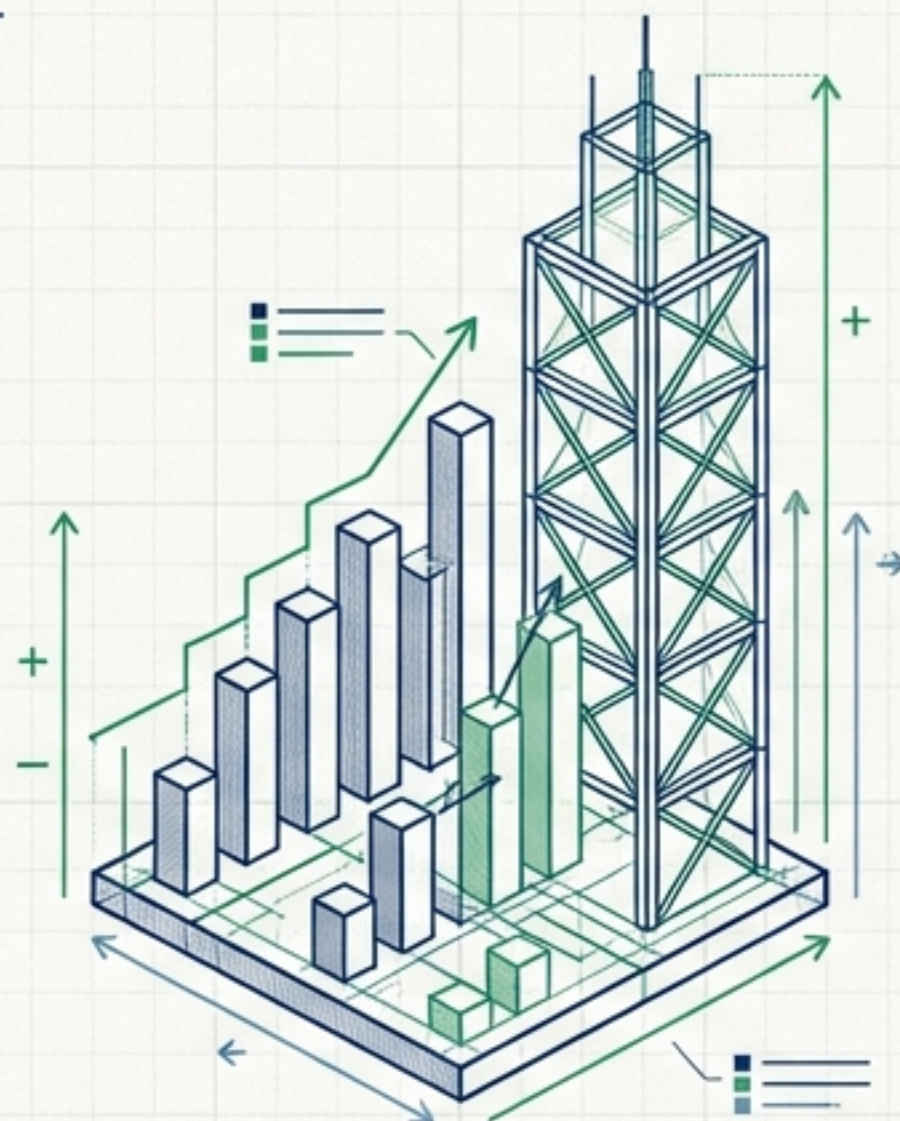
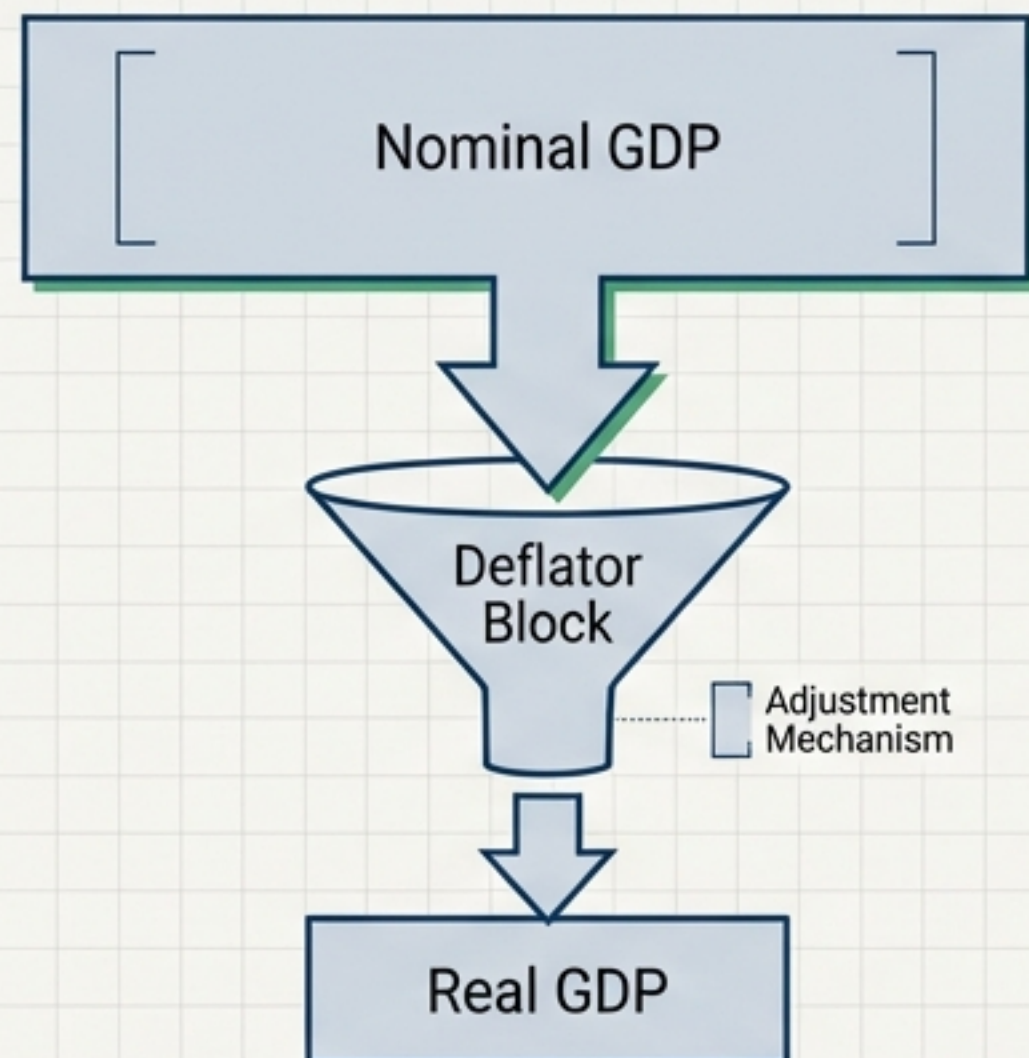




