ECON2103: Financial Economics
Lecture 6

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This week's topics

- Jensen's free cash flow theory
- Agency costs
- Agency problem
- Interest deductibility
- The return on equity
- The interest tax shield
- A net operating loss
- The cost of capital
- The irrelevance theory
- Me-first rule
- Subordination
- Retirement
- The equity risk
- Debt and risk

Governance value of debt financing

- The free cash flow of a company is, basically, its gross cash flow less any capital expenditures and dividends.
- One management problem is how effectively a company uses its free cash flows.
- Jensen (1986) argues that by using debt financing, a firm reduces its free cash flows and, hence, the firm must re-enter the debt market to raise new capital.
- Jensen theory, known as Jensen’s free cash flow theory, contends that the need to issue debt benefits the firm in two ways.

Agency costs

- Agency costs are the costs that arise from the separation of the management and the ownership of a company.
- They include all costs of resolving agency problems between management and shareholders, and also include the cost of monitoring company management.
  - Agents may incur different costs to obtain particular forms of information.
  - Transacting parties may be differently informed.
- Agency costs further include costs associated with operating and informing a board of directors, as well as with providing financial information to shareholders and other investors.

Jensen’s free cash flow theory

- First, there are fewer resources under control of management and less chance of wasting these resources in unprofitable investments.
- Second, being continually dependent on the debt market to raise new capital imposes a governance discipline on management that would not have been there otherwise.
- A company’s use of debt financing may help to reduce agency costs.

Capital structure and taxes

- In general, interest payments on debt obligations are deductible for tax purposes, whereas dividends paid to shareholders are not deductible.
- Because taxes affect the cost of financing, tax law naturally affects capital structure decisions.

Interest deductibility and capital structure

- The deductibility of interest represents a government subsidy of debt financing: By allowing interest to be deducted from taxable income, the government is sharing the cost of a debt issue with the borrowing company.

Three capital structures

- We consider the following:

Table 5.4
Three Capital Structures and Their Impact on Earnings

	Capital Structure		
$ in millions	*A*	*B*	*C*
Debt	$0.0	$10.0	$20.0
Operating earnings	5.0	5.0	5.0
− Interest expense	0.0	1.0	2.0
= Taxable income	5.0	4.0	3.0
− Taxes	1.5	1.2	0.9
= Earnings available to owners	3.5	2.8	2.1

The return on equity

- Under capital structure *A*, the owners would have an ROE of *10% (= $3.5 million/$35 million).*
- Compare this to the ROE under capital structure *B*, which is *11.2% (= $2.8 million/$25 million)* and *14% (= $2.1 million/$15 million)* under capital structure *C*.
- For the two levered capital structures, the owners benefit from the tax deductibility of interest in that ROE increases.

The interest tax shield

- The benefit from tax deductibility of interest expenses is referred to as the interest tax shield.
- The tax shield from interest deductibility is:

Tax shield = Tax rate X Interest expense

- Recognizing that the interest expense is the interest rate on the debt, which we will denote by r_d, multiplied by the par value of debt, denoted by D, the tax shield for a company with a tax rate of τ is:

$$\text{Tax shield} = \tau \times r_d \times D$$

A net operating loss

- If a company has deductions that exceed operating earnings, the result is a net operating loss.
- The company does not have to pay taxes in the year of the loss and may “carry” this loss to previous tax years, where (with some limits) it may be applied against those years’ taxable incomes.
- If the previous years’ taxable incomes are insufficient to absorb the entire loss, the tax shield must be discounted at a rate that reflects both the uncertainty of realizing its benefit and the time value of money.

The cost of capital

- The cost of capital is the return that must be provided for the use of investors’ funds.
- In raising new funds, the relevant cost of capital is a marginal concept.
- The cost of capital is the cost associated with raising one more dollar of capital.

Capital structure in a perfect capital market: The irrelevance theory

- The Modigliani-Miller theorem states that capital structure does not affect the firm's market value.
- The Modigliani-Miller theorem assumes a perfect capital market under conditions of risk.
- Buyers and sellers are all assumed to use the same probability distributions to characterize future uncertain returns
- Financing decisions are further assumed to have no effect on the business risk of the firm.
- Buyers and sellers of securities cannot individually affect ruling market interest rates.

