Lecture 15:
The Great Depression

Macroeconomics (Quantitative)

Econ 101B

Jón Steinsson

University of California, Berkeley

The Great Depression

- Perhaps the worst economic calamity of all time

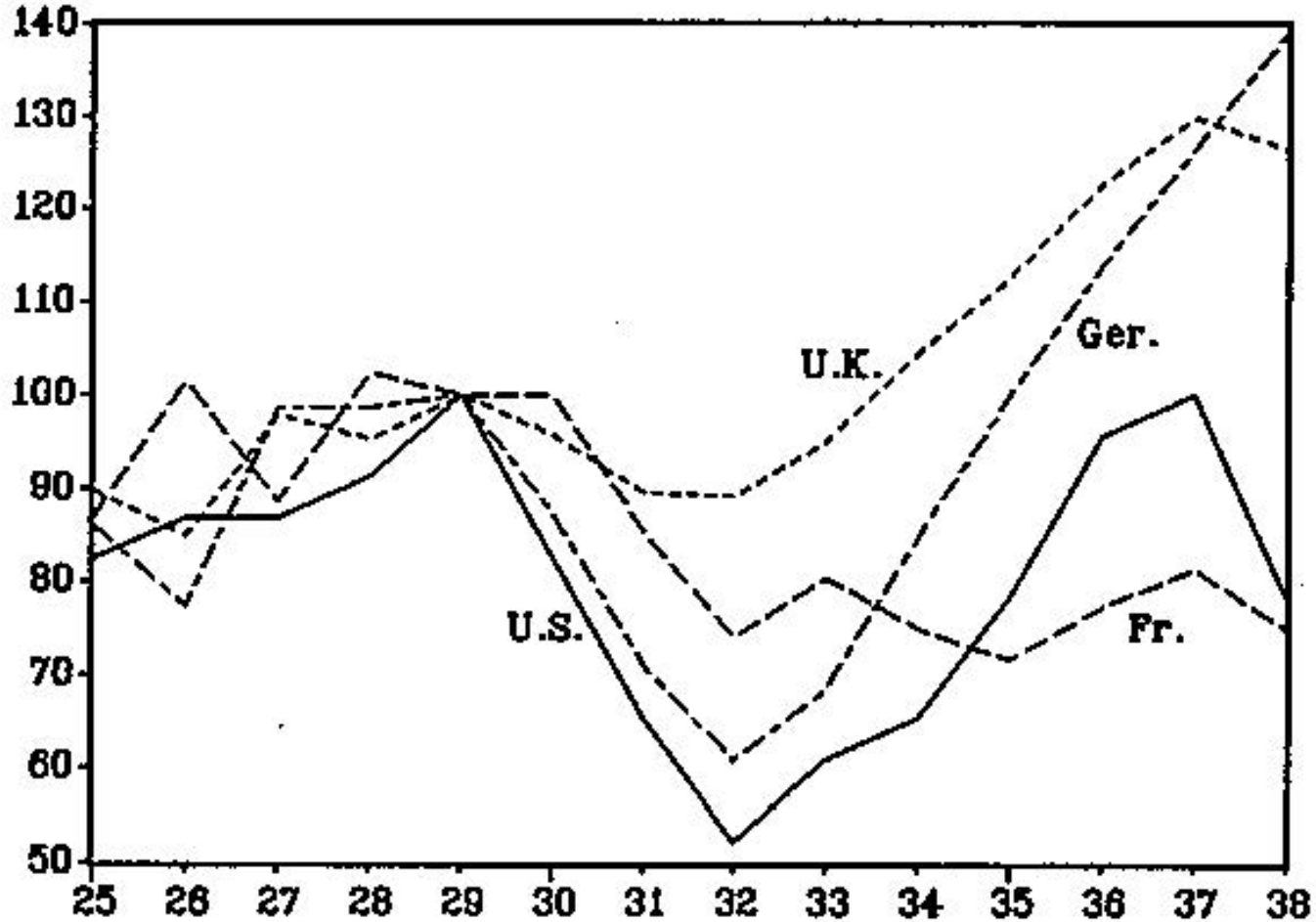


Figure 1.1
Industrial production in four countries (1929 = 100). Sources: Mitchell (1980, pp. 376–377); Federal Reserve System (1940).

Source: Temin (1989)

Table 1.1
Industrial unemployment rates

Country	1921–29	1930–38	Average Rate	Difference	Ratio of difference to average
United States	7.9	26.1	17	18.2	1.07
United Kingdom	12	15.4	13.7	3.4	0.25
France	3.8	10.2	7	6.4	0.91
Germany	9.2	21.8	15.5	12.6	0.81

Source: Eichengreen and Hatton (1988).

Source: Temin (1989)

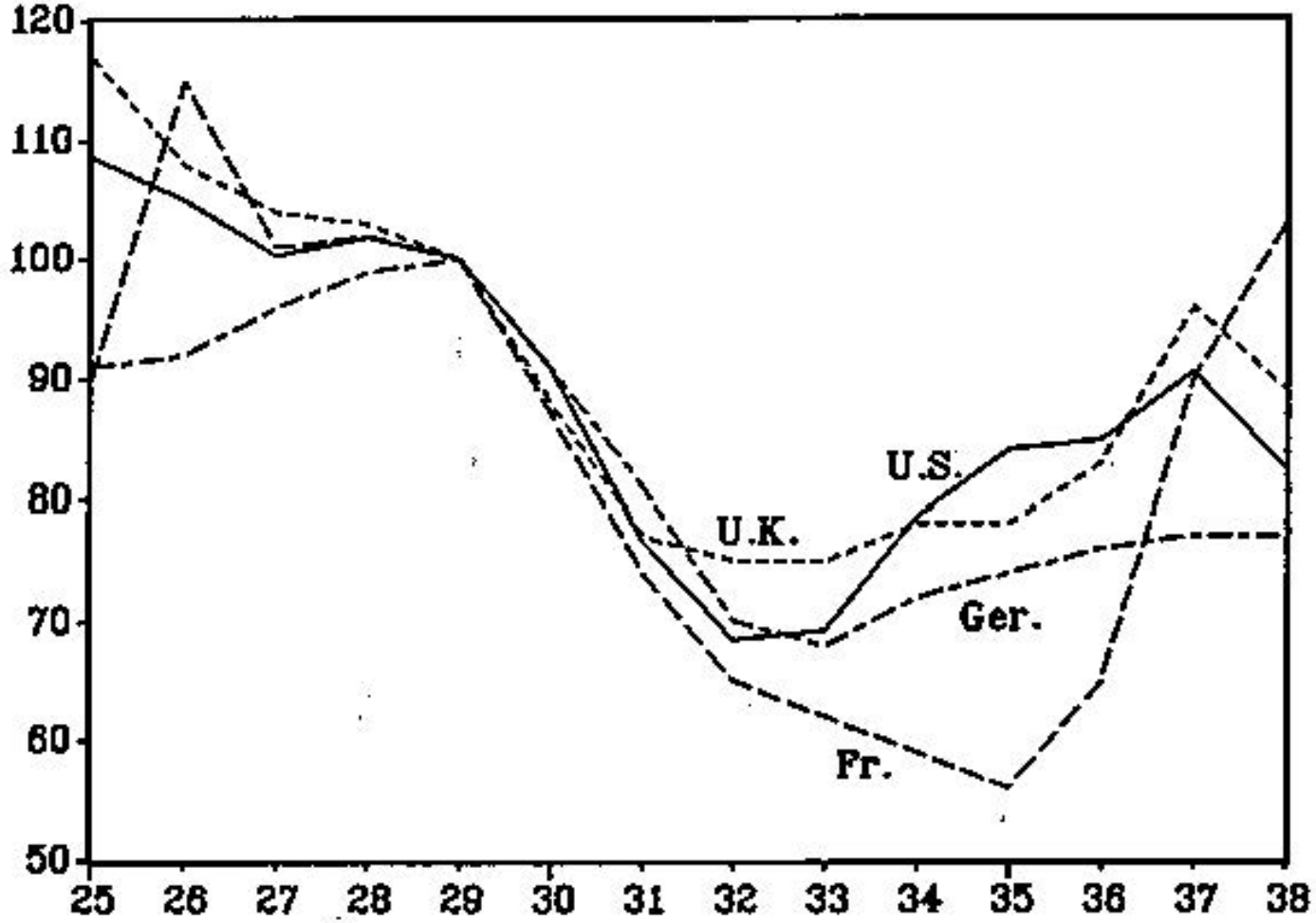


Figure 1.2
Wholesale prices in four countries (1929 = 100). Sources: Mitchell (1980, pp. 774–775); U.S. Bureau of the Census (1975, p. 200).

