is a one-time payment on top of any regular dividend, which lets cyclical firms share profits in good years without committing to them in bad years, while a liquidating dividend is viewed more as a return of capital.
- Stock dividends and forward splits raise the share count and lower the price per share in proportion, and reverse splits do the opposite, so the company's total value, a shareholder's wealth and proportional ownership are unchanged.
- In time order a dividend is declared, the stock goes ex-dividend, the record date passes and the dividend is paid; other things equal, the share price falls by the dividend amount when the stock goes ex-dividend, the first day a buyer no longer receives it.
- Exam convention: the ex-dividend date precedes the record date by one or two business days, with the gap set by the settlement cycle; current practice: US equity trades have settled T+1 since May 2024, so a US company's two dates are now normally the same day.

- On the ex-dividend date the percentage price change equals the negative dividend effect plus the market effect plus the company-specific effect, so for a stock as risky as the market the company-specific part is the actual change plus the dividend percentage minus the index move.

EXAM SHORTCUTS

- A 3-for-2 split and a 50% stock dividend are economically identical (50% more shares, each worth one-third less), so other things equal neither lowers the share price more than the other.
- The ex-dividend date comes one business day less than the settlement period before the record date, so T+2 settlement gives a one-day gap and T+1 settlement puts the two dates on the same day.

MODULE 42.2 · RETURN CALCULATIONS FOR EQUITIES

- Price return is $(P_1 - P_0)/P_0$, using only the split-adjusted price change, and total return is $(P_1 - P_0 + D)/P_0$, adding the cash dividends received.
- Stock splits, stock dividends and reverse splits do not change the rate of return once the beginning price, ending price and dividend per share are on the same share basis.
- A dividend reinvested in the same stock buys D/P_{PD} extra shares per share held at the price on the payment date, and the return is $r_E = [P_1(1 + D/P_{PD}) - P_0]/P_0$, with the cash dividend not added again.
- A dividend invested elsewhere, such as in a bank deposit, enters the holding period return as the dividend plus what it earns until the end of the period.
- A share's value is $P_0 = [E(P_1) + E(D_1)]/(1 + r_E)$, where r_E is the required rate of return; this is the basis of discounted cash flow models, in which a share is worth the present value of expected future cash flows.
- A holding period may be shorter or longer than a year, so a return question has to be read for whether an annualized figure is wanted.

EXAM SHORTCUTS

- Splits, stock dividends and reverse splits leave the rate of return unchanged, so working with the value of the whole position avoids restating every per-share figure on a new share basis.

FORMULAS

Price return and total return on equity	$\text{price return} = \dfrac{P_1 - P_0}{P_0}$ $\text{total return} = \dfrac{P_1 - P_0 + D}{P_0}$
Reinvested dividends	$r_E = \dfrac{P_1\left(1 + \dfrac{D}{P_{PD}}\right) - P_0}{P_0}$
Equity value as a present value	$P_0 = \dfrac{E(P_1) + E(D_1)}{1 + r_E}$

43 Introduction to Equity Valuation

- Intrinsic value cannot be observed and is estimated with valuation models; a perceived value above the market price means the stock looks undervalued, below it overvalued, and equal to it fairly valued.
- Naïve or story-based valuation rests on a story unconnected to the company's finances, relative valuation compares multiples with a peer group, and absolute valuation uses only the company's own characteristics, such as the present value of expected cash flows.
- Exam convention: book value of equity = share capital + additional paid-in capital + retained earnings − treasury stock; current practice also adds AOCI and other reserves, so the two agree only when those items are zero, and noncontrolling interest is excluded in both.

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- Book value is most useful for companies with substantial tangible assets and least useful for early-stage or asset-light companies and those whose value lies in intangibles, and a negative book value alone does not mean the shares cannot provide value to investors.
- Market capitalization (share price × shares outstanding) reflects the company's fair value as a going concern, so a P/B above 1 signals excess value and a P/B below 1 a value shortfall to investigate.
- Enterprise value is the market value of the common and preferred stock and of the debt, less cash and short-term investments, and it is usually divided by EBITDA, EBIT or revenue to compare companies with different capital structures.
- In present value models, dividends, FCFE and residual income are discounted at the required return on equity, while FCFF, the cash available to both debt and equity holders, is discounted at the WACC to give firm value.
- An asset-based model values equity at the fair value of assets minus liabilities and preferred stock and can give a floor value, whereas multiplier models compare equity multiples or EV multiples with peers.

