

Theory of stock market

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Agendas

- Overview on corporation stock and stock market
- Stock valuation techniques
- Behavior of stock prices (in another lecture slide)

Four types of firms/business formations.

- Sole proprietary
 - Single-owner firm
- Partnership **v.s.** limited partnership
 - More than one owner.
 - General partner **and** Limited liability partner
 - Only GP can be managing firm, and making decision.
- Limited company
 - Each member of the company has limited liability.
 - Owner can be managing director.
 - Voting right is based share of ownership.

Four types of firms/business formations.

- Corporation
 - A special form of business legal entity, subject to corporate law
 - With a defined structure of “**control**” and “**ownership**”
 - Entity is separated from **owner**.
 - Owners are not responsible for any obligations created by the corporation.

Structure of corporation

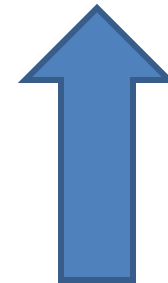
Board of trustees

Stakeholders of Corporations



Managerial decision

- CEO, CFO, CMO...
- Employees



Financiers

**Run firm,
Investment,
Generating return from fixed asset**

Owner of corporation: **financers**

Board of trustees

Debt: Creditors

Equity: Shareholders

Managerial decision

- CEO, CFO, CMO...
- Employees

**Run firm,
Investment,
Generating return from fixed asset**

**Ownership
Allocation of right,
Contingent on
situations**

Common stock of corporation

- What Is Common Stock? [?]
- Equity, **an ownership position**, in a corporation [?]
 - Payouts to common stock are dividends, in two forms:
 - Cash dividends
 - Stock dividends [?]
 - Unlike bonds, payouts are **uncertain** in both magnitude and timing.
 - [?] Equity can be sold (private vs. public equity)

Common stock of corporation

- Key Characteristics of Common Stock: ☐
 - Residual claimant to corporate assets (after bondholders) ☐
 - Limited liability ☐
 - Voting rights ☐

Corporation stock: private v.s. public

- Primary Market (Underwriting) [?]
 - Venture capital: A company issues shares to special investment partnerships, investment institutions, and wealthy individuals [?]
 - Initial public offering (IPO): A company issues shares to the general public for the first time (i.e., going public) [?]
 - Secondary or seasoned equity offerings (SEO): A public company issues additional shares [?]
 - Stock issuance to the general public is usually organized by an investment bank who acts as an underwriter: it buys part or all of the issue and resells it to the public
- Secondary Market (Resale Market) [?]
 - Organized exchanges [?]
 - OTC

Agenda

- Overview on corporation stock and stock market
- Stock valuation techniques

Shareholders' right

- Right to claim on dividend pay-out by firms/corporations.

Valuation of risky cash flow asset

- Principle of valuation revisited:

$$\begin{aligned} P_0 &= V_0 \\ &= \frac{E(CF_1)}{1+r} + \frac{E(CF_2)}{(1+r)^2} + \dots + \frac{E(CF_T)}{(1+r)^T} + \dots \end{aligned}$$

- $E[*]$ = Expected of cash-flow delivered at time t.
- r = risk-adjusted discount rate or required rate of return from stock holding.

Shareholders' right

- Right to claim on dividend pay-out by firms/corporation.
 - Cash dividend:
 - $CF_t = D_t$
 - D_t : the cash dividend payment in period t

Gordon model or Dividend cash flow (DCF) model

- Case 1: Constant dividend

$$- E(CF_t) = D \quad \forall t$$

$$- V_0 = D \left\{ \frac{1}{1+r} + \frac{1}{(1+r)^2} + \dots + \frac{1}{(1+r)^T} + \dots \right\} = \frac{D}{r}$$

Gordon model or Dividend cash flow (DCF) model

- Case 2: Dividend grow at rate “g” per period.
 - Suppose that $CF_0 = D_0$
 - $E(CF_1) = (1 + g)D_0$; $E(CF_2) = (1 + g)^2 D_0$;
 $E(CF_3) = (1 + g)^3 D_0$
 - $V_0 = D_0 \left\{ \frac{1+g}{1+r} + \frac{(1+g)^2}{(1+r)^2} + \dots + \frac{(1+g)^T}{(1+r)^T} + \dots \right\} = \frac{D_0(1+g)}{r-g}$
 - $V_0 = \frac{D_1}{r-g}$, $r > g$

The Gordon Growth Model

Assumptions:

- Dividends are the correct metric to use for valuation purposes.
- The dividend growth rate is forever: It is perpetual and never changes.
- The required rate of return is also constant over time.
- The dividend growth rate is strictly less than the required rate of return.

