DEPARTMENT OF COMMERCE AND FINANCIAL STUDIES
BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI – 620024
MBA (Financial Management)

Course Code and Name: FMFC1/24 – CORPORATE FINANCE

Unit – V/ Topic : COST OF CAPITAL

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Scheme of Presentation

- To determine a firm's cost of debt
- To determine a firm's cost of equity capital
- To determine a firm's overall cost of capital
- Understand pitfalls of overall cost of capital and how to manage them
- Dividend Policy
- Types of Dividends;
- Irrelevance of Dividend;
- Relevance of Dividend;
- Factors Influencing Dividend Policy;
- Types of Dividend Policies;
- Dividend Policies in Practice;
- Bonus Shares and Repurchase of Shares.

Why cost of capital is important?

- The return earned on assets depends on the risk of those assets. The return to an investor is the same as the cost to the company. cost of capital provides us with an indication of how the market views the risk of assets. cost of capital can also help us determine our required return for capital budgeting projects.

Required return

- The required return is the same as the appropriate discount rate based on the risk of the cash flows.
- One should need to know the required return for an investment before compute the NPV and make a decision about whether or not to take the investment.
- One should need to earn at least the required return to compensate our investors for the financing they have provided.

Cost of equity

- The cost of equity is the return required by equity investors given the risk of the cash flows from the firm.
- There are two main methods for determining the cost of equity:
  1. Dividend growth model
  2. SML or CAPM

Dividend growth model method

- Start with the dividend growth model formula and rearrange to solve for R_E

$$P_0 = \frac{D_1}{R_E - g}$$

$$R_E = \frac{D_1}{P_0} + g$$

Dividend growth model method—Example

- Your company is expected to pay a dividend of $4.40 per share next year. (D_1)
- Dividends have grown at a steady rate of 5.1% per year and the market expects that to continue. (g)
- The current stock price is $50. ($P_0$)
- What is the cost of equity?

$$R_E = \frac{4.40}{50} + .051 = .139$$

Estimating the dividend growth rate—Example

- One method for estimating the growth rate is to use the historical average.

Year	Dividend	% change
2003	1.23	
2004	1.30	(1.30 – 1.23) / 1.23 = 5.7%
2005	1.36	(1.36 – 1.30) / 1.30 = 4.6%
2006	1.43	(1.43 – 1.36) / 1.36 = 5.1%
2007	1.50	(1.50 – 1.43) / 1.43 = 4.9%

Average = (5.7 + 4.6 + 5.1 + 4.9) / 4 = 5.1%

Advantages and disadvantages of dividend growth model method

- Advantage—easy to understand and use
- Disadvantages
  - Only applicable to companies currently paying dividends
  - Not applicable if dividends aren't growing at a reasonably constant rate
  - Extremely sensitive to the estimated growth rate
  - Does not explicitly consider risk

The SML method

- Compute cost of equity using the SML
  - Risk-free rate, R_f
  - Market risk premium, $E(R_M) - R_f$
  - Systematic risk of asset, β

$$R_E = R_f + \beta_E (E(R_M) - R_f)$$

SML approach—Example

- Company's equity beta = 1.2
- Current risk-free rate = 7%
- Expected market risk premium = 6%
- What is the cost of equity capital?

$$R_E = 7 + 1.2(6) = 14.2\%$$

Advantages and disadvantages of SML method

- Advantages
  - Explicitly adjusts for systematic risk
  - Applicable to all companies, as long as beta is available
- Disadvantages
  - Must estimate the *expected* market risk premium, which does vary over time
  - Must estimate beta, which also varies over time
  - Relies on the past to predict the future, which is not always reliable

Cost of equity

- Data:
  - Beta = 1.2
  - Market risk premium = 8%
  - Current risk-free rate = 6%
  - Analysts' estimates of growth = 8% per year
  - Last dividend = $2
  - Current stock price = $30

  - Using SML: $R_E = 6\% + 1.2(8\%) = 15.6\%$
  - Using DGM: $R_E = [2(1.08) / 30] + .08$
    $= 15.2\%$

Cost of debt

- The cost of debt = the required return on a company's debt.
- Usually focus on the cost of long-term debt or bonds.
- Method 1 = Compute the yield to maturity on existing debt.
- Method 2 = Use estimates of current rates based on the bond rating expected on new debt.
- The cost of debt is NOT the coupon rate.

Cost of debt—Example

- Suppose we have a bond issue currently outstanding that has 25 years left to maturity. The coupon rate is 9% and coupons are paid semiannually. The bond is currently selling for $908.72 per $1000 bond. What is the cost of debt?
  - 50 **[N]**; PMT = 45 **[PMT]**; 1000 **[FV]**; 908.75**[+/-][PV]** ; **[CPT] [I/Y]** = 5%; YTM = 5(2) = 10%

Cost of preference shares

- Preference shares generally pay a constant dividend every period.
- Dividends are expected to be paid every period forever.

- Preference share valuation is an annuity, so we take the annuity formula, rearrange and solve for R_P.

Cost of preference shares— Example

- Your company has preference shares that have an annual dividend of $3. If the current price is $25, what is the cost of a preference share?
- $R_P = 3 / 25 = 12\%$

Weighted average cost of capital

- Use the individual costs of capital to compute a weighted ‘average’ cost of capital for the firm.
- This ‘average’ = the required return on the firm’s assets, based on the market’s perception of the risk of those assets.
- The weights are determined by how much of

Determining the weights for the WACC

- Weights = percentages of the firm that will be financed by each component.
- Always use the target weights, if possible.
  - If not available, use market values.

Capital structure weights

- Notation
  - E = market value of equity = number of outstanding shares times price per share
  - D = market value of debt = number outstanding bonds times bond price
  - V = market value of the firm = D + E
- Weights
  - w_E = E/V = percentage financed with equity
  - w_D = D/V = percentage financed with debt

Capital structure weights—Example

- Suppose have a market value of equity equal to $500 million and a market value of debt equal to $475 million.
  - What are the capital structure weights?
    - V = 500 million + 475 million = 975 million
    - w_E = E/D = 500 / 975 = .5128 = 51.28%
    - w_D = D/V = 475 / 975 = .4872 = 48.72%

Taxes and the WACC— Classical tax system

- One should need to consider the effect of taxes on the various costs of capital.
- Interest expense reduces our tax liability.
  - This reduction in taxes reduces the cost of debt.
  - After-tax cost of debt = $R_D(1-T_C)$.
- Dividends are not tax deductible, so there is no tax impact on the cost of equity.

WACC

$$WACC = (E/V) \times R_E + (P/V) \times R_P + (D/V) \times R_D \times (1 - T_C)$$

Where:

(E/V) = % of common equity in capital structure
(P/V) = % of preferred stock in capital structure
(D/V) = % of debt in capital structure

R_E = firm's cost of equity
R_P = firm's cost of preferred stock
R_D = firm's cost of debt

T_C = firm's corporate tax rate

WACC I—Extended example

- Equity information
  - 50 million shares
  - $80 per share
  - Beta = 1.15
  - Market risk premium = 9%
  - Risk-free rate = 5%
- Debt information
  - $1 billion in outstanding debt (face value)
  - Current quote = 110
  - Coupon rate = 9%, semiannual coupons
  - 15 years to maturity
- Tax rate = 40%

WACC II—example

- What is the cost of equity?
  - $R_E = 5 + 1.15(9) = 15.35\%$
- What is the cost of debt?
  - N = 30; PV = -1100; PMT = 45; FV = 1000; CPT I/Y = 3.9268
  - $R_D = 3.927(2) = 7.854\%$
- What is the after-tax cost of debt?
  - $R_D(1-T_C) = 7.854(1-.4) = 4.712\%$

WACC III—example

- What are the capital structure weights?
  - E = 50 million (80) = 4 billion
  - D = 1 billion (1.10) = 1.1 billion
  - V = 4 + 1.1 = 5.1 billion
  - w_E = E/V = 4 / 5.1 = .7843
  - w_D = D/V = 1.1 / 5.1 = .2157
- What is the WACC?
  - WACC = .7843(15.35%) + .2157(4.712%) = 13.06%

Taxes and the WACC— Imputation tax system

- In an imputation system shareholders are given a tax credit for the local taxes paid. This will alter the cost of equity for the firm.
- We have to adjust the WACC formula to take into account the tax advantage of imputation.
- $WACC = w_E R_E(1-T_C) + w_D R_D(1-T_C)$
- This adjustment assumes all shareholders can take advantage of the tax credits.