EXAM SHORTCUTS

- Pick the model from the facts given: stable, predictable dividends point to a dividend discount model, a non-payer with a stable capital structure to FCFE, negative FCFE or an unstable capital structure to FCFF, and liquidation or mostly liquid tangible assets to an asset-based model.

FORMULAS

Book value, market capitalization and enterprise value	$\text{book value} = \text{share capital} + \text{additional paid-in capital} + \text{retained earnings} + \text{accumulated other comprehensive income (and other reserves)} - \text{treasury stock}$ $\text{book value per share (BVPS)} = \frac{\text{book value of equity}}{\text{shares outstanding}}$
Limits of book value	$\text{P/B} = \frac{\text{market price per share}}{\text{BVPS}} = \frac{\text{market capitalization}}{\text{book value of equity}}$ $\text{EV} = \text{market value of common and preferred stock} + \text{market value of debt} - \text{cash and short-term investments}$

44 Discounted Cash Flow (DCF) and Growth Models

MODULE 44.1 · CASH FLOW METRICS

- A present value model values equity as the present value of a cash flow measure forecast over a horizon plus the present value of a terminal value, using a discount rate that matches the measure.
- A DDM takes the minority shareholder's view and suits mature firms with high, consistent payouts, while FCFE, the capacity to pay dividends, takes a controlling shareholder's view; the discount rate for both is the required return on equity.
- $FCFE = \text{net income} + \text{depreciation} - WCInv - CapEx + \text{net borrowing}$, and with a target debt-to-assets ratio DR it becomes $\text{net income} - (1 - DR)(\text{net investment})$.
- FCFF is a pre-leverage cash flow, $FCFF = FCFE + \text{interest}(1 - t) - \text{net borrowing}$, discounted at the WACC and used when heavy capital spending makes FCFE negative or the capital structure is volatile.
- Residual income per share is $EPS_t - r \times BVPS_{t-1}$, discounted at the required return on equity, and the model requires clean surplus accounting.
- The valuation process chooses the cash flow measure, forecasts it, chooses a matching discount rate, estimates the terminal value and finally sums the present values.

EXAM SHORTCUTS

- For a firm with no debt, FCFF equals FCFE, so there is no interest or net borrowing adjustment to make.

MODULE 44.2 · VALUATION MODELS

- The constant growth model $V_0 = D_1/(r-g) = D_0(1+g)/(r-g)$ requires g below r and below the long-run growth rate of the economy, and it fits mature firms with stable leverage and a high payout ratio best.
- The constant growth model gives value one period before the cash flow in its numerator, and the same form values FCFE at the cost of equity and FCFF at the WACC.
- In a two-stage model each high-growth dividend is discounted at r, and the terminal value $V_n = D_{n+1}/(r-g_L)$ is discounted n periods.
- If the constant growth model fits the company, the growth rate implied by the market price is $g = r - D_1/P_0$.
- Sustainable growth is $g = b \times ROE$, where b is the retention ratio, assuming constant ROE, constant payout and no new equity; the required return and beta are not inputs.
- The WACC weights the after-tax cost of debt and the cost of equity by market values, the present value of FCFF at the WACC is firm value, and equity value is firm value minus the market value of debt.

EXAM SHORTCUTS

- Under constant growth, $V_t = V_0(1+g)^t$, so a value at a future date follows from today's value without forecasting the later dividend.

MODULE 44.3 · MODEL LIMITATIONS AND PREFERRED STOCK VALUATION

- The cash flow measure and its size, the length of the forecast horizon and the discount rate are all estimates in a present value model, and small changes in r, especially in $r-g$, move the value a lot.
- DDMs ignore stock buybacks, past dividend growth is a poor guide for a firm whose competitive environment is deteriorating, and a rapidly growing firm needs a multistage model with a finite high-growth period.
- Preferred stock ranks ahead of common equity for dividends and in liquidation, so its required return is lower than that of common equity, and its dividend is the stated rate times par.
- A perpetual preferred is worth D_p/r_p, the constant growth model with g = 0, while a finite-maturity preferred is valued like a bond as the present value of its dividends and its face value.
- An embedded option's value is subtracted when the issuer holds the right and added when the investor holds it, so a callable preferred is worth less and pays a higher dividend, while putable and convertible preferreds are worth more than identical option-free preferreds.

EXAM SHORTCUTS

- For a perpetual preferred, a required yield above the dividend rate means a value below par, so a price above par can be ruled out without calculation.

