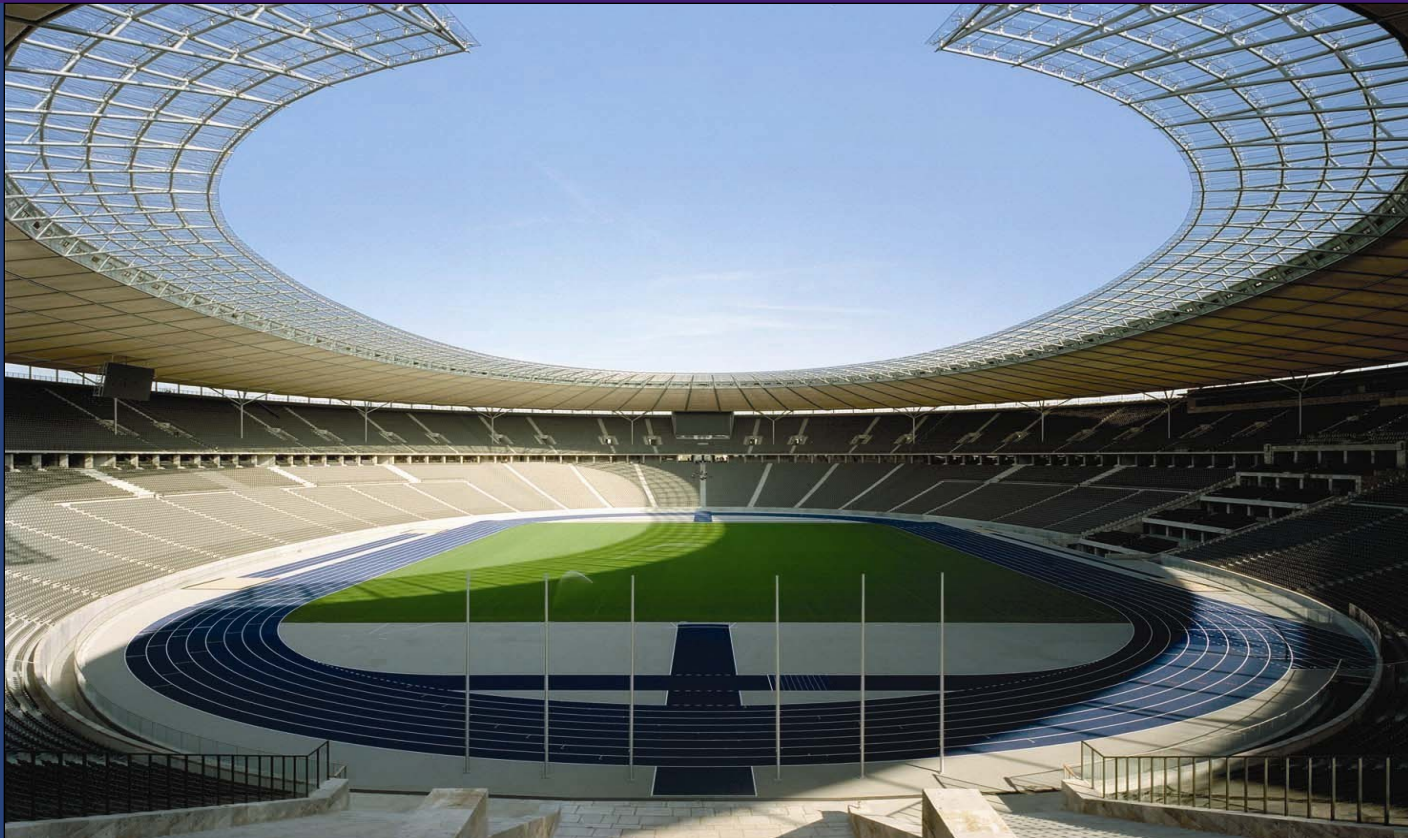


# 13

## THE FINANCIAL CRISIS OF 2007-2009





# The Causes for and the Fallout from the Financial Crisis of 2007-09

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# THE UNEXPECTED CRISIS

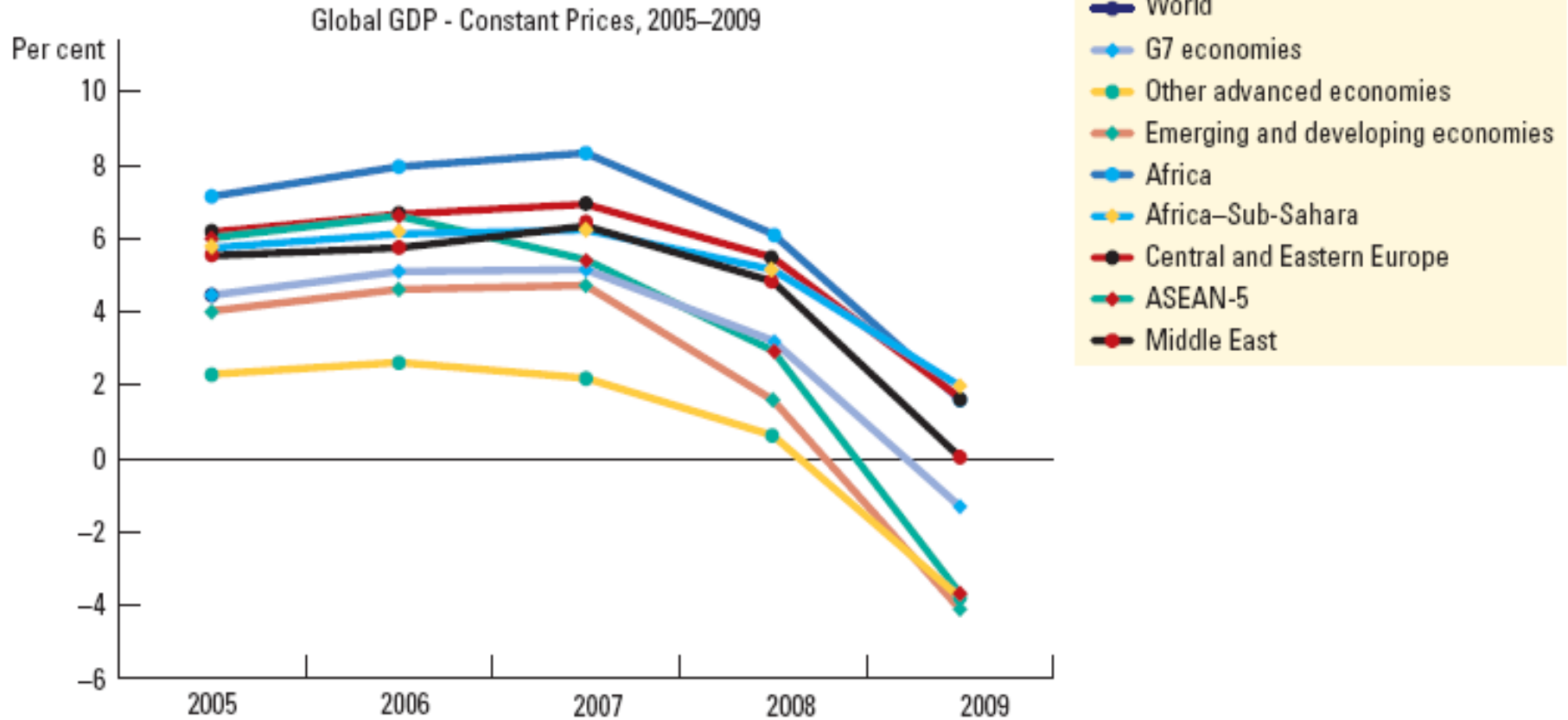
- In March 2007 the UK government was forecasting GDP growth in 2008 to be between 2.5% and 3%
- In fact, by the middle of 2008, GDP was falling as the UK entered its deepest recession in more than 60 years
- In the autumn there was a run on UK bank Northern Rock, which was then nationalized – the first run on UK bank in 100 years

# THE INTERNATIONAL CRISIS

- In March 2008 the US problems at investment bank Bear Sterns hit the headlines
- In September 2008 the US government announced it would take temporary ownership of Fannie Mae and Freddie Mac because of problems with these two major players in the US mortgage market
- US GDP fell throughout 2008

# Figure 1 Global Real GDP growth, 2005-09

Global GDP (Constant Prices) Broken Down, 2005–09



Source: Data from the IMF.