Summary of capital cost calculations—Table 12.1

I. The cost of equity, R_E

A. Dividend growth model approach (from Chapter 7):

$$R_E = D_1/P_0 + g$$

where D_1 is the expected dividend in one period, g is the dividend growth rate and P_0 is the current share price.

B. SML approach (from Chapter 11):

$$R_E = R_f + \beta_E \times (R_M - R_f)$$

where R_f is the risk-free rate, R_M is the expected return on the overall market, and β_E is the systematic risk of the equity.

II. The cost of debt, R_D

A. For a firm with publicly held debt, the cost of debt can be measured as the yield to maturity on the outstanding debt. The coupon rate is irrelevant. Yield to maturity is covered in Chapter 6.

B. If the firm has no publicly traded debt, then the cost of debt can be measured as the yield to maturity on similarly rated bonds (bond ratings are discussed in Chapter 6).

III. The weighted average cost of capital, WACC (classical tax system)

A. The firm's WACC is the overall required return on the firm as a whole. It is the appropriate discount rate to use for cash flows similar in risk to the overall firm.

B. The WACC is calculated as:

$$\text{WACC} = (E/V) \times R_E + (D/V) \times R_D \times (1 - T_C)$$

where T_C is the corporate tax rate, E is the *market* value of the firm's equity, D is the *market* value of the firm's debt, and $V = E + D$. Note that E/V is the percentage of the firm's financing (in market value terms) that is equity, and D/V is the percentage that is debt.

IV. The weighted average cost of capital, WACC (imputation tax system)

A. The firm's WACC is the overall required return on the firm as a whole. It is the appropriate discount rate to use for cash flows similar in risk to the overall firm.

Summary of capital cost calculations—Table 12.1 (cont.)

B. The WACC is calculated as:

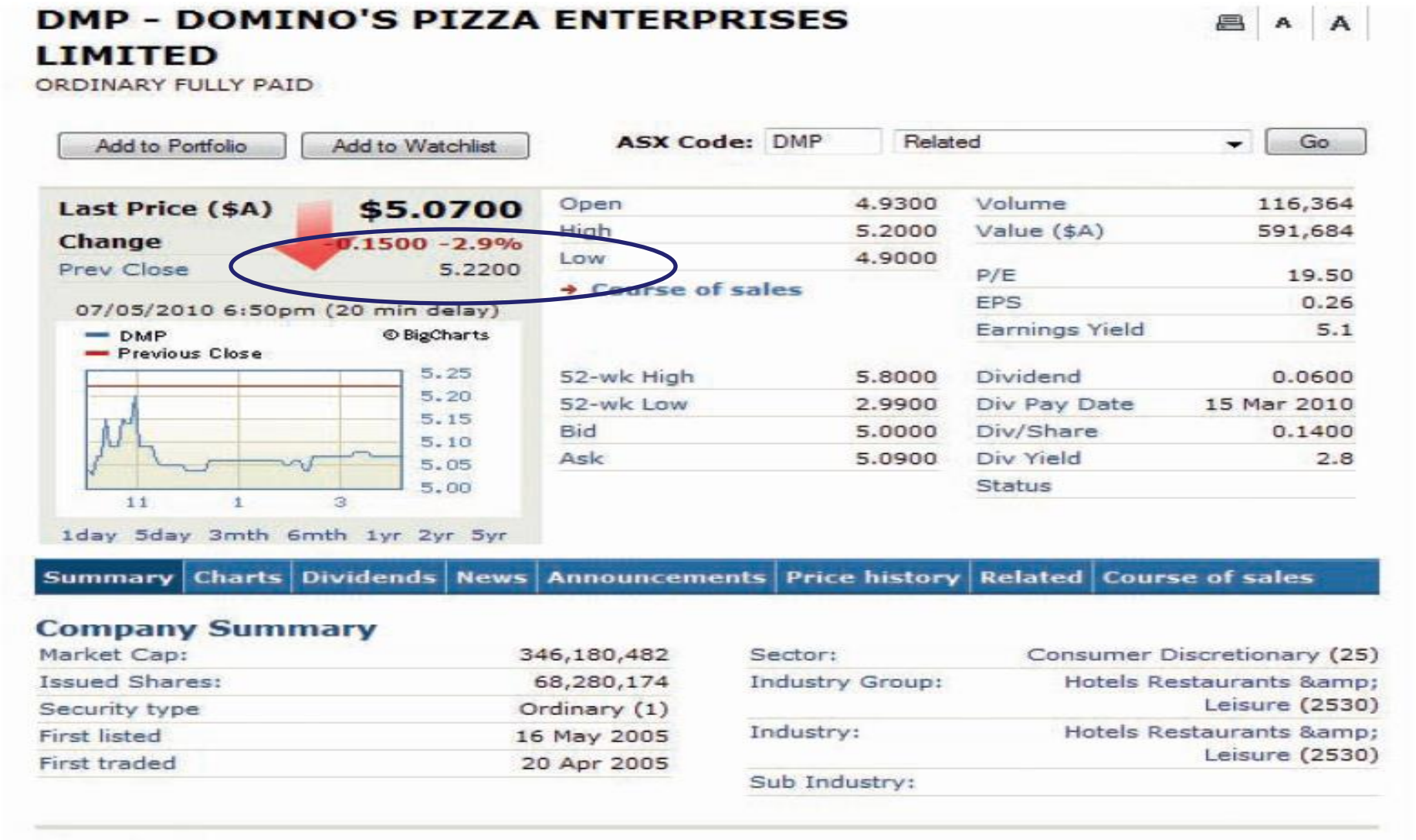
$$WACC = (E/V) \times R_E \times (1 - T_C) + (D/V) \times R_D \times (1 - T_C)$$

where T_C is the corporate tax rate, E is the *market* value of the firm's equity, D is the *market* value of the firm's debt, and $V = E + D$. Note that E/V is the percentage of the firm's financing (in market value terms) that is equity, and D/V is the percentage that is debt.

Factors that Influence a company's WACC

- Market conditions, especially interest rates, tax rates and the market risk premium
- The firm's capital structure and dividend policy
- The firm's investment policy
  - Firms with riskier projects generally have a higher WACC

Cost of equity—Domino's Pizza



DMP – DOMINO'S PIZZA ENTERPRISES LIMITED

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Last Price ($A)	$5.0700
Change	-0.1500 -2.9%
Prev Close	5.2200

07/05/2010 6:50pm (20 min delay)

DMP — Previous Close — © BigCharts

5.25 5.20 5.15 5.10 5.05 5.00

11 1 3

1day 5day 3mth 6mth 1yr 2yr 5yr

Open	4.9300	Volume	116,364
High	5.2000	Value ($A)	591,684
Low	4.9000		
→ Course of sales		P/E	19.50
		EPS	0.26
		Earnings Yield	5.1
52-wk High	5.8000	Dividend	0.0600
52-wk Low	2.9900	Div Pay Date	15 Mar 2010
Bid	5.0000	Div/Share	0.1400
Ask	5.0900	Div Yield	2.8
		Status	

Summary | Charts | Dividends | News | Announcements | Price history | Related | Course of sales

Company Summary

Market Cap:	346,180,482	Sector:	Consumer Discretionary (25)
Issued Shares:	68,280,174	Industry Group:	Hotels Restaurants & Leisure (2530)
Security type	Ordinary (1)	Industry:	Hotels Restaurants & Leisure (2530)
First listed	16 May 2005	Sub Industry:	
First traded	20 Apr 2005		

Source: <http://markets.smh.com.au/apps/qt/quote.ac?sy=smh&type=delayedquote&code=DMP#tabs> 8 May 2010.

