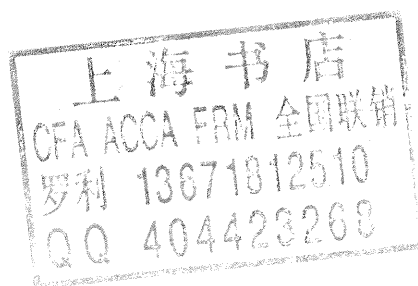


BOOK 5 – FIXED INCOME, DERIVATIVE, AND ALTERNATIVE INVESTMENTS

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FORMULAS

full price = clean price + accrued interest

$$\text{duration} = -\frac{\text{percentage change in bond price}}{\text{yield change in percent}}$$

value of a callable bond = value of an option-free bond – value of the call

$$\text{TIPS coupon payment} = \text{inflation-adjusted par value} \times \frac{\text{stated coupon rate}}{2}$$

absolute yield spread = yield on the higher-yield bond – yield on the lower-yield bond

$$\text{relative yield spread} = \frac{\text{absolute yield spread}}{\text{yield on the lower-yield bond}} = \frac{\text{higher yield}}{\text{lower yield}} - 1$$

$$\text{yield ratio} = \frac{\text{higher yield}}{\text{lower yield}}$$

after-tax yield = taxable yield \times (1 – marginal tax rate)

$$\text{taxable-equivalent yield} = \frac{\text{tax-free yield}}{(1 - \text{marginal tax rate})}$$

$$\text{bond equivalent yield} = \left[(1 + \text{monthly CFY})^6 - 1 \right] \times 2$$

spot rate from forward rates:

$$S_3 = \left[(1 + {}_1f_0)(1 + {}_1f_1)(1 + {}_1f_2) \right]^{\frac{1}{3}} - 1$$

forward rate from spot rates:

$${}_1f_2 = \frac{(1 + S_3)^3}{(1 + S_2)^2} - 1$$

$$\text{effective duration} = \frac{(\text{bond price when yields fall} - \text{bond price when yields rise})}{2 \times (\text{initial price}) \times (\text{change in yield in decimal form})} = \frac{V_- - V_+}{2V_0(\Delta y)}$$

percentage change in bond price = –effective duration \times change in yield in percent

$$\text{portfolio duration} = w_1 D_1 + w_2 D_2 + \dots + w_N D_N$$

$$\text{percentage change in price} = \text{duration effect} + \text{convexity effect}$$

$$= \left\{ [-\text{duration} \times (\Delta y)] + \left[\text{convexity} \times (\Delta y)^2 \right] \right\} \times 100$$

$$\text{price value of a basis point} = \text{duration} \times 0.0001 \times \text{bond value}$$

$$\text{value of a long FRA at settlement: (notional principal)} \frac{(\text{floating} - \text{forward}) \left(\frac{\text{days}}{360} \right)}{1 + (\text{floating}) \left(\frac{\text{days}}{360} \right)}$$

$$\text{intrinsic value of a call: } C = \text{Max}[0, S - X]$$

$$\text{intrinsic value of a put: } P = \text{Max}[0, X - S]$$

$$\text{option value} = \text{intrinsic value} + \text{time value}$$

lower and upper bounds for options:

<i>Option</i>	<i>Minimum Value</i>	<i>Maximum Value</i>
European call	$c_t \geq \text{Max}[0, S_t - X / (1 + \text{RFR})^{T-t}]$	S_t
American call	$C_T \geq \text{Max}[0, S_t - X / (1 + \text{RFR})^{T-t}]$	S_t
European put	$p_t \geq \text{Max}[0, X / (1 + \text{RFR})^{T-t} - S_t]$	$X / (1 + \text{RFR})^{T-t}$
American put	$P_t \geq \text{Max}[0, X - S_t]$	X

$$\text{put-call parity: } c + X / (1 + \text{RFR})^T = S + p$$

$$\text{put-call parity with asset cash flows: } C + X / (1 + \text{RFR})^T = (S_0 - \text{PV}_{\text{CF}}) + P$$

plain-vanilla interest rate swap:

$$(\text{net fixed-rate payment})_t = (\text{swap fixed rate} - \text{LIBOR}_{t-1}) \left(\frac{\text{number of days}}{360} \right) (\text{notional principal})$$

income method for real estate:

$$\text{appraisal price} = \frac{\text{net operating income}}{\text{market cap rate}}$$

$$\text{net operating income} = \text{gross potential income} - \text{collections and vacancy losses} - \text{total operating expenses}$$