# Deep Causes of Crises

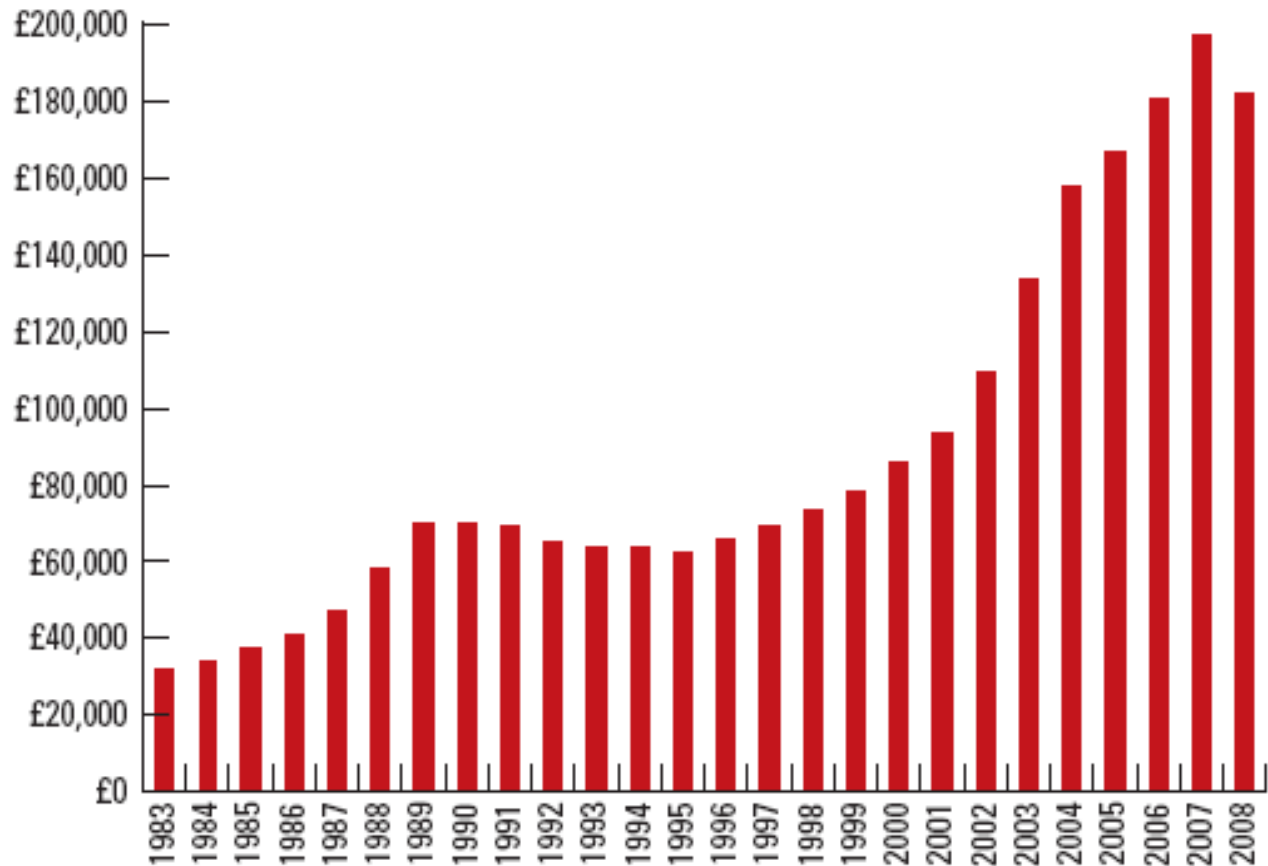
- Deregulation
  - Began in the 1980s in the UK and USA
  - Various restrictions on bank lending and hire purchase were relaxed
  - Building Societies Act (1986) ended building societies dominance of mortgage lending for houses in the UK
  - Some building societies converted to banks
  - Access to mortgages became easier
- Stock markets fell heavily in 2000 – the ‘dot.com’ crash
- Interest rates were cut
- 9/11 attack on the World Trade Centre in New York in 2001. Interest rates were cut again

# BUBBLES AND SPECULATION

- Demand for loans from the corporate sector was held back by firms' desire to rebuild their balance sheets, especially in the USA
- Banks looked elsewhere for profit opportunities
- Deregulation and global trading made it easier to borrow funds in countries where interest rates were low and invest those funds in assets in countries where interest rates were higher
- Sub-prime mortgage borrowers were a new market for banks in the USA
- In the UK, larger mortgage loans were made available
- House prices rose

# Figure 2 UK House Prices 1983-2008

UK House Prices, 1983–2008



Source: Data from Halifax House Price Index.