Divisional and project costs of capital

- Using the WACC as our discount rate is only appropriate for projects that are the same risk level as the firm's current operations.
- If we are looking at a project that is NOT the same risk level as the firm, we need to determine the appropriate discount rate for that project.

Risk-adjusted WACC

- A firm's WACC reflects the risk of an *average* project undertaken by the firm.
  - 'Average' ➡ risk = the firm's current operations
- Different divisions/projects may have different risks.
  - The division's or project's WACC should be adjusted to reflect the appropriate risk and capital structure.

Using WACC for all projects

- What would happen if we used the WACC for all projects, regardless of risk?
- Assume the WACC = 15%

		Decision
Project	IRR	WACC=15%
A	17%	Accept
B	18%	Accept
C	12%	Reject

Using WACC for all projects (cont.)

- Assume the WACC = 15%.
- Adjusting for risk changes the decisions.

	Required		Decision	
Project	Return	IRR	WACC=15%	Risk Adj
A	20%	17%	Accept	Reject
B	15%	18%	Accept	Accept
C	10%	12%	Reject	Accept

Pure play approach

- Find one or more companies that specialize in the product or service being considered.
- Compute the beta for each company.
- Take an average.
- Use that beta along with the CAPM to find the appropriate return for a project of that

Subjective approach

- Consider the project's risk relative to the firm overall.
- If the project is more risky than the firm, use a discount rate greater than the WACC.
- If the project is less risky than the firm, use a discount rate less than the WACC.
- You may still accept projects that you shouldn't and reject projects you should accept, but your error rate should be lower than when not considering differential risk at all.

Subjective approach—Example

Risk level	Discount rate
Very low risk	WACC – 8%
Low risk	WACC – 3%
Same risk as firm	WACC
High risk	WACC + 5%
Very high risk	WACC + 10%

Unit-V:Cost of Capital, Capital Structure

- Cost of debt and preference shares
- Cost of equity and retained earnings
- Weighted Average Cost of Capital
- Project cost of capital

Cost of equity

The **cost of equity** is the rate of return required by the company's ordinary shareholders in order for that investor to bear the risk of holding that company's shares. The return consists both of dividend and capital gains.

Cost of debt

- **Cost of debt** is the interest a company pays on its borrowings. It is expressed as a percentage rate. In addition, **cost of debt** can be calculated as a before-tax rate or an after-tax rate. Because interest is deductible for income taxes, the **cost of debt** is usually expressed as an after-tax rate.

Cost of Retained Earnings

- The **cost of retained earnings** is the **earnings** foregone by the shareholders the opportunity **cost of retained earnings** may be taken as the **cost of retained earnings**. It is equal to the income that the shareholders could have otherwise earned by placing these funds in alternative investments.

Cost of Preference Shares

Cost of preference share capital is that part of cost of capital in which we calculate the amount which is payable to preference shareholders in the form of dividend with fixed rate.

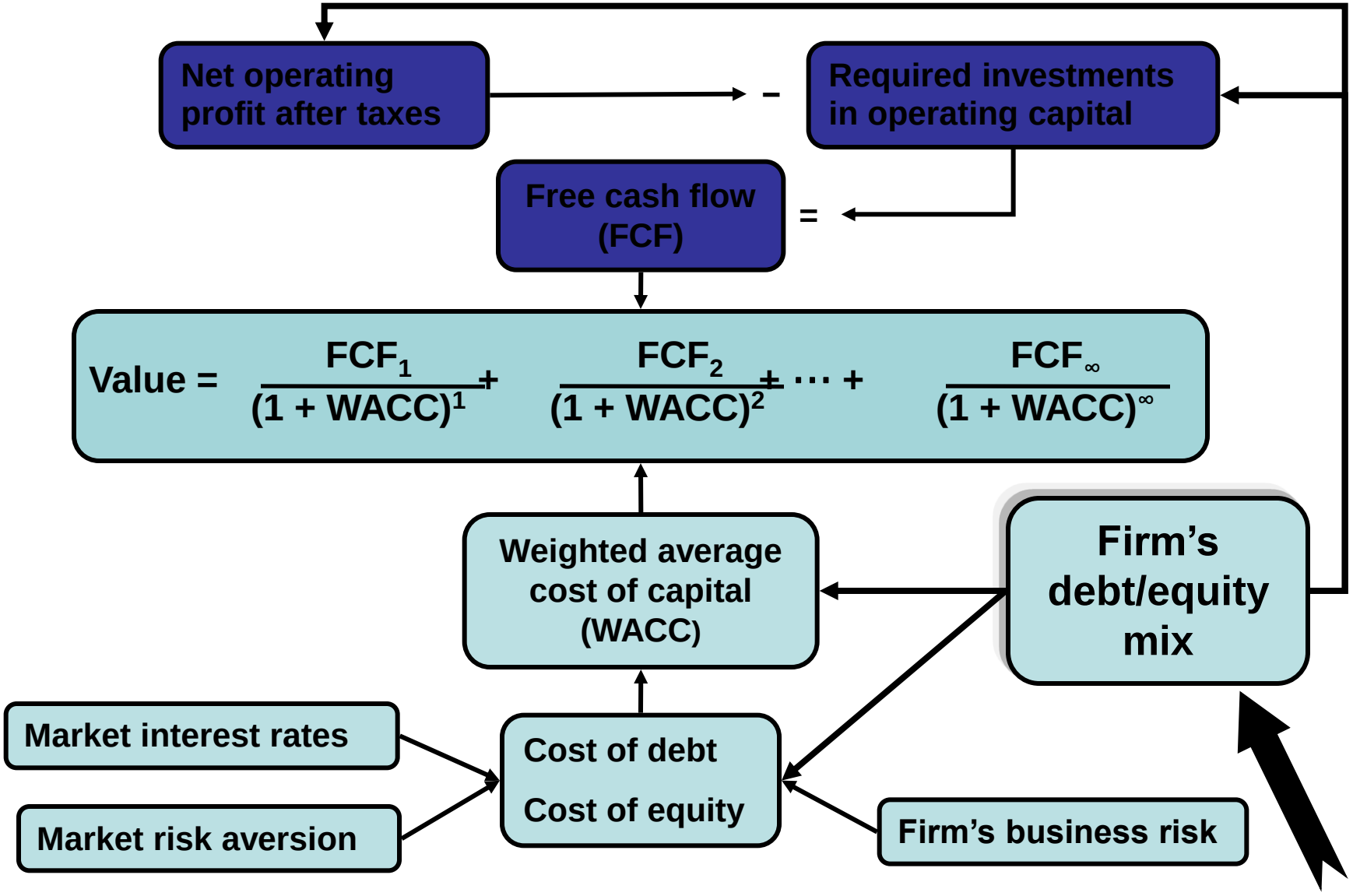
Weighted Average Cost of Capital

- Weighted average cost of capital (WACC) is a calculation of a firm's cost of capital in which each category of capital is proportionately weighted. All sources of capital, including common stock, preferred stock, bonds and any other long-term debt, are included in a WACC calculation
-

Topics in Chapter

- Overview and preview of capital structure effects
- Business versus financial risk
- The impact of debt on returns
- Capital structure theory, evidence, and implications for managers
- Example: Choosing the optimal structure

Determinants of Intrinsic Value: The Capital Structure Choice



Goal of the Firm ?

- Maximize Firm Value
- Maximize Profits
- Minimize WACC
- Maximize ROIC
- Maximize shareholder Wealth

Goal of the Firm is

- Maximize Firm Value
- Minimize WACC
  - Through:
    - Lowering risk
    - Increasing Cash Flows
    - Maximize Operational. Profits
    - Growth Business
    - Reduce Taxes

Factors Affecting Capital Structure:

The following the important factors which affect the capital structure

- Business Risk
- Debt's tax deductibility
- Ability to raise capital under adverse terms
- Managerial decisions:
  - Conservative vs. Aggressive
  - Minimize WACC through Lowering risk Increasing Cash Flows, Maximize Operational Profits, Growth Business, Reduce Taxes.