FORMULAS

Cash flow measures for present value models and the valuation process	$V_0 = \sum_{t=1}^{n} \frac{E(CF_t)}{(1+r)^t} + \frac{E(TV_n)}{(1+r)^n}$
Free cash flow to equity	$FCFE = \text{net income} + \text{depreciation} - WCInv - CapEx + \text{net borrowing}$ $FCFE = CFO - FCInv + \text{net borrowing}$ $\text{net investment} = CapEx - \text{depreciation} + WCInv$ $FCFE = \text{net income} - \text{net investment} + \text{net borrowing}$ $\text{net borrowing} = DR \times \text{net investment}$ $FCFE = \text{net income} - \text{net investment} + DR \times \text{net investment} = \text{net income} - (1-DR)(\text{net investment})$

Free cash flow to the firm	$FCFF = CFO - CapEx + \text{interest}(1-t)$ $FCFF = FCFE + \text{interest}(1-t) - \text{net borrowing}$
EBITDA	$FCFF = EBITDA(1-t) + (\text{depreciation} \times t) - FCInv - WCInv$
Residual income	$RI_t = EPS_t - r \times BVPS_{t-1}$
Constant growth (Gordon growth) model	$V_0 = \frac{D_1}{r-g} = \frac{D_0(1+g)}{r-g}$ $g = r - \frac{D_1}{P_0}$
Multistage (two-stage) models	$V_0 = \sum_{t=1}^{n} \frac{D_t}{(1+r)^t} + \frac{V_n}{(1+r)^n}$ $V_n = \frac{D_{n+1}}{r-g_L}$
Estimating the constant growth rate	$g = (1 - \text{dividend payout ratio}) \times ROE = b \times ROE$ $SGR_{FCFE} = \left(1 - \frac{FCFE}{\text{net income}}\right)\left(\frac{\text{net income}}{\text{beginning book value}}\right)$ $SGR_{FCFF} = \left(1 - \frac{FCFF}{NOPAT}\right)\left(\frac{NOPAT}{\text{beginning book value of total capital}}\right)$
Weighted average cost of capital	$WACC = \frac{MV_d}{MV_d + MV_e} r_d(1-t) + \frac{MV_e}{MV_d + MV_e} r_e$
Non-callable, non-convertible preferred	$V_0 = \sum_{t=1}^{N} \frac{D_p}{(1+r_p)^t} + \frac{FV}{(1+r_p)^N}$ $V_0 = \frac{D_p}{r_p}$

45 Relative Value Equity Valuation Approaches

MODULE 45.1 · PRICE MULTIPLES AND EQUITY VALUATION

- Price multiples put the share price over a per-share measure, EV multiples put EV over a firm-level measure belonging to all capital providers, a trailing multiple uses the most recent past period and a leading multiple uses next period's forecast.
- The method of comparables takes its benchmark from the mean or median multiple of a peer group and rests on the law of one price, and when a few extreme values skew the peers' multiples the median, or the mean after removing outliers, is the better benchmark.
- A stock whose price multiple is above the benchmark looks overvalued, and one whose multiple is below the benchmark looks undervalued.
- The justified leading P/E from the constant growth model is $\text{payout ratio}/(r-g)$, the trailing version multiplies it by $(1+g)$, and it rises with g, falls as r rises and, with r and g constant, rises with the payout ratio.
- The justified P/B is $(ROE - g)/(r-g)$, so with r above g it is above 1.0 if ROE exceeds r, equal to 1.0 if ROE equals r and below 1.0 if ROE is below r.

- The PEG ratio, $(P/E)/g$ with g in whole percentage points, adjusts for growth only and a PEG above the peers' benchmark looks overvalued, while the regression approach adjusts for several fundamentals at once and its fitted equation, intercept included, gives the justified multiple.

EXAM SHORTCUTS

- With r above g, the justified P/B is above 1.0 exactly when ROE is above r, so the side of 1.0 can be read from ROE and r before any calculation.

