

Multiple choice – 3 points each – 30 points total

1. Which of the following statements is false? (Assume conventional cash flows.)
 - A. The NPV will be positive if the IRR is less than the cost of capital.
 - B. If the multiple IRR problem does not exist, any independent project acceptable by the NPV method will also be acceptable by the IRR method.
 - C. When $IRR = \text{cost of capital}$, $NPV = 0$.
 - D. The IRR can be positive even if the NPV is negative.
 - E. The NPV method is not affected by the multiple IRR problem.

2. Project A has conventional cash flows and is acceptable according to the NPV criterion. If the required rate of return is 12 percent, then:
 - A. the project will be acceptable using the IRR criterion.
 - B. the project will be rejected under the IRR criterion.
 - C. the project could be accepted or rejected depending on whether the IRR is greater than or less than 12 percent.
 - D. the project will be accepted only if the IRR is equal to 12 percent.
 - E. the project must also be acceptable according to the Payback Method.

3. All else the same, actions or events that cause firm returns to be less correlated with changes in the economy will _____ the firm's systematic risk.
 - A. increase
 - B. decrease
 - C. not affect
 - D. affect, but the direction is uncertain
 - E. increase the firm's unsystematic risk but not affect

4. The pure play approach:
 - A. cannot be used if the firm has preferred stock outstanding.
 - B. is easier to implement than the subjective approach.
 - C. is most useful when each division makes a multitude of products.
 - D. should be used only if the firm has more than three divisions.
 - E. can be used to find the cost of capital for a division.

5. Given the following information: The risk-free rate is 7%, the beta of stock A is 1.2, the beta of stock B is 0.8, the expected return on stock A is 13.5%, the expected return on stock B is 11.0%. We also know that stock A is fairly priced and the betas of stocks A and B are correct. Which of the following must be true?
 - A. Stock B is also fairly priced.
 - B. The price of stock B is too high.
 - C. The price of stock B is too low.
 - D. The expected return on stock B is too high.
 - E. The expected return on stock A is too high.

6. Which of the following describes a portfolio that plots below the security market line?

- A. The security is undervalued.
- B. The security is providing a return that is greater than expected.
- C. The security's reward to risk ratio is too low.
- D. The security's beta is too low.
- E. The security provides a return that exceeds the average return on the market.

7. Which one of the following stocks will have the highest expected return?

Stock	A	B	C	D	E
Standard deviation	4%	9%	11%	13%	7%
Beta	.8	1.1	1.4	1.3	.9

- A. Stock A.
- B. Stock B.
- C. Stock C.
- D. Stock D.
- E. Stock E.

8. The principle of diversification states that spreading an investment over a number of assets will eliminate:

- A. All of the risk.
- B. All of the systematic risk and part of the unsystematic risk.
- C. All of the unsystematic risk and part of the systematic risk.
- D. Most of the systematic risk.
- E. Most of the unsystematic risk.

9. Suppose a firm uses a constant WACC to make capital investment decisions without any adjustments for risk. The firm will tend to:

- A. accept profitable, low risk projects and reject unprofitable, high risk projects.
- B. accept profitable, low risk projects and accept unprofitable, high risk projects.
- C. reject profitable, low risk projects and accept unprofitable, high risk projects.
- D. reject profitable, low risk projects and reject unprofitable, high risk projects.
- E. become less risky over time.

10. You purchase a bond on January 1, 2008 for \$839.67. The bond has a \$1,000 face value, an 8% annual coupon rate, and can be sold for \$822.33 on December 31, 2008. What was your percentage return for the year?

- A. -2.1%
- B. 7.5%
- C. 8.6%
- D. 11.6%
- E. 11.8%

Partial Credit Problems --- SHOW ALL WORK

Problem 1 (10 points) Calculate the WACC for the following company:

Debt: 1,000 7 percent coupon bonds outstanding, with 20 years to maturity, and a quoted price of 90.125. 1,000 9 percent coupon bonds outstanding, with 10 years to maturity and a price of 109. These bonds pay interest semi-annually.

Preferred Stock: 5,000 shares of 9 percent preferred stock selling at \$93 per share.

Common Stock: 50,000 shares of common stock selling for \$35 per share. The stock has a beta of 1.3 and will pay a dividend of \$3.25 next year. The dividend is expected to grow by 7 percent per year indefinitely.

Market: A 12 percent expected return, a 4 percent risk free rate and a 35 percent tax rate.

