Class 10

$$r_A = \frac{E}{E+D} r_e + \frac{D}{E+D} r_D$$

when $\frac{D}{E}$ = constant. In this case,

$r_{DTS} = r_A$

↳ debt tax shield

$\Rightarrow A^U + DTS \circ D+E$

Question 1.

Suppose a firm uses its company cost of capital to evaluate all of its projects. Will it underestimate or overestimate the NPV of new projects that are riskier than the firm's average projects?

→ Overestimate. We are in a setting where we are considering the "discount rate" problem. We should use a higher r, and therefore obtain a lower NPV.

Question 2.

An oil company is drilling a series of new wells on the perimeter of a producing oil field. About 20 % of the new wells will be dry holes. Even if a new well strikes oil, there is still uncertainty about the amount of oil produced: 40 % of new wells which strike oil produce only 1,000 barrels a day; 60 % produce 5,000 barrels a day.

(a) Forecast the annual cash revenues from a new perimeter well. Use a future oil price of $100 per barrel.

(b) A geologist proposes to discount the cash flows of the new wells at 30 % to offset the risk of dry holes. The oil company's normal cost of capital is 10 %. Does this proposal make sense? Explain briefly why or why not.

a) Annual cash revenue is calculated as expected-sold × price × #days.

$$\mathbb{E}[\text{daily production}] = 0.2 \cdot 0 + 0.8 \cdot [(0.4 \cdot 1000) + (0.6 \cdot 5000)]$$
$$= 2720$$

$$\mathbb{E}[\text{annual revenue}] = 2720 \cdot 365 \cdot 100\$ = 99.28\ M\$$$

b) No. This is diversifiable risk. Should affect annual revenue but not the discount rate.
This is bc there are MANY WELLS.

Question 3.

You are computing the discount rate for a project in the furniture business. Your firm is 100% equity financed and will remain that way. There are three publicly traded firms that are in the furniture business and are not involved in any other lines of business. However, only one of these three firms is 100% equity financed. *You should only use the 100% equity-financed "pure play" for your calculations because the equity betas of the other two pure plays are higher than their respective asset betas due to the presence of*

debt. Is the statement in italics correct?

No, we can find the correct approx. of r_E (or β_E) with the appropriate

$$\beta_A = \frac{E}{E+D}\beta_E + \frac{D}{E+D}\beta_D.$$

And use the average to find our approximation.

Question 4.

XYZ Inc., a diversified conglomerate, is deciding whether to buy a copper mine. XYZ already owns some gold mines and has recently invested in the biotech industry. XYZ's cost of capital is currently 10%. The following is a list of other companies for which market data are available.

Firm	Industry	# shares (in millions)	Price/share	Debt (book value in millions)	Beta equity
A	Gold/Biotech	3	10	15	1
B	Copper	1	5	1	1.02
C	Copper	2	20	0	0.8
D	Copper	1.5	3	3	1.37

As a simplifying assumption you can set all debt betas equal to zero.

What opportunity cost of capital should XYZ use for evaluating whether to buy the copper mine? Use a risk free rate of 7% and a market risk premium (r_m-r_f) of 8%.

① Only use B, C, D; with the formula $\beta_A = \frac{E}{E+D}\beta_E + \frac{D}{E+D}\overbrace{\beta_D}^{=0}$

- (B) $\beta_A = \frac{5}{6} \cdot 1.02 \Rightarrow \beta_A = 0.85$
- (C) $\beta_A = \frac{40}{40} \cdot 0.8 \Rightarrow \beta_A = 0.8$
- (D) $\beta_A = \frac{4.5}{7.5} \cdot 1.37 \Rightarrow \beta_A = 0.822$

$\Rightarrow \bar{\beta}_A = 0.824$

With CAPM we get $r = 7\% + 0.824 \cdot 8\% = 13.592\%$