The MM theorem's conditions

- There is no tax advantage associated with debt financing relative to equity financing.
- There are no costs associated with voluntary liquidation or bankruptcy.
- No transactions charges are paid on their purchase or sale.
- Any financial arrangements available to firms are assumed to be available to individuals on the same terms.
- Financial transactions capable of adversely affecting the positions of creditors relative to owners are not permitted, thus preventing involuntary expropriation of particular investors' wealth positions. (**Me-first rules**)

Me-first rules

- Consider first the case where a firm has some risky debt outstanding and also elects to raise additional debt at time 1.
- Both the outstanding debt and the new issue take the form of a bond.
- The existing bondholders are referred to as original bondholders, purchasers of the new issue as new bondholders.
- We assume the original bond has a par value of $1,000 requiring a 10% annual interest payment, and further that the new bond is issued on the same terms.

Example: Me-first rules

- Both bonds are assumed to mature at time 2, when each requires a payment of $1,100 (par value of $1,000 plus interest of $100).
- Assume that the two bond issues have equal claims on the firm's assets in the event of bankruptcy: The two classes of creditors (i.e., bondholders) are said to be paid pari passu.
- The situation we consider is summarized as:

State	*Probability*	*Operating earnings*	*Original bondholders*	*Stockholders*
1	p	$2,500	$1,100	$300
2	$1 - p$	$ 800	$ 800	$ 0

Example continued

- Consider a different claim as:

State	Probability	Operating earnings	Old bondholders	New bondholders	Stockholders
1	p	\$2,500	\$1,100	\$1,100	\$300
2	$1-p$	\$ 800	\$ 400	\$ 400	\$ 0

- Comparing the distribution of claims of the original bondholders with and without the issuance of the new bonds, we see that this financing arrangement effectively expropriates a part of the wealth position of the original bondholders.
- At the same time, the financing arrangement does not change the distribution of funds available to the stockholders.

Subordination

- To prevent such an adverse occurrence for the original bondholders, the appropriate me-first rule in this case requires subsequent debt issues to be subordinated to the first (original) bondholder.

State	*Probability*	*Operating earnings*	*Old bondholders*	*New bondholders*	*Stockholders*
1	p	\$2,500	\$1,100	\$1,100	\$300
2	$1 - p$	\$ 800	\$ 800	\$ 0	\$ 0

Without changing its capital structure

- Stockholders also have rules that prohibit the firm changing its capital structure in ways that would affect them adversely.

State	*Probability*	*Operating earnings*	*Bondholder 1*	*Bondholder 2*	*Stockholders*
1	p	\$2,500	\$1,100	\$1,100	\$300
2	$1-p$	\$1,100	\$ 550	\$ 550	\$ 0

Retirement

- Suppose that bond issue 1 is retired by management at time 1.
- Then, unless other conditions were imposed, the claims for the holders of bond issue 2 and the stockholders would become:

State	*Probability*	*Operating earnings*	*Bondholder 2*	*Stockholders*
1	p	\$2,500	\$1,100	\$1,400
2	$1 - p$	\$1,100	\$1,100	\$ 0

Consequence of the MM theorem

- One way of explaining that the market value of the firm is unaffected by capital structure changes in a perfect capital market is to show that under the foregoing assumptions any claims represented by financial instruments can be undone by investors.

State	*Probability*	*Operating earnings*	*Bondholders*	*Stockholders*
1	p	\$1,700	\$1,120	\$580
2	$1 - p$	\$ 800	\$ 800	\$ 0

Business and financial risk

- As different financial claims are used by management to obtain funding, the financial risks associated with each class of claims can and usually do change, as illustrated next.

State	*Probability*	*Operating earnings*
1	0.5	\$2,500
2	0.5	\$1,100

A different example

- Suppose that at time 1 bonds promising to pay \$1,000 (par value plus interest) at time 2 are issued, while the remaining financing of the firm takes the form of equity.

