Corporate Finance
February 5, 2008
Problem Set #1 -- ANSWERS
Klick

1. You win a judgment against a defendant worth $20,000,000. Under state law, the defendant has the right to pay such a judgment out over a 20 year period, using a statutory annual discount rate of 5 percent. Your client informs you that she makes 10% in her investment portfolio. You know that the defendant is an insurance company that is regulated in such a way that its portfolio only makes a rate of return of 7%.
    a. Will the insurer choose to pay the judgment in a lump sum or will it elect the 20 year payment schedule? Why (i.e., show your work)?

First determine the payments under the payment system

PV=20,000,000
FV=0
N=20
I/Y=5

➔ PMT= $1,604,852/year

Now examine the insurer's choice. Either it can pay out $20M now or it can pay the payment laid out above. There are a couple of ways to compare here. First, you could evaluate what the insurer values the loss of 1,604,852/year for 20 years and compare that to 20M.

FV=0
PMT=1,604,852
N=20
I/Y=7

➔ PV= $17,001,825

That is, the insurer would be willing to pay 17,001,825 to avoid these yearly payments but it wouldn't pay 20,000,000 to avoid them, so it will elect to use the payment schedule.

Another way to think of this is to determine what kind of yearly payments could the insurer generate from 20,000,000 over the next 20 years given its investment opportunities. Compare that amount to the PMT required under the state's schedule.

PV=20,000,000
N=20

I/Y=7
FV=0

➔ PMT=1,887,859

That is, the insurer can make more from keeping the money and investing it and satisfying its judgment year to year, so it will necessarily choose to pay in installments.

      b. Imagine that the post-judgment bargaining rules in this state allow a victorious plaintiff to make a single counter offer, in the situation where the defendant chooses the yearly payment option, which the defendant either accepts or declines (i.e., the defendant either agrees to pay the counter offer in a lump sum or it chooses the payment option but it cannot make a subsequent counter offer). What lump sum do you offer to the defendant to satisfy the judgment? Why?

Given that you know from part 1a that the insurer is indifferent between paying on the installment plan and giving up $17,001, 825, you cannot offer more than that (and expect the offer to be accepted). So you compare this number to your client's valuation of the schedule payments

FV=0
N=20
I/Y=10
PMT=1,604,852

➔ PV=13,663,010

Therefore, your client values this income stream at $13,663,010 and is better off with any lump sum payment above this. Since the insurer will accept anything below $17,001,825, so it makes sense to offer $17,001,825 (perhaps minus a penny to make sure the insurer is strictly better off under the lump sum payment).

Corporate Finance
February 5, 2008
Problem Set #2
Klick

1. In the process of valuing the assets of a firm your employer is targeting for takeover, you find that the target has large real estate holdings in Tallahassee, FL. You determine that, in the aggregate, these holdings will generate before-tax rental incomes of $5,000,000 this year and that amount is projected to grow by 3% per year. Based on the risk of the market, you determine that the appropriate discount rate is 8%. Currently, on these properties, property taxes amount to $500,000/year.

   1.a What value do you place on these real estate holdings?

   Note that while the rental income is projected to grow, the tax rate is not, so we need to do 2 valuations. The present discounted value of the in-flows and the present discounted value of the outflows:

   $$PV = \frac{5,000,000}{.08 - .03} = 100,000,000$$

   $$PV = \frac{-500,000}{.08} = -6,250,000$$

   So the net present value of the holdings is

   100,000,000-6,250,000= $93,750,000

   1.b You learn that all rental property taxes are scheduled to go up by 10% (i.e., if taxes now are x, the new tax payment will be 1.1x) after 3 year's time. Does this change your valuation of the properties?

   First, determine what the property will be worth under the new tax treatment, noting that the rent starting in period 4 will be higher than the present rent due to the assumed growth.

   $$PV = \frac{5,463,635}{.08 - .03} = 109,272,700$$

   $$PV = \frac{-550,000}{.08} = -6,875,000$$

   So the holdings, in three years, will be worth

   109,272,700-6,875,000= $102,397,700

   Now discount that back to the present
   FV=102,397,700

PMT=0
N=3
I/Y=8

➜ 81,286,596

Now you need to determine what the property is worth for the three years before the tax change takes place

PMT1=5,000,000-500,000
PMT2=5,150,000-500,000
PMT3=5,304,500-500,000

Discount each of these accordingly

PV1=4,166,667
PV2=3,986,626
PV3=3,813,967

So, the total value of these land holdings now is

81,286,596 + 4,166,667 + 3,986,626 + 3,813,967 = $93,253,856

1.c You further learn that you can place the property holdings in a trust. While trusts currently pay the same property tax as everyone else, when the new taxes go into effect, property held in trusts becomes "tax-free" as part of a legislative deal. How much is the property worth now if it were placed in a trust vehicle?