Basic Definitions

- V = value of firm
- FCF = free cash flow
- WACC = weighted average cost of capital
- r_s and r_d are costs of stock and debt
- w_s and w_d are percentages of the firm that are financed with stock and debt.

How can capital structure affect value?

$$V = \sum_{t=1}^{\infty} \frac{FCF_t}{(1 + WACC)^t}$$

$$WACC = w_d (1-T) r_d + w_s r_s$$

A Preview of Capital Structure Effects

- The impact of capital structure on value depends upon the effect of debt on:
  - Weighted Average Cost of Capital
  - Financial Cash Flows

(Continued…)

The Effect of Additional Debt on WACC

- Debtholders have a prior claim on cash flows relative to stockholders.
  - Debtholders' "fixed" claim increases risk of stockholders' "residual" claim.
- Firm's can deduct interest expenses.
  - Reduces the taxes paid Frees up more cash for payments to investors Reduces after-tax cost of debt

(Continued…)

The Effect on WACC (Continued)

- Debt increases risk of bankruptcy
- Adding debt increase percent of firm financed with low-cost debt and decreases percent financed with high-cost equity
- Net effect on WACC = uncertain.

(Continued…)

The Effect of Additional Debt on FCF

- Additional debt increases the probability of bankruptcy.
  - Direct costs: Legal fees, “fire” sales, etc.
  - Indirect costs: Lost customers, reduction in productivity of managers and line workers.

(Continued…)

- Impact of indirect costs
  - Net Operational Profit After Tax goes down due to lost customers and drop in productivity
  - Investment in capital goes up due to increase in net operating working capital .

(Continued…)

Business Risk: Uncertainty in EBIT, NOPAT, and ROIC

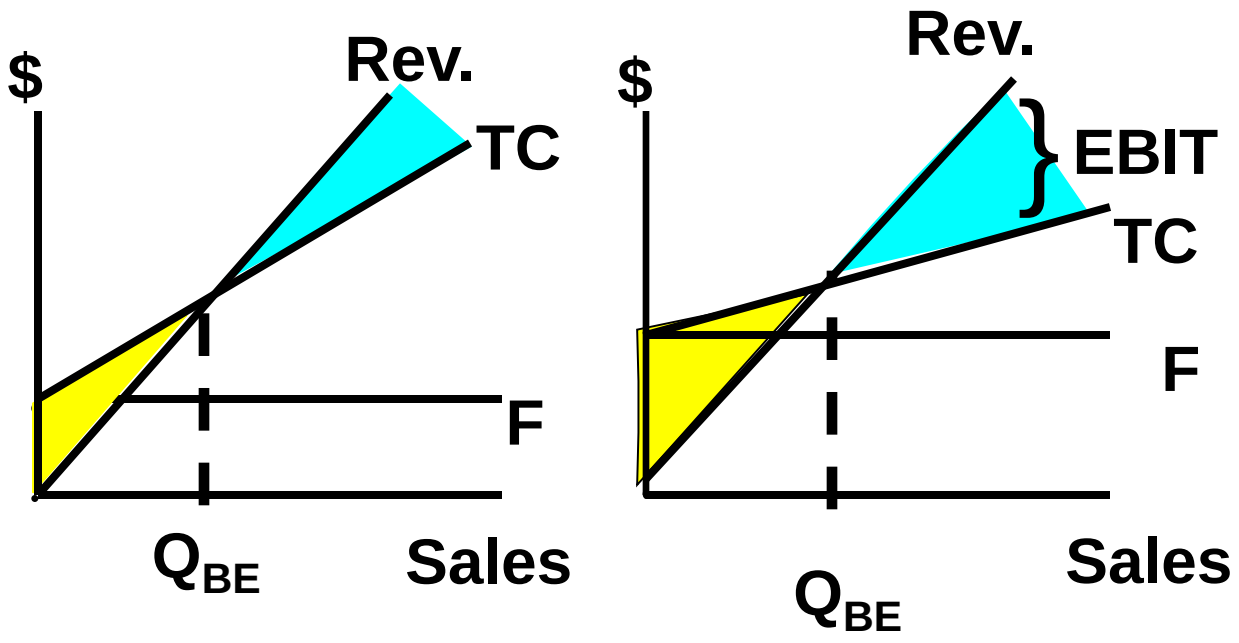
- The following business risk arise due to uncertainty in above
- Uncertainty about demand (unit sales).
- Uncertainty about output prices.
- Uncertainty about input costs.
- Product and other types of liability.
- Degree of operating leverage (DOL).

What is operating leverage, and how does it affect a firm's business risk?

- Operating leverage is the change in EBIT due to change in quantity sold.
- The higher the proportion of fixed costs relative to variable costs, the greater the operating leverage.

(More...)

Higher operating leverage leads to more business risk: small sales decline causes a larger EBIT decline.



(More...)

Business Risk versus Financial Risk

- Business risk:
  - Uncertainty in future Earnings Before Interest Tax, Net Operational Profit After Tax.
  - Depends on business factors such as competition, operating leverage, etc.
- Financial risk:
  - Additional business risk concentrated on common stockholders when financial leverage is used.
  - Depends on the amount of debt and preferred stock financing.

Capital Structure Theory

The following are the important capital structure theories

1. MM theory
   - Zero taxes
   - Corporate taxes
   - Corporate and personal taxes
2. Trade-off theory
3. Signaling theory
4. Pecking order
5. Debt financing as a managerial constraint
6. Windows of opportunity

MM Results: Zero Taxes

- Assumptions of MM Theory
- (1) no transactions costs (2) no restrictions or costs to short sales and (3) individuals can borrow at the same rate as corporations.
- MM prove that if the total CF to investors of Firm U and Firm L are equal, then arbitrage is possible unless the total values of Firm U and Firm L are equal:
  - $V_L = V_U$.
- Because FCF and values of firms L and U are equal, their WACCs are equal.
- Therefore, capital structure is irrelevant.

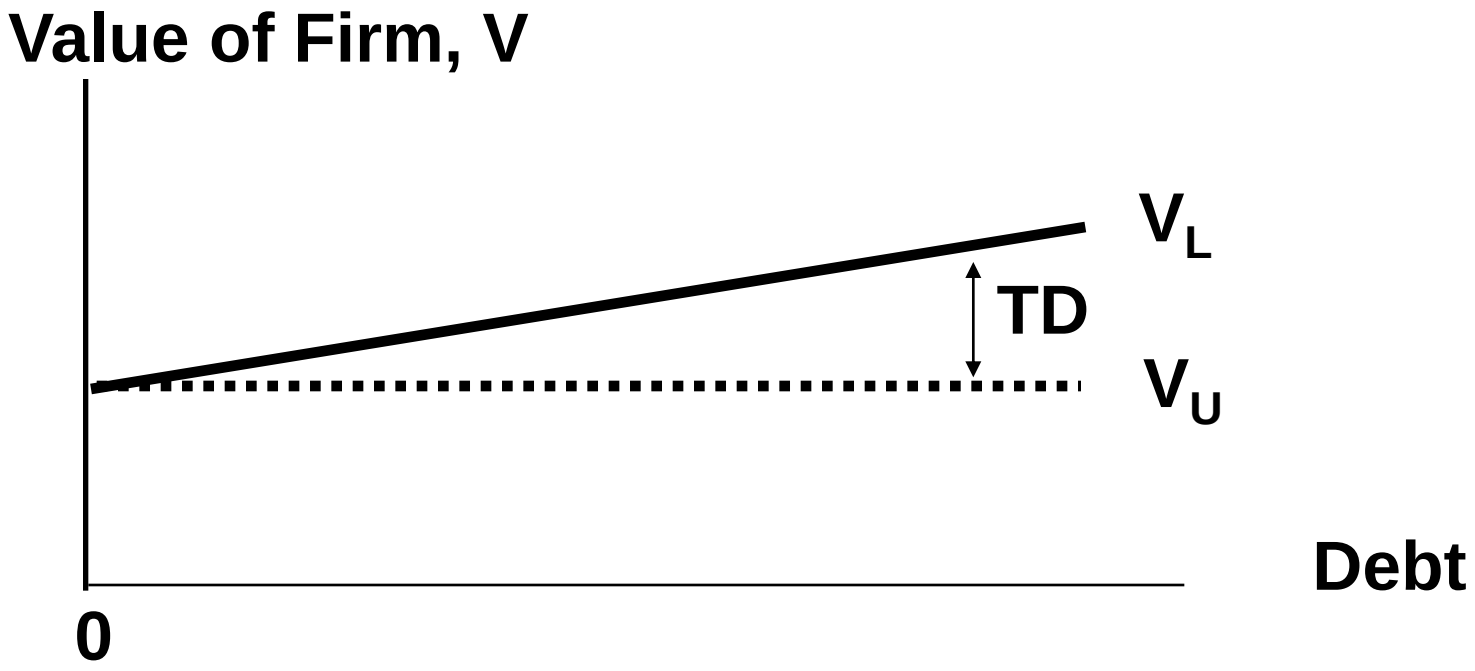
MM Theory: Corporate Taxes

- Corporate tax laws allow interest to be deducted, which reduces taxes paid by levered firms.
- Therefore, more CF goes to investors and less to taxes when leverage is used.
- In other words, the debt “shields” some of the firm’s CF from taxes.