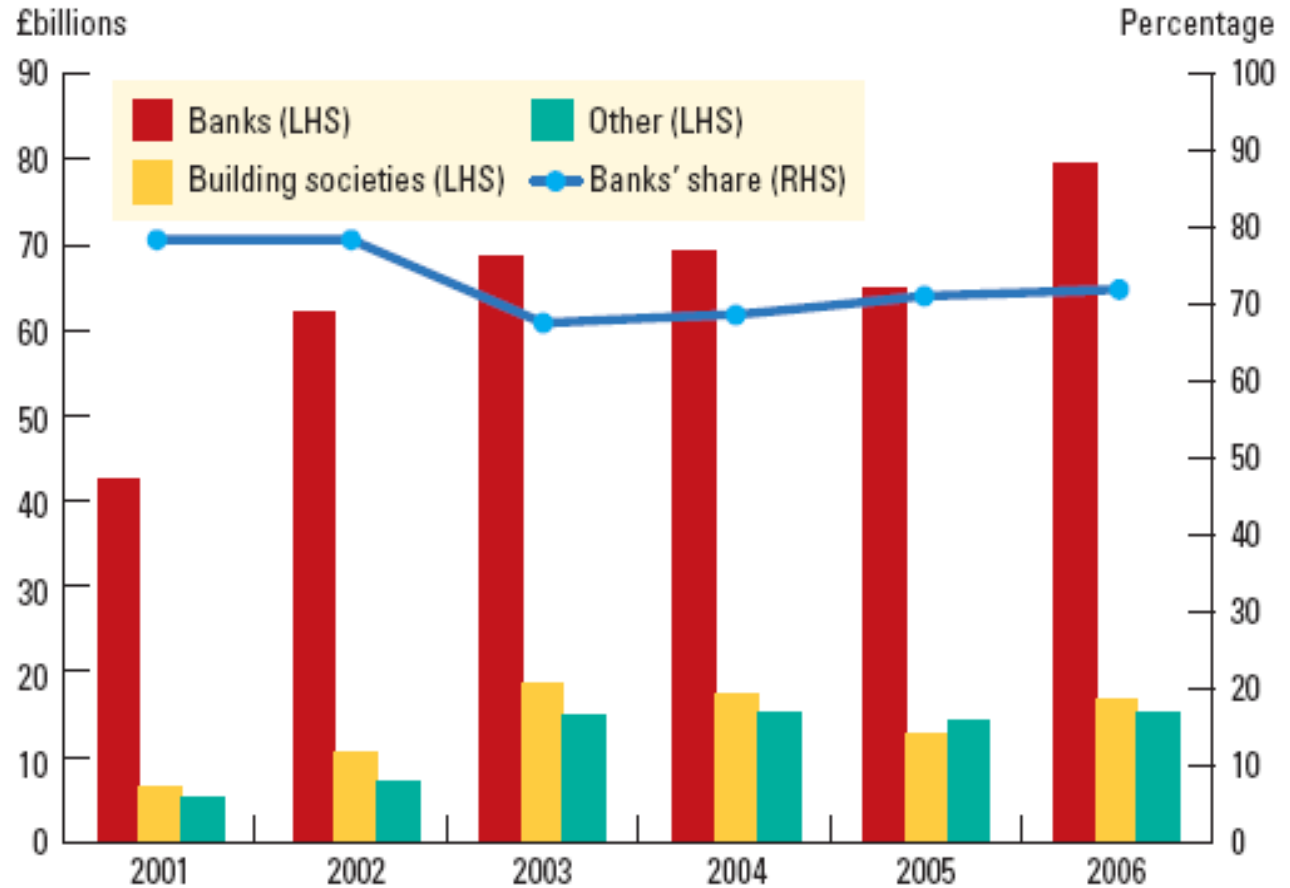


# BUBBLES AND SPECULATION

- Homeowners borrowed more money against their homes to fund holidays, car purchases, home extensions and second homes etc
- Second homes might be holiday homes or homes bought to let with the intention of making more money as house prices rose
- Lenders such as Northern Rock even loaned more than the value of the property

# Figure 3 UK Net Mortgage Lending 2001-2006

## Net Mortgage Lending, 2001-06



Source: Data from the BBA, Bank of England and Office for National Statistics.

# THE SUB-PRIME MARKET

- Individuals assessed to be a relatively high credit risk
  - Poor credit histories
  - No jobs
- Teaser rates
  - 2/28 – 2 years of low interest rate and then 28 years at a variable rate
- Loan to property value ratio rose from around 50% to over 80% by 2005/06

# THE SUB-PRIME MARKET

- In 2004 sub-prime loans accounted for around 35% of all US mortgages issued
- Borrowers were helped by low interest rates
  - Fed funds rate stayed at 1% for 31 consecutive months from 2003
- Housing related jobs growth
  - Between 2001 and 2005 some 40% of the total increase in US employment came from housing related activity

# SECURITIZATION

- Sub-prime mortgages were higher risk for the banks
- Banks would need increased reserves to protect themselves against the higher risk of the loans they were making
- But this need can be avoided by moving the loans off the banks' balance sheets
- Securitization is the process of creating asset backed securities
  - Backed by mortgages and saleable to other investors

# SECURITIZATION

- A mortgage is an asset for the lender
  - An asset that provides a stream of cash flows over, say, 25 years
- Such assets are attractive to other investors but sub-prime mortgages have too much credit risk to be attractive
- ...UNLESS a lot of such mortgages are packaged together
  - The risk of any particular mortgage borrower defaulting is high but the risk of default on all the mortgages in the package is low

# SECURITIZATION

- So banks bundle up packages of mortgages to sell to other investors
- They pay credit rating agencies to assess the packages and rate their riskiness
  - AAA, AA.... BB, B, CCC
- Additionally, the banks may take a first loss position
  - The bank agrees to assume the first, say, 4% of losses so the buyer of the package does not lose any money until losses exceed 4%

