Capital Structure: Theory and Practical Decision Making

How do firms choose Capital Structures?

Can managers affect firm value by employing *different* debt/equity mix?

Modigliani & Miller Framework

- Modigliani-Miller (MM) Propositions-- 3 situations with differing set of assumptions:

1. World without taxes:
2. World with Corporate Taxes
3. World with Corporate & Personal Taxes

Modigliani & Miller Framework -- Continued

- What do the two Propositions say for each of the 3 situations?
- **Proposition I-- Deals with Value of firm**
- **Proposition II-- Deals with WACC of firm**

World Without Taxes (Prop. I) {MM 1958}

- Conventional wisdom prior to 1958
  - leverage is good: increases $\text{Value}_{\text{firm}}$
    - leverage $\rightarrow$ WACC $\downarrow$
- MM: Firm's value (S/H wealth) is unaffected by Capital Structure (leverage)
  - set of restrictive assumptions

Prop I-- Continued

- Arbitrage support for Prop. I: *Homemade Leverage* can be substituted for *Corporate Leverage*
  - Firm cannot do anything for the investors that they can't do for themselves.
- **THUS**, *Proposition I:*
- $V_L = V_U = EBIT/r_o$

World Without Taxes (Prop. II)

- If Prop. I holds, r_{wacc} of a firm is independent of Capital Structure employed
  - as leverage ↑, (I.e., we use more of the cheaper debt), why doesn't the r_{wacc} ↓ ???
    - cost of equity capital ↑ linearly with leverage
- $r_s = r_o + B/S * (r_o - r_B)$

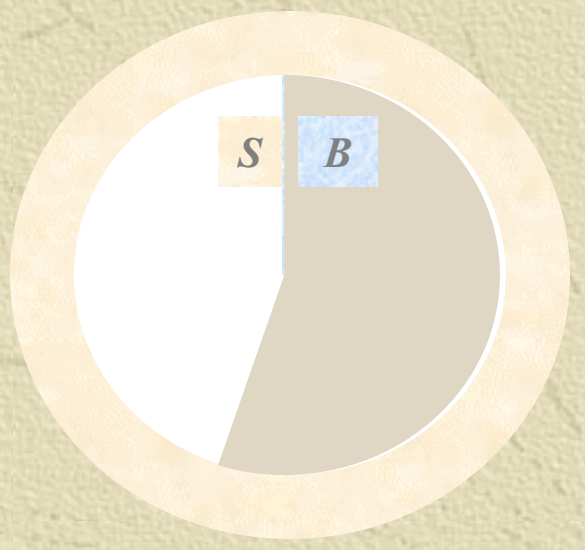
Terminology

- r_B is the interest rate (*before-tax* cost of debt)
- r_s is the return on (levered) equity (cost of equity)
- r_0 is the return on unlevered equity
  - Cost of Capital
- B is the value of debt
- S is the value of levered equity

