

Lecture 1

Asset Markets and Asset Prices

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Reading

- Textbook: chapter 1
- Bodie, Z., R. Merton, D. Cleeton, *Financial Economics*, Prentice Hall, chapter 1 & 2.

Key Points

- Overview
- The main types of capital markets
- Fundamental principles of asset price determination
- Arbitrage
- Asset market efficiency
- Stock index (optional)

Overview

- *Finance* is the study of the how people and institutions allocate *scarce resources over time*.
- In implementing their decisions, people need the financial system, including:
 - a set of markets
 - financial intermediaries
 - regulatory authority
- The ultimate function of the system is to satisfy people's consumption preference.

Capital market

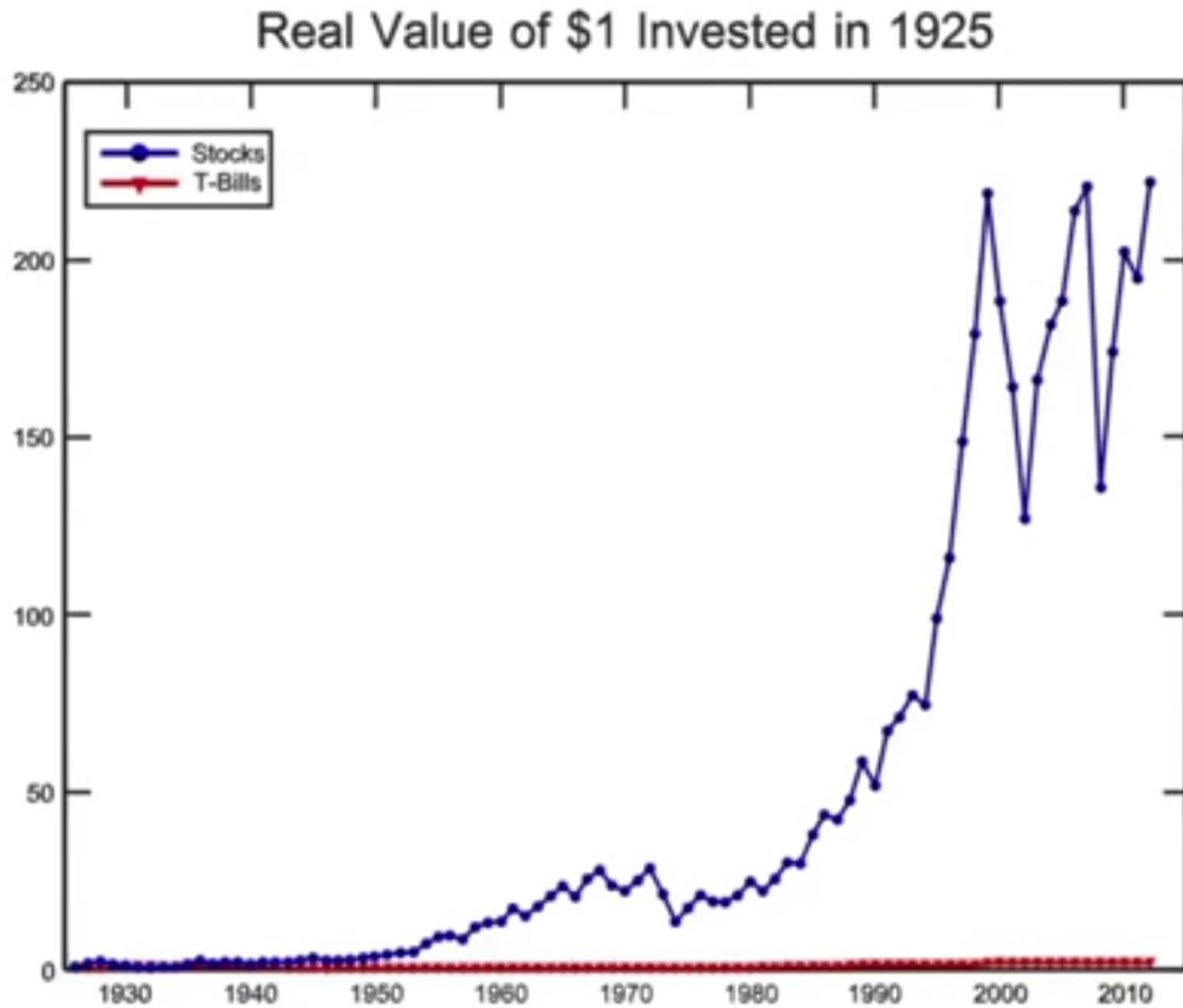
- Main different type of capital market:
 - *Money markets*: to facilitate the exchange of securities such as treasury bills (commonly, three-month or six-month government debt) or other loans with a short time to maturity.
 - *Equity market*: the stock exchange is the main ‘secondary’ market for shares in corporations. The ‘primary’ market involves the issue of new shares by corporations. There are many categories of the shares (common shares, preferred shares)

Capital market

- *Bond markets*: there are markets for long-term securities such as government debt or corporate bonds.
 - Bond are less risky than shares
 - A typical bond will pay a sequence of coupons and maturity value.
 - Bonds are commonly traded on stock exchanges in much the same way as shares among investors, without issuer.

