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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. Assume perfect capital markets. Assume also that two firms possess identical assets that will pay either $200 or $400 a year from today. Ajax has debt that matures for $150 one year from today. This debt trades for $140 today while Ajax stock trades for $200. Bounce has debt that matures for $300 one year from today. Bounce's debt trades for $230 while Bounce's stock trades for $100. 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.

$V_A = 140 + 200 = 340 \Rightarrow$ short sell

$V_B = 230 + 100 = 330 \Rightarrow$ buy

Transaction	CF_0	CF_1 = 200	400
+6 Shortsell A bonds	+ 140 +4	− 150 +4	− 150 +4
+6 Shortsell A stock	+ 200 +4	−50 +4	− 250 +4
+6 Buy B debt	−230 +4	+200 +4	+300 +4
+6 Buy B stock	−100 +4	∅ +4	+100 +4
Total	+10 +3	∅ +3	∅

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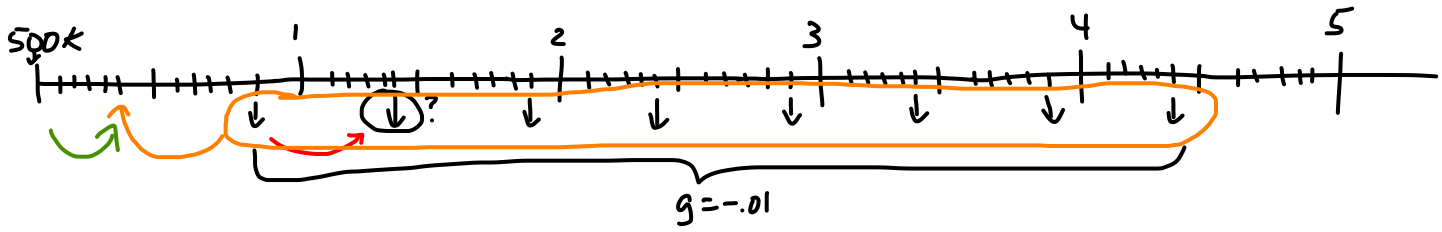
2. You have just deposited $500,000 in an account that pays an APR or 6% per year with quarterly compounding. You plan to make the first semiannual withdrawal from this account 11 months from today and will make your final withdrawal 4 years and 5 months from today. If you plan for your withdrawals to fall by 1% each, set up the calculations that would allow you to determine how large your 2nd withdrawal can be?



$V_{5m} = 500\left(1+r\left(\frac{1}{4}\right)\right)^{5/3} = A$ +16

$r\left(\frac{1}{4}\right) = \frac{.06}{4}$ +9

$V_{5m} = \left(\frac{C_{11m}}{r\left(\frac{1}{2}\right)+.01}\right)\left(1-\left(\frac{.99}{1+r\left(\frac{1}{2}\right)}\right)^{8}\right) = B$ +16 $\Rightarrow$ set $A=B$ + solve for C_{11m} +9

$r\left(\frac{1}{2}\right) = \left(1+r\left(\frac{1}{4}\right)\right)^{2} - 1$ +9

$C_{14\,5m} = C_{11m}(.99)^{1}$ +16

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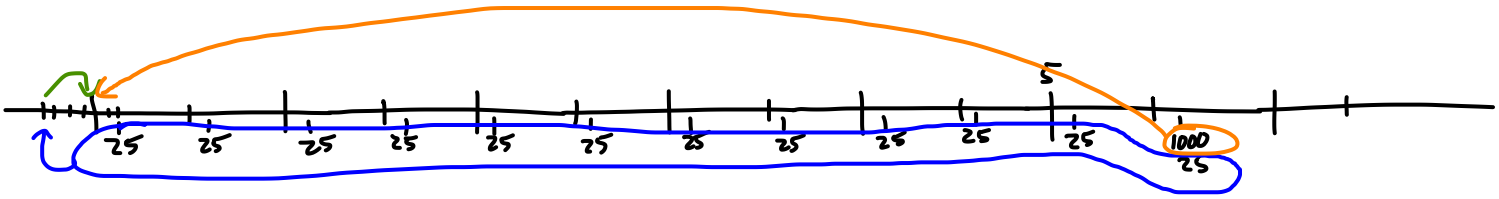
3. Carrot Inc.'s outstanding bonds mature 5 years and 8 months from today for $1000. The annual coupon rate equals 5% and coupons are paid semiannually. Set up the calculations needed to determine the yield to maturity on the bond if the clean price of the bond is $1105.



$\text{coupon} = \frac{.05(1000)}{2} = 25$ +7

$DP = 1105 + 25\left(\frac{4}{6}\right)$ +14

$DP = \underbrace{\frac{25}{y}\left(1-\left(\frac{1}{1+y}\right)^{12}\right)}_{+14}\underbrace{(1+y)^{4/6}}_{+14} + \underbrace{\frac{1000}{(1+y)^{11\,2/6}}}_{+14} \Rightarrow$ solve for y +5

yield to maturity $= y \times 2$ +7

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4. DontDrive Corp. is considering investing $47 million to expand its fleet of jets. The jets would be depreciated beginning a year from today using the 7-year MACRS class. DontDrive estimates that the new fleet will generate $150 million of additional revenue one year from today. Revenues are then expected to grow at a rate of 4% per year for the foreseeable future. Variable costs equal 67% of sales and fixed costs associated with the new jets will equal $14.4 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 need all of the hangers in its maintenance facilities. Carry had been renting surplus space for $1 million per year. 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	8457	8350	8998	9236	9572
Accts Rec	0	17158	18234	19704	19626	20281
Inventory	0	3282	3498	3629	3850	3835
Accts Payable	0	7094	7426	7324	7371	7402
Short-term Debt	0	124	122	124	131	131

Set up the calculations needed to determine the unlevered net income and free cash flows associated with the jets in year 4.