The Capital-Structure Question and The Pie Theory

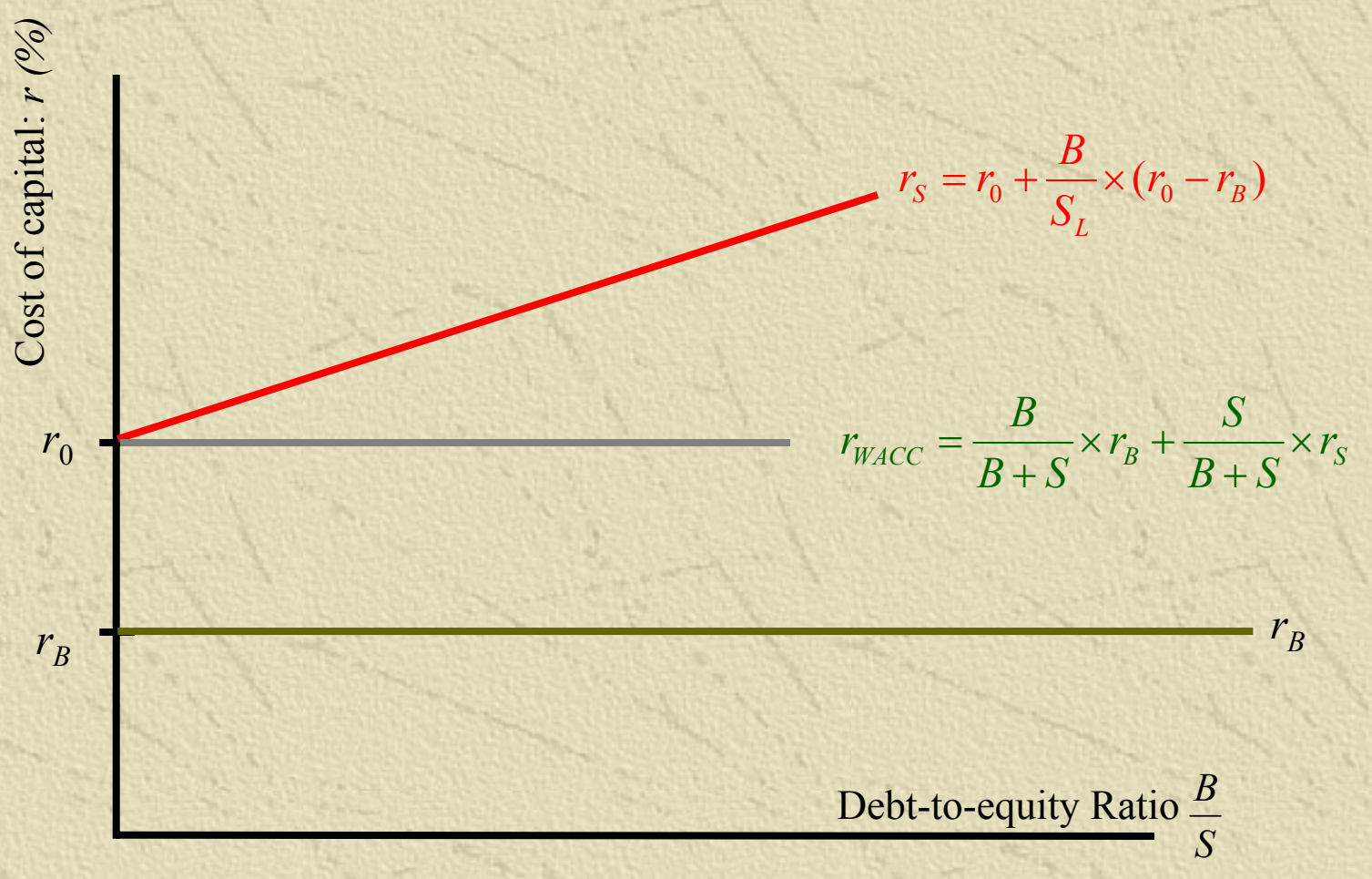
- The value of a firm is defined to be the sum of the value of the firm's debt and the firm's equity. $V = B + S$

- If the goal of the management of the firm is to make the firm as valuable as possible, the the firm should pick the debt-equity ratio that makes the pie as big as possible.



Value of the Firm

The Cost of Equity, the Cost of Debt, and the WACC: MM Proposition II with No Corporate Taxes



