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The exam has 10 questions. The exam will be collected at 4:20 p.m. You may use a calculator. The formula sheet is on the last page, which you may take it off from the rest of the exam. You do not have to return the formula sheet. Please show your work to receive credit, i.e. even if you are using a calculator to find the answers you should set up the equation using appropriate formulas.

Good Luck!

95

- 1) You put \$35,000 into a bank account earning 6% annually. You can't withdraw the money until the balance has doubled. How long will you have to leave the money in the account? (5 points)

$$FV = PV(1+r)^n \rightarrow 70,000 = 35,000(1.06)^n$$

$$2 = (1.06)^n$$

$$\ln 2 = n \ln 1.06$$

$$11.895 = n \rightarrow n = 11.895 \text{ years}$$

- 2) Your firm has identified three potential investment projects. The projects and their cash flows are shown here:

Project	Cash Flow Today (\$)	Cash Flow in One Year (\$)
A	-10.00	20.00
B	5.00	5.00
C	20.00	-10.00

Suppose all cash flows are certain and the interest rate is 10%.

- What is the NPV of each project?
- If the firm can choose only one of these projects, which should it choose?
- If the firm can choose any two of these projects, which should it choose? (12 points)

a) A.  $NPV = \text{today} + \frac{FV}{(1+r)^n}$   $NPV = -10 + \frac{20}{(1.1)} = \$8.18$

B.  $NPV = 5 + \frac{5}{(1.1)} = \$9.54$

C.  $NPV = 20 + \frac{-10}{(1.1)} = \$10.91$

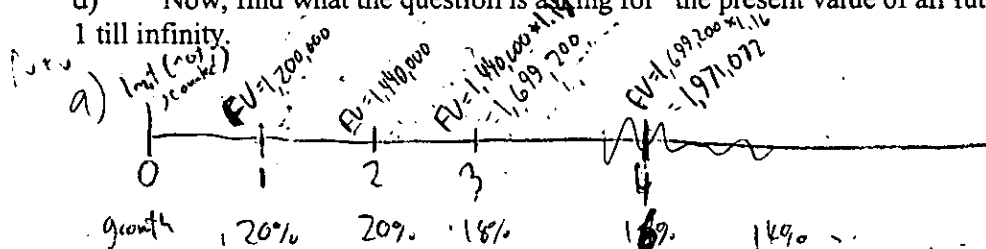
- b). The firm should choose the project with the highest net present value (holding factors like risk constant). In this case, it should choose project C.

- c). If the firm can choose any two projects, it should choose B & C as they provide the highest NPV. Also, these projects produce positive cashflow immediately and are thus more liquid.

3) You are running a hot Internet company. Analysts predict that its earnings will grow at 20% per year for the next two years. After that, as competition increases, earnings growth is expected to slow to 2% per year and continue at that level forever. Your company expect to have just announced earnings of \$1 million. What is the present value of all future earnings (EXCLUDING the just announced \$ 1 million earnings) if the interest is 8%? (13 points)

*Part a through d is designed to help you solve the problem. If you can do it in few steps, please feel free to skip a through d. However, if you find the question difficult to tackle, follow the step a through d will lead you to the correct answer.*

- Draw the earnings' stream for this company. This will help you figure out how to do the discounting of each period's earnings to today's value. (Hint: Figure out the exact earnings amount for year 1 and year 2, starting from year 3 you can apply the growing perpetuity formula.)
- Find the value (at the end of year 2) for all earnings from year 3 till infinity:
- Find the value (today) for all earnings from year 3 till infinity using the number you got from part (b):
- Now, find what the question is asking for "the present value of all future earnings" starting from year 1 till infinity.



$$PV_{\text{year 1}} = \frac{FV}{(1+r)^n} = \frac{1,200,000}{(1.08)^1} = \$1,111,111.11$$

$$PV_{\text{year 2}} = \frac{1,440,000}{(1.08)^2} = \$1,234,567.90$$

$$PV_{\text{rest 2 yrs}} = \$2,345,679.01$$

$$b). \text{ Total perpetual earnings (year 3+)} = \frac{1,440,000 \times 1.02}{.08 - .02} = \$24,000,000$$

$$c). PV_{\text{today}} = \frac{24,000,000}{1.08^2} = \$20,576,131.69$$

$$d). PV \text{ of all future earnings} = \text{perpetual} + \text{1st 2 years} = \$20,576,131.69 + 2,345,679.01$$

