MBAS 821 Formula Sheet

1. Time Value of Money

$$PV = \frac{FV_t}{(1+r)^t}$$

$$FV_t = PV(1+r)^t$$

$$PV(\text{Perpetuity}) = \frac{C}{r}$$

$$PV(\text{Annuity}) = \frac{C}{r}\left[1 - \frac{1}{(1+r)^t}\right]$$

$$PV(\text{Growing Perpetuity}) = \frac{C}{r-g}$$

$$PV(\text{Growing Annuity}) = \frac{C}{r-g}\left[1 - \left(\frac{1+g}{1+r}\right)^t\right]$$

$$1 + EAR = (1 + \frac{APR}{m})^m$$

$$FV_t(\text{Continuous Compounding}) = e^{rt}$$

2. Investment Decisions

$$NPV = \sum_{t=1}^{T} \frac{CF_t}{(1+r)^t} - C_0$$

$$\sum_{t=1}^{T} \frac{CF_t}{(1+IRR)^t} - C_0 = 0$$

$$PI = \frac{\sum_{t=1}^{T} \frac{CF_t}{(1+r)^t}}{C_0}$$

3. Capital Budgeting

$$NPV = \sum_{t=0}^{N} \frac{FCF_t}{(1+r)^t}$$

Yearly FCF Calculation

$$FCF = \text{Unlevered NI} + Dep - CAPEX - \Delta NWC$$

$$FCF = EBIT \times (1 - T_C) + Dep - CAPEX - \Delta NWC$$

$$FCF = EBITDA \times (1 - T_C) + Dep \times T_C - CAPEX - \Delta NWC$$

$$FCF = NI + \text{Interest Expenses} \times (1 - T_C) + Dep - CAPEX - \Delta NWC$$

Straight-line depreciation asset sales

$$\text{Tax paid (or credits received)} = (\text{Sale Price} - \text{Book Value}) \times T_C$$

PV of CCA tax shields

$$PVTS_{CCA} = \frac{CAPEX \times d \times T_C}{r + d} \times \frac{(1 + \frac{r}{2})}{(1 + r)} - \frac{\text{Sales Price}_t \times d \times T_C}{r + d} \times \frac{1}{(1 + r)^t}$$

4. Securities and Firm Valuation

$$P(\text{Zero-coupon bond}) = \frac{FV}{(1 + YTM_n)^n}$$

$$P(\text{Coupon bond}) = \frac{CPN}{YTM_n}\left[1 - \frac{1}{(1 + YTM_n)^n}\right] + \frac{FV}{(1 + YTM_n)^n}$$

YTM calculation: $$\frac{CPN}{YTM_n}\left[1 - \frac{1}{(1 + YTM_n)^n}\right] + \frac{FV}{(1 + YTM_n)^n} - P = 0$$

$$HPR = \frac{P_n - P_0 + \sum_{t=1}^{n} CPN_t}{P_0}$$

DDM

$$P(DDM) = \sum_{t=1}^{\infty} \frac{Div_t}{(1+r)^t}$$

$$g = RR \times ROE \qquad \text{where} \qquad RR = \frac{\text{Retained Earnings}}{\text{Net Income}}$$

$$\text{Constant growth:} \quad r = \frac{Div_{t+1}}{P_t} + g$$

DCF

$$\text{Enterprise Value} = \text{Market Value of Equity} + \text{Debt} - \text{Cash}$$

$$V_0 = \sum_{t=1}^{\infty} \frac{FCF_t}{(1+r_{WACC})^t}$$

$$P_0 = \frac{V_0 + \text{Cash}_0 - \text{Debt}_0}{\text{Shares Outstanding}_0}$$

$$V_0 = \left(\sum_{t=1}^{N} \frac{FCF_t}{(1+r_{WACC})^N} \right) + \frac{V_N}{(1+r_{WACC})^N}$$

$$V_N(\text{Terminal Value}) = \frac{FCF_{N+1}}{r_{WACC} - g}$$

P/E Multiples

$$P_{\text{target}} = \text{Average P/E ratio from comparables} \times EPS_{\text{target}}$$

5. Risk and Return

$$HPR = \frac{P_n - P_0 + \sum_{t=1}^{n} \text{Income}_t}{P_0}$$

$$\bar{r} = \frac{1}{n}\sum_{t=1}^{n} r_t$$

$$r_{geo} = \left[\prod_{t=1}^{n}(1+r_t)\right]^{\frac{1}{n}} - 1$$

$$\sigma^2 = \frac{\sum_{t=1}^{n}(r_t - \bar{r})^2}{n-1}$$

$$E(R) = \sum_{i=1}^{N} R_i Pr(i)$$

$$\sigma^2 = \sum_{i=1}^{N}\left[\big(R_i - E(R)\big)^2 Pr(i)\right]$$

$$E(R_p) = \sum_{i=1}^{N} W_i E(R_i)$$

$$\sigma_P^2 = W_A^2\sigma_A^2 + W_B^2\sigma_B^2 + 2W_A W_B cov(R_A, R_B)$$

$$cov(R_A, R_B) = \sum_{i=1}^{N} Pr(i)(R_{A,i} - E(R_A))(R_{B,i} - E(R_B))$$

$$corr(R_A, R_B) = \rho_{A,B} = \frac{Cov(R_A, R_B)}{\sigma_A \sigma_B}$$