MM Result: Corporate Taxes

- MM show that the total CF to Firm L's investors is equal to the total CF to Firm U's investor plus an additional amount due to interest deductibility:
  - $CF_L = CF_U + r_d DT$.

MM relationship between value and debt when corporate taxes are considered.



Under MM with corporate taxes, the firm's value increases continuously as more and more debt is used.

Miller's Theory: Corporate and Personal Taxes

- Personal taxes the advantage of corporate debt:
  - Corporate taxes favor debt financing since corporations can deduct interest expenses.
  - Personal taxes favor equity financing, since no gain is reported until stock is sold, and long-term gains are taxed at a lower rate.

Miller's Model with Corporate and Personal Taxes

$$V_L = V_U + \left(1 - \frac{(1 - T_c)(1 - T_s)}{(1 - T_d)}\right) D$$

T_c = corporate tax rate.
T_d = personal tax rate on debt income.
T_s = personal tax rate on stock income.

$T_c = 40\%$, $T_d = 30\%$, and $T_s = 12\%$.

$$V_L = V_U + \left(1 - \frac{(1 - 0.40)(1 - 0.12)}{(1 - 0.30)}\right)D$$

$$= V_U + (1 - 0.75)D$$

$$= V_U + 0.25D.$$

Value rises with debt; each \$1 increase in debt raises L's value by \$0.25.

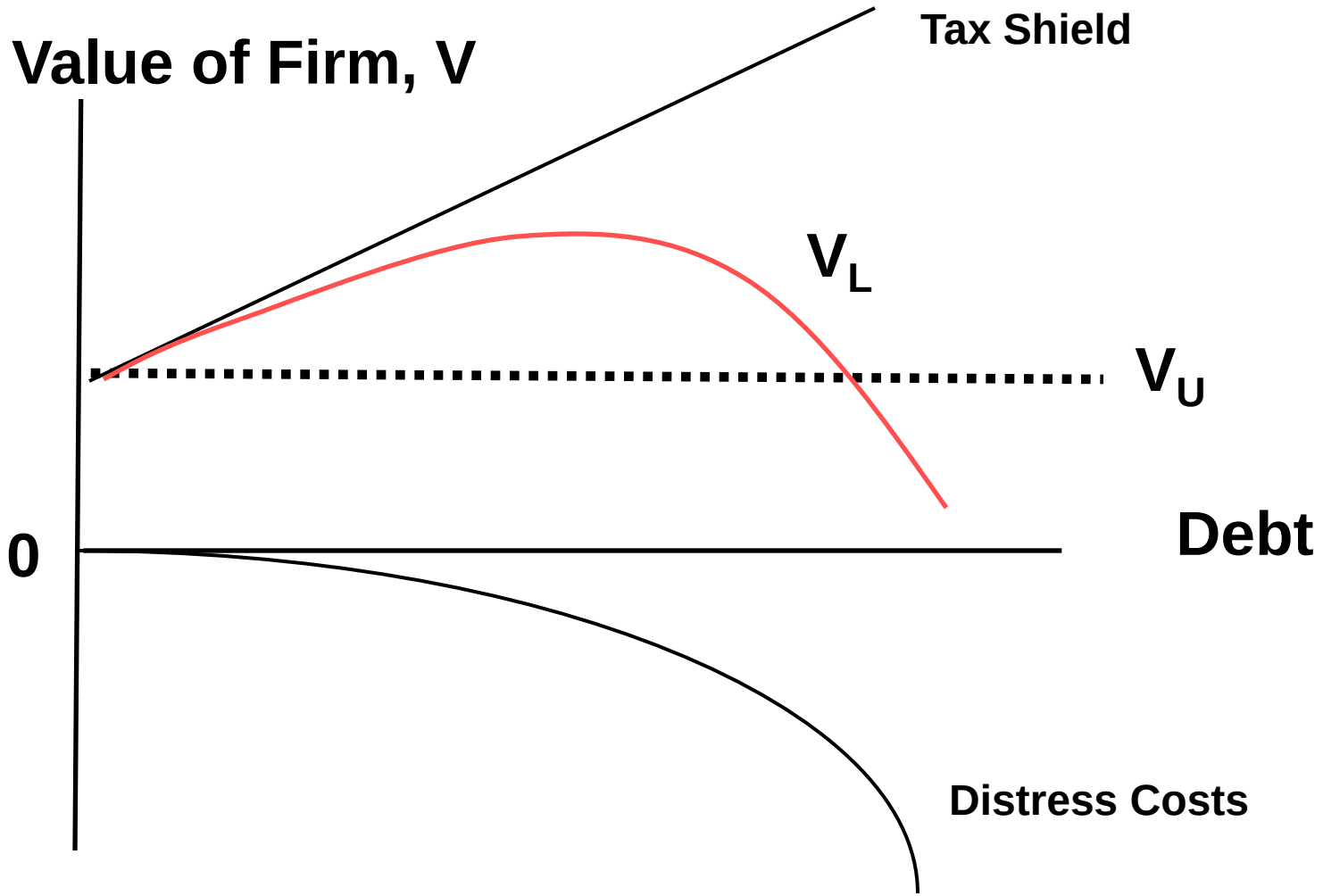
Conclusions with Personal Taxes

- Use of debt financing remains advantageous, but benefits are less than under only corporate taxes.
- Firms should still use 100% debt.
- Note: However, Miller argued that in equilibrium, the tax rates of marginal investors would adjust until there was no advantage to debt.

2. Trade-off Theory

- MM theory ignores bankruptcy costs, which increase as more leverage.
- At low leverage levels, tax benefits outweigh bankruptcy costs.
- At high levels, bankruptcy costs outweigh tax benefits.
- An optimal capital structure exists that balances these costs and benefits.

Tax Shield vs. Cost of Financial Distress



3. Signaling Theory

- MM assumed that investors and managers have the same information.
- But, managers often have better information. Thus, they would: Sell stock if stock is overvalued.
  - Sell bonds if stock is undervalued.
- Investors understand this new stock sales as a negative signal.
- Implications for managers?

4. Pecking Order Theory

- Firms use internally generated funds first, because there are no flotation costs or negative signals.
- If more funds are needed, firms then issue debt because it has lower flotation costs than equity and not negative signals.
- If more funds are needed, firms then issue equity.

5. Debt Financing and Agency Costs

- One agency problem is managers can use corporate funds for non-value maximizing purposes.
- The use of financial leverage:
  - Bonds “free cash flow.”
  - Forces discipline on managers to avoid perks and non-value adding acquisitions.

(More...)

- A second agency problem is the potential for “underinvestment”.
  - Debt increases risk of financial distress.
  - Therefore, managers may avoid risky projects even if they have positive NPVs.

6.Investment Opportunity Set and Reserve Borrowing Capacity

- Firms with many investment opportunities should maintain reserve borrowing capacity, especially if they have problems with asymmetric information.

