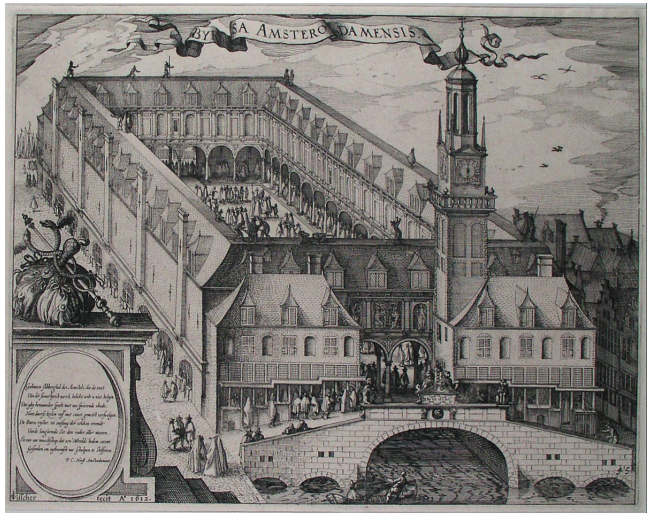
Asset Markets (Chapter 7)

The First Formal Stock Exchange



Outline

1. How asset markets work
2. Main concepts
3. Prices and yields
4. Efficiency and bubbles

Financial Asset Markets

Examples

- money markets
- bond markets
- foreign exchange markets
- derivative markets

Characteristics

- durability, small strorage costs
- stocks instead of flows; trade volume divorced from production
- fast reactions to economic conditions
- well organized institutionalized trading platforms
- perfect competition

Stock Market Capitalization and Trading

Exchange	Value (% GDP)	Volume (monthly)	Vol Daily (%)
London	164.8%	196.7	0.30%
New York	92.7%	1550.5	0.45%
Frankfurt	45.7%	111.3	0.38%
Euronext	83.5%	161.8	0.26%
Zurich	212.8%	86.5	0.30%

February 2016, volume in millions local currency

Trading Hours

Scope of Financial Sector

All banks within EU employ about 2.3 million people

Central banks

- ECB: 3500 employees
- all CB's in EU: 50 000 people

Critics

- financial sector is not producing anything concrete to economy
- rather the sector is responsible for speculation which causes instability even to real economy
- the sector is too big and wastes resources (e.g. talented people)
- do you agree?

Financial Asset Markets

Demand and supply are balanced for the whole stock

- for goods market the demand and supply of flows are balanced

Durability: market participants care about the future value of their holdings

- asset markets are forward-looking
- expectations matter, market aggregates information
- no profit/arbitrage condition: on average similar assets yield similar returns

Functioning of Asset Markets

Intermediation

- financial intermediaries channel resources from savers to investors and borrowers
- professional traders carry out trades (note: in many cases ordinary people have no access to trade on stock exchanges)
- example: average forex trade is about 1–2 MEUR, transactions costs 0.05%

Allocation of risk

- investors are willing to take risk in exchange of higher returns
- pricing of risk and allocating it to those willing to bear it
- insuring against financial uncertainty: diversification

Financial Asset Markets and Macroeconomics

Demand side

- changes in borrowers' balance sheets can amplify macroeconomic fluctuations

Supply side

- financial institutions are responsible of providing liquidity to real side of the economy

Financial accelerator

- firms need money to invest, consumers want to smooth their consumption over lifecycle and insure against risks
- small shocks can be amplified due to adjustments to investments and consumption
- mechanism: fall is asset prices, firms' balance sheets deteriorate, ability to borrow decreases, tightening financial conditions, declining economic activity
- note: financial imperfections (incomplete and asymmetric information)
- note: behind financial aggregates there are microfoundations

Concepts

Rate of return

- the payoff on the asset over some specified period of time divided by the initial investment in the asset, minus one

Liquidity

- ease with which an asset, or security, can be converted into ready cash without affecting its market price

