

Monetary Policy & Central Banking

Banking crises

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Why is the banking system prone to crises?

- What about banks is different from other businesses?

Maturity mismatch

Assets	Liabilities
Cash/reserves	Deposits
Govt securities	Short-term wholesale funding
Loans	Long-term debt
Other assets	Equity (Capital)

Assets

- Relatively **illiquid**
- Longer maturity
- Difficult to sell quickly without a loss
- Subject to e.g., credit risk

Liabilities

- Relatively **liquid**
- Deposits can be withdrawn quickly
- Often short-term

Maturity mismatch

Assets	
Reserves	10
Loans	90
Total	100

Liabilities + Equity	
Deposits	90
Equity	10
Total	100

- What happens if depositors suddenly want 30?
- The Bank must find another 20. It can borrow, sell securities, sell/pledge loans or get liquidity from the central-bank.
- What problem is the bank facing? Solvency or Liquidity?

Cost of a banking crisis

- [Reinhart and Rogoff \(2009\):](#)
- After a banking crisis unemployment rate rises an average of 7 percentage points from peak to trough, which lasts on average over four years.
- Output falls (from peak to trough) an average of over 9 percent, although the trough is reached after roughly two years.

Why have banks at all?

- If they can have such a negative impact, why have banks at all?

Social value of banks

Households / depositors	Firms / borrowers
Want liquidity	Want long-term funding
May need money unexpectedly	Investment projects take time
Prefer safe, liquid claims	Need funds tied up for years
Don't want to monitor borrowers	Have specialised investment opportunities

- Information asymmetries make it costly for depositors to find borrowers to lend to.
- Banks reduce these transaction costs.

Social value of banks

1. Liquidity provision

- Depositors can access funds when they need them.

2. Maturity transformation

- Banks convert short-term savings into long-term investment.

3. Information production

- Banks screen and monitor borrowers - reduces transaction costs.

4. Risk sharing

- Banks diversify across many borrowers and depositors.

Diamond and Dybvig: liquidity 'insurance' and bank runs

Diamond and Dybvig

- Individuals receive an endowment of 1 at $t = 0$.
- They can invest for 2 periods (to $t = 2$), but some will have to consume early at $t = 1$.
- Early consumer with probability π .
- Consumer utility is given by:
 - $U(c_1, c_2) = \begin{cases} u(c_1), & \text{if early} \\ u(c_2), & \text{if late} \end{cases}$
 - with:
 - $u'(c) > 0, u''(c) < 0$

Diamond and Dybvig

- There are two investment technologies open to the bank.

- Short-term technology implies no return:

$$1 \rightarrow 1$$

- Long-term technology, positive return:

$$1 \rightarrow R, \quad R > 1$$

- But if the long-term investment is liquidated early, it only produces:

$$1 \rightarrow L, \quad L < 1$$

Banks provide liquidity insurance

- The bank promises c_1 to early consumers and c_2 to late consumers.
- The bank faces the (simplified) resource constraint:

$$\pi c_1 + \frac{(1 - \pi)c_2}{R} \leq 1$$

- Where π is the fraction of early consumers.
- Subject to the constraint, the bank chooses c_1, c_2 to maximise:

$$\max_{c_1, c_2} \pi u(c_1) + (1 - \pi)u(c_2)$$

Banks provide liquidity insurance

- Set up the Lagrangian:

$$\mathcal{L} = \pi u(c_1) + (1 - \pi)u(c_2) + \lambda \left[1 - \pi c_1 - \frac{(1 - \pi)c_2}{R} \right]$$

- The first-order condition for c_1 is: $\pi u'(c_1) - \lambda\pi = 0 \Rightarrow \lambda = u'(c_1)$
- For c_2 : $(1 - \pi)u'(c_2) - \lambda \frac{1-\pi}{R} = 0 \Rightarrow \lambda = Ru'(c_2)$
- Combining the two:
- $u'(c_1) = Ru'(c_2)$

Banks provide liquidity insurance

- Given: $u'(c_1) = Ru'(c_2)$ from previous slide...

- Since $R > 1$, it must be that:

$$u'(c_1) > u'(c_2)$$

- Because the utility function is concave ($u''(c) < 0$), we have diminishing marginal utility, and it must therefore be that:

$$c_1 < c_2$$

- So early consumers get less.

