

Basic Tools of Finance

(Chapter 27 in Mankiw & Taylor)

- We have seen that the financial system coordinates saving and investment
 - These are decisions made today that affect us in the future
- But the future is uncertain – there is risk
- And we need to know how to compare money across time: would you prefer £100 today or £103 next year?



Present Value: The Time Value of Money

- **Finance**

- Studies how people make decisions:

- Allocation of resources over time
- Handling of risk

- **Present value**

- Amount of money today that would be needed using prevailing interest rates

- To produce a given future amount of money





Present Value

- **Future value**
 - Amount of money in the future that an amount of money today will yield
 - Given prevailing interest rates
- **Compounding**
 - Accumulation of a sum of money
 - Interest earned remains in the account
 - To earn additional interest in the future





Present Value

- Present value = £100
 - Interest rate = r
 - Future value = ...
 - $(1+r) \times \text{£}100$ – after 1 year
 - $(1+r) \times (1+r) \times \text{£}100 = (1+r)^2 \times \text{£}100$ – after 2 years
 - $(1+r)^3 \times \text{£}100$ – after 3 years ...
 - $(1+r)^N \times \text{£}100$ – after N years





Present Value

- Future value = £200 in N years
 - Interest rate = r
 - Present value = $£200/(1+r)^N$
- Discounting
 - Find present value for a future sum of money





Present Value

- **General formula for discounting:**
 - r – interest rate
 - X – amount to be received in N years (future value)
- Present value = $X/(1+r)^N$





- But we don't always know with certainty what X might be in the future?
 - What will that share be worth?
 - There's risk





Managing Risk

- **Rational response to risk**
 - Not necessary to avoid it at any cost
 - Take it into account in your decision making
- **Risk aversion**
 - Dislike of uncertainty or bad things
 - You would not accept a bet, which is *fair*, whereby you pay out £1 if the coin is heads but receive £1 if it's tails
- **Models of risk are based on *utility***
 - A person's subjective measure of well-being/ satisfaction





