

You have the entire class period to answer these questions. You may use scrap paper, a calculator, and a writing implement. If you think certain assumptions are important in determining the answer and those assumptions are not made clear in the question, feel free to write them down, as it may affect the extent to which you receive partial credit. Total points = 100.

PART I. Answer every question in this section to receive full credit (80 points possible).

(9 pts) 1. Wheeling Savings and Loan has assets of \$100 million, which are split evenly between 8% fixed rate home mortgages due in 30 years and 7% auto loans due in 5 years. This S&L funds all of its loans with certificates of deposit that are due in 2003.

(2 pts) a. What is the maturity gap of this institution? $[(.5(30)+.5(5))- 2= 17.5-2=15.5]$

(2 pts) b. If you were a Wheeling shareholder, would you prefer to see the yield curve shift up or shift down? down (long assets would gain a lot while CDs would gain little)

(4 pts) c. Which of the following strategies could Wheeling use to protect itself from interest rate risk? (Circle ALL strategies that apply.)

1. Enter a plain vanilla swap and agree to pay floating.
2. Write a call option on Treasury securities.
3. Sell some of the mortgage loans to Fannie Mae and use the cash to make more auto loans.
4. Convince some of the CD investors to exchange their CDs for 1 year CDs.
5. Sell futures contracts on Treasury bonds.

(Note for this question, any strategy that helps should be circled. #2 would not necessarily fully protect the firm from interest rate risk, but it's better than just borrowing short and lending long.)

(6 pts) 2. Your mutual fund owns Worldcom bonds due in 2012. The bonds are rated BBB+ and trade at a YTM of 7.60%. The price is 104.79. The spread on the bond is currently 245 bp and the duration of the bond is 7.53 years. Worldcom appears to be suffering from the recession and a highly competitive environment. Hence many investors expect its rating to drop to BBB and its spread to widen by 25 bp. Should the bond suffer the events expected, while Treasuries remained unchanged, what would be the new value of each Worldcom bond in your portfolio? (Show your work for full credit.) 102.89

First, note that the coupons are semi-annual, which you always assume unless explicitly noted. .

To get the price change when rates go up by 25 bp, use the modified duration formula:

$$\% \text{ change in } P = - MD * \text{rate change}$$

$$\% \text{ change in } P = - MD * 25 \text{ bp}$$

$$MD = 7.53/(1.038) = 7.2543$$

$$[\text{New } P - 104.79]/104.79 = -7.2543 * 25 \text{ bp}$$

$$\text{New } P - 104.79 = -1.814\% * 104.79$$

$$\text{New } P = 104.79 - \$1.90 = 102.89$$

(2 pts.) 3 . True or False: A yield curve slope of more than 200 basis points is an indication that the economy is likely to go into a recession. F - an inverted yield curve means recession not a steep one (200 bp difference between long and short yields is very steep)__

(2 pts.) 4. True or False: The net present value of an interest rate swap at origination is typically zero. T- the fixed rate in a swap is typically chosen so that neither party is "expected" to gain from the contract at the time it is entered into__

(2 pts.) 5. True or False: If a prepackaged bankruptcy is unsuccessful because of lack of agreement by bondholders, the distressed firm can overcome the holdout problem by doing an exchange offer. F - bankruptcy rules make it easier to overcome a holdout problem, so leaving the courts to do an out of court exchange because of holdouts makes no sense.__

(2 pts.) 6. True or False: A conventional mortgage is a mortgage that is not guaranteed. T- mortgages guaranteed by FHA and VA are not considered part of the conventional market__

(2 pts.) 7. True or False: If housing values fall in a slow economy, most mortgages will have lower LTVs. F- LTV describes the credit risk of a mortgage, whether old or new. If housing prices fall, the Vs on the old mortgages (which are the majority) fall, and most LTVs go up.__