Windows of Opportunity

- Managers try to “time the market” when issuing securities.
- They issue equity when the market is “high” and after big stock price run ups.
- They issue debt when the stock market is “low” and when interest rates are “low.”
- The issue short-term debt when the term structure is upward sloping and long-term debt when it is relatively flat.

Empirical Evidence

- Firms don’t make quick corrections when stock price changes cause their debt ratios to change– doesn’t support trade-off model.
- After big stock price run ups, debt ratio falls, but firms tend to issue equity instead of debt.

Empirical Evidence (Continued)

  - Inconsistent with trade-off model.
  - Inconsistent with pecking order.
  - Consistent with windows of opportunity.
- Many firms, especially those with growth options and asymmetric information problems, tend to maintain excess borrowing capacity.

Implications for Managers

- Take advantage of tax benefits by issuing debt, especially if the firm has:
  - High tax rate, Stable sales
  - Low operating leverage
- Avoid financial distress costs by maintaining excess borrowing capacity, especially if the firm has:
  - Volatile sales

Implications for Managers (Continued)

- High operating leverage, Many potential investment opportunities, Special purpose assets (instead of general purpose assets that make good collateral)

Implications for Managers (Continued)

- If manager has asymmetric information regarding firm's future prospects, then avoid issuing equity.
- Always consider the impact of capital structure choices on lenders' and rating agencies' attitudes

Current Value of Operations

- Expected FCF = $30 million.
- Firm expects zero growth: g = 0.
- V_{op} = [FCF(1+g)]/(WACC − g)
  = [$30(1+0)]/(0.12 − 0)
  = $250 million.

Other Data for Valuation Analysis

- Company has no ST investments.
- Company has no preferred stock.
- 100,000 shares outstanding

Current Valuation Analysis

V_{op}	$250
+ ST Inv.	0
V_{Total}	$250
– Debt	0
S	$250
÷ n	10
P	$25.00

Investment bankers provided estimates of r_d for different capital structures.

w_d	0%	20%	30%	40%	50%
r_d	0.0%	8.0%	8.5%	10.0%	12.0%

If company recapitalizes, it will use proceeds from debt issuance to repurchase stock.

The Cost of Equity at Different Levels of Debt: Hamada's Formula

- MM theory implies that beta changes with leverage.
- b_U is the beta of a firm when it has no debt (the unlevered beta)
- $b = b_U [1 + (1 - T)(w_d/w_s)]$

The Cost of Equity for w_d = 20%

- Use Hamada's equation to find beta:

  $b = b_U [1 + (1 - T)(w_d/w_s)]$

  $= 1.0 [1 + (1-0.4) (20\% / 80\%)]$

  $= 1.15$

- Use CAPM to find the cost of equity:

  $r_s = r_{RF} + b_L (RPM)$

  $= 6\% + 1.15 (6\%) = 12.9\%$

The WACC for $w_d = 20\%$

- $WACC = w_d (1\text{-}T) r_d + w_{ce} r_s$
- $WACC = 0.2 (1 – 0.4) (8\%) + 0.8 (12.9\%)$
- $WACC = 11.28\%$

- Repeat this for all capital structures under consideration.

Beta, r_s, and WACC

w_d	0%	20%	30%	40%	50%
r_d	0.0%	8.0%	8.5%	10.0%	12.0%
w_s	100%	80%	70%	60%	50%
b	1.000	1.150	1.257	1.400	1.600
r_s	12.00%	12.90%	13.54%	14.40%	15.60%
WACC	12.00%	11.28%	**11.01%**	11.04%	11.40%

The WACC is minimized for w_d = 30%. This is the optimal capital structure.

Corporate Value for $w_d = 20\%$

- V_{op} = [FCF(1+g)]/(WACC − g)
  = [\$30(1+0)]/(0.1128 − 0)
  = \$265.96 million.
- Debt = $D_{New} = w_d V_{op}$
  = 0.20(265.96) = \$53.19 million.
- Equity = $S = w_s V_{op}$
  = 0.80(265.96) = \$212.77 million.

Value of Operations, Debt, and Equity

w_d	0%	20%	30%	40%	50%
r_d	0.0%	8.0%	8.5%	10.0%	12.0%
w_s	100%	80%	70%	60%	50%
b	1.000	1.150	1.257	1.400	1.600
r_s	12.00%	12.90%	13.54%	14.40%	15.60%
WACC	12.00%	11.28%	11.01%	11.04%	11.40%
V_{op}	$250.00	$265.96	**$272.48**	$271.74	$263.16
D	$0.00	$53.19	$81.74	$108.70	$131.58
S	$250.00	$212.77	$190.74	$163.04	$131.58

Value of operations is maximized at w_d = 30%.

Anatomy of a Recap: Before Issuing Debt

	Before Debt
V_{op}	$250
+ ST Inv.	0
V_{Total}	$250
− Debt	0
S	$250
÷ n	10
P	$25.00
Total shareholder wealth: S + Cash	$250

Issue Debt (w_d = 20%), But Before Repurchase

- WACC decreases to 11.28%.
- V_{op} increases to $265.9574.
- Firm temporarily has short-term investments of $53.1915 (until it uses these funds to repurchase stock).
- Debt is now $53.1915.

Anatomy of a Recap: After Debt, but Before Repurchase

	Before Debt	After Debt, Before Rep.
V_{op}	$250	$265.96
+ ST Inv.	0	53.19
V_{Total}	$250	$319.15
– Debt	0	53.19
S	$250	$265.96
÷ n	10	10
P	$25.00	$26.60
Total shareholder wealth: S + Cash	$250	$265.96

After Issuing Debt, Before Repurchasing Stock

- Stock price increases from $25.00 to $26.60.
- Wealth of shareholders (due to ownership of equity) increases from $250 million to $265.96 million.

The Repurchase: No Effect on Stock Price

- The announcement of an intended repurchase might send a signal that affects stock price, and the previous change in capital structure affects stock price, but the repurchase itself has no impact on stock price.
  - If investors thought that the repurchase would increase the stock price, they would all purchase stock the day before, which would drive up its price.
  - If investors thought that the repurchase would decrease the stock price, they would all sell short the stock the day before, which would drive down the stock price.

Remaining Number of Shares After Repurchase

- D_{Old} is amount of debt the firm initially has, D_{New} is amount after issuing new debt.
- If all new debt is used to repurchase shares, then total dollars used equals
  - $(D_{New} – D_{Old})$ = ($53.19 - $0) = $53.19.
- n_{Prior} is number of shares before repurchase, n_{Post} is number after. Total shares remaining:
  - $n_{Post} = n_{Prior} – (D_{New} – D_{Old})/P$
    = 10 – ($53.19/$26.60)
    = 8 million.

(Ignore rounding differences; see *Ch15 Mini Case.xls* for actual calculations).

Anatomy of a Recap: After Rupurchase

	Before Debt	After Debt, Before Rep.	After Rep.
V_{op}	$250	$265.96	$265.96
+ ST Inv.	0	53.19	0
V_{Total}	$250	$319.15	$265.96
– Debt	0	53.19	53.19
S	$250	$265.96	$212.77
÷ n	10	10	8
P	$25.00	$26.60	$26.60
Total shareholder wealth: S + Cash	$250	$265.96	$265.96

Key Points

- ST investments fall because they are used to repurchase stock.
- Stock price is unchanged.
- Value of equity falls from $265.96 to $212.77 because firm no longer owns the ST investments.
- Wealth of shareholders remains at $265.96 because shareholders now directly own the funds that were held by firm in ST investments.

Intrinsic Stock Price Maximized at Optimal Capital Structure

w_d	0%	20%	30%	40%	50%
r_d	0.0%	8.0%	8.5%	10.0%	12.0%
w_s	100%	80%	70%	60%	50%
b	1.000	1.150	1.257	1.400	1.600
r_s	12.00%	12.90%	13.54%	14.40%	15.60%
WACC	12.00%	11.28%	**11.01%**	11.04%	11.40%
V_{op}	$250.00	$265.96	**$272.48**	$271.74	$263.16
D	$0.00	$53.19	$81.74	$108.70	$131.58
S	$250.00	$212.77	$190.74	$163.04	$131.58
n	10	8	7	6	5
P	$25.00	$26.60	**$27.25**	$27.17	$26.32

Shortcuts

- The corporate valuation approach will always give the correct answer, but there are some shortcuts for finding S, P, and n.
- Shortcuts on next slides.