# The Financial Analyst's Toolkit

Core Valuation, Corporate Finance, and Pricing Formulas

# Macroeconomic Foundations & Expected Return

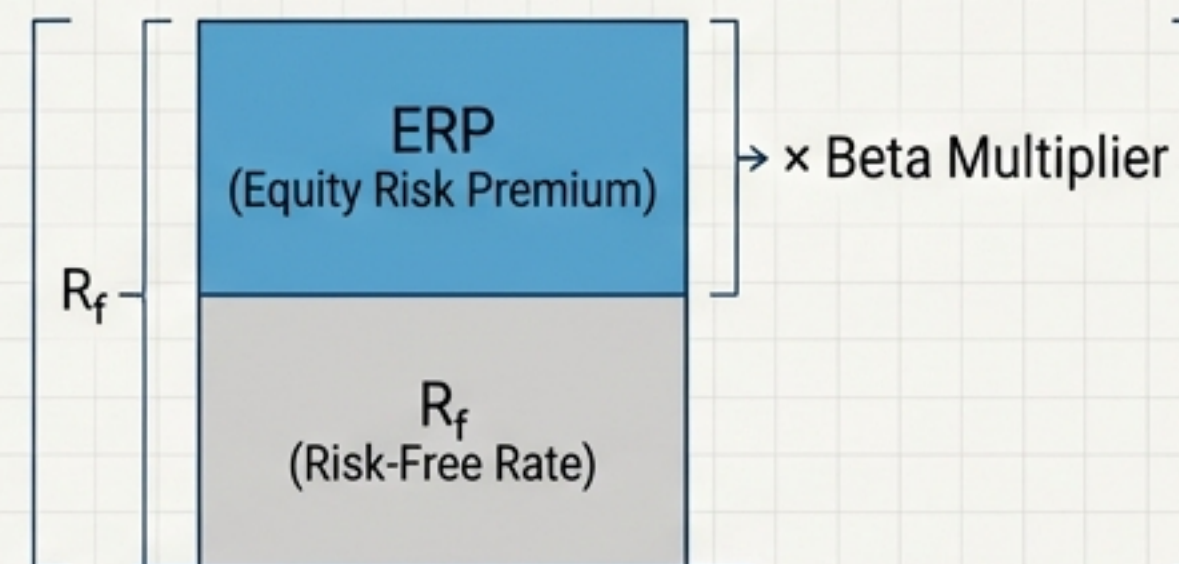


## Macro Formulas:

$$GDP\ Deflator = \frac{Nominal\ GDP}{Real\ GDP} \times 100$$

$$Inflation = \left[ \frac{(Deflator_t - Deflator_{t-1})}{Deflator_{t-1}} \right] \times 100$$

## The Risk Premium Stack



## Return & Risk Formulas:

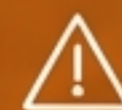
$$E(R_i) = R_f + \beta_i(R_m - R_f) \quad [CAPM]$$

$$ERP = R_m - R_f$$

$$\beta_i = \frac{Cov(R_i, R_m)}{Var(R_m)} \quad [Beta]$$

$$E(R_p) = \sum (w_i \times R_i) \quad [Portfolio\ Expected\ Return]$$

$$E(R) = \sum (r_k \times p_k) \quad [Probability-Weighted\ Return]$$



**EXAM TRAP:** Beta uses Covariance in the numerator, Variance of the Market in the denominator. Do not mix up the variances!

# Financial Health Dashboard: Ratio Matrix

## Liquidity

$$\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

$$\text{Quick Ratio} = \frac{\text{Cash} + \text{Mkt Sec} + \text{Receivables}}{\text{Current Liab.}}$$

$$\text{Cash Ratio} = \frac{\text{Cash} + \text{Mkt Sec}}{\text{Current Liab.}}$$

## Efficiency & Turnover

$$\text{Inventory Turnover} = \frac{\text{COGS}}{\text{Average Inventory}}$$

$$\text{Receivables Turnover} = \frac{\text{Net Credit Sales}}{\text{Average Receivables}}$$

$$\text{Total Asset Turnover} = \frac{\text{Net Sales}}{\text{Average Total Assets}}$$

## Leverage & Solvency

$$\text{Debt-to-Equity} = \frac{\text{Total Debt}}{\text{Shareholders' Equity}}$$

$$\text{Debt-to-Assets} = \frac{\text{Total Debt}}{\text{Total Assets}}$$

$$\text{Interest Coverage} = \frac{\text{EBIT}}{\text{Interest Expense}}$$

## Profitability & Market Value

$$\text{Gross Margin} = (\text{Gross Profit} / \text{Net Sales}) \times 100$$

$$\text{Operating Margin} = (\text{Operating Income} / \text{Net Sales}) \times 100$$

$$\text{Net Margin} = (\text{Net Income} / \text{Net Sales}) \times 100$$

$$\text{ROA} = \text{Net Income} / \text{Average Total Assets}$$

$$\text{ROE} = \text{Net Income} / \text{Average Shareholders' Equity}$$

$$\text{EPS} = (\text{Net Income} - \text{Pref. Div}) / \text{Weighted Avg. Shares}$$

$$\text{P/E} = \text{Market Price per Share} / \text{EPS}$$



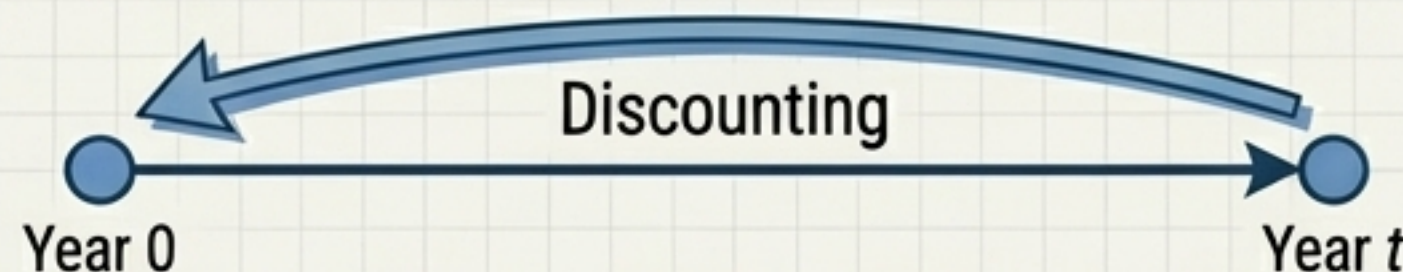
EXAM TRAP: Turnover ratios always use COGS or Sales in the numerator and Average balances in the denominator. Profitability margins use period-end figures.