Example: Suppose that a company pays out dividend at \$5 in the initial date. The pay out is expected to grow at the rate of 4% per year. Suppose that the required market rate of return for this stock is 8%. Calculate the fair price of the stock?

$$V_0 = \frac{D_1}{r - g} = \frac{5 * (1 + 0.04)}{0.08 - 0.04} = \$ 130 \quad (r > g)$$

When Is the Gordon Growth Model **Most** Appropriate for Valuing Equity?

Dividend-
paying
company



Insensitive to
the business
cycle



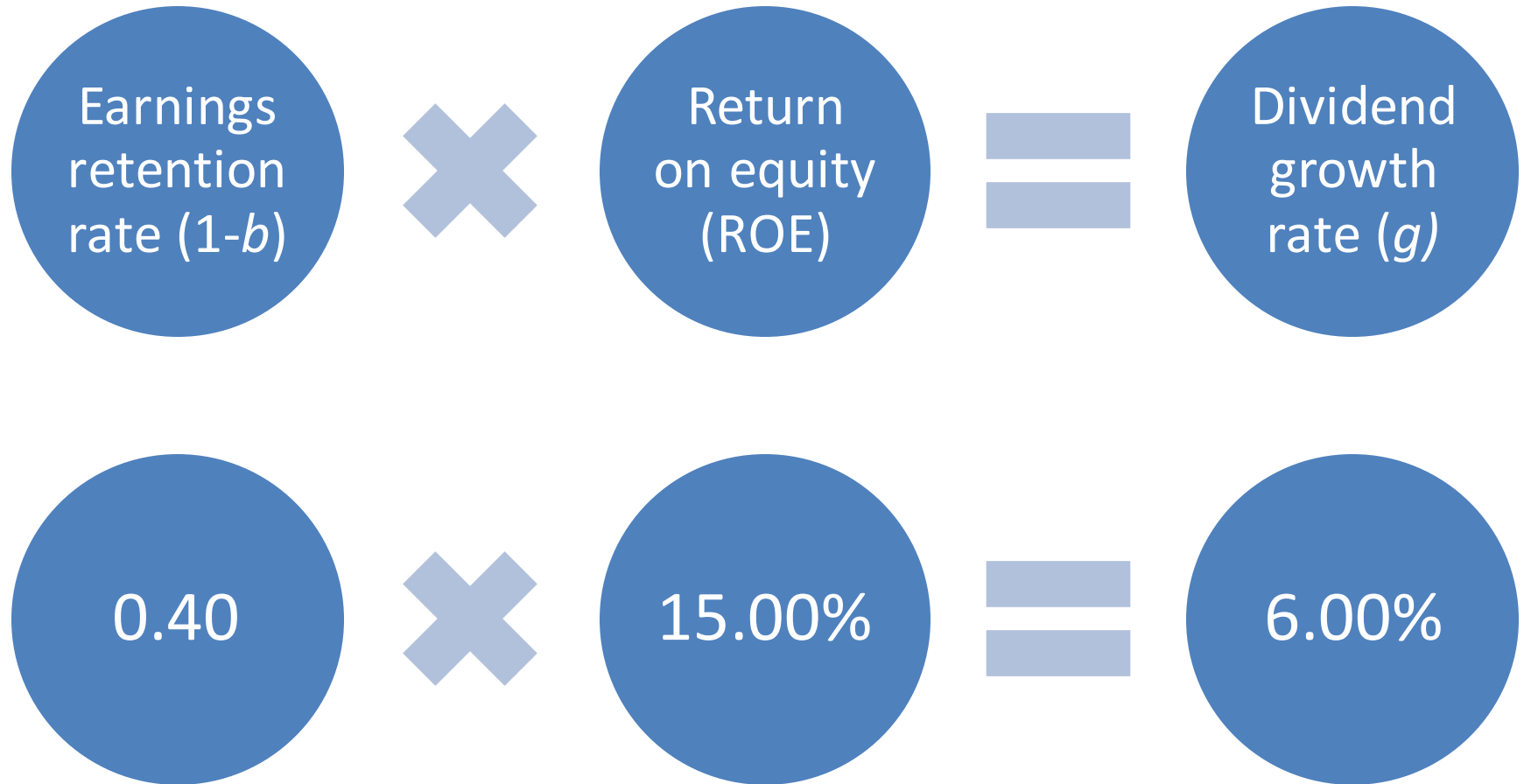
Use the
Gordon
growth model



Mature
growth phase

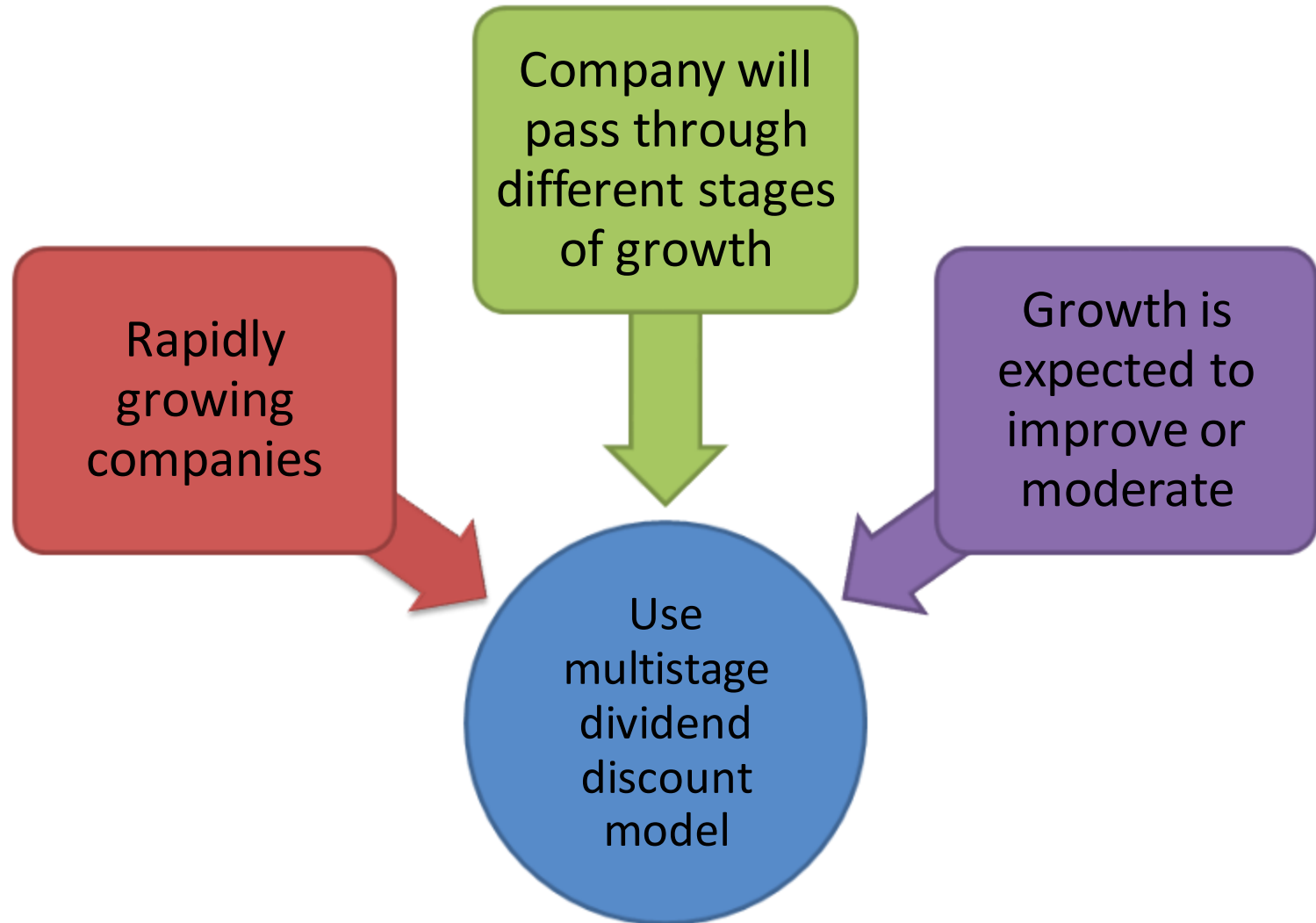
Practical issues 1:

