

DJIA	13582.45
NASDAQ	3176.26
S&P500	1459.99
EUR	41.30
Oil	95.29
10yr	1.808%

9-19-2012

• Int. R ↓ Value ↑
 " ↑ Value ↓

$$\text{Price of Bond} = P = \frac{C}{1+r} + \frac{C}{(1+r)^2} + \frac{C}{(1+r)^3} + \frac{C+FV}{(1+r)^4}$$

$$P = C(1+r)^{-1} + C(1+r)^{-2} + C(1+r)^{-3} + (C+FV)(1+r)^{-4}$$

$$-P' = \frac{dP}{dr} = -C(1+r)^{-2} - 2C(1+r)^{-3} - 3C(1+r)^{-4} - 4(C+FV)(1+r)^{-5}$$

$$\frac{dP}{dr} = \frac{-C}{(1+r)^2} + \frac{-2C}{(1+r)^3} + \frac{-3C}{(1+r)^4} + \frac{-4(C+FV)}{(1+r)^5}$$

distributive formula = $ab+cb=b(a+c)$

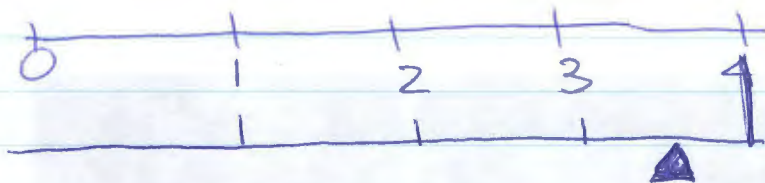
$$\frac{dP}{dr} = \frac{-1}{1+r} \left[\frac{C}{1+r} + \frac{2C}{(1+r)^2} + \frac{3C}{(1+r)^3} + \frac{4(C+FV)}{(1+r)^4} \right]$$

$$\frac{\Delta P/P}{\Delta r} \approx \frac{-1}{1+r} \left[\frac{C}{1+r} + \frac{2C}{(1+r)^2} + \frac{3C}{(1+r)^3} + \frac{4(C+FV)}{(1+r)^4} \right]$$

P

$$\frac{\Delta P/P}{\Delta r} = -1 \left[\frac{C}{1+r} + \frac{2C}{(1+r)^2} + \frac{3C}{(1+r)^3} + \frac{4(C+FV)}{(1+r)^4} \right]$$

Seesaw



- "4yr" doesn't describe when getting cash b/c accurately b/c you're getting cash at each period.
- should come up w/ w.A. time of when getting \$

$$P = \frac{C}{1+r} + \frac{C}{(1+r)^2} + \frac{C}{(1+r)^3} + \frac{C+FV}{(1+r)^4}$$
$$= 1 \left(\frac{C}{1+r} \right) + 2 \left(\frac{C}{(1+r)^2} \right) + 3 \left(\frac{C}{(1+r)^3} \right) + 4 \left(\frac{C+FV}{(1+r)^4} \right)$$

rewriting equation ...

$$D = \frac{\frac{C}{1+r} + \frac{2C}{(1+r)^2} + \frac{3C}{(1+r)^3} + \frac{4(C+FV)}{(1+r)^4}}{P}$$

weighted Avg. Time = Elasticity (which is a E)

- (look at "Duration; volatility" slide)

$D = 3.5396 =$ This bond behaves like a 3.5396yr bond as opposed to a "4yr" bond.

Duration Spreadsheet Example.

CF 10%
 FV 1000
 YTM 8%
 Compound Period 2.

Price Elasticity of Bond = -Duration.

$$\frac{\Delta P/P}{\Delta r/r} = -D \cdot P \cdot \frac{\Delta r}{r}$$

original r, where start.

$$\Delta P = -D \cdot P \cdot \left(\frac{\Delta r}{r} \right)$$

↑ ↑

$$\underline{-33.70} = (-) 3.41 \cdot 1067.33 \cdot \left(\frac{.01}{1.08} \right)$$

- if buy a bond whose D matches its holding period exactly when need \$, then protected from 1 int. rate. change; get exact amount of \$ expected.

(D. Spreadsheet)

$$8\% = 1395.265301$$

$$9\% = \underline{1395.33974}$$