# The Mathematical Engine: Time Value of Money (TVM)

## Single Sums

$$PV = \frac{FV}{\left(1 + \frac{i}{n}\right)^{nt}} \quad FV = PV \times \left(1 + \frac{i}{n}\right)^{nt}$$

## Visual Timeline



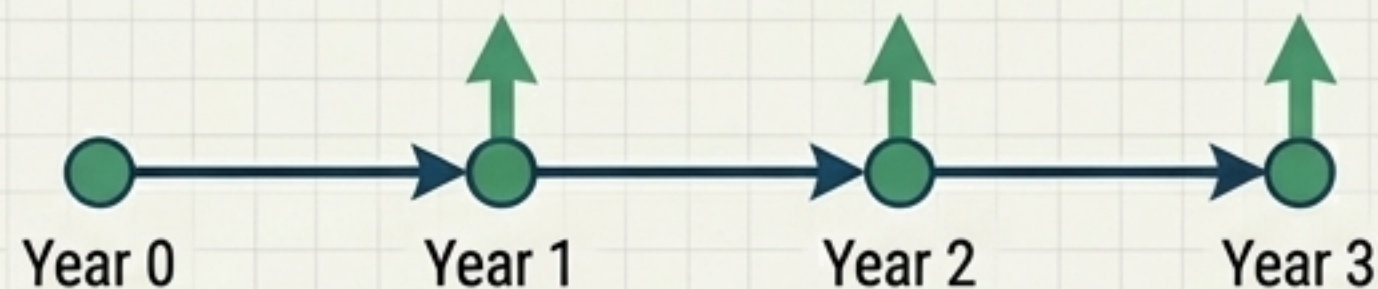
## Ordinary Annuities (Payments at END of period)

Constant:  $PV_{annuity} = PMT \times \frac{[1 - (1+r)^{-n}]}{r}$

FV:  $FV_{annuity} = PMT \times \frac{[(1+r)^n - 1]}{r}$

Growing:  $PV_{growing} = C \times \left[1 - \frac{((1+g)/(1+r))^n}{r-g}\right]$

## Visual Timeline

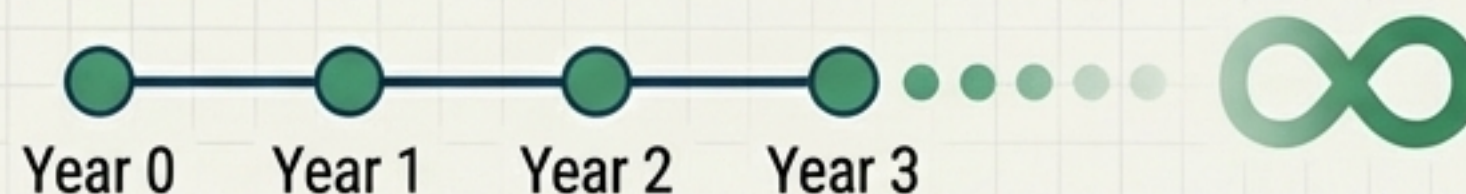


## Perpetuities (Infinite Horizon)

Constant:  $PV_{perp} = \frac{C}{r}$

Growing:  $PV_{growingperp} = \frac{C}{r-g}$

## Visual Timeline



[r = discount rate] [g = growth rate] [n = periods] [PMT/C = cash flow]



**EXAM TRAP:** Ordinary annuities assume payments occur at the END of the period. For annuities due, multiply the PV result by (1+r).

# Fixed Income Mechanics: Bond Valuation

## The Standard Pricing Equation

$$PV_{coupons} = \sum \left[ \frac{C}{(1+r)^t} \right]$$

Present Value of Annuity stream

+

$$PV_{principal} = \frac{F}{(1+r)^n}$$

Present Value of Single Sum

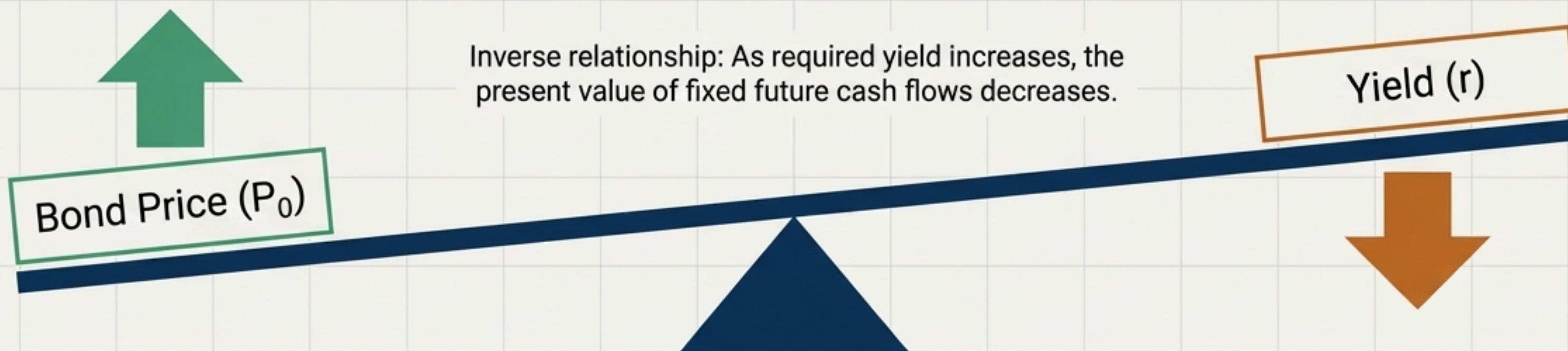
$$P_0 = \sum \left[ \frac{C}{(1+r)^t} \right] + \frac{F}{(1+r)^n}$$

Perpetual Bond (Consol)

$$P_0 = \frac{C}{r}$$

Identical to Level Perpetuity

## The Pricing Teeter-Totter

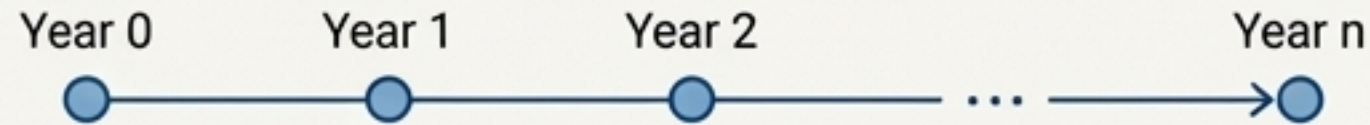


Inverse relationship: As required yield increases, the present value of fixed future cash flows decreases.