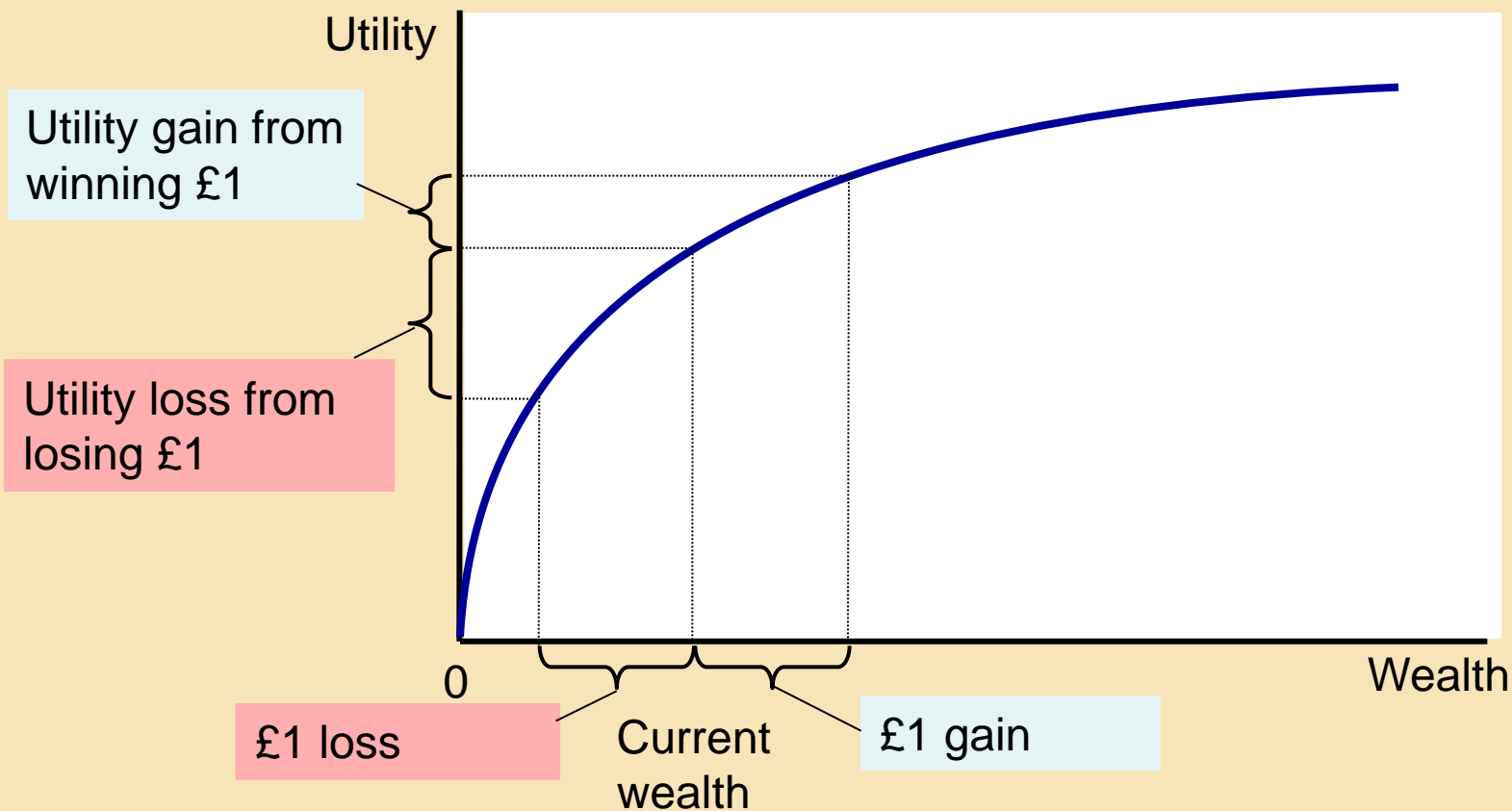
Managing Risk

- **Utility function**
 - Every level of wealth provides a certain amount of utility
 - For a risk averse person exhibits diminishing marginal utility
 - The more wealth a person has the less utility he gets from an additional £
 - Hence the utility lost from losing the £1 is greater than the utility gained from winning it



Figure 1

The Utility Function: Diminishing Marginal Utility



This utility function shows how utility, a subjective measure of satisfaction, depends on wealth. As wealth rises, the utility function becomes flatter, reflecting the property of diminishing marginal utility. Because of diminishing marginal utility, a £1 loss decreases utility by more than a £1 gain increases it.



Implications of risk aversion

- **Diminishing marginal utility explains:**
 - Insurance markets
 - this is how people deal with risk
 - discussed in semester 1
 - Diversification
 - Risk-return trade-off





Managing Risk

- **The markets for insurance**
 - Person facing a risk
 - Covers themselves by paying a fee to insurance company
 - Insurance company
 - Accepts all or a part of risk
- **Insurance contract – essentially a gamble**
 - You may not face the risk
 - car may not break down
 - Pay the insurance premium and receive peace of mind





Managing Risk

- **Role of insurance**
 - Not to eliminate the risks
 - Spread the risks around more efficiently
 - If your car does break down you don't have to cover the cost yourself as the insurance company pays out
- **Markets for insurance – problems:**
 - Adverse selection
 - High-risk person – more likely to apply for insurance
 - Moral hazard
 - After people buy insurance - less incentive to be careful
 - and the global financial crisis: banks took on risk knowing they'd be bailed out on the downside (but privatise the upside)





Managing Risk

- **Diversification**
 - Reduction of risk
 - By replacing a single risk with a large number of smaller, unrelated risks
 - “Don’t put all your eggs in one basket”
- **Risk**
 - Standard deviation - measures the volatility of a variable
 - Pricing risk





