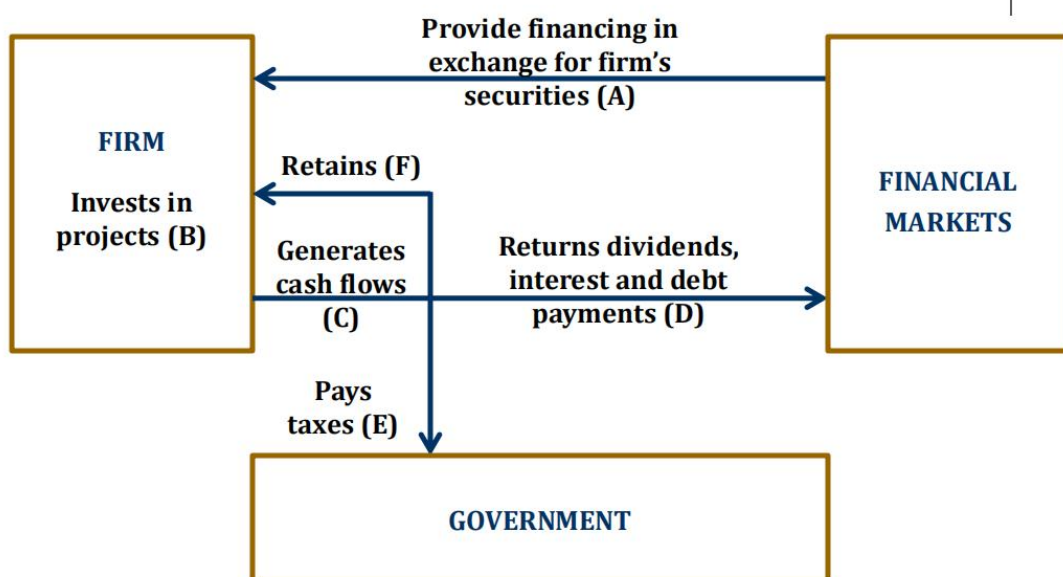




Finance is the process of transferring money from savers to borrowers through financial markets/ institutions

## Cash Flows



# Sole proprietorship



- ❖ A business owned by a single person
  - No formal charter required, very few government regulations
  - Unlimited liability for business debt since no distinction between personal and business assets
  - Profit taxed as individual income (single taxation)
  - Equity is limited to the proprietor's personal wealth
  - Duration is limited to the life of the sole proprietor

	Corporation	Partnership
Liquidity and marketability	Shares can be exchanged without termination of the corporation. Common stock can be listed on a stock exchange.	Units are subject to substantial restrictions on transferability. There is usually no established trading market for partnership units.
Voting rights	Usually each share of common stock entitles the holder to one vote per share on matters requiring a vote and on the election of the directors. Directors determine top management.	Some voting rights by limited partners. However, general partners have exclusive control and management of operations.
Taxation	Corporations have double taxation: Corporate income is taxable, and dividends to shareholders are also taxable.	Partnerships are not taxable. Partners pay personal taxes on partnership profits.
Reinvestment and dividend payout	Corporations have broad latitude on dividend payout decisions.	Partnerships are generally prohibited from reinvesting partnership profits. All profits are distributed to partners.
Liability	Shareholders are not personally liable for obligations of the corporation.	Limited partners are not liable for obligations of partnerships. General partners may have unlimited liability.
Continuity of existence	Corporations may have a perpetual life.	Partnerships have limited life.

## True or False?



- The goal of financial management for a public firm is to maximize the current value per share of the existing stocks.
- The goal of financial management is to maximize the value of existing owners' equity.
- We evaluate financial managers' decisions on the basis of whether they add value to the business owners.
- Maximizing shareholders' value is equivalent with maximizing firm value.
- Maximizing shareholders' value is equivalent with maximizing the value of all the stakeholders (i.e., creditors, suppliers, customers, government, community, etc.)
  - Corporate social responsibility debate (video)

## Through what ways can ESG affect firm value?

- ESG affects long term cash flow:
  - Government intervention
    - Emission allowances and carbon allowances auctions
  - Customer preferences
  - Brand value
  - Employee disruption of business
    - Union
    - OpenAI's mass exodus