[C = Coupon] [F = Face Value] [r = Yield to Maturity per period]

# Equity Valuation: Dividends & Residual Income

## Dividend Discount Models (DDM)



**General Multi-Period:**

$$P_0 = \sum_t^n \left[ \frac{D_t}{(1+r)^t} \right] + \left[ \frac{P_n}{(1+r)^n} \right]$$

**Constant-Growth (Gordon) model:**

$$P_0 = \frac{D_1}{r - g}$$

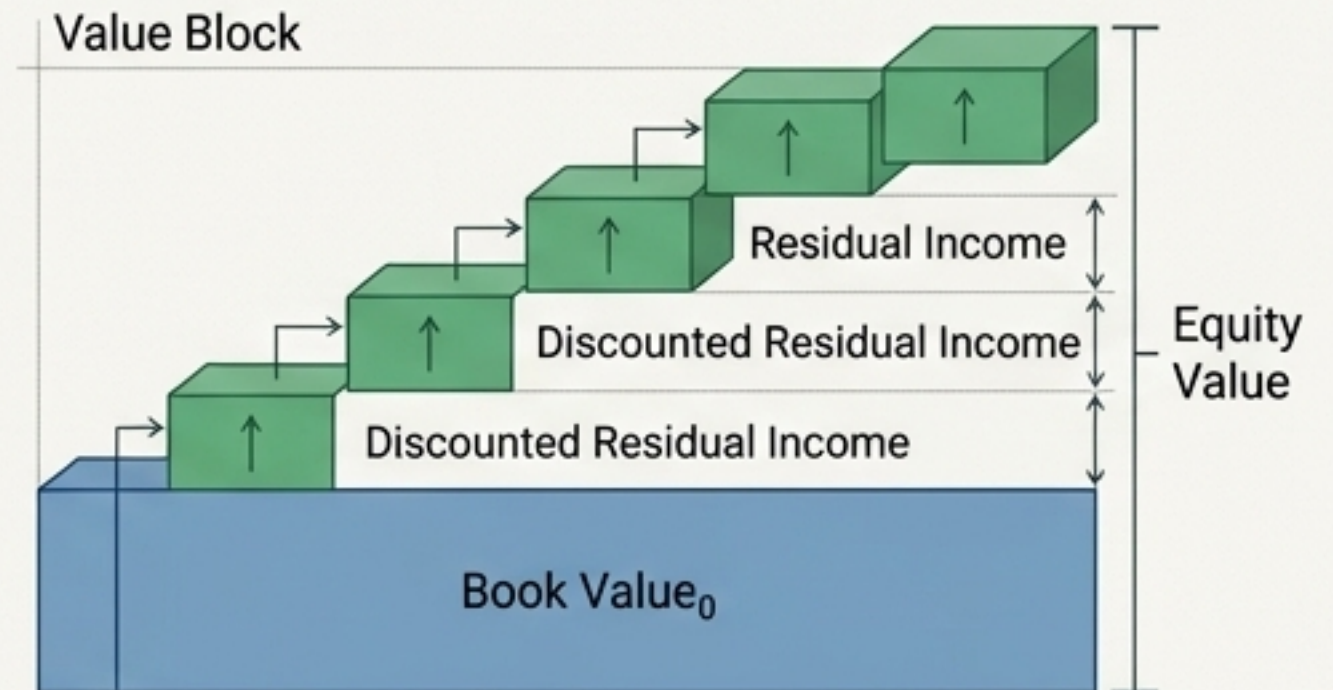
**Zero-Growth model:**

$$P_0 = \frac{D}{r} \quad (\text{Identical to perpetuity})$$

### EXAM TRAP

In the Gordon Growth Model, the numerator is strictly D1 (next year's dividend), NOT D0 (current dividend).  
 $D1 = D0 \times (1+g)$ .

## Residual Income Model (RIM)



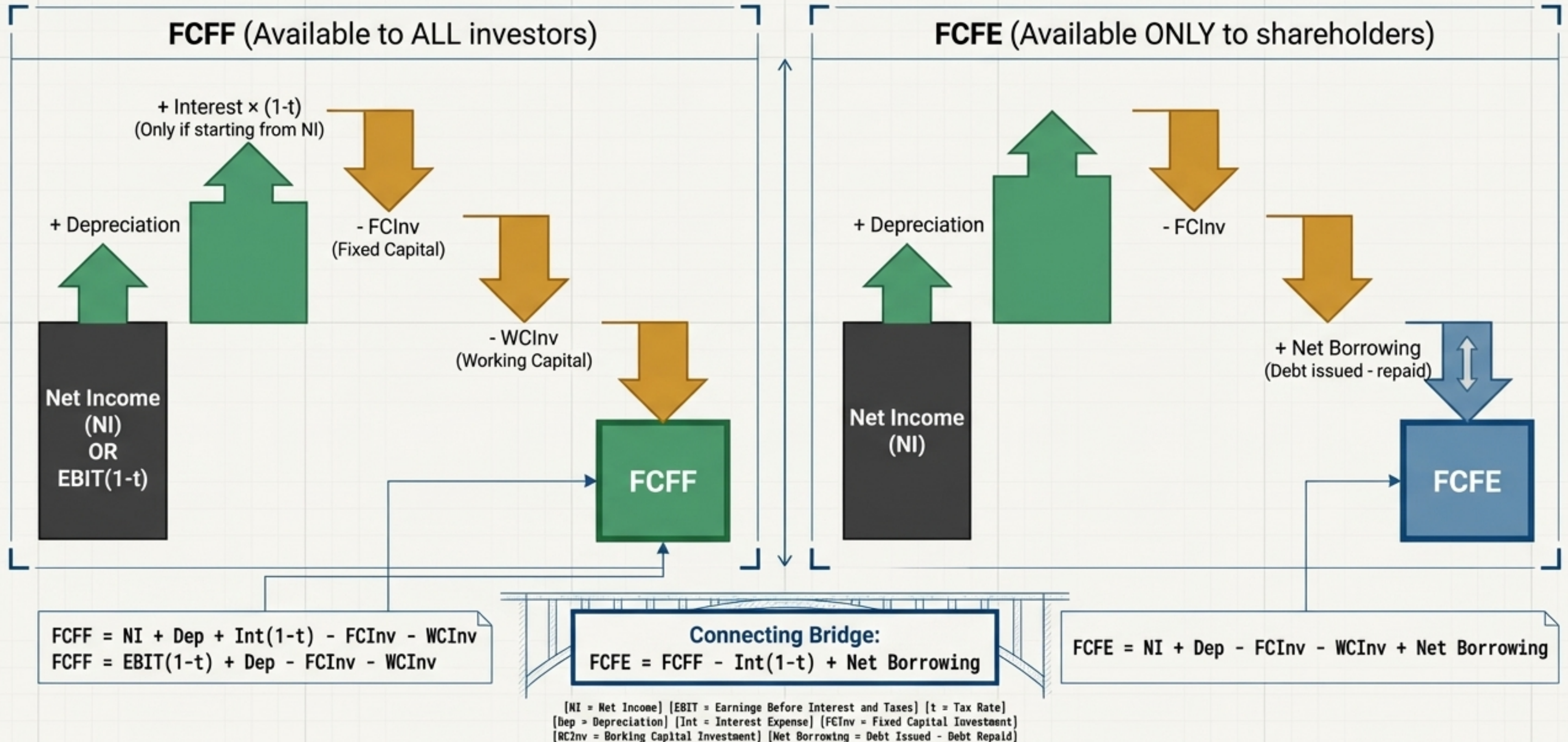
**Residual Income (RI) = Net Income - (Equity Capital × Cost of Equity)**

