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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. On a per share basis, an ETF holds a long position in risk-free assets that mature for $100 one year from today. The return on the risk-free bonds equals 4%. And on a per share basis, the ETF holds 5 shares of Ajax and has sold short 2 shares of Bounce. Ajax shares trade for $25 per share today and a year from today will pay either $30 if the economy is strong or $21 if the economy is weak. Bounce shares trade for $30 today and a year from today will pay either $39 if the economy is strong or $20 if the economy is weak. The ETF's shares trade for $150 today. 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.

No arbitrage price of risk-free = $\frac{100}{1.04} = 96.15$

No arbitrage price of ETF = $5(25) - 2(30) + 96.15 = 161.15 \Rightarrow$ buy

Payoff on ETF:

strong = $5(30) - 2(39) + 100 = 172$

weak = $5(21) - 2(20) + 100 = 165$

Transaction	CF_0	CF_1 strong	CF_1 weak
+6 Buy ETF	-150 +4	$+172$ +4	$+165$ +4
+6 Short 5 Ajax	$+5(25) = +125$ +4	$-5(30) = -150$ +4	$-5(21) = -105$ +4
+6 Buy 2 Bounce	$-2(30) = -60$ +4	$+2(39) = +78$ +4	$+2(20) = +40$ +4
+6 Short risk-free	$+96.15$ +4	-100 +4	-100 +4
Total	$+11.15$ +3	0	0

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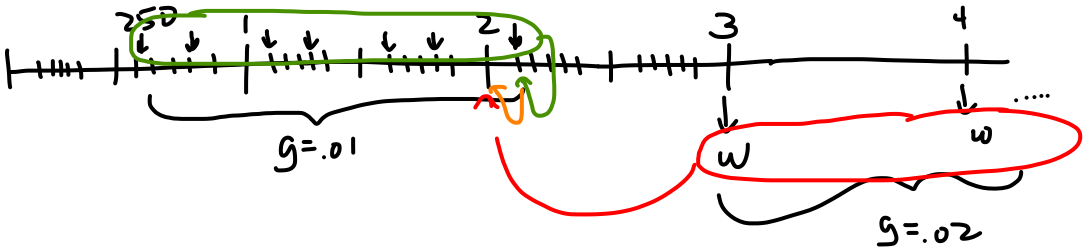
2. Seven months from today, you plan to make the first of a series of quarterly deposits into an account earning an APR of 3% per year with monthly compounding. Two years and one month from today you will make your final deposit. Three years from today, you will make your first annual withdrawal from this account. You would like for these withdrawals to continue forever and for your withdrawals to grow by 2% each. Set up the calculations needed to solve for your first withdrawal if your first deposit equals $250 and subsequent deposits grow by 1% each.



Deposits

$V_{2y\,1m} = \left(\frac{250}{r(\frac{1}{4})-.01}\right)\left((1+r(\frac{1}{12}))^7-(1.01)^7\right)$ +15

$r(\frac{1}{12}) = \frac{.03}{12}$ +8

$r(\frac{1}{4}) = (1+r(\frac{1}{12}))^3 - 1$ +8

$V_{2y} = \frac{V_{2y\,1m}}{(1+r(\frac{1}{12}))^1} = A$ +15

Withdrawals

$V_{2y} = \frac{w}{r(1)-.02} = B$ +15

$r(1) = (1+r(\frac{1}{12}))^{12} - 1$ +8

$\Rightarrow$ set $A=B$ + solve for w +6

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3. Assume a U.S. Treasury bond pays an annual coupon of $50 and matures five years from today for $1000. Set up the calculations needed to determine the price and yield to maturity on the bond if the yields on zero-coupon Treasuries vary by maturity as follows: 1-year = 7%; 2-year = 5%; 3-year = 4%; 4-year = 3.5%; 5-year = 3%.

$$\text{Price} = \overset{+7}{\frac{50}{1.07}} + \overset{+7}{\frac{50}{(1.05)^2}} + \overset{+7}{\frac{50}{(1.04)^3}} + \overset{+7}{\frac{50}{(1.035)^4}} + \overset{+7}{\frac{1050}{(1.03)^5}} = A$$

$$A = \overset{+18}{\frac{50}{y}\left(1-\left(\frac{1}{1+y}\right)^5\right)} + \overset{+18}{\frac{1000}{(1+y)^5}} \Rightarrow \text{solve for } \overset{+4}{y} \text{ to get YTM}$$