Diamond and Dybvig insights

- The bank effectively provides **insurance against an individual's liquidity shock**. Does so by pooling risk across many depositors.
- Without a bank: since there is a risk a depositor might need their money in the short-term, they do not make long-term investments.
- With a bank: the bank insures against this risk and enables depositors to invest in longer-term assets.
- This is a key insight: Banking can improve risk sharing.

The Bank Run Problem

- Suppose the bank promises $c_1 > 1$ to those who withdraw early.
- This is possible because not everyone is expected to withdraw.
- But now imagine that depositors believe **everyone else will withdraw**.
- The bank cannot meet all withdrawals from liquid resources.
- It must liquidate long-term investments.
- If early liquidation produces only $L < 1$, then the bank incurs losses.

Bank run problem

Equilibrium 1: No run

Depositors expect others to wait

↓

Only genuinely early consumers withdraw

↓

Bank keeps long-term assets invested

↓

Late consumers receive c_2

↓

Efficient liquidity insurance

Equilibrium 2: Bank run

Depositors expect others to withdraw

↓

Everyone tries to withdraw

↓

Bank liquidates long-term assets

↓

Early liquidation generates $L < 1$

↓

Bank cannot fulfil its promised payments

↓

Bank fails

Expectation of a run can cause a run, even if the Bank is fundamentally sound.

Diamond-Dybvig: what have we learned?

- Banks provide a valuable service by allowing households to hold liquid claims while financing long-term investment.
- But maturity transformation also creates **fragility**.
- Diamond–Dybvig shows how a financial crisis can arise from a coordination problem.
- A bank can therefore fail even when the underlying long-term investments would have been viable.
- **But why might you lose faith in a bank?**

Asset price bubbles

Asset price booms/busts and financial crises

- Many financial crises are preceded by periods of rapidly rising **asset prices and credit**.
- A **bubble** occurs when the price of an asset exceeds its fundamental value because investors expect that they will be able to sell it at a higher price in the future.
- Can get this in equities, housing, other financial or real assets...
- **But does a bubble require investors to be irrational?**

Can it be rational to pay more than fundamental value for an asset?

- Suppose an asset has a fundamental value of £100.
- But its market price is: $P_t = £120$
- Would you pay £120 for this asset?

Can it be rational to pay more than fundamental value for an asset?

- Suppose an asset has a fundamental value of £100.
- But its market price is: $P_t = £120$
- Would you pay £120 for this asset?
- Suppose you expect to be able to sell next year for £132.
- Then the expected return is: $\frac{132-120}{120} = 10\%$
- If the return available on comparable investments is $\leq 10\%$, buying the asset at £120 can be rational.

Can it be rational to pay more than fundamental value for an asset?

- The investor does not need to believe that the asset is fundamentally worth £120.
- They only need to expect that someone will pay them enough for it in the future.
- Fundamental value and expected resale price are not the same thing.

A bubble component

- We can write the market price as: $P_t = P_t^F + B_t$ where:
- P_t^F = fundamental value, and B_t = bubble component.
- In our example: $P_t^F = 100$, $P_t = 120$, so: $B_t = 20$.
- If the required return is 10%, the £20 bubble must be expected to become: $E_t(B_{t+1}) = 22$.
- More generally: $E_t(B_{t+1}) = (1 + r)B_t$
- So a bubble can persist even when investors are rational.

But what if the bubble might burst?

- Now suppose there is a chance that the bubble will burst next year.
 - Probability the bubble survives = 90%, and the value is B_{t+1}^S .
 - Probability it bursts = 10% and $B_{t+1} = 0$.
- Now, $E_t(B_{t+1}) = 0.9B_{t+1}^S + 0.1(0)$.
- If investors still want a 10% return $E_t(B_{t+1}) = 22$, then the bubble will have to grow more than 10%:
 - For $0.9B_{t+1}^S = 22$ we need $B_{t+1}^S = 24.4$, or 22% growth.
- Even though the required expected return is only 10%.

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- Even though the required expected return is only 10%.
- **Why?** Investors must be compensated for the possibility that the bubble bursts and they lose the entire bubble component.