(2 pts.) 8. True or False: A financial institution that does little asset transformation is more likely to end up in bankruptcy than one that does a great deal of asset transformation. F- Asset transformation means selling financial products (eg. Savings accounts) that have returns that are unrelated to the FI's assets' returns. If the assets lose value, the customer does not share in the loss and the firm must have a good buffer to absorb the loss itself. If the buffer is eaten up, the FI will go bankrupt. In low AT firms, the customer absorbs the loss and the FI is unlikely to fail unless the whole product line disappears (e.g, there are no more stock mutual funds).__

(2 pts.) 9. True or False: A fallen angel is more likely to default as a result of a recession than other junk bonds because fallen angels are typically poorly run firms in mature, low-growth industries. F- Fallen angels typically just fall to the BB level. Even if they are poorly run on average, their greater equity buffer is sufficient to keep them out of default, even in a recession. But B-rated bonds are more likely to default in a recession because of their thin buffer.__

(2 pts.) 10. True or False: Most firms that default on bonds have not raised money in the bond markets in the last ten years. F-The typical "age" at default is two to three years, meaning that the firm issued a bond two or three years prior to its default (not ten or more years prior).__

(3 pts.) 11. PIMCO is interviewing two bond portfolio managers in the government bonds group. Mr. Bonds has averaged returns of 5% over the last 5 years with an average duration of 9 years. Mr. MacGwire has had a portfolio duration of 3 years over the same period and an average return of 4.8%. Which manager is PIMCO more likely to hire and why? Mr. Bonds has been running a portfolio that has three times as much risk on average as MacGwire's (as they both managed Treasuries, duration is the appropriate measure of risk). For all that risk, Bonds should have had a much higher return. Go with MacGwire instead.

(6 pts.) 12. The one year Treasury rate is currently 3% and investors expect inflation to average 2% over the next year. At the end of a year, you believe the Fed will cease its extremely easy money policy and real rates will revert to normal levels. Hence, you expect that nominal interest rates in one year will be 4%, even though inflation will drop to 1.5%. In the following year you expect inflation to rebound to 2% (same as this year) and no further change in Fed policy. What rate on a 3-year Treasury security would make you indifferent between investing in a 3 year note and rolling over a series of one-year bills? (Show your work for full credit.)

There are two parts to this question that need to be shown in detail. First, the Fisher equation to show how nominal rates are set. The first two years' nominal rates are given, but the last year's must be calculated using the Fisher equation. Once the rates are found, the second part of the question is to use the expectations theory formula.

Year	1	2	3
Inflation:	2	1.5	2
Real rate:	1	2.5	2.5 (this is what the "no change in Fed policy" means)
Nominal rate:	3	4	4.5

Using the expectations hypothesis, these beliefs are consistent with a three year rate of:

$$[1.03 * 1.04 * 1.045]^{1/3} - 1 = 1.0383$$

(4 pts.) 13. In each pair of debt instruments offered in the U.S., circle the one that has the most credit risk (assume all other features are the same and today's bond environment).

- a. A Ba1 10 year corporate bond (the rating is lower) A BBB- 10 year corporate bond
- b. Disney's 10 year bond, YTM=6.5% Time Warner's 2 year bond, YTM=6.25% (TW's spread (6.25-2.5 = 375bp) is much higher than Disney's (6.5-4.5=200 bp). You need to consider today's steep yield curve.
- c. A Safeway Baa3 rated 10-year bond, YTM=7.5% (the rating info is irrelevant; use the spread info) A Kroger 10-year bond, YTM=7%, on watch with negative implications
- d. Big Bear's senior bonds (Senior bonds are junior to bank loans because loan covenants allow them to become secured) Big Bear's bank loans

(4 pts) 14. Below are pairs of firms that are in financial distress. Circle the one in each pair of firms that is likely to spend less time in default. (Assume all other features are the same.)