$$= \$22,921,810.70$$

PV of  
ALL future  
earnings

4) Suppose U.S. Bank is offering a 20-year mortgage with an EAR of 6.80%. If you plan to borrow \$150,000, what will your monthly payment be starting 1 month from today? (10 points)

$$1 + \text{EAR} = \left(1 + \frac{\text{APR}}{12}\right)^{12}$$

$$1.068^{1/12} = \left(1 + \frac{\text{APR}}{12}\right)^{1/12}$$

$$1.005497 = \left(1 + \frac{\text{APR}}{12}\right)^{1/12}$$

$$.005497 = \text{APR}/12$$

$$\text{APR} = 6.5968\%$$

$$PV = CF \left( \frac{1}{\frac{r}{n}} - \frac{1}{\frac{r}{n} \left(1 + \frac{r}{n}\right)^n} \right)$$

$$(r/n = .005497)$$

$$150,000 = CF \left( \frac{1}{.005497} - \frac{1}{.005497 (1.005497)^{240}} \right)$$

$$= CF(191.917 - 48.807)$$

$$150,000 = CF(133.1095)$$

$$CF = \$1126.89$$

- monthly payment

5) Suppose a 7-year, \$1,000 face value bond with an 8% coupon rate and semiannual coupons is trading with a YTM of 6.75%.

i) Without doing any computation, explain why you expect the bond to be trading at a discount, at par, or at a premium.

ii) If the YTM of the bond rises to 7% (APR with semiannual compounding), what price will the bond trade at? (10 points)

i) The bond should be trading at a premium. This is because its coupon rate is higher than its YTM, meaning it is paying more than comparable bonds. When it trades @ a premium, the face value is lower than the trade price.  
 $\text{coupon} = 80/m = 40$

$$P_i). PV = \text{coupon} \left( \frac{1}{\frac{ytm}{n}} - \frac{1}{\frac{ytm}{n} \left(1 + \frac{ytm}{n}\right)^{n \cdot m}} \right) + \text{face} \left( \frac{1}{\left(1 + \frac{ytm}{n}\right)^{n \cdot m}} \right)$$

$$ytm/n = 3.5\%$$

$$= 40 \left( \frac{1}{.035} - \frac{1}{.035 (1.035)^{14}} \right) + 1000 \left( \frac{1}{(1.035)^{14}} \right)$$

$$= 40 (10.92052) + 617.78$$

$$= \$1054.60 = \text{trade price}$$

6) Prizes are often not "worth" as much as claimed. Compute the present value of a prize of \$5,000,000 which is to be received in equal payments over 20 years, with the first payment beginning today. Assume an interest rate of 7% over the 20 years. (10 points)

$n = 20 - 1$  - 1st payment is today.

