Chapter 5: Capital structure and dividends

Exercises - solutions

1. (a) The value of Flotsam's debt is €20 million. The value of its equity is 10 million shares × €8 = €80 million, so its assets have a value of €100 million. Alternatively, the cash flow to Flotsam's shareholders is €10 million - (20 × 0.05) = €9 million. With a required return of 11.25%, the value of this cash flow is $9/0.1125 = 80$. Still another way is to calculate the opportunity cost of capital (or r_a): $r_a = 0.05 \times \frac{20}{100} + 0.1125 \times \frac{80}{100} = 0.1$ and use this to calculate the value of the total cash flow: $10/0.1 = 100$.

    (b) In a Modigliani-Miller world without taxes Flotsam and Jetsam have to have the same value. So Jetsam's total value is also €100 million, its debt has a value €80 million, which leaves €20 million for its equity, i.e. €2 per share. The cash flow to Jetsam's shareholders is €10 million - (80 × 0.05) = €6 million or 0.6 per share. Solving $(0.6/r) = 2$ for r gives $r = 0.3$. We can check this by calculating the required return on equity with MM proposition 2:

    $$r_e = r_a + (r_a - r_d)\frac{D}{E} = 0.1 + (0.1 - 0.05)\frac{80}{20} = 0.3$$

    (c) Mrs Grange owns 10% of Flotsam's shares. The value of that investment is $0.1 \times 80 = €8$ million and it produces an annual cash flow of $0.1 \times (10 - (20 \times 0.05)) = €0.9$ million. Mr Skelton can replicate this investment by buying 10% of Jetsam's shares and 'undo' the difference in borrowing by the two companies. The difference in borrowing is $80 - 20 = €60$ and 10% of this is €6 million. So Mr Skelton should lend €6 million risk free and buy 10% of Jetsam's shares, which costs €2 million, a total investment of €8 million. This investment produces a cash flow of $0.1 \times (10 - (80 \times 0.05)) = €0.6$ million from the shares and $0.05 \times 6 = €0.3$ million from the risk free lending, in total $0.6 + 0.3 = €0.9$ million, identical to Mrs Grange's investment.

2. (a) increase
    (b) increase
    (c) increase
    (d) decrease
    (e) no effect if priority share has same rights as common shares plus priority
    (f) decrease

3. (a) decrease, income bonds only receive coupon (i.e. interest) payments if the issuing company has enough earnings to make the payment.
    (b) decrease
    (c) increase
    (d) increase

(e) increase

4. No, if you are the only lender, the loan is already secured with all of the company's assets. If the interest is not paid, you can ask for the company to be declared bankrupt which may lead to the sale of the company's assets to repay the loan. Securing a loan is only meaningful if there are also unsecured loans.

5. The advantages are that the companies whose capital was tied up in internal capital categories get access to capital that can be invested in other projects and that investors get access to new securities. The pooling of internally held capital of many companies also gives an insurance and diversification effect. The dangers are that the internal control and risk management procedures, that applied to the internal capital categories, no longer apply to external capital and have to be replaced by new, probably costly, procedures.

6. (a) The CAPM gives the return on ZXco's equity before refinancing: $r_e = r_f + \beta_e(r_m - r_f) = .04 + 1.2(.06) = 0.112$. The WACC is then: $.2 \times .04 + .8 \times .112 = 0.0976$

   (b) First, we calculate β_a before refinancing: $\beta_a = D/V \times \beta_d + E/V \times \beta_e = .2 \times 0 + .8 \times 1.2 = 0.96$. With this asset β we can calculate the equity β after refinancing: $\beta_a = D/V \times \beta_d + E/V \times \beta_e \Rightarrow 0.96 = .6 \times 0 + .4 \times \beta_e \Rightarrow \beta_e = 2.4$. The CAPM gives $r_e = .04 + 2.4 \times .06 = 0.184$. The WACC remains: $.6 \times .04 + .4 \times .184 = 0.0976$.

   Alternatively, we could have used MM proposition 2 to calculate r_e : $r_e = r_a + D/E(r_a - r_f) = .0976 + .6/.4(.0976 - .04) = 0.184$. In the absence of taxes, the WACC equals r_a. We can check this with CAPM and β_a : $r_a = .04 + .96 \times .06 = 0.0976$

7. (a) First, we use MM proposition 2 and the data of the mining industry on average to calculate r_a, the return on assets:

$$r_e = r_a + (1 - \tau)(r_a - r_d)\frac{D}{E}$$
$$.114 = r_a + (1 - .3)(r_a - .07)\frac{.4}{.6} \quad \Rightarrow r_a = .1$$

Alternatively, we can use the formula for r_a under the MM assumptions:

$$r_a = r_d(1 - \tau)\frac{D}{V - \tau D} + r_e\frac{E}{V - \tau D}$$

The amounts D, E and V are not known, but we only need the proportions, which are known:

$$r_a = 0.07(1 - 0.3)\frac{0.4}{1 - 0.3 \times 0.4} + 0.114\frac{0.6}{1 - 0.3 \times 0.4} = 0.1$$

With this r_a we can calculate the required return on AG Goldmünzen & Verschuldung's equity investment in the planned mine:

$$r_e = r_a + (1 - \tau)(r_a - r_d)\frac{D}{E}$$
$$r_e = .1 + ((1 - .3)(.1 - .07)\frac{.8}{.2} = .184 \text{ or } 18.4\%$$

8. (a) TechCon's value before refinancing is calculated as follows: over its EBIT of 100 it pays 20 in taxes. The net earnings have a value of $80/.1 = 800$. Refinancing with 50% debt means issuing 400 debt, with a yearly interest bill of $.04 \times 400 = 16$.