- a. A firm whose workforce has shrunk over the last ten years A firm that fired its CEO (the other is likely to have PBGC claims and more likely to have an entrenched manager).
- b. A firm whose bank debt has been sold to vulture funds (vultures have an incentive to get their money back quickly whereas banks want to ignore the issue) A firm that has a syndicated bank loan still in the hands of its original bankers
- c. A firm with a holdout problem of 3% of bondholders (This is a *minor* holdout problem and means an exchange offer could be done in a month) A firm with six classes of bondholders, each of which has taken a vote showing that two-thirds of the group is in favor of the proposed haircuts
-

- d. A retailer that has a shortfall in working capital _____
A retailer with sufficient cash on hand to pay its bondholders 75% of the money owed to them. (The other retailer needs DIP financing and has to enter bankruptcy to get it, whereas this one could do an appealing exchange offer with this much cash.)

(2 pts.) 15. Name a Federal Reserve Chairman who was more dovish than Alan Greenspan.
_____ Arthur Burns or his short-lived successor, William Miller. Volcker is considered the most hawkish Fed chairman since the Great Depression, so he is not a correct answer. _____

(4 pts.) 16. Which of the following is NOT typical of the Federal Reserve under Alan Greenspan. (Circle ALL that are not typical.)

- a. The Fed targets the Federal Funds rate.
- b. The Fed most often changes policy immediately after the employment report is released.
- c. The Fed's main goal in monetary policy is to preserve the strength of the dollar in the foreign exchange markets.
- d. The Fed provides little or no indication of the bias.

(b is circled b/c the Fed pays attention to the report but makes changes mostly on FOMC days. C is just not important. On d - the Fed sometimes says a few sentences and often says nothing.)

(5 pts.) 17. A 3 year bond has a coupon of 5% (paid semi-annually) and has a yield to maturity of 4%. What is the bond's duration (show your work for full credit and report duration to the nearest hundredth of a year.) 2.826

This bond pays 25 every six months for the next three years (assuming the standard \$1000 face).

time	cash flow	Discount	PV of CF	wt	wt*time	or do PV * time
.5	2.5	$1/(1.02)$	2.45	.0238	.012	1.23
1	2.5	$1/(1.02^2)$	2.40	.0233	.023	2.40
1.5	2.5	$1/(1.02^3)$	2.36	.0230	.035	3.53
2	2.5	$1/(1.02^4)$	2.31	.0225	.045	4.62
2.5	2.5	$1/(1.02^5)$	2.26	.0220	.055	5.66
3	102.5	$1/(1.02^6)$	91.02	.8854	2.656	273.05
Sums			102.80	1.000	2.826	290.49

(8 pts.) 18. You are considering the purchase of a junior subordinated bond that matures in six months. The issuer of this bond is Junebee, a cellphone provider that will either get new financing in late April or it will be sold to a competitor. Junebee owes money to exactly three groups of creditors: it has a \$200 million senior subordinated bond due in 2007; the bonds you are considering, which have a face value of \$500 million and a coupon of 15% (paid semi-annually); and a LIBOR +3% bank loan of \$400 million, also due in 6 months. If Junebee can get its system to work well in the next several months, you and the rest of the bond market believe it will have a going-concern value of \$1.6 billion. However, investor patience is wearing thin and if they fail to make a good showing soon, their funding will dry up and they will be sold to the competitor at a price of about \$700 million. You believe there is a 96% chance that the value of the firm will be \$1.6 billion. Assuming you are not risk averse, would you prefer this investment (assuming you pay face value for the junior sub bonds) or would you prefer to invest in a six-month T-bill that has a (annualized) coupon of 4%? (Show your work for full credit and report the return at an annualized rate without compounding.) _____

Good state: Firm value = 1.6 b, implying full payment of all debt and equity =500 m

Bad state: Firm value = 700 million, implying full payment of bank loan and sr. sub debt (APR rules state this is the case and bcy courts will enforce it). So jr sub gets 100 million in bad state rather than stated face of \$500 million.

$E(r)$ on 6-month jr sub investment = $(1.075*96) + (.04*(100/500)) = 1.032 + .008 = 1.04$
4% (8% annualized) is twice what one would earn on the six month T-bill, so buy the bonds.

(4 pts) 19. A mortgage applicant has a credit score that is not high enough for automatic approval, but not so low as to receive an automatic rejection. The applicant's score is low because his TDS is high. What could the bank do to ensure that the loan is made without reducing the bank's credit standards? (Circle ALL that are reasonable.)