$= 19$

$$CF = \$5,000,000 / 20 \text{ yrs} = \$250,000 \text{ payments}$$

$$PV(\text{annuity}) = CF \left( \frac{1}{r} - \frac{1}{r(1+r)^n} \right)$$

$$= 250,000 + 250,000 \left( \frac{1}{.07} - \frac{1}{.07(1.07)^{19}} \right)$$

$$= 250,000 + 2,583,898.82$$

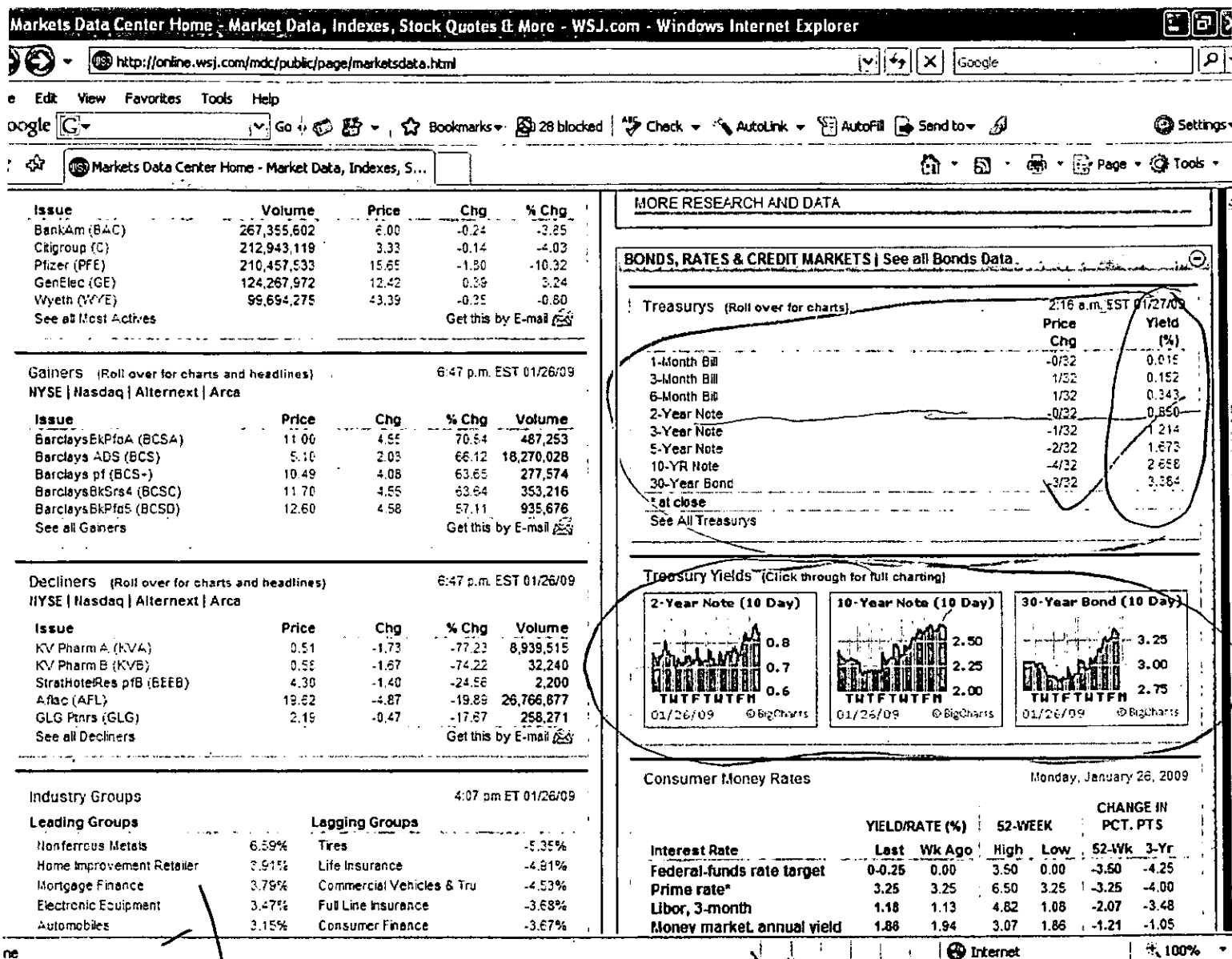
$$= \$2,833,898.82 \text{ is the present value of the } \$5,000,000 \text{ dollar prize.}$$



7) The following is taken from Monday's WSJ:

a) Highlight in the picture where you can find information about treasury yield curve. How do you characterize the shape of the latest treasury yield curve? Does this shape indicate that we are going into a recession soon?

b) What is the relationship between treasury yield and its price? What would happen to the price of treasury securities if the government decides to auction \$40 billion of 2-year T-notes next week? And explain why. (10 points)



- a) All of the treasury yields pictured (2yr, 10yr, 30yr) have ~~normal~~ upward sloping yield curves. These curves are upward sloping and indicate higher yields for longer term investments. They do not indicate we are going into a recession as recessions are indicated by downward slopes. (due to expected interest rate cuts).
- 2
- b) The higher the treasury yield, the higher ~~the~~ the price. The price of treasury securities would drop. This is because 1) Sales of securities would likely outweigh purchases with the issuance of lucrative T-bonds. 2) Because the government is attempting to lower the supply of cash, it would appear that interest

- 8) The following are the most actively traded corporate bonds as of Monday, January 26, 2009.
- Which of these bonds are called 'junk bonds'? (Hint: there are six of them)
  - Now consider the bond offered by Johnson Controls. What is the credit spread of this bond given all the information you are given so far in the exam?
  - If tomorrow S&P issues a report saying that they will change the bond rating of Johnson Controls to AA. What would happen to its yield and bond price? (10 point)