# Through what ways can ESG affect firm value?

- ESG affects discount rate:
  - Non-ESG imposes risk factors
    - Climate change: physical damage to facilities, increased insurance costs, or operational disruptions due to natural disasters.
    - Resource scarcity: water, energy, raw materials
  - Investor preferences
    - Green equity (firm based)
    - Green bond (project-based)

## Last class

- Introduction to corporate finance.
- What is finance?
- What is corporation? How is it different from proprietorship 独资企业 and partnerships 合伙人?
  - Limited liability
  - How easy/difficult is the transfer of ownership
  - Tax treatment
- What are corporate finance decisions?
- Goal of corporations



## Simulated exam questions

- True or false: general partners are protected by limited liability
- Give me one example of corporate payout decisions
- Explain in one example how the rise of ESG investment is not conflicted with the company's purpose of maximizing shareholder value

### Cash Flows

- Cash Flows occur in the future
- Unless contractually fixed, cash flows need to be forecasted
- For non-financial assets (e.g., cash flows from investment projects), cash flows can be conceptually challenging.

# Time Value of Money

- Investment has **opportunity cost**.
- An important benchmark is the return on “risk-free” assets such as government bond.
  - Let  $r$  denote the risk-free rate
  - \$1 today is equivalent to  $(1 + r)^t$  dollars  $t$  periods later, namely, has a Future Value of

$$FV = (1 + r)^t$$

- \$C promised in certainty  $t$  periods later is equivalent to  $C/(1 + r)^t$ , namely, has Present Value of

$$PV = \frac{C_t}{(1 + r)^t}$$

3/21

## How is discount rate for risky asset calculated?

- If you are willing to pay \$90, what is your discount rate?
  - $PV_B = 90 = 105 / (1 + r_B) \leftrightarrow r_B = 16.67\%$
  - Note: “Willing to pay” is not the same as what you actually pay.
- We say that the **risk-premium** for Investment B is
  - $16.67\% - 10\% = 6.67\%$
- For risky cash flows:
  - **Discount rate = risk-free rate + risk-premium**

So how do I determine the discount risk/risk premium

No-arbitrage condition:

- two assets having the same cash flow should have the same price today
- Which allows us to calculate the discount rate

# NPV



- **NPV** measures how much an investment **adds value** to the investor(s).
  - Financial assets
  - Real assets: cost-cutting plans, competitive bidding, equipment and real estate, etc.
  - Other investments: education, house purchasing
- It is simply the present value of cash flows, calculated at the appropriate risk adjusted discount rate.

$$NPV = -C_0 + \sum_{t=1}^T \frac{C_t}{(1+r)^t}$$

The basic **capital budgeting rule** in corporate finance is to **take positive NPV projects**

Why can these investments make a positive NPV?

- The corporate may have exclusive access to the project
  - Specialized in producing certain products
  - Have exclusive customer relationship
  - Hold patents / trade secrets on the technology
  - Natural monopoly

Summary/Recap of NPV

Details & Applications

Discount rate: cost of capital at firm level

Application: how does stock price change post announcement of new investment project?

NPV vs other project estimating methods

# Summary of what we've learned

- Valuation:
- the value of any company/security/project/asset is the expected present value of its future cash flows
- Present value and future value of a single cash flow:

$$FV = (1 + r)^t, \quad PV = \frac{C_t}{(1 + r)^t}$$

- Present value of multiple cash flows (discounted cash flow/DCF 现金流贴现):

$$PV = \frac{C_1}{(1 + r)^1} + \frac{C_2}{(1 + r)^2} + \dots + \frac{C_T}{(1 + r)^T}$$

- Special case of PV

	$g > 0\%$	$g = 0\%$ (No growth)
<b>Annuity</b>	$PV = \frac{C_1}{r - g} \left[ 1 - \left( \frac{1 + g}{1 + r} \right)^T \right]$	$PV = \frac{C_1}{r} \left[ 1 - \left( \frac{1}{1 + r} \right)^T \right]$
<b>Perpetuity</b>	if $g < r$ $PV = \frac{C_1}{r - g}$	$PV = \frac{C_1}{r}$

- NPV:
  - Understand the full cash flow schedule and apply the DCF method
  - Investment/cost/expenses/loss: negative cash flow;
  - Revenue/income/sales/gain: positive cash flow

