**FIN 302** **Class Notes**

# Chapter 15: Debt Policy

## Two Cases:

## Case one: NO TAX

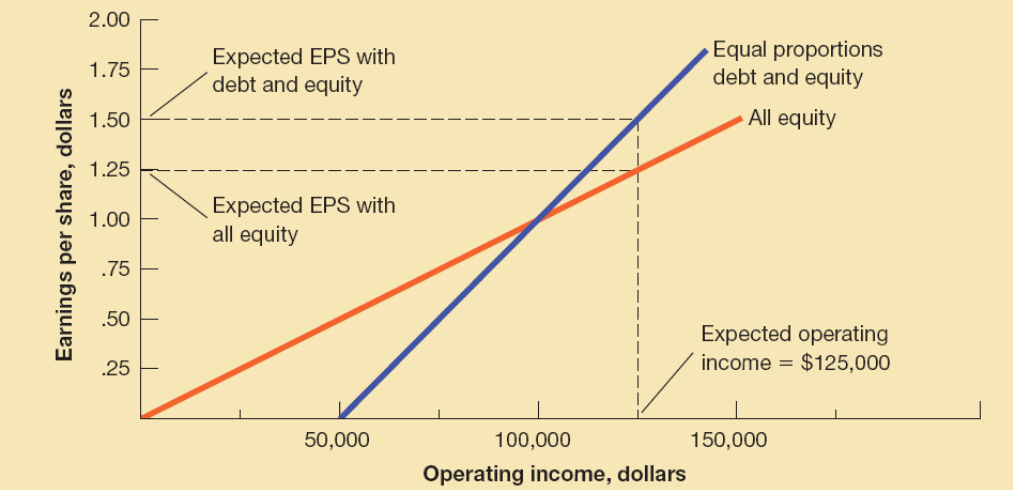
| | All Equity | Half Debt |
|---|---|---|
| Number of shares | 100,000 | 50,000 |
| Price per share | $10 | $10 |
| Equity Value | $1,000,000 | $500,000 |
| Debt Value | $0 | $500,000 |
| Firm Value | $1,000,000 | $1,000,000 |
| Cost of debt | 10% | 10% |
| Tax Rate | 0% | 0% |

| | State Of the economy | | | | | |
|---|---|---|---|---|---|---|
| | Bad | Normal | Good | Bad | Normal | Good |
| EBIT | 75,000 | 125,000 | 175,000 | 75,000 | 125,000 | 175,000 |
| Interest Expenses | 0 | 0 | 0 | 50,000 | 50,000 | 50,000 |
| Tax | 0 | 0 | 0 | 0 | 0 | 0 |
| Net Income | 75,000 | 125,000 | 175,000 | 25,000 | 75,000 | 125,000 |
| EPS | 0.75 | 1.25 | 1.75 | 0.5 | 1.5 | 2.5 |
| ROE | 7.5% | 12.5% | 17.5% | 5.0% | 15.0% | 25.0% |
| | | | | | | |
| Equity Value | 1,000,000 | 1,000,000 | 1,000,000 | 500,000 | 500,000 | 500,000 |
| Debt Value | 0 | 0 | 0 | 500,000 | 500,000 | 500,000 |
| Firm Value | $1,000,000 | $1,000,000 | $1,000,000 | $1,000,000 | $1,000,000 | $1,000,000 |
| WACC ($r_{assets}$) | 7.5% | 12.5% | 17.5% | 7.5% | 12.5% | 17.5% |

## How Borrowing Affects Earnings per Share

Borrowing almost always increases earnings in good years and decrease earnings in bad years. Debt financing increases the variability of earnings per share for any change in revenues.(Financial Risk)

Shareholders, with debt above them, have prospects for higher earnings per share, but added risk. The net effect in the valuation process is that the expected earnings per share have gone up, with the use of debt, but so has the shareholder required rate of return. The increased earnings per share in the valuation function have increased, but are offset by the increased discount rate. There is no change in the value of the assets or the stock of the shareholders.




## How Borrowing affect firm value (with NO Tax):

The value of business assets, assuming there is no tax deductibility of interest, is not affected by the **capital structure** mix of debt and equity. The present value of the cash flows from assets, the value of assets, is equal to the value of securities issued by the business. Changing the mix of securities does not affect the value of the assets.

