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Problems (75 points each)

Note: Unless I specifically state "Calculations required", you can just set up all problems. If you are using the result of an unsolved equation in a later step, just make that clear. One way to do this, set up the equation and call your result "A" or "B", etc. If in any step you are solving for something other than the left-hand side of the equation, indicate which variable you are solving for. If you prefer, you can solve everything (but this will take longer).

1. Ajax currently trades for $50 per share and will pay $35 if the market is weak and $60 if the market is strong. The market trades for $55 and will pay $45 if the market is weak and $70 if the market is strong. The risk-free rate equals 5%. Set up a table that shows the set of arbitrage trades today will generate an arbitrage profit, the arbitrage profit today, and that the net cash flows from this arbitrage always equal $0 a year from today. Calculations required.

Equivalent to Ajax: Buy market + short-sell $10 of risk-free

Cost of equivalent $= 55 - \frac{10}{1.05} = 55 - 9.5238 = 45.4762 \Rightarrow$ short Ajax

Transaction	CF_0	CF_1 Weak	CF_1 Strong
+8 Short Ajax	+50 +5	−35 +5	−60 +5
+8 Buy market	−55 +5	+45 +5	+70 +5
+8 Short risk free	+9.5238 +6	−10 +5	−10 +5
Total	+4.5238 +5	0	0

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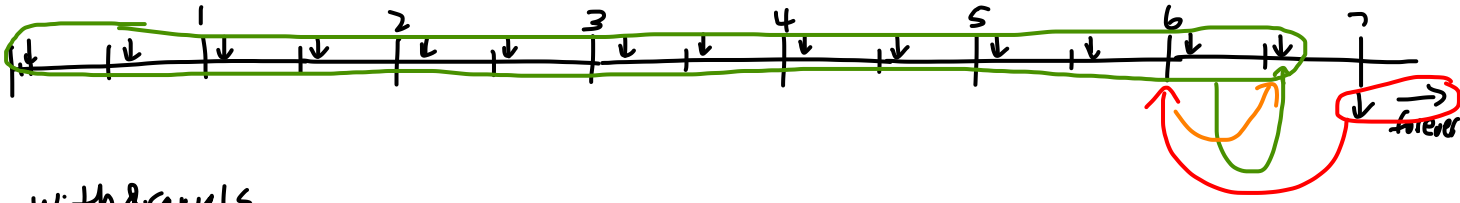
2. Two months from today, you plan to make the first of a series of semiannual deposits into an account earning an APR of 7% per year with quarterly compounding. After your first deposit, you would increase your deposits by 1% each through your final deposit six years and eight months from today. Seven years from today, you will make your first annual withdrawal from this account. You would like for these withdrawals to continue forever and for your withdrawals to grow by 1% each. Set up the calculations needed to solve for your first deposit if your first withdrawal equals $1000.



Withdrawals

$V_{6y} = \frac{1000}{r(1)-.01}$ +15

$r(\frac{1}{4}) = \frac{.07}{4}$ +8

$r(1) = (1+r(\frac{1}{4}))^4 - 1$ +8

$V_{6y8m} = V_{6y}(1+r(1))^{8/12} = A$ +15

Deposits

$V_{6y8m} = \left(\frac{C}{r(\frac{1}{2})-.01}\right)\left((1+r(\frac{1}{2}))^{14} - (1.01)^{14}\right) = B$ +15

$r(\frac{1}{2}) = (1+r(\frac{1}{4}))^2 - 1$ +8

$\Rightarrow$ set A=B and solve for C +6

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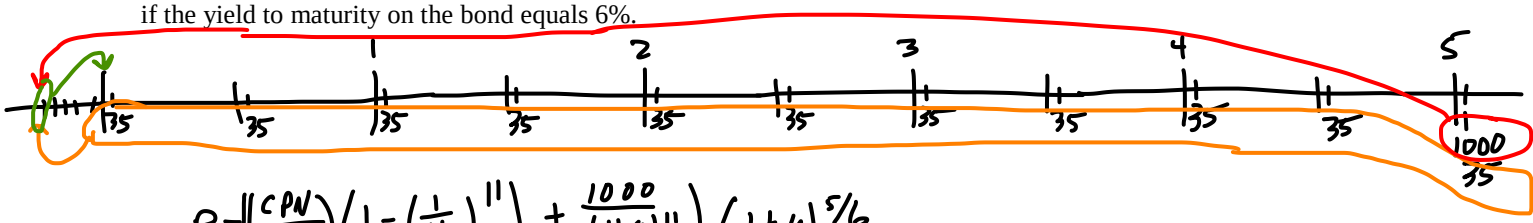
3. Carrot Inc.'s outstanding bonds mature 5 years and 1 month from today for $1000. The annual coupon rate equals 7% and coupons are paid semiannually. Set up the calculations needed to determine the clean price of the bond if the yield to maturity on the bond equals 6%.



