Fall 2015: Midterm A for 4:00 Class Name Key

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. Sinking Fortress ETF trades for $500 and has the following positions (on a per-share basis) in the following securities: it has short-sold two shares of Chasing Dollars Bank, it has purchased three shares of AB AllBev, and it has purchased risk-free bonds that mature for $100 one year from today. The price of these risk-free bonds today is $95. Each share of Chasing Dollars Bank trades for $100 and will pay either $90 or $120 a year from today depending on whether the economy is weak or strong. Each share of AB AllBev trades for $200 and will pay either $190 or $260 a year from today depending on whether the economy is weak or strong. Set up a table that shows net cash flows will always equal $0 next year and which answers the following questions. Note: Use "+" for inflows and "–" for outflows. Calculations required.
   a. What set of transaction today generates an arbitrage profit?
   b. What arbitrage profit do these transactions create?
   ~~c. Assume the economy is strong a year from today. What transactions are required to unwind your arbitrage trades?~~

Payoff on ETF:

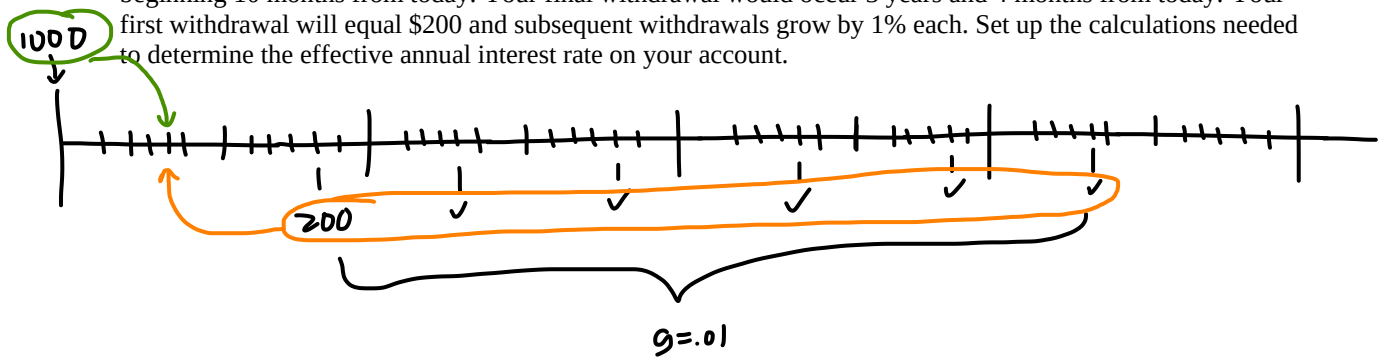
$W = 2(-90) + 3(190) + 100 = 490$

$S = 2(-120) + 3(260) + 100 = 640$

cost of equivalent portfolio $= -2(100) + 3(200) + 95 = 495$

Transact (t=0)	CF_0	CF_1: W	CF_1: S
+6 Short ETF	+4: +500	+4: −490	+4: −640
+6 Short 2 Chasing	+4: +200 = 2(100)	+4: −180 = −2(90)	+4: −240 = −2(120)
+6 Buy 3 AllBev	+4: −600 = −3(200)	+4: +570 = 3(190)	+4: +780 = 3(260)
+6 Buy Treasury	+4: −95	+4: +100	+4: +100
Total	+3+5	0	0

2. You have just deposited $1000 into an account. You plan to begin semiannual withdrawals from this account beginning 10 months from today. Your final withdrawal would occur 3 years and 4 months from today. Your first withdrawal will equal $200 and subsequent withdrawals grow by 1% each. Set up the calculations needed to determine the effective annual interest rate on your account.

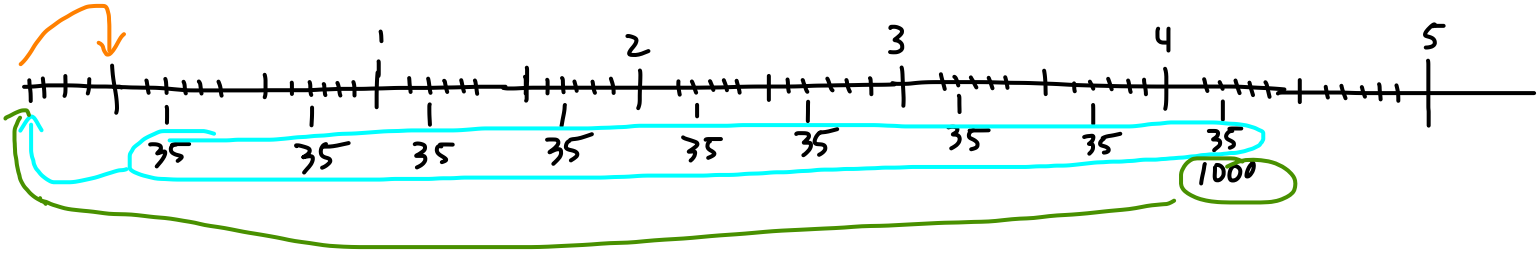


$1000\left(1+r\left(\frac{1}{2}\right)\right)^{4/6} = \left(\frac{200}{r\left(\frac{1}{2}\right)-.01}\right)\left(1-\left(\frac{1.01}{1+r\left(\frac{1}{2}\right)}\right)^{6}\right)$ ⇒ set equal & solve for $r\left(\frac{1}{2}\right)$ +12

+25 +25

$r(1) = \left(1+r\left(\frac{1}{2}\right)\right)^{2} - 1$ +13

3. A bond that matures four years and two months from today for $1000 has a coupon rate of 7%. Coupons are paid semiannually. Set up the calculations needed to determine the clean price of the bond if its yield to maturity equals 9%.