- a. Require a higher downpayment from the applicant by insisting he cash out some savings bonds his aunt left him.
- b. Offer a mortgage on a cheaper house.
- c. Suggest that he switch to a lower paying, but more stable job.
- d. Drop the PMI requirement so that more of his monthly payments go to the loan.

(TDS =total debt service is defined as debt payments over income, so a cheaper house or a higher downpayment means lower mortgage payments as a fraction of income. c means TDS go up more, plus he loses points for stability in the model. D means the bank has more credit risk on this mortgage than its other mortgages to similar applicants.)

(6 pts.) 20. Rank the following debt obligations in order of decreasing sensitivity to interest rates (most sensitive is number one, least sensitive is number 6):

- a. A 30 year Baa3-rated noncall life bond with semi-annual coupons of 5% 1
- b. A 5 year home equity loan with an interest rate of 9% 4
- d. A corporate bank loan with interest at LIBOR +200bp, reset semi-annually 6
- e. A 10 year bond with (semi-annual) 8% coupon payments, YTM=8% 2
- f. A 10 year bond with (semi-annual) 8% coupon payments, YTM=12% 3
- g. A 1 year zero-coupon bond 5

(Sensitivity is measured by duration for most of the instruments. The rankings of a, e, f and g are easily seen by using the duration spreadsheet program that you have. The bank loan is floating, so it has the duration of a 6 month zero. The home equity loan is amortizing so it has a lower duration than e or f for sure, but not as low as g.)

(3 pts) 21. At the last FOMC meeting on October 2, the Fed decided to lower the target rate to 2.5%. Most of the investors in the market expect the Fed to lower rates at the next meeting as well, but you believe they are wrong. Specifically, you expect the rate to remain unchanged until the risk of recession is well behind us, possibly next Summer. Which of the following actions would appear most profitable to you? (Circle ONE.)

- a. Sell the Fed Funds contract ending February 2002.
- b. Buy 10-year treasury bond options that expire in December 2001.
- c. Buy the Fed Funds contract ending October 2001.
- d. Sell the Fed Funds contract ending December 2001.

I also took (a) as an answer, because there is uncertainty as to whether the Feb contract would be available at the time you took the test. If not, then the Feb contract would be available after people realized the Fed's position and no money would be made on it. The December contract would have ended after the next meeting, is available now, and would be priced as if yields are falling, so it's something to sell short. B is a bad choice because the treasury options are not as sensitive to Fed actions as the FF contract is.

Part II. Choose two of the following three questions to answer. If you answer all three questions, only the first two will be graded. (10 points for each correct answer.)

II.1. A bank is considering a loan to Argosy Gaming with an all in spread of 5%. Argosy has a 4% chance of default. If default occurs, the bank believes it will lose 25% on the loan. In contrast, a loan to Majestic Star Casino would have an all in spread of 6%. Majestic has a 5% chance of default and if it defaults, losses will be in the range of 35%. The bank has decided it will only make one of the loans. Using the KMV framework, state which of the two loans is preferable and why. Show your work for full credit.

The KMV framework differs from the analysis we did on pricing a one-year loan in that it also takes into consideration what the variance of the returns is. So to get the whole picture of the decision, calculate both the expected return and the variance of the two loans.

$$E(r) = \text{All in spread} - \text{expected loss}$$

$$\text{Variance} = (p * (1-p))^{1/2} * \text{loss given default}$$

Argosy:	$E(r) = 5\% - (.04 * 25)$	$=$	4%
Majestic:	$E(r) = 6\% - (.05 * 35)$	$=$	4.25%

If you were completely indifferent to the risk, you would choose Majestic. But KMV says to consider the risk as well.