Source: Temin (1989)

Key Questions

1. What caused the initial downturn?

2. Why did this downturn become such a colossal calamity?

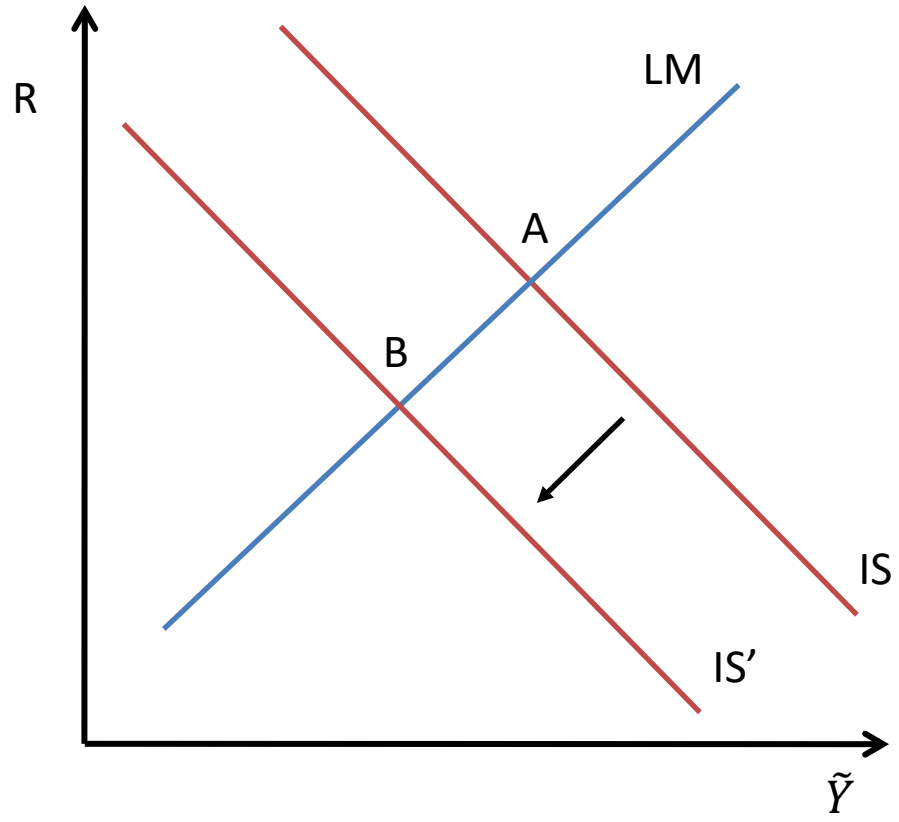
Stock Prices

Source: Robert Shiller's website

What Caused the Great Depression

- IS curve shock?

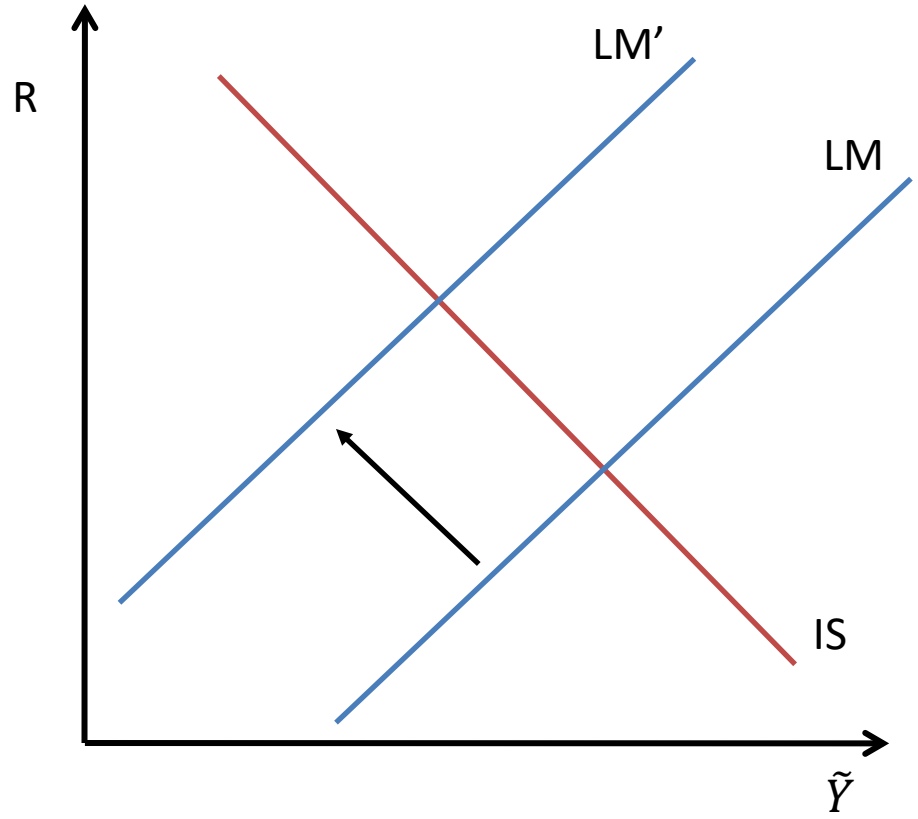
- Stock market crash of October 1929
- Also, massive volatility in stock market created uncertainty about the future
- Consumers / firms adopt wait and see attitude



What Caused the Great Depression

- LM curve shock?

- Tight monetary policy in U.S. in 1928/29 to counteract stock market boom
- Tight monetary policy globally because of gold standard constraints



Money Supply on the Gold Standard

- Recall that $M = B_m M_b$
- Determination of M_b on gold standard:

$$M_b = \frac{M_b}{M_g} M_g = \frac{1}{\mathrm{GCR}} M_g$$

  - M_g is monetary gold, i.e., gold held at the Treasury (or central bank) to back the monetary base
  - GCR is the "gold cover ratio" amount by which central bank leverages up the monetary gold

Money Supply on the Gold Standard

$$M = B_m \frac{1}{\mathrm{GCR}} M_g$$

- M_g: Determined by gold flows into or out of country
  - If goods are cheap in country, more exports than imports, and gold will flow into country
- GCR: Determined by central bank (monetary policy). But usually lower limits set by law (e.g., 40% in US)
- B_m: Determined by banks and the public (C/D and R/D)