Estimating a Long-Term Growth Rate



Practical issue 2: unstable growth phase

→ Multistage Dividend Discount Model



The Two-Stage Dividend Discount Model

Dividends grow at rate g_S for n years
and rate g_L thereafter:

$$V_0 = \sum_{t=1}^n \frac{D_0(1+g_S)^t}{(1+r)^t} + \frac{V_n}{(1+r)^n}$$

$$V_n = \sum_{t=n+1}^{\infty} \frac{D_0(1+g_L)^t}{(1+r)^t} = \frac{D_n(1+g_L)}{r-g_L} = \frac{D_{n+1}}{r-g_L}$$

$$D_{n+1} = D_0(1+g_S)^n(1+g_L)$$

Example: A company with $D_0 = \$1$ and $r = 20\%$ grows at 6% for the first 7 years and then drops to zero thereafter. What should its current price be?

Practical issues 3:

100% Earning retention



$b = 1$
No dividend
policy



Valuation???

Dividend growth → price changes

AMZN	Amazon.com Inc.	\$142,290.00	31.20%	0.3	-0.30%
GOOGL	Google Inc.	\$352,810.00	22.40%	0.05	20.20%
NFLX	Netflix, Inc.	\$20,150.00	26.20%	0.52	4.50%

- **These are some examples of companies that do not pay out their dividend.**
- **Underlying reasons?**

Shareholders' right

- Right to claim on dividend pay-out by firms/corporation.
 - Cash dividend:
 - $CF_t = D_t$
 - D_t : the cash dividend payment in period t
 - Stock dividend:
 - Instead of paying out dividend in cash, offer investors new shares.
 - This is all about dividend policy.
 - Good for firm: Cash hoarding for firms investment.
 - Good for investors: wait to earn higher return in the future/tax shield.