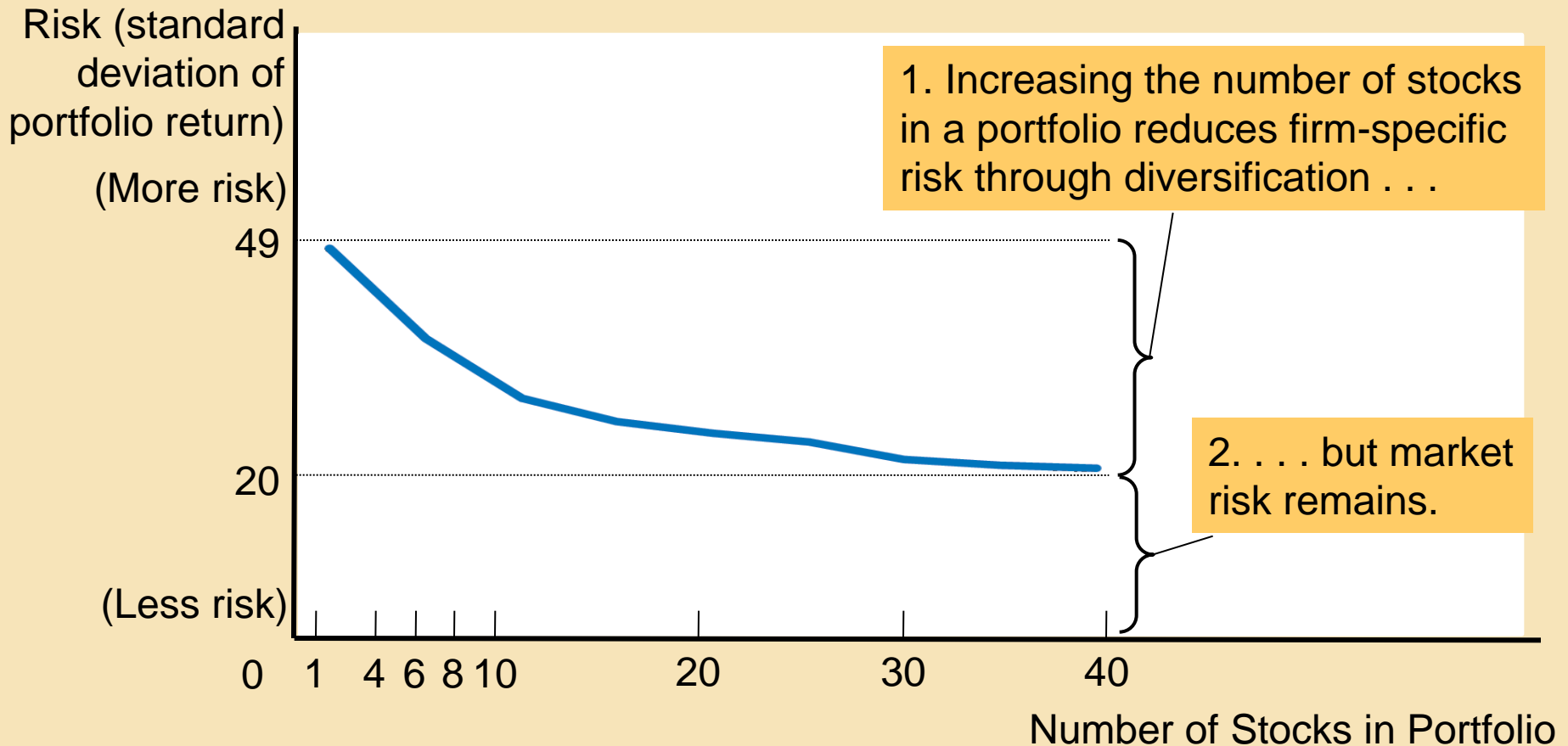
Managing Risk

- Risk of a portfolio of stocks
 - Depends on number of stocks in the portfolio
 - And their correlation
 - The higher the standard deviation of the portfolio's return, the more volatile it is and the riskier the portfolio



Figure 2

Diversification Reduces Risk



This figure shows how the risk of a portfolio, measured here with a statistic called the standard deviation, depends on the number of stocks in the portfolio. The investor is assumed to put an equal percentage of his portfolio in each of the stocks. Increasing the number of stocks reduces, but does not eliminate, the amount of risk in a stock portfolio.



Managing Risk

- **Diversification**
 - Can eliminate firm-specific (idiosyncratic) risk
 - Cannot eliminate market risk
- **Firm-specific risk**
 - Affects only a single company
- ***Market or aggregate or beta risk***
 - Affects all companies in the stock market
 - e.g. economy goes into recession; or Euro collapses