$$P=\left(\left(\frac{CPN}{y}\right)\left(1-\left(\frac{1}{1+y}\right)^{11}\right)+\frac{1000}{(1+y)^{11}}\right)(1+y)^{5/6}$$

+15 +15 +15

+8 $CPN=\frac{.07\times 1000}{2}=35$

+7 $y=\frac{.06}{2}$

$CP=P-35\left(\frac{5}{6}\right)$ +15

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4. DontDrive Corp. is considering investing $16 million to expand its fleet of jets. The jets would be depreciated beginning a year from today using the 10-year MACRS class. DontDrive estimates that the new fleet will generate $50 million of additional revenue one year from today. Revenues are then expected to grow at a rate of 3% per year for the foreseeable future. Variable costs equal 64% of sales and fixed costs associated with the new jets will equal $4.8 million per year. DontDrive's tax rate equals 35%. DontDrive will not issue any long-term debt to fund the new jets, but the interest rate on the new short-term debt will equal 6%. With the additional jets, DontDrive will be large enough to demand a discount on the fuel it purchases. DontDrive estimates that it will save $1 million per year in fuel costs on its existing fleet if it proceeds with the expansion. The incremental working capital associated with the new jets for the next five years will equal:

Year	0	1	2	3	4	5
Cash	0	2819	2783	2999	3079	3191
Accts Rec	0	5719	6078	6568	6542	6760
Inventory	0	1094	1166	1210	1283	1278
Accts Payable	0	2365	2475	2441	2457	2467
Short-term Debt	0	41	41	41	44	44

Set up the calculations needed to determine the unlevered net income and free cash flows associated with the jets in year 3.

See Key for 12/11

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5. Extend Corp. expects earnings per share of $5 one year from today. For each of the next four years, Extend plans to pay out 20% of its earnings and reinvest 80% of its earnings in projects earning 25%. Beginning five years from today (and every year thereafter), the return on Extend's projects will fall to 5% and the firm plans to pay out 85% of its earnings. Set up the calculations needed to determine the price per share of Extend's stock if its equity cost of capital equals 10%.

See Key for 12/10

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6. Use the following to set up the calculations needed to determine Falter Inc.'s unlevered cost of capital. Falter's equity has a beta of 1.1 and the yield to maturity on Falter's debt equals 8%. There is a 25% chance that Falter will default on its debt and the expected loss rate on the bonds if Falter defaults equals 40%. The market value of Falter's equity equals $100 million and of its debt equals $60 million. The dividend yield on the market equals 2% and both earnings and dividends for the S&P500 are expected to grow by 5% per year forever. The return on U.S. Treasuries varies by maturity as follows: 1-year = 0.5%; 5-year = 1.3%; 10-year = 2%; 20-year = 3%; 30-year = 3.5%.

$$r_U = \left(\frac{100}{100+60}\right) r_E + \left(\frac{60}{100+60}\right) r_D \quad +2\text{ pts}$$

$$r_E = .02 + 1.1(E(r_{MKT}) - .02) \quad +2\text{ pts}$$

$$E(r_{MKT}) = .02 + .05 \quad +1\text{ pt}$$

$$r_D = .08 - .25(.4) \quad +2\text{ pts}$$

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7. Assume there is a 30% chance that Grab Corp.'s EBIT will equal $100 million, a 45% chance that Grab's EBIT will equal $250 million, and a 25% chance that Grab's EBIT will equal $500 million. Assume also that the corporate tax rate equals 35%, that the personal tax rate on equity income equals 10%, and that the personal tax rate on interest income equals 40%. Determine Grab's tax-optimal capital structure. Calculations required.

EBIT

100-250:

$E(T_c) = .7(.35) = .245$ +15

$T^* = 1 - \frac{(1-.245)(1-.1)}{(1-.4)} = -.1375$ +15

0-100:

$E(T_c) = .35$ +15

$T^* = 1 - \frac{(1-.35)(1-.1)}{(1-.4)} = .025$ +15

$\Rightarrow$ optimal interest = 100 million +15

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8. Assume the corporate tax rate equals 35%, that the personal tax rate on dividends equals 10%, that the tax rate on capital gains equals 40%, and that the tax rate on interest equals 25%.
   a. Do firms has a tax incentive to pay out or to retain and reinvest surplus cash? Calculations required. Assume any surplus cash would be reinvested in risk-free securities.
   b. If firms pay out cash to stockholders, do they have a tax incentive to pay out the cash as a dividend or through a repurchase of shares? Calculations required.

$$\tau^*_{retain} = \left(1 - \frac{(1-.35)(1-.4)}{1-.25}\right) = .48 \Rightarrow \text{tax incentive to pay out}$$ +25 +13

$$\tau^*_d = \left(\frac{\tau_d - \tau_g}{1-\tau_g}\right) = \left(\frac{.1-.4}{1-.4}\right) = -.5 \Rightarrow \text{incentive to pay dividends}$$ +24 +13