

Course Summary

Part I - NPV

- Coupon
- Principal
- Pricing
- YTM

Bonds

- IRR
- Payback rule
- Book rate of return

Alternative measures

- APR
- EAR
- Semiannual
- Continuous

Compounding

- Calculating NPV when taxes present

Taxes

$$NPV = CF_0 + \frac{CF_1}{(1+r_1)} + \frac{CF_2}{(1+r_2)^2} + \frac{CF_3}{(1+r_3)^3} + \dots = \sum_{i=0}^T \frac{CF_i}{(1+r_i)^i}$$

Spot rates vs forward rates

Equity valuation

Special CF patterns

Role of capital markets

- Going between
- Synthetic forwards

Inflation

- Dividend growth model
- PVGO
- FCF

- Real vs nominal

- Perpetuity
- Annuity
- Growth
- Deferral

- Fisher separation

Part II - CAPM

Statistics

- Population vs. sample
- mean
- variance, standard dev.
- correlation, covariance
- Regressions R2,

Discount rate

- Calculating, using CAPM
- Risk premium
- Risk-free rate

$$r_i = r_f + \beta_i [r_m - r_f]$$
$$\beta_i = \frac{\text{Cov}(\tilde{r}_i, \tilde{r}_m)}{\text{Var}(\tilde{r}_m)}$$

Portfolio choice

- Risk aversion
- portfolio: expected return, variance, standard deviation
- Systematic vs unique risk
- Diversification
- Perfectly diversified portfolios

CAPM concepts

- Minimum variance frontier
- Efficient frontier
- Capital market line (CML)
- Security market line (SML)

Beta

- Estimating beta from market data
- Estimating beta from population data
- Beta of portfolio
- Beta and leverage

Part III - Valuation

Estimate beta of stock: β_E

Either:

- Calculate covariance of stock with market and divide by market variance *or*
- Regress stock returns on market returns

Unlever β_E to obtain β_A . Solve for β_A in:

APV: Constant debt *amount*:
$$\beta_E = \beta_A + \frac{D_L}{E_L} (\beta_A - \beta_D)(1 - T_C)$$

WACC: Constant debt *proportion*:
$$\beta_E = \beta_A + \frac{D_L}{E_L} (\beta_A - \beta_D)$$

Forecast **all-equity** cash flows (CF)

Calculate r_A using CAPM

$$r_A = r_f + \beta_A (r_m - r_f)$$

APV: Constant amount of debt

WACC: Constant proportion of debt

Calculate $V_L = E_L + D_L$:

- Discount all-equity after-tax CF using r_A .
- Add PV(tax shield) = $T_C \times D_L$

Calculate WACC from r_A :

$$WACC = r_A - \left(\frac{D_L}{D_L + E_L} \right) T_C r_D$$

Calculate $V_L = E_L + D_L$:

- Discount all-equity after-tax CF using WACC

Part IV - Derivatives

Concepts

- Types of derivatives: Forwards, Swaps, Futures, Options
- American vs European option
- Delta hedging
- General payoff structures
- Replicating strategy/Noarbitrage

Put-call parity

$$C = S + P - K / (1+r)^T$$

Binomial pricing

$$C = S\Delta + B$$
$$\Delta = \frac{C_u - C_d}{(u-d)S}, \quad B = \frac{uC_d - dC_u}{(u-d)(1+r)}$$

Black Scholes pricing

$$C = S N(x) - Ke^{-rT} N(x - \sigma\sqrt{T}),$$

where $x \equiv \frac{[\log(S/K) + (r + \sigma^2/2)T]}{\sigma\sqrt{T}}$