Argosy:	$(.96 * .04)^{1/2} * 25$	$=$.049
Majestic:	$(.95 * .05)^{1/2} * 35$	$=$.0763

The Majestic loan has a lot more risk and not much more return. You were not expected to calculate a Sharpe ratio, as I did not mention that in class, but that is also a way to think about the risk return tradeoff,

Argosy:	$4 / .049$	$=$.82
Majestic:	$4.25 / .0763$	$=$.56

Majestic has a much lower Sharpe ratio, so it is not a good choice. As they are in the same industry, the added diversification and correlation with other loans in the portfolio is not an important factor.

II.2. Ideal Bank has \$500 million in assets, all of which have a duration of 7 years. The assets are funded largely with deposits, which have a duration of 2 years. Equity on the balance sheet currently totals \$35 million. Treasury put options are available on Treasury bonds that have a duration of 8.1 years and trade at par. The option has a delta of .4. If Ideal Bank wanted to completely insulate itself from interest rate risk, what would it do? (Be precise as possible in your answer.)

Assets	Liabilities
500m. , D=7	465 m deposits, D=2
	35 m Equity
500 m	500 m

First calculate LADG: $LADG = 7 - [(465/500)*2] = 5.14$

Potential loss of equity is interest rate change times LADG * A = $-5.14 * 500 = -2570$

Set this potential loss equal to potential gain in option market:

$$5.14 * 500m = N_p * B * \text{delta} * D_B = N_p * B * .4 * 8.1$$

$$5.14 * 500m / (3.24) = N_p * B$$

$$793.21 \text{ m.} = N_p * B$$

As I did not state in the problem what B is, you should pick a reasonable number, like \$100,000.

No points were taken off for picking odd face values (some picked \$1 million others \$1000,

no one picked 793.21 m)

Assuming B=\$100,000, then you should buy 7932 contracts (you can't but .1 contract, so round down).

II.3. A Treasury bond has 6 years remaining until maturity and has a 6% coupon (paid semi-annually). The bond has a YTM of 5%. It sells for a price of \$105.13. The bond's duration is 5.15 years. Show all work for full credit.

(5 pts) a. Calculate the bond's convexity factor. 30.2

(3 pts) b. If the YTM goes to 4%, the bond price will change. Show the new price using duration as a method of approximating the change. \$110.41

(2 pts) c. Redo your answer to (b) using both duration and convexity in the approximation. \$110.59

Time in Half Years	Coupon	Half YTM	Power	Discount Factor	Present Value of C	time *	time*(time+1) * PV of C
1	3	1.025	1	1.025	2.9268293	2.926829	5.853658537
2	3	1.025	2	1.050625	2.8554432	5.710886	17.13265913
3	3	1.025	3	1.076891	2.7857982	8.357395	33.42957879
4	3	1.025	4	1.103813	2.7178519	10.87141	54.35703869
5	3	1.025	5	1.131408	2.6515629	13.25781	79.54688588
6	3	1.025	6	1.159693	2.5868906	15.52134	108.6494051
7	3	1.025	7	1.188686	2.5237957	17.66657	141.3325595
8	3	1.025	8	1.218403	2.4622397	19.69792	177.2812593
9	3	1.025	9	1.248863	2.4021851	21.61967	216.1966577
10	3	1.025	10	1.280085	2.3435952	23.43595	257.7954726
11	3	1.025	11	1.312087	2.2864343	25.15078	301.8093337
12	103	1.025	12	1.344889	76.586256	919.0351	11947.45596
				Sums	105.12888	1083.252	13340.84047
				Price		105.1289	
				Duration		5.152017	
				Modified D		5.026358	
				Convexity		30.19628	

$$\% \text{ change in } P = -MD * \text{change in } R$$

$$MD = 5.15/1.025 = 5.024$$

$$\text{New } P - 105.13 = (-5.024 * -1\%) * 105.13$$

$$\text{New } P - 105.13 = 5.28$$

$$\text{New } P = 110.41$$

Using CX as well:

$$(\text{New } P - 105.13)/105.13 = (-5.024 * -.01) + [.5 * 30.2 * (.01)^2]$$

$$\text{New } P - 105.13 = [.05024 + .001515] * 105.13 = 5.18\% * 105.13 = \$5.46$$

$$\text{New } P = 105.13 + 5.46 = 110.59$$