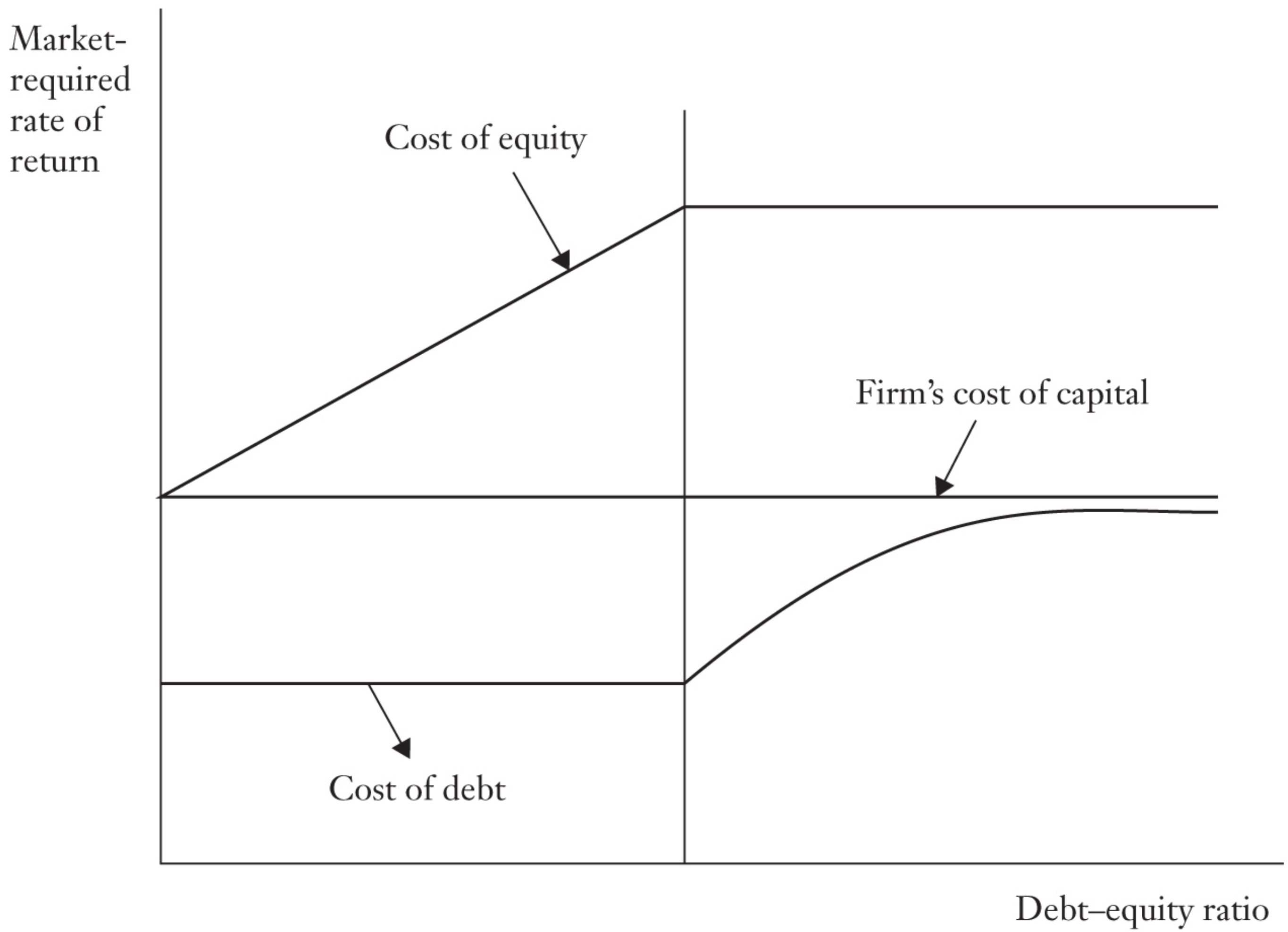
State	*Probability*	*Operating earnings*	*Bondholders*	*Stockholders*
1	0.5	\$2,500	\$1,000	\$1,500
2	0.5	\$1,100	\$1,000	\$ 100

A different scenario

- Now suppose that management is considering bond financing alternatives of either $1,100 or $1,500.

			Financing using bond issue 1		Financing using bond issue 2	
State	*Probability*	*Operating earnings*	*Bondholders*	*Stockholders*	*Bondholders*	*Stockholders*
1	0.5	$2,500	$1,100	$1,400	$1,500	$1,000
2	0.5	$1,100	$1,100	$ 0	$1,100	$ 0

Figure 5.1
Cost of Capital Unaffected by Leverage



Cost of capital unaffected by leverage

- if enough bonds are issued, they eventually become risky.
- Whether the bonds become risky or not, our previous analysis shows that the market required rate of return on the firm as a whole (i.e., its cost of capital) remains unchanged as long as the conditions of the Modigliani-Miller theorem are satisfied.

