

**Boston College, MF 820
Spring 2008
Professor Strahan
Midterm Exam**

Name: _____ (1 point)

Write all answers on the exam. You may use the back of pages if necessary. The exam has 100 points. You are allowed a 1-page 'cheat' sheet. Calculators are permitted, but not computers. There are 9 pages (some are blank); please verify this! Please read all of the questions carefully! You have 2.5 hours. Be brief, but show all relevant calculations (partial credit will be assigned). Your answers must be legible. Good Luck!

True, False, Uncertain. (7 points each)

Explain why the following statements are true, false, or uncertain. Your grade depends on the clarity, coherence and correctness of your answer.

1. Prosper.com's lending groups help reduce adverse selection problems.

T. The lending group leaders act as gatekeepers to screen out bad borrowers, which should help reduce adverse selection some. And, the groups themselves get rated based on defaults, thus helping reduce the asymmetry of information about risk between borrowers and lenders. Lending groups also may mitigate moral hazard by generating some pressure (e.g. social pressure) on members to pay.

2. Although they produce different products, financial institutions perform similar functions for their customers.

T. Institutions produce different products but they all to some degree offer financial contracting (e.g. lending, leasing, underwriting), liquidity production (e.g. deposit taking, securitization, credit lines, making markets in derivatives) and risk management services (e.g. diversification, insurance of various types, letters of credit).

3. Demand deposits behave like long-term liabilities for interest rate risk purposes because the interest rate is fixed at zero.

U. The key thing to understand is that even though the rate paid on a demand deposit is zero, customers may withdraw funds if rates rise, and those fund would need to be replaced by liabilities paying market rates. Whether or not demand deposits are long or short term w.r.t. interest rates depends on customer behavior. If customers (such as large corporate deposits) are very sensitive to market rates and withdraw funds if rates rise, then these deposits are like very short-duration liabilities. If customers (such as unsophisticated retail depositors) are very

insensitive to market rate and will not withdraw funds very much when rates rise, then it is true that these deposits would act like long-term liabilities.

4. If the duration of a bank's assets and liabilities are equal, then the duration of net worth equals the duration of assets.

$$T. D^{nw} = D^A (A/NW) - D^L(L/NW)$$

If $D^A = D^L$ then the following holds:

$$\begin{aligned} D^{nw} &= D^A (A/NW) - D^A(L/NW) \\ &= D^A [(A/NW) - (L/NW)] = (D^A / NW) [(A - L)] = D^A \end{aligned}$$

5. Due to the rise of the syndicated lending market, bank balance sheets are increasingly dominated by loans to businesses.

F. Syndicated lending has been rising, in part as a reaction to the growth of the bond market, but bank balance sheets are less and less devoted to business lending. As shown in lecture notes 2, the share of bank assets in business loans has fallen from 21% to 11% between 1980 and 2006.

Longer Questions

1. Imagine that you are managing a trading portfolio with 50,000 shares of Deutsche Telecom (DT). The current price is 13 Euros per share. The standard deviation of the daily return on DT estimated over the past 3 months is 2.5 percent.

A. Use delta normal to compute the 1-day, 99% VAR from the perspective of a German Bank (i.e. in Euros). (5 points)

$$\text{VAR} = 2.33 * 50,000 * 13 * 0.025 = \mathbf{37,862 \text{ Euros}}$$

This is equal to VAR in dollars of $37,862 * 1.4 = \mathbf{\$53,000}$

B. The \$/Euro exchange rate is currently 1.4 (that is $\$1.4 = 1 \text{ Euros}$), and the standard deviation of the percentage change in the exchange rate is 1% per day, again using the past 3 months of data. Also, the correlation between the percentage change in the exchange rate and the return on DT is estimated to be equal to 0.5. Use delta normal to compute the 1-day, 99% VAR for the same trading portfolio from the perspective of a US bank (i.e. in US dollars). (10 points)

We need to compute the VAR from the exchange rate risk:

$$\text{VAR}^e = 2.33 * (50,000 * 13) * 1.4 * 0.01 = \mathbf{\$21,200}$$

The total VAR = $(53,000^2 + 21,200^2 + 2*0.5*53,000*21,200)^{0.5} = \$66,206$

2. Consider the following disclosure made by USBank about its market risk in its recent Annual Report:

“Market risk is the exposure to an adverse change in market prices or rates. The bank had the following exposures:

Trading VAR by risk type (millions of dollars):

	2006		
	<u>Avg.</u>	<u>Min</u>	<u>Max</u>
Foreign exchange	22	14	42
Equity	56	34	95
Fixed income	31	18	50
Commodities	45	22	129
Portfolio Effects	(70)	-	-
Total	84	55	137

a) What else must the bank disclosure for these figures to be meaningful for shareholders? (5 points)