Q: If you invest 1\$ in stock market in 1925 in US, what is the value of your investment now?

Capital market

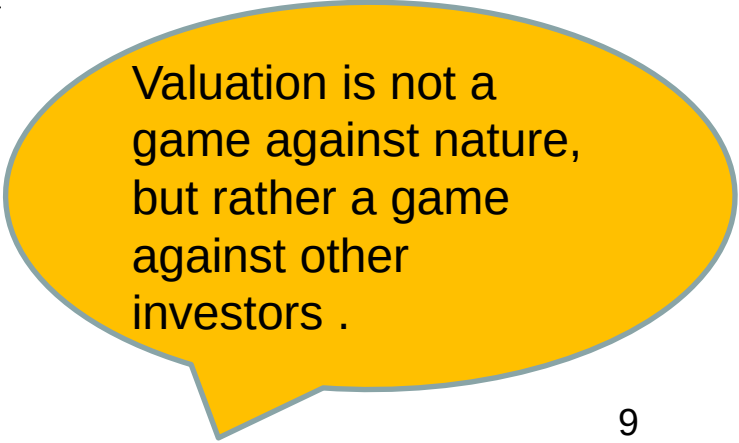


Capital market

- *Derivative market*: derivatives are financial instruments that derive their value from the underlying asset with which they are associated.
 - Forward agreements: there are contracts in which the parties agree to execute an action at a stipulated location and date in the future.
 - Eg. A forward contract might specify the delivery of 5000 bushels of wheat to a firm in Chicago, six months from the date of the agreement, at a price of 3.5 dollar per bushel.
 - A future is standardized contract, which is a special type of forward contract, and designed for trading in the contract itself.
 - Options

Asset Pricing Determination

- Asset pricing determination: an overview
 - The simplest economic theory of price determination applied to asset markets: supply and demand.
 - At each instant of time, the total stock of asset is assumed to be fixed, the market price is allowed to adjust.
 - Determinants of the demand
 - Valuation
 - Income
 - Preferences....



Valuation is not a game against nature, but rather a game against other investors .

Rates of return

- Rate of return:

$$(\text{net}) \text{ return} \equiv \frac{\text{payoff} - \text{price}}{\text{price}}$$

- Real return: nominal rate of return minus rate of inflation.
- Observed market price plays two distinct roles:
 - Opportunity cost
 - The price conveys information

Shanghai Composite Index (Price)