激活



- Interdependence of price and discount rate
- NPV:
  - $Price = DCF^{-1}(Cash\ Flow, discount\ rate)$
- Discount rate:
  - $Discount\ rate = DCF^{-1}(Cash\ Flow, Price)$
- Application:
  - Calculating discount rate based on assets' price and cash flow
    - E.g.: Yield-to-Maturity 到期收益率 in bond market
- Risk premium =  $r(\text{risky}) - r(\text{risk-free})$ 
  - Cost of capital of a company is the discount rate for cash flows of a company.
  - One of the main ingredients of any **valuation** or **capital budgeting exercise** is to determine the appropriate cost of capital for the firm's cash flows or that of its projects.
  - For firms with both equity and debt, the cost of capital is the weighted average of cost of debt and cost of equity
  - This is called the weighted average cost of capital (WACC)

- Value of a Firm = PV of the cash flows the firm is expected to generate now and in the future
- Who receive the cash flows?
  - Investors: holders of the company's stock and debt
  - PV of firm's cash flows = PV of cash flows to stockholders + PV of cash flows to debtholders
- **Value of a Firm (V) = Market Value of Equity (E) + Market Value of Debt (D)**
  - $E = \# \text{ of shares} \times \text{Price per share}$
  - $D = \# \text{ of bonds} \times \text{Bond Price or market value of private debt}$
- The cost of capital or *discount rate for cash flows of a firm* is the a weighted average of the cost of equity and debt.

$$WACC = \frac{E}{V} E(R_E) + \frac{D}{V} E(R_D)$$

- If the company pays corporate tax at rate of  $\tau$ :

$$WACC = \frac{E}{V} E(R_E) + \frac{D}{V} E(R_D)(1 - \tau)$$

- We will explain why in later classes.
- The value of a company taking up a new project is the sum of
  - The current value of the company
  - The NPV of the project
- A positive NPV project should be taken and a negative NPV project should be rejected

# NPV and Issuing Price of Stock

Number of shares outstanding:	10,000
Current stock price per share:	\$100
Assets (Market Value)	\$1,000,000
Equity (Market Value)	\$1,000,000
Present value of cash flows generated by the <b>new</b> project:	\$210,000
Total initial cost of the <b>new</b> project:	\$110,000

- The firm has zero cash holdings and is about to **issue new stocks to finance the initial investment** of this project.
- The firm will announce the share issuance and new project together.
- Assume the financial market is frictionless and competitive.
- **How many shares** should be issued to finance the project?
- What is the **issuing price**?

# NPV and Issuing Price of Stock

Method I: existing investors' perspective

- Time line: announce (t=0); receive cash (t=1); project taken (t=3);
- **NPV of the new project goes to the existing shareholders.**
- At t=0, share price incorporate the NPV of the new project

$$\begin{aligned}
 \text{New Share Price} &= \frac{\text{Original Equity Value} + \text{NPV}}{\text{Current Num. shares outstanding}} \\
 &= \frac{\$1,000,000 + \$110,000}{10,000} = \$110
 \end{aligned}$$

- At t=1, the issue price of new share = new share price (why?)
  - No news, no price change & Financial investors get zero NPV
- Required Capital = N shares issue x Issue price

$$N \text{ shares issue} = \frac{\text{Required Capital}}{\text{Issue Price}} = \frac{\$110,000}{\$110} = 1,000$$



# NPV and Issuing Price of Stock

## Method II: new investors' perspective

- **NPV of investing in financial assets is zero.**
- Amount of cash provided = Value of new shares issued
- Value of new shares = Total Firm Value x Ownership of new investors

*Required capital*

$$= (\text{Original Equity Value} + PV) \times \frac{N.\text{Shares Issue}}{N.\text{Shares Issue} + N.\text{Shares outstanding}}$$

$$\$110,000 = (\$1,000,000 + \$210,000) \times \frac{N.\text{Shares Issue}}{N.\text{Shares Issue} + 10,000}$$

$$\rightarrow N = 1,000$$

- Required Capital = N shares issue x Issue price

$$\$110,000 = 1,000 \times \text{Issue Price} \rightarrow \text{Issue Price} = \$110$$

To sum:

- Share price was \$100 that reflects the value of current assets (\$1,000,000).
- When the firm **announces the plan** of stock issuance to finance the new project (with NPV of \$100,000), share price change to ??
  - \$110 (existing shareholders captures all the NPV of the new project)
- Later, new shares are issued at \$110 and new investors break even (i.e., zero NPV). (why do they want to invest then?)

