Finance II (441) Paola Sapienza

Homework Assignment 5

(1) Bond covenants and the fine print in bond prospectuses:

(A) Who benefits from the fine print in bond contracts when the firm gets into financial trouble? You can answer this question in one sentence.

(B) Who benefits from the fine print when the bonds are issued?

(2) Occasionally firms extend the life of warrants that would otherwise expire unexercised. Warrants are options a firm issues on its own stock. What is the cost of extending the life of the warrants? Who pays the cost?

(3) Whirlpool has decided to issue convertible bonds.

Each $1000 face value bond is convertible into 25 shares of stock. The bond makes one risk free interest payment at maturity (in one year). The risk free interest rate is 8.3%.

The stock is currently selling at $40 per share and pays no dividends. The appropriate discount rate for Whirlpool equity is 15%. This rate is based on a beta of 0.8 and a market price of risk of 8.4%. Assume that the market believes the stock price next year is equally likely to be: 40,42,44,46,48,50,52.

A) Is the market correctly valuing the stock given its expectations?

B) What is the value of the convertible bond? Assume that the convertible bond has a beta of 0.6.

C) What is the beta of the imbedded option?

D) Being an industrious student, you have spent your spare weekends researching Whirlpool stock. You have discovered that the market has incorrectly estimated the mean stock price for next year. In reality next year the stock price is equally likely to be 44, 46, 48, 50, 52, 54, or 56. With your private information, how would you value the stock and the convertible bond? Is one a better investment than the other?

E) Take another example where you have researched Whirlpool (ignore your findings in D). You have discovered that the stock price will not be 40 or 52 next year. The market has over estimated the variance of the stock return. The stock price is equally likely to be 42, 44, 46, 48, or 50. What are the true values of the stock and the convertible bond? Use a beta of 0.7 for the convertible. Which is a better investment?

(4) Interest rate hedging at Procter & Gamble. On April 12, 1994, P&G announced it would take a one time charge of $157 million to close out two interest rate swaps it had purchased through Bankers Trust. P&G claimed it did not fully understand the swaps into which it had entered. "Derivatives like these are dangerous and we were badly burned" said CEO Edwin Artzt.[1] Some have argued that the swaps into which P&G entered were quite complicated and very difficult to understand. "Nobody knows for sure how P&G lost $153 million."[2] I would like you to analyze P&G=s hedge.

A) Procter and Gamble entered into a swap where they agreed to pay a spread above the

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[1] *Derivatives Strategy*, April 25, 1994, page 1.

[2] *Derivatives Strategy*, April 25, 1994, page 3.

commercial paper rate. The spread was calculated as:

$$\text{Spread} = \max[0, 17.0415 * r_{\text{5 year treasury}} - P_{\text{30 year treasury w/ coupon rate of 6.25\%}}] - 0.0075$$

The price of a 30 year treasury note can be written as a function of the rate on a 30 year treasury bond. The following formula calculates the price per dollar of face value, which is the

$$P_{30\,yr} = \sum_{t=1}^{60} \frac{\frac{.0625}{2} * 1}{\left(1 + \frac{r_{30}}{2}\right)^t} + \frac{1}{\left(1 + \frac{r_{30}}{2}\right)^{60}}$$

$$= \frac{.0625 * 1}{r_{30}} \left[1 - \frac{1}{\left(1 + \frac{r_{30}}{2}\right)^{60}} \right] + \frac{1}{\left(1 + \frac{r_{30}}{2}\right)^{60}}$$

price used in the spread formula above.
The payments on P&G's swap depend on the 5 and 30 year government bond rates. Construct a table which reports the spread as a function of the 5 and 30 year interest rates.

P&G Spread	Thirty year rate			
Five year rate	5 %	6 %	7 %	8%
5 %				
6%				
7%				
8%				

B) This derivative is more complicated than a bet on the direction of interest rates. However, would you characterize this as a bet on rates rising or falling? A fixed for floating swap can also be used to bet on the direction of future interest rates. How is this derivative different from a direct fixed for floating rate swap?

C) What must P&G's risk exposure to interest rates look like to justify this hedge?

(5) Preferred Exchangeable Redemption Cumulative Securities (PERCS) for common exchange. VideoServer is an all equity firm with 2000 shares outstanding. Next year the value of VideoServer's

assets will be 100K, 200K, 300K, 400K, 500K, or 600K. The following question is long and very challenging. It is included for those of you who want to push yourselves.

