FIN 325 Corporate Finance
L5 (Techniques): Techniques Revision

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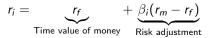Summer 2016

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Decision rules

- The best decision rule to use is NPV/discounted cash flow analysis.

- Measures the cash flows paid to all stakeholders in the company, (both debt and equity).

- Accounts for the time value of money in addition to risk.

- All about **marginal/incremental benefit** (MB) versus **marginal/incremental cost** (MC).

    - If NPV is positive — indicates that $MB > MC$.

    - If NPV is negative — indicates that $MB < MC$.

- Remember to always look at the cash flows arising from the new potential project **separately** from the rest of the firm.

Discount rates

- An input into the use of the NPV method of valuation.

- Always match the **risk** and **maturity** of the project's cash flows.

- Can be determined using the CAPM theory.

$$r_i = \underbrace{r_f}_{\text{Time value of money}} + \underbrace{\beta_i(r_m - r_f)}_{\text{Risk adjustment}}$$

- Risk adjustment can be broken into two parts

  - $(r_m - r_f)$ is the **compensation per unit** of systematic risk.

  - β_i is the **number of units** of systematic risk, to which the project is exposed.

- The riskless rate and market risk premium are aggregate variables we can easily observe.

- The β_i is something specific to the project.

Finding β_i

- The β_i coefficient for the determination of r_i measures the correlation of the project's risk with that of the market.

- When evaluating a new project, we need to find the units of risk of the underlying project, independent of capital structure.

- This is captured by the beta of assets — β_A.

- Beta of equity — β_E — captures business and financial risks.

- Unless your comparable firm has the same capital structure as you will use for the new project, β_Es are not comparable.

- We find β_A by removing the effects of capital structure — through **unlevering**.

Example 1

- An all-equity firm with 20m shares outstanding has a stock price of $7.50 per share.

- Although investors currently expect the firm to remain an all-equity firm, it plans to announce that it will borrow $50m and use the funds to repurchase shares.

- The firm will pay interest only on this debt and it has no further plans to change the amount of debt.

- Assume a corporate tax rate of 40%.
  - **(a)** What is the market value of the assets before the announcement?
  - **(b)** What is the market value of the firms assets (including any tax benefits) just after the debt is issued but before the shares are repurchased?
  - **(c)** What is the share price just before the repurchase? How many shares will they repurchase?
  - **(d)** What are their market value balance sheet and share price after the repurchase?

Example 1 solutions (1)

(a) Just use the usual formula

$$
\begin{aligned}
V &= E \\
&= 7.5 * 20 \\
&= \$150m
\end{aligned}
$$

given that the firm currently has no debt outstanding.

(b) Here we need to take account of the original assets that the firm had, in addition to the extra cash from the debt issuance and the debt tax shield (DTS).

$$
\begin{aligned}
V &= \text{existing assets} + \text{cash from debt} + \text{tax sheild} \\
&= 150 + 50 + 40\% * 50 \\
&= \$220m.
\end{aligned}
$$

Example 1 solutions (2)

(c) Just before the repurchase, we have that

$$
\begin{aligned}
E &= V - D \\
&= 220 - 50 \\
&= 170.
\end{aligned}
$$

Therefore, given that no shares have yet been repurchased, we still have 20 million of them outstanding. Then we can find the share price as

$$
\begin{aligned}
P &= \frac{170}{20} \\
&= \$8.50.
\end{aligned}
$$

Assuming that the firm repurchases the shares at their true value, we will find that they will repurchase $\frac{50}{8.5} = 5.882$ million shares.

Example 1 solutions (3)

(d) We have that after the shares have been repurchased, the assets remaining will be given by

$$
\begin{aligned}
V' &= 150 + 0.4 * 50 \\
&= \$170m.
\end{aligned}
$$

Then we see that the value of equity will be

$$
\begin{aligned}
E' &= V' - D \\
&= 170 - 50 \\
&= 120
\end{aligned}
$$

where we have subtracted out the value of the debt that will be outstanding after the repurchase. Then we can find the new share price to be

$$
\begin{aligned}
P' &= \frac{120}{20 - 5.882} \\
&= \$8.50.
\end{aligned}
$$

Example 2

- A firm will have EBIT this coming year of \$15m.

- It will also spend \$6m on total capital expenditures and increases in net working capital, and have \$3m in depreciation expenses.

- This is currently an all-equity firm with a corporate tax rate of 35% and a cost of capital of 10%.

  (a) If this firm is expected to grow by 8.5% per year, what is the market value of its equity today?

  (b) If the interest rate on its debt is 8%, how much can the firm borrow now and still have nonnegative net income this coming year?

  (c) Is there a tax incentive for this firm to choose a D/V ratio that exceeds 50%?

Example 2 solutions (1)

(a) We use equation 10 from the formula sheet to see that

$$
\begin{aligned}
FCF &= \text{EBIAT} + \text{Depreciation} - \text{Investment} \\
&= \text{EBIT}(1 - T_c) + \text{Depreciation} - \text{Capex} - \Delta\text{NWC} \\
&= 15(1 - 0.35) + 3 - 6 \\
&= 6.75
\end{aligned}
$$

where the second line uses equation 13 for investment. Then we use the growing perpetuity formula, equation 7, to get

$$
\text{E} = \frac{6.75}{0.1 - 0.085} = \$450\text{m}
$$

where we can attribute the right side to equity since the firm is 100% equity financed.

