

**Second Test, Spring 2000  
with answers**

1. (8 points) Suppose these three Treasury issues currently (4/19/00) trade at these prices:

	<b>Issue</b>	<b>Coupon</b>	<b>Bid</b>	<b>Ask</b>
Feb 05 note	7½	105:08	105:10	
Feb 05-10	11¾	122:30	123:04	
Feb 05 np	0	74:12	74:15	

All three mature on the 15<sup>th</sup>, and Feb 05-10 becomes callable at par on 2/15/05. Is there an arbitrage here? If yes, what does your arbitrage argument depend on, and if no, why not?

*If the callable costs more than an otherwise identical bond that matures on 2/15/05, then there is an arbitrage in selling the callable and buying the other. This argument depends on the government calling the bond if the market price is above par.*

*Buy the synthetic:  $(11.75/7.5)(105+10/32) + (1-11.75/7.5)(74+12/32) = 122.8438$   
Sell the callable:  $122+30/32 = 122.9375$*

*There is a small arbitrage profit. Other concerns we would have about capturing this profit are that the callable could be on special, or go on special, and that the price difference goes the wrong way in the short run.*

2. (8 points) “Allowing insiders to trade boosts trading, and thereby increases liquidity, so we should stop criminalizing and start encouraging this activity.” Comment on this statement carefully.

*Market makers defend against the probability of trading against insiders by increasing their spreads. An increase in the probability would cause wider spreads, thereby decreasing liquidity.*

3. (8 points) You and some classmates decide to enter private equity by starting the Wharton VC fund, and your pitch to potential limited partners is that your fund dominates those of existing VC firms because of your connections to other new Wharton grads. How might the potential LP’s respond?

*This VC fund would be at a competitive disadvantage in fund-raising because of the incentive problem with harvesting – the success of these investments will be all the partners have to raise their next fund with, encouraging them to go public sooner than optimal. We saw evidence of this dynamic having a major effect.*

4. Everybody is risk-neutral, and the risk-free rate is 0%. There are prime and sub-prime consumers, and if you, the owner-entrepreneur, invest \$100M in a portfolio

of consumer receivables, then they payoffs of that portfolio, at current market prices, depend on the type of consumer, and whether there is Depression (D) or Prosperity (P) which each have probability  $\frac{1}{2}$ :

	Depression	Prosperity
Subprime	\$0M	\$180M
Prime	\$90M	\$120M

- a. (5 points) Suppose you have no way to commit to which type of consumer you invest in. Does it work to finance with \$80M face value of debt (and paying the rest of the \$100M yourself)?

*With 80 in Debt, your payoffs would be*

	Depression	Prosperity	$E[\text{payment}]$
Subprime	\$0M	\$100M	\$50M
Prime	\$10M	\$40M	\$25M

*So you would choose Subprime, so the debt would sell for its expected payment of  $0/2 + \$80M/2 = \$40M$ . You would have to pay in the remaining \$60M, so you would lose in expectation ( $\$60M > \$50M$ ). So it doesn't work.*

- b. (5 points) Suppose that, right after you choose the portfolio, it can be liquidated for 50 cents on the dollar (i.e. for \$50M). If creditors can observe the type of consumer you choose and you give them the right to liquidate right after you choose, is it now possible to finance with \$80M face value of debt?

*If investors see you invest in Subprime, they would calculate*

*Payoff if liquidate: \$50M*

*Payoff if no liquidation: \$40M, so liquidate, you get nothing*

*If they see you invest in Prime, they would calculate*

*Payoff if liquidate: \$50M*

*Payoff if no liquidation: \$80M (always at least \$80M if you invest in Prime)*

*So no liquidation, you get \$25M*

*So investors recognize that you'll choose Prime, so the debt is worth 80, so you pay in 20 for an expected net profit of  $\$25M - \$20M = \$5M$ .*

5. (8 points) An insurance company holds a \$100M portfolio of BBB-rated bonds. Because of ratings-based capital requirements, they would rather hold \$100M- $x$  of AAA-rated bonds and \$ $x$  of B-rated bonds, where  $x$  is as small as possible. But they still want to get the returns they would get from the portfolio of BBB-rated bonds. How, generally speaking, could an investment bank help out?

