

**FUNDING INVESTMENTS
FINANCE 238/738, D. Musto
FIRST TEST, 10/19/06
80 MINUTES / 80 POINTS**

WRITE ALL ANSWERS ON THIS TEST
SHOW ALL YOUR WORK
ANSWER ONLY ON THE FRONT, NOT THE BACK
USE A BLUE BOOK FOR SCRATCH PAPER

Your Name: _____

Your Section: _____

GRADERS WILL NOT READ THE BACK OF THIS PAGE

1. A stock currently trades for 35. In one period it will be 50 or 20, each with probability $\frac{1}{2}$. If it is 50 one period from now, then it will be either 70 or 35 one period after that (i.e. two periods from now) each with probability $\frac{1}{2}$, and if it is 20 one period from now, then it will be either 35 or 10 one period after that, each with probability $\frac{1}{2}$. The one-period risk-free rate is 5% (and will be next period, too).
 - a. You are replicating a European put option on this stock, expiring in two periods, with strike price 25. How many shares of the stock do you buy today, when it trades for 35, and what adjustment will you make to your position in the stock if it goes to 50 in one period? What if it goes to 20 in one period?

The option is worthless at the \$50 dollar node, so $n=0$ at that node.

At the period 1, \$20 node, then the option can expire either worthlessly should the stock reach 35 or at \$15. Therefore, the hedge ratio at the \$20 period 1 node is,

$$\begin{aligned}35n_1 + 1.05B_1 &= 0 \\10n_1 + 1.05B_1 &= 15\end{aligned}$$

This implies that $n_1 = -0.6$. Plug that back in, we get $10(-0.6) + 1.05B_1 = 15$, so $B_1 = 21/1.05 = 20$, so the option value is $(-0.6)(20) + 20 = 8$

With this in mind, the initial synthetic relation is given by,

$$\begin{aligned}50n + 1.05B &= 0 \\20n + 1.05B &= 8\end{aligned}$$

This implies that the initial hedge ratio is $n = -8/30 = -0.267$

GRADERS WILL NOT READ THE BACK OF THIS PAGE

- b. At the time of the market crash of 10/19/87, many investors held “portfolio insurance,” which was essentially a put option on the market (e.g., if you invest 1000 then your portfolio could go up with the market but would not fall below 900). Some commentators blame much of the crash on portfolio insurance. For example, the *San Francisco Chronicle* states that “it entailed computer-generated orders to hedge the portfolios by selling stocks and stock index futures in precisely determined volumes when stock prices moved down. But during the 1987 crash, the strategy failed. The market fell so far so fast that the computers began issuing sell orders in volumes too great for the market to handle.” Considering your answer to part a, do you agree or disagree with the proposition that a large amount of portfolio insurance would exacerbate, rather than counteract, a downturn in the market?

As stocks drop, the delta of a put option written on those stocks becomes more negative. Therefore, to keep his dynamic replication going, the protection writer must sell more stocks. If the amount of protection written is large enough, then the rehedging action itself feeds into the price fall.

GRADERS WILL NOT READ THE BACK OF THIS PAGE

2. This is from a press release dated last Friday:

HEADLINE: Majority of Holders of Metaldyne 11% Senior Subordinated Notes Due 2012 Announce Execution of Lockup Agreement

On September 1, 2006, Metaldyne Corporation (the "Company") announced that it has agreed to be acquired by Asahi Tec Corporation in a cashout merger (the "Transaction"). The Media Release accompanying that announcement indicated that the Company would seek necessary "consents and waivers" for the Transaction from the holders of the Company's 11% Senior Subordinated Notes due 2012 (the "11% Notes"). On October 4, 2006, the Company filed a Form 8-K, in which it indicated that the Company and Asahi Tec Corporation were in discussions regarding whether a tender offer for the Company's Senior Subordinated Notes "should be pursued on the previously contemplated basis or at all in connection with the (Transaction)."