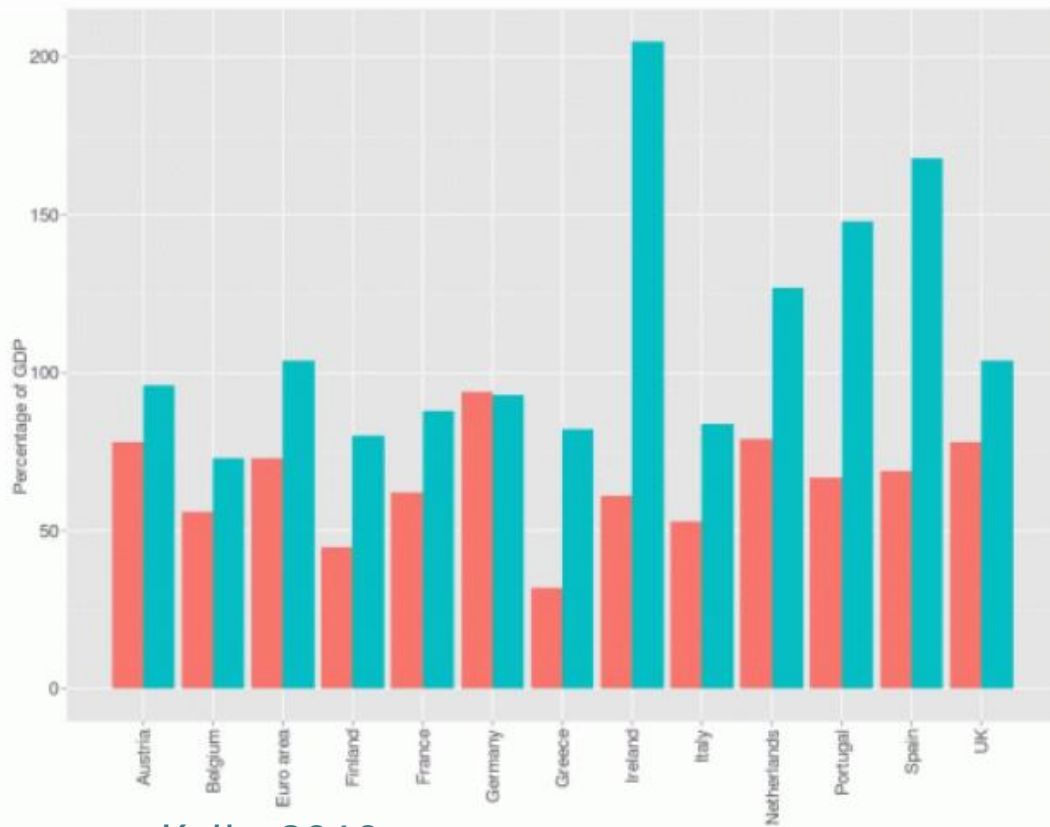
Greater crash risk $\Rightarrow$ faster growth if the bubble survives

When does a bubble become dangerous?

- During a bubble: Asset prices ↑ , Credit ↑ , Leverage ↑
- If investors lose their own money, the macro effect may be limited.
- The danger is much greater when the boom has become intertwined with **balance sheets and the financial system**.
- Rising prices tend to encourage borrowing to invest.
- But if asset prices subsequently fall, highly leveraged households, firms and financial institutions can experience large losses.
- Then a fall in asset prices causes defaults and bank losses.

Bubbles, leverage and bank balance sheets

Figure 1. Bank lending to households and non-financial firms as a percentage of GDP (GNP for Ireland), 1997 and 2008.