Present Value Models

Value of an investment = present value of expected future benefits

Future benefits =
dividends

$$V_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t}$$

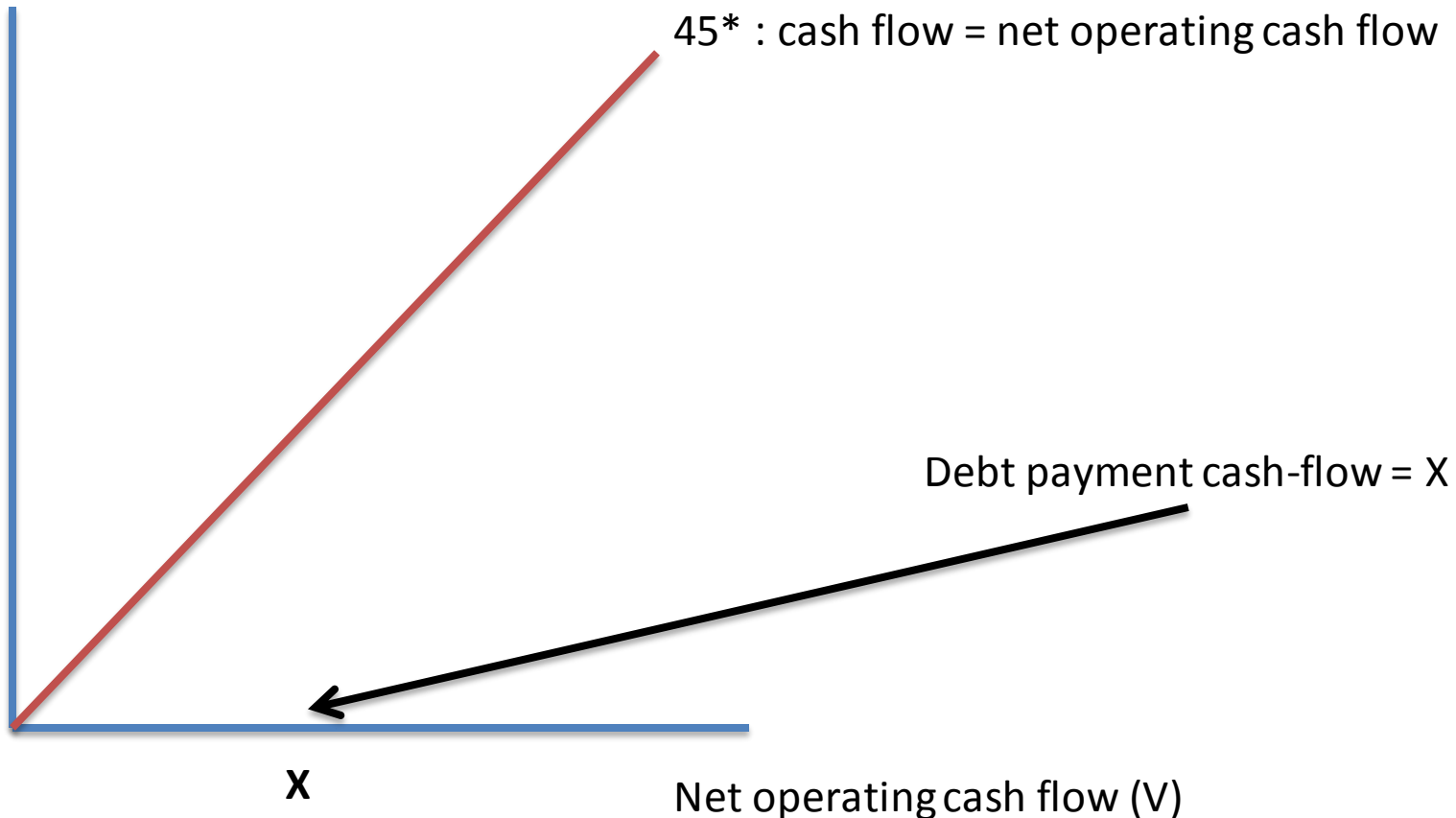
Future benefits = free
cash flow to equity