Cost of capital in a perfect capital market

- Since in a perfect capital market the firm's weighted average cost of capital depends only on the firm's business risk, the cost of capital does not change as the capital structure is altered.
- But the individual costs of the firm's debt and of its equity capital will depend on capital structure choices because they are affected by financial risks.

The rate of return on the firm's equity

- The cost of capital for firm *j* is defined as follows:

$$E(r_j) = \frac{E[V_j(2)] - V(1)}{V_j(1)} \qquad (5.1)$$

where $V_j(2)$ is the distribution of firm *j* values at time 2 and $V_j(1)$ its market value at time 1.

- The market rate of discount applied to the firm's bonds is:

$$E(r_{j,B}) = \frac{B_j(2) - B_j(1)}{B_j(1)} \qquad (5.2)$$

where $B_j(2)$ is the bond principal and interest at time 2 and $B_j(1)$ the market value of the bonds at time 1.

Derivation

- The rate of return on the firm's equity is defined as:

$$E(r_{j,S}) = \frac{E[V_j(2)] - B_j(2) - S_j(1)}{S_j(1)} \qquad (5.3)$$

where $V_j(2) - B_j(2)$ represents earnings available to stockholders at time 2 and $S_j(1)$ the time 1 market value of this distribution.

- By (5.1) and (5.2) we obtain

$$V_j(1)[1 + E(r_j)] = E[V_j(2)]$$

and

$$B_j(1)(1 + r_{j,B}) = B_j(2)$$

Derivation continued

- By (5.3),

$$E(r_{j,S}) = \frac{V_j(1)[1+E(r_j)] - B_j(1)(1+r_{j,B}) - S_j(1)}{S_j(1)} \qquad (5.4)$$

- Since $V_j(1) = B_j(1) + S_j(1)$,

$$E(r_{j,S}) = \frac{V_j(1)E(r_j) - B_j(1)r_{j,B}}{S_j(1)}$$

- Further,

$$E(r_{j,S}) = \frac{[S_j(1) + B_j(1)]E(r_j) - B_j(1)r_{j,B}}{S_j(1)}$$

The equity risk

- Finally, we obtain

$$E(r_{j,S}) = E(r_j) + [E(r_j) - r_{j,B}]\frac{B_j(1)}{S_j(1)} \qquad (5.5)$$

- Note that the ratio $B_j(1)/S_j(1)$ is the firm j's financial leverage ratio, and that it increases as additional bonds are issued.
- While the expected return on the firm is constant, the equity risk—and hence, the rate of return required on the equity—can change as more debt is issued.

Example

- The following example indicates how equation (5.5) reflects the manner in which financial risks change as the firm becomes more highly levered.
- The example will also exhibit the effects associated with issuing risky bonds.
- Suppose a firm has *V(1) = $1,000* and the following distribution for *V(2)*:

State	*Probability*	*V*(2)
1	0.5	$1,675
2	0.5	$ 525

Example continued

- Then *E[V(2)]* is equal to *$1,100*, and the cost of capital for firm *j* is:

$$E(r_j) = \{E[V(2)] - V(1)\} / V(1) = \{1,100 - 1,000\} / 1,000 = 0.10$$

- Suppose that the firm issues bonds promising to pay *$525* at time 2.
- We obtain

$$E(r_{j,S}) = \frac{E[V(2)] - B(2) - S(1)}{S(1)} = \frac{(1,100 - 525) - 500}{500} = \frac{575 - 500}{500} = 0.15$$

Another example

- Let us now consider another capital structure where the amount of debt outstanding is large enough for the debt to be risky.

State	*Probability*	$B(2)$	$B(2)$	$S(2)$
1	0.5	\$1,675	\$735	\$940
2	0.5	\$ 525	\$525	0

- When the rate of return is established independently of a distribution's absolute size (which will be the case by CAPM), the rate of return on equity in the present example must be 15% as in the first capital structure.