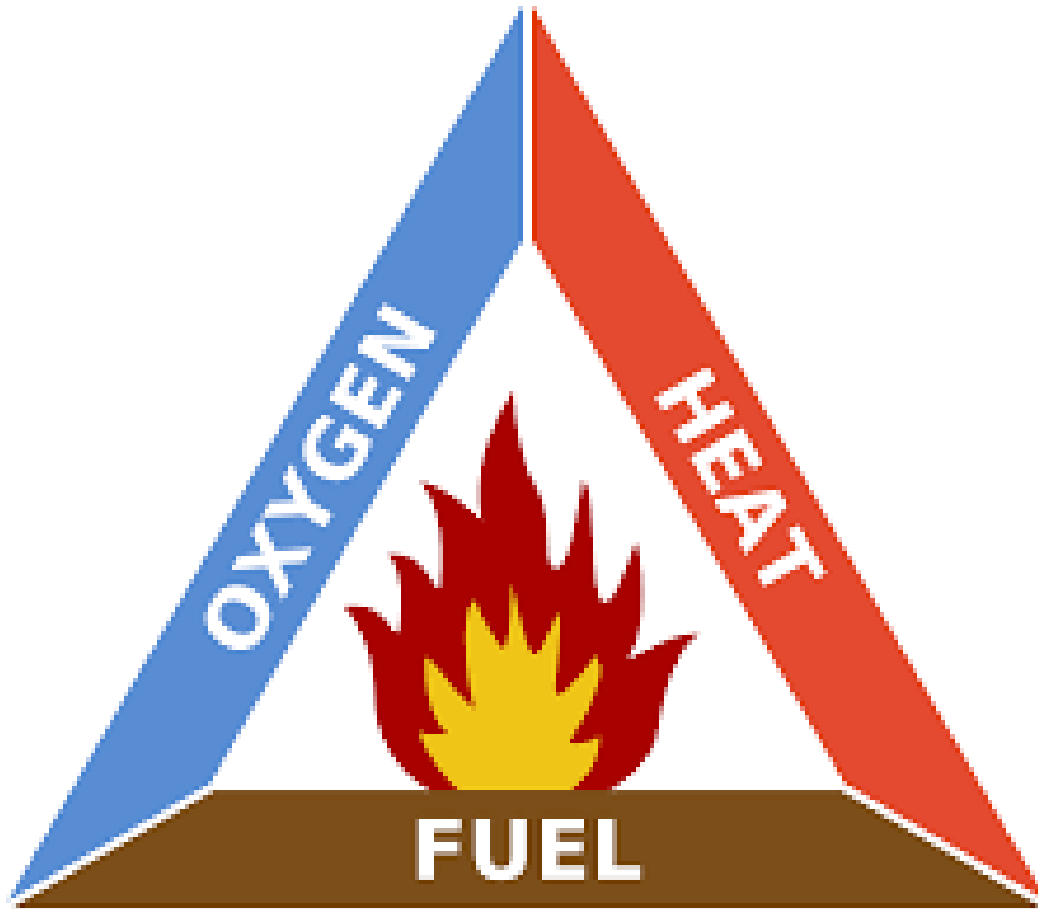
Kelly, 2010.

- “The share of Irish banks’ assets in property-related lending increased from less than 40 per cent before 2002 to over 60 per cent by 2006.”
- Honohan (2009), “Resolving Ireland’s Banking Crisis”, *The Economic and Social Review*, 40(2), 207-231.

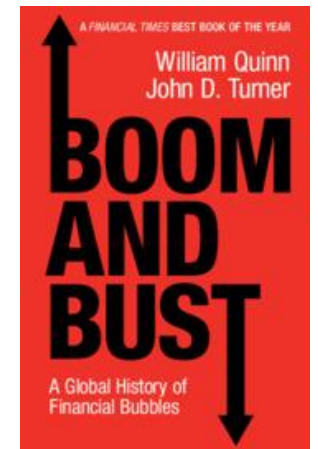
The bubble triangle

- What conditions are required for a bubble to occur?