$$V_0 = \sum_{t=1}^{\infty} \frac{FCFE_t}{(1+r)^t}$$

Firm value: Stock vs debt

Alternative form of fund-raising: stock vs debt

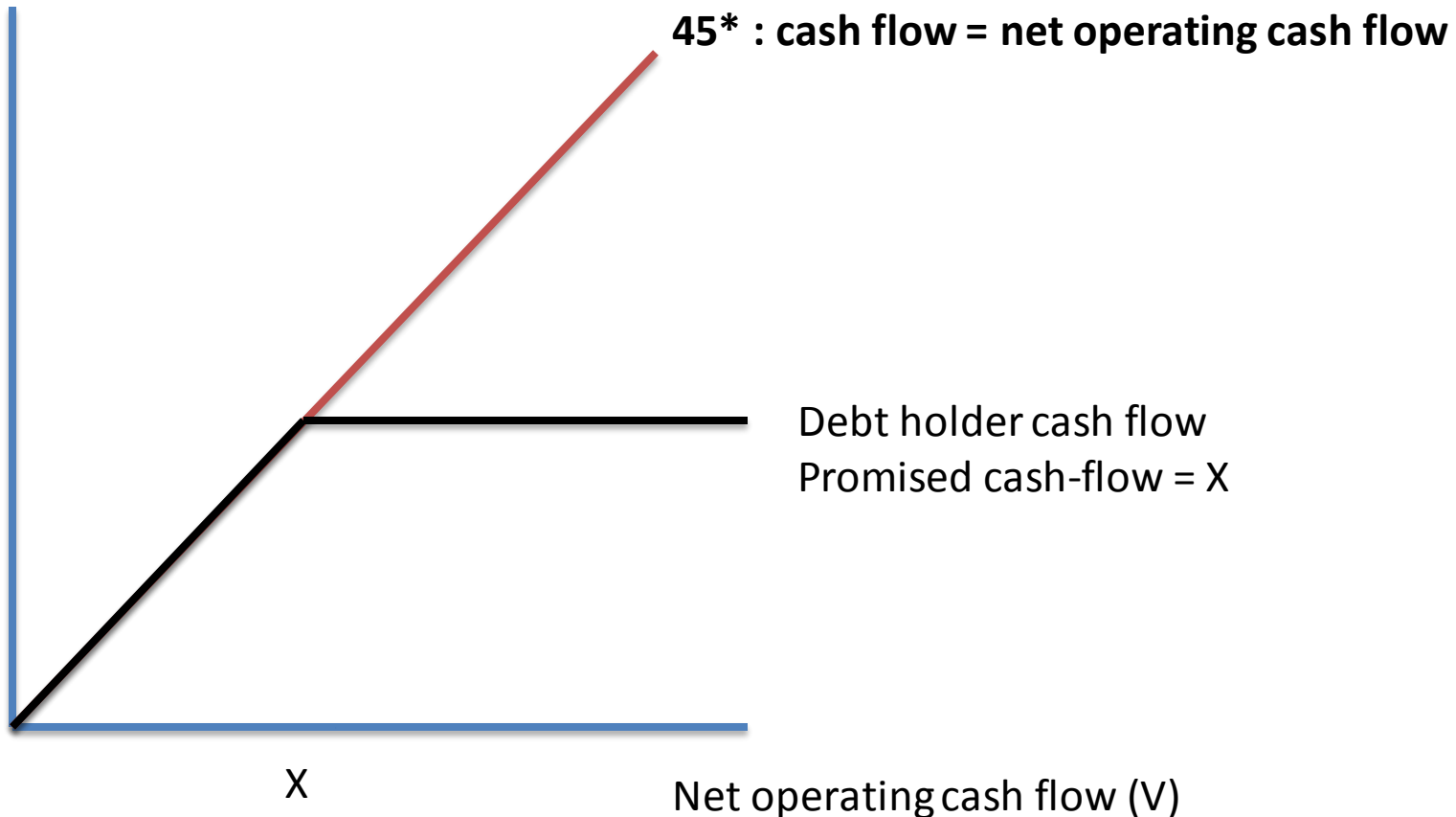
Cash flow (value to firms)