Problem 2 (10 points) Your company has been approached to bid on a contract to sell 14,500 widgets a year for 4 years. Due to technological improvements, they will be outdated and no sales will be possible beyond that time. The equipment necessary for the production will cost \$3.1 million and will be depreciated on a straight-line basis to a pretax salvage value of \$250,000. Production will require an investment in NWC of \$120,000 to be returned at the end of the project. Fixed costs are \$550,000 per year and variable costs are \$155 per unit. The tax rate is 40 percent and the required return is 13 percent. Additionally, the president of the company will only undertake the project if it has an NPV of \$100,000. What bid price should you set for the contract?

Problem 3 (10 points) Staind, Inc. expects to have sales of \$19,500,000 next year, with a profit margin of 8 percent. The company has 300,000 shares of stock outstanding and a ROE of 15 percent. The company pays out 25 percent. The required return on the company's stock is 12 percent. What is the value per share of the stock?

Problem 4 (15 points) The Halestorm Weather Company (HWC) has hired you as a consultant to evaluate the NPV of its rain control system. HWC plans to charge farmers for seeding clouds above farms to induce or deter rain. They anticipate that the business will continue into perpetuity. Following the negligible start-up costs, HWC expects the following nominal cash flows at the end of the first year: Revenues = \$225,000, Labor costs = \$175,000, Other costs = \$45,000. The company will lease machinery for \$25,000 per year. The lease payments start at the end of year 1 and are expressed in nominal terms. Revenues will increase by 5 percent per year in real terms. Labor costs will increase by 3 percent per year in real terms. Other costs will increase by 1 percent per year in real terms. The rate of inflation is expected to be 6 percent per year. HWC's required rate of return is 10 percent in real terms. The company has a 34 percent tax rate. All cash flows occur at year end. What is the NPV of HWC's proposed weather modification project today?

Problem 5 (25 points)

AMERICAN SHIPPING

American Shipping, which is one of the largest container ship owners in Savannah, Georgia, is considering purchasing a tugboat to assist its large fleet of container ships out of its dock facilities. They specialize in managing a fleet of 500-700 foot seagoing container ships in North American and the Caribbean. The company management is committed to cutting costs in every possible way. The company owns its docking facilities in Savannah along with trucking companies to move the containerized freight.

The Problem: American Shipping is trying to cope with the rising costs of tugboat services in the Savannah harbor. The port of Savannah is approximately 25 miles inland from the Atlantic Ocean on the Savannah River and has many sandbars and other obstructions to navigation. The Savannah Port Authority, which regulates all shipping in the harbor, requires that a licensed tugboat captain be on board every container ship entering the harbor and a tugboat in attendance nearby. The current harbor tugboat company, Savannah Tugboat and Lumber has always provided tugboat services to American Shipping and all other shipping companies in the harbor. However, Savannah Tugboat and Lumber is now requiring all shipping companies to sign a 10-year contract for captain and tugboat services. The Savannah Port Authority has recently decided to allow shipping companies to own and maintain their own tugboats under Port Authority supervision. American Shipping must decide whether to purchase a tugboat or sign a 10-year contract with Savannah Tugboat and Lumber.

Tugboat: The tugboat being considered by American Shipping is being built by Continental Shipyards in Mobile, Alabama. The tugboat has a length of 122 feet, and requires a crew of four (one captain, a first mate and two deckhands) to be on duty 24 hours a day. American Shipping is negotiating with Continental Shipyards on the basic cost of the tugboat. The basic tugboat will cost \$15,000,000 and have a useful and depreciable life of 10 years. There are several reasons why the tugboat costs only \$15,000,000. First, the tugboat manufacturer does not supply an engine unless requested by the customer. The tugboat requires two marine diesel 12-cylinder engines. American Shipping has two spare container boat engines on hand that it purchased last month in anticipation of installing them on a container boat. The engines can be installed on the tugboat with no modifications. Each engine costs \$1,000,000, has a 10-year depreciable life with no salvage value at the end of its life. Second, the tugboat must be equipped with radar and navigation devices that are specialized for American harbors. American Shipping has a radar unit that it purchased for one of its container ships some years ago. The radar unit is now certified only for harbor use and can no longer be used on international waters in container boats. Furthermore, this particular unit could only be fitted to the tugboat manufactured by Continental Shipyards. The radar unit costs \$1,000,000, has a ten-year life and has no salvage value. Third, the low cost of the tugboat will be offset somewhat by the higher maintenance costs that will require the tugboat to be in dry-dock during its fifth-year of operation.

Costs of Operating the Tugboat: The contract from Savannah Tugboat and Lumber Company calls for an annual payment of \$7,000,000 per year in tugboat and captain fees. That is, if American Shipping does not buy its own tugboat, it will have to pay \$7,000,000 per year to Savannah Tugboat and Lumber. American Shipping also estimates the tugboat will have annual cash operating costs of \$2,000,000 per year excluding depreciation. Depreciation will equal \$1,500,000 per year for the tugboat, \$200,000 per year for both engines and \$100,000 per year for the radar unit.