*This theory or idea won Franco Modigliani and Merton Miller (MM) a Nobel Prize.*

**MM's Arguments:**

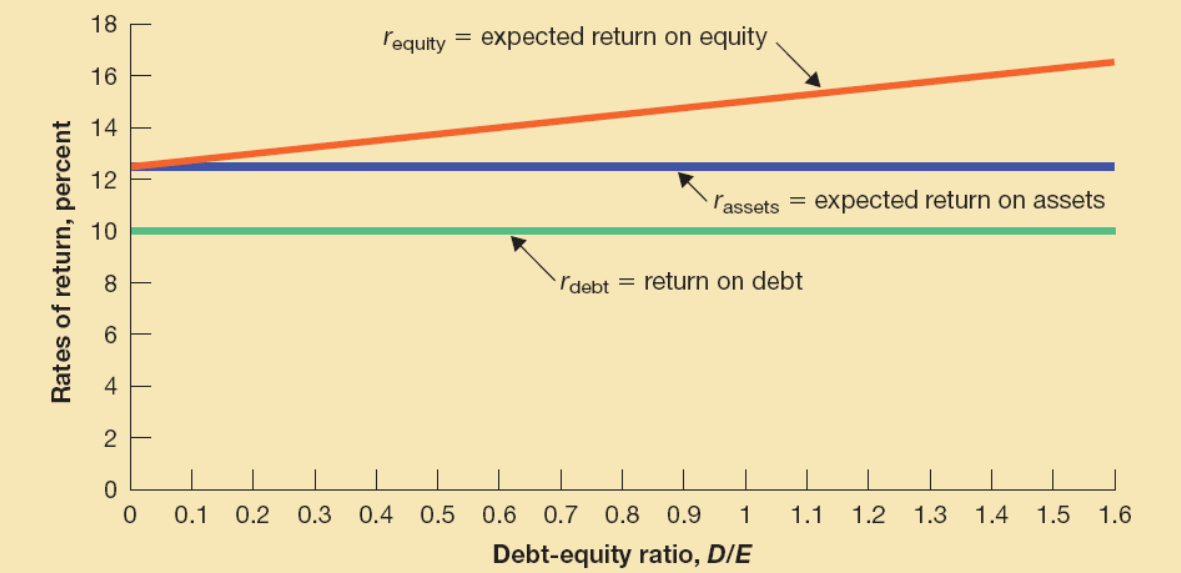
**MM's proposition I (debt irrelevance proposition):** The value of business asset is not affected by the capital structure mix. Debt policy should not matter to shareholders. It is the assets that count for value.

**MM's proposition II:** The WACC or the ($r_{assets}$) does not change as debt is added to the capital structure. Although the cost of equity increases as we add more debt, equity weight declines; which keep the WACC unchanged. Since the WACC does not change; the market value of the firm should not change either.

$WACC = r_{assets} = r_{debt}[D/(D+E)] + r_{equity}[E/(D+E)]$

Thus,

$r_{equity} = r_{assets} + D/E\ (r_{assets} - r_{debt})$




**(with NO TAX) : Value of levered firm = Value of all equity firm**

## Case Two: With TAX

| | All Equity | Half Debt |
|---|---|---|
| Number of shares | 100,000 | 50,000 |
| Price per share | $10 | $10 |
| Equity Value | $1,000,000 | $500,000 |
| Debt Value | $0 | $500,000 |
| Firm Value | $1,000,000 | $1,000,000 |
| Cost of debt | 10% | 10% |
| Tax Rate | 35% | 35% |

| | State Of the economy | | | | | |
|---|---|---|---|---|---|---|
| | Bad | Normal | Good | Bad | Normal | Good |
| EBIT | 75,000 | 125,000 | 175,000 | 75,000 | 125,000 | 175,000 |
| Interest Expenses | 0 | 0 | 0 | 50,000 | 50,000 | 50,000 |
| Tax | 26,250 | 43,750 | 61,250 | 8,750 | 26,250 | 43,750 |
| Net Income | 48,750 | 81,250 | 113,750 | 16,250 | 48,750 | 81,250 |
| EPS | 0.4875 | 0.8125 | 1.1375 | 0.325 | 0.975 | 1.625 |
| | | | | | | |
| Equity Value | 650,000 | 650,000 | 650,000 | 325,000 | 325,000 | 325,000 |
| Debt Value | 0 | 0 | 0 | 500,000 | 500,000 | 500,000 |
| Firm Value | $650,000 | $650,000 | $650,000 | $825,000 | $825,000 | $825,000 |
| WACC | 7.5% | 12.5% | 17.5% | 5.9% | 9.8% | 13.8% |

## How Borrowing affect firm value (with Tax):

With taxes, the value of the firm increase with higher level of debt because of the interest tax shield or the tax savings resulting from the deductibility of interest payments. The deductibility of interest is a tax shield that diverts government taxes to the shareholders. Thus the tax shield increases the value of an all-equity business by the amount equal to the value of the tax shield.

(with TAX):

**Value of levered firm = value if all-equity financed + PV of the tax shield**

Annual interest tax shield = Interest Expenses * Tax rate
PV of tax shield = Debt * Tax rate

## Corporate Taxes and the Weighted-Average Cost of Capital

The value of the corporate tax shield is represented in the lower after-tax cost of debt. Lower after-tax costs of debt lowers the WACC and increases the present value of stream of asset cash flows.

## Other Non-Tax Considerations:

### Costs of Financial Distress:

### Bankruptcy Costs:

court-directed legal process that occurs when the value or the financial conditions of a business deteriorate to the point where the bills are not paid or the value of the equity is zero. In addition, there are the indirect costs associated with bankruptcy related to managerial limitations and efforts to correct the economic problems may be significant.

