CHAPTER 30

VALUING EQUITY IN DISTRESSED FIRMS

Problem 1

a. True. Equity investors cannot lose more than their equity investment.

b. False. They can make equity more valuable, not the firm.

c. True. It transfers wealth to the bondholders.

d. True. This is the equivalent of the life of the option.

e. True. There is a transfer of wealth to bondholders.

Problem 2

a. Reinvestment rate = g/ROC = 5%/12% = 41.67%

Value of the firm = 40(1.05)(1-.5)(1-0.4)/(.10-.05) = $294 million

b.

The value of the equity is computed as a call option on the value of the firm, using the call option pricing formula, $SN(d_1) - Ke^{-rt}N(d_2)$, where $d_1 = \frac{\ln(S/K) + (r + \sigma^2/2)t}{\sigma\sqrt{t}}$, $d_2 = d_1 - \sigma\sqrt{t}$.

S = $294

K = $500

t = 5 years

r = 5%

σ = 0.125

The equity or call option value can be written as 294 N(-0.8657) -500 $e^{-0.25}$ N(-1.1452).

Since $N(d_1) = 0.1933$; $N(d_2) = 0.1261$, the option value is $7.75 million.

Value of Call (Equity) = $7.75 million

c. Value of Debt = $294 - $7.75 = $286.25 million

Appropriate Interest Rate = $(500/286.25)^{1/5} - 1 = 11.80\%$

Problem 3

Value of firm

Current free cashflow to firm = $ 850* (1-.4) – (550 – 400) = $ 700 million

Year	*EBIT (1-t)*	*Net cap ex*	*FCFF*	*PV*

1	$612.00	$180.00	$432.00	$392.73
2	$734.40	$216.00	$518.40	$428.43
3	$881.28	$259.20	$622.08	$467.38
4	$1,057.54	$311.04	$746.50	$509.87
5	$1,269.04	$373.25	$895.80	$556.22
Terminal	$1,332.50	$444.17	$888.33	

I used a reinvestment rate of 33.33% (5/15) in the terminal year.

Terminal value = 888.33/(.10-.05) = $ 17,766

Value of firm = $392.73 + 428.43 + 467.38 + 509.87 + 556.22 + 17766.60/1.1^5$ = $13,386.28 million

Value of equity as an option

S = 13386.28

K = 10000.00

T = Weighted duration of debt = 3 years

Riskless rate = 5%

Variance in firm value = $(.35)(.4)^2+(.15)(.6)^2+ 2\ (.35)(.15)(.5)(.4)(.6) = .20 = 0.0403$

Value of equity = $ 4958 million

If the market value of equity = 30 * 210 = $ 6300 million

Trial and error yields an implied standard deviation of 46.53%.

Value of debt = Firm value – Value of equity

= 13386 – 4958 = $8,428 million

Problem 4

Value of firm = EBIT (1-t) (1- Reinvestment rate) (1+g)/(r – g)

= 25 (1-.4) (1 – 4/10) (1.04)/(.09-.04) = $ 187.20 million

Face value of debt = $ 250 + $ 250 = $ 500 million

Average duration of debt = (2+4)/2 = 3 years

Standard deviation in firm value = $0.25^2(.5)^2+0.4^2(.5)^2+ 2*.25*.4*.5*(.5)^2 = 28.39\%$

Riskless rate = 7%

Value of equity as an option = $ 3.30 million

Problem 5

d1 = -0.15 N(d1) =0.4404

d2= -0.90 N(d2) =0.1841

Value of Equity = 400 (.4404) - 800 exp (-.06*6) (.1841) =$ 73.41

Value of Debt = 400 - 73.41 = $ 326.59

Interest rate on debt = (800/326.59)^(1/6) - 1 = 16.08%

Default spread on debt = 16.08% - 6% = 10.08%