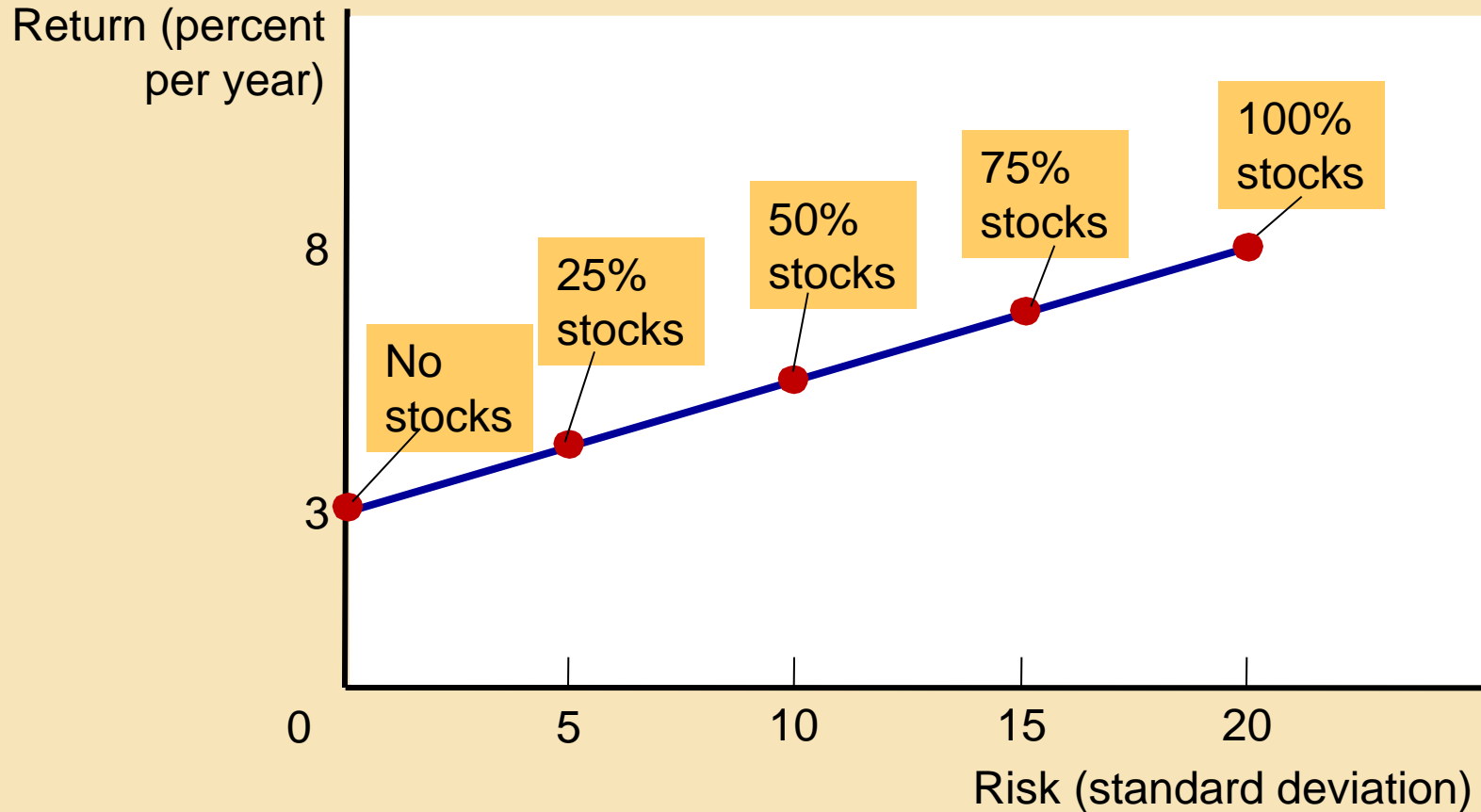
Risk-return trade-off: an example

- **Two types of assets**
 - Share portfolio: diversified group
 - Historically 8% real return; compensates for...
 - 20% standard deviation (s.d.): higher risk
 - US government short-term bonds: Safe alternative
 - Historically 3% real return
 - 0% s.d. (if we believe the US won't default!)
- The more a person puts into stocks
 - The greater the risk and the return
 - Individual preferences determine where you want to be on this trade-off curve



Figure 3

The Trade-off between Risk and Return



When people increase the percentage of their savings that they have invested in stocks, they increase the average return they can expect to earn, but they also increase the risks they face.