$$\text{Equity Value} = \text{Book Value}_0 + \sum_t^n \frac{RI_t}{(1+r)^t}$$

## Relative P/E Valuation

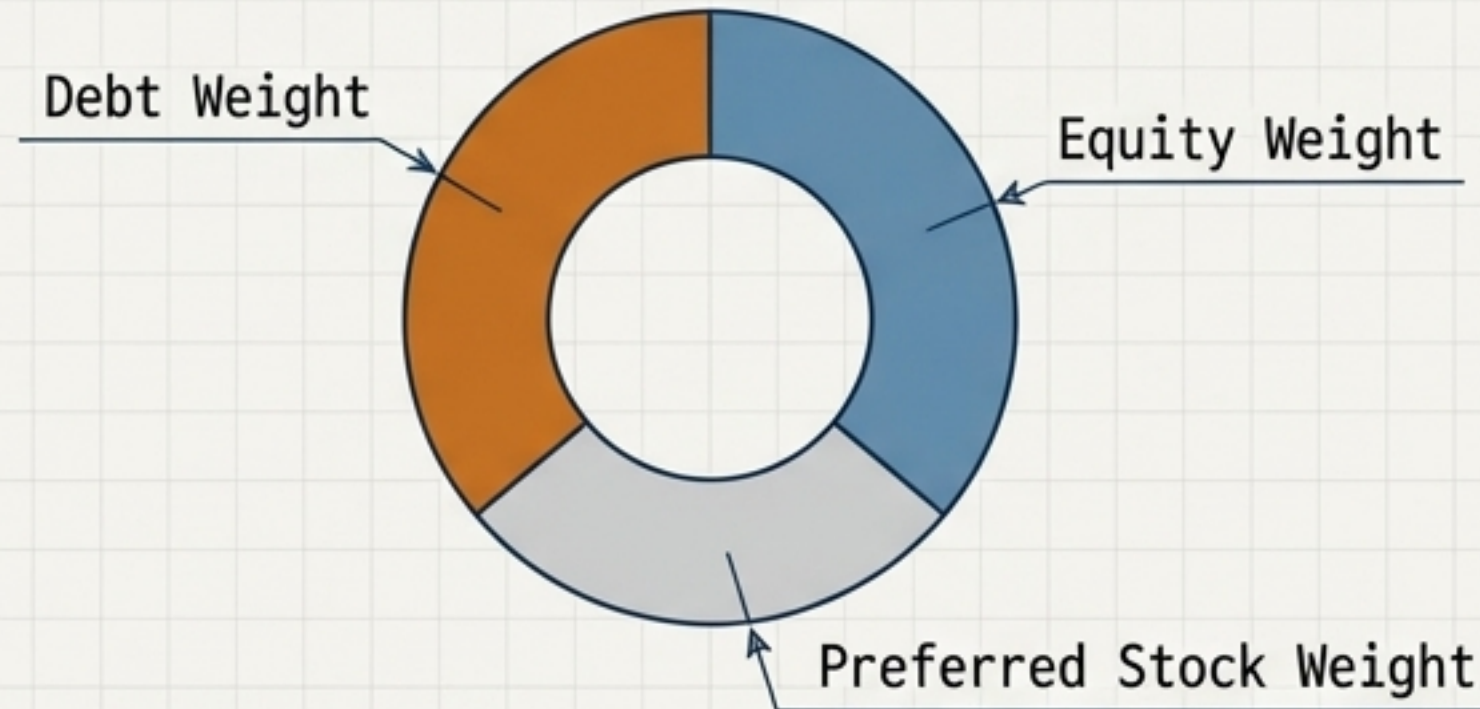
$$\text{Equity Value per Share} = \text{P/E Multiple} \times \text{EPS}$$

# Corporate Cash Flows: FCFF vs. FCFE



# The Corporate Discount Rate: WACC

Capital Structure Weighting Scale



## Weighted Average Cost of Capital Formulas

Simple Form (Debt + Equity):

$$WACC = \left[ \frac{D}{D+E} \right] \times K_d(1-T) + \left[ \frac{E}{D+E} \right] \times K_e$$

Extended Form (Adding Preferred):