Debt is riskless

- Thus

$$0.15 = \frac{E[S(2)] - S(1)}{S(1)} = \frac{470 - S(1)}{S(1)}$$

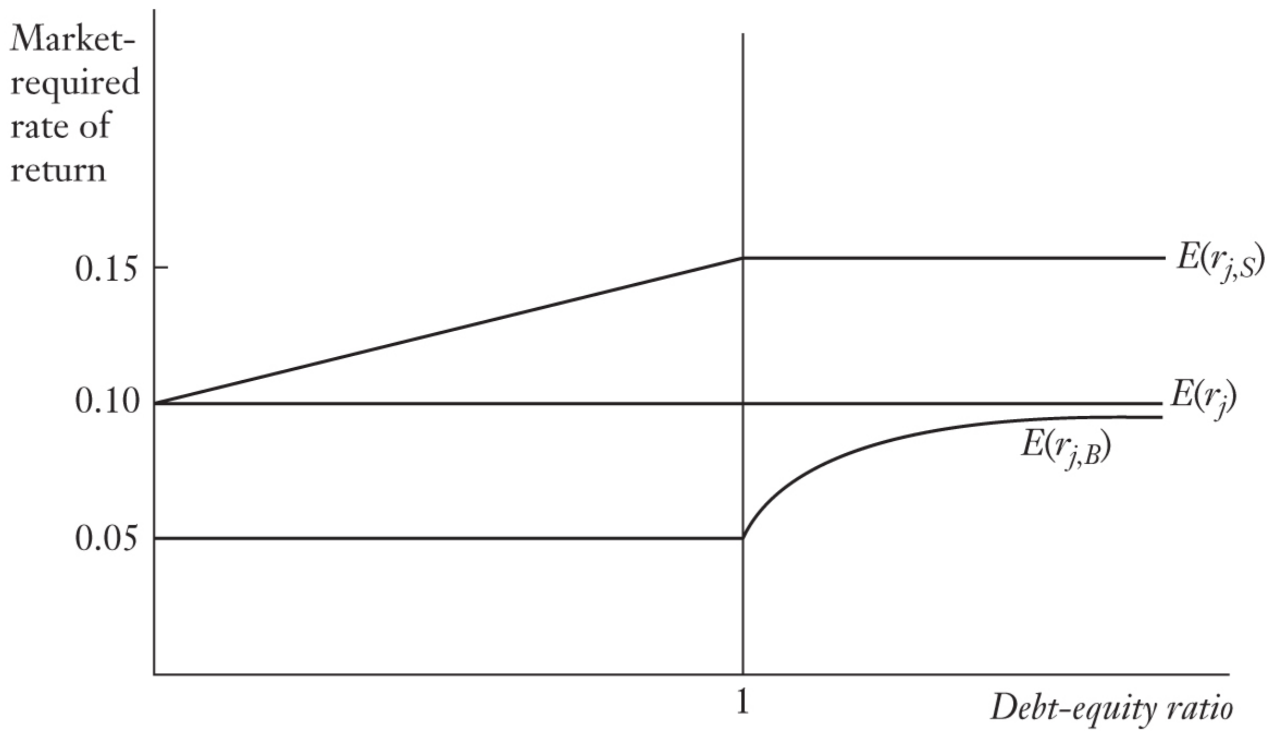
- As *S(1)* is approximately *\$409*, *B(1) = \$1,000 - \$409 = \$591*.
- Then by the MM theorem,

$$0.10 = 0.15\left(\frac{409}{1000}\right) + E(r_{j,B})\left(\frac{591}{1000}\right)$$

- Note that

$$E(r_{j,B}) = \frac{E[B(2)] - B(1)}{B(1)} = \frac{630 - 591}{591} = 0.066$$

Figure 5.2
Effect of Leverage on Required Returns on Stocks and Bonds



Debt and risk

- We see that for the particular firm in question, debt is riskless until the debt-equity ratio reaches unity, after which point the debt becomes risky.
- In this example, more debt does not lower the average cost of funds in the present example even though debt always has a lower required return than equity.
- On the other hand, large issues of debt do not raise the cost of capital either because (as we have assumed) defaulting on the debt involves no bankruptcy costs.

Key points 1

- The Modigliani-Miller theorem asserts that in a perfect capital market, the capital structure decision does not affect the firm's market value.
- Under the assumptions of the Modigliani-Miller theorem, changes in capital structure merely repackage the earnings stream that determines the firm's market value.
- As long as the repackaging can occur without itself creating additional costs or benefits, it cannot affect the firm's market value.

Key points 2

- The main reason the market value of the firm is unaffected by capital structure changes in a perfect capital market is that the capital structures change the way an income pie is divided, but without affecting the size of the pie.
- An assumption in the Modigliani-Miller theorem is that financial transactions capable of affecting adversely the position of creditors vis-a`-vis owners are not permitted.