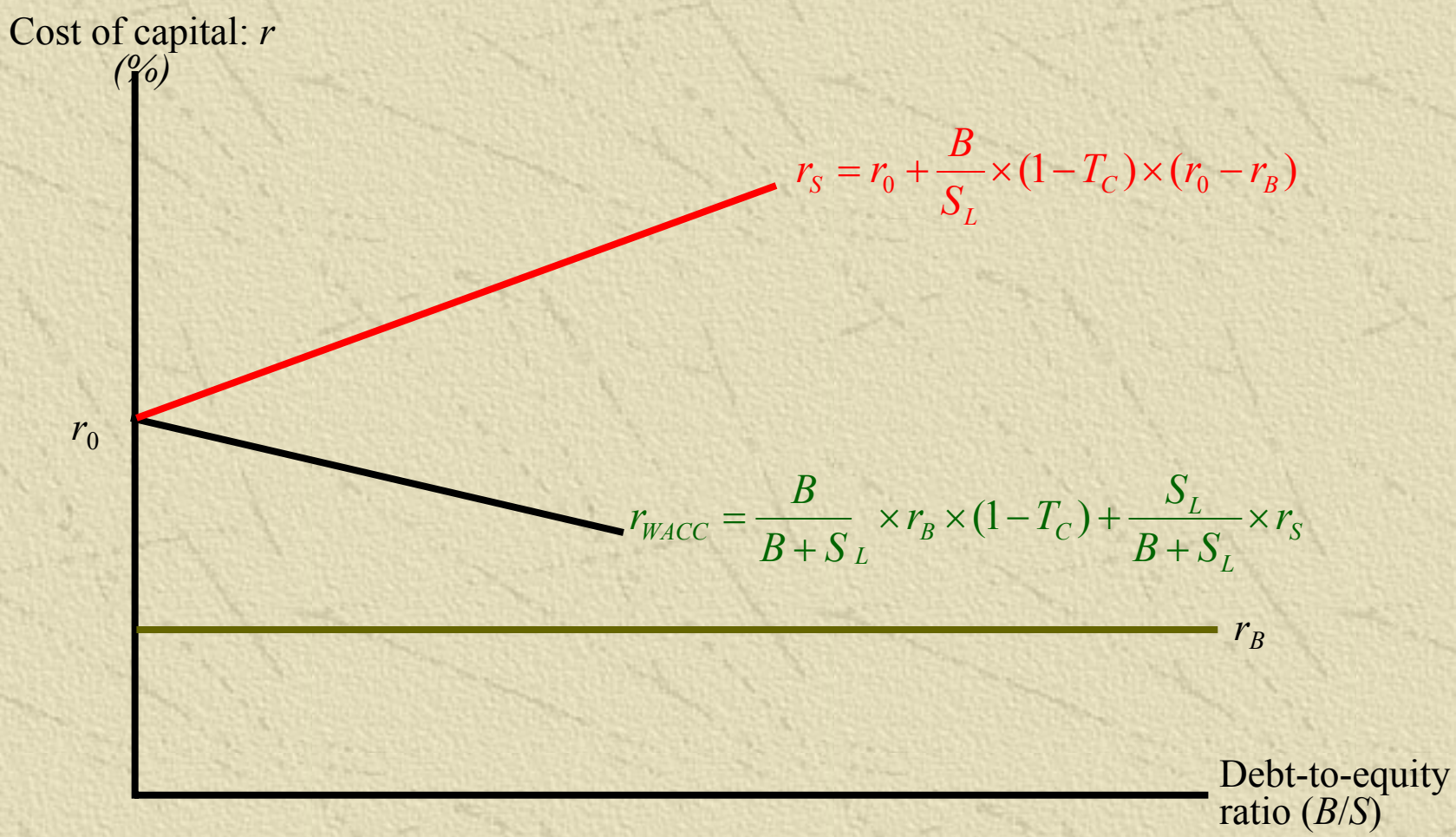
World With Corp. Taxes (Prop. I) {MM 1963}

- Unlike Dividends, **Interest is tax-deductible**
- Total income to all investors ↑ by $T_C * r_B * B$ (Tax rate * interest)
  - *tax shield from debt* (Perpetuity)
- $V_L = V_U$ + PV of tax-shield= $V_U + T_C B$
- (V_U = EBIT * $(1 - T_C)/r_o$)
  - **Firm value increases with Leverage**
- Optimal cap. structure might be *all debt!!*

World With Corp. Taxes (Prop. II)