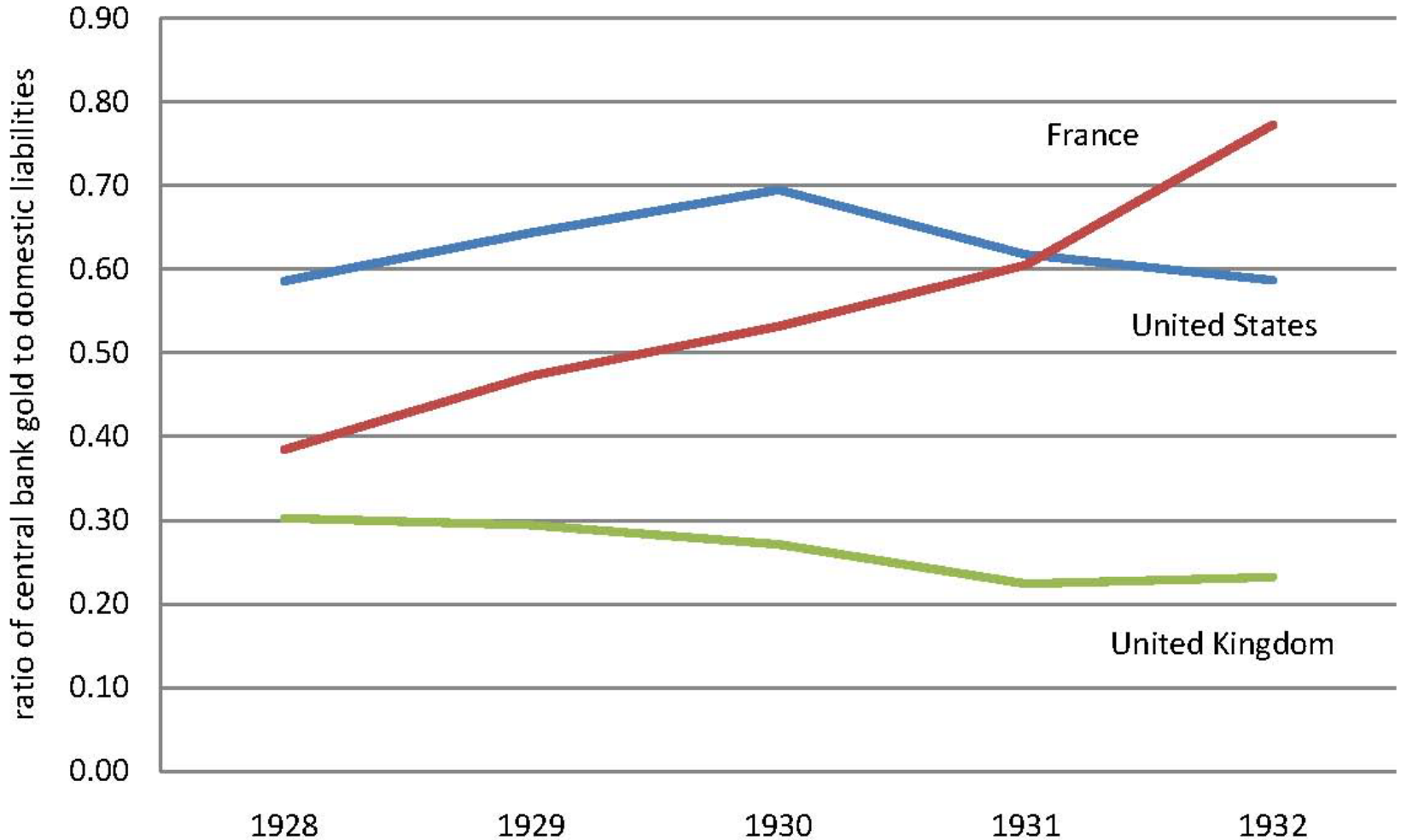
Did France Cause the Great Depression?

- "Rules of the game" of the gold standard:
  - Allow inflows and outflows of gold to affect money supply
- "Rules" were supposed to be an equilibrating force:
  - Money supply affects prices, which then stops gold flows
- But during this period the world experienced a huge deflationary episode – the Great Depression. What went wrong?
- France (and U.S.) arguably violated the "rules of the game" by hoarding gold without creating money (i.e. raised GCR)

Monetary Policy in France and U.S.

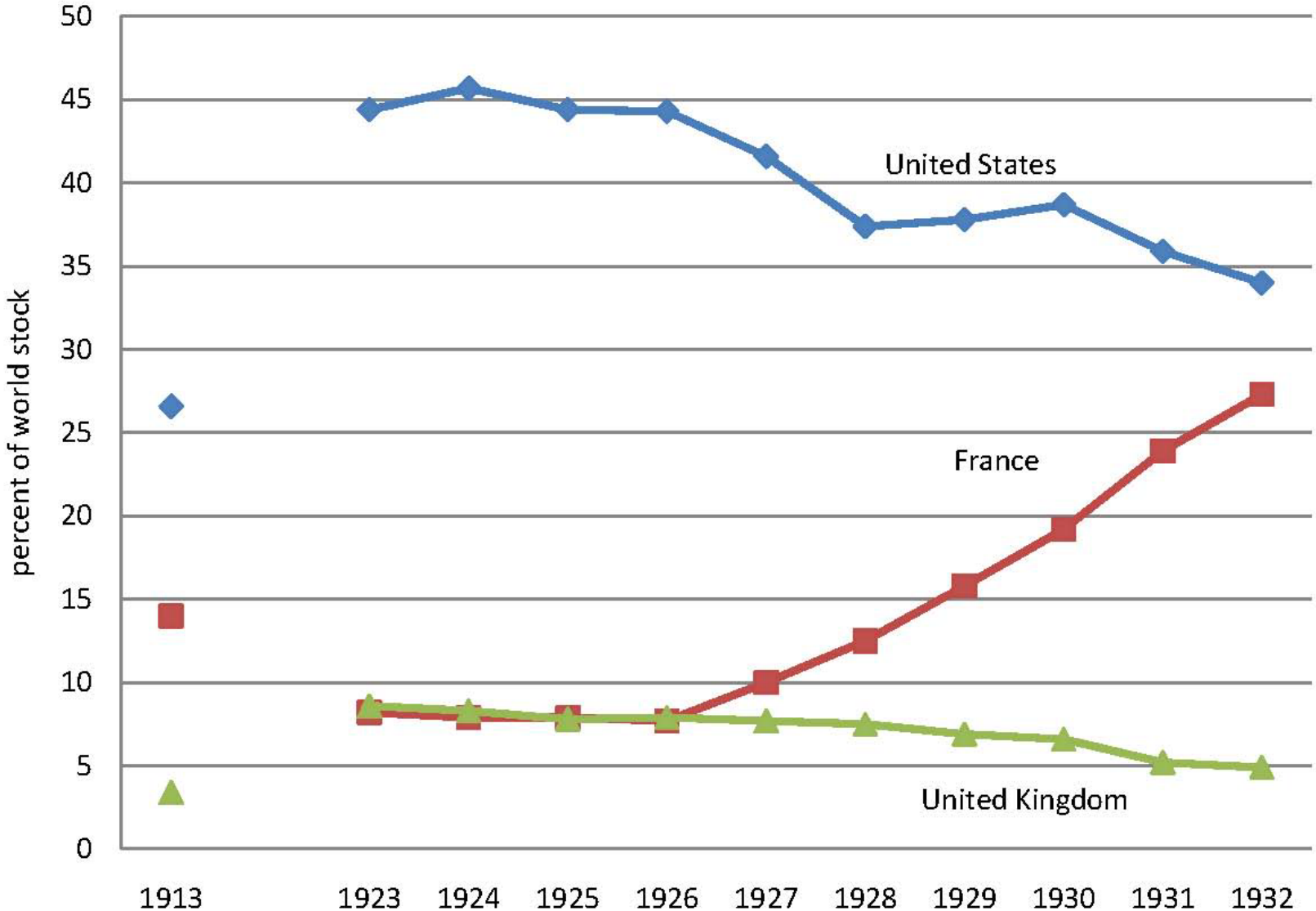
- High inflation in 1923-1926 lead to great conservatism in French monetary policy in the years leading up to Great Depression
- They wanted to avoid another such experience
- France experienced large gold inflows, which they allowed to raise gold cover ratio
- France liquidated holdings of sterling which raised the gold cover ratio

Figure 3: Cover Ratios of Major Central Banks, 1928-1932



Source: Irwin (2010)

Figure 2: Share of World Gold Reserves



Source: Irwin (2010)

Monetary Policy in U.S. and Germany

- U.S. and Germany also worried about holding sterling as reserves and liquidated holdings (i.e. raised gold cover ratios)
- Generally, lack of trust across countries led to scramble for gold by all central banks, which worsened aggregate shortage of gold

Monetary Policy in 1928-1929

- Loss of gold forced U.K. to raise interest rates
  - Higher interest rates meant to entice investors to send money to Britain
  - Higher interest rates also deflationary (reduce spending by households and firms)
- U.S. Fed raised interest rates as well
  - Worried about boom on Wall Street
  - Worried about outflow of gold to France