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

$V_0 = \left(\frac{35}{r(\frac{1}{2})}\left(1 - \left(\frac{1}{1+r(\frac{1}{2})}\right)^9\right) + 1000\left(\frac{1}{1+r(\frac{1}{2})}\right)^9\right)\left(1+r(\frac{1}{2})\right)^{4/6}$

+16 +16 +16

$r(\frac{1}{2}) = \frac{.09}{2}$ +8

$clean = V_0 - 35\left(\frac{4}{6}\right)$ +11

4. Slamburger is considering investing $12.5 million today in a new retail store. The new store will fall into the 15-year MACRS class and will be built on land Slamburger acquired a year ago for $1 million. This land could be sold today for an after-tax cash flow of $1.2 million. Slamburger expects revenues a year from today to equal $200 million. In the following years, sales are expected to grow by 3% per year. Slamburger estimates that variable costs be the same as at existing stores and thus will equal 77.5% of revenues that and fixed costs associated with the store will equal $35 million per year. The $50 million per year spend operating Slamburger's corporate headquarters will not change as a result of the new store, but 5% of this cost will be allocated to the new store. Net working capital (in millions) associated with the store will be as follows:

	Year	0	1	2	3	4	5
	Cash	0.00	12.00	12.91	13.94	14.62	14.51
+	AR	0.00	6.50	6.88	7.04	7.48	7.95
+	Inv	0.00	25.50	27.55	29.57	31.33	31.22
−	AP	0.00	25.00	26.59	27.19	28.58	28.32
					23.36	24.85	

Set up the calculations needed to determine the new store's unlevered net income and free cash flow today and four years from today if Slamburger's marginal tax rate equals 35%.

$UNI_4 = (R_4 - E_4 - D_4)(1 - .35)$ +14

$R_4 = 200(1.03)^3$ +11

$E_4 = .775R_4 + 35$ +11

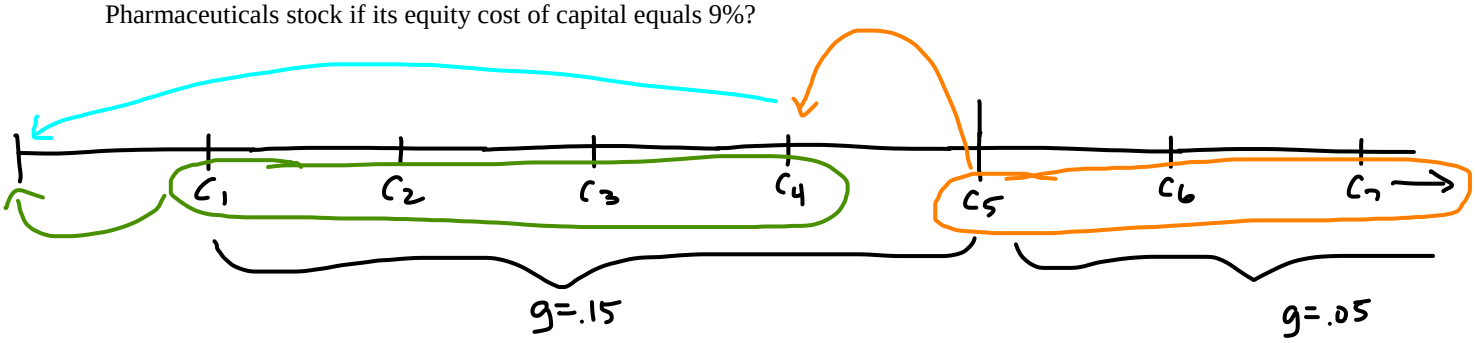
$D_4 = 12.5(.0770)$ +11

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

$CE_4 = D$ +3

$NWC_4 = 24.85 - 23.36$ +11

5. Orchid Pharmaceuticals expects earnings of $200 million a year from today. It expects to pay out 25% of its earnings as dividends and expects to pay out 10% of its earnings through repurchases of common stock. Orchid Pharmaceuticals expects earnings to grow by 15% per year through five years from today and by 5% per year thereafter. Orchid Pharmaceuticals currently has 100 million outstanding shares. What is the value of Orchid Pharmaceuticals stock if its equity cost of capital equals 9%?



+17 +17 +17

$$PV(Payouts) = \left(\frac{C_1}{.09-.15}\right)\left(1-\left(\frac{1.15}{1.09}\right)^4\right) + \left(\frac{C_5}{.09-.05}\right)\left(\frac{1}{1.09}\right)^4 = A$$

$$C_5 = C_1(1.15)^4 \quad +8$$

$$P_0 = \frac{A}{100} \quad +8$$

$$C_1 = (.25+.1)(200) \quad +8$$