

Question 1

In this question you need first to calculate the Future Value of the monthly deposits you will make every month, for 30 years, in the Stock and Bond Account. The aggregate value will then become the Present Value of the monthly withdrawals you will do for 25 years.

The rates presented to you are Stated Annual Rates; the time length between the deposits and the withdrawals is a month so you have that for the Stock Account the interest rate is $11\%/12$, for the bond Account the interest rate is $7\%/12$ and for the retirement account the interest rate is $9\%/12$.

So, the solution to the problem is

$$S = \frac{\$700}{\frac{0.11}{12}} \left[1 - \left(\frac{1}{1 + \frac{0.11}{12}} \right)^{30 \cdot 12} \right] \left(1 + \frac{0.11}{12} \right)^{30 \cdot 12} = \$1,963,163.82$$

$$B = \frac{\$300}{\frac{0.07}{12}} \left[1 - \left(\frac{1}{1 + \frac{0.07}{12}} \right)^{30 \cdot 12} \right] \left(1 + \frac{0.07}{12} \right)^{30 \cdot 12} = \$365,991.3$$

Then, the aggregate amount in the retirement account will be $\$2,329,155.12$

To find the value withdrawn every month, we just need to solve the following equation

$$\$2,329,155.12 = \frac{W}{\frac{0.09}{12}} \left[1 - \left(\frac{1}{1 + \frac{0.09}{12}} \right)^{25 \cdot 12} \right]$$

The solution is $W = \$19,546.19$

Question 2

- a) In this question you are told the company will not pay any of the following 5 Earnings. It will start only paying 40% of the Earnings after that. You are also told that the return on retained Earnings for the first part will be 20% and for the second part will be 15%.

This means that the growth rate of Earnings will be 20% (100%*20%) for the period when the company retains all Earnings and 9% (60%*15%) for the period when the firm only retains 60% of the Earnings.

The key here is to find which will be the first Earning that will not be totally retained. Forty percent of it will be first Dividend being paid. After that, the Dividends will grow at the same rate as the Earnings, 9%.

The first Earning not to be completely retained is the sixth Earning. The value will be simply $\$10 \cdot (1+20\%)^6 = \29.86 , because it compounds the five times it was totally retained and earned 20%. The respective Dividend is $\$29.86 \cdot 40\% = \11.94 .

The Price then is simply

$$P = \frac{\$11.94}{0.15 - 0.09} * \left(\frac{1}{1.15}\right)^5 = \$98.97$$

- b)** To find the Present Value of Growth Opportunities, you simply need to apply this formula

$$P = \frac{E_1}{r} + PVGO$$

In our case $P = \$98.97$, $E_1 = \$12 = \$10 \cdot 1.2$ and $r = 15\%$. Therefore

$$\$98.97 = \frac{\$12}{0.15} + PVGO \Leftrightarrow PVGO = \$98.97 - \$80 = \$18.97$$

- c)** To find the rate of return enjoyed by the stockholders, the easier way is to remember that the discount rate is exactly that. Their rate of return is 15%. This makes it easy to know how it splits between Dividend Yield and Capital Gains Yield in the two phases of business.

In the first phase of business, the company doesn't pay any Dividends, so the Dividend Yield must be 0%. This makes the Capital Gains Yield to be 15%. In fact, if you compute the Price of Stock next year it's going to be \$113.82, which is a 15% increase.

For the second part of business, you know the Dividends are growing at a 9% rate. This immediately tells you that the Price will grow at 9%. So, the Capital Gains Yield in this case will be 9% and the Dividend Yield only 6%, to add to 15% total return. If you compute the Price of Stock in year 6 (when the second stage begins) it is \$199.07. For a Dividend of \$11.94 this represents 6%.

- d) The difference this announcement makes in relation to the original announcement is that the payout policy for the second phase of business is changed. They will not retain 60% but instead 100%.

We saw in class that when the discount rate is the same as the rate of return in re-invested Earnings, the payout policy does not influence the price of the stock.

This is exactly what is happening here. The discount rate is 15% and the rate of re-investment is also 15%.

So, the announcement will not change the price, which is again \$98.97.

Question 3

- a) To find the price of Bond 1, you simply solve the equation

$$P = \frac{\$1,000}{1.055} = \$947.87$$

To find the Yield to Maturity of Bond 2, you solve the equation

$$\$1,009.1 = \frac{\$70}{1 + YTM} + \frac{\$1070}{(1 + YTM)^2}$$

Using the quadratic formula, you get the Yield to Maturity to be 6.5%

To find the Coupon Rate of Bond 3, you solve the equation

$$\$947.99 = \frac{C}{1.075} + \frac{C}{(1.075)^2} + \frac{C}{(1.075)^3} + \frac{\$1,000}{(1.075)^3}$$

The result is C=\$55 which means the Coupon Rate is 5.5%

- b) In order to find the yearly rates for all Bonds, you need to figure out how much the Price of the Bonds will be one year from now, with the reduction in their Yield of 1%.

The first Bond will not have a Price, since it reaches Maturity and you simply collect the last Coupon and the Face Value. Bond 2 will become a one year Bond with Yield to Maturity of 5.5%. The Price of such a Bond is \$1,014.22. Bond 3 becomes a two year Bond with Yield to Maturity of 6.5%. The Price of that Bond will be

$$P = \frac{\$55}{1.065} + \frac{\$1055}{(1.065)^2} = \$972.69$$

The rate of return is for Bond 1

$$\frac{\$1,000 - \$947.87}{\$947.87} = 5.5\%$$

The rate of return is for Bond 2

$$\frac{\$70 + \$1,014.22 - \$1,009.1}{\$1,009.1} = 7.44\%$$

The rate of return is for Bond 3

$$\frac{\$50 + \$972.69 - \$947.99}{\$947.99} = 7.88\%$$

For the first Bond, you don't have Capital Gains Yield because since the Bond matures, you can't sell it. All the return you get is from Current Yield. So, Current Yield 5.5% and Capital Gains Yield 0%.

For the second Bond, the Current Yield is 6.94% and the Capital Gains Yield is 0.5%.

For the third Bond, the Current Yield is 5.27% and the Capital Gains Yield is 2.61%.

Question 4

In this question all the items mentioned were incremental except for the security costs. It is mentioned the security costs ALREADY exist. What is being done is to

change the way they are imputed between the different projects of the firm. As we saw in class, this is not incremental. Without the project, the security costs would still be \$200,000.

The Cash Flows follow this table

	Year 0	Year 1	Year 2	Year 3
(+) Sales		27	30	37.8
(-) Cost of Sales		9	10	12.6
(-) Lost Sales of old model		9	12	15
(+) Cost of lost sales of old model		3	4	5
(+) Extra sales of Boots		6.25	7.5	8.75
(-) Cost of extra sales of boots		1.25	1.5	1.75
(-) Fixed Costs		8	8	8
(-) Depreciation		4.1	4.1	4.1
(=) Operational Result		4.9	5.9	10.1
(-) Taxes		1.96	2.36	4.04
(=) Net Income		2.94	3.54	6.06
(+) Depreciation		4.1	4.1	4.1
(-) Variation of NWC	0.75			-0.75
(-) Investment	12.3			
(+) Sale of Equipment				3.5
(-) Tax on Sale of Equipment				1.4
(=) Cash Flow	-13.05	7.04	7.64	13.01
Present Value of Cash Flow	-13.05	6.18	5.88	8.78

Then the NPV=\$7.79 million.

The Profitability index is

$$\frac{\$20.84\text{million}}{\$13.05\text{million}} = 1.6$$

The Payback is 1.79 years and the Discounted Payback is 2.11 years.