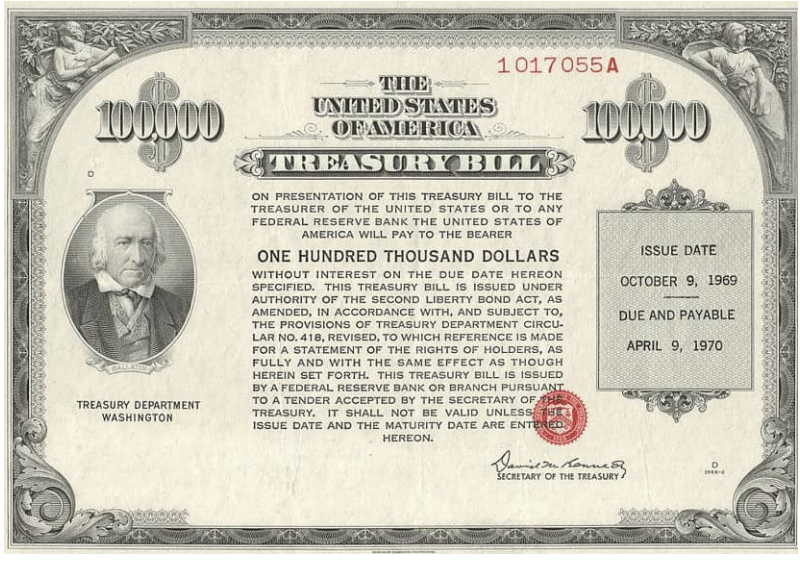
Risk

- the chance that an outcome or investment's actual gains will differ from an expected outcome or return

Maturity

- time it takes for an asset to pay off

Treasury Bill



Price of Time

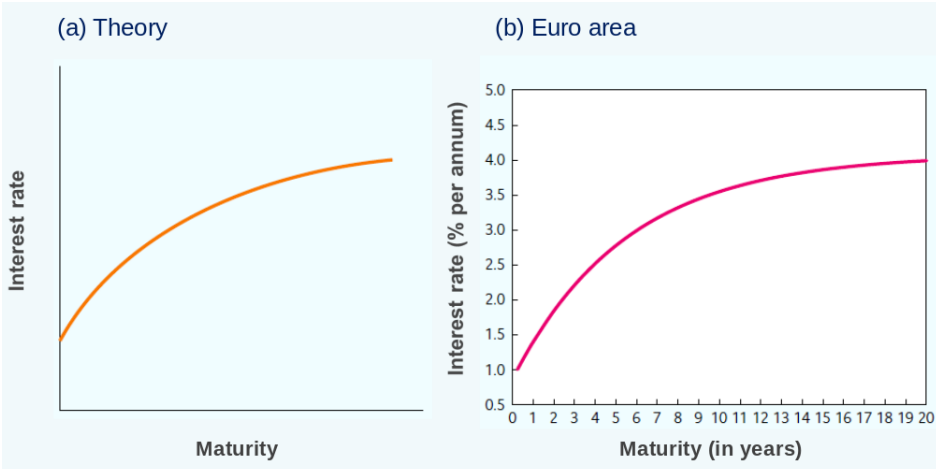
Price of future: interest paid by borrowers

- interest rates determined in the market
- fixed-income securities, e.g. bonds (standardized loan contracts): fixed payment stream according to agreed interest rate
- equity securities (stocks and shares): dividends (but no obligation to pay any)

Yield curve

- uncertainty grows as the time horizon lengthens
- maturity premium: (typically) higher interest for longer term maturity loans, premium increases with maturity

Yield Curve



Panel (b) shows the yield curve observed on May 11th, 2011, for high-quality government bonds in euros for maturities that range from 3 months to 20 years.

Yield Curve

Different ways of carrying out lending or borrowing

- one single long term contract or multiple contract of shorter time span
- e.g., two year loan contract or two one year loan contracts
- no profit condition (no arbitrage): different contracts have the same cost
- long term interest: averages of current and expected short term interests
- yield curve reveals market expectations

Term structure of interest rates

- annual interest of the long term loan R_L, maturity L
- expected one-year interest rate r_t^e at time t; compound interest is $(1+r_1)\cdot(1+r_2^e)\cdots(1+r_L^e)$
- if there is no uncertainty: $(1+R_L)^L = (1+r_1)\cdot(1+r_2^e)\cdots(1+r_L^e)$ (no arbitrage)
- take logs and approximate $\ln(1+x)\approx x$ to obtain $LR_L \approx r_1 + r_2^e + \ldots + r_L^e$
- $R_L \approx (r_1 + r_2^e + \ldots + r_L^e)/L$
- risk premium Ψ_L: $R_L = (r_1 + r_2^e + \ldots + r_L^e)/L + \Psi_L$