# CREDIT DEFAULT SWAPS (CDS)

- Additionally buyers of mortgage backed securities may insure themselves against the risk of losses due to defaulting mortgagees
  - They do this using credit default swaps (CDS)
  - A CDS is a derivative contract
  - A derivative is a contract whose value derives from some underlying asset – in this case a package of mortgages



# SPECIAL PURPOSE VEHICLES (SPV)

- The way this process works in practice is that banks create SPV
- An SPV is a corporate entity set up with the object of buying packages of assets and issuing bonds to investors to raise the finance to pay for the packages of assets
- So the investors actually buy a bond issued by the SPV and the SPV gets the money to pay the coupon payments on the bond from the stream of income produced by the assets it holds

# THE EFFECT ON MORTGAGE LENDING

- The SPV is a company in its own right, whose shares may be held by the bank that set it up or by other parties in the financial sector
- So the mortgages the bank created are no longer on the bank's balance sheet and the bank does not have to hold reserves to support those mortgages (to protect itself from the risk of defaults)
- Having shifted a batch of mortgages off its balance sheet, a bank is able to lend to more homebuyers and create more mortgages
- So the amount of mortgage lending that the banks can engage in is increased as a result of securitization and the use of SPV

# THE EFFECT OF ALL THIS MORTGAGE LENDING

- The effect of all this mortgage lending (and in particular of mortgage defaults) is increased by the activity in the CDS market
- Buyers of mortgage backed bonds issued by an SPV can buy CDS from more than one protection seller
- And CDS are tradable so they can be sold on to other parties
- So the value of CDS in issue can be far greater than the value of the bonds insured

# THE EFFECT OF ALL THIS MORTGAGE LENDING

- The buyer of a CDS will receive payment from the protection seller if a 'credit event' occurs
- Typical credit events are insolvency of the SPV and failure of the SPV to pay coupon payments that are due to bondholders
- The SPV will be unable to make coupon payments if it does not receive interest and repayments of principal from the mortgagees whose mortgages it holds

# THE EFFECT OF ALL THIS MORTGAGE LENDING

- A credit event will cost protection sellers (who sold CDS) a lot of money
- Large scale mortgage defaults will put the protection sellers in financial difficulty
- The CDS market is unregulated and CDS are traded 'over the counter' (rather than on an exchange like a stock market or a commodity market) – so there are no central records of trades

# THE EFFECT OF ALL THIS MORTGAGE LENDING

- The effect of the securitization of mortgages and the operation of the CDS market based on them is to create a massive web of financial interdependence
- The value of the CDS market has been estimated at between \$45 trillion and \$60 trillion
- \$60 trillion is more than World GDP!!!

# THE BUBBLE BURSTS

- As concerns about the threat to economic growth from the dot.com crash and 9/11 passed, central banks became more concerned about inflation
- The Federal Reserve raised interest rates for 16 consecutive months starting in 2005
- By the autumn of 2006 the Federal funds rate was 5.25%
- The Bank of England began to raise rates in June 2006

# THE BUBBLE BURSTS

- Some homeowners found their interest payments more than doubling
- Many could not afford the higher payments and were forced to sell their homes or had their homes repossessed by their mortgage lender
- House prices began to fall as a result
- As prices fell, more and more people found they owed more to their mortgage lender than their home was worth – they had negative equity in their home



# THE BUBBLE BURSTS

- If some areas suffer high rates of repossessions (called foreclosures in the USA) then the houses in that area become hard to sell and begin to fall into disrepair
- Even those who could afford their mortgage payments are therefore affected
- As the housing market deteriorates, so the default rates on mortgage lending go up
- The SPV that issued mortgage-backed bonds struggle to meet their obligations to bondholders