Confidence level
Holding period

VAR numbers are meaningless without these two pieces of information.

b) State two reasons why the min and max VAR may be so different from each other. (5 points)

The volatility of the risk factors may vary a lot over time
The position sizes may vary a lot over time

3. You are in charge of the risk management division at Hacks, Inc. Hacks’ assets consist of investments worth \$30 million today in 3-year zero-coupon bonds (so \$30 million is a present value). Hack’s liabilities consist of a \$26 million zero-coupon CD due in 10 years (again, \$26 is the present value). The term structure of interest rates is flat at 5%. Assume that all shifts in the term structure are parallel.

a. What is the Modified duration of Hacks’ assets and liabilities? (3 points)

Asset duration = 3; liability duration = 10

Asset modified duration = 2.86; liability modified duration = 9.52

b. Hacks thinks that interest rates may rise to 5.5%. Compute the exact change in the value of Hacks' assets and compare this with the approximate change using duration. (5 points)

$$\text{Exact change} = 30 \cdot 1.05^3 / 1.055^3 - 30 = -\$0.425$$
$$\text{Approximate change} = -2.86 \cdot 30 \cdot 0.005 = -\$0.429$$

c. Consider the net worth of Hacks [$NW = PV(A) - PV(L)$]. What is the modified duration of net worth? What is the duration-approximated change in net worth from an increase in rates from 5% to 5.5%? (7 points)

$$\text{Duration of net worth} = 2.86(30/4) - 9.52(26/4) = -40.48$$
$$\text{Change in NW} = -(-40.48) \cdot 4 \cdot 0.005 = \$0.81$$

d. Hacks wants to duration hedge its net worth using a 2-year interest rate swap. The payments are swapped at the end of each year, so there are 2 net payments, one in 1 year's time and a second in two year's time. The floating rate resets at the end of the first year. Compute the notional principal of the swap needed for Hacks to be duration hedged, and be sure to say whether Hacks is receiving the fixed rate side of the swap or the floating rate side. (10 points)

We need a hedge that will decrease in value by \$0.81 to be hedged. Since our underlying portfolio has relative long-term liabilities, we will need to receive the fixed rate payment and pay the float rate payment.

$$\text{Mod. Duration of float rate side} = 1 / 1.05 = .952$$
$$\text{Mod. Duration of fixed side} = [1 \cdot (0.05/1.05) + 2 \cdot (1.05/1.05^2)] / 1.05 = 1.859$$

$$\text{So Change in swap} = (1.859 - 0.952) \cdot NP \cdot 0.005 = \$0.81$$

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$$\mathbf{NP = \$178.4 \text{ million}}$$

Again, we **receive fixed, pay float** on this swap. The NP is huge because the swap is very short and we are hedge a very unbalanced position in our underlying assets and liabilities.

4. Consider the following two syndication strategies for a \$3.3 billion loan:

	<u>Number</u>	<u>Underwritten Amount</u>	<u>Individual S/U Amount</u>	<u>Individual Allocation</u>
Lead Bank	1	\$3,300	-	\$300
Sub-Underwriters	0			
Participants	20			\$150

	<u>Number</u>	<u>Underwritten Amount</u>	<u>Individual S/U Amount</u>	<u>Individual Allocation</u>
Lead Bank	1	\$3,300	\$660	\$300
Sub-Underwriters	4		\$660	\$300
Participants	9			\$200

Briefly compare the risks and rewards from the lead bank's perspective of these two structures. (7 points)

Credit risks: The lead holds the same final share in either structure; hence the risks and rewards are the same for credit risk.

Underwriter risks: The first structure has very high underwriter risk for the lead bank - basically all of this risk resides with the lead. If they can't place the loan with other banks, they will have to fund it themselves. (Or, they may have to sell off pieces to other banks at a discount, which is costly to the lead.) The second structure allows the lead to lay off 80% of the underwriter risk to the sub-underwriters. The rewards are naturally also higher under the first structure since the lead will keep 100% of the commitment fee, whereas in the second structure a large fraction of the fees will be paid to the 4 sub-underwriters. As usual, with greater risk comes greater potential reward!

Do you think the borrower would care about which structure the lead bank chooses to syndicate this loan? Explain briefly (7 points)

The borrower will not care in terms of the pricing, but they may care for several other reasons. First, it may be that the deal is more likely to close successfully with the second structure, particularly if the borrower has relationships with the S/U banks as in the case we studied in class. Second, the structure with S/U banks has a more concentrated syndicate, which is likely good for the borrower because it makes renegotiation easier down the road. Third, the borrower may prefer fewer banks to limit release of sensitive information about their firm/project.