A group of holders of a majority of the Company's 11% Notes, represented by the law firm of Brown Rudnick Berlack Israels LLP, has entered into an agreement (the "Lockup Agreement") relating to any tender offer or consent solicitation that may be proposed by the Company in respect of the 11% Notes. As of October 12, 2006, the signatories to the Lockup Agreement (the "Signatories") hold an aggregate of \$141,425,000 in 11% Notes--in excess of a majority of the \$250,000,000 in outstanding 11% Notes.

The Lockup Agreement generally provides that the Signatories will not tender the 11% Notes nor provide any requested consent absent the express supermajority written agreement of the Signatories. Pursuant to the Lockup Agreement, a supermajority agreement requires 90% in principal amount of the 11% Notes held by the Signatories, and at least 2/3 in number of Signatories. In addition, if a supermajority of Signatories determines to accept a tender or provide consents, each one of the Signatories will be required to tender or provide consents in accordance with that determination.

- a. The bondholders have opted for this collective action over choosing their own individual best courses of action. Does this seem wise? Why or why not? Explain.

This is wise. A collective action decision eliminates the coordination problem between offerees. As such, the sub note holders can extract a better tender price.

GRADERS WILL NOT READ THE BACK OF THIS PAGE

- b. Suppose this merger creates \$1 Billion in value. Can these bondholders extract most of that by withholding their consents? What else is relevant?

Since the tendering of the sub-notes is crucial to the merger, these bondholders can extract a fair amount of value. The ceiling is set by any call feature or defeasance clause in the original offering. If the company can call the bond at some price, then the bondholders cannot extract a tender price higher than the call premium.

Note: the merger candidate is not in bankruptcy. Do not assume, as some of you did, that is a workout. There is no evidence from the text that the Company is in distress. Therefore, cram downs and subordination preferences do not apply.

As a further note, there is nothing inherently impossible about offering the bondholders a tender price above par (as some of you thought).

GRADERS WILL NOT READ THE BACK OF THIS PAGE

3. This is from a *Daily Deal* article last Thursday:

Bankrupt landscape nursery operator Thompson & Walters Nursery LLC will sell its assets for at least \$10.8 million.

The day before the Cornelius, Ore.-based company filed for Chapter 11 with the U.S. Bankruptcy Court for the District of Oregon in Portland on Thursday, Oct. 5, it signed a letter of intent to sell its withering nursery production and brokerage business to Judkins Nursery Inc.

The sale is subject to higher bidders in a bankruptcy court auction, which Judkins will enter as the stalking horse.

An auction date hasn't been set, but the letter of intent requires the sale to be closed by Nov. 20 so the winning bidder will have time to prepare for the spring ordering season, court filings said.

Should Judkins be outbid at the auction, it will receive 2% of the final purchase price as a breakup fee, court papers show.

What is going on here? Why might this nursery, which was not in bankruptcy, have gone *into* bankruptcy to effect a sale it had already arranged?

Upon filing for Chapter 11, Cornelius can affect an asset sale such that the assets being sold are free and clear of any lien attachment. Judkins, should it be the winner, will walk away with the assets knowing there are no hidden liabilities.

The breakup fee is a premium to compensate Judkins for effectively setting a firm floor price for the auction.

Had the asset sale being made prior to bankruptcy and Cornelius subsequently files for Chapter 7 and 11, a fraudulent conveyance issue may arise the adjudication of which may reverse the asset transfer.

GRADERS WILL NOT READ THE BACK OF THIS PAGE

4. In the Treasury-price listings from last Friday's *Wall Street Journal* we see an 11¾% bond maturing 11/15/2014, which is callable at par on every coupon date starting 11/15/2009. This is the first bond listed here. We also see a couple bonds maturing on one of these coupon dates, 5/15/2013:

<u>Coupon</u>	<u>Maturity</u>	<u>Bid</u>	<u>Asked</u>
11.750	11/15/09-14	119:26	119:27
3.625	5/15/13	93:21	93:22
0.000	5/15/13	73:09	73:10

- a. Is the callable bond selling for more or less than a synthetic bond with the same coupon, maturing 5/15/13?