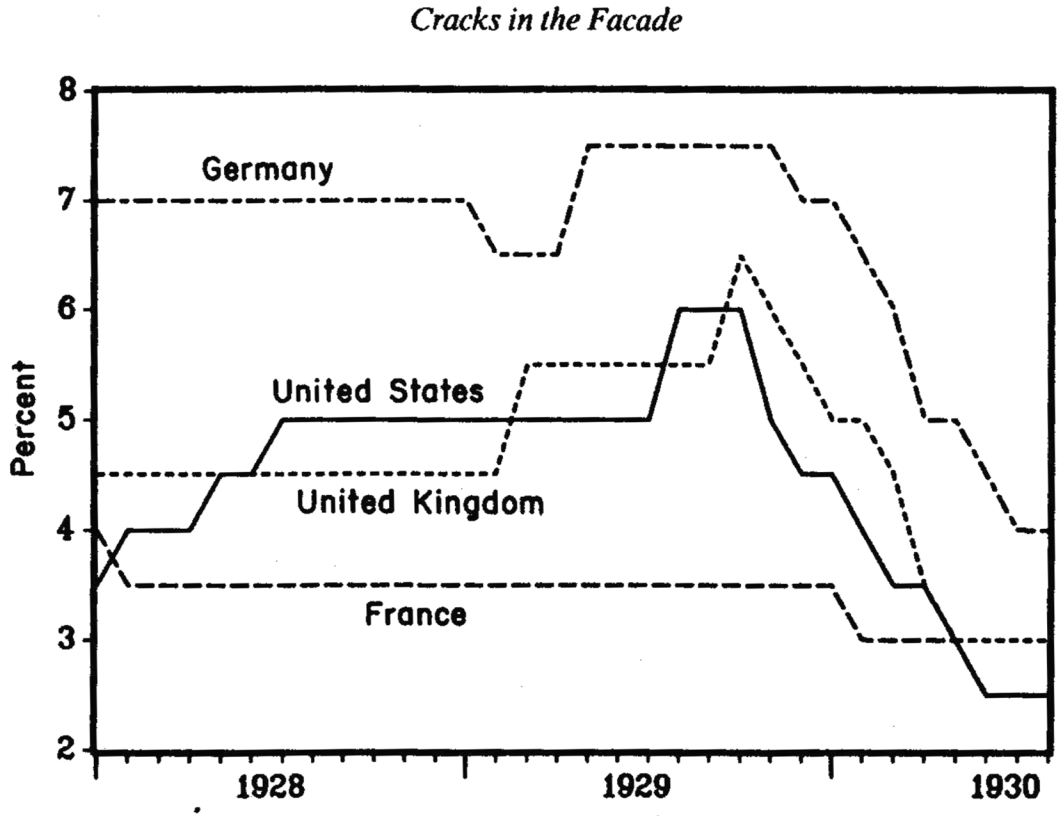


Fig. 8.6. **Central bank discount rates, January 1928–August 1930.** The Reichsbank was forced to maintain a higher discount rate than those of other major central banks by the recurrent weakness of Germany's balance of payments. *Source: Banking and Monetary Statistics, pp. 439, 656–659.*

Source: Eichengreen (1992)

Deflationary Monetary Policy

$$M = M_g \times \frac{1}{\mathrm{GCR}} \times B_m$$

- Policy by France and U.S. to raise GCR lead to a fall in the world money supply
- What consequences does this have?

$$\Delta \log M = \Delta \log P + \Delta \log Y$$

- Deflationary pressure
- In the short run, prices were sluggish and output dropped

From Recession to Depression

- These monetary policy actions were likely one of the impulses causing the onset of the Great Depression
- But how did an initially mild recession turn into a massive economy calamity?
- To understand that, we need to shift our focus to B_m

$$M = M_g \times \frac{1}{\text{GCR}} \times B_m$$

Bank Crises During the Great Depression

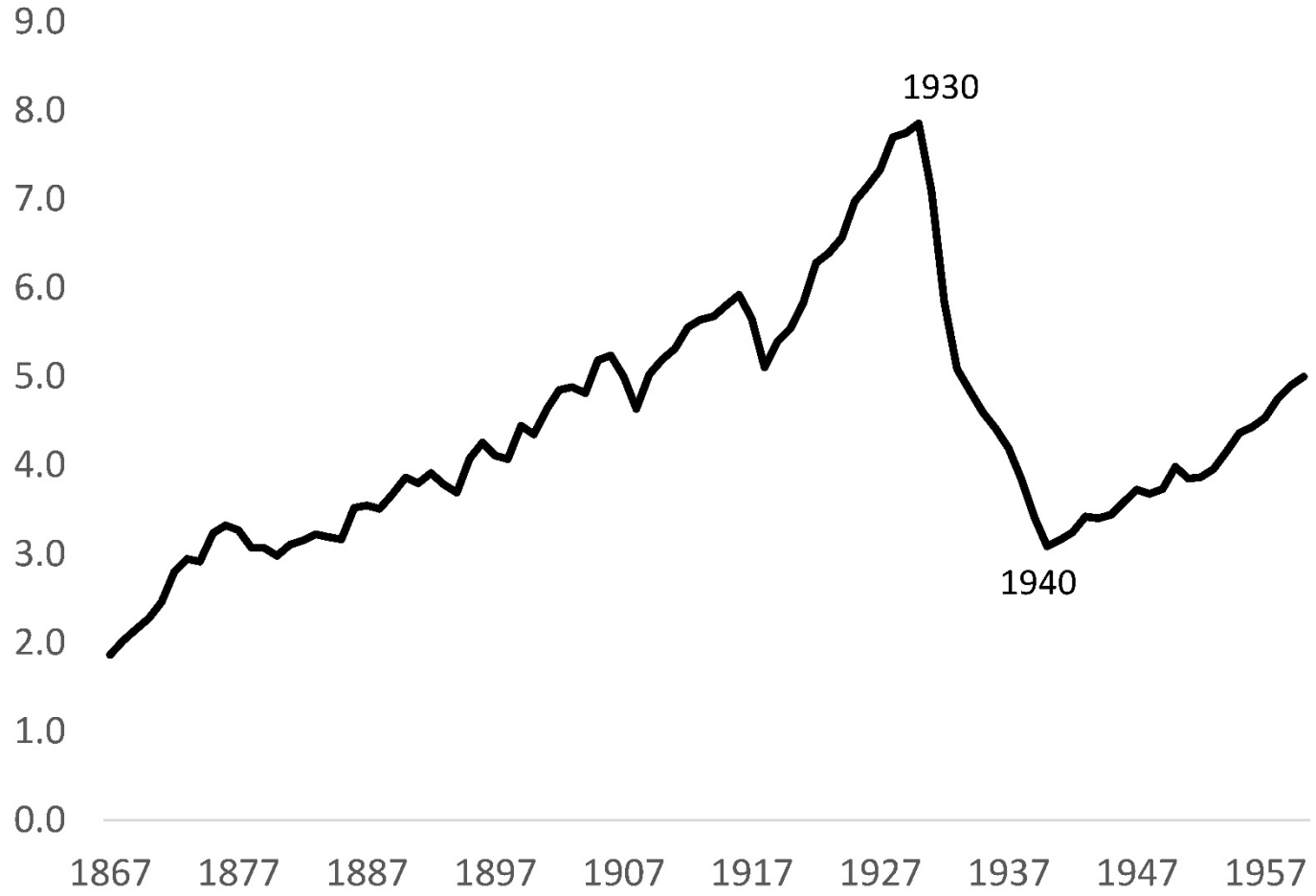
Three large bank panics:

- November 1930 to January 1931: 800 banks fail
- September 1931 to October 1931: 800 banks fail
- December 1932 to March 1933: 4000 banks fail
  - State and then general bank holiday
- Number of banks fell from 24,000 to 14,000 between 1929 and 1933

Collapse of Money Multiplier

$$M = M_g \times \frac{1}{\text{GCR}} \times B_m$$

- The money multiplier B_m collapsed during the Great Depression as people withdrew money from banks and banks raised reserve ratios



Source: Friedman and Schwartz (1963)

Fed as a Lender of Last Resort

- Failed miserably in the Great Depression
  - 9,000 banks failed
  - 1/3 of all banks in U.S.
- Many scholars believe these banking panics played a significant role in the severity of the Great Depression (fall in B_m)
- U.S. introduced deposit insurance in 1930's to lessen reliance on lender of last resort (no more bank runs for 70 years)

Massive Monetary Policy Mistake

I would like to say to Milton and Anna:
Regarding the Great Depression.
You're right, we did it. We're very sorry.
But thanks to you, we won't do it again

Ben Bernanke

Governor of Federal Reserve

November 8, 2002

Gold Standard as Root Cause

- Several reasons why Fed screwed up
- Strong belief in the importance of adherence to gold standard was one important reason

$$M = M_g \times \frac{M_b}{M_g} \times \frac{M_b + D}{M_b}$$

- Limited scope to increase M_b/M_g (reduce GCR)
  - Legal lower limit on gold cover ratio
  - Worry about speculative attack
- Should never have allowed B_m to fall as it did
  - But even lender of last resort actions involved some increase in M_b/M_g