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4. Carry Corp. is considering investing $71 million to expand its fleet of trucks. The trucks would be depreciated beginning a year from today using the 7-year MACRS class. Carry estimates that the new fleet will generate $30 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 41% of sales and fixed costs associated with the new trucks will equal $7.5 million per year. Carry's tax rate equals 35%. Carry will not issue any long-term debt to fund the new trucks, but the interest rate on the new short-term debt will equal 6%. With the additional trucks, Carry will need all of the bays in its maintenance facilities. Carry had been renting surplus space for $2 million per year. The incremental working capital associated with the new trucks will equal:

Year	0	1	2	3	4	5
Cash	0	2511	2696	2701	2873	2852
Acct. Receive	0	2723	2810	2930	3145	3122
Inventory	0	609	620	653	649	644
Acct. Payable	0	3182	3194	3216	3290	3412
STDebt	0	258	280	296	320	323

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

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

$R_4 = 30(1.04)^3$ +11

$E_4 = .41 R_4 + 7.5 + 2$ +11

$D_4 = 71(.1249)$ +11

$T_C = .35$

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

$CE_4 = 0$ +3

+11

$\Delta NWC_4 = NWC_4 - NWC_3$

$NWC_4 = 2873 + 3145 + 649 - 3290$

$NWC_3 = 2701 + 2930 + 653 - 3216$

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5. Delay Corp. expects earnings per share of $15 one year from today. For each of the next three years, Delay plans to pay out 25% of its earnings and reinvest 75% of its earnings in projects earning 20%. Beginning four years from today (and every year thereafter), the return on Delay's projects will fall to 3% and the firm plans to pay out 90% of its earnings. Set up the calculations needed to determine the price per share of Delay's stock if its equity cost of capital equals 8%.

$g_{2-4} = .75(.2) = .15$ +6

$D_1 = .25(15) = 3.75$ +6

$E_4 = 15(1.15)^3$ +6

$g_{5+} = .1(.03) = .003$ +6

$D_4 = E_4(.9)$ +6

$$P_0 = \left(\frac{D_1}{.08-.15}\right)\left(1-\left(\frac{1.15}{1.08}\right)^3\right) + \left(\frac{D_4}{.08-.003}\right)\left(\frac{1}{1.08}\right)^3$$

+15 +15 +15

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6. Set up the calculations needed to determine Exhale Inc.'s unlevered cost of capital. Exhale's equity has a beta of 0.8 and the yield to maturity on Exhale's debt equals 12%. There is a 15% chance that Exhale will default on its debt and the expected loss rate on the bonds if Exhale defaults equals 55%. The market value of Exhale's equity equals $300 million and of its debt equals $100 million. The market risk premium equals 4% and the return on U.S. Treasuries varies by maturity as follows: 1-year = 0.75%; 5-year = 1.8%; 10-year = 2.5%; 20-year = 3.5%; 30-year = 4%.

$r_U = \left(\frac{300}{300+100}\right) r_E + \left(\frac{100}{300+100}\right) r_D$ +25

$r_E = .025 + .8(.04)$ +25

$r_D = .12 - .15(.55)$ +25

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7. Flip Corp. is currently funded with 100% equity. There is a 20% chance that Flip's assets will pay off $100 million a year from today, a 50% chance that Flip's assets will pay off $200 million a year from today, and a 30% chance that Flip's assets will pay off $400 million a year from today. All the risk is fully diversifiable and the risk-free interest rate equals 6%. Flip is considering issuing debt that matures for $150 million one year from today and using the proceeds to repurchase common stock. In the event of default, 40% of the value of Flip's assets will be lost due to bankruptcy costs.
   a. Set up the calculations needed to determine the value of Flip's equity before the debt issue/stock repurchase.
   b. Set up the calculations needed to determine the gain or loss by Flip's equity holders if Flip issues the debt.

a. $E(C) = .2(100) + .5(200) + .3(400)$ +11

$V_0 = \frac{E(C)}{1.06}$ +11

b. $E(C_B) = .2(100)(.6) + .5(150) + .3(150)$ +11

$V_B = \frac{E(C_B)}{1.06}$ +11

$E(C_S) = .2(0) + .5(50) + .3(250)$ +11

$V_S = \frac{E(C_S)}{1.06}$ +11

$Gain = (V_S + V_B) - V_0$ +9

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8. Assume markets are perfect. Assume also that Gallop Inc. has assets (including cash) with a market value of $250 million. Gallop has a total of 20 million shares outstanding. Today, Gallop plans to pay out $10 million in dividends and plans to use an additional $20 million to repurchase shares. A year from today, the market value of Gallop's assets (including cash) is expected to be $260 million. Set up the calculations needed to determine the price per share of Gallop's stock a year from today.

$P_0 = \frac{250}{20}$ +18

# of shares repurchased $= \frac{20}{P_0} = A$ +19

# of shares left $= 20 - A = N$ +19

$Price_1 = \frac{260}{N}$ +19