Calculating S, the Value of Equity after the Recap

- $S = (1 - w_d) V_{op}$
- At $w_d = 20\%$:
- $S = (1 - 0.20)\ \$265.96$
- $S = \$212.77$.

(Ignore rounding differences; see *Ch15 Mini Case.xls* for actual calculations).

Number of Shares after a Repurchase, n_{Post}

- At $w_d = 20\%$:
- $n_{Post} = n_{Prior}(V_{opNew} - D_{New})/(V_{opNew} - D_{Old})$

  $= 10(\$265.96 - \$53.19)/(\$265.96 - \$0)$

  $= 8$

Calculating PPost, the Stock Price after a Recap

- At $w_d = 20\%$:
- $P_{Post} = (V_{opNew} - D_{Old})/n_{Prior}$

  $= (\$265.96 - \$0)/10$

  $= \$26.60$

Optimal Capital Structure

- w_d = 30% gives:
  - Highest corporate value
  - Lowest WACC
  - Highest stock price per share
- But w_d = 40% is close. Optimal range is pretty flat.

Part B

Firm U: Unleveraged

	Economy		
	Bad	Avg.	Good
Prob.	0.25	0.50	0.25
EBIT	$2,000	$3,000	$4,000
Interest	0	0	0
EBT	$2,000	$3,000	$4,000
Taxes (40%)	800	1,200	1,600
NI	$1,200	$1,800	$2,400

Firm L: Leveraged

	Economy		
	Bad	Avg.	Good
Prob.*	0.25	0.50	0.25
EBIT*	$2,000	$3,000	$4,000
Interest	1,200	1,200	1,200
EBT	$ 800	$1,800	$2,800
Taxes (40%)	320	720	1,120
NI	$ 480	$1,080	$1,680

*Same as for Firm U.

Firm U	Bad	Avg.	Good
BEP	10.0%	15.0%	20.0%
ROI*	6.0%	9.0%	12.0%
ROE	6.0%	9.0%	12.0%
TIE	∞	∞	∞
Firm L	**Bad**	**Avg.**	**Good**
BEP	10.0%	15.0%	20.0%
ROI*	8.4%	11.4%	14.4%
ROE	4.8%	10.8%	16.8%
TIE	1.7x	2.5x	3.3x

*ROI = (NI + Interest)/Total financing.

Profitability Measures:

	U	L
E(BEP)	15.0%	15.0%
E(ROI)	9.0%	11.4%
E(ROE)	9.0%	10.8%
Risk Measures:		
σ_{ROE}	2.12%	4.24%
CV_{ROE}	0.24	0.39
E(TIE)	∞	2.5x

Conclusions

- Basic earning power = BEP = EBIT/Total assets is unaffected by financial leverage.
- L has higher expected ROI and ROE because of tax savings.
- L has much wider ROE (and EPS) swings because of fixed interest charges. Its higher expected return is accompanied by higher risk.

(More...)

- In a stand-alone risk sense, Firm L's stockholders see much more risk than Firm U's.
  - U and L: $\sigma_{ROE(U)} = 2.12\%$.
  - U: $\sigma_{ROE} = 2.12\%$.
  - L: $\sigma_{ROE} = 4.24\%$.
- L's financial risk is $\sigma_{ROE} - \sigma_{ROE(U)} = 4.24\% - 2.12\% = 2.12\%$. (U's is zero.)

(More...)

- For leverage to be positive (increase expected ROE), BEP must be > k_d.
- If k_d > BEP, the cost of leveraging will be higher than the inherent profitability of the assets, so the use of financial leverage will depress net income and ROE.
- In the example, E(BEP) = 15% while interest rate = 12%, so leveraging “works.”

The Optimal Capital Structure

- Calculate the cost of equity at each level of debt.
- Calculate the value of equity at each level of debt.
- Calculate the total value of the firm (value of equity + value of debt) at each level of debt.
- The optimal capital structure maximizes the total value of the firm.

Cost of Equity at Zero Debt

- Since the firm has 0 growth, its current value, $2,000,000, is given by

  $\text{Dividends}/k_S = (\text{EBIT})(1\text{-T})/k_S$
  $= 500{,}000\ (1 - 0.40)/k_S$

- k_S = 15.0% = unlevered cost of equity.

- $b_U = (k_S - k_{RF})/RP_M = (15 - 6)/4 = 2.25$

Cost of Equity at Each Debt Level

- Hamada's equation says that

$$b_L = b_U (1 + (1-T)(D/E))$$

Debt(000s)	D/E	b_L	k_S
0	0	2.25	15.00%
250	0.142	2.44	15.77
500	0.333	2.70	16.80
750	0.600	3.06	18.24
1,000	1.000	3.60	20.40

$D = \$250$, $k_d = 10\%$, $k_s = 15.77\%$.

$$S_1 = \frac{(EBIT - k_d D)(1 - T)}{k_s} = \frac{[\$1,807 + 0.10(\$250)](0.6)}{0.1577} = \$1,807.$$

$$V_1 = S_1 + D_1 = \$1,807 + \$250 = \$2,057.$$

$$P_1 = \frac{\$2,057}{100} = \$20.57.$$

Shares repurchased $= \frac{\$250}{\$20.57} = 12.15.$

Shares remaining $= n_1 = 100 - 12.15 = 87.85.$

Check on stock price:

$P_1 = \quad = \quad = \$20.57.$

Other debt levels treated similarly.

$\frac{S_1}{n_1} \quad \frac{\$1,807}{87.85}$

Value of Equity at Each Debt Level

- Equity Value = Dividends/k_S

Debt(000s)	k_D	Divs	k_S	E
0	na	300	15.00%	2,000
250	10%	285	15.77	1,807
500	11%	267	16.80	1,589
750	13%	241.5	18.24	1,324
1,000	16%	204	20.40	1,000

Total Value of Firm

Debt (000s)	E	Total Value	Price per Share
0	2,000	2,000	$20.00
250	1,807	2,057	20.57
500	1,589	2,089	20.89
750	1,324	2,074	20.74
1,000	1,000	2,000	20.00

Total Value is Max-imized with 500,000 in debt.

Calculate EPS at debt of $0, $250K, $500K, and $750K, assuming that the firm begins at zero debt and recap-italizes to each level in a single step.

Net income = NI = [EBIT - k_d D](1 - T).
EPS = NI/n.

D	NI	n	EPS
$ 0	$300	100.00	$3.00
250	285	87.85	3.24
500	267	76.07	3.51
750	242	63.84	3.78

- EPS continues to increase beyond the $500,000 optimal debt level.
- Does this mean that the optimal debt level is $750,000, or even higher?

Find the WACC at each debt level.

D	S	V	k_d	K_s	WACC
$ 0	$2,000	$2,000	--	15.00%	15.0%
250	1,807	2,057	10%	15.77	14.6
500	1,589	2,089	11.0	16.80	14.4
750	1,324	2,074	13.0	18.24	14.5
1,000	1,000	2,000	13.0	20.40	15.0

e.g. D = $250:

WACC = ($250/$2,057)(10%)(0.6)
+ ($1,807/$2,057)(15.77%)
= 14.6%.

- The WACC is minimized at D = $500,000, the same debt level that maximizes stock price.
- Since the value of a firm is the present value of future operating income, the lowest discount rate (WACC) leads to the highest value.

How would higher or lower
business risk affect
the optimal capital structure?

- At any debt level, the firm's probability of financial distress would be higher. Both k_d and k_s would rise faster than before. The end result would be an optimal capital structure with less debt.
- Lower business risk would have the opposite effect.

Is it possible to do an analysis exactly like the one above for most firms?

- No. The analysis above was based on the assumption of zero growth, and most firms do not fit this category.
- Further, it would be very difficult, if not impossible, to estimate k_s with any confidence.