- We've now discussed both time and risk
- So, what determines the price of a share?
 - Is S and D. But what's behind why a person is willing to buy a share
- Is continued debate with opposing schools of thought
 - 1. Fundamental analysis
 - Try and buy undervalued shares
 - 2. Efficient Markets Hypothesis
 - Might as well just pick the shares in my portfolio randomly as shares are always correctly valued
 - 3. Psychological determinants: Keynes/Shiller



Asset Valuation

- **Fundamental analysis**
 - Study of a company's accounting statements and future prospects to determine its value
- **Undervalued stock:**
(currently traded) $\text{price} < \text{value}$
- **Overvalued stock:** $\text{Price} > \text{value}$
- **Fairly valued stock:**
 - $\text{Price} = \text{value}$





‘The cynic knows the price of everything and the value of nothing’ (Oscar Wilde)

- We know the price, but what is the *value* of a stock?
- Use fundamental analysis to pick a stock
 - Do all the necessary research yourself
 - Rely on the advice of City analysts
 - Buy a mutual fund
 - A manager conducts fundamental analysis and makes the decision for you
- Value = Net Present Value of stream of future dividends + final sale price of share





Valuation (cont.)

- Dividend pay-out depends, *inter alia*, on the firm's profitability
 - and profitability depends on the demand for the firm's product, its competitors, taxes, interest rates, government regulation...
 - so lots of information to contend with





The efficient markets hypothesis

- Asset prices reflect all publicly available information about the value of an asset
 - Price = Value. Prices move only as info changes
- Each company listed on a major stock exchange is followed closely by many money managers
 - and they buy shares whose price $<$ value and sell those whose price $>$ value
 - ‘If an economist had a formula that could reliably forecast prices a week in advance, say, then that formula would become part of generally available information and prices would fall a week earlier’
 - Equilibrium of supply and demand sets the market price, so all shares are fairly valued



EMH

- **Stock markets**
 - Exhibit informational efficiency
- **Informational efficiency**
 - Asset prices reflect all available information
 - At a given point in time, the market price is the best guess of the stock's value
 - Prices only change as new information (news) arrives. But this news arrives randomly...
- **Implication of efficient markets hypothesis**
 - Stock prices should follow a random walk
 - Future changes in stock prices are impossible to predict from currently available information





Implications of the EMH

- If prices do reflect all available information and are correctly valued, then no stock is a better buy than any other
- The best you can do is buy a diversified portfolio (an index fund) like a mutual fund which buys all the stocks in an index – to minimise idiosyncratic risk
 - Can't beat the market on a risk-adjusted basis
 - There is no means of picking *winners* and *losers*



- The efficient markets hypothesis
 - Theory about how financial markets work
 - Probably not completely true
- Evidence
 - Stock prices – very close to a random walk
 - But perhaps some mean reversion in the long-run

- Active funds
 - Actively managed mutual funds
 - Professional portfolio manager
 - Buy only the best stocks
- Performance of index funds
 - Better than active funds

- Active portfolio managers
 - Lower return than index funds
 - Trade more frequently
 - Incur more trading costs
 - Charge greater fees
 - Only 25% of managers beat the market



Asset Valuation

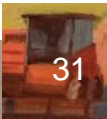
- **Efficient markets hypothesis**
 - Assumes that people buying & selling stock are rational
 - Process information about stock's underlying value
- **Fluctuations in stock prices**
 - Partly psychological: Keynes' *animal spirits* or Greenspan's *irrational exuberance* (Shiller's book)
 - Herd behaviour: what you pay today depends on what you think others will pay tomorrow





Bubbles

- **When the price of an asset is**
 - above its fundamental value market is said to be experiencing a “speculative bubble”
- **Possibility of speculative bubbles**
 - Value of the stock to a stockholder depends on:
 - Stream of dividend payments
 - Final sale price (and this depends on what you think others will pay). This can take off, independently of the fundamentals; witness the dotcom bubble





The case for and against

- Ongoing debate about whether departures from rational pricing are important or rare
 - For market irrationality
 - Movements in stock market are hard to explain using incoming news that should alter a rational valuation
 - 2007-9 global financial crisis; bubbles persisted, even though EMH says they cannot
 - www.economist.com/node/14030296
 - For rationality (EMH)
 - Impossible to know the correct/rational valuation of a company so should not conclude that movements are irrational
 - If the market were irrational, a rational person should be able to beat the market; but it is hard to beat the ‘market’