MODULE 45.2 · PRICE AND ENTERPRISE VALUE MULTIPLES

- A share's value is $P_0 = E_1/r + PVGO$, so the PVGO share of the price is $1 - (E_1/P_0)/r$, and a negative PVGO suggests management is investing in negative-NPV projects.
- Core earnings strip out nonrecurring items, and for cyclical firms normalized EPS is either the average EPS over the most recent cycle, which ignores growth in firm size, or the average ROE over the cycle times current BVPS, which captures it better.
- P/S is used when earnings are negative or not comparable, suits mature and cyclical firms with similar revenue recognition and little or no leverage, and its justified value is the justified trailing P/E times the profit margin.
- EBIT, EBITDA and FCFF belong to all capital providers and are paired with EV; the justified EV/EBITDA is $FCFF_1/(WACC - g)$ divided by EBITDA, rising with g and falling with WACC.
- P/B works best for firms with mainly tangible assets and similar accounting, leverage and asset mix, banks are often valued on price-to-tangible book, and value-to-book or EV-to-book helps when leverage differs or book equity is negative.
- The justified dividend yield is $(r - g)/(1 + g)$ or payout times earnings yield, and for yields the rule is reversed: an actual yield above the justified yield signals an undervalued stock.

EXAM SHORTCUTS

- Match the multiple to the situation: negative or non-comparable earnings point to P/S, a capital-intensive industry with different leverage across peers to EV/EBITDA, negative book equity to value-to-book or EV-to-book, and a peer group with non-payers rules out dividend-based multiples.

MODULE 45.3 · PEER GROUPS AND MULTIPLES-BASED VALUATION

- An industry-based peer group holds firms with the same principal business activity, and suitable peers are hard to find for unique firms, industries with members at widely different life cycle stages, firms in different tax or regulatory jurisdictions and conglomerates.
- A statistical factor-based peer group, usually formed with a multifactor model, holds firms with the same or close exposures to risk-return factors regardless of industry, but its relationships are estimated from past data and may not persist.
- Comparables can mislead when the whole peer group is overvalued or undervalued, and multiples built on current unadjusted figures can be distorted by accounting choices, nonrecurring items or cyclicality.
- Comparing a stock with its own past multiples or with peer averages over a whole business cycle reduces the risk of benchmarking against a currently mispriced peer group, though differences in growth and required return still have to be controlled for.
- A terminal value can be estimated as $TV_n = \text{justified leading P/E}_n \times E_{n+1}$, with the justified leading P/E equal to $\text{payout}/(r - g)$.

EXAM SHORTCUTS

- When next-period earnings are $E_n(1 + g)$, the justified trailing P/E applied to E_n gives the same terminal value as the justified leading P/E applied to E_{n+1}, so either pairing can be used.

FORMULAS

Method of forecasted fundamentals	$\frac{P_0}{E_1} = \frac{D_1/E_1}{r-g} = \frac{\text{payout ratio}}{r-g}$ $\frac{P_0}{B_0} = \frac{ROE-g}{r-g}$
Reconciling the two methods	$PEG = \frac{P/E}{g}$ (g in whole percentage points) $\widehat{P/B}_i = b_0 + b_1\, ROE_i + b_2\, g_i$
Value = assets in place + growth opportunities	$P_0 = \frac{E_1}{r} + PVGO$ $\frac{PVGO}{P_0} = 1 - \frac{E_1/P_0}{r}$
Price-to-sales (P/S)	$\frac{P_0}{S_0} = \frac{P_0}{E_0} \times \frac{E_0}{S_0} = \frac{\text{payout} \times (1+g)}{r-g} \times \text{profit margin}$
Enterprise value multiples	$EV = \text{market value of common and preferred stock} + \text{market value of debt} - \text{cash and short-term investments}$ $EV = \frac{FCFF_1}{WACC - g}$ $FCFF = EBITDA(1-t) + \text{Dep} \times t - \text{CapEx} - \text{WCInv}$
Balance-sheet multiples	$\frac{EV}{BV \text{ of capital}} = \frac{ROC \times (1 - \text{reinvestment rate})}{WACC - g}$
Cash-flow multiples and yields	$\frac{D_0}{P_0} = \frac{D_0}{E_0} \times \frac{E_0}{P_0}$ (payout × earnings yield) $\frac{D_0}{P_0} = \frac{r-g}{1+g}$
Using projected future values	$TV_n = \text{justified leading P/E}_n \times E_{n+1}$ $\text{justified leading P/E}_n = \frac{\text{payout}}{r-g}$

46 Financial Statement Forecasting in Equity Valuation

MODULE 46.1 · FINANCIAL STATEMENT FORECAST MODELS

- A disaggregated valuation model forecasts full financial statements through revenue, expense, asset and financing modeling; it improves the estimate of future cash flows but does not change how the discount rate is estimated and still needs a terminal value.
- Revenue can be forecast with the historical approach (the company's own past growth, for mature firms with stable business models), the bottom-up approach (company drivers such as units × prices, same-store sales plus new stores, or capacity × utilization × price) or the top-down approach (nominal GDP growth, or industry growth and market share).
- A revenue premium stated as a percentage of GDP growth gives growth of $g_{GDP}(1+x)$, while a premium stated in percentage points is added to GDP growth.
- Exam convention: forecast revenue growth is market growth plus the proportional change in market share, $g_{market} + (\text{new share}/\text{old share} - 1)$; current practice: computing next year's sales in levels gives the exact growth.