Risk-Return Trade-off

Diversification

- reducing risk of investor's portfolio by allocating funds to different assets

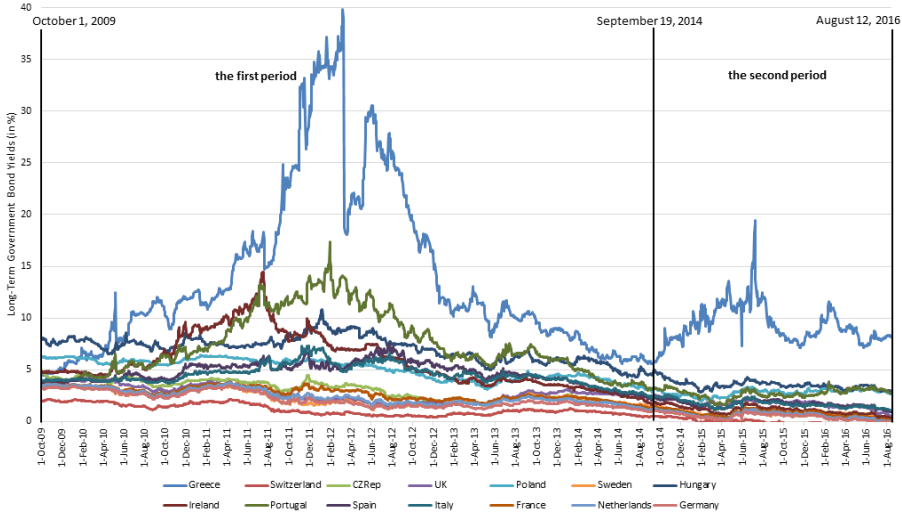
Macroeconomic risk

- not diversifiable
- innovations, politics, migration, trade, catastrophes

Undiversified risk is accepted only for a price

- the higher the undiversifiable risk the higher the expected rate of return

Euro Area Government Bond Yields



Bonds

Pricing

- receiver gets coupon payments and the repayment of principal (amount borrowed)
- at any time instant bond price reflects the present value of payments

Examples

- discount bond (or zero coupon bond): maturity one year, example; assume face value (principal) 10 000
- consol (or perpetuity): infinite maturity, assume coupon payment 1 each year

Arbitrage pricing

- assume that there is no risk
- price today = price of riskless asset (paying interest rate i)
- example contd: buy discount bond today at price P, sell it and invest with rate i, in next year $(1+i)P$, no arbitrage $(1+i)P = 10000$, which gives $P = 10000/(1+i)$

Bond Yields

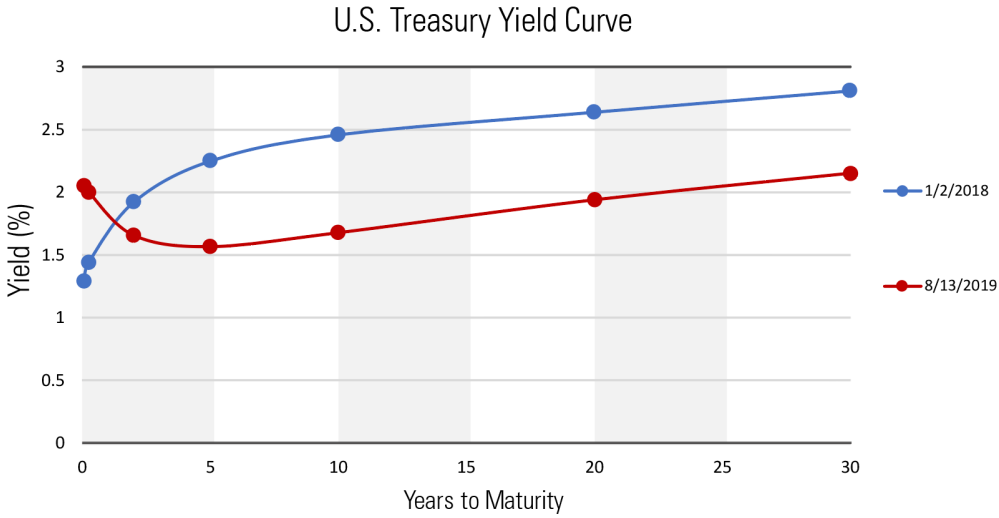
Discount bond with t year maturity and face value 1

- price $P_t = 1/(1+R_t)^t$, here R_t is the spot interest rate (or yield) for maturity t
- note: $R_t = 1/P_t^{1/t} - 1$
- if prices P_t are known, it is possible to find R_t (called yield to maturity) producing the yield curve
- note: market prices of bonds sold on open markets are known

Types of yield curves

- normal: increasing
- steep: steeply increasing
- inverted: long-term yields below short-term yields
- What information does the shape convey?

