# ECN 106 Macroeconomics 1 

## Lecture 9

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## Roadmap for this lecture

- Fundamental concepts of financial economics
- Features of and responses to financial crises
- The Great Depression of the 30s
- The Great Recession of 2008-
- Mankiw chapters 11-3, 15-1


## The "usual" recession

- "None of the postwar economic expansions died of old age: they were all murdered by the Fed." (R. Dornbusch).
- Recessions are often started by central banks in order to reduce inflation.
- Contractionary monetary policy
- Negative correlation between output and interest rates
- Rather short


## The "usual" recession II



## Recessions following financial crisis

- Features
- Usually longer and deep
- Positive correlation between output and risk-free interest rate (negative IS shock)
- Risky interest rate increases (increase in risk premium)
- We need to introduce a few extra concepts to understand them


## Concepts: balance sheets and leverage

| Assets | Liabilities |  |  |
| :--- | :--- | :--- | ---: |
| Loans | 1,000 | Deposits | 1,000 |
| Investments | 900 | Short-term debt | 400 |
| Cash and reserves | 100 | Long-term debt | 400 |
|  |  |  |  |
| Total assets | 2,000 | Total liabilities | 1,800 |
|  |  | Equity (net-worth) | 200 |

- Equity (aka net worth or capital): total assets - total liabilities
- Leverage: ratio of total assets to equity
- Equals 10 in the example
- Increases return on equity in case asset values increase
- Increases risk to equity when asset values fall.


## Illiquidity versus insolvency

- Insolvency: value of liabilities exceeds that of assets even if the latter are held to maturity.
- Equity absorbs fluctuations in value of assets relative to liabilities.
- Insolvency when negative equity.
- Illiquidity but solvency: the value of liabilities to be rolled over exceeds that of assets if the latter have to be sold at current market prices.
- Reserves provide cushion against risk of illiquidity (liquidity risk)


## In our example

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|  |  |  |  |
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- Insolvency: value of loans value falls below 800 .
- Given leverage of $10,10 \%$ fall in value of assets wipes out equity.
- Illiquidity: e.g. depositors withdraw 600 , loans + investment can only be sold for less than 500 at current prices.


## Banks and maturity transformation

- Maturity transformation: mismatch between duration of assets and liabilities
- Long maturity assets (mainly loans): 1,900 in the example
- Short maturity liabilities (mainly sight deposits): 1,400 in the example.
- Long maturity assets relatively less liquid
- Characteristic feature of banks
- ... and 'shadow banking sector' nowadays
- (Funding) Liquidity risk
- Consequence of maturity transformation
- Not only deposits: Northern Rock


## Maturity transformation and bank runs

- Liquidity risk: banks may fail even if they are solvent
- Not enough money to pay back all depositors if a large fraction (relative to assets) of deposits are withdrawn at the same time.
- Highly unlikely in normal times.
- Diamond-Dybvig: two possible equilibria for a solvent but illiquid bank
- Good equilibrium: 'usual' fraction of deposits is withdrawn and the bank functions normally.
- (Inefficient) bank-run equilibrium: all depositors try to withdraw their deposits at the same time. Bank is bankrupt despite being solvent.


## The average financial crises

| Economic variable | Average outcome |
| :--- | :--- |
| Real GDP | $-9.3 \%$ |
| Duration of GDP contraction | 1.9 years |
| Unemployment | +7 |
| Duration of employment downturn | 4.8 years |
| Housing price | $-35 \%$ |
| Equity price | $-56 \%$ |
| Increase in real government debt | $+86 \%$ |

Source: Reinhart and Rogoff (2008), 'The aftermath of financial crises'

|  | Average of previous <br> recessions since 1950 |
| :--- | :---: |
| GDP | $-1.7 \%$ |
| Nonfarm Employment | $-2.1 \%$ |
| Unemployment Rate | 2.5 |

## Financial bubbles and their ending

- Irrational exuberance
- Excessive leverage
- Trust in liquidity/solvency
- Liquidation
- Financial crisis?


## Anatomy of a financial crisis (1825)

- The literary reference is courtesy of Professor J. Bradford Delong at Berkeley, http://tinyurl.com/25nhwf2
- The 1825 financial crisis through the eyes of Marianne Thornton (E. M. Forster, Marianne Thornton: A Domestic Biography 1797-1887).
- Sister of Henry (the protagonist of our story), partner of Pole, Thornston, and Co.
- Daughter of Henry Thornton (1760-1815), author of "An Enquiry into the Nature and Effects of the Paper Credit of Great Britain". One of the fathers of the concept of "Lender of last resort".