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- Expenses can be linked to revenue by a regression $\Delta\text{Expense} = b_0 + b_1 \times \Delta\text{Revenue}$ for established companies with enough data, itemized when new information must be reflected, or set by a direct margin, with $\text{COGS} = \text{forecast revenue} \times (1 - \text{gross margin})$.
- A constant growth asset model keeps total asset turnover constant, and financing needs equal the change in operating assets minus the change in non-debt liabilities minus the change in retained earnings, a positive result being new financing needed and a negative one a surplus.

EXAM SHORTCUTS

- The exam-convention market-share growth differs from the exact growth computed in levels only by the product of the two changes, so the two answers are close unless both changes are large.

MODULE 46.2 · MODELS BASED ON COMPANY CHARACTERISTICS

- A start-up is valued with a P/S multiple of anticipated sales discounted by the VC investor's ROI multiple, a growth-stage firm mainly through a terminal value from a P/E on forecast net income, a mature firm with a constant growth model, and a declining firm with adjusted historical data, higher discount rates and a probability-weighted value.
- $\text{ROI multiple} = (1 + r)^n$, post-money value is expected revenue × P/S divided by the ROI multiple, pre-money value is post-money value minus the VC investment, and the VC's fractional ownership is the investment divided by post-money value.
- A growth-stage terminal value is $TV_n = NI_n \times P/E$, discounted at r for n years or divided by the target ROI multiple when the required return is stated as a multiple.
- When the going-concern assumption is in doubt, value is the probability-weighted average of the going-concern value and the distress sale value, where the equity's distress value is what shareholders recover after creditor claims and liquidation costs.
- From a forecast model, $FCFF = NOPAT - \text{net investment}$ gives firm value $FCFF_1/(WACC - g)$, and equity value is firm value minus the market value of debt.
- The sustainable growth rate of FCFF is the reinvestment rate $1 - FCFF/NOPAT$ times the return on capital, NOPAT divided by the beginning book value of total capital (debt plus equity).

EXAM SHORTCUTS

- Read margins from the growth assumptions: revenue forecast to grow faster than expenses means rising margins, and most operating expenses growing faster than revenue means a falling operating profit margin, though the effect on gross and net margins needs more information.

FORMULAS

Revenue modeling	$g_{revenue} = g_{market} + \left(\frac{\text{new share}}{\text{old share}} - 1\right)$
Expense (profit) modeling	$\Delta\text{Expense} = b_0 + b_1 \times \Delta\text{Revenue}$ $\text{COGS} = \text{forecast revenue} \times (1 - \text{gross margin})$
Financing modeling	$\text{financing needs} = \Delta\text{operating assets} - \Delta\text{non-debt liabilities} - \Delta\text{retained earnings}$
Start-up stage: venture capital arithmetic	$\text{ROI multiple} = (1 + r)^n \implies r = (\text{ROI multiple})^{1/n} - 1$ $\text{post-money value} = \frac{\text{expected revenue} \times (P/S)}{\text{ROI multiple}}$ $\text{pre-money value} = \text{post-money value} - \text{VC investment}$ $f = \frac{\text{VC investment}}{\text{post-money value}}$

Growth stage	$TV_n = NI_n \times P/E$ $V_0 = \frac{TV_n}{(1+r)^n}$ or $V_0 = \frac{TV_n}{\text{ROI multiple}}$
Decline stage	$\text{value} = P(\text{going concern}) \times \text{going-concern value} + P(\text{distress}) \times \text{distress sale value}$
Enterprise value and EV multiples	$\text{EV} = \text{market value of common and preferred stock} + \text{market value of debt} - \text{cash and short-term investments}$
Valuing equity from forecast model outputs	$SGR_{FCFF} = \left(1 - \frac{FCFF}{NOPAT}\right)\left(\frac{NOPAT}{\text{beginning book value of total capital}}\right)$