Issuer Name	Coupon	Maturity	Rating		High	Low	Last	Change	Yield %
			Moody's/S&P	Fitch					
AT&T BROADBAND	9.455%	Nov 2022	Baa2/BBB+/BBB+		116.615	112.500	116.615	5.181	7.499
BANK OF AMERICA	3.125%	Jun 2012	Aaa/AAA/AAA		103.975	103.112	103.171	-0.620	2.146
CTIGROUP	6.500%	Aug 2013	A2/A/A+		97.589	93.649	95.276	-0.619	7.749
ELECTRONICS INTL	6.250%	Nov 2014	Ba2/BB-/BB-		77.250	76.875	76.875	-0.125	11.878
GENERAL ELECTRIC CAPITAL CORP	5.625%	May 2018	Aaa/AAA/--		99.032	91.447	94.637	-1.238	6.400
GOLDMAN SACHS GP	3.250%	Jun 2012	Aaa/AAA/AAA		104.357	103.634	103.683	-0.278	2.114
HCA	6.375%	Jan 2015	Caa1/B-/CCC+		66.500	65.750	66.500	3.000	15.091
JEFFERSON SMURFIT	8.250%	Oct 2012	Caa3/CC/C		14.250	10.500	11.500	0.375	106.834
JOHNSON CONTROLS	5.250%	Jan 2011	Baa1/BBB/A-		98.265	89.250	91.000	-0.500	10.441
JPMORGAN CHASE & CO	2.625%	Dec 2010	Aaa/AAA/AAA		102.873	102.240	102.326	-0.030	1.340
PHILIP MORRIS INTL	6.875%	Mar 2014	A2/A/A+		112.831	109.822	109.822	-0.921	4.699
SMURFIT-STONE CONTAINER CORP	8.000%	Mar 2017	Caa3/CC/C		15.000	11.000	14.125	3.000	61.118
STONE CONTAINER	8.375%	Jul 2012	Caa3/CC/C		14.250	10.938	13.938	2.813	100.206
UNITED RENTALS (N.A.)	6.500%	Feb 2012	B2/BB-/BB-		84.000	79.300	80.938	-0.063	14.456
VALERO ENERGY CORP	6.625%	Jun 2037	Baa2/BBB/BBB		79.388	72.998	74.846	-2.494	9.115

- a). The bonds A-rated below BBB are junk bonds and thus provide the highest yields. These are Flextronics, HCA, Jefferson Smurfit, Smurfit-Stone, Stone Container, and United Rentals.
- b). The credit spread is the difference between its yield % and the treasury yield %. Johnson matures in 2 years (Jan 11) and should be compared w/ the 2 year treasury. The 2 year treasury yield is .85%. The credit spread, then, is  $10.44\% - .85\% = 9.59\%$  credit spread.
- c). In this event, because the bond will be viewed as less risky, the yield will decrease. When the yield decreases (and gets closer to the coupon rate) the bond, which is now trading at a discount, will increase.

9) Short questions (3 points each)

i) Explain the difference between nominal money and real money. Given an example of both type.

ii) How is inflation measured? What is the relationship between nominal interest rate, real interest rate and the rate of inflation?

- i) Real money refers to the buying power of money whereas nominal money merely refers to the amount. For example, I could offer a friend \$10 in a year (nominal) or offer to buy him \$10 <sup>change in</sup> worth of goods @ today's prices, in a year (real).
- ii) Inflation is measured by the CPI, or Consumer Price Index, which is an aggregate of the prices of common goods used in daily life. The nominal interest rate is the real interest rate multiplied by inflation.  $(1 + \text{nominal rate} = (1 + \text{real rate}) \cdot (1 + \text{inflation}))$

10) True/False (2 points each)

a) The appropriate manner of adjusting for inflationary effects is to discount nominal cash flows with real interest rates.

false

b) Projects with an NPV of zero decrease shareholders' wealth by the cost of the project.

false

c) As the opportunity cost of capital decreases, the net present value of a project increases.

true

d) Any sequence of equally spaced, level cash flows is called an annuity. An annuity is also known as a perpetuity.

false

e) The more frequent the compounding, the higher the future value, other things equal.

true

f) The principal goal of financial managers is to maximize the wealth of debt holders because debt holders are the residual claim holders of a company's assets and profit.

false

g) Prior to its maturity, the zero-coupon bond is traded at a price equal to its face value.

false