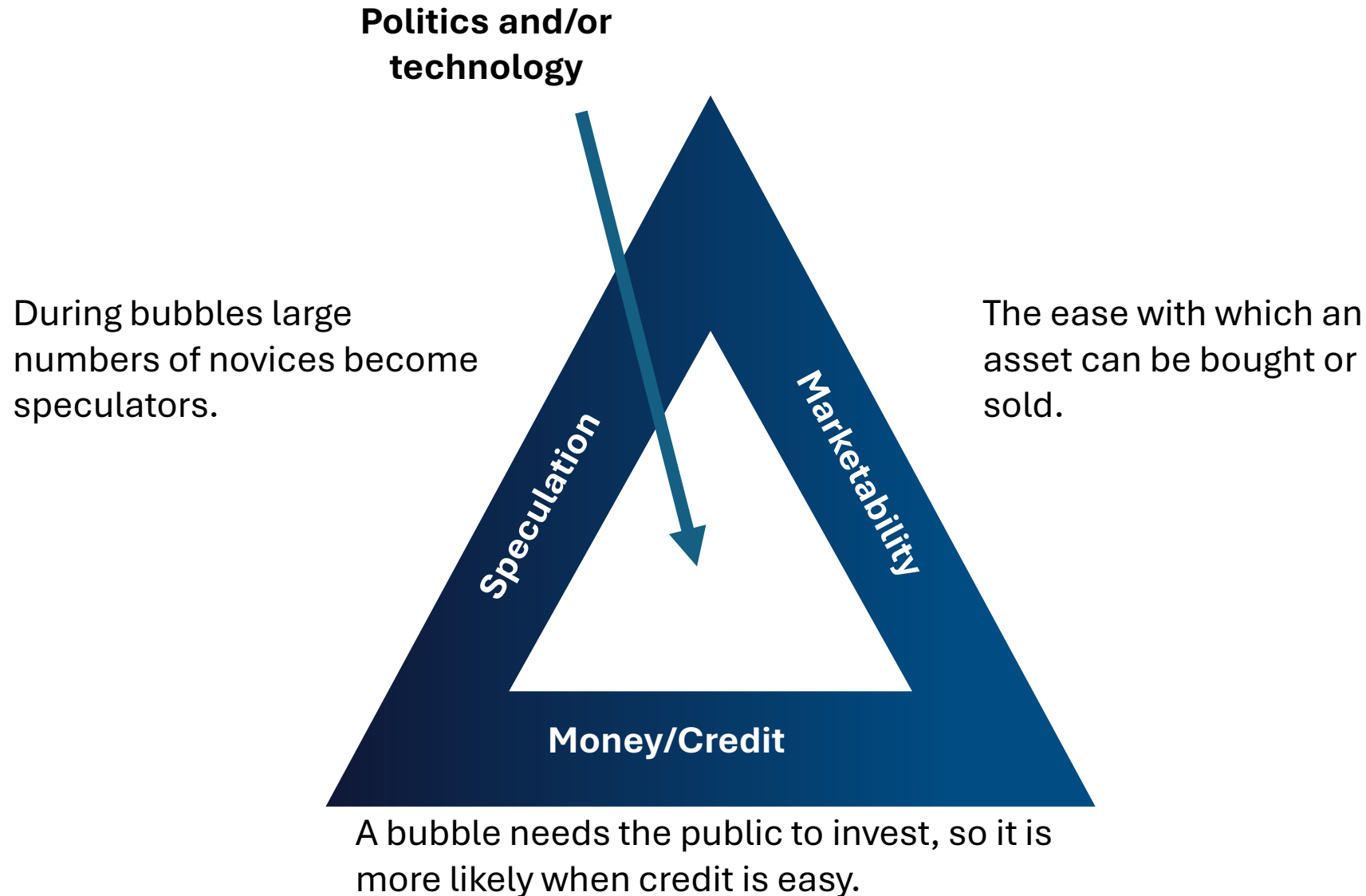
Fire triangle



- The **fire triangle** explains the conditions necessary for a fire: oxygen, heat and fuel.
- If these three are present in sufficient quantities, a spark can start a fire.
- Without them, you cannot have a fire.
- Quinn and Turner propose a “bubble triangle”.



Bubble triangle



Marketability

- **Legality of trading:** Banning trading does not necessarily prevent black market activity, but it does make trade more difficult.
- **Divisibility:** being able to buy only a small portion of an asset makes it more marketable.
 - A public company is more marketable than a house. Financial innovations that make an asset more marketable can spark bubbles (e.g., mortgage-backed securities).
- **Transportability:** digital assets can be bought and sold multiple times a day, cars cannot.
 - Trading the deeds to a house, rather than the house, increases transportability.

Money and credit

- **Cheap or easy credit** allows for leveraged investments.
 - As bank lending expands so too do funds to invest in an asset. But when those loans have to be repaid and investors have to sell the asset...
- Low interest rates can lead to a **search for yield**.
 - Investors get pushed into riskier assets with higher yield.

Speculation

- Speculation is always present to some extent, but **in a bubble often the broader public becomes involved in speculation.**
 - Many trade purely on momentum.
 - Joe Kennedy (father of JFK) in 1929: “If shoe-shine boys are giving stock tips, then it's time to get out of the market.”
- Professional speculators may try to “ride the bubble”.
- Speculation is more likely when investors have limited exposure to downside risk: defaulting on debt is not costly/limited liability in banks, poorly aligned incentives for institutional investors.

The spark

- **Technology** can spark a bubble: using new technology causes some firms to be unusually profitable.
 - Since the technology is new, it's uncertain what the true value is – maybe it really is transformative technology.
 - Excitement around a technology leads to large exposure in the media, drawing in further investors.
- **Government policies** can cause asset prices to rise.
 - Housing bubbles often arise because governments promote homeownership for a wide set of the population.
 - Governments can also affect some of the “sides” of the triangle – e.g., reducing interest rates, or financial deregulation.

Tutorial

Prepare a short explanation for the class on your boom-bust example.

1. When did your bubble take place?
2. How does your boom fit with the bubble triangle? (Speculation, marketability, money/credit and a spark.)
3. What triggered the bursting of the bubble?

You can use the references provided and/or any you find online.