47 Industry and Competitive Analysis

MODULE 47.1 · INDUSTRY ANALYSIS FRAMEWORK

- Industry and competitive analysis has five steps: define the industry, survey it, analyze its structure with Porter's five forces, examine external influences with PESTLE, and analyze the competitive strategies of its companies.
- Commercial classification systems such as GICS, ICB and TRBC group companies by the products and services they offer into hierarchical tiers; they are consistent, but groups can be too broad or too narrow, and a company in several industries is often placed by the product that earns the most revenue.
- Defensive industries have relatively stable demand through expansions and contractions, cyclical industries have earnings that depend heavily on the stage of the cycle and usually high operating leverage, and growth industries grow revenue strongly through all phases of the cycle.
- Industry size is one year's total sales of the product or service; the top-down approach uses government or third-party data and suits industries with many private or small firms, while the bottom-up approach adds up company revenues and works best when large listed companies dominate.
- ROIC is NOPAT divided by average invested capital (long-term liabilities plus equity), a return to all capital providers, and ROIC above WACC means value is being created.
- The HHI is the sum of squared market shares in percent, with a maximum of 10,000 and a reading above 1,800 often taken as high concentration; unless the industry is segmented or highly differentiated, higher concentration means less competition and more pricing power.

MODULE 47.2 · PORTER'S FIVE FORCES AND PESTLE ANALYSIS

- Porter's five forces are the threat of new entrants, the threat of substitutes, the bargaining power of suppliers, the bargaining power of customers and rivalry among existing competitors; when they are strong, industry returns on capital are unlikely to exceed the cost of capital.
- An economic moat is a durable competitive advantage, from sources such as cost advantages, efficient scale, proprietary intangible assets, network effects and high switching costs, and the longer it lasts the longer profits stay above the cost of capital.
- The threat of entry is stronger when barriers are low, and rivalry is stronger with slow growth, high fixed costs, difficulty exiting, many similar-sized firms and little differentiation.
- Suppliers have power when they are few, when inputs are scarce or customized, or when they hold proprietary technology, customers have power when they are large and concentrated and products are commodity-like, and firms may respond with backward or forward vertical integration.
- PESTLE covers political, economic, social, technological, legal and environmental influences on an industry, and monetary policy and regulation are indirect political channels.

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- In the innovation matrix, breakthrough innovation solves a distinct problem in an indistinct domain, sustaining innovation a distinct problem in a distinct domain, disruptive innovation an indistinct problem in a distinct domain, and basic research has no specific commercial objective.

FORMULAS

Profitability	$\text{operating profit margin} = \frac{\text{operating income}}{\text{total revenue}}$ $\text{ROIC} = \frac{\text{NOPAT}_t}{\text{average invested capital}}$
Market share and concentration	$\text{market share} = \frac{\text{company sales}}{\text{industry size}}$ $HHI = \sum_{i=1}^{N} (\text{market share}_i)^2$

48 Company Analysis: Past, Present, and Future

MODULE 48.1 · CORPORATE STRATEGY AND INDUSTRY POSITION

- A business model explains how a company defines and creates value (its customers, products and services, key resources and protection from rivals), while the competitive strategy is only the part about how it wins against rivals.
- An intentional competitive strategy is proactive, with clear measurable goals and monitored performance, and is more likely to create long-term value than an unintentional one, which is reactive and may simply keep the status quo or copy industry norms.
- Looking forward, a strategy is judged by whether it can respond to the threats found with Porter's five forces, whether it is neutral to or helped by the PESTLE influences, and whether the company can execute it.
- A start-up focuses on product and business-model development, partnerships and raising capital, a growth company on sales growth, a mature company on efficiency and defending market share, and a declining company on cost management, restructuring, reinvention or exit.
- The serviceable market is the part of the total addressable market the company can reach, $\text{TAM} \times \text{technical fit} \times \text{geographic reach}$, and the obtainable market is the share of it the company can realistically win given its scale and strategy.
- Porter's generic strategies are cost leadership (lowest costs and prices with enough volume), differentiation (distinctive products earning a price premium behind an economic moat) and focus (a niche, possibly mixing both), and a firm with no clear advantage is stuck in the middle.

EXAM SHORTCUTS

- Read the strategy from the customer and industry clues: price-conscious customers with little product differentiation and limited innovation point to cost leadership, customers who value uniqueness point to differentiation, and a narrow customer group, region or product points to focus.