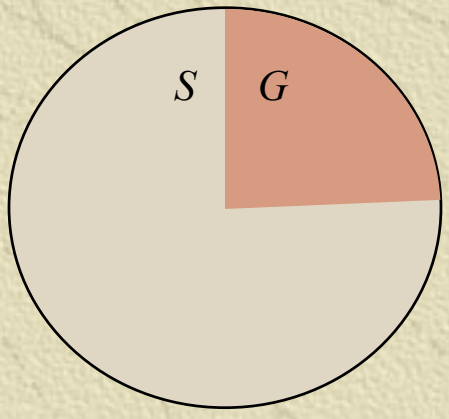
- Cost of equity still ↑ as B/S ↑
  - However, some of the increase in equity risk and return is offset by interest tax shield
    - Thus, overall the cost of capital continues to ↓ as leverage ↑
- $r_s = r_o + B/S * (1 - T_C) * (r_o - r_B)$
- r_{wacc} ↓ as leverage ↑

The Effect of Financial Leverage on the Cost of Debt & Equity Capital

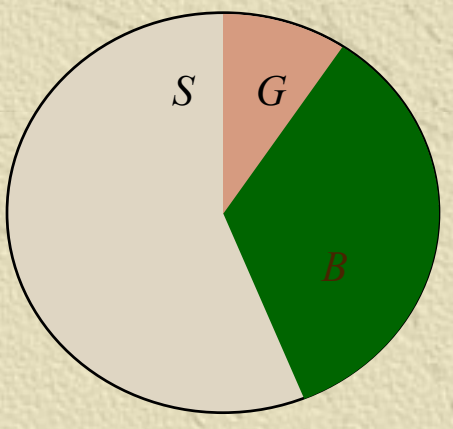


Total CF to Investors Under Each Cap. Str. with Corp. Taxes

All-equity firm



Levered firm



The levered firm pays less in taxes than does the all-equity firm.

Thus, the sum of the debt plus the equity of the levered firm is greater than the equity of the unlevered firm.

World With Corporate & Personal Taxes {Miller 1977}

- Miller (1977)
  - Interest on bonds taxed as personal income
  - Income from stocks:
  - Partly from dividends (taxed as personal income) & partly from capital gains (taxed at lower CG rate)
    - Also CG taxes can be deferred

World With Corporate & Personal Taxes (Prop. I)--Contd.

- Miller (1977)
  - Favorable tax treatment of income from stocks:
    - Investors are willing to accept **relatively** lower *before-tax* returns on stocks

$$\text{PV of Tax-Shield} = \left[1 - \frac{(1 - T_C)*(1 - T_S)}{(1 - T_B)}\right] * B$$

