

Solution to Problem Set 8

1. (a) Leverit's expected cash flow is

$$E(C_1) = \frac{1}{6}80 + \frac{1}{3}160 + \frac{1}{3}280 + \frac{1}{6}360 = \$220M.$$

To find the market value, we need to find the return that investors require on Leverit. Using the CAPM

$$r_E = R_f + \beta_E(E(R_m) - R_f) = 5\% + 1.2 \times 6\% = 12.20\%.$$

The market value thus is

$$V = \frac{E(C_1)}{1 + r_E} = \$196.08M.$$

The stock price is the market value divided by N , the number of shares outstanding. It is

$$P = \frac{V}{N} = 1.96.$$

Return on (market) equity is $r_E = 12.20\%$, and earnings per share are

$$EPS_1 = \frac{E(C_1)}{N} = \$2.20.$$

- (b) The face value of debt is smaller than Leverit's cash flow, for all realizations of the cash flow. Therefore, Leverit can always pay its debt. Since the debt is riskless, its market value is the face value discounted at the riskless rate, i.e.

$$D = \frac{20}{1 + 5\%} = \$19.05M.$$

- (c) Since there are no market imperfections, the MM theorem applies. The market value of Leverit does not change. Therefore the new market value of the equity is

$$E = V - D = \$177.03M.$$

Leverit's new leverage is

$$L = \frac{D}{E} = 10.76\%.$$

- (d) We denote the new stock price by P . Leverit can buy back D/P shares, where D is the market value of debt. Therefore, the new stock price satisfies the following equation

$$P = \frac{E}{N - \frac{D}{P}} = \frac{177.03}{100 - \frac{19.05}{P}}.$$

Solving this equation, we get $P = \$1.96$. The stock price thus does not change. This is not surprising given the MM theorem. A recapitalization does not affect the value of the firm, and thus should not have any effect on shareholder wealth. Note that the value of total equity is smaller after the recapitalization. However, the recapitalization also reduces the number of shares outstanding.

- (e) To find Leverit's new return on equity, we note that the MM theorem implies that the cost of capital

$$\frac{D}{V}r_D + \frac{E}{V}r_E,$$

is the same before and after the recapitalization. The cost of capital before the recapitalization is 12.20%. The cost of capital after the recapitalization is

$$\frac{19.05}{196.08}5\% + \frac{177.03}{196.08}r_E.$$

Solving for r_E , we get 12.97%. To find the new earnings per share, we note that expected cash flow to equityholders is smaller by $\$20M$, and that the number of shares is smaller by $D/P = 9.71M$. New earnings per share are

$$EPS_1 = \frac{200}{100 - 9.71} = 2.22.$$

- (f) Debt is still riskless since the smallest possible cash flow ($\$80M$) is greater than the face value of debt. Therefore, we can simply repeat the previous steps. We find

Face Value of Debt	Leverage	EPS
0	0	2.20
20	10.76	2.22
40	24.11	2.23
60	41.13	2.26
80	63.55	2.29

Earnings per share increase with leverage, although the share price stays constant. The intuition is that leverage makes the stock riskier. Therefore earnings are discounted at a higher rate. Since the stock price stays constant, earnings per share have to increase.

2. (a) Shareholders like risk (as opposed to bondholders). Since reorganization involves more risk than liquidation, shareholders would usually prefer the reorganization.

- (b) It is true that the shareholders' slice of the pie decreases. However, shareholders receive the proceeds of the debt issue. They can receive the proceeds either as a dividend or as a share buyback.
- (c) It is true that issuing debt raises the cost of debt and equity. However, debt is cheaper than equity, and this tends to reduce the cost of capital.
- (d) The value of debt is the present value of the cash flows specified in the debt contract, discounted by the YTM. (This is the definition of the YTM.) The value of debt is also the present value of *expected* cash flows, discounted by the rate of return that investors require, r_D . (This is true for all investments.) If the company cannot always meet its debt payments, expected cash flows will be smaller than the cash flows specified in the debt contract. In addition, since debt becomes risky and is likely to have a positive beta, r_D may be larger than the riskless rate. Therefore, the YTM will be larger than the riskless rate. This is true even when bankruptcy is costless.
- (e) It is true that volatility of cash flows makes leverage unattractive. However, there are other factors that may favor debt. One such factor is redeployability. If an airline goes bankrupt it can easily sell its planes and airport facilities to other airlines.
- (f) It is true that debt is cheaper than equity. However, issuing debt makes equity more risky. Unless there are market imperfections, issuing debt will not affect the value of the company.

Questions 3 and 4 will be discussed in class.