Monetary Narrative of Great Depression

- France hoarded gold from 1926 onward
  - Caused a fall in world money supply
  - Rigidity of prices led output to fall
- Downturn led to banking panics
  - Fed didn't react, B_m fell sharply
  - Recession became a depression

$$\Delta \log M_t = \Delta \log P_t + \Delta \log Y_t$$

$$M = M_g \times \frac{1}{\text{GCR}} \times B_m$$

Correlation versus Causation

- How do we know correlation runs from money to output as opposed to reverse causation or some third factor?
- Narrative above based on detailed historical research
- But we don’t have a treatment group and a control group to compare
- Unfortunately, no parallel universes some with Great Depressions some not

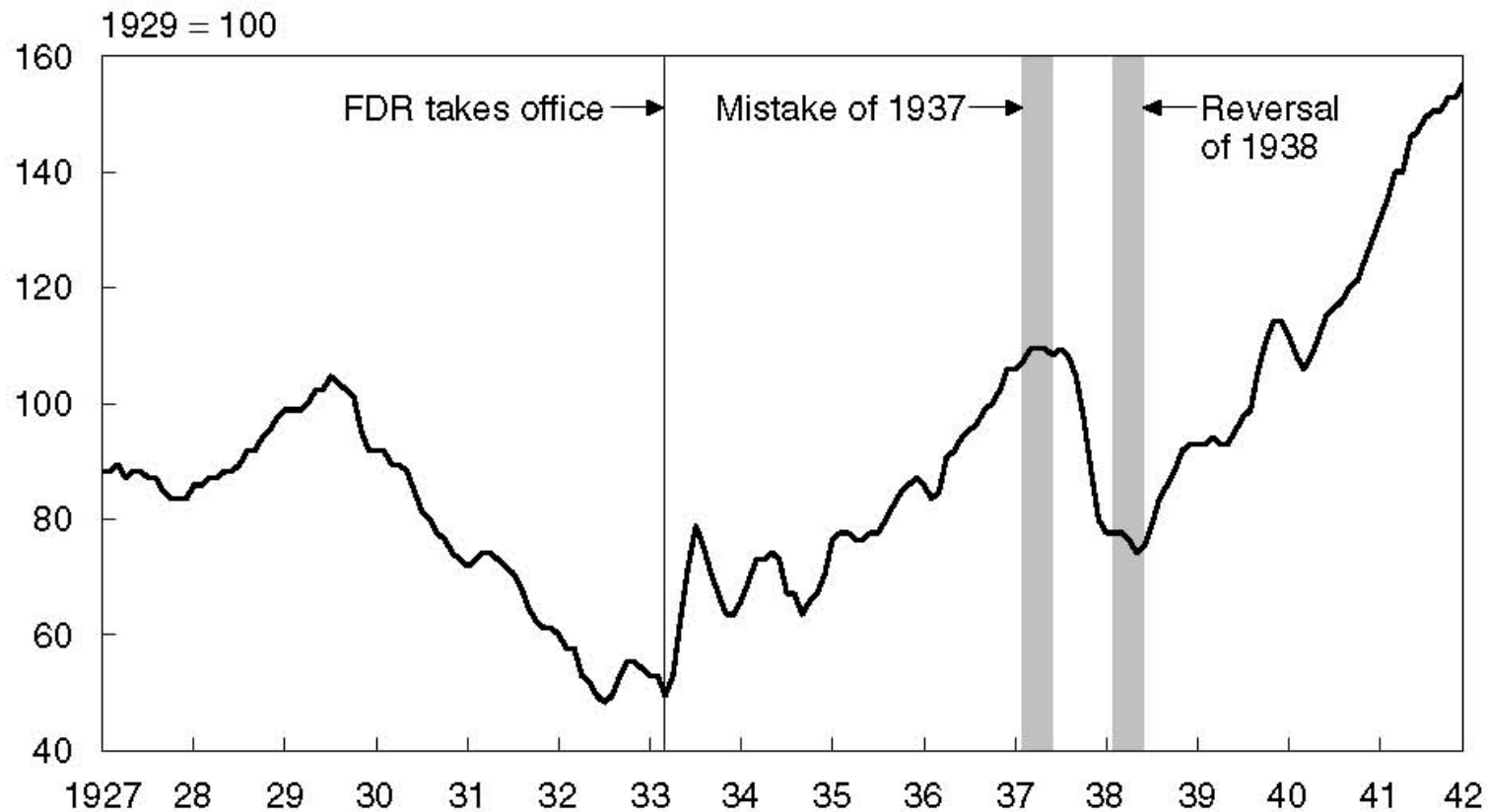
Four Natural Experiments

- Bernanke argues that Friedman and Schwartz identify four natural experiments:
  - Changes in money stock occurs for reasons largely unrelated to the contemporaneous behavior of prices and output
  - Since movements in money are “exogenous” one can interpret response of economy as reflecting cause and effect

Four Natural Experiments

1. Tight monetary policy in 1928-29
2. Sterling Crisis of 1931
   - Fed raises rates after Britain forced off gold
3. Easing in spring of 1932
   - Congress pressured Fed to ease. They did. Economy started improving. Congress adjourned in July. Fed went back to old ways. Economy resumed collapse
4. Run on the dollar
   - Speculation about whether Roosevelt would take dollar off gold standard. Slow run on dollar and banks

Figure 6 Monthly Index of Industrial Production



Note: The reflation program in 1933 resulted in a rapid recovery in industrial production. Deflationary expectations in 1937 led to a large output contraction, but the recovery resumed again in 1938 with the administration's renewed commitment to reflate.

Source: Federal Reserve Board.

Source: Eggertsson and Pugsley (2007)

International Evidence

- Countries that exited gold standard earlier experienced less severe Depression and recovered earlier
- Correlation versus causation?
- What is most obvious "confounding factor"?
  - Countries that leave gold standard are more likely to have been hit harder initially (since speculators pray on weak countries)
- This confounding factor actually strengthens the case

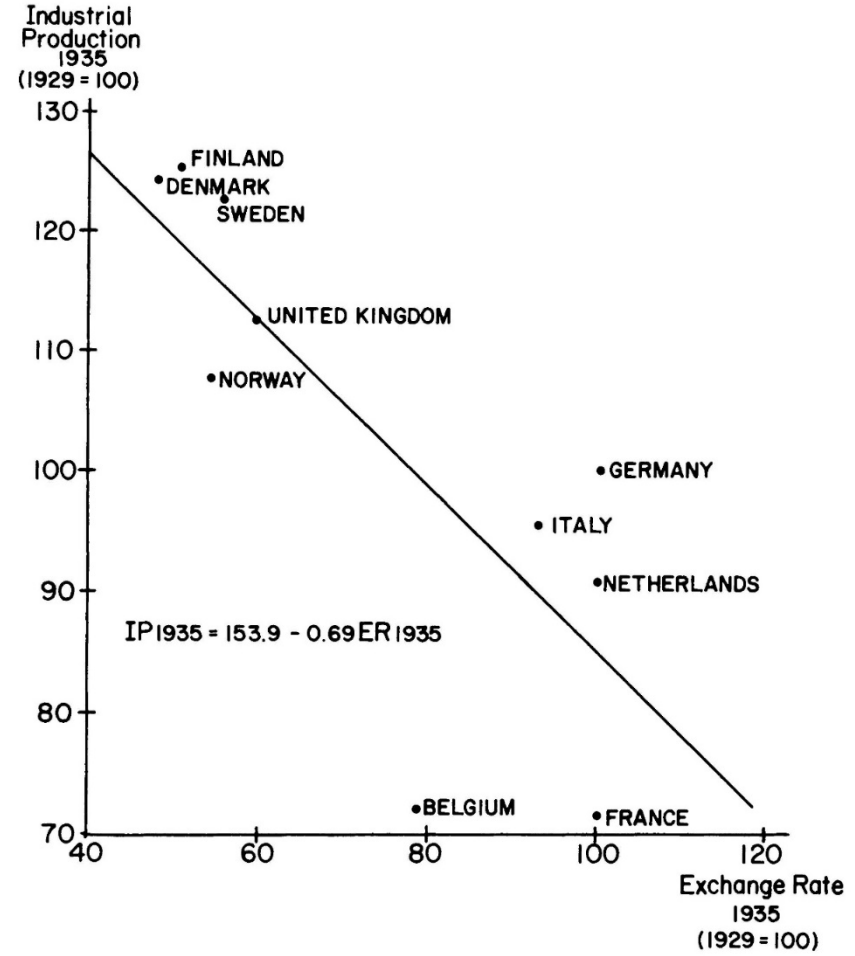


FIGURE 1
CHANGES IN EXCHANGE RATES AND INDUSTRIAL PRODUCTION, 1929–1935

Source: Eichengreen and Sachs (1985)

