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UCLA, ENG 111 SECOND MIDTERM *Spring 2018* *Mel Bulu Taciroglu*

NAME: [redacted]

1. *(10 points)* You are considering to invest on Project A and/or Project B which have profitability indices of 1.2 and 1.5 respectively. The cash increments of A over B has a profitability index of 0.8. (Assume you do not have a budget constraint.)

$PI_A = 1.2$
$PI_B = 1.5$
$PI_{A-B} = 0.8$

a) If A and B are not mutually exclusive(you can pick A, B, or both) , which project(s) should you take on?

Because $PI(A-B) = 0.8 < 1$, we would want to choose B (over A), because A & B aren't mutually exclusive & you must take incremental PI. X

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b) If A and B are mutually exclusive, which project(s) should you take on?

If A & B are mutually exclusive, we would take Project B because $PI(B) > PI(A)$

2. *(20 points)* Your firm is considering a project with a five-year life and an initial cost of $120,000. You ~~already spent $15,000 on market research before starting the project~~. The firm expects to sell 2,100 units per year at a price of $20 per unit. Market rate is 12%. The firm will have the option to abandon this project after three years at which time it expects it could sell the project for $50,000. At what level of sales (quantity per year) should the firm be willing to abandon this project?

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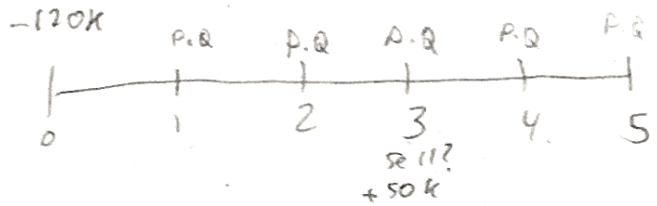
15k sunk costs

$n = 5$ yrs
$C_0 = \$120{,}000$
$Q = 2100$ units
$P = \$20$
$R = 12\%$
@ $t = 3$ yrs; sell for 50K



Revenue $= P \cdot Q = 20 \cdot 2100 = \$42000 = 42K$

$NPV_{\text{No sell}} = -120K + \frac{42K}{0.12}\left(1 - \frac{1}{1.12^5}\right) = 31400.60$, NPV of selling project must be higher than 31400.60

$NPV_{\text{sell}} = -120K + \frac{20 \cdot Q}{0.12}\left(1 - \frac{1}{1.12^5}\right) + \frac{50K}{1.12^3} > 31400.60$

$48.03 \cdot Q + 35589.01 > 151400.60$

$48.03Q > 115811.59$

$Q > 2411$ units

$Q \approx 2410.90 \approx 2411$

$BV_{future} = (1+\ )^{18} C + 1000$ $\quad 110.5 + 0.1105C = C$

3. *(20 points)* A 20-year bond with a $1,000 face value that is issued exactly two years ago just distributed its second coupon. The current yield on this bond is 11.05%. What would be the capital gains yield of this bond during the last year of its lifetime if the market rate now and in the future is 12%?

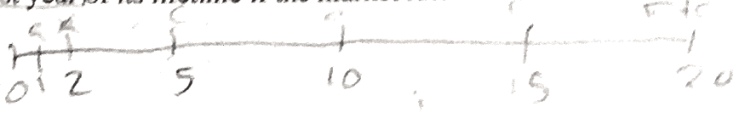
(3)

$n = 20$ yr

$F = 1000$

at $t=2$: $y_{tm} = 11.05\% = y$

$R = 12\%$



$y = y_{curr} + y_{cap} = \frac{C}{BV} + y_{cap}$

$y_{cap} = y - y_{curr} = y - \frac{C}{BV}$

$BV = \frac{C}{y}\left(1 - \frac{1}{(1+y)^{18}}\right) + \frac{F}{(1+y)^{18}}$

$= \frac{C}{0.1105}\left(1 - \frac{1}{(1+0.1105)^{18}}\right) + \frac{1000}{(1+0.1105)^{18}}$

$BV = C \cdot 7.677 + 151.588$

BV in last year $= 1.1105^{18}(C \cdot 7.667 + 151.588)$

$= 50.65 \cdot C + 1000$

$y_{curr} = \frac{C}{BV_{future}} = 11.05\% = \frac{C}{1000+C} \rightarrow C = 98.29$

$BV = \frac{C}{r}\left[\frac{(1+R)^{18}-1}{R}\right] + F = \frac{98.29(1.12^{18}-1)}{0.12} + 1000$

$= 6479.63$

4. *(25 points)* Default Bond Question: Consider two bonds currently trading in the market, one by company A and the other by company B. Assume that neither bond carries any risk other than the default and interest-rate risk.

A:
n = 1 yr
F = 1000
r = x%
P = 20%
default: all payments cut in half

B:
n = 30 yrs
r = x%
F = 1000
t_0 = 2 yrs ago

Company A: 1-year, x% coupon, $1,000 face value bond issued today with a default risk of 20% in which case only half of all the promised payments are expected to be made.

Company B: 30-year, x% coupon, $1,000 face value bond issued exactly two years ago with two of its coupons are already distributed, including the one distributed just today.

Market conditions: Average return you can get in the market is 10%. Investors expect a 0.5% higher yield per year (a total of 10.5% yield per year) to hold longer term bonds. $R = 10\%$ ytm expected (10.5%) only for long term bonds

$r = \frac{C}{F}$

a) If company A's bond is selling for $900 today, how much would you pay for company B's bond?