Miller (1977)-- Continued

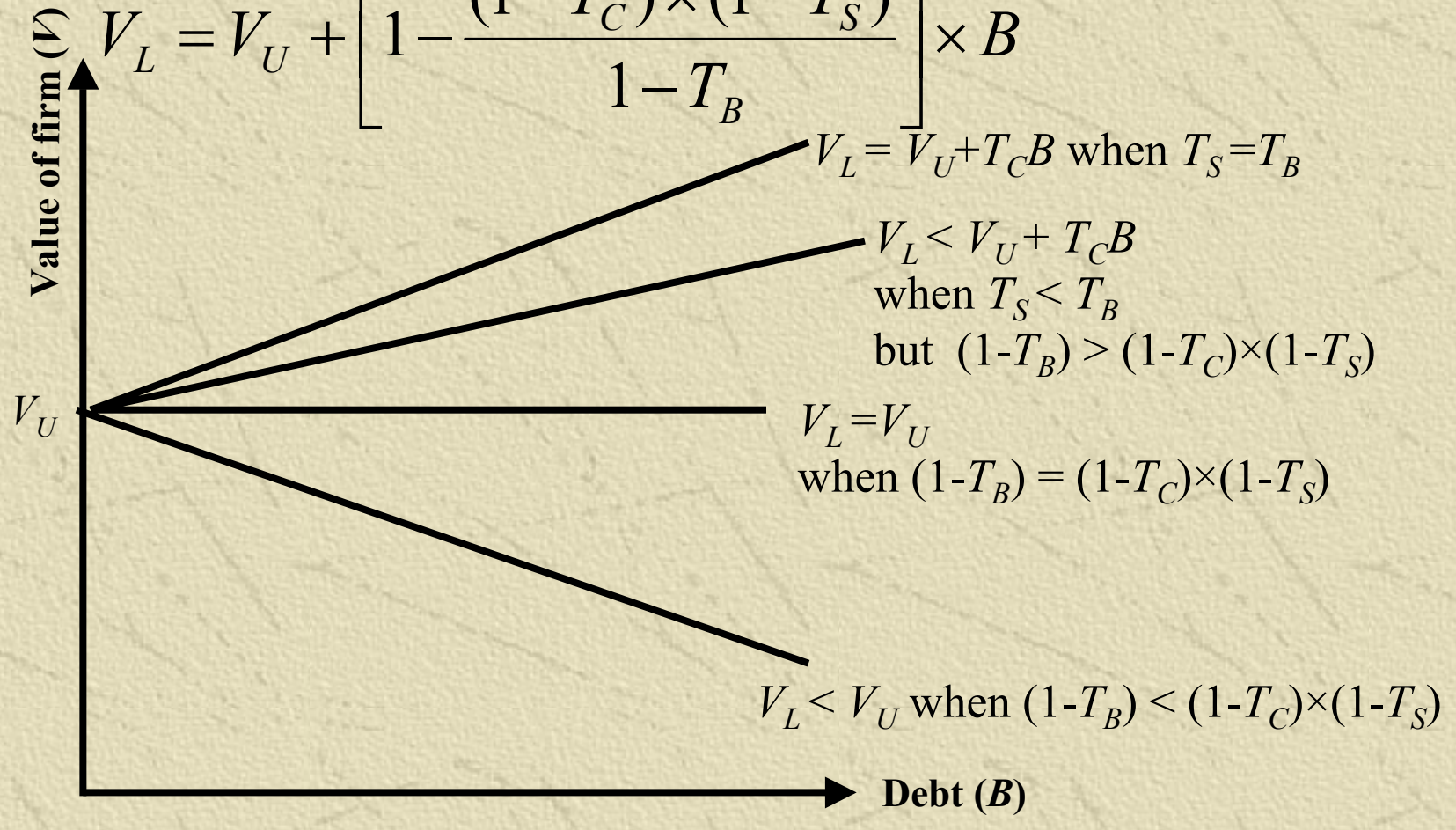
- $V_L = V_U$ + PV of tax-shield
- What is the Gain from leverage?
  - deductibility of interest favors usage of debt
  - favorable tax treatment of income from stock
    $\rightarrow$ preference for equity financing
- *What's the net effect?*
- Gain from leverage (if any) depends on relative values of T_C , T_S , and T_B

Miller (1977)-- Continued

- If $T_B = T_S$, we revert to Prop. I with Corp. taxes
- If $T_S = 0$, and $T_C = T_B$, no gain from leverage (original Prop. I without any taxes)
- Real-world: $T_S \neq 0$, but $T_S < T_B$
  - *Some* gain to leverage but not as much as the world with corporate taxes alone

Effect of Fin. Lev. on Firm Value with both corp. & personal Taxes

$$V_L = V_U + \left[1 - \frac{(1-T_C)\times(1-T_S)}{1-T_B}\right] \times B$$



EBIT- EPS analysis

- What is the impact on EPS of different financing alternatives?
  - Future EBIT (which is **NOT** dependent on financing mechanism) is unpredictable
  - Debt → a *"fixed"* obligation
- Debt: ↑ EPS (vis-a-vis Stock financing) during "good" years & ↓ during "bad" years

EBIT- EPS analysis-- Continued

- Break-Even/Indifference point: *Level of EBIT* at which EPS of two financing alternatives is the same

Criticisms of MM & Miller models

- Homemade leverage leads to a larger "loss exposure" than Corporate leverage
  - discourages substitution
- Assumption of no transaction costs!
- borrowing $\text{rate}_{\text{firm}} \neq \text{borr. rate}_{\text{personal}}$
- We are ignoring financial distress & agency costs

Costs of Financial Distress

- Probability/costs of bankruptcy might (at least partially) offset the benefits of leverage
- *Indirect costs of financial distress:*
  - customers, suppliers, and employees take "evasive actions"
  - non-optimal managerial actions
    - Deferred Maintenance