Speculative Attacks

- Summer and fall of 1931:
  - Series of speculative attacks on currencies that were on the gold standard
- Culminated in Britain going off the gold standard in September of 1931
- Speculative attacks on currencies with fixed exchange rates have been common ever since
- Often very traumatic events!
- Let's try to understand these events a bit better

The Sterling Crisis

- In May 1931, the Austrian bank Credit-Anstalt failed and was bailed out by the Austrian government.
- This led investors to doubt Austria's ability to maintain the gold standard and flee.
- Austria responded by:
  - Seeking foreign loans (didn't get enough)
  - Raising interest rates, raising taxes, cutting spending
  - Eventually, suspended convertibility (and imposed capital controls)

Crisis Spreads

- The Credit-Anstalt crisis quickly spread to Hungary and more importantly Germany
- Germany suspends convertibility in September (and imposed capital controls)
- Many other countries also suspend convertibility and imposed capital controls around this time for similar reasons (e.g., Australia, Canada, Brazil, and Argentina)

Sterling Comes Under Attack

- The next country investors started to worry about was Britain (the center of the financial system at the time)
- Crisis had weakened Britain's Balance of Payments
  - Relied heavily on investment income from abroad
  - Capital controls imposed by other countries eliminated that income from country after country
  - Speculators started worrying about sustainability of Britain's peg to gold – run on sterling

Britain's response

- British government tried similar tactics as Austria:
  - Asked for loans from other countries
  - Raised interest rates
- But was overwhelmed by speculative attack and suspended convertibility on September 19 1931

The Sterling Crisis

- The fact that Britain went off gold in the fall of 1931 was a watershed moment

- British Treasury official is taking a bath
- Aid bursts in and says:

  “We’re off the gold standard”
- Astonished official says:

  “I did not think that was possible.”

Crisis Spreads to U.S.

- After Britain fell, speculators began worrying that the U.S. might also leave the gold standard.
- Run on the U.S. dollar
- Fed reacted by raising interest rates sharply
  - This "worked." The speculative attack subsided
  - However, consequences for economy were (arguably) dire

Speculative Attacks

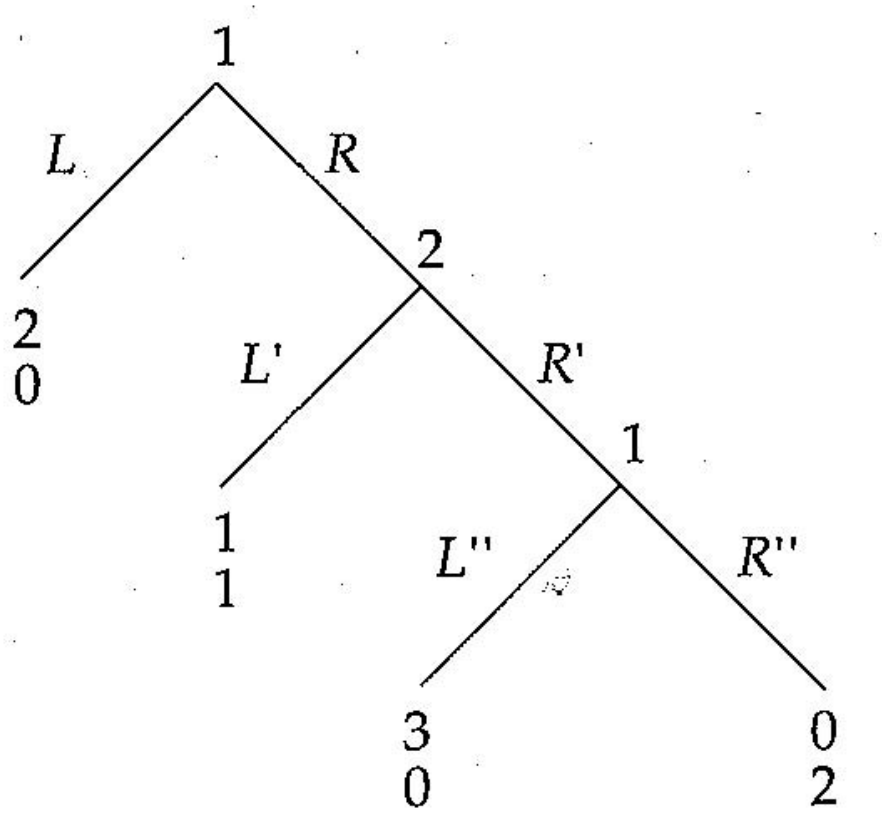
- Sterling crisis illustrates that gold standard is a system of fixed exchange rates
- Countries with a fixed exchange rate are subject to speculative attacks
- Speculative attacks can be self-fulfilling for similar (but slightly more involved) reasons as bank runs can be

More Game Theory

- To understand this better, it is helpful to introduce a few more concepts from game theory
- We look at dynamic games
- Define a precise notion of credibility

Dynamic Games

- How do we solve this game?
- Backward-induction:
  - Begin at the “end” of the game and work backward
- Stage 3:
  - Player 1 (P1) prefers L’’
- Stage 2:
  - P2 knows P1 will play L’’
  - So, P2 plays L’
- State 1:
  - P1 knows P2 will play L’
  - So, P1 plays L



Gibbons (1992): Game Theory For Applied Economists, pages 59-61

Dynamic Games

Entry game:
Firm 1 can either enter (e)
or not enter ($\bar{e}$)
Firm 2 can either retaliate (r)
or not retaliate ($\bar{r}$)