Example


U.S. Treasury Yield Curve
Yield (%)
3
2.5
2
1.5
1
0.5
0
0
5
10
15
20
25
30
Years to Maturity
1/2/2018
8/13/2019
Source: U.S. Department of the Treasury

Bonds Prices and Interest Rates

Interest rates define the risk-free rate of return

- risk-free return is the opportunity cost for other investments
- rule of thumb: when interest rates are low, bond prices increase

Example:

- initial situation: $i = 3\%$ and yield $r = 4\%$
- new situation: $i = 1\%$, bonds become more attractive, price increases, yield decreases
- question: what is the impact of low bond yields on investments?

Yield Curve Control

Central banking in normal times

- CB raises or lowers short-term rates, e.g. rate of overnight deposits

Yield curve control

- CB raises or lowers long-term rates, e.g. buying long-term bonds to keep the rate from rising above target
- currently adopted by some CBs (e.g. Japan, Australia) due to ZLB
- if credible, commitment to target changes the market price (CB's balance sheet is not necessarily expanded)
- note: yield $P^{-1/t} - 1$, buying increases the price, which decreases yield
- note: quantity target in QE but price target in YCC

Stocks

Dividends

- d_t paid (per share) at the end of period t
- dividend yield d_t/q_t

q_t real share price at the beginning of time period t

- anticipated capital gain $(q_{t+1} - q_t)/q_t$

Pricing

- return $d_t/q_t + (q_{t+1} - q_t)/q_t$
- riskless rate r (real interest rate) and risk premium ψ
- no profit condition: $r + \psi = d_t/q_t + (q_{t+1} - q_t)/q_t$
- implication

$$q_t = (d_t + q_{t+1})/(1 + r + \psi) = \sum_{j=0}^{\infty} \frac{1}{(1 + r + \psi)^{j+1}} d_{t+j}$$

Example: S & P


SPX, SPCFD 2475.57
SELL 2475.6
0.0
BUY 2475.6
Market Closed
Rate hike March 15, 2017
Rate hike June 14, 2017
Rate hike Dec. 13, 2017
Rate hike March 21, 2018
Rate hike June 13, 2018
Rate hike September 26, 2018
Rate hike December 19, 2018
Rate cut July 31, 2019
Rate cut Sept. 18, 2019
Rate cut Oct. 30, 2019
3295.5
3295.5
3000.0
2800.0
2600.0
2400.0
2200.0
2000.0
2017
Apr
Jul
Oct
2018
Apr
Jul
Oct
2019
Apr
Jul
Oct
2020

Interest Rates and Stocks

- Two channels

1. Interest rates affect firm borrowing
   - direct impact
   - higher interest rates, more expensive to invest, lower earnings (and dividends, lower stock prices)
2. Interest rates affect consumer spending
   - indirect impact
   - higher interest rates, less consumption and less earnings for firms

Other Financial Assets

Securitization

- creating new securities from existing assets
- underlaying assets can be highly risky and thus hard to sell individually

Investment funds

- instead of investing into assets buying shares of funds that invest

Derivatives

- instruments whose payments depend on circumstances of other assets
- CDS (credit default swap): if there is a *credit event*, the issuer pays a predetermined amount, important tool for transferring and pricing of risk

Mortgage Securitization in the US

Securitization of mortgage loans

- starting from late 1990's, banks started to bundle mortgage loans and resell the bundles
- bundling also pools the risks (of loan defaults), i.e. form of diversification
- note: traditionally banks hold mortgages as assets in their balance sheets and have possibility of foreclosure in case of default, which aligned banks interest to that of borrower
- lenders and intermediaries selling mortgage backed securities (MBS) had no incentive to act prudently: many loans were of inferior quality (subprime mortgages)

Overvaluation of MBS (peak at 2006)

- US real estate boom
- risks (related to individual loans) were much more correlated than anticipated
- declining housing prices: value of mortgages exceeded the values of homes for many subprime borrowers causing loan defaults, foreclosures and further declines