$UNI_4 = (R_4 - E_4 - D_4)(1 - T_c)$ +14

$R_4 = 150(1.04)^3$ +11

$E_4 = R_4(.67) + 14.4 + 1$ +11

$D_4 = 47(.1249)$ +11

$FCF_4 = UNI_4 + D_4 - CE_4 - \Delta NWC_4$ +14

$CE_4 = 0$ +3

$\Delta NWC_4 = NWC_4 - NWC_3$ +11

$NWC_4 = 9236 + 19,626 + 3850 - 7371$

$NWC_3 = 8998 + 19,704 + 3629 - 7324$

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5. Exercise Inc. has 2,000,000 share outstanding. It also has $15,000,000 of outstanding debt and $6,000,000 of excess cash. In each of the next four years (starting a year from today), Exercise expects to generate free cash flows of: $12,000,000; $24,000,000; $30,000,000; and $33,000,000. Thereafter, free cash flows are expected to grow at 1% per year forever. Set up the calculations needed to determine the price per share of Exercise's stock if its weighted average cost of capital equals 11%.

$$V_0 = \overset{+11}{\frac{12}{1.11}} + \overset{+11}{\frac{24}{(1.11)^2}} + \overset{+11}{\frac{30}{(1.11)^3}} + \overset{+11}{\left(\frac{33}{.11-.01}\right)}\overset{+11}{\left(\frac{1}{1.11}\right)^3}$$

$$\text{Price} = \frac{V_0 + 6 - 15}{2} \overset{+11}{+9}$$

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6. Given the following information, set up the calculations needed to determine the average annual return and standard deviation of returns on Fold Inc. from December 31, 2011 through December 31, 2014. Assume all dividends are reinvested.

Date	Div	Price
12/31/2014	0	129.98
8/6/2014	2.92	118.34
12/31/2013	0	136.49
8/7/2013	1.94	106.42
12/31/2012	0	75.36
8/15/2012	1.76	73.07
12/30/2011	0	73.35

$r(8/15) = \frac{1.76}{73.35} + \frac{73.07-73.35}{73.35} = A$ +5

$r(12/31/12) = \frac{75.36-73.07}{73.07} = B$ +5

$r(8/7) = \frac{1.94}{75.36} + \frac{106.42-75.36}{75.36} = C$ +5

$r(12/31/13) = \frac{136.49-106.42}{106.42} = D$ +5

$r(8/6) = \frac{2.92}{136.49} + \frac{118.34-136.49}{136.49} = E$ +5

$r(12/31/14) = \frac{129.98-118.34}{118.34} = F$ +5

$r(2012) = (1+A)(1+B)-1 = G$ +5

$r(2013) = (1+C)(1+D)-1 = H$ +5

$r(2014) = (1+E)(1+F)-1 = I$ +5

$\bar{r} = \frac{G+H+I}{3}$ +15

$SD = \sqrt{\frac{(G-\bar{r})^2+(H-\bar{r})^2+(I-\bar{r})^2}{2}}$ +15

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7. Assume perfect capital markets. Assume also that Grab Corp. has 100,000 shares outstanding and that the firm's stock trades for $50 per share. Grab also has debt outstanding with a market value of $2,000,000. Grab's debt is risk-free and so earns a risk-free rate of 3%. Grab's stock has a beta of 0.8 and the market risk premium equals 5%.
   a. Set up the calculations needed to determine Grab's equity cost of capital.
   b. Set up the calculations needed to determine Grab's equity cost of capital if the firm decides to issue an additional $1,000,000 of debt and used the proceeds to repurchase common stock.

a. $r_E = .03 + .8(.05) = A$ +25

b. $r_U = \left(\frac{D}{D+E}\right).03 + \left(\frac{E}{D+E}\right)A$

$D = 2,000,000$

$E = 100,000 \times 50$ +25

$r_E = r_U + \left(\frac{D2}{E2}\right)(r_U - .03)$

$D2 = 2,000,000 + 1,000,000$

$E2 = 100,000 \times 50 - 1,000,000$ +25

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8. Assume the corporate tax rate equals 15%, that the personal tax rate on dividends equals 25%, that the tax rate on capital gains equals 30%, and that the tax rate on interest equals 40%.
   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.

a. $\tau^*_{retain} = \left(1 - \frac{(1-.15)(1-.3)}{(1-.4)}\right) = .008333$ (+25) $\Rightarrow$ incentive (+13) to pay out

b. $\tau^*_d = \frac{\tau_d - \tau_g}{1-\tau_g} = \frac{.25-.3}{1-.3} = -.0714$ (+24) $\Rightarrow$ incentive to pay (+13) dividends