$$WACC = w_d \times K_d(1-T) + w_e \times K_e + w_p \times K_p$$

## Deconstructed Variables:

$\left[ \frac{D}{D+E} \right]$  or  $w_d$  = Target weight of debt

$K_d(1-T)$  = After-tax cost of debt

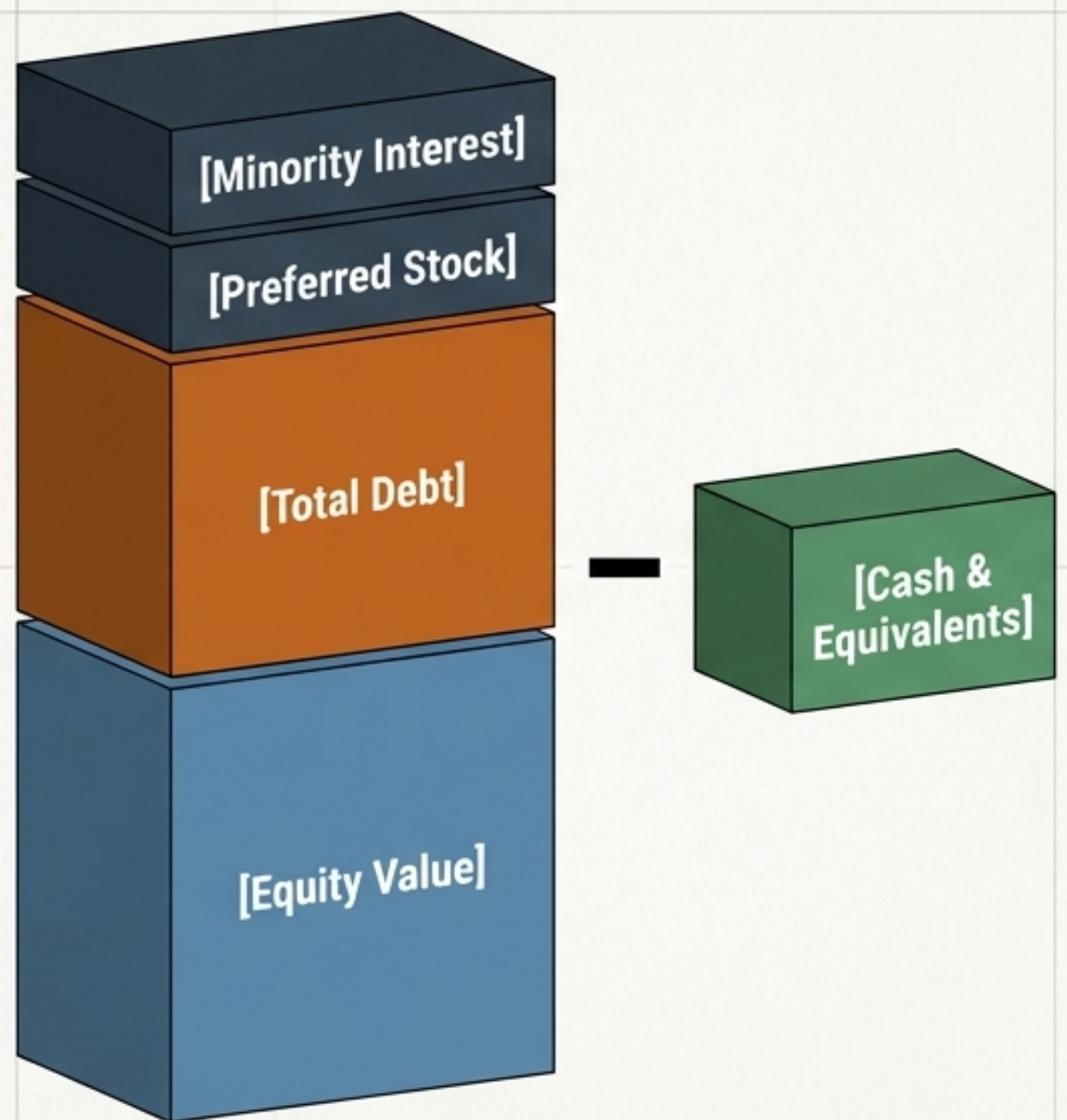
$K_e$  = Cost of equity (usually CAPM)



### EXAM TRAP:

WACC strictly uses the AFTER-TAX cost of debt  $K_d(1-T)$  because interest payments are tax-deductible. Equity and preferred stock do not get this tax shield.

# Valuation Stacking: Enterprise Value (EV)



## Core Equations:

$$EV = \text{Market Cap} + \text{Total Debt} - \text{Cash \& Equivalents}$$

$$EV = \text{Equity Value} + \text{Debt} + \text{Pref. Stock} + \text{Minority Int.} - \text{Cash}$$

$$\text{Net Debt} = \text{Total Debt} - \text{Cash \& Equivalents}$$

## The EV Bridge:

$$\text{Equity Value} = EV - \text{Net Debt}$$

## Alternative Valuation (Multiple-Based):

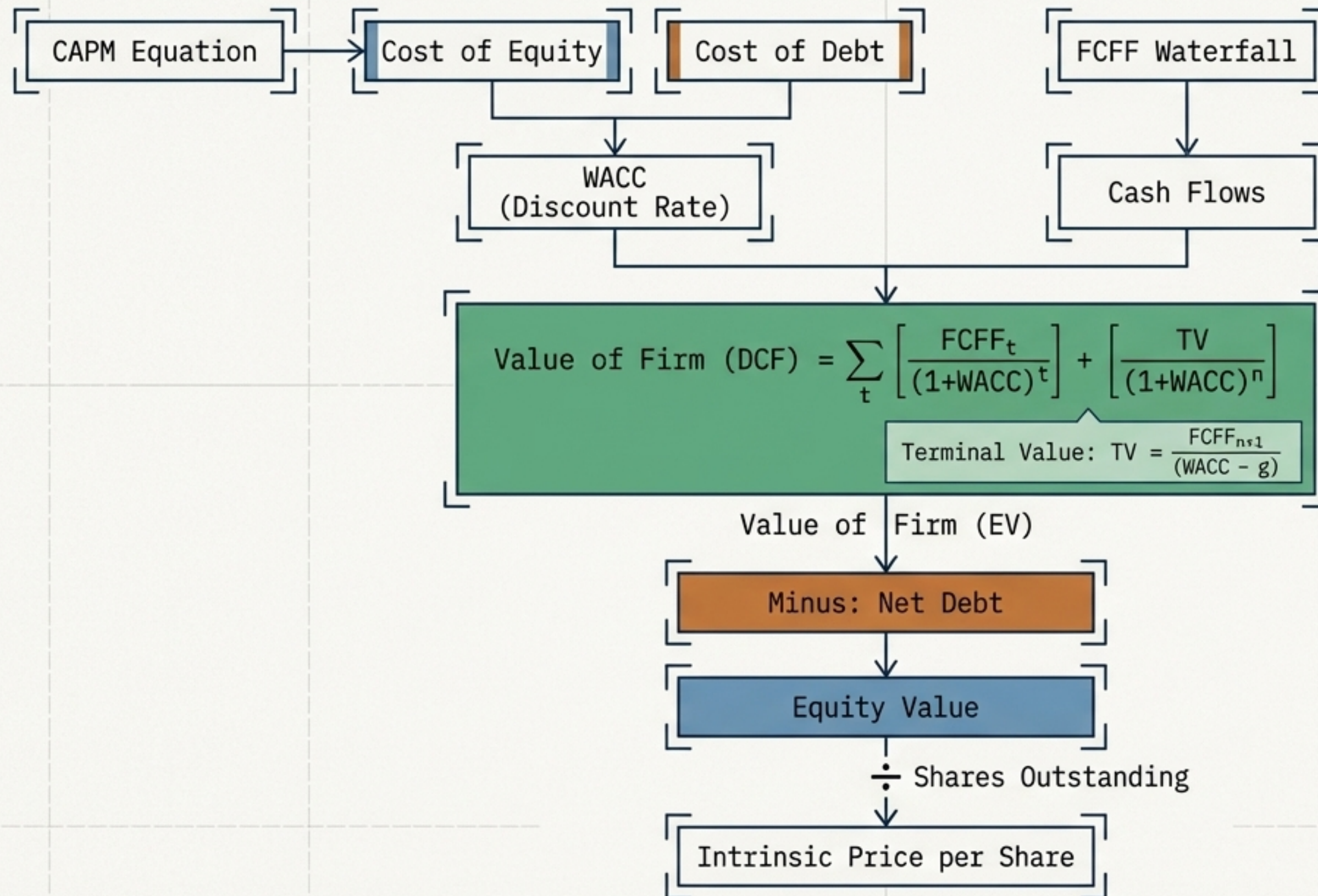
$$\text{Step 1: } EV = (\text{EV/EBITDA Multiple}) \times \text{EBITDA}$$