Great Financial Crises

Crises in 2007–2010

- started from the collapse of housing bubble in US

Consequences

- global financial crises and Great Recession
- direct losses due to household default on subprime mortgages atmost $500 bn
- U.S. and European banks lost about $2.8 trillion
- in U.S. 8.5 million jobs were lost
- slower growth of 1 to 1.5 ppt in the following decade

Mitigating policies

- aimed to break the financial accelerator
- e.g. Fed bought MBS to reverse the decline in their prices
- note: borrower's net worth determines its ability to borrow

Market Efficiency

Efficient market hypothesis

- asset prices fully reflect all available information
- impossible to gain consistently above average returns

Implications

- markets aggregate information: prices reflect consensus of traders
- impossible to systematically outperform the market
- speculation cannot be destabilizing

Arbitrage

Market makers

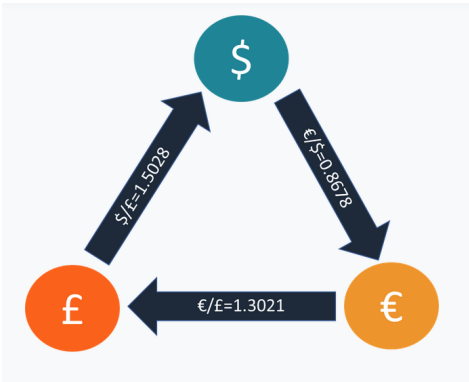
- counterparts for trades
- large specialized financial institutions that keep the market liquid
- compensation of the market maker: bid-ask spread

Arbitrage; no profit condition in action

- making profits from trades that do not imply taking additional risk

1. yield arbitrage: leads to identical returns for identical assets
2. spatial arbitrage: leads to similar prices for similar assets traded at different locations when full capital mobility
3. triangular arbitrage: leads to relative prices of three or more currencies being consistent with each other

Example: Triangular Arbitrage

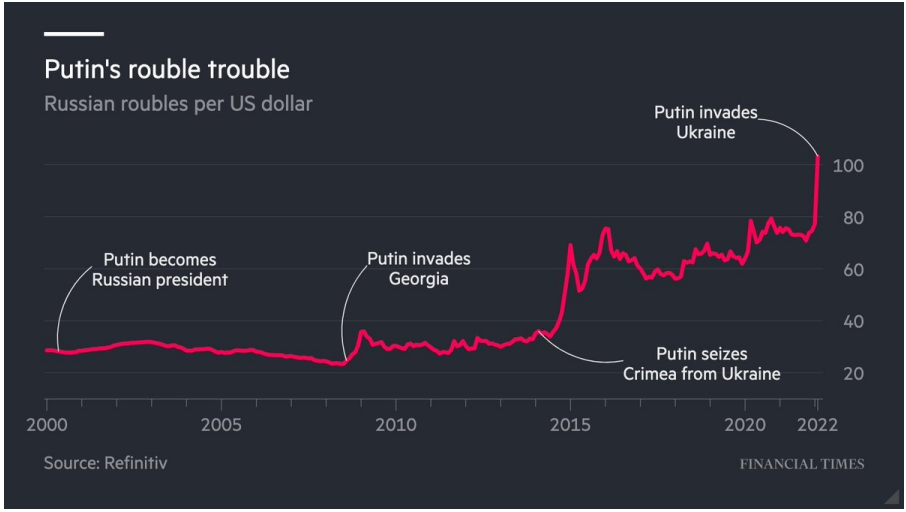


Exchange rates as in the picture

euro/pound undervalued: $0.8678 \times 1.5028 = 1.3041 > 1.3021$

0. Assume trading with \$1
1. sell dollar for euros: 1×0.8678 euros
2. sell euros for pounds: $0.8678 \times 1.3021 = 0.66646187$
3. sell pounds for dollars: $0.66646187 \times 1.5028 = 1.00155890$ USD

The Exchange Rate of Rouble



Efficiency: Anomalies

How and why asset prices deviate from their fundamental values?