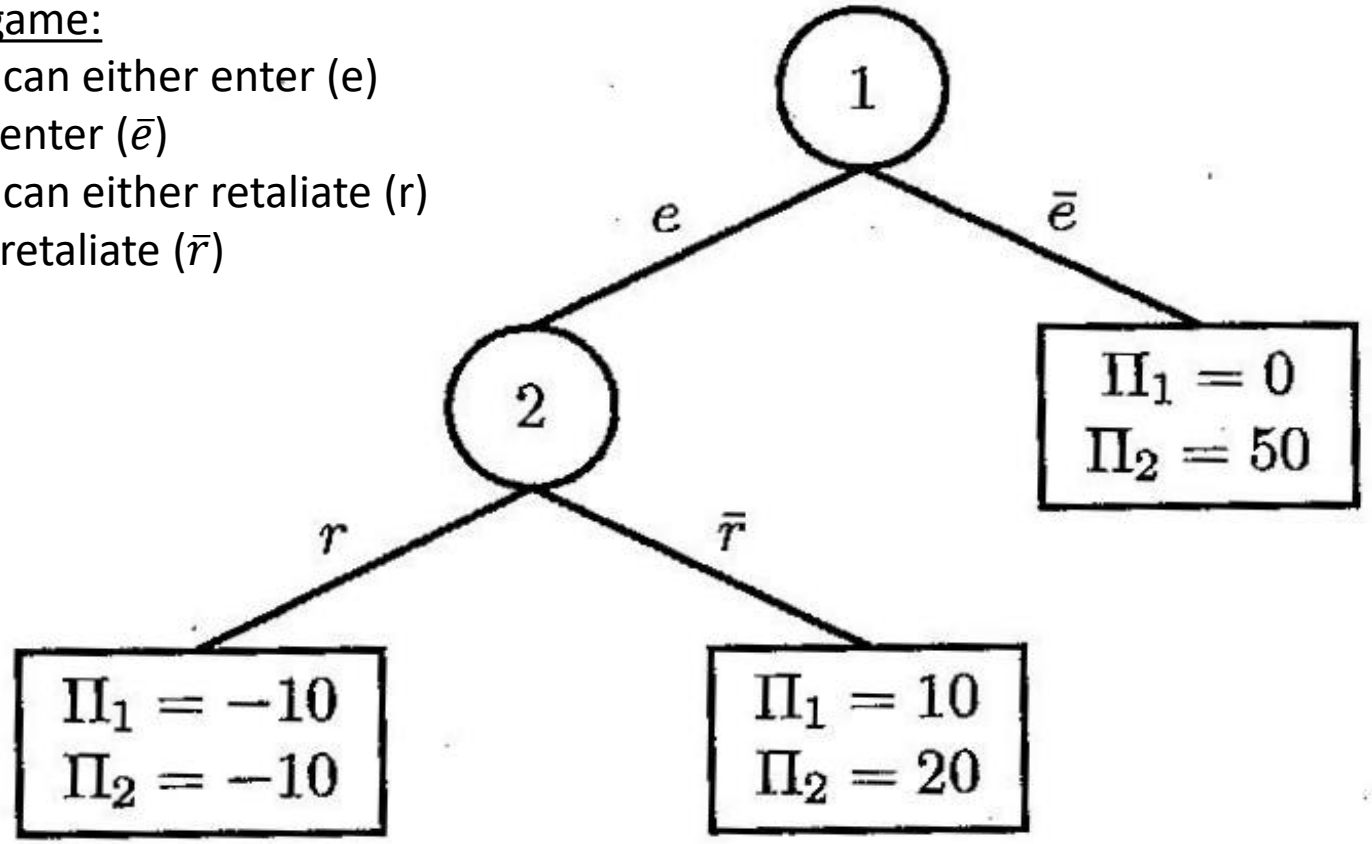


FIGURE 4.6 EXTENSIVE-FORM REPRESENTATION: THE SEQUENTIAL-ENTRY GAME.

Cabral (2000): Introduction to Industrial Organization

Dynamic Games

Entry game:
Firm 1 can either enter (e)
or not enter ($\bar{e}$)
Firm 2 can either retaliate (r)
or not retaliate ($\bar{r}$)

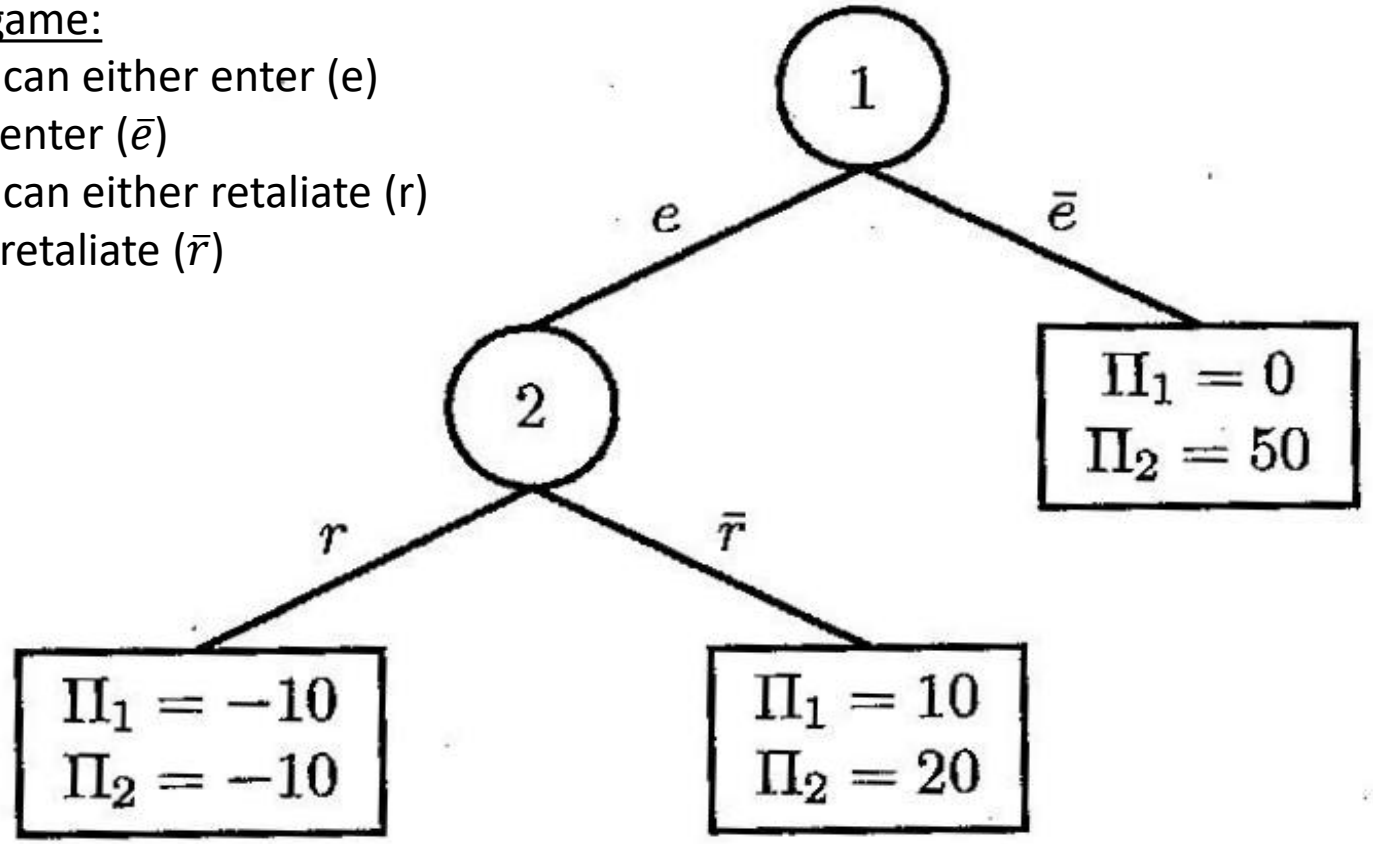


FIGURE 4.6 EXTENSIVE-FORM REPRESENTATION: THE SEQUENTIAL-ENTRY GAME.

Cabral (2000): Introduction to Industrial Organization

Subgame Perfect Equilibrium

- Game has two Nash equilibria:
  - $(e, \bar{r})$ and $(\bar{e}, r)$
- $(\bar{e}, r)$ relies on a threat by P2 that is "not credible"
- Subgame Perfect Equibrium:
  - Nash equilibrium in each subgame of the full game
- Subgame perfect equilibrium formalizes notion of "credibility"
- Rules out "non-credible threats"

