**FIN 7020**

**Problem Set #10 (due 11/21/2018)**

**Problem 1:**

You are thinking of starting a firm that manufactures electronic medical devices. The required capital investment in plant and equipment is $20,000,000.00. After your manufacturing facility is completed, the firm will generate an average return on investment before interest and taxes of 15 percent each year. However, the earnings before interest and taxes is risky and will vary from year to year depending upon economic conditions in the medical equipment industry. For present value calculations, assume that the EBIT is realized at the end of each year starting with the first cash flow being received at the end of t =0 (i.e., at t = 1). The risk-free rate is .035. The stakeholders of the firm have personal tax rates TS = TB = .15. The corporate tax rate is .28. You have looked at other electronic medical device manufactures that have similar products and assets. MedEDev Inc, in particular, is very similar to your proposed firm. Below is the data on MedEDev Inc.

Value of Debt, B $20,000,000

Value of Equity, S $10,000,000

Shareholders personal tax rates

Dividend and Capital Gains Rate .15

Interest Income .15

Corporate Tax Rate .28

Expected Return on Equity .12

Yield on Debt .065

Expected Return on the Market .20

1. If you fund your firm by issuing only equity, what is a good estimate of the required rate of return on the firm’s equity in the unlevered firm?
2. What will be the value of your unlevered firm?
3. If you fund your firm solely with equity, should you go forward with your idea? Why or why not?

**Problem 2:**

Recall that in class we discussed how personal tax rates affect the marginal contribution of a dollar of debt to the value of the firm (prior to considering the effects of bankruptcy costs). Determine the marginal contribution of debt for the following combinations of personal tax rates on interest income (TB), distributions to equity holders (TS), and the corporate tax rate (TC).

TC TS TB Marginal Contribution

.20 .20 .20

.20 .35 .20

.20 .20 .35

.20 .35 .35

.35 .20 .20

.35 .20 .20

.35 .35 .20

.35 .20 .35

.35 .35 .35

**Problem 3:**

Your firm has always purposefully determined its capital structure given the trade-off between the tax benefits and potential bankruptcy costs associated with debt. Currently your firm’s debt-to-equity ratio is .3. Last year your firm hired a tax wizard. This person is so good at shielding corporate income that your firm’s corporate marginal tax rate has fallen from .35 to .25. Your firm responds by changing its capital structure to take advantage of this change. Your debt is short-term; so, you will have to refinance anyway.

1. Will you want to increase, decrease, or keep the level of debt the same as it was previously? Explain.
2. Once you do what you suggest (i.e., increase, decrease, or keep the same), what do you predict will happen to the rate your firm must pay on the debt when you refinance? What does the present value of bankruptcy cost have to do with this effect? Explain your answer. (Assume that the yield curve on zero-coupon bonds is essentially that same as it was over the past year.)

1. After your firm alters its capital structure, what happens to its probability of bankruptcy? Explain your answer.

**Problem 4:**

You are a trader who trades both puts and calls on Procter and Gamble. Information about current market conditions is displayed below.

Stock Price Exercise Price Expiration Date Call Price Put Price

88 90 1/12th of a year 3.447 5

88 95 1/12th of a year 2.131 8

The annualized continuously-compounded risk-free rate is .06 (6%).

1. Given the information above, are there any arbitrage opportunities?

2. If no, explain why. If yes, describe one set of trades you could make now to exploit the arbitrage opportunity. Show that this strategy generates an arbitrage profit.

**Problem 5:**

Draw a profit diagram for each of the following combined option positions.

Combination 1:

Short 1 call with an exercise price of $50 with a call price of $2, and

Long 1 call with an exercise price of $55 with a call price of $1.

Combination 2:

Long 1 call with an exercise price of $50 with a call price of $2, and

Long 1 put with an exercise price of $50 with a put price of $1.

Combination 3:

Short 1 put with an exercise price of $50 and an put price of $1, and

Long 1 call with an exercise price of $50 and a call price of $2.