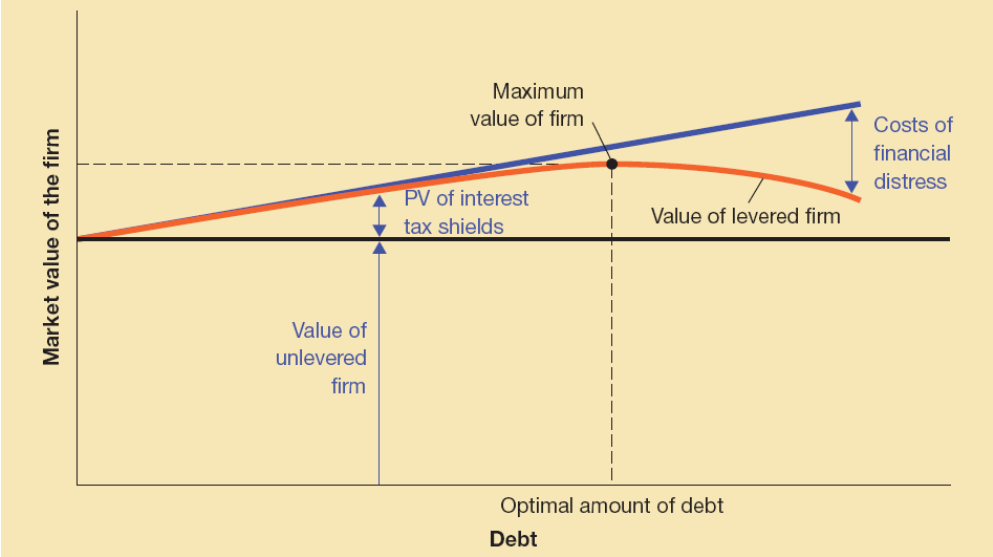
### Financial Distress without Bankruptcy:

1-Often a valueless firm may take added risk to bet on a turnaround. With little remaining to lose, managers/owners may bet the creditor's money in a risk turnaround venture, thus increasing the costs of financial distress.

2-Added equity invested in a financial distressed situation for a reasonable project may reward creditors, not reward owners, and the project may be ignored.

As the debt/equity increases, the **costs of financial distress**, or the costs of possible bankruptcy, increases. The added costs of financial distress overtakes the added value of the tax shield at some point and may lower the value of the firm at some high debt/equity ratio.

The theoretical optimum capital structure is the debt/equity level in which the PV of the tax shield is just offset by the PV costs of financial distress. This debt/equity level will maximize market value of the business.




**Value of levered firm = value if all-equity financed + PV of the tax shield - PV costs of Financial Distress**

**Agency Cost:**

Debt helps in reducing the agency problem between managers and shareholders.

With more debt the manager does not have excess cash to spend on non profitable activities. Also, debtholders will monitor managers closely to make sure the manager is able to payoff the debt.

## The Trade-Off Theory

Financial managers are concerned about finding that "right" mix of capital structure that produces the lowest or optimal cost of capital.

The trade-off theory of optimal capital structure state that there is an optimum debt/ratio ratio that maximizes market value, offsetting the benefits of the tax shield against the increasing costs of financial distress.

## Pecking Order Hypothesis

Under the pecking order theory there is no optimal debt/equity ratio. Firms rely on retain earnings to finance investments, then on debt, then on external equity.

In addition, firms issue external equity rather than debt only when equity is overvalued. That is why sock prices goes down when the firm announce new stock issues.

## Determinants of Capital Structure in Practice

**Business risk**: Operating Leverage (Firms with high fixed costs, use less debt)

**Tax shields**: The higher the tax shield from debt, the higher the debt ratio. The higher the tax shield form non-debt sources (e.g. Depreciation) the lower the need for debt to protect from taxes.

**Industry standards**: Firms usually compare their debt ratio to other firms in the industry.

**Asset structure:** Firms with more fixed assets, borrow more because they can use those fixed assets as collateral.

**Lender and bond-rater requirements**: Lenders put restriction on how much debt the firm can have.

**Managerial attitude**: The more risk avers the manager, the less debt he s willing to have.

**Retention of control**: If managers are concerned about loosing control in the firm, they will depend more on debt.

## EBIT-EPS Analysis:

Determine the level of EBIT where EPS would be identical under either debt or equity financing.

$$EPS_d = EPS_e$$

$$\frac{(EBIT - I_d)(1-T)}{N_d} = \frac{(EBIT - I_e)(1-T)}{N_e}$$

**Example: Using Case Two Table:**

$$100,000(0.65EBIT - 32,500) = 50,000(0.65EBIT)$$
$$65,000EBIT - 3,250,000,000 = 32,500EBIT$$
$$32,500EBIT = 3,250,000,000$$
$$EBIT = 100,000$$