MODULE 48.2 · REVENUE, PROFITABILITY, AND CAPITAL

- Net income is the most comprehensive earnings measure but is volatile and less useful for start-ups and highly cyclical industries; EBIT removes financing and tax effects but is distorted by depreciation policies; EBITDA allows comparison across differing investment policies, leverage and taxes but is not a GAAP/IFRS measure and ignores the cost of replacing assets.
- Pricing power, the ability to change the terms of an offer in the company's favor without hurting sales, is high when demand is inelastic and grows with differentiation, switching costs, brand loyalty, barriers to entry and a lack of substitutes.

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- Operating profit is $Q(P - VC) - FC$, and the larger the share of fixed costs, the more operating profit changes in percentage terms relative to a change in volume, in both directions.
- Exam convention: $\text{FCFE} = \text{NI} + \text{D\&A} - \Delta\text{working capital} - \Delta\text{LT assets} + \Delta\text{debt}$; current practice: the D&A add-back is correct only when the long-term asset change is gross investment, and working capital excludes cash and short-term debt.
- The cash conversion cycle is $\text{DOH} + \text{DSO} - \text{DPO}$; a longer CCC means a greater need to finance working capital, and a negative CCC means operations fund the company.
- Value is created when ROIC, NOPAT over average invested capital, exceeds the WACC, and the degree of financial leverage, $\%\Delta \text{ net income} / \%\Delta \text{ operating income}$, rises when borrowing adds interest expense.

EXAM SHORTCUTS

- With price, variable cost per unit and fixed costs unchanged, a change in units sold moves operating profit by the change in units times $P - VC$, so the whole profit figure need not be recomputed.

FORMULAS

Market potential for start-up and growth companies	$\text{Serviceable market} = \text{TAM} \times \text{technical fit (\%)} \times \text{geographic reach (\%)}$
Operating profitability	$\text{EBITDA} = \text{revenue} - \text{COGS} - \text{operating expenses (excluding D\&A)}$ $\text{EBIT} = \text{EBITDA} - \text{depreciation and amortization}$ $\text{Net income} = \text{EBIT} - \text{interest expense} - \text{taxes}$
Operating leverage	$\text{Operating profit} = Q \times (P - VC) - FC$
Free cash flow to equity	$\text{FCFE} = \text{NI} + \text{D\&A} - \text{capital expenditures} - \Delta\text{working capital} + \text{net borrowing}$
Working capital management	$\text{CCC} = \text{DOH} + \text{DSO} - \text{DPO}$
Capital investments	$\text{Net capital expenditure} = \text{total capital expenditure} - \text{D\&A}$ $\text{ROIC} = \frac{\text{NOPAT}}{\text{average invested capital}}$ $\text{invested capital} \approx \text{total long-term liabilities} + \text{total equity}$
Capital structure	$\text{DFL} = \frac{\%\Delta \text{ net income}}{\%\Delta \text{ operating income}}$

49 Equity Analyst Research Reports

- An initiating-coverage report is thorough because readers may know little about the company, while subsequent reports are shorter updates often triggered by expected events such as earnings releases, and the front page is written last.
- The financial analysis and valuation section shows only the measures that support the price target, which is set by intrinsic value from several valuation techniques and can be absolute or relative, a point or a range, usually over one to two years.
- As a rough guideline, a stock expected to rise by at least about 10%–15% (in absolute terms or relative to a benchmark) is a buy, one expected to fall by at least that much is a sell, and one in between is a hold.
- A subsequent report gives the recommendation with the rationale for any change, variance analysis of expected versus actual results, and changes to the valuation and risks, and every report should distinguish facts from opinions and disclose potential conflicts of interest.

- Sell-side research is produced by investment banks and brokers for clients in a standardized format under conflict-of-interest constraints, whereas buy-side research is produced by investing firms for internal use, is customized and is mostly unregulated because it is not published.
- Sell-side coverage tilts toward stocks that generate trading volume and its recommendations are mostly buy or hold and in line with the consensus, while the buy side has more scope to cover smaller stocks and includes activist short selling.
- Analysts using the same model can reach different values through their assumptions on revenue and costs, capital investment, the terminal value and financing, and a valuation driven mainly by financing deserves skepticism.
- Exam convention: when investment grows at the same rate as net income, free cash flow shows no overall change; current practice: equal dollar increases leave free cash flow unchanged, while equal percentage growth makes their difference grow at that rate.

EXAM SHORTCUTS

- "Sell-side" and "buy-side" say who produces a report and nothing about its recommendation, so an answer that links sell-side research to sell ratings can be eliminated.