A) What will be the stock price conditional on VideoServer's value? What is the payoff to a call option on VideoServer stock with a strike price of $150 and one year until expiration?

VideoServer=s Value	100K	200K	300K	400K	500K	600K
Stock Price						
Option Payoff (X=150)						

B) VideoServer has decided to execute a zero cost PERCS for common equity exchange. This means they will issue a PERCS to some of their shareholders in exchange for one share of common stock. The PERCS will be structured so that the market value of the PERCS is identical to the current price of the stock. After the exchange, VideoServer will have 1600 shares of common stock and 400 PERCS outstanding.

PERCS are like preferred equity minus an imbedded option. They pay a fixed dividend and have a priority higher than common stock. At the end of the year, the PERCS convert into common equity. However, the number of shares each PERCS converts into is a function of the stock price on that day. The number of shares each PERCS converts into is:

$$\text{Min}[1, \frac{150}{P_{\text{Stock}}}]$$

Calculate the price of stock as a function of the value of the firm next year. First calculate the following numbers. Each one will depend upon the value of VideoServer's assets next year.

1) The payoff to one PERCS as a function of the value of the firm.
2) The total payoff to all PERCS
3) The total payoff to old common equity owners. This is the payoff to investors who own the common equity -- not the investors whose PERCS will convert into common equity.

To verify that your answer is correct, calculate the number of shares into which the PERCS convert. Then divide the total value of the firm by the total number of shares.

VideoServer's Value	100K	200K	300K	400K	500K	600K
Payoff to single PERCS						
Payoff to all PERCS						
Payoff to equity owners						
VS Stock price						
Number of common equity shares from PERCS						
Total number of shares						

VS Stock price						

C) A PERCS is a portfolio of a share of common stock minus a call option on the underlying common stock. In our example, the strike price of the call option is $150. When VideoServer announces the zero cost PERCS for common exchange, their stock price doesn't change. Since no money is being paid into or out of the corporation, the firm's assets do not change. The price of exchange traded options on VideoServer stock may change. These options are issued by traders on the options exchange, not by VideoServer. Should the price of these options rise, fall, or remain unchanged on the announcement of the exchange (fill in the table below and compare to the table from part (A))?

VideoServer's Value	100K	200K	300K	400K	500K	600K
VS Stock Price						
Payoff to exchange traded option						

D) Daniel Associates is a small investment banking boutique.[3] You are one of Daniel Associates new hires. Their client, VideoServer, wishes to execute the zero cost PERCS for common exchange. Daniel Associates will purchase the PERCS from VideoServer and then sell them to the market (VideoServer's shareholders). Since Daniel Associates will own the securities for several days, they will be exposed to risk. They have asked you to design a hedge. To do this you must construct a portfolio from traded securities which replicates the payoff to the PERCS. How would you construct such a portfolio. Be specific.

[3] An investment banking boutique is a small firm that specializes in only a few of the services usually offered by an investment bank. They are often created when someone leaves an investment bank to start their own firm. During the merger wave of the 1980s, some of the most productive investment bankers who specialized in mergers and acquisitions left the big investment banks to start their own merger and acquisition boutiques.

VideoServer's Value	100K	200K	300K	400K	500K	600K

E) Instead of working for a firm, you now are working for money managers. Assume that VideoServer does not execute a PERCS for common exchange. They are an all equity firm with 2000 shares outstanding.

1) Your client, the Northwestern University endowment, would like to purchase a PERCS on VideoServer. This is the security I described in B). The only problem is VideoServer board of directors has decided not to issue PERCS. Construct a PERCS from publicly traded securities. How will you price the security?

VideoServer's Value	100K	200K	300K	400K	500K	600K
VS Stock price (no PERCS)	50	100	150	200	250	300
Pseudo PERCS						

2) You have another client: Chicago Public Teachers Pension plan. They would like a security whose payoff mimics the stock of VideoServer if they had issued the PERCS. Remember, VideoServer's board has decided not to issue the PERCS. How would you construct the security that CPTPP wants and how would you price it?

Video Server's Value	100K	200K	300K	400K	500K	600K
VS Stock price (no PERCS)	50	100	150	200	250	300
Pseudo VS stock with PERCS						