$$\text{Step 2: } \text{Equity Value} = EV - \text{Net Debt}$$



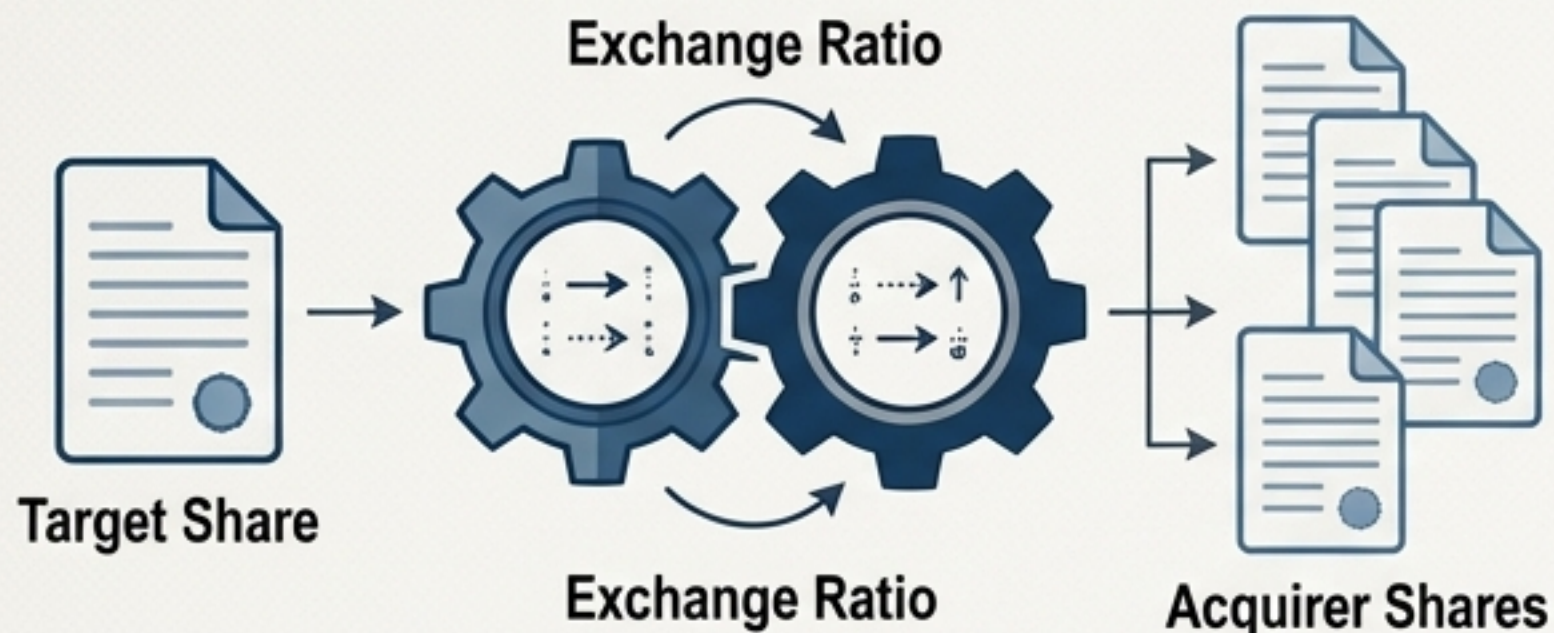
**EXAM TRAP:** Cash is SUBTRACTED when moving from Equity Value to EV because an acquirer could theoretically use the target's own cash to instantly pay off a portion of its debt.

# Synthesis: The Master Valuation Bridge



# Corporate Events: M&A Deal Math

## The Deal Mechanics



$$\left[ \text{Exchange Ratio} = \frac{\text{Offer Price per Target Share}}{\text{Acquirer Share Price}} \right]$$

$$\left[ \text{New Shares Issued} = \text{Exchange Ratio} \times \text{Target Shares Outstanding} \right]$$

## Post-Deal Analysis



$$\left[ \text{Pro Forma EPS} = \frac{\text{Pro Forma Net Income}}{\text{Pro Forma Diluted Shares Outstanding}} \right]$$

$$\left[ \text{EPS Accretion/(Dilution)} \% = \left( \frac{\text{Pro Forma EPS}}{\text{Acquirer Standalone EPS}} \right) - 1 \right]$$

## Synergy Value:

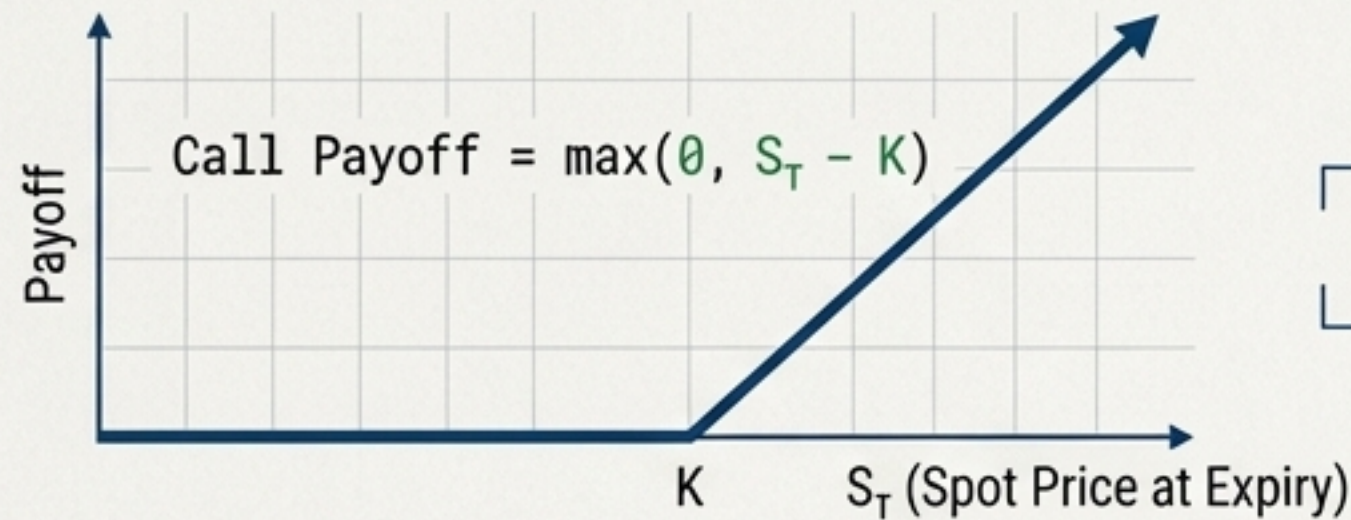
$$\left[ \text{Value of Synergy} \approx \text{Value of Combined Firm (with synergy)} - \text{Value of Combined Firm (without synergy)} \right]$$