## Background of Pole, Thornton, and Co.

The [Thornton family] Bank... had... in 1815 passed out of Thornton control.... Henry [Mariannes brother in his mid-twenties] longed to join it... in 1825 he became an active partner... in Pole, Thornton, and Co. It was said to be yielding 40,000 a year...
[It] was regarded as one of the most stable and most extensive banking houses in London.... The active partner was Peter Free.... On the surface all was now serene. Young Henry must have stepped aboard the family ship with confidence and pride...

## Irrational exuberance

## PRIVATE AND CONFIDENTIAL <br> Dearest Mrs. H.M....

There is just now a great pressure in the mercantile world, in the consequence of the breaking of so many of these scheming stock company bubbles...

## Excessive leverage

...and [Managing Partner] Free had been inexcusably imprudent in not keeping more cash in the House but relying on that credit... which would enable them to borrow whenever they pleased...

## Trust in liquidity/solvency

... Saturday however - that dreadful Saturday I shall never forget - the run increased to a frightful degree, everybody came in to take out their balance, no one brought any in; one old steady customer, who had usually 30,000 there, drew it out without, as is usual, giving any warning, and in order to pay it the House was left literally empty....
...Henry saw it all lay upon him.... [H]e found that during the next hour they would have to pay thirty-three thousand [pounds], and they should receive only twelve thousand. This was certain destruction, and he walked out, resolved to try one last resource...

## Liquidity provision

John Smith had been... particularly kind to Henry... told him honestly he believed that they must break, and he could hardly expect him to lend it, but yet if he could get them on till five, it would be an inexpressible relief. John Smith asked if he could give his word of honour... that the House was solvent. Henry said he could. Well! then he said they should have everything they could spare, which was not quite enough tho', for they had been hard-pressed themselves....
[N]ever, [Henry] says, shall he forget watching the clock to see when five would strike, and end their immediate terror.... The clock did strike... as Henry heard the door locked, and the shutters put up, he felt they would not open again....

## Lending to solvent institutions

[T]he next morning at 8 o'clock.... [A]ll the Bank of England directors who were in town.... John Smith began by saying that the failure of this House would occasion so much ruin that he should really regard it as a national misfortune...[H]e then turned to Henry and said, 'I think you give your word the House is solvent?' Henry said he could.... Henry then proceeded to tell them he had brought the Books.... 'Well then', said the Governor and the Deputy Governor of the Bank, 'you shall have four hundred thousand pounds by eight tomorrow morning, which will I think float you'.

## Lender of last resort

In the words of the then Bank of England Director, Jeremiah Harman (from Walter Bagehot's, Lombard Street):

We lent [cash] by every possible means and in modes we had never adopted before; we took in stock on security, we purchased Exchequer bills, we made advances on Exchequer bills, we not only discounted outright, but we made advances on the deposit of bills of exchange to an immense amount, in short, by every possible means consistent with the safety of the Bank, and we were not on some occasions over-nice.

## Outcome

- Did it work?
- According to Brad Delong
- cotton consumption in Britain was expected to increase at a rate of $8 \%$ per year.
- Only $3 \%$ increase in 1825 over 1824, and $11 \%$ decrease in 1826 over 1825. $24 \%$ below trend.
- Followed by a $30 \%$ increase in 1827 over 1826.
- Reasonably rapid recovery.


## The short run model

| Market | $(Y, r)$ space | $(Y, P)$ space |
| :--- | :--- | :--- |
| Labour | - | SRAS $P=\bar{P}$ |
| Goods | IS $Y=\bar{C}+c(Y-\bar{T})+a-b(r+\rho)+\bar{G}$ | AD $Y=Y^{A D}\left(\frac{\bar{M}}{P}, \bar{Z}, \pi^{e}\right)$ |
| Money | $\frac{M}{P}=Y L\left(r+\pi^{e}\right)$ |  |

- $\rho$ is the premium for liquidity and default risk


## Shocks and policy response in 1825



- IS to IS' (E to A). Fall in consumption associated with burst of bubble.
- IS' to IS" (A to B). Fall in investment due to increase in risk premium $\rho$
- LM to LM' (B to C). Ideal

Central bank response.