## Takeaways:

- Share price changes to reflect value changes;
- NPV of the new project goes to the existing shareholders.



What if the financial market is *not competitive*?

- Say, there is only one investor who is willing to finance the new project
- But he wants to take all the NPV surplus
- Then, the existing investors break even:
  - $\frac{10,000}{10,000+M} \times 1,210,000 = \$100 \times 10,000$
  - $M = 2,100$
  - $P_{issue} = \frac{110,000}{2,100} = \$52.38$
- You can regard this as the lowest issuing price that the existing shareholders can bare

An alternative setting:

- The company's stock is valued at **\$100** under the **expectation** that the company will raise \$110,000 to finance a project, which will generate cash flows with PV of \$210,000
  - **\$90** per share for the value of assets in place
  - **\$10** per share for the **NPV of future project** (why?)
- The announcement of the capital offering is fully expected (no surprise)
  - Share price **will not change** after the issuance → **\$100**
  - $P_{issue} = \$100$ ;  $M = \frac{110,000}{\$100} = 1,100$  (new investors break even)
  - Total value of assets increase by \$110,000 (cash raised)
  - Value change for the existing shareholders around the announcement:
$$\frac{10,000}{10,000 + 1,100} \times (1,000,000 + 110,000) - 100 \times 10,000 = 0$$

In this example, the **existing investors** still capture **all the NPV of the new project**, and new investors still break even.

- Why don't we see value changes for the existing investors around the announcement of equity offering?
- Because the new project was fully anticipated, and the announcement brings no news to the market.
- Before the market was aware of the existence of the project, share price was \$90.
- This is when the  $NPV = (\$100 - \$90) \times 10,000 = \$100,000$  is reflected in share price.

A company holds \$80 cash today, and has access to one project that requires an initial investment of \$80 tomorrow and yields either \$100 or \$110 with 50%-50% probability in one year.

The company is fully financed through equity.

The company's manager has no agency problem (i.e., capital budgeting decision made based on the positive NPV rule).

There is no information asymmetry (i.e., the market has known about the project and formed rational belief about managerial decision).

Financial market is efficient and competitive.

Another financial asset that pays either \$100 or \$110 with 50%-50% probability is traded in the market at \$90.

If you hold **the company's stock** today, what's your **expected return** for the next year?

- Will the project be taken tomorrow?
  - Discount rate  $r = E(R_{Fin}) = \frac{105-90}{90} = 16.67\%$
  - NPV of the project  $= \frac{105}{1+16.67\%} - 80 = \$10 > 0$
  - YES!
- What's the *expected* value of the firm one year later?
  - \$105
- What's the value of the firm by the end of tomorrow?
  - $\frac{105}{1+16.67\%} = \$90 \rightarrow$
  - **Firm value = PV of its (current and) future cash flows**

What's the value of the firm today? (Assuming the market has known that the project will be taken tomorrow.)

- $\$80 + \$10 = \$90 \rightarrow$
- **Firm value = Value of assets in place + NPV of future projects**

What's the expected return of holding the stock?

- $\frac{105-90}{90} = 16.67\%$
- The **expected return** of the firm's investors (stockholders in this case) is the firm's **cost of capital**, which is also the proper **discount rate** for the firm's cash flows

What if the market doesn't know about the project today, and the manager announces it after it's taken tomorrow?

The price today is \$80.

The price will jump up to \$90 after tomorrow's announcement.

If you somehow knows about the project before other investors do, you will want to buy the stock today at \$80 and sell it at \$90 tomorrow.

Of course, if your purchase order is big, the other investors may infer that some good news is on the way and charge you higher than \$80...



An asset creates value for its owner (investors) if it generates a positive value of cash flows.

NPV measures how much an investment adds value to the investors.

For a risky cash flow, the discount rate is the expected return on a financial asset of comparable risk.

In an efficient market, investing in *financial* assets earns zero NPV.

The capital budgeting rule of corporate finance (for *real* assets) is to take positive NPV projects.

Firm value incorporates the NPV of ongoing and potential projects.

The cost of capital or discount rate for cash flows of a firm is the a weighted average of the cost of equity and debt.