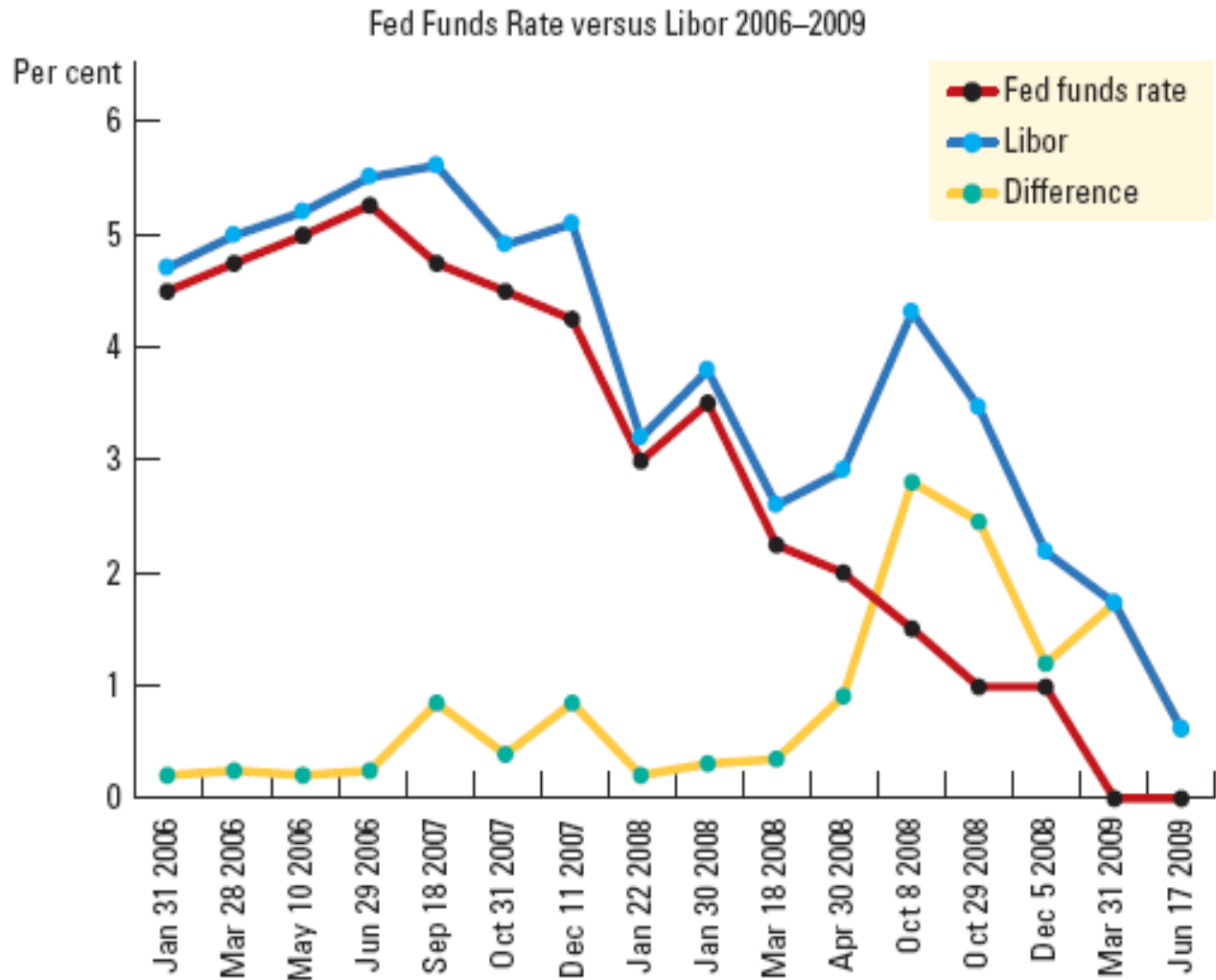
# THE BUBBLE BURSTS

- The banks that set up the SPV may then have to bail them out, which limits the banks' ability to make other loans
- As a result, banks became less willing to lend to other banks
- And concern grew about the extent of banks' exposure to the bad debts, so making banks reluctant to lend to each other even if they had the money to lend
- The inter-bank market tightened up

# THE BUBBLE BURSTS

- The interest rates at which banks lend to each other are based on LIBOR – the London inter-bank offer rate
- During 2008 LIBOR rose sharply
- Many mortgages and other loans that banks make to non-banks are priced relative to LIBOR
- Over 70% of variable rate sub-prime mortgages in the USA in mid 2007 were based on six-month LIBOR

# Figure 4 Federal Funds Rate Versus LIBOR, 2006-09



Source: Data from British Bankers' Association Libor and Board of Governors of the Federal Reserve System

# THE BUBBLE BURSTS

- If LIBOR goes up, so do the borrowing costs of millions of bank customers
- Defaults can be expected to rise further
- More banks got into difficulty
- After Bear Stearns and Merrill Lynch were rescued by being taken over earlier in the year, Lehman Brothers filed for bankruptcy in September 2008

# THE BUBBLE BURSTS

- The collapse of Lehmans led to claims on sellers of CDS estimated at between \$400 billion and \$600 billion
- AIG had been a big player in the CDS market and was now left seriously exposed
- The US government stepped in to help AIG because of the huge impact that AIG's bankruptcy would have had on the financial system and the wider economy

# GLOBAL RECESSION ENSUES

- In January 2008 nearly 820,000 motor vehicles were produced in the USA
- By February 2009 production was down to under 390,000 – a fall of over 50%
- US unemployment rose from 6.2% in August 2008 to 9.7% a year later
- In the UK in the first half of 2009 an average of 53 pubs closed down every week