Building the short synthetic:

Buy (11.75/3.625) of the 3.625, costs (11.75/3.65)(93+22/32) = 303.6767

Short (1-11.75/3.625) of the 0, costs (1-11.75/3.625)(73+9/32) = -164.2510

*Total is 303.6767-164.2510 = **139.4256***

*Callable costs 119+27/32 = **119.8438**, much less*

GRADERS WILL NOT READ THE BACK OF THIS PAGE

- b. Whether or not the callable is in fact trading for more than the synthetic, would there be an arbitrage opportunity if it were? Why or why not? Be precise.

Yes there is an arbitrage, because you could pocket the difference today, and as long as the Treasury uses its call optimally, you won't have to pay money out later, because

If the Treasury calls the callable on 5/13, future cash flows are the same

If the Treasury calls the callable on an earlier call date, the synthetic must be trading for at least 100, because otherwise the Treasury would have been better off not calling the callable, and instead buying the synthetic and paying off the callable with its cash flows, and calling on 5/13.

If the Treasury has not called the callable by 5/13, it must not be trading for more than 100 because if it were, the Treasury would profit by selling an identical security at that premium price, and calling the callable out of the proceeds, keeping the remainder as profit.

GRADERS WILL NOT READ THE BACK OF THIS PAGE

5. You are the owner/manager of a firm with two projects to choose from, projects A and B. Both projects cost 100, and their payoffs in one year depend on whether there is depression (*D*) or prosperity (*P*), each of which has probability $\frac{1}{2}$:

<i>Project</i>	<i>Payoff in D</i>	<i>Payoff in P</i>
<i>A</i>	80	140
<i>B</i>	60	155

You want to raise money by issuing debt, to be paid out of the payoff of the project you choose, and you cannot commit to which project you will choose. You pay out of your pocket whatever the debt sale does not raise (i.e. 100 minus the sale price of the debt), and you get whatever is not paid to debt out of the payoff. Everybody is risk-neutral, and the discount rate is 0.

- a. What is your expected net profit if you finance by selling debt with face value 70?

From the equity owner's point of view:

<i>Project</i>	<i>Payoff in D</i>	<i>Payoff in P</i>	<i>Expectation</i>
<i>A</i>	10	70	40
<i>B</i>	0	85	42.5

Since $42.5 > 40$, the equity manager would choose B. Knowing this, the bond investor demands a price of \$65 $[(60+70)/2]$ for the bond with the notional of \$70.

This means that the equity manager must self finance \$35 instead of \$30 and undertake Project B. His net expected profit is $42.5-35 = 7.5$

GRADERS WILL NOT READ THE BACK OF THIS PAGE

- b. Is your net profit higher or lower if you instead finance by selling debt with face value 70, convertible into 1/2 of the firm's equity (so that, if they want to, debt holders can decide after observing the payoff whether to exchange their debt claim for 1/2 the payoff)?

From the bondholder's view

<i>Project</i>	<i>Payoff in D</i>	<i>Payoff in P</i>	<i>Expectation</i>
<i>A</i>	<i>70</i>	<i>70</i>	<i>70</i>
<i>B</i>	<i>60</i>	<i>77.5</i>	<i>68.75</i>

From the manager's point of view

<i>Project</i>	<i>Payoff in D</i>	<i>Payoff in P</i>	<i>Expectation</i>
<i>A</i>	<i>10</i>	<i>70</i>	<i>40</i>
<i>B</i>	<i>0</i>	<i>77.5</i>	<i>38.75</i>

*Since the manager can no longer do better by picking B, he will pick A. The investor is then comfortable with buying the debt at par. This nets the investor a profit of **\$10**.*