Costs of Financial Distress--Continued

- *Direct costs of financial distress:*
  - Legal costs, court costs, administrative costs…

⇑ debt, ⇑ the fixed interest;

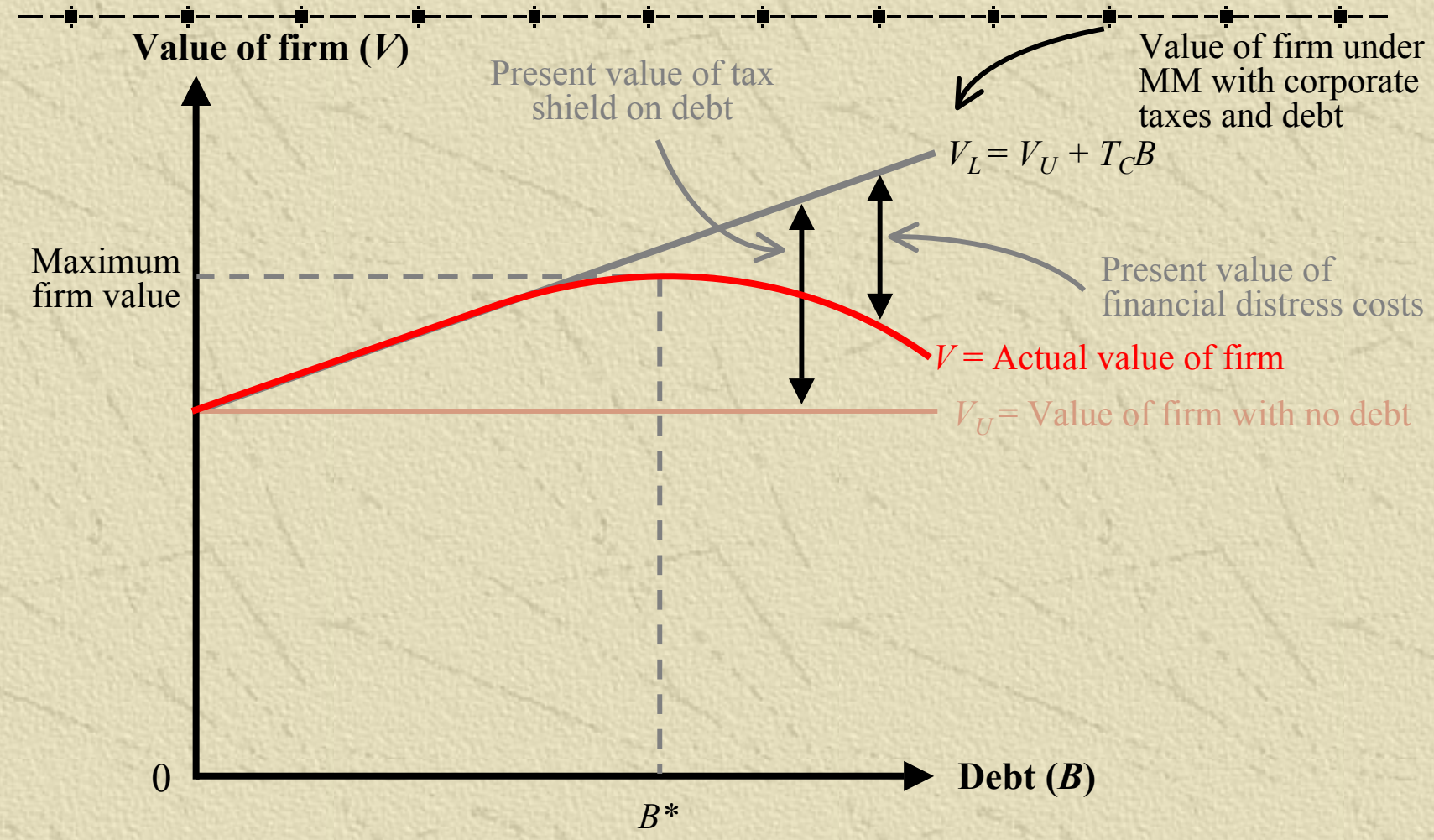
Thus, ⇑ the probability that a drop in the earnings will lead to financial distress:

Thus, ⇑ the probability that costs of financial distress will be incurred

Financial Distress & Firm Value

- $V_L = V_U$ + PV of Tax Shield
  - PV of expected costs of financial distress
- Costs of financial distress ↑ *non-linearly* with debt
  - ∪ shaped value curve implies an **Optimal Capital Structure**

Integration of Tax Effects and Financial Distress Costs

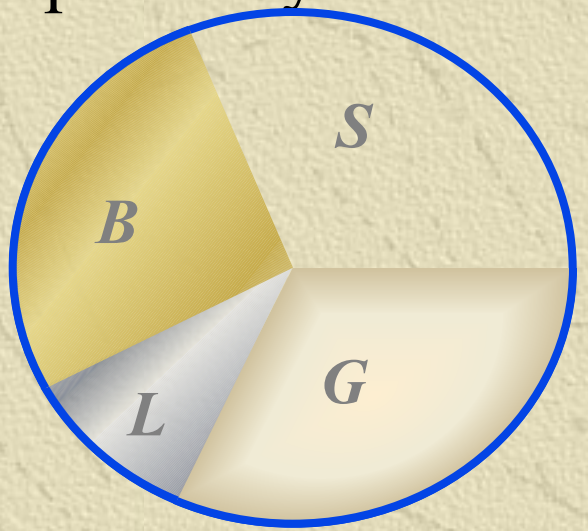


Integration of Tax Effects and Financial Distress Costs

- There is a trade-off between the tax advantage of debt and the costs of financial distress.
- It is difficult to express this with a precise and rigorous formula.

The Pie Model Revisited

- Taxes and bankruptcy costs can be viewed as just another claim on the cash flows of the firm.
- Let G and L stand for payments to the government and bankruptcy lawyers, respectively.
- $V_T = S + B + G + L$



- *The essence of the M&M intuition is that V_T depends on the cash flow of the firm; capital structure just slices the pie.*

Agency Cost of debt

- Agency costs between B/Hs and S/Hs create additional drag on the value of the firm
  - another cost of leverage
  - managers have the opportunity to take actions that would "transfer wealth" from B/Hs to the S/Hs

1. Increase the riskiness of the firm
2. Don't accept positive NPV projects
3. Pay extra dividends to the S/Hs

Agency cost of debt -- Continued

- Who incurs the cost of these "disincentives?"
- **S/Hs!!**
  - B/Hs know about these disincentives and demand compensation at the outset
- Can the agency cost be reduced?
  - Yes; by including protective covenants
    - COSTLY mechanism
    - limits what the managers can & can't do

Recapitulation

- $V_L = V_U$ + PV of TS
  - PV of expected costs of financial distress
  - PV of Agency Cost of debt
- MM 1963: tax gains from leverage
  - optimal capital structure might be 99+ % debt
- How to reconcile seeming MM anomaly of gross under-leveraging by U.S. corporations??
  - Actual B/S ratios are nowhere close to 99%!!!

Recapitulation-- Continued

- In the presence of personal taxes, when T_S is significantly less than T_B, tax gains from leverage might be *relatively* small.
  - When joined with reasonable presumed costs of leverage (bankruptcy & agency costs), theoretical MM predictions might be v. close to *"observed"* capital structures.

Issues relevant to making "real-life" capital structure decisions

1. Taxes: can firm "use" tax-shield?
2. Leverage causes r_S ↑
3. Is Financial distress a "significant" possibility
   - if yes, then agency cost of debt
4. Cash flow ability to service debt
5. EBIT-EPS Analysis
6. Industry average debt ratios

“Real-Life”-- Continued

7. Timing
   - Is this a good time to issue debt or equity?
8. Flexibility
   - how will today’s financing decision affect future financing?

- H.W. Chapter 15: 1, 2, 4, 5, 9, 12, 15, 17

  Chapter 16: 5, 11, 12, 13