Firm value: Stock vs debt

Alternative form of fund-raising: stock vs debt

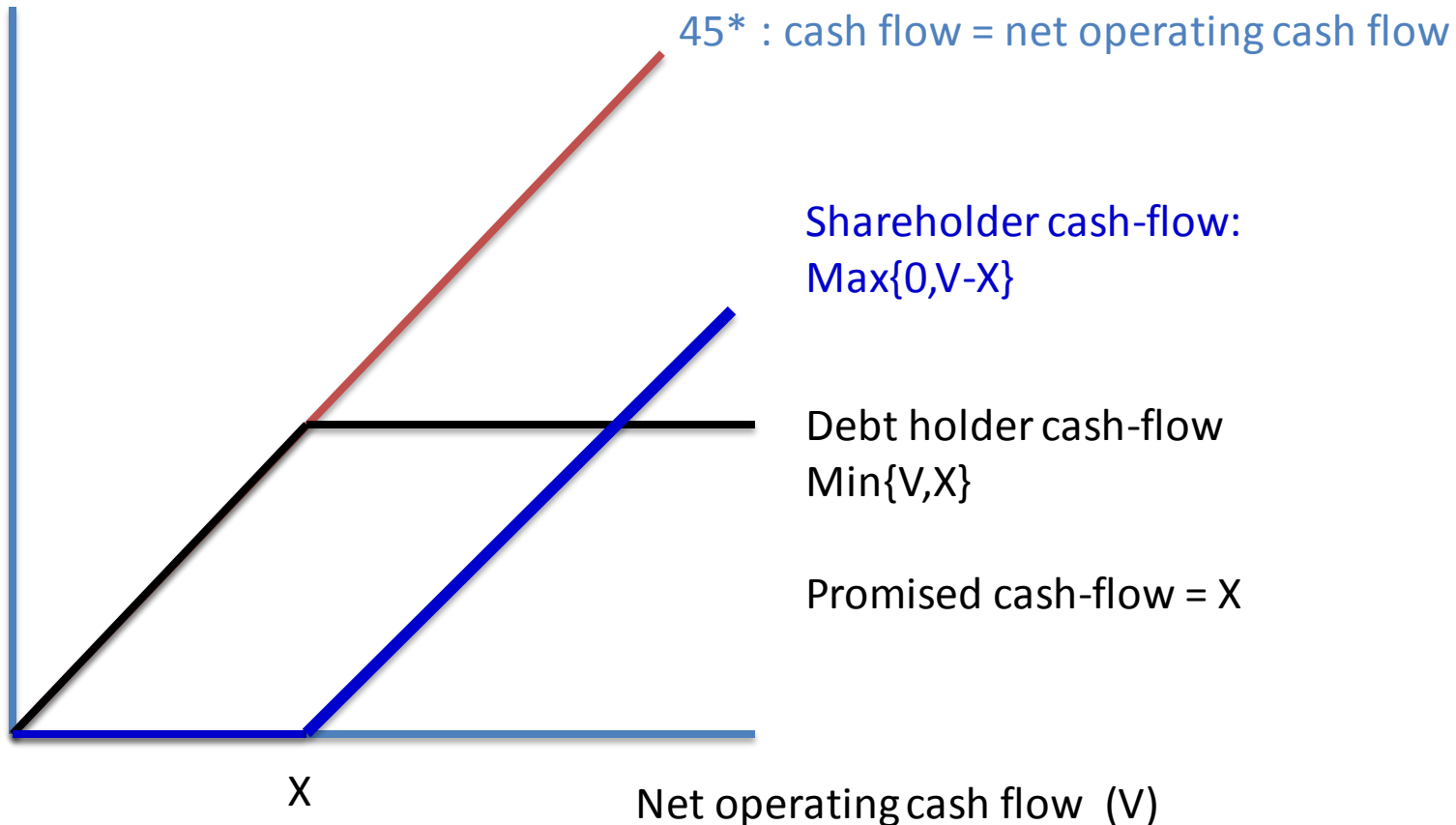
Cash flow



Firm value: Stock vs debt

Alternative form of fund-raising: stock vs debt

Cash flow



Dividend growth → price changes

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Claim on FREE cash flow to Equity holder

**$(\text{Revenue} - \text{Cost} - \text{Net depreciation})(1 - \text{tax})$
+ net depreciation – capital expenditure – interest
expense*(1-tax) = Free cash flow claimed by equity holder**

Summing up

- Knowing basic techniques for stock valuation
- Basically, stock price is determined by firm's potential growth.
- Most of the time, this is reflected in terms of dividend. Potential growth firm should pay out high dividend.
- In practice, some companies do not pay-out dividend.
- Valuation of these companies require measuring a proxy for cash-flow that is owned by equity holder.
- The commonly used concept is the “free cash flow”. Free cash flow basically measures net earning of a firm, after deducting all the expenses incurred in the operation of firm. It reflects the residual parts that can be claimed by shareholders.

What's left behind, and not discussed so far is

- “Required rate of return” used for discounting cash-flow of stock!

Subjective v.s. equilibrium required rate of return

- Subjective required rate of return.
 - Subjective valuation of stock for each individual
- Suppose that we want make a good estimate for the current equilibrium price, what do we need to know?
 - Equilibrium required rate of return of the stock.
- Any theory that we can consult for?
 - CAPM theory

CAPM Theory

- Equilibrium predictions for the rate of return of risky asset.
 - Developed by William Sharpe, who built upon the framework of Harry Markowitz.
- Risk-free v.s. Risky asset → How should the market price risk of a particular asset in terms of required premium over the risk-free rate?