Noise traders

- only some of the traders ace informed about the fundamentals, the rest (noise traders) systematically lose money
- new noise traders arrive to replace exiting noise traders
- may cause temporary deviations from fundamental value

Herds

- traders update their beliefs according what they see others doing, which may lead to overamplification of wrong signals

Hot Potato Game

Bubbles

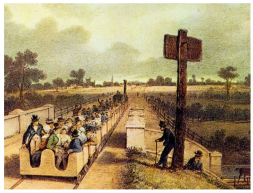
A Bubble

- persistent and growing deviation of asset price from its fundamentals

Mechanism

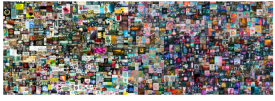
- fundamental value $\bar{q}$, assume $q_t > \bar{q}$ is observed
- using $q_t = (d + q'_{t+1})/(1 + r)$ it is possible to deduce q_{t+1}
- expected capital gain offsets low dividend, the strory repeats itself
- overvalued share is justified by further price increases (leading to "non-fundamental paths")
- the result is a speculative bubble
- uncertainty related to the burst of the bubble

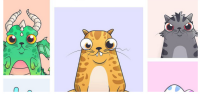
Bubbles



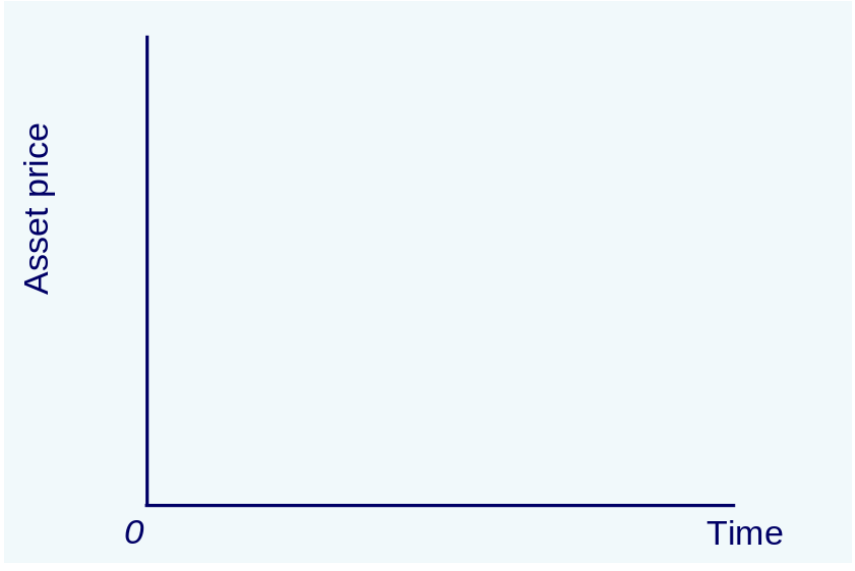

DOTCOM BUBBLE
Nasdaq Composite
MarketMoments


9.6
SILVER SURFER
50
SECRETS OF WONDERFUL MARTS





Possible Stock Price Paths



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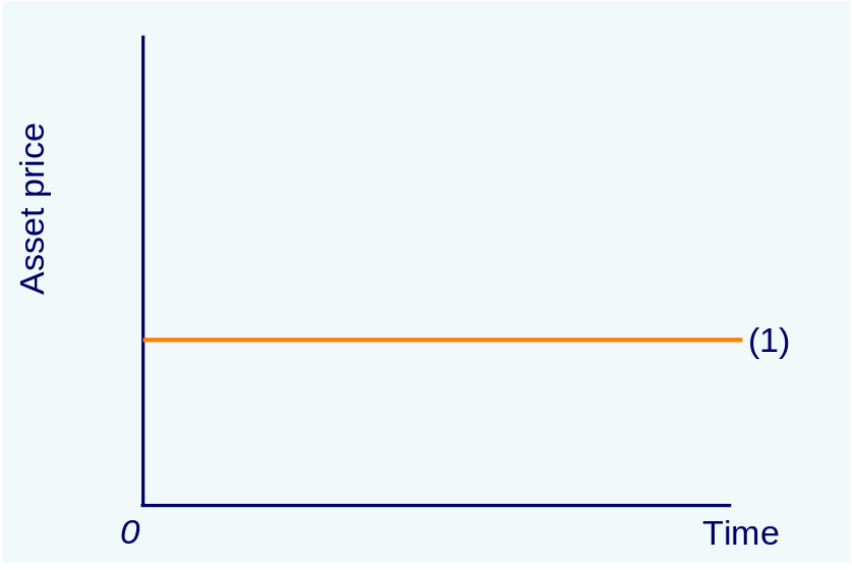