# The Rationality Assumption in the Efficient Markets Hypothesis

- The prices of financial assets reflect all relevant generally available information
- Market participants are assumed to act rationally
- New information comes out all the time, but if it is really new then it is unpredictable – by definition!
- Hence new information generates a random walk in asset prices (see Ch. 27)



# Do Bubbles Reflect Irrational Behavior?

- Greenspan thought so: irrational exuberance
- The EMH is based on an assumption that there are enough people in the markets who behave rationally to counter the few who do not
- In turn, Keynes believed that, given that most investors will wish to sell assets they own at some point in the future, it is reasonable to be interested in what value others will later attach to those assets
- In speculative bubbles asset prices rise because of an expectation about what other people, in the future, will think the asset is worth, not just an expectation about future profits

# Do asset prices reflect all relevant available information?

- Despite new technology, information transfer is not instantaneous and nor is it assimilated and understood by all at the same speed
- Information about sub-prime mortgage borrowers may have been widely available and yet not properly understood
- There is a time lag during which some agents may be able to exploit an information advantage for profit
- We might conclude that on average markets are efficient but there are times when they are not

# PRICING RISK

- A corporate bond is a means by which the issuer borrows money from the bond investor
- There is a risk to a bond investor that the bond issuer will not be able to pay back the money
- We can attach a probability to that risk
- We can then use this as an element in valuing the bond – we price the risk

# Problems with Default Risk Estimation and Bond Valuation

- When mortgages are put into a pool and used to back a bond in the securitization process, it can be very difficult to work out the probability of the bond going into default
- This is because of the concept of correlation
  - If the probability of a mortgage borrower defaulting rises when another borrower defaults, then we say these events (default by the borrowers) are correlated
    - For example, it is known that in a couple if one partner dies then the probability of the other dying rises (stress cardiomyopathy)
    - Note that death is bound to happen sometime, but a mortgage default may never happen!
- So it's difficult to price the risk and value the bond.

# THE ROLE OF THE 'QUANTS'

- David Li (an employee of JP Morgan Chase) worked out a model to estimate risk in pools of loans and so help in pricing it
  - Moody's and Standard & Poor's incorporated Li's approach in their method for rating collateralized debt obligations (CDOs)
- But the historical information used in Li's model reflected a period of rising house prices and stock markets
  - During such good times correlations between defaults were relatively low
  - It turned out that Li's model led people to under-estimate risk when economic and financial conditions were not so good
- The problem with employing clever mathematicians is that the new information they provide is highly technical and may not be fully understood by those using it

# EMH: DEAD OR RESTING?

- So does this show the EMH to be false?
- We might argue that it shows that attempts to beat the market, e.g. by using sophisticated mathematical modelling, fail
- See the excerpt of Burton G. Malkiel 2003 paper (pp. 828 – 829)

# Key Aspects of Monetary Policy Response

- The conduct of the US Federal Reserve, the European Central Bank (ECB) and the Bank of England during the crisis has come in for particular scrutiny
- Markets were looking for three key aspects of policy response from central banks:
  - Speed of intervention
  - Innovation
  - Coordination

# Speed of Intervention

- Intervention began when credit markets froze
  - The ECB authorized an injection of €95 billion into the financial markets on 9 August 2007 and another €61 billion the next day
  - The Fed announced a \$38 billion injection soon after
  - The Bank of England became involved with the problems of Northern Rock on 10 August and the UK government eventually agreed to guarantee all existing deposits with Northern Rock on 17 September



# The Conduct of Monetary Policy: Bank of England

- The Bank of England has more limited powers to deal with the crisis than other central banks – concerned with price but not financial stability
- The Bank of England announced it would provide financial help to institutions that needed overnight funds but only at a penalty rate
  - The penalty rate was removed at the end of August (2007) after news that Barclays had asked to borrow £1.6 billion was seen as another sign that a major bank was in trouble
- Also in November 2007, the Bank of England makes first cut of interest rates by 1.5%
- By March 2009 UK rates were at 0.5% - the lowest in the Bank's 300 year history
- A new Banking Act was passed in 2009 giving the Bank additional powers and responsibilities

# THE CONDUCT OF MONETARY POLICY: The U.S. Fed

- As 2008 progressed the signs became clearer that the financial crisis was spilling over into the real economy
- The Fed cut US rates by 0.75% in January 2008
- And even before the end of October, the Fed cut again by another 1%
- In October, seven major countries announced a coordinated 0.5% cut in interest rates
  - the Fed had cut its rates to a target of between 0 and 0.25%
- In the US, discussions to set up the \$700 billion Troubled Asset Relief Plan (TARP) to support banking system were followed the announcement of a further \$800 billion support by the Fed in November