The division of the earnings (cash flow) then becomes:

EBIT	100.0
interest	-16.0
EBT	84.0
taxes	-16.8
net earnings	67.2

To calculate the value of these earnings we need the cost of equity after refinancing, which can be calculated with MM proposition 2

$$r_e = r_a + (1 - \tau)(r_a - r_d)\frac{D}{E}$$

This calls for E, but since the cash flows are perpetuities we can use the balance sheet identity $V_a + tD = E + D$

$$r_e = r_a + (1 - \tau)(r_a - r_d)\frac{D}{V_a + \tau D - D}$$

$$r_e = .1 + (1 - .2)(.1 - .04)\frac{400}{800 + .2 \times 400 - 400} = 0.14$$

this gives an equity value of $67.2/.14 = 480$. The total company value is $480 + 400 = 880$. The change in company value is thus $880 - 800 = 80$

A shorter calculation uses MM proposition 1: $V_l = V_u + \tau D$. The change in value is τD or $.2 \times 400 = 80$

9. (a) The clientele effect says that investors select their portfolios in such a way that the dividend payments they receive are enough to cover their needs for cash. This does not create value for (non-)dividend paying stocks if there are enough dividend paying and non dividend paying stocks to choose from. A change in dividend policy forces investors to make costly adjustments to their portfolios so that they prefer companies with stable, i.e. sticky, dividend policies.

   (b) Firms with very high earnings in some periods and very low earnings in other periods can only maintain a stable (sticky) payout ratio if it is low.

   (c) To the extent that the volatility is market synchronous (i.e. that it represents systematic risk) it reduces the value of the earnings. This may lead to the erroneous conclusion that a low payout ratio gives a low value.

   (d) If earnings fall sharply because of a strike but dividends remain stable, the payout ratio will rise.

   (e) A fall in earnings will be reflected in the stock price but the percentage decrease will be less than the percentage decrease in earnings, since an occasional strike will not affect the long term earnings potential. This means that the price-earnings ratio will go up. An erroneous conclusion would be that an increase in the payout ratio leads an increase in the price-earnings ratio, i.e. that investors would be willing to pay more for earnings that are paid in dividend than for earnings that are retained in the company. As a numerical example, consider a firm with perpetual earnings of 20; the firm pays 10 in dividends, so the payout ratio is 0.5. Its return on equity is 10% so the value of the earnings is $20/0.1 = 200$, which gives a price/earnings ratio of $200/20 = 10$. This year the firm is hit by a strike, and its earnings are halved. Dividends are sticky and remain 10, so that the payout ratio becomes 1. The strike is one-time event, so the firm's value becomes:

   $$\frac{10 + 200}{1.1} = 190.9$$

   The price/earnings ratio becomes: 190.9/10=19. The erroneous conclusion would be: if the payout ratio goes up, the P/E goes up.

10. (a) Before the dividend payment, MacroHard holds assets worth $1250 million, including the $250 to be paid as dividends. Its debt is worth $550 million, so its equity has a value of $1250 - 550 = 700$ million or $700/2.5 = 280$ per share. After the dividends are paid the firm holds assets worth $1000 million, debt is still worth $550 million, so equity is $1000 - 550 = 450$ million or $450/2.5 = 180$ per share. The change in stock price is thus $100, exactly equal to the amount of dividend per share: $250/2.5$.

    (b) The dividend payment reduces the value of the assets that MacroHard holds from $1250 to $1000 million. Equity is reduced from $700 to $450 million, this changes the debt-equity ratio from $550/700$ to $550/450$.

    (c) If MacroHard wants to pay dividend without changing investment and financial policy it has to issue shares to pay for the dividends. After the dividends are paid the price per share is $180. So the firm has to issue $250/180 = 1.3889$ million shares. This leaves the values on the balance sheet unaltered but the firm now has $2.5 + 1.3889 = 3.8889$ million shares @ 180 instead of 2.5 million @ 280.

    (d) If MacroHard uses the $250 million to buy back shares it has to buy $250/280 = 0.89286$ million shares. The total value of the firm will become $1000 of which $550 is debt and $450 equity. The number of outstanding shares becomes $2.5 - 0.89286 = 1.6071$ million, the share price remains $450/1.6071 = 280$.

11. (a) Internally generated funds as retained earnings slip the control of the market because management does not have to ask the market to provide them, they are already under management's control. This increases the risk that these funds will be used on projects that increase management's wealth rather than shareholders'. Paying out all earnings eliminates this risk.

    (b) Since there are no capital gains we can use Gordon's growth model to calculate the present value of the growing dividend stream:

$$P_0 = \frac{A}{r - g} = \frac{2.5}{.165 - .04} = 20$$