Midterm Exam #2 - Solutions
Finance 325
October 28, 2010

Name: _____

Exam Instructions:

- This exam should have 7 pages (including this one) and 6 questions. The point value is given for each problem. The entire exam is worth 100 points.
- You may use a calculator and the provided formula sheet on this exam.
- You must show your work in order to receive credit for your answers. Partial credit will be given for partially correct answers.
- If a question asks "Why/Explain", you should give an explanation that would convince a skeptic.
- You may use the back of a page if you need additional space to write an answer.

Suggestions:

- Use your time wisely. Move on to another problem if you feel like you're stuck.
- You may ask me questions if you are unclear about a problem. I may be able to clarify the problem for you.

GOOD LUCK!!

1. You are trying to determine the share price of AWW, which is in the pet grooming business. It is not publicly traded, but you know that it has 200,000 shares outstanding, and has expected earnings this year of $255,000 and expected cash flows of $400,000. You find that publicly-traded pet grooming companies have an average P/E ratio of 34 and an average P/CF ratio of 29. What would be a good range of price estimates for the share price of AWW? (14 pts)

We can use price multiples of similar companies (in the same industry) to get a sense of what the value of the firm is, and then divide by the number of shares outstanding to get an approximate share price:

Using P/E ratio:

$$\frac{P}{E} = 34 = \frac{P}{255{,}000}$$

$$P = 8.67M$$

$$\frac{P}{share} = \frac{\$8.67M}{0.2M} = \$43.35/share$$

Using P/CF ratio

$$\frac{P}{CF} = 29 = \frac{P}{400{,}000}$$

$$P = \$11.6M$$

$$\frac{P}{share} = \frac{\$11.6M}{0.2M} = \$58.00/share$$

So a good range of estimates would be between $43.35 and $58 per share

2. AWW (the same company from above) needs to purchase a new pet-drying machine. They can buy either the Dry-O-Matic or the No-Mor-Wet machine. The Dry-O-Matic costs $18,000, will last 7 years, and requires maintenance expenditures of $2,000 per year for the life of the machine. The No-Mor-Wet costs $24,000, will last 9 years, and will require $1,750 per year in maintenance during its life. Whichever machine AWW buys, they plan to continue buying the same machine indefinitely. Which machine should they choose if their cost of capital is 19%? (16 pts)

Since AWW will be repeating this investment indefinitely, and the lives of the projects are not the same, we cannot use the NPV of each investment… we can solve using same end-year or EAA.

Solving for the EAA of both:

$$NPV_{D-O-M} = -18 - 2\left(\frac{1}{0.19} - \frac{1}{0.19(1.19)^7}\right) = -25.41$$

EAA_{D-O-M} :

$$-25.41 = EAA_{D-O-M}\left(\frac{1}{0.19} - \frac{1}{0.19(1.19)^7}\right)$$

$$EAA_{D-O-M} = -6.857$$

$$NPV_{N-M-W} = -24 - 1.75\left(\frac{1}{0.19} - \frac{1}{0.19(1.19)^9}\right) = -31.29$$

EAA_{N-M-W} :

$$-31.29 = EAA_{N-M-W}\left(\frac{1}{0.19} - \frac{1}{0.19(1.19)^9}\right)$$

$$EAA_{N-M-W} = -7.515$$

The EAA of the Dry-O-Matic is greater than the EAA of the No-Mor-Wet, so we choose the Dry-O-Matic.

3. Ice cream is your favorite food, so you are looking to get into the ice cream business for yourself. You have found a Baskin-Robbins franchise for sale, and are considering whether this would be a good investment. The owners are asking for $1,000,000 for their store. For an additional $500,000 (so the final purchase price would be $1.5 million), the owners would be willing to buy the store back from you for $650,000 in one year if you want to leave the business.

   You think there is a 60% chance that the business will do great, and that the store will generate annual cash flows of $240,000 into perpetuity (starting next year). You are aware, however, that this business is risky, and there remains a 40% chance that the store will do poorly and annual CFs will only be $110,000 per year into perpetuity.

   What should you do regarding this opportunity? Your discount rate is 18.9%. (18 pts)

If you decide to forgo the option (and just pay $1 million):

Today **Year 1**

-1 → **0.240/year into perpetuity (prob. = 0.60)…** $PV = \frac{0.240}{0.189} = 1.270$

-1 → **0.110/year into perpetuity (prob. = 0.40)…** $PV = \frac{0.110}{0.189} = 0.582$

The expected CFs (PV is as of year 0):

$$E[CF] = (0.60)(1.270) + (0.40)(0.582) = 0.995$$

And the NPV is: -1 + 0.995 = -0.005, or -$5,000. So this is not a good option.

If we decide to pay for the option to sell after one year:

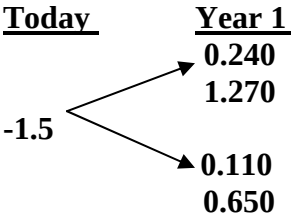
Today	**Year 1**	**Year 2**
-1.5	**0.240**	**0.240/year into perpetuity (prob. = 0.60)**
	0.110	**0.110/year into perpetuity (prob. = 0.40)**

We need to check to see if we would sell back to the original owners after 1 year:

$$good: PV_1 = \frac{0.240}{0.189} = 1.270 > 0.650$$

$$bad: PV_1 = \frac{0.110}{0.189} = 0.582 < 0.650$$

Thus, if the store does well, we keep it, while if the store does poorly, we sell after 1 year:



Expected CFs in year 1 are:

$$E[CF] = (0.60)(1.270 + 0.240) + (0.40)(0.110 + 0.650) = 1.210$$

$$NPV = -1.5 + \frac{1.21}{1.189} = -0.482 = -\$482{,}000$$

So this option is even worse. Unfortunately, this store is not a good investment, and you should not buy the store with or without the option.