*Propose this: put the BBB bonds in a trust that issues a senior and a subordinated claim back to the insurance company. The senior claim will have a higher rating, and the subordinated claim will have a lower rating. With enough subordination, the senior claim will be AAA, and no matter how you slice it the insurance company gets the same returns.*

6. (9 points) Here's a picture from the 4/17/00 *Wall Street Journal*, showing the path of the Dow-Jones Industrial Average on 4/14/00. To an opportunistic investor, this path represented – in expectation - an opportunity to
- A) Buy Small-Cap mutual funds at a bargain on 4/14
  - B) Sell Small-Cap mutual funds at a bargain on 4/14
  - C) Buy Small-Cap mutual funds at a bargain on 4/17
  - D) Sell Small-Cap mutual funds at a bargain on 4/17
  - E) None of the above

Which answer is best? Justify your choice, and disregard what actually transpired on 4/17; the perspective of this question is that of an investor who is deciding, during the trading hours of 4/14, whether to submit an order to a mutual fund company before the 4/14 close (i.e. 4PM), in which case he'll get the 4/14 mutual fund price, or after the 4/14 close, in which case he'll get the 4/17 mutual fund price.

*The graph showed a steep decline at the end of the day. The last trades of illiquid stocks will have been some time during this decline, so they will be relatively high compared to their true value as of 4PM. So the answer is B.*

7. A company, now worth \$95MM, has a \$120MM face-value bond maturing soon, held in \$20MM blocks by six institutional investors. So the company is facing bankruptcy, which it wants to avoid because it would be worth only \$60MM in bankruptcy. Suppose the company makes a voluntary exchange offer: exchange your 1/6 claim on the existing bond for a 1/6 claim on a bond with face value \$90MM.

a. (6 points) Show that everybody would win if the offer succeeded, but the offer won't succeed.

*If 5 of the 6 investors exchange, there will be  $(5)(15)+20=95$  in debt, so the company will be solvent. The one who didn't exchange will get 20, and the rest will get 15. Everybody will want to be the one who doesn't exchange, so the offer will fail, and they will each get  $60/6 = 10$  in bankruptcy.*

b. (3 points) How could you modify the offer to increase the chance of success?

*One way is a minimum participation requirement – in this case, that would have to be that the offer is good only if all six tender. Another way is prepackaged bankruptcy – when you exchange, you vote to approve the exchange in bankruptcy. If you don't get all six exchanging, go into bankruptcy just to get the exchange forced on everybody. This presumes, though, that the value doesn't go down to 60 in bankruptcy if you go there for just a moment. A third way is a coercive offer.*

8. We've seen strategies for constructing claims on securitizations such that, over a range of possible outcomes, there is no variation of the payments to the claim. Briefly outline each strategy, and characterize what happens to the claims' cash flows for outcomes *outside* the range where there is no variation.

a. (5 points) PAC bond

*Calculate the principal payments that come in if the prepayment speed is  $X$  and if the prepayment speed is  $Y > X$ . The area under both these lines is the scheduled payment to the PAC bond, and it will come in exactly on schedule if the speed is between  $X$  and  $Y$ . If the speed is higher, the companion bond will be paid down too quickly and once it is, all principal goes to the PAC so it gets some earlier payment. If the speed is lower there just won't be enough principal in some early months to pay the scheduled amount, so the PAC bond's payments will be delayed somewhat.*

b. (5 points) Soft-bullet

*There is a scheduled principal payment date, and the time until then is divided into the Revolving period and the Accumulation period. During the Revolving period the trust remains invested by investing back out the principal that came in into new receivables. During the Accumulation period the trust self-liquidates by no longer investing back out. As long as the Accumulation period is long enough that enough principal pays back to repay note holders their face value, then note holders get all their principal on exactly the scheduled date. If principal payment is slower, they'll get whatever is there on the repayment date, and wait for the rest. There is also the possibility of Early Amortization during the Revolving period – the trust stops reinvesting and starts paying out, generally because of a decline in the receivables' quality.*

9. (10 points) An all-equity company with 7M shares trades at \$8/share. Design a rights offering that would raise \$10M cash for the company, and show that it would work.

*Here's one: for each share you get a right to buy another for  $\$10M/7M = \$1.4286$ . Will everyone exercise? If  $n$  have exercised, the value of the company per share is*

$$\begin{aligned} [56M + (10/7)n]/[7M+n] &= [10M + (10/7)n]/[7M+n] + [46M]/[7M+n] \\ &= 10/7 + [46M]/[7M+n] > 10/7 \end{aligned}$$

*So you exercise for 10/7.*