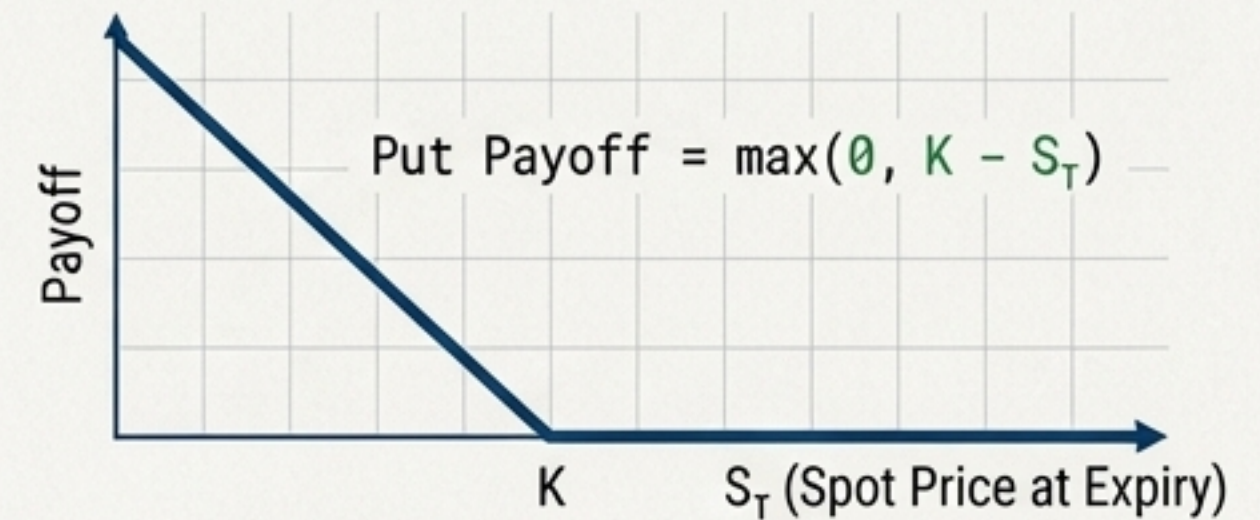
**EXAM TRAP:** Pro Forma Diluted Shares = Acquirer's Original Shares + NEW Shares Issued. Never use the Target's original share count in the Pro Forma denominator!

# Derivatives: Payoffs & Put-Call Parity

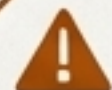
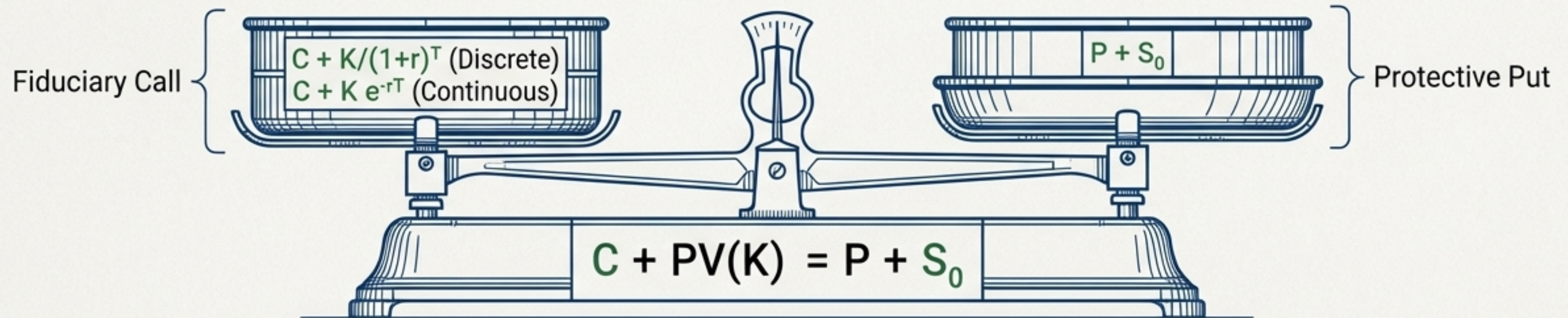
## European Option Payoffs At Expiry



$S_T$  = Spot price at expiry,  
 $K$  = Strike price



## Put-Call Parity

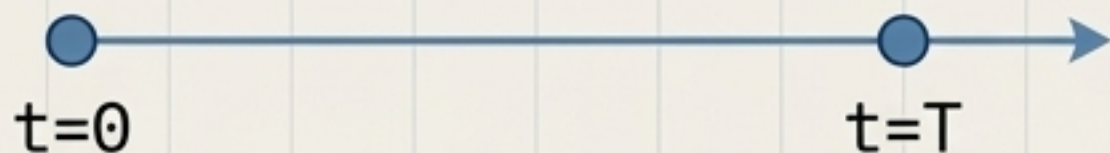


### EXAM TRAP:

Put-Call parity only applies to European options on the same underlying asset, with the same strike price ( $K$ ) and same expiration ( $T$ ).

# Advanced Mathematics: Forwards & Black-Scholes

## Forward Pricing



Discrete Form (No income):

$$F_0 = S_0(1+r)^T$$

Continuous Form:

$$F_0 = S_0 e^{rT}$$

Black-Scholes Deconstructed - European Call, No Dividends)

$$S_0 N(d_1)$$

Expected present value of  
receiving the stock.

—

$$K e^{-rT} N(d_2)$$

Expected present value of  
paying the strike price.

$$C = S_0 N(d_1) - K e^{-rT} N(d_2)$$

$$d_1 = \frac{\ln\left(\frac{S_0}{K}\right) + \left(r + \frac{\sigma^2}{2}\right)T}{\sigma\sqrt{T}}$$
$$d_2 = d_1 - \sigma\sqrt{T}$$