CAPM THEORY

- Consider the following return process of an asset issued by firm “j”.

$$r_{j,t} = \mu_j + \theta_{j,t} + s_t$$

μ_j = *mean return of asset j.*

$\theta_{j,t} \sim N(0, \sigma^2)$ = *firm-level risk (shocks)*

$s_t \sim N(0, \sigma_s^2)$ = *aggregate-level risk (shocks)*

CAPM THEORY: two risk components

- To attract investor to choose the risky asset, an excess return (over risk-free rate) must be required. (Obvious!)
- What is not obvious, and asked by William Sharpe is the following two questions:
 - What types/parts of risk associated with the investment on risky asset (e. g. $\theta_{j,t}, s_t$) should investor call/ask for the premium to compensate for the risk?
 - And, to which extent, should the investor require the premium to compensate such a particular type of risk?

CAPM THEORY: law of large number!

- Intuitively, part of the return driven by **idiosyncratic risk** (firm-level shocks) does not need any premium!
- Following Markowitz, risk-averse investor can eliminate the idiosyncratic risk by using the portfolio diversification.
 - This follows from the **Law of the large number**; firm-level shocks should be completely washed out!

CAPM theory: aggregate-level risk

- What should remain is the aggregate-level shocks, i.e. the shocks that cause the system-wide movement in the rate of return across all the assets.
- Thus, investor would only require premium to compensate the aggregate risk!

CAPM theory: aggregate-level risk exposure?

- How do we measure the aggregate-risk exposure for each asset? And, how much does the investor price such an aggregate risk-exposure into the so-called “excess premium” for each asset?

CAPM theory: the equation

- William Sharpe proved that, in the single common factor model (single aggregate-risk), equilibrium required rate of return is given by the following linear equation

$$r_j = r_f + \beta_j(r_m - r_f)$$

r_m = return of market portfolio (index)

r_f = risk-free rate (e.g. 3-month T-bills)

CAPM theory: the equation

- William Sharpe proved that

$$\beta_j = \frac{\text{cov}(r_j, r_m)}{\sigma_m}$$

$$r_j = r_f + \frac{\text{cov}(r_j, r_m)}{\sigma_m} (r_m - r_f)$$

CAPM theory: risk to be priced in?

- From the equation, Sharpe interpreted that “part of the variation in return of risky asset that will be priced must be the part that is correlated across system-wide”
- Systematic vs Unsystematic risk

CAPM theory:

quantity of risk v.s. price of risk

- To show this, rewrite the equation in terms of correlation and risk of asset

$$r_j = r_f + \frac{\text{cov}(r_j, r_m)}{\sigma_m^2} (r_m - r_f)$$

$$r_j = r_f + \text{cor}(r_j, r_m) \sigma_j \frac{(r_m - r_f)}{\sigma_m}$$

$$r_j = r_f + \text{cor}(r_j, r_m) \frac{(r_m - r_f)}{\sigma_m} \sigma_j$$

CAPM theory: practical use 1.1

- Practical use of the CAPM is to estimate “beta” using the regression.
- Then, use the expected value of the rate of return on risky asset as the proxy for the required rate of return for discounting cash-flow of the risky asset.
- This is common approach for **unlevered** firms!

CAPM theory: practical use 1.2

- Most companies have sophisticated structure of financing.
 - Mixture of debt and equity
- Required rate of return implied by the CAPM is not appropriate.
- Weighted average cost of capital is more appropriate concept.

CAPM theory: practical use 2

- Stock selection!
- Suppose the one believes in CAPM equation, required rate of return should be equal to
$$r_f + \hat{\beta}_j(r_m - r_f)$$
- Let $r_{j,t}$ be the actual return at time “t” of asset j.
- Investor should sell (buy) asset j if $r_{j,t}$ is greater (lower) than the equilibrium required rate of return on asset j.