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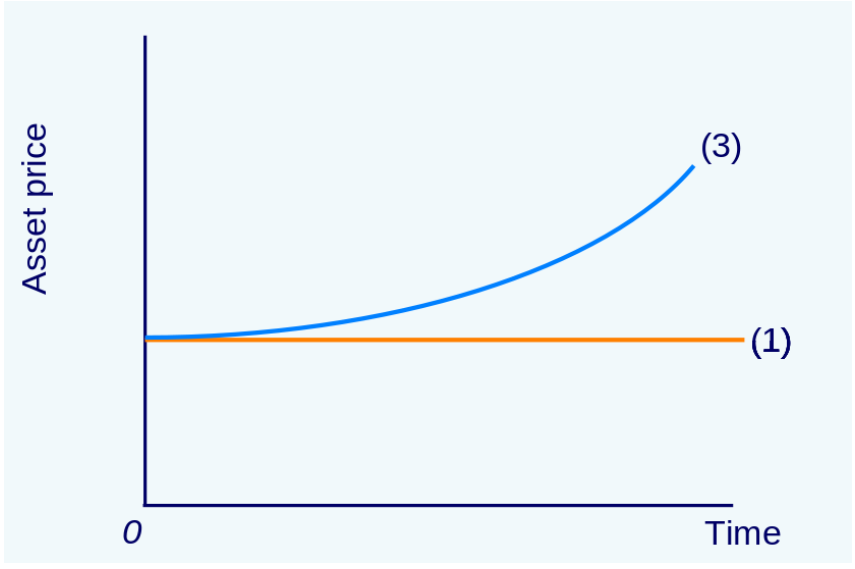

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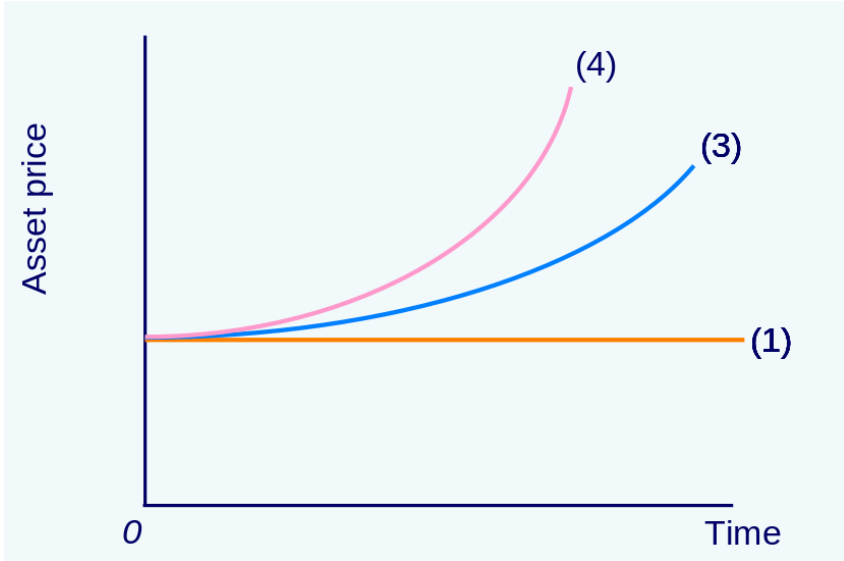
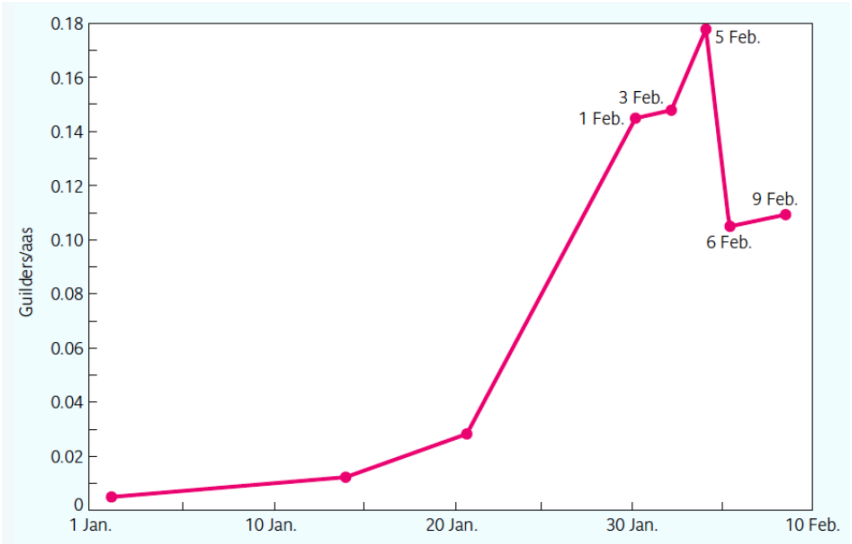
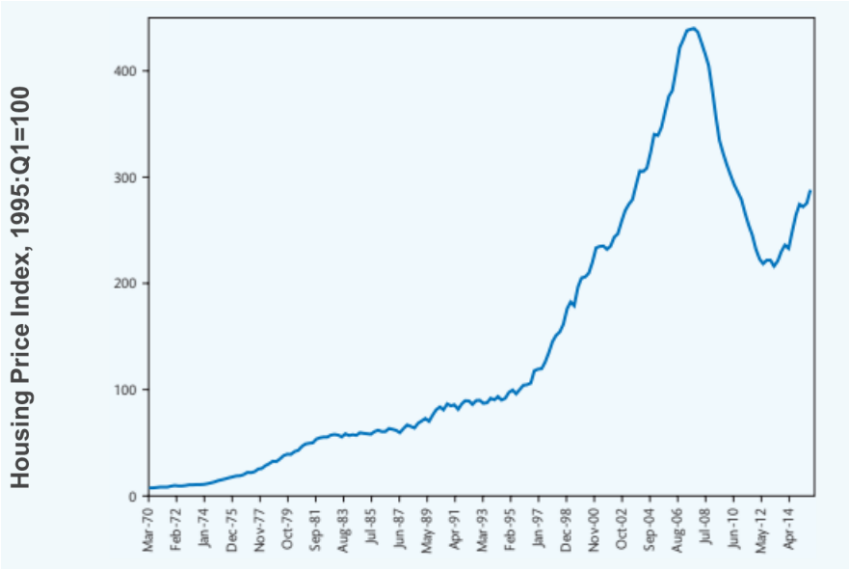