## Standard recipe since 1825

Henry Thornton (the father) and Walter Bagehot:
Central bank should lend freely against good (in the long run) collateral at penalty rates.

## Liquidity provision

- Funding liquidity: liability side
- Inability to rollover liabilities.
- CB lends against good collateral
- Mostly traditional banks
- Market liquidity: asset side
- Inability to trade assets at prices close to fundamental value
- CB buys assets if price is below fundamental value.
- It may even buy risky assets if $\rho$ is unreasonably high.


## Liquidity management

- Ex post:
- Funding liquidity. Central bank as lender of last resort.
- Market liquidity. Central bank as market maker of last resort.
- Ex ante:
- Deposit insurance.
- Commitment to engage as lender and market maker of last resort.
- Both coordinate expectations on good (no-run) equilibrium.
- Problems
- Ex post
- Illiquidity versus insolvency: difficult to judge
- What is the fundamental value of assets?
- Ex ante: moral hazard (hence 'at penalty rates').


## The Great Depression: a lesson lost

## GDP



## Unemployment



## Nominal interest rates



## Real interest rates



## Inflation



## Other monetary variables

| Year | Nominal <br> Interest Rate (3) | Money Supply <br> (4) | Price Level (5) | Inflation (6) | Real Money <br> Balances (7) |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 1929 | 5.9 | 26.6 | 50.6 | - | 52.6 |
| 1930 | 3.6 | 25.8 | 49.3 | -2.6 | 52.3 |
| 1931 | 2.6 | 24.1 | 44.8 | -10.1 | 54.5 |
| 1932 | 2.7 | 21.1 | 40.2 | -9.3 | 52.5 |
| 1933 | 1.7 | 19.9 | 39.3 | -2.2 | 50.7 |
| 1934 | 1.0 | 21.9 | 42.2 | 7.4 | 51.8 |
| 1935 | 0.8 | 25.9 | 42.6 | 0.9 | 60.8 |
| 1936 | 0.8 | 29.6 | 42.7 | 0.2 | 62.9 |
| 1937 | 0.9 | 30.9 | 44.5 | 4.2 | 69.5 |
| 1938 | 0.8 | 30.5 | 43.9 | -1.3 | 69.5 |
| 1939 | 0.6 | 34.2 | 43.2 | -1.6 | 79.1 |
| 1940 | 0.6 | 39.7 | 43.9 | 1.6 | 90.3 |

Paper rate, 4-6 months, series $\times 445$. (4) The money supply is series $\times 414$, currency plus demand deposits, measured in billions of dollars. (5) The price level is the GNP deflator $(1958=100)$, series E1. (6) The inflation rate is the percentage change in the price level series. (7) Real money balances, calculated by dividing the money supply by the price level and multiplying by 100, are in billions of 1958 dollars.

## 1930 versus 1825

- 1928-29 Fed raises rates to pop the stock market bubble.
- 1929 stock market crash: fall in consumption and investment
- Increase in risk premium, but the Fed let the money supply fall until 1933.
- Worsening of balance sheets.
- Deflation.
- Fall in $\pi^{e}$ shifts LM further to the right.
- Further worsening of balance sheets (spiral) and downward shift in IS.


## Graphically



- LM to LM' (E to A). Fed cuts the money supply to prick stock market bubble.
- IS' to IS" (A to B). Fall in consumption due to fall in wealth
- LM to LM' (B to C). Fall in investment due to increase in risk premium $\rho$
- Until 1933 increase in base money insufficient to offset the fall in the money multiplier


## The dangers of deflation

Debt-deflation spiral

- Value of collateral is impaired and creditors may want to redeem their debts.
- Banks do not invest in illiquid projects.
- Collective attempt to realize assets further depresses prices.
- Banks reluctant to lend to risky projects. $\rightarrow \rho_{t} \uparrow$
- Investment falls as higher $\rho_{t}$ and negative $\pi_{t}^{e}$ increase real interest rates.
- Fall in output further increases rate of deflation...


## The Great Recession of 2008- : US and UK

## How it compares to the Great Depression

## GDP



## Unemployment




## Nominal interest rates



## Inflation

UK CPI inflation



## Real interest rates



## Current versus previous recessions



## Fall in risk appetite

Libor: private (hence risky) short term borrowing rate.