Year 5: As with all boats, maintenance is an integral part of any operation. American Shipping must place the tugboat in dry-dock for repairs and maintenance for the entire year. As a result, the firm will have to pay \$8,000,000 in tugboat fees to Savannah Tugboat and Lumber, have no cash operating costs and have a repair expense equal to \$1,000,000 in year 5.

Other Issues: If American Shipping goes ahead with the purchase of its tugboat, Savannah Lumber and Tugboat Company which is the only tugboat company in the harbor, has informed American Shipping that it will cancel its long-term contract to ship lumber. Savannah Tugboat and Lumber has been a long-time customer of American Shipping. They ship pine trees to a paper mill in the Caribbean with American Shipping. As a result, American Shipping will lose \$1,000,000 per year in business if it buys the tugboat. The tugboat with engines and radar can be sold for \$1,500,000 at the end of the product life.

American Shipping faces a 40% tax rate and a 10% discount rate

Analysis: Calculate the payback period, NPV and IRR. Can you use each of these in this analysis? Should American Shipping buy the tugboat?

Answer Key**FIN 6100****EXAM #2****Summer 2009**

1. A
2. A
3. B
4. E
5. B

6. C
7. E
8. E
9. C
10. B

Problem #1

First bond	Second Bond
901.25 ± PV	1,090 ± PV
1,000 FV	1,000 FV
35 PMT	45 PMT
40 N	20 N
CPT I/Y	CPT I/Y
$3.999 \times 2 = 7.998$	$3.847 \times 2 = 7.693$

$$k_{D1} = 7.998\%(1 - .35) = 5.198\%$$

$$k_{D2} = 7.693\%(1 - .35) = 5.000\%$$

$$k_P = \$9 / \$93 = .0968$$

$$k_E = (\$3.25 / \$35) + .07 = 16.29\%$$

$$k_E = 4\% + 1.3(12\% - 4) = 14.4\%$$

$$k_E = (17\% + 14.4\%) / 2 = 15.35\%$$

D ₁	1,000 × \$901.25	=	\$901,250
D ₂	1,000 × \$1,090	=	\$1,090,000
Pref	5,000 × \$93	=	\$465,000
CS	50,000 × \$35	=	<u>\$1,750,000</u>
			\$4,206,250

$$w_{D1} = \$901,250 / \$4,206,250 = .214$$

$$w_{D2} = \$1,090,000 / \$4,206,250 = .259$$

$$w_P = \$465,000 / \$4,206,250 = .111$$

$$w_E = \$1,750,000 / \$4,206,250 = .416$$

$$WACC = .214(5.198\%) + .259(5.000\%) + .111(9.68\%) + .416(15.35\%)$$

$$WACC = 9.87\%$$

Problem #2

ICO

Equipment	<3,100,000>
NWC	<u><120,000></u>
	<3,220,000>

Salvage value

$$(BV - MV)(\text{Tax rate}) = (\$0 - 250,000)(.40) = -\$100,000$$

$$\$250,000 - 100,000 = \$150,000$$

$$\text{NPV} = \$100,000 = -\$3,220,000 + \text{OCF}(\text{PVIFA}_{4,13\%}) + \$270,000/1.13^4$$

$$\$3,154,403.94 = \text{OCF}(2.974471326)$$

$$\$1,062,492.30 = [(P - VC)Q - FC](1 - \text{tax rate}) + \text{Dep}(\text{tax rate})$$

$$\$1,062,492.30 = [(P - \$155)14,500 - 550,000](1 - .40) + \$775,000(.40)$$

$$\$750,492.30 = [(14,500P - 2,247,500) - 550,000](.60)$$

$$\$750,492.30 = 8,700P - 1,348,500 - 330,000$$

$$\$2,428,992.30 = 8,700P$$

$$P = \$279.19$$

Problem #3

$$\text{Net income} = \$19,500,000(.08) = \$1,560,000$$

$$\text{EPS} = \$1,560,000 / 300,000 = \$5.20$$

$$\text{Dividends per share} = \$5.20(.20) = \$1.30$$

$$\text{Retained earnings next year} = \$5.20(.75) = \$3.90$$

$$g = \text{ROE} \times b = .15 \times .75 = 11.25\%$$

Next year:

Firm pays \$1.30 dividend, retains \$3.90

$$\text{Earnings created at } t = 2 \text{ by retained earnings: } \$3.90(.15) = \$0.585$$

$$\text{Per share NPV at } t = 1: -\$3.90 + \$0.585 / .11 = \$1.418$$

$$\text{NPVGO} = \$1.418 / (.12 - .1125) = \$189.09$$

Value of the firm as a cash cow:

$$\text{Value as a cash cow} = \$5.20 / .12 = \$43.33$$

$$\text{Value per share} = \text{Value as a cash cow} + \text{NPVGO} = \$43.33 + 189.09 = \$232.42$$

Problem #4

The discount rate is expressed in real terms, and the cash flows are expressed in nominal terms. We can answer this question by converting all of the cash flows to real dollars. We can then use the real interest rate. The real value of each cash flow is the present value of the year 1 nominal cash flows, discounted back to the present at the inflation rate. So, the real value of the revenue and costs will be:

$$\text{Revenue in real terms} = \$225,000 / 1.06 = \$212,264.15$$

$$\text{Labor costs in real terms} = \$175,000 / 1.06 = \$165,094.34$$

$$\text{Other costs in real terms} = \$45,000 / 1.06 = \$42,452.83$$

$$\text{Lease payment in real terms} = \$25,000 / 1.06 = \$23,584.91$$

Revenues, labor costs, and other costs are all growing perpetuities. Each has a different growth rate, so we must calculate the present value of each separately. Using the real required return, the present value of each of these is:

$$PV_{\text{Revenue}} = \$212,264.15 / (0.10 - 0.05) = \$4,245,283.02$$

$$PV_{\text{Labor costs}} = \$165,094.34 / (0.10 - 0.03) = \$2,358,490.57$$

$$PV_{\text{Other costs}} = \$42,452.83 / (0.10 - 0.01) = \$471,698.11$$

The lease payments are constant in nominal terms, so they are declining in real terms by the inflation rate. Therefore, the lease payments form a growing perpetuity with a negative growth rate. The real present value of the lease payments is:

$$PV_{\text{Lease payments}} = \$23,584.91 / [0.10 - (-0.06)] = \$147,405.66$$

Now we can use the tax shield approach to calculate the net present value. Since there is no investment in equipment, there is no depreciation; therefore, no depreciation tax shield, so we will ignore this in our calculation. This means the cash flows each year are equal to net income. There is also no initial cash outlay, so the NPV is the present value of the future aftertax cash flows. The NPV of the project is:

$$NPV = (PV_{\text{Revenue}} - PV_{\text{Labor costs}} - PV_{\text{Other costs}} - PV_{\text{Lease payments}})(1 - t_c)$$

$$NPV = (\$4,245,283.02 - 2,358,490.57 - 471,698.11 - 147,405.66)(1 - .34)$$

$$NPV = \$836,674.53$$

Problem #5

ICO

Purchase of tugboat	<15,000,000>
Engines	<u><2,000,000></u>
	<17,000,000>

The radar equipment is a sunk cost since it cannot be used elsewhere.

Cash flows for years 1-4 and 6-10

Saved expense	7,000,000	
Lost sales	<1,000,000>	
Oper. Cost	<2,000,000>	
Dep	<u><1,700,000></u>	Tugboat + engines
EBT	2,300,000	
Tax	<u><920,000></u>	
NI	1,380,000	
+Dep	<u>1,700,000</u>	
OCF	<u>3,080,000</u>	

Year 5 cash flow

Saved expense	7,000,000	
ST&L fee	<8,000,000>	
Lost sales	<1,000,000>	
Repair fee	<1,000,000>	
Dep	<u><1,700,000></u>	Tugboat + engines
EBT	<4,700,000>	
Tax	<u>1,880,000</u>	
NI	<2,820,000>	
+Dep	<u>1,700,000</u>	
OCF	<u><1,120,000></u>	

$$\begin{aligned} \text{Salvage taxes} &= (\text{Book value} - \text{Market value})(\text{tax rate}) \\ &= (\$0 - \$1,500,000)(.40) = -\$600,000 \end{aligned}$$

$$\text{Salvage CF} = \$1,500,000 - \$600,000 = \$900,000$$

Net cash flows

Year	Cash flow
0	<17,000,000>
1-4	3,080,000
5	<1,120,000>
6-9	3,080,000
10	3,080,000 + 900,000

$$\text{Payback period} = 6 + \frac{2,720,000}{3,080,000} = 6.88 \text{ years}$$

$$\text{NPV} = -\$335,613.91$$

IRR = 9.55% – Although this is the IRR according to the BA II Plus, there is another IRR since the cash flows change sign. Therefore, in this problem IRR is not applicable.