What type of analysis should firms conduct to help find their optimal, or target, capital structure?

- Financial forecasting models can help show how capital structure changes are likely to affect stock prices, coverage ratios, and so on.

(More...)

- Forecasting models can generate results under various scenarios, but the financial manager must specify appropriate input values, interpret the output, and eventually decide on a target capital structure.
- In the end, capital structure decision will be based on a combination of analysis and judgment.

What other factors would managers consider when setting the target capital structure?

- Debt ratios of other firms in the industry.
- Pro forma coverage ratios at different capital structures under different economic scenarios.
- Lender and rating agency attitudes (impact on bond ratings).

- Reserve borrowing capacity.
- Effects on control.
- Type of assets: Are they tangible, and hence suitable as collateral?
- Tax rates.

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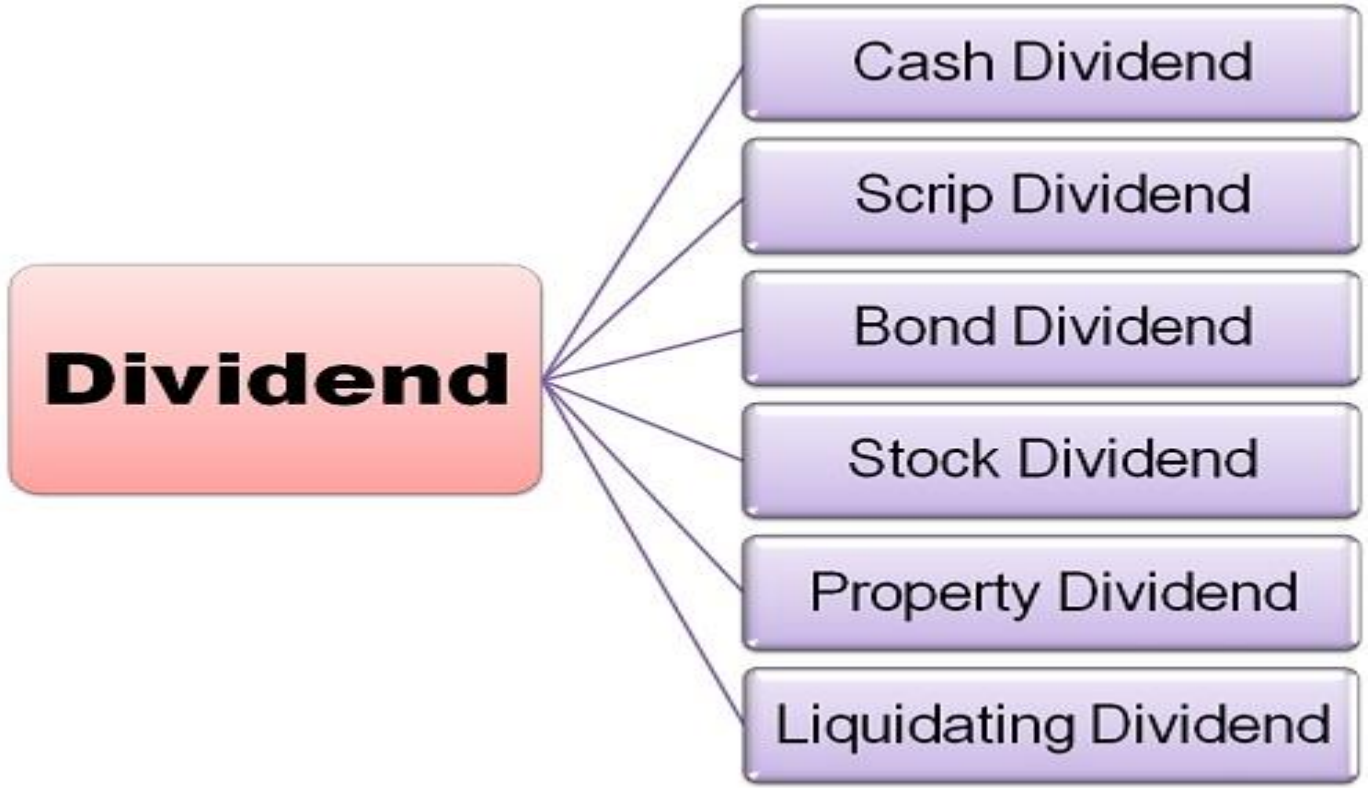
Definition

- The Dividends are the proportion of revenues paid to the shareholders. The amount to be distributed among the shareholders depends on the earnings of the firm and is decided by the board of directors.

Types of Dividend



Relevance of Dividend

- Walter and Gordon suggested that shareholders prefer current dividends and hence a positive relationship exists between dividend and market value. The logic put behind this argument is that investors are generally risk-averse and that they prefer current dividend, attaching lesser importance to future dividends or capital gains.

Irrelevance of Dividend

- As per Irrelevance Theory of Dividend, the market price of shares is not affected by dividend policy. Payment of dividend does not change the wealth of the existing shareholders because payment of dividend decreases cash balance and their share price falls by that amount. Franco Modigliani and Merton Miller,

Factors Influencing Dividend Policy

- ***1. Legal requirements***

There is no legal compulsion on the part of a company to distribute dividend. However, there certain conditions imposed by law regarding the way dividend is distributed. Basically there are three rules relating to dividend payments. They are the net profit rule, the capital impairment rule and insolvency rule.

- ***2. Firm's liquidity position***

Dividend payout is also affected by firm's liquidity position. In spite of sufficient retained earnings, the firm may not be able to pay cash dividend if the earnings are not held in cash.

- ***3. Repayment need***

A firm uses several forms of debt financing to meet its investment needs. These debt must be repaid at the maturity. If the firm has to retain its profits for the purpose of repaying debt, the dividend payment capacity reduces.

- ***4. Expected rate of return***

If a firm has relatively higher expected rate of return on the new investment, the firm prefers to retain the earnings for reinvestment rather than distributing cash dividend.

- ***5. Stability of earning***

If a firm has relatively stable earnings, it is more likely to pay relatively larger dividend than a firm with relatively fluctuating earnings.

- ***6. Desire of control***

When the needs for additional financing arise, the management of the firm may not prefer to issue additional common stock because of the fear of dilution in control on management. Therefore, a firm prefers to retain more earnings to satisfy additional financing need which reduces dividend payment capacity.

- ***7. Access to the capital market***

If a firm has easy access to capital markets in raising additional financing, it does not require more retained earnings. So a firm's dividend payment capacity becomes high.

- ***8. Shareholder's individual tax situation***

For a closely held company, stockholders prefer relatively lower cash dividend because of higher tax to be paid on dividend income. The stockholders in higher personal tax bracket prefer capital gain rather than dividend gains.

4 types of dividend policy

There are basically 4 types of dividend policy. Let us discuss them on by one:

1.) Regular dividend policy: in this type of dividend policy the investors get dividend at usual rate. Here the investors are generally retired persons or weaker section of the society who want to get regular income. This type of dividend payment can be maintained only if the company has regular earning.

Merits of Regular dividend policy:

- It helps in creating confidence among the shareholders.
- It stabilizes the market value of shares.
- It helps in marinating the goodwill of the company.
- It helps in giving regular income to the shareholders.

- **2) Stable dividend policy:** here the payment of certain sum of money is regularly paid to the shareholders. It is of three types:

a) Constant dividend per share: here reserve fund is created to pay fixed amount of dividend in the year when the earning of the company is not enough. It is suitable for the firms having stable earning.

b) Constant pay out ratio: it means the payment of fixed percentage of earning as dividend every year.

c) Stable rupee dividend + extra dividend: it means the payment of low dividend per share constantly + extra dividend in the year when the company earns high profit.

3) Irregular dividend: as the name suggests here the company does not pay regular dividend to the shareholders. The company uses this practice due to following reasons:

- Due to uncertain earning of the company.
- Due to lack of liquid resources.
- The company sometime afraid of giving regular dividend.
- Due to not so much successful business.

4) No dividend: the company may use this type of dividend policy due to requirement of funds for the growth of the company or for the working capital requirement.