4. Your company, PBR Inc. is considering the launch of a new product. It estimates that it will sell 800,000 units in year 1, in the second year: 1 million units, and in the third year: 500,000 units. PBR will sell the product for $3 per unit and variable non-labor costs will be $1 per unit. PBR will close down production after year 3. New equipment costing $1 million will be required. The equipment will be depreciated to zero on a straight-line basis over 10 years. PBR thinks it can sell the equipment in year 3 for $400,000. Production will take place in part of PBR's primary plant. PBR has no other use for the space being used for production. PBR will move experienced production workers to the new line. The total salary of these experienced workers is $500,000 per year. However, replacements will need to be hired to replace the workers being moved to the new line. The total cost of the new replacement workers will be $400,000 per year. PBR's current level of working capital at its primary production facility is $300,000. The new product will require the working capital to increase to a level of $380,000 immediately, then to $400,000 in year 1, in year 2 the level will be $350,000, and finally in year 3 the level will return to $300,000. PBR's tax rate is 35%. The discount rate for this project is 10%. Should PBR launch this new product? (20 pts)

Proceeds = 400 – (0.35)(400 – 700) = 505
Incremental labor expenses are $400,000 per year… the other workers are not incremental.

	0	1	2	3
Δ Rev:		**2400**	**3000**	**1500**
- Δ Costs:		**800**	**1000**	**500**
- Δ Depr:		**100**	**100**	**100**
- Δ Labor:		**400**	**400**	**400**
EBIT		**1100**	**1500**	**500**
- taxes (35%)		**385**	**525**	**175**
NI		**715**	**975**	**325**
+ Δ Depr		**100**	**100**	**100**
- cap exp	**1000**			
+ proceeds				**505**
- Δ NWC	**80**	**20**	**-50**	**-50**
Δ FCF	**-1080**	**795**	**1125**	**980**

$$NPV = -1080 + \frac{795}{1.10} + \frac{1125}{(1.10)^2} + \frac{980}{(1.10)^3} = 1{,}308.77$$

The NPV is positive, so they should launch the project.

5. Johnson Protective Services is considering a facilities upgrade. The investment has an expected life of 5 years. Management estimates that if the project is undertaken, the company's annual after-tax cash flows over the next 5 years will be only $12,000 per year. If they do not upgrade the facilities, they expect annual after-tax cash flows will be *negative* $400,000 per year. Assuming that the company intends to stay in business, how much can the company justify paying for the upgrade, given a discount rate of 15% APR, compounded quarterly? (14 pts)

Annual CF with project: 12,000
Annual CF without project: -400,000

➔ **Incremental Annual CF = 412,000**

They would take the project if the NPV is 0 or greater… thus, we need to solve for the cost of the upgrade so that NPV is 0. First, we need an annual interest rate in order to use the annuity formula:

$$\boldsymbol{EAR = \left(1 + \frac{0.15}{4}\right)^{4} - 1 = 0.15865 = 15.865\%}$$

$$NPV = 0 = UpgradeCost + 412\left(\frac{1}{.15865} - \frac{1}{.15865(1.15865)^{5}}\right)$$

$$UpgradeCost = -1{,}353.3$$

Therefore, they would be willing to pay as much as $1.353 million for the upgrade.

6. Acme Industries, Inc. looks at the following decision criteria when evaluating projects:

    1. NPV must be greater than zero.
    2. IRR must be greater than the cost of capital.
    3. Payback period must be less than 6 years.
    4. The value of the firm must increase by at least $500,000 as a result of the investment.

    In order to undertake an investment, at least three of the four criteria above must be met (in other words, one of the criteria may say "no", but if the other 3 say "yes", then the investment is undertaken).

    Critically evaluate the above policy (i.e. discuss its pros and cons). If the policy is a good one, explain why. If not, explain why not and suggest an alternative policy. (18 pts)

Let's look at each component of the policy:

1. **NPV gives us the correct investment decision every time (assuming that the value of real options have been included and that we aren't looking at repeated investment choices with different life spans). But these assumptions would also need to be incorporated in the other criteria as well... so this really isn't a knock on NPV.**
2. **IRR also gives us the correct investment decision as long as the following conditions hold: i) the initial CFs of the investment are negative, then followed by positive CFs and ii) the investment choices are not mutually exclusive.**
3. **Payback period is not a good method for evaluating investment decisions. Future CFs are not discounted, distant CFs are ignored, and the benchmark period is arbitrary.**
4. **This is the same as saying that NPV must be at least $500,000. This means that the firm would ignore some investments that increase firm value by less than $500,000. Shareholders would not approve of foregoing investments that could increase their wealth!**

Of these choices, only NPV works all the time. Because there are essentially two NPV requirements, we would be certain that we would never take a negative NPV project (as this would fail two of the conditions). But we may pass on good investments. One could imagine a scenario that an investment had an NPV of "only" $450,000 and the payback period was not met… resulting in no investment. Or that NPV was $1 million, but the CFs were such that IRR was meaningless and the payback period was 9 years.

Ultimately, because this policy will cause us to miss out on good investments, it is not a good policy. I suppose that there are several "correct" policies that you could suggest, but the best one (in my mind) is to just use NPV greater than zero. It will always identify good investments to make and we will avoid bad investments.