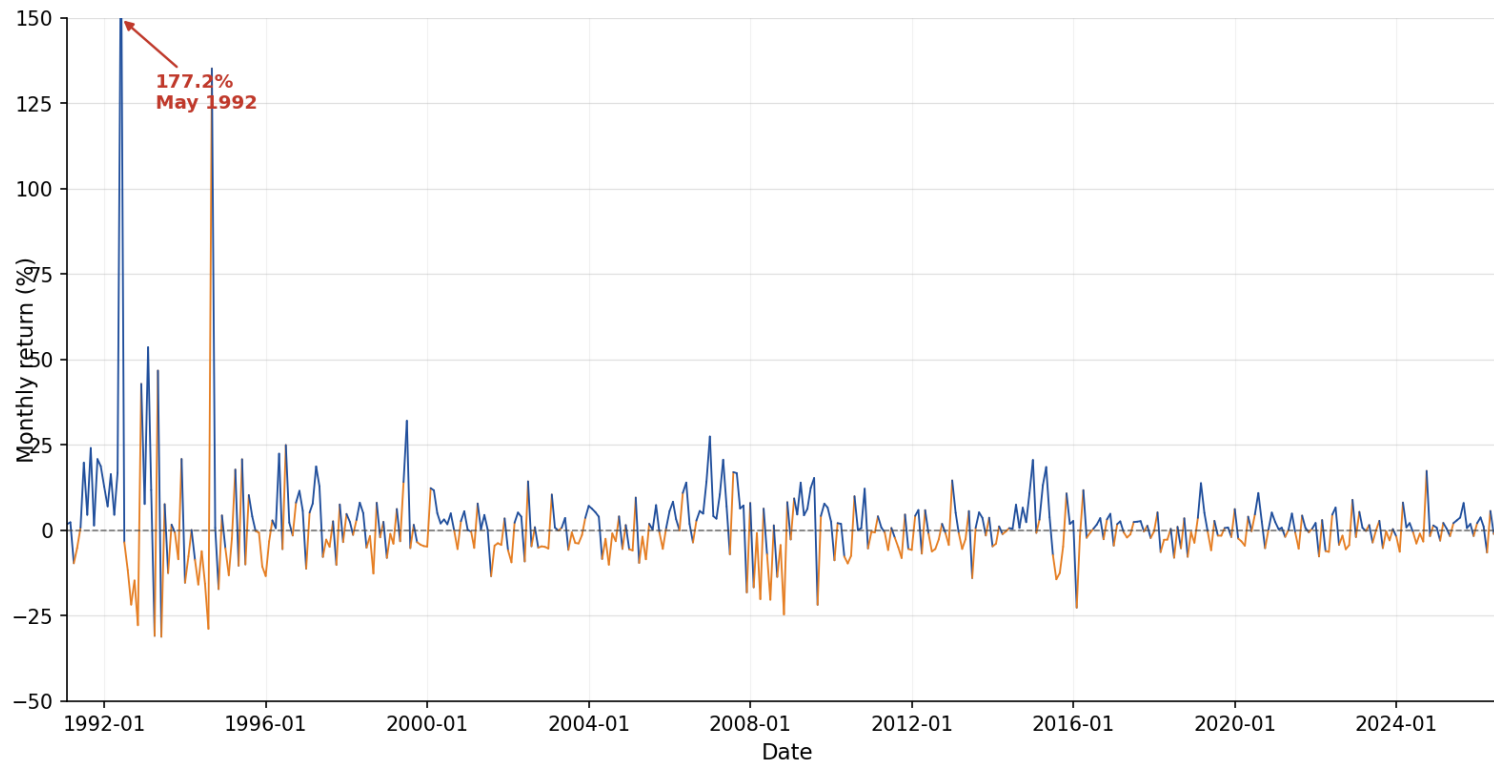
SSE Composite Index (000001.SH): Daily Close, Dec 1990 - Sep 2026



Source: Sina Finance (finance.sina.com.cn, via akshare); unadjusted daily series, 8,718 trading days. For research reference only.