Expected Price $= 900(1+R)^n = P \cdot (F+C)$ + $(1-P) \cdot (F+C)$
default | no default

$\rightarrow 900(1+0.1) = 0.2 \cdot (500 + 500x) + 0.8(1000 + 1000x)$

$990 = 100 + 100x + 800 + 800x$

$90 = 900x \rightarrow x = 0.10$

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$BV_B = \frac{C}{ytm}\left(1 - \frac{1}{(1+ytm)^n}\right) + \frac{F}{(1+ytm)^n} = \frac{1000 \cdot 0.1}{0.105}\left(1 - \frac{1}{1.105^{18}}\right) + \frac{1000}{1.105^{18}}$

$= 794.51 + 165.76 = \$960.27$

b) If you purchased company B's bond and your friend purchased company A's bond and immediately learned that company A would not default, what is the yield you are expecting and the yield your friend is expecting?

- $BV_B = \frac{C}{y+m}\left(1-\frac{1}{(1+y+m)^n}\right) + \frac{F}{(1+y+m)^n} = \frac{1000\cdot 0.1}{0.1105}\left(1-\frac{1}{1.0115^{18}}\right) + \frac{1000}{1.0115^{18}} = 960.27$

$$\text{current yield} = \frac{C}{BV} = \frac{0.1\cdot 1000}{960.27} = 0.104$$ ✗

- $BV_A = \frac{C}{(1+R)^n} + \frac{F}{(1+R)^n} = \frac{1000\cdot 0.1 + 1000}{1.1} = 1000$

$$\text{yield: } \frac{C}{BV} = \frac{0.1\cdot 100}{1000} = 0.10$$ ✗

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c) Can you tell if the extra yield that is demanded by the investors went up or down if the bond is selling for $900 exactly a year later after the third coupon is distributed and the market rate is still at 10%?

$BV_B = 900 = \frac{100}{r}\left(1-\frac{1}{(1+r)^{17}}\right) + \frac{1000}{(1+r)^{17}} \Rightarrow r \approx$ ✗ close to 11.5% > 10.5%

Because we know the price of the bond went down, this suggests that the yield must have increased. Since originally the price was $960, the yield needs to have increased to lower the price of the bond. While there are less periods of collection (17 years, not 18 years), this isn't as significant since this is a long term bond.

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5. *(15 points)* Ozark Inc. has the following cost information on its new project.

Equipment: $700 (good for 5 years) $\Rightarrow n=5$
Annual Fixed cost: $200 per year FC
Per Unit Variable cost: $3 per unit VC
Opportunity Cost(discount rate): 12% $= R$
Quantity that will be produced and sold (per year): 85 $= Q$
Tax rate: 34% $= t$

$$Dep = \frac{700}{5} = 140$$

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a) What is the financial break-even price?

$$PV = \frac{EAC}{R}\left(1-\frac{1}{(1+R)^n}\right) \Rightarrow 700 = \frac{EAC}{0.12}\left(1-\frac{1}{1.12^5}\right) \rightarrow EAC = 194.19$$

$$Q = \frac{EAC + FC(1-t) - t\cdot Dep}{(P-VC)(1-t)} \Rightarrow P = \frac{EAC + FC(1-t) - t\cdot Dep}{(1-t)Q} + VC$$

$$= \frac{194.19 + 200(1-0.34) - 0.34(140)}{(1-0.34)(85)} + 3$$

$$P = \$7.97$$

b) If the Ozark's opportunity cost were to be 1% per month what would be the financial break-even price?

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$$I_a = \left(1 + \frac{i}{p}\right)^p - 1 = \left(1 + \frac{0.01}{12}\right)^{12} - 1 = 0.010046$$

$$700 = \frac{EAC}{0.010046}\left(1 - \frac{1}{(1.010046)^5}\right) \Rightarrow EAC = 144.25$$ ✗

$$P = \frac{EAC + FC(1-t) - t(Dep)}{(1-t)Q} + VC = 3 + \frac{144.25 + 200(0.66) - 0.34 \cdot 140}{0.66 \cdot 85}$$

$P = \$7.08$ $\$7.08$ ✗

6. *(5 points) Is the following statement TRUE or FALSE? Explain with a few sentences:*

"A longer term bond would be more open to inflation risk, reinvestment risk, as well as, liquidity risk."

True ✗

(3)

A longer term bond is more open to the risks mentioned. Under normal economic expectations, we have positive but moderate inflation & growth rates, which means positive increasing market rate in the future. In normal yield curve, we want generally increasing curve so as time to maturity increases, so does the yield, as well as the risk increases, too, so increasing risk means the long term bond is more open to inflation risk, reinvestment risk, & liquidity risk, so the statement is true.

7. *(5 points) Is the following statement TRUE or FALSE? Explain with a few sentences:*

" If the current yield of a bond is lower than its coupon rate, then the market rate should be lower than its coupon rate."

If $y_{cur} < r$ & $r = \frac{C}{F}$ $y_{cur} = \frac{C}{BV}$, then this means

(5)

the Bond value is actually higher than the Face value. In order for $BV > F$, then this means that the coupon rate(r) should be higher than market value (R) so that $R < r$ (this is a premium bond). As a result, this statement is true since $R < r$.