The valuation of the first three years before the new tax goes into effect is the same as above

4,166,667+3,986,626+3,813,967 = 11,967,260

Now we just need to value the property after the new tax rules apply

$$PV = \frac{5,463,635}{.08-.03} = 109,272,700$$

And we need to discount this back to the present

FV=109,272,700
PMT=0
I/Y=8
N=3

➔ 86,744,192

Add this to the value of the first three years

86,744,192 + 11,967,260 = 98,711,452

Note something shown by this problem:

The effect of a tax change (even a future one, as long as it is known) is immediately capitalized into the present value of the property. Thus, it is the current owner who "pays" or "benefits" from a tax increase or decrease even if it is the future owner who nominally pays the tax bill each year.

Corporate Finance
March 3, 2008
Problem Set #3
Klick

1. You are tasked with valuing a bond with the following properties and expectations. Since the debt does not trade in a liquid market, there is no market price against which you can judge your valuation.

The bond has a face value of $1,000,000. It pays an annual interest payment of $75,000 and matures in 5 years. Assume that the underlying default risk is constant through the life of the bond and is captured by a 3%/year risk premium (note that this risk is essentially the same as the risk for the bond fund referenced below). Due to regulatory restrictions on its investments, the bondholder's current opportunity cost of its funds is equivalent to the return on an inflation indexed bond fund equal to 3%/year (these restrictions were put in place after the entity came into possession of the bond you are valuing). Your best estimate of inflation is a constant annualized rate of 4%/year.

1.a) What is the bond currently worth?

PMT=75,000
FV=1,000,000
I/y= 3+3+4=10%
N=5
PV=$905,230

1.b) If market interest rates increase such that the bond fund indexed above moves to 4%/year as of the beginning of year 2 (but the underlying risk does not change; all that changes is general productivity levels), what is the bond worth at that time?

PMT=75,000
FV=1,000,000
I/y=3+4+4=11
N=4
PV=$891,414

1.c) Revert to the original assumptions, but now assume the owner of the bond pays a 25% tax on all of its investment earnings.

PMT=(1-.25)*75,000=56,250
FV=1,000,000
I/y=3+(1-.25)*3+4=3+2.25+4=9.25
N=5
PV=$859,910

1.d) Assume now that the entity no longer faces the regulatory investment restriction and could invest in higher risk portfolios. In principle, how does that affect your calculations in terms of valuing the bond (i.e., don't solve for anything; describe how this does or does not change the inputs in your calculations)?

Basically, for opportunity cost terms, you want to compare like risks with like risks. So, if the comparable risk is still the bond fund, then you will use that as your opportunity cost. On the other hand, if, for some reason, the regulatory restriction had previously ruled out another investment option/portfolio with equivalent risk but a higher rate of return (e.g., some kind of mix of bonds funds and a diversified equity fund), the higher rate of return is the relevant opportunity cost.

Corporate Finance
March 3, 2008
Problem Set #4
Klick

1. You are asked to review the price estimates involved in an initial public offering. The investment bank provides you with all of the data on the firm that it used in its own estimation. Examining the data, you find that over the 5 years the firm has been in existence, it generated earnings (i.e., revenues over costs) of $20,000,000 in year 1, $22,000,000 in year 2, $24,200,000 in year 3, $26,620,000 in year 4, and $29,282,000 last year. You have every reason to believe that it will follow the same growth pattern for the foreseeable future. Based on your estimates of the underlying risk of the firm and the industry in which it operates, you determine that an appropriate discount rate is 15%/year. The investment bank has determined it will float 100,000,000 shares in the offering.

1.a What is your estimate for the initial share price based on this information?

The growth indicated above is 10%/year. This implies the following valuation:

$$P = \frac{\left(\dfrac{29,282,000*(1.1)}{100,000,000}\right)}{.15-.10} = \frac{\left(\dfrac{32,210,200}{100,000,000}\right)}{.05} = \frac{.3221}{.05} = \$6.44/share$$

1.b Now assume that the earnings numbers presented above are nominal numbers (i.e., have not been adjusted to account for inflation and thus do not entirely represent real buying power growth). Namely, general price levels have increased at a constant rate of 3%/year and this inflation is likely to continue into the future. Further, the discount rate indicated above does not include price level considerations. What is your new valuation of the initial share price?

You are evaluating the price to be paid now (not 5 years ago) so the relevant earnings number is still .3221 per share. What changes is the amount of the growth that is real as opposed to merely inflationary. This implies:

$$P = \frac{.3221}{.15-(.1-.03)} = \frac{.3221}{.08} = \$4.03/share$$

1.c Revert to the original assumptions laid out in the original question. Assume that after the IPO is launched, the shares actually appreciate to $10/share quite quickly in the market and this is not merely a temporary price surge (i.e., the price stays at this level well beyond the time period in which many IPOs surge and then subsequently level out at a lower price). What does this imply about the difference between your valuation and the market's?