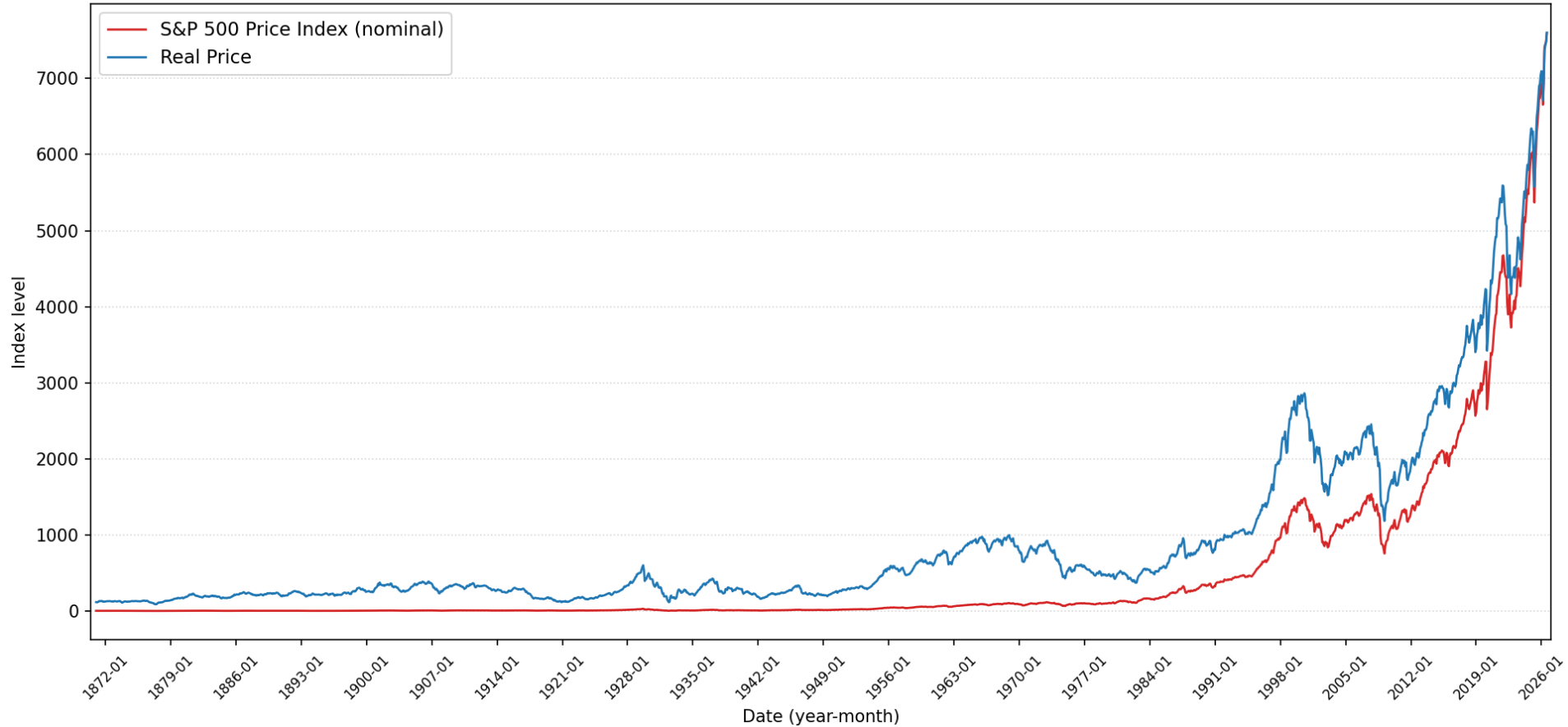
Shanghai Composite Index Monthly Return

SSE Composite Index (000001.SH): Monthly Returns, Jan 1991 - Sep 2026



S&P 500 Price Index

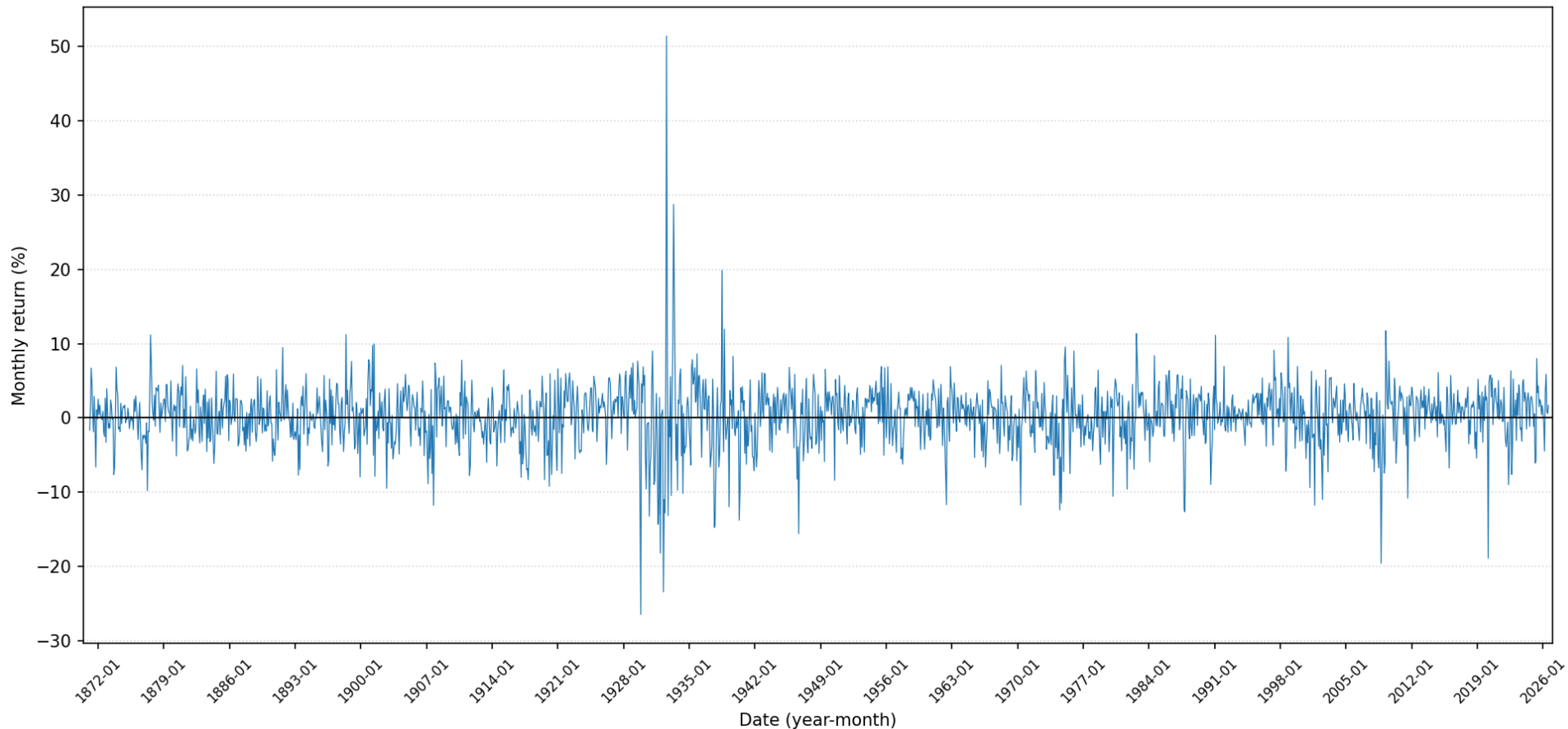
S&P 500 Price Index: Nominal vs Real (1871–2026)



