

EA-1 SEMINAR

SECTION 5

BONDS

BONDS - TERMINOLOGY

P = Price of bond = Amortized value	F = par value or face value
C = redemption value	r = coupon rate usually nominal convertible semi-annually
g = modified coupon rate based on redemption value = Fr / C	Fr = coupon amount
K = PV of redemption value = Cv^n = $C(1+i)^{-n}$	i = yield rate for investor
	n = # interest conversion periods

BONDS – PRICE FORMULAS

$$\begin{aligned}
 P &= Fr(a\bar{n}|i) + K \\
 &= Fr(a\bar{n}|i) + Cv^n
 \end{aligned}
 \quad \text{General}$$

$$\begin{aligned}
 P &= Fr(a\bar{n}|i) + C(1 - i(a\bar{n}|i)) \\
 &= C + (Fr - Ci)a\bar{n}|i
 \end{aligned}
 \quad \begin{array}{l} \text{Alternate} \\ \text{Callable} \end{array}$$

$$\begin{aligned}
 P &= Cv^n + Fr(a\bar{n}|i) \\
 &= Cv^n + Cg(a\bar{n}|i) \\
 &= K + Cg\left(\frac{1 - v^n}{i}\right) \\
 &= K + \frac{g}{i}(C - Cv^n) \\
 &= K + \frac{g}{i}(C - K) \\
 &= Cv^n + \frac{g}{i}(C - Cv^n)
 \end{aligned}
 \quad \begin{array}{l} \text{Makeham} \\ \text{Serial} \\ \text{Bond} \end{array}$$

BONDS – PRICE FORMULAS



i Bond gives biannual coupons
Annual interest rate

$$P = X a_{\overline{n}|i} + C v^n$$

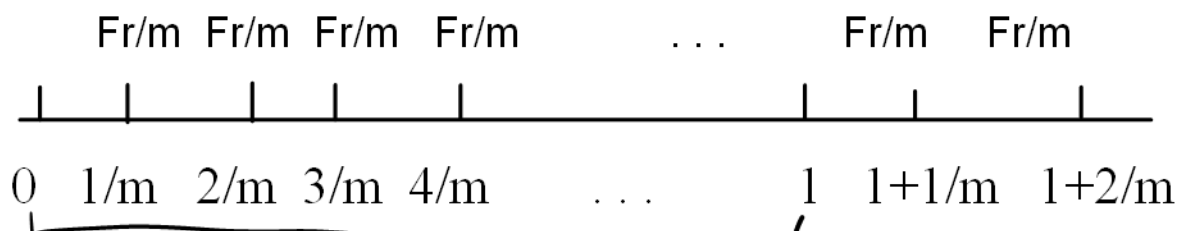
$$Fr = X s_{\overline{2}|i} \Rightarrow X = \frac{Fr}{s_{\overline{2}|i}}$$

$$P = Fr \left(\frac{a_{\overline{n}|i}}{s_{\overline{2}|i}} \right) + C v^n$$

General Result - coupon every k years

$$P = Fr \left(\frac{a_{\overline{n}|i}}{s_{\overline{k}|i}} \right) + C v^n$$

BONDS – PRICE FORMULAS



N year bond, annual coupon Fr,
payable mthly, annual yield rate

$$P = Fr a_{\overline{n}|i^{(m)}} + C v^n \quad \text{General}$$

$$P = C + (Fr - Ci^{(m)}) a_{\overline{n}|i^{(m)}} \quad \text{Alternate}$$

$$P = K + \frac{g}{i^{(m)}} (C - K) \quad \text{Makeham}$$

Derive monthly rate, value price
using monthly coupons

$$P = \left(\frac{Fr}{12} \right) a_{\overline{12n}|j} + C(1+i)^{-n}$$

$$(1+j)^{12} = 1+i$$

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