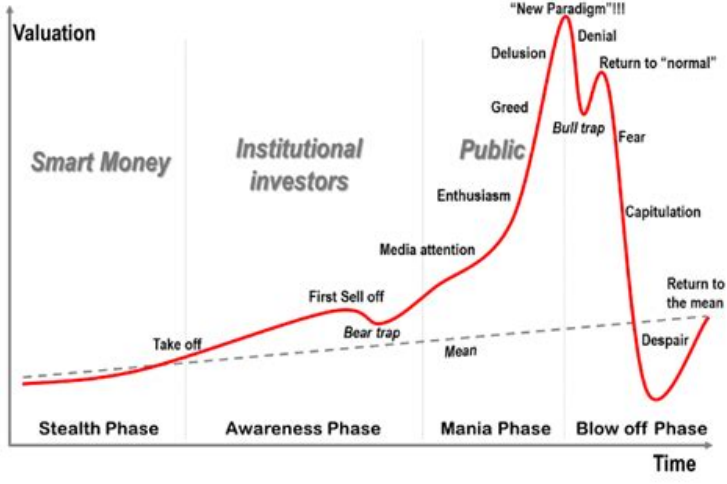
Tulipmania 1637



Housing Bubble in Ireland



A Typical Asset Market Bubble



Other Famous Bubbles

Bicycle bubble in UK in 1890's

- burst caused only regional distress but did not have major impact on UK economy as a whole

Real estate bubble in Japan 1980's

- bursted in 1991 and lead to *lost decade*

Dotcom bubble of 1990's

- bursted in 2002 and lead to a recession in U.S.

Contemporary bubbles or not?

- electric cars, cannabis stocks, Bitcoin...

Monetary Policy and Bubbles

Should central banks react to stock price developments?

No because

- difficult to identify bubbles ex ante
- interest rates are ineffective in bursting bubbles
- bubbles not funded by banks are not dangerous

Yes because

- bubbles and crashes have pro-cyclical effect, destabilizing effect for financial markets
- interest rates can be effective in preventing bubbles; higher interest rate is likely to prevent bubbles

Consensus view

- central banks should focus on stabilizing inflation and the output gap, and ignore fluctuations in asset prices