Source: Robert Shiller's website: <http://www.econ.yale.edu/~shiller/data.htm>

S&P 500 Price Index Real Monthly Return (1871.2-2026.8)

S&P 500 Price Index: Real Monthly Return (1871-2026)



The Role of Expectation

- In the text book, there is an example from *Keynes's General Theory*:
 -professional investment may be likened to those newspaper competition in which the competitors have to pick out the six prettiest faces from a hundred photographs, the price being awarded to the competitor whose choice most nearly corresponds to the *average preferences* of the competitors as whole; so that each competitor has to pick, *not* those faces which he himself finds prettiest, but those which he thinks likeliest to match the fancy of the other competitors....

The Role of Expectation

- Keynes' example may seem to involve circular reasoning: asset prices affect expectations, expectations affect decisions, decisions affect prices, and so on.
- The puzzle pinpoints the simultaneous interactions that occur between observed prices in the present and beliefs about prices in the future.
- A simple downward-sloping demand curve may be difficult to justify – for a higher price today could lead investors to infer that the price will be even higher tomorrow, thus encouraging a greater demand to hold the asset...

The Role of Expectation

- Dell stock price is \$58 and P/E ratio is 88 in 2000. Historically, P/E ratio for stand Poor's index average is 16. Do you think Dell's P/E ratio is too High?
 - Dell has been very successful operation with innovative production, direct market, and made to order inventory system.
 - Dell's stock price declined to \$29 in 2003, a loss of 50 percent. By 2011, Dell was trading at \$14 per share.
- General Motors' P/E ratio is 8.5 and Ford is 5.0. Do you think their P/E ratio are too low?
 - General Motors' stock declined from \$80 per share in 2000 to \$4 in 2008 (and then went bankrupt) and Ford declined from \$29 to \$3 over the same period.

Performance Risk, Margins and Short-selling

- Uncertainty about the future plays a central role in economics.
Two categories of risk:
 - price risk: future prices are unknown.
 - performance risk: default on contract
- Margins: good faith deposits (collateral).
 - “The margin” is the proportion of an investment which is paid for in advance.
 - Purpose of margins: a mechanism for minimizing performance risk.
 - Margins also allow leveraged asset purchases or sales

Margins

Buying on Margin

- Buying on margin: investor pays a fraction of assets' cost in advance (borrows the remainder from broker).
- Later, either (i) takes delivery and pays remainder; or (ii) sells the asset

Short Sale

- Selling an asset that the investor does not own.
- Steps:
 1. Borrow an asset, sell it.
 2. Later, repurchase the asset and return to lender.

Buying on margin

- **Actual margin** is defined by:

$$\text{actual margin} = \frac{\text{collateral} - \text{loan}}{\text{collateral}}$$

where collateral = market value of the asset

loan = amount borrowed from broker.

- Initial margin: actual margin required at the outset
- Maintenance margin: actual margin below this, triggers a margin call
- Margin call: demand to deposit funds in the margin account