Example 2 solutions (2)

(b) The EBIT represents our earnings before <u>interest expenses</u> and taxes. So it follows that

$$
\begin{aligned}
\text{Net Income} &= 0 \\
\Rightarrow (\text{EBIT} - \text{Interest})(1 - T_c) &= 0 \\
\Rightarrow \text{EBIT} - \text{Interest} &= 0 \\
\Rightarrow \text{EBIT} &= \text{Interest}
\end{aligned}
$$

So we know that total interest is given by the product of the debt level with the interest rate, which means that

$$
\begin{aligned}
\text{Interest} &= r_D D \\
&= 0.08 D \\
\Rightarrow 15 &= 0.08 D \\
\Rightarrow D &= \frac{15}{0.08} = \$187.5\text{m}.
\end{aligned}
$$

With a debt level any higher than this, the net income will be negative. Given that the firm has fixed EBIT, the firm can pay the interest from raising the extra debt through using some of the cash that they raise through the debt issuance.

Example 2 solutions (3)

(c) The answer to this turns out to be no. Recall that, in order to benefit from the DTS, we need to be paying positive taxes. Remember also that a tax shield is like a refund cheque — we pay taxes to the government and then they send us the tax shield back. So if our earnings before tax are negative, we won't pay taxes.

Example 2 solutions (4)

- As we saw in part (b), a level of debt of $D = 187.5m$ will cause EBIT = interest, meaning that the taxable earnings are zero. If debt were any higher, our pre-tax earnings would be negative. Now see that, when the firm in this example has debt, the firm value is worth

$$
\begin{aligned}
V &= E + D + PV(DTS) \\
&= 450 + D + PV(DTS) \\
&> 450.
\end{aligned}
$$

So we can see that for $\frac{D}{V} > 50\%$, it is necessary for $D > 225$. Without any further calculation, we can immediately see that debt of 225 exceeds the 187.5, which results in zero taxable earnings. Given this, a $\frac{D}{V}$ ratio at least as large as 50% will result in negative pretax earnings and consequently no tax shield benefits. Therefore the firm has no incentive to use this much debt.

Example 3

- An all-equity firm with assets worth \$25b and 10b shares outstanding plans to borrow \$10b and use these funds to repurchase shares.

- The firms corporate tax rate is 35% and it plans to keep its outstanding debt equal to \$10b permanently.

  (i) Without the increase in leverage, what would their share price be?

  (ii) Suppose the firm offers \$2.75 per share to repurchase its shares. Would shareholders sell for this price?

  (iii) Suppose the firm offers \$3.00 per share, and shareholders tender their shares at this price. What will firms share price be after the repurchase?

  (iv) What is the lowest price the firm can offer and have shareholders tender their shares? What will its stock price be after the share repurchase in that case?

Example 3 solutions (1)

(i) Notice firstly that, after issuing the $10b in debt, the firm keeps the debt stock fixed at $10b. As a result, it follows that the firm is initially 100% equity financed. Therefore we have that the value of the assets is equal to the value of equity initially. So the share price, (P), is initially

$$P = \frac{25}{10} = \$2.50.$$

Example 3 solutions (2)

(ii) Here the key is the stages in which the firm moves. They firstly issue the debt and <u>then</u> use it to repurchase the shares. After they issue the debt, the value of their assets will change, as they now have another $10b in cash in addition to the tax shields realised by the debt (DTS).

$$
\begin{aligned}
\text{Assets} &= \text{existing assets} + \text{extra cash from debt} + PV(\text{tax shield}) \\
&= 25 + D + D * \tau_C \\
&= 25 + 10 + 10(0.35) \\
&= \$38.5b,
\end{aligned}
$$

where you can notice that we are using the APV method assuming that the discount rate for the PV(DTS) is equal to r_D. That is —
$PV(DTS) = \frac{\tau_C r_D D}{r_D} = \tau_C D$.

Example 3 solutions (3)

- Then we can subtract the value of the debt from the assets to get the value of equity

$$
\begin{aligned}
E &= A - D \\
&= 38.5 - 10 \\
&= \$28.5b.
\end{aligned}
$$

Then, as usual, the value of each share ($\hat{P}$) just before the repurchase, is given by

$$
\begin{aligned}
\hat{P} &= \frac{28.5}{10} \\
&= \$2.85.
\end{aligned}
$$

So the value of our each share is now placed at \$2.85. The shareholders will, as a result, not be satisfied with an offer of \$2.75 as it's below value.

Example 3 solutions (4)

(iii) For this part of the question, the firm is going to spend the extra $10b that it had in cash after the debt-issuance on buying-back shares. As a result of the share buy-back, the value of equity will fall by $10b — the firm is buying-back $10b worth of equity. The new value of equity is given by

$$
\begin{aligned}
E' &= \text{equity before buy-back} - \text{amount spent on buy-back} \\
&= 28.5 - 10 \\
&= 18.5.
\end{aligned}
$$

The number of remaining shares is given by

$$
\begin{aligned}
\text{Remaining shares} &= \text{original number of shares} - \\
&\qquad \text{no. of shares bought-back} \\
&= 10 - \frac{\text{amount spent on buy-back}}{\text{buy-back price}} \\
&= 10 - \frac{10}{3} \\
&= 6.667b
\end{aligned}
$$

Then the new share price, P' is given by

$$
P' = \frac{18.5}{6.667} = \$2.775.
$$

Example 3 solutions (5)

(iv) We saw in part (ii) that the fair value of the shares was \$2.85 after the debt-issuance but before the buy-back. This is the minimum price the firm can offer and still have them accept the deal. This will be the price such that the shareholders are indifferent between selling and not selling. The firm will buy $\frac{10}{2.85} = 3.51b$ shares at this price, leaving $10 - 3.51 = 6.49b$ shares remaining. The share price will then be given by $\frac{18.5}{6.49} = 2.85$ afterwards.

Takeaways

- This finishes-up the first topic of valuation techniques.

- Next we move onto corporate finance theory.