GRADERS WILL NOT READ THE BACK OF THIS PAGE

6. Tom is making a market in Amazon stock. He posts a bid and an ask at which he will honor the next request to sell or buy 1 share. Amazon will be 32.3 or 32.9 tomorrow, depending on whether their 3rd-quarter earnings report is negative or positive. Tom puts ½ probability on each outcome, but he knows that 40% of trades come from investors who have already seen the report, and therefore already know the outcome, and who trade to make money, whereas the other 60% come from investors whose information is the same as Tom's, and who trade either for liquidity reasons, or because they think they're informed even though they actually aren't.
- a. Assuming competition forces Tom to just break even in expectation, what bid and ask does he post?

$$\begin{aligned} 0.4(B - 32.3) + 0.6(B - 32.6) &= 0 & \text{Implies Bid} &= \mathbf{32.48} \\ 0.4(32.9 - A) + 0.6(32.6 - A) &= 0 & \text{Implies Ask} &= 32.72 \end{aligned}$$

- b. Jerry buys order flow from brokerages. That is, he pays a brokerage to send him trades, which he executes at the prices currently quoted by Tom. Jerry knows that the brokerage customers of I*TRADE place orders for Amazon stock that are completely unrelated to whether Amazon subsequently goes up or down. How much would Jerry be willing to pay per share for this order flow? (*don't worry here about the effect of Jerry's purchase on Tom's quotes*)

$$\text{The spread is } 32.72 - 32.6 = \mathbf{0.12}$$

Note: 0.24 per share or 32.6 per share is not the right answer for full credit. The question explicitly asks for "pay per share for this order flow"

GRADERS WILL NOT READ THE BACK OF THIS PAGE

7. This past Tuesday, Bloomberg ran this item:

Lowest Repo Rate as of 10 a.m. New York time:

The 10-year note, a 4 7/8 percent coupon maturing in August 2016, closed with the lowest repo rate: 4.5 percent, up from 4.4 percent.

Most other Treasury securities were reported to have repo rates of 5.25%.

- a. What is the significance of this note's repo rate for those with long and short positions in it?

This repo rate makes it cheaper to go long and more expensive to go short.

- b. In Tuesday's *Wall Street Journal* we see that this note, the current 10-year, is trading with a yield of 4.77%, whereas the old 10-year, maturing May 2016, is trading with a yield of 4.78%. What could explain this? And is the repo rate relevant to trying to profit from it?

What could explain this is the premium that on-the-run bonds generally trade at, due to their higher liquidity. The trade would be to sell the on-the-run, buy the off-the-run, and wait for them to be both off the run, when the premium will be gone. The repo rate is relevant because it increases the cost of shorting the on-the-run, and considering this is a small premium, the profit could easily be wiped out.

GRADERS WILL NOT READ THE BACK OF THIS PAGE

8. You want to sell a security today to investors with a 1-year horizon: they want to cash out of the security in a year at fixed price. However, you don't want to redeem the security in a year. What security designs would allow you to argue to investors that they will be able to cash out at a fixed price in a year, even though you will not redeem it or otherwise buy it back? What risks do these designs entail?

We have seen several security designs that deliver some amount of confidence that the security price will be at or around a particular number on a date in the future. We have seen

-floating-rate notes, which will generally trade around par on the dates their coupons reset to the new n-month rate, but if the spread over LIBOR is no longer the market spread for that issuer, it will not trade at par

-credit sensitive notes, whose coupon adjustments are intended to bring the security back toward par, but as we saw, this can be insufficient, and furthermore has a "death-spiral" sort of effect

-death-spiral convertibles, which promise a dollar value of equity. They have the downside of encouraging hedge funds to hammer the stock price

-reset bonds, which work as long as there is a coupon which makes the security trade at par, and which does not provoke the issuer to file bankruptcy

-auction-rate preferred, which, like reset bonds, work as long as there is a dividend that clears the market at par.