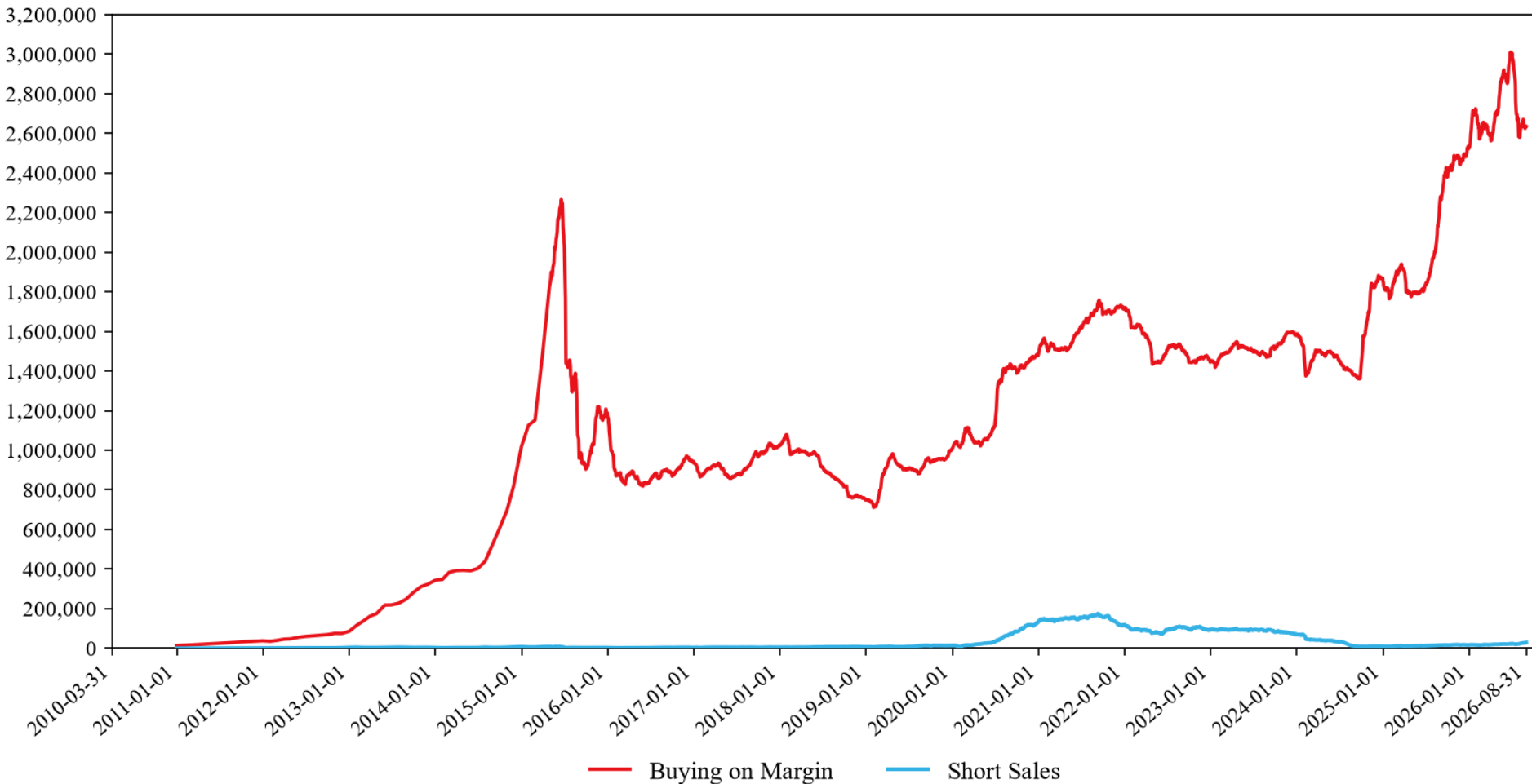
Example: buying on margin

- An investor, A, instructs a broker, B, to purchase 100 shares of company XYZ when the market price is \$10 each. Suppose that A and B have an arrangement whereby A's instructions are carried out so long as B holds a margin of 40% of the transaction value. Hence, A makes an immediate payment of \$400 and B has effectively loaned A \$600.
- B holds the shares as collateral against the loan to A.
- What happens when the share price is above \$10?
- What happens when the share price is below \$10, e.g. \$5?

Margin trading in China

- Initiated from March 31, 2010
- Only 90 stocks can be traded on margin, 50 in SSE, 40 in SZSE.
- Till now, more than 4,300 stocks & ETFs in total.

Balance (in 1 million yuan) (2010.3-2026.8)



Buying on Margin Balance vs. Shanghai Composite Index



Short sales

- Actual margin is:

$$\text{actual margin} = \frac{\text{collateral} - \text{loan}}{\text{loan}}$$

where, collateral = funds (cash) in the margin account

loan = market value of asset short-sold.