FORMULAS

Two-stage FCFE valuation $$V_0 = \frac{FCFE_1}{1+r} + \frac{FCFE_2/(r-g)}{1+r}$$

50 The Capital Asset Pricing Model, Market Model, and Other Factor-Based Equity Models

MODULE 50.1 · ESTIMATING THE COST OF EQUITY WITH THE MARKET MODEL AND CAPM

- The CAPM, $E(R_i) = R_f + \beta_i[E(R_m) - R_f]$, prices only systematic risk, and its security market line has the risk-free rate as intercept and the market risk premium as slope.
- Beta equals $\rho_{i,m}\sigma_i/\sigma_m$ and is estimated by regressing the stock's returns on a market proxy over a lookback period, where a longer sample lowers the standard error but may describe a business or capital structure that no longer applies.
- Exam convention: the square root of R^2 is described as the stock–index correlation; current practice: it gives the correlation's magnitude, and the sign follows the sign of beta.
- Adjusted beta is $\omega \times \text{raw beta} + (1-\omega) \times 1.0$, with ω commonly 2/3, because market model betas tend to revert toward 1.0.
- In the pure-play approach the peers' levered beta is unlevered with the peers' D/E and tax rate and relevered with the subject company's D/E and tax rate, the $(1-t)$ term appearing in both steps.
- The forward-looking market risk premium is $D_1/P_0 + g - R_f$, a long-term government rate is the more appropriate risk-free rate, and for emerging markets the country risk premium, the sovereign yield spread times $\sigma_{\text{equity index}}/\sigma_{\text{sovereign debt}}$, is added to the MRP inside the beta term.

EXAM SHORTCUTS

- Adjusted beta is a weighted average of the raw beta and 1.0, so it lies between them: a raw beta above 1 is adjusted down and one below 1 is adjusted up, and any answer outside that range can be ruled out.
- When the subject and its peers share one tax rate, a subject with lower leverage than the peers has a lower levered beta than theirs, and one with higher leverage a higher beta.

MODULE 50.2 · ARBITRAGE PRICING THEORY

- A single market factor does not adequately explain why returns differ across stocks, which motivates multifactor models such as arbitrage pricing theory, $E(R_i) = R_f + \beta_{1i}f_1 + \cdots + \beta_{ki}f_k$.
- APT is a statistical factor model that specifies neither the number nor the identity of its factors, whereas the CAPM has one factor, the market portfolio.

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- The four-factor model adds size (SMB), value (HML) and momentum (UMD) factors to the market factor, and each of these three is measured by a zero-cost portfolio holding equal amounts long and short.
- A positive SMB beta means the stock behaves like a small-cap stock and a positive HML beta like a value stock, while negative betas point to large-cap and growth behavior, and a negative factor beta must keep its sign in the expected return.
- Betas on the long-short factors average about zero across stocks, so individual betas are often negative, while the market beta averages 1.0.
- Multifactor models are used to estimate the cost of equity (two stocks with the same market beta can have different required returns), to describe a stock's or portfolio's style, and to form statistical factor-based peer groups, although betas estimated from past data may not persist.

FORMULAS

CAPM and the security market line	$E(R_i) = R_f + \beta_i \left[E(R_m) - R_f\right]$
Adjusted beta (mean reversion)	$\text{adjusted beta} = \omega \times \text{raw beta} + (1 - \omega) \times 1.0$ $\omega \text{ commonly } 2/3$
Beta from comparables (pure-play approach)	$\beta_U = \dfrac{\beta_{L,\text{peers}}}{1 + (1 - t_{\text{peers}}) \dfrac{D}{E}_{\text{peers}}}$ $\beta_{L,\text{subject}} = \beta_U \left[1 + (1 - t_{\text{subject}}) \dfrac{D}{E}_{\text{subject}}\right]$
Estimating the market risk premium	$E(R_m) = \dfrac{D_1}{P_0} + g$ $MRP = \dfrac{D_1}{P_0} + g - R_f$
Emerging markets: country risk premium	$CRP = \text{sovereign bond yield spread} \times \dfrac{\sigma_{\text{equity index}}}{\sigma_{\text{sovereign debt}}}$ $E(R_i) = R_f + \beta_i \left(MRP + CRP\right)$
Arbitrage pricing theory (APT)	$E(R_i) = R_f + \beta_{1i} f_1 + \beta_{2i} f_2 + \cdots + \beta_{ki} f_k$
The four-factor model	$E(R_i) = R_f + \beta_{mkt} \left[E(R_m) - R_f\right] + \beta_{SMB} E(SMB) + \beta_{HML} E(HML) + \beta_{UMD} E(UMD)$

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