# THE CONDUCT OF MONETARY POLICY: ECB

- The ECB had cut rates to 1%
- In addition to this easing of monetary policy, governments took additional steps
  - e.g. extra guarantees to protect bank deposits, injecting money into banks, nationalizing banks

# Innovation

- When the interest rates are close to zero, there is no more scope to adjust the price of money
- Central banks therefore turned to affecting the supply of money
  - e.g. through quantitative easing (QE) in the UK
- QE directly puts more money into financial institutions – money that they can then choose to lend
  - The purpose of QE is to put the banks in a better position to lend
  - The process of QE involves the central bank buying assets from private sector institutions, such as banks, pension funds and insurance companies
- The biggest element of QE was the purchase of gilts

# Secondary Effect of QE

- There is a second effect of QE
- Central bank buying of gilts (and other debt securities) pushes up prices for corporate bonds
- Higher bond prices mean lower yields, so companies issuing new bonds are able to borrow more cheaply
- And lower gilt yields encourage banks to lend rather than hold gilts

# THE CONDUCT OF MONETARY POLICY

- The Bank of England admitted that it would be difficult to know whether QE would work and how long it would take to see an effect
- Banks might choose not to lend, despite QE, as they attempt to strengthen their balance sheets
- It was suggested that QE would work more effectively if the central bank bought 'toxic assets' rather than gilts

# Coordination

- The speed with which central banks acted varied because of technical and ideological reasons
- Once inflationary pressures eased, then central banks relaxed monetary policy and acted in a coordinated way in October 2008 to cut interest rates
- Central banks have expanded their roles and introduced new policy tools and instruments – there has been innovation

# LESSONS LEARNED?

- Was weak regulation to blame for the crisis?
- Can stronger regulation prevent a future financial crisis of the scale of the 2007-09 crisis?



# LESSONS LEARNED?

- The OECD has been critical of national regulatory bodies and identified the following key causes of the crisis:
  - The bonus culture in banks
  - Credit ratings agencies
  - Failures in corporate governance
  - Poor risk management strategies and understanding

# LESSONS LEARNED?

- Suggested actions include:
  - Improve demarcation of responsibilities, e.g. make the Bank of England responsible for monitoring systemic risks and the FSA responsible for risks in individual institutions
  - Overhaul credit ratings agencies
  - Increase transparency of operations (bearing in mind commercial sensitivities) to improve market discipline and prevent excessive risk taking
  - Discourage the growth of institutions that are too big to fail and thus raise the problem of moral hazard, e.g. by setting stricter capital requirements that reflect the systemic risk posed by an institution
  - Ensure regulators have better information on all financial institutions, including off-balance sheet entities
  - Reduce barriers to international cooperation among regulators

# LESSONS LEARNED?

- The IMF has broadly concurred with the OECD in its analysis of the crisis. It suggests that:
  - the high extent of financial innovation allowed excessive leverage to be carried out
  - the lack of coordination and the legal constraints for wider information-sharing prevented the regulatory bodies from understanding what happens
- Suggested actions include:
  - Require banks to set aside capital during ‘good times’ to provide a reserve that can be used when the economy suffers a downturn and credit conditions are tight

# Summary

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- Deregulation of financial markets encouraged new ways of lending and made it easier for lenders to access funds.
- The relatively benign economic climate of the early 2000s encouraged banks to become more risk seeking.
- Some of this risk could be insured against through new products such as credit default swaps (CDS).
- Banks in the US increased lending to the sub-prime market at rapid rates.
- The resulting effects on the housing market of easier access to mortgages increased demand and prices.
- Mortgage lending (along with other loans) were securitized by banks.
- Securitization in association with CDS increased interdependency within the global financial system.

# Summary

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- When interest rates started to rise to combat inflation in 2005, defaults in the sub-prime market rose.
- As the defaults grew, the liabilities of banks to the debt which had been built up increased, along with their liabilities to CDS claims.
- The banking crisis led to a sharp reduction in interbank lending as credit dried up.
- Tight credit along with the collapse of the housing market fed through to the real economy and unemployment began to rise and economic activity to slow.
- Most economies of the world experienced recession by 2008.

# Summary

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- The efficient market hypothesis formed the basis for policy making and regulation in many global financial markets.
- Efficient markets rely on high quality information and the ability of market participants to understand that information in pricing risk
- Financial institutions developed a range of new products based on assumptions of limited risk
- A lack of understanding of these models from bankers through to regulators and central bankers undermined a key basis of efficient markets

# Summary

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- When the crisis hit, central banks responded by reducing interest rates and developing new techniques to complement fiscal stimuli
- Quantitative easing has been adopted by both the UK and US as a means of trying to improve credit flows and limit the depth of the recession
- Both central banks and regulators have come in for criticism about their role in the crisis and their response afterwards
- Ongoing debate and discussions about how best to avoid such a financial crisis in the future will continue