- Initial and maintenance margin: as for buying on margin
- Market regulations often restrict which investors can short sell, and conditions under which they can short sell

Example: short sales

- Investor A has an agreement with broker B which allows A to make short sales of company XYZ's shares (the shares might be borrowed from B's own portfolio or from the portfolio of one of B's other clients).
- Suppose that A instructs B to short-sell 100 shares at a market price of \$10 each. B holds the proceeds, \$1000 in A's margin account and also demands an additional deposit of, say, \$400.
- Sooner or later A will return the borrowed shares by instructing B to purchase 100 XYZ shares at the ruling market price.
- If the market price is below \$10, gain or loss?
- If the market price is above \$10, say \$14, and the short sale remains in place, what happens to investor A?

Arbitrage

- Law of one price (LoP) = identical assets have the same price.

Why? If not, there are unlimited profit opportunities

- Arbitrage generalizes LoP to *link* prices of *non-identical* assets
- Arbitrage strategies, definition:
 - risk-free, and
 - require zero initial outlay
- Prediction: zero payoff, in market equilibrium

Arbitrage

- Prediction requires frictionless markets
 - zero transaction costs, and
 - no institutional restrictions on trades.
- Require only mild assumptions about investor behavior,
 - merely that more wealth is preferred to less.
- Arbitrage links asset prices (is only a partial theory).

Example 1

- Foreign Exchange Market

$$£1 = \$1.50$$

$$¥15 = £1$$

$$\$1 = ¥12$$

Arbitrage opportunity exists or not?

- Yes, there exists arbitrage opportunity.
- Do the following strategy:
 - borrow £1 and sell it for \$1.50
 - buy ¥18 with the \$1.50;
 - buy £1 for ¥15
 - Profit = ¥3, after repaying £1 loan

Triangle Arbitrage

- More generally

$$R_{A/C} = R_{A/B} * R_{B/C}$$

$$R_{A/B} = 1/R_{B/A}$$

It is enough to know the exchange rates between any two in order to know the third.

- More specifically, in the example

$$R_{¥/£} = R_{\$/£} * R_{¥/\$} = 1.5 * 120 = 180$$

$$R_{£/¥} = 1/R_{¥/£} = 1/180 = 0.5556$$

The other two pair follow the same form.

Asset market efficiency

- Allocative efficiency (Pareto efficiency):
 - Does the capital market allocate resources efficiently?

An allocation is Pareto efficient if there does not exist a possible redistribution which would make at least one person better off without harming another person.
- Operational efficiency:
 - is the capital market organized efficiently?
- Informational efficiency:
 - do asset prices reflect information? (too vague)
- Portfolio efficiency (mean-variance analysis):
 - minimum variance of return for any level of expected return

Stock index

- **Price-weighted index:** (DJIA, Nikkei 225)

Average computed by adding the prices of the stocks and dividing by a “divisor”.

- **Value-weighted index:** (S&P 500)

Computed by calculating a weighted average of the returns of each security in the index, with weights proportional to outstanding market value.

- **Equally-weighted index:**

An index computed from a simple average of returns (so it places equal weight on each return)

Price-weighted series:

- The **arithmetic** average of current security price.

$$\text{price - weighted index} = \frac{\Sigma \text{ of stock prices}}{\# \text{ of stocks in index adjusted for splits}}$$

- It assumes you purchase an **equal number of shares** of each stock represented in the index. High-priced stock will have a relatively greater effect on the index.
- Two major index: Dow Jones Industrial average, Nikkei Dow Jones stock average (Nikkei 225).

The Dow Jones Industrial Average (DJIA)

- The Dow is a price-weighted index that uses 30 stocks.
- The criticisms:
 - The limit number of stocks in the index.
 - The **downward bias** in the computation of the index.
 - The fact that the 30 stocks represent the biggest stocks on the NYSE. (contains NASDAQ-listed firms from Nov 1, 1999)

Market value-weighted series

- Summing the **total value** (current stock price time the number of shares outstanding) of all the stocks in the index.

$$\frac{\Sigma[(\text{price}_{\text{today}})(\text{number of shares outstanding})]}{\Sigma[(\text{price}_{\text{base year}})(\text{number of shares outstanding})]} \times \text{base year index value}$$

- It assumes you make a **proportionate** market value investment in each company in the index.
- Problem: greater market capitalization have a greater impact

Major market value-weighted indexes

- Standard & Poor's 500 (S&P 500) index composite measures 500 firms.
- New York Stock Exchange Index considers all NYSE stocks in one of five value-weighted indexes: industrial, utility, transportation, financial, and the composite index.
- Other value-weighted U.S. series include the NASDAQ Series, the AMEX Market Value Index, the Dow Jones Equity Market Index, Wilshire 5000 Equity Index, etc.
- International value-weighted indexes include the Morgan Stanley Capital International Indexes, etc.
- Chinese stock markets: Shanghai Composite Index, Shenzhen Component Index, etc.