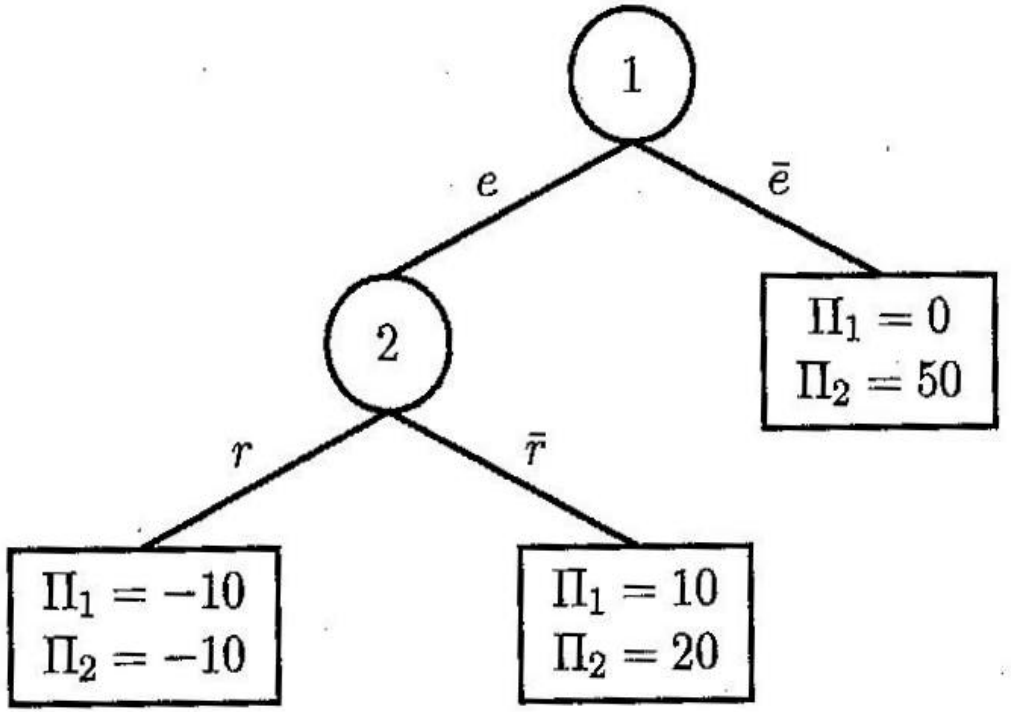
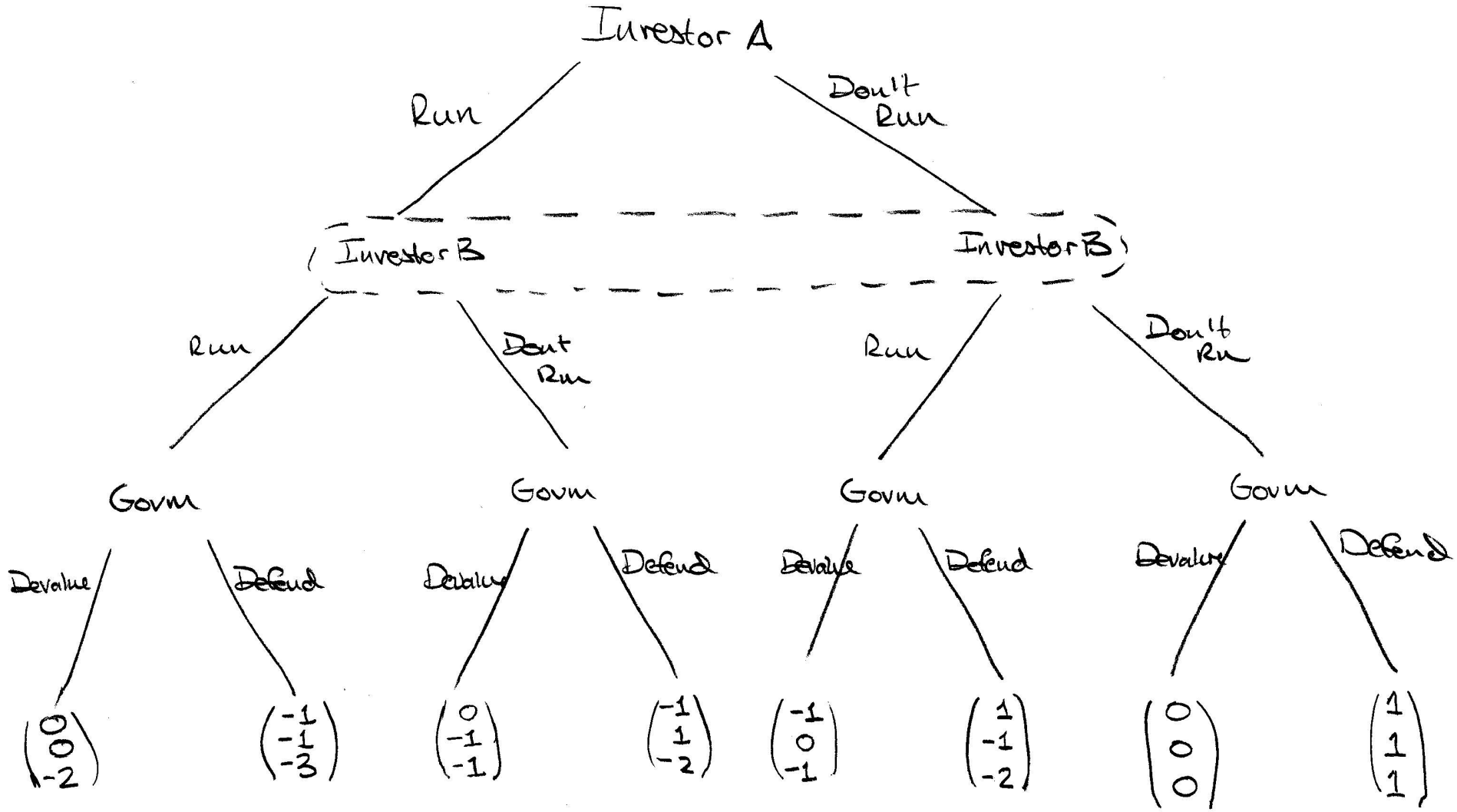


FIGURE 4.6 EXTENSIVE-FORM REPRESENTATION: THE SEQUENTIAL-ENTRY GAME.

Currency Attack Model



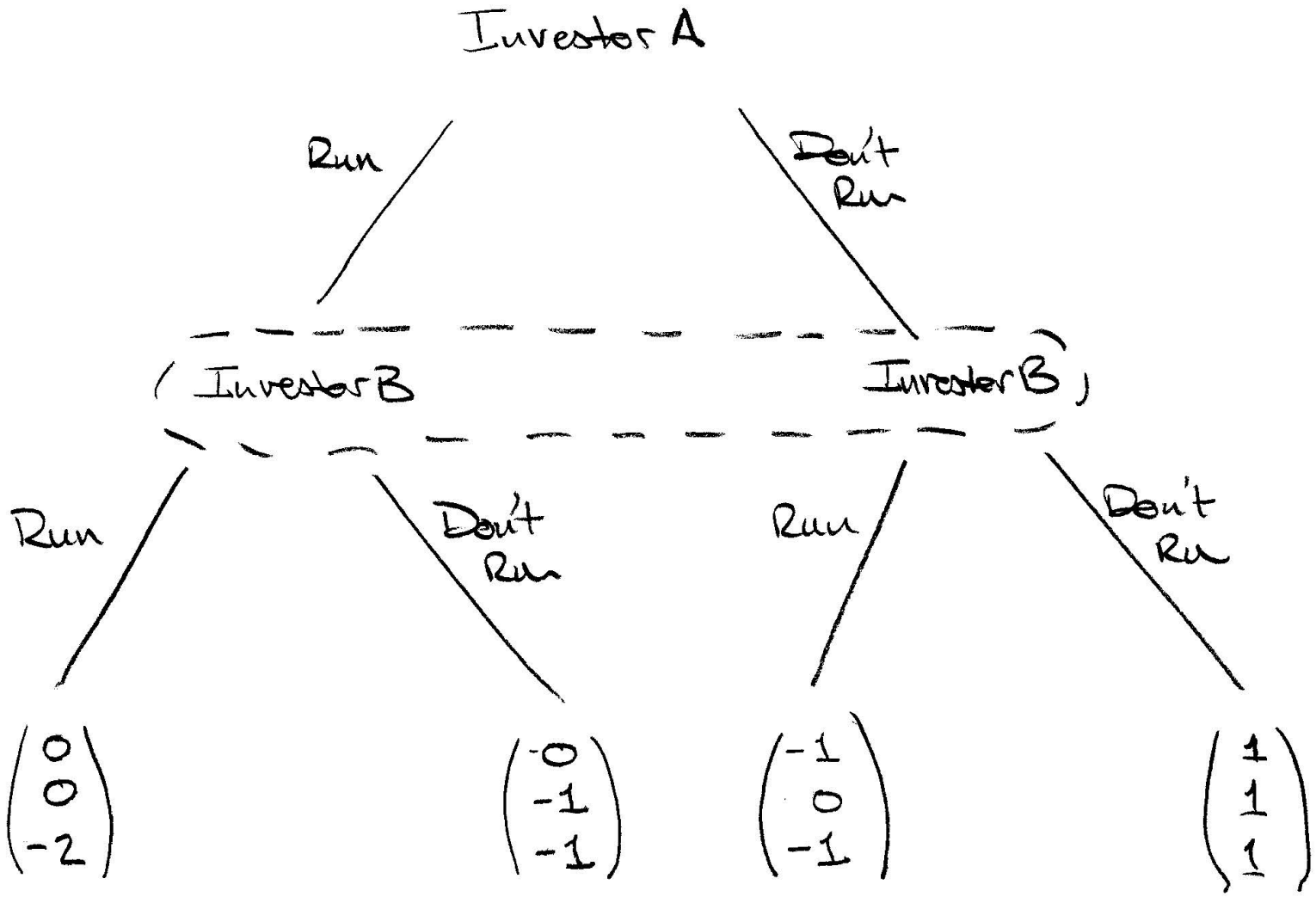
Currency Attack Model

- Two investors who act simultaneously
- Bubble around Investor B is meant to denote that they doesn't know at which node they are
- This means they must do same thing at both nodes
- Government acts last and knows at which node it is when it acts.
- It can therefore act differently at different nodes
- Government's strategy is four actions (one for each node)

Currency Attack Model

- Let's solve for subgame perfect equilibria by backward induction
- Optimal government action is:
  - Devalue if either A or B run (and also if they both do)
  - Defend if neither A nor B runs
- Given this strategy by government, model simplifies to …

Currency Attack Model