Note that the "market" is doing the same calculation you are so it must suggest a difference of opinion regarding one of the elements of your calculation. Since the earnings data are what they are, there will be no difference there. The difference must arise from a) the relevant discount rate, b) the relevant growth rate, c) the relevant inflation expectation, or d) some combination of a-c. Based on the information provided in the question there is no way to determine where exactly the difference lies.

Corporate Finance
March 13, 2008
Problem Set 5
Klick

NOTE: See excel worksheet for numerical calculations

1. The table below shows the returns for 5 periods for 4 assets

Period	FSU	USC	COL	PENN
1	-.0758983	1.026655	.8113388	.1933351
2	.2734837	.5731258	-.2240789	.9680307
3	.4696062	-.1592076	.3424175	-.0828287
4	.5494415	.1549023	1.094444	1.070175
5	1.283367	.9045238	.4758786	.3512881

1.a Calculate the mean and variance for each asset's returns

$$\text{mean}(x) = \bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

$$\text{var(x)} = \frac{1}{n}\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2$$

Mean(FSU) = 0.5; Var(FSU) = 0.20
Mean(USC) = 0.5; Var(USC) = 0.20
Mean(COL) = 0.5); Var(COL) = 0.20
Mean(PENN) = 0.5; Var(Penn) = 0.20

1.b Calculate the covariance between each pair of assets

$$\text{Cov}(x,y) = \frac{1}{n}\sum_{i=1}^{n}\left(x_i - \bar{x}\right)\left(y_i - \bar{y}\right)$$

All covariances are 0 (to 6 decimal places)

1.c Calculate the mean return and the variance for a portfolio that has half of its value (at the beginning) in FSU and the other half in USC.

Mean = 0.5
Var = 0.1

1.d Calculate the mean return and the variance for a portfolio that has 1/3 of its value (at the beginning) in FSU, 1/3 in USC, and 1/3 in COL.

Mean = 0.5
Var = 0.07

1.e. Calculate the mean return and the variance for a portfolio that has 1/4 of its value (at the beginning) in FSU, 1/4 in USC, 1/4 in COL, and 1/4 in PENN.

Mean = 0.5
Var = 0.05

1.f Discuss how you could have arrived at your answers for 1.c-1.e just on the basis of your answers for 1.a and 1.b.

The variance of a constant (b) times a variable with variance v is b^2*v.
If two variables are independent (i.e., covariance = 0) the variance of the sum is the sum of the variances.

Putting those two things together and noting that you already know FSU, USC, COL, and PENN are all independent, the variances of the portfolios are easy to figure out, namely

Var(c) = (.5 * .5 * .2) + (.5 * .5 *.2)
Var(d) = (1/3*1/3*.2) + (1/3*1/3*.2) + (1/3*1/3*.2)
Var(e) = (.25*.25*.2) + (.25*.25*.2) + (.25*.25*.2) + (.25*.25*.2)

Corporate Finance
March 13, 2008
Problem Set 6
Klick

Note: see excel sheet for supporting calculations

1. The following table provides the market return and the return on stock FSU for the past 20 periods:

Period	Market	FSU
1	-0.022	-0.112
2	-0.066	-0.036
3	-0.008	-0.015
4	0.057	0.021
5	0.06	0.027
6	0.039	0.092
7	0.095	0.06
8	-0.012	-0.064
9	0.007	0.032
10	0.09	0.147
11	0.081	0.135
12	0.017	0.006
13	0.094	0.068
14	0.021	-0.064
15	0.015	0.047
16	0.095	0.127
17	0.068	0.076
18	0.067	0.05
19	0.035	0.076
20	0.087	0.018

1.a Assume the risk free rate of return per period is 0.03 throughout the sample. If the market return on the 21st period is 0.035, what does the CAPM predict regarding FSU's return in the 21st period?

For CAPM, we need to know Beta for FSU. Remember:

$$\beta_i = \frac{\text{Covariance}(r_i, r_m)}{\text{Variance}(r_m)}$$

$$\text{Covariance}(r_i, r_m) = \frac{1}{n}\sum_{t=1}^{n}\left(r_{i_t} - \overline{r_i}\right)\left(r_{m_t} - \overline{r_m}\right) = 0.002228$$

$$\text{Variance}(r_m) = \frac{1}{n}\sum_{t=1}^{n}\left(r_{m_t} - \overline{r_m}\right)^2 = 0.002013$$

$$\therefore \beta_{FSU} = \frac{0.002228}{0.002013} = 1.107$$

According to the CAPM

$$\hat{r}_i = r_f + \beta_i \left(r_m - r_f \right)$$

So

$$r_{FSU_{21}} = 0.03 + 1.107 * \left(0.035 - 0.03 \right) = 0.03 + 1.107 * \left(0.005 \right) = 0.036$$