Unweighted price indicator series

- It place an equal weight on the returns of all index stocks, regardless of their prices or market values.
- A \$20 stock is just as important as a \$4000 stock, and a small size company is just as important as a large-size company.
- It assumes that the index portfolio makes and maintains an **equal dollar** investment in each stock in the index.
- In effect, you are working with percentage price change.

- The change in value of an unweighted index maybe calculated using two methods:

- ❖ Arithmetic mean:

change in the average index value= $(\sum X_i)/n$, where X_i = the return on each stock from time= t to time= $t+1$.

- ❖ Geometric mean:

change in the average index value= $\sqrt[n]{X_1 \times X_2 \times \dots \times X_n}$,

where $X_i=(1+HPR_i)=\text{price}_{t+1}/\text{price}_t$ for stock i .

Note: the use of geometric mean rather than the arithmetic mean will result in a lower index value.

- The Value Line (VL) Composite Average is an equal-weighted index where VL's 1695 stock returns are averaged using the geometric mean.
- The Financial Times Ordinary Share Index is a geometric average of 30 major stocks on the London Stock Exchange.
- Most academic studies are conducted using arithmetically averaged equal-weighted indexes.

Example 1

- Given the following information for the three stocks, calculate a price-weighted and value-weighted index return over a 1-month period.

December 31, 2010				January 31, 2011		
	Share price	Number of shares	Market value	Share price	Number of shares	Market value
Stock X	\$10	3,000	30,000	\$20	3,000	60,000
Stock Y	\$20	1,000	20,000	\$15	1,000	15,000
Stock Z	\$60	500	30,000	\$40	500	20,000
Total	\$90	4,500	80,000	\$75	4,500	95,000

➤ I. The **price-weighted** index

$= (10 + 20 + 60) / 3 = 30$ as of Dec 31, 2010.

• The **price-weighted** index

$= (20 + 15 + 40) / 3 = 25$ as of Jan 31, 2011.

The **percentage return in one-month** is
 $= 25 / 30 - 1 = -16.7\%$

➤ II. Take the Dec 31 2010 as base year (base index = 100),

• The **value-weighted** index at Jan 31, 2011
 $= 95,000 / 80,000 * 100 = 118.75$.

• The **value-weighted percentage return** $= (118.75 / 100) - 1 = 18.75\%$

Example 2

company	Number of shares	Stock price
A	100	\$100
B	1,000	\$10
C	10,000	\$1

We use this example to show how the price-weighted index and the value-weighted index differ.

A. The price-weighted index $= (100 + 10 + 1) / 3 = 37$

- If stock A doubles in value, the index value is:
 $(200 + 10 + 1) / 3 = 70.33$
- If stock C doubles in value, the index value is:
 $(100 + 10 + 2) / 3 = 37.33$
- This is not a good indicator of movement in the value of assets in general. However, if your portfolio were constructed to contain an equal number of shares of each stock, a price-weighted index would be a good indicator of the portfolio's price behavior.

B. Using a base market capitalization of 30,000

$(100 \times 100 + 1000 \times 10 + 10000 \times 1)$ and a base index value=100,

- If stock A doubles, the index goes to:

$$(100 \times 200 + 1000 \times 10 + 10000 \times 1) / 30000 \times 100 = 133$$

- If stock C doubles, the index goes to:

$$(100 \times 100 + 1000 \times 10 + 10000 \times 2) / 30000 \times 100 = 133$$

- In the market value-weighted index, the value of the index remained unchanged, indicating that wealth was equally influenced by the price changes. You can also see that the value-weighted index automatically adjusts for stock splits, since if the number of shares goes up, the price of each share will fall. If A,B, C were of different size, the index would be biased in the direction of the larger company.

Example 3

- Calculate both the arithmetic and geometric unweighted index values. Assume an initial index value is 131.

stock	Initial price	Current price	Price change
A	\$12	\$15	$15/12-1=+25\%$
B	\$52	\$48	$48/52-1=-7.7\%$
C	\$38	\$45	$45/38-1=+18.4\%$

❖ Arithmetic change in index

$$=(25\%-7.7\%+18.4\%)/3= 11.9\%$$

- New index value = $131*(1+11.9\%)= 146.59$

❖ Geometric change in index

$$=((1+25%)*(1-7.7%)*(1+18.4%))^{1/3}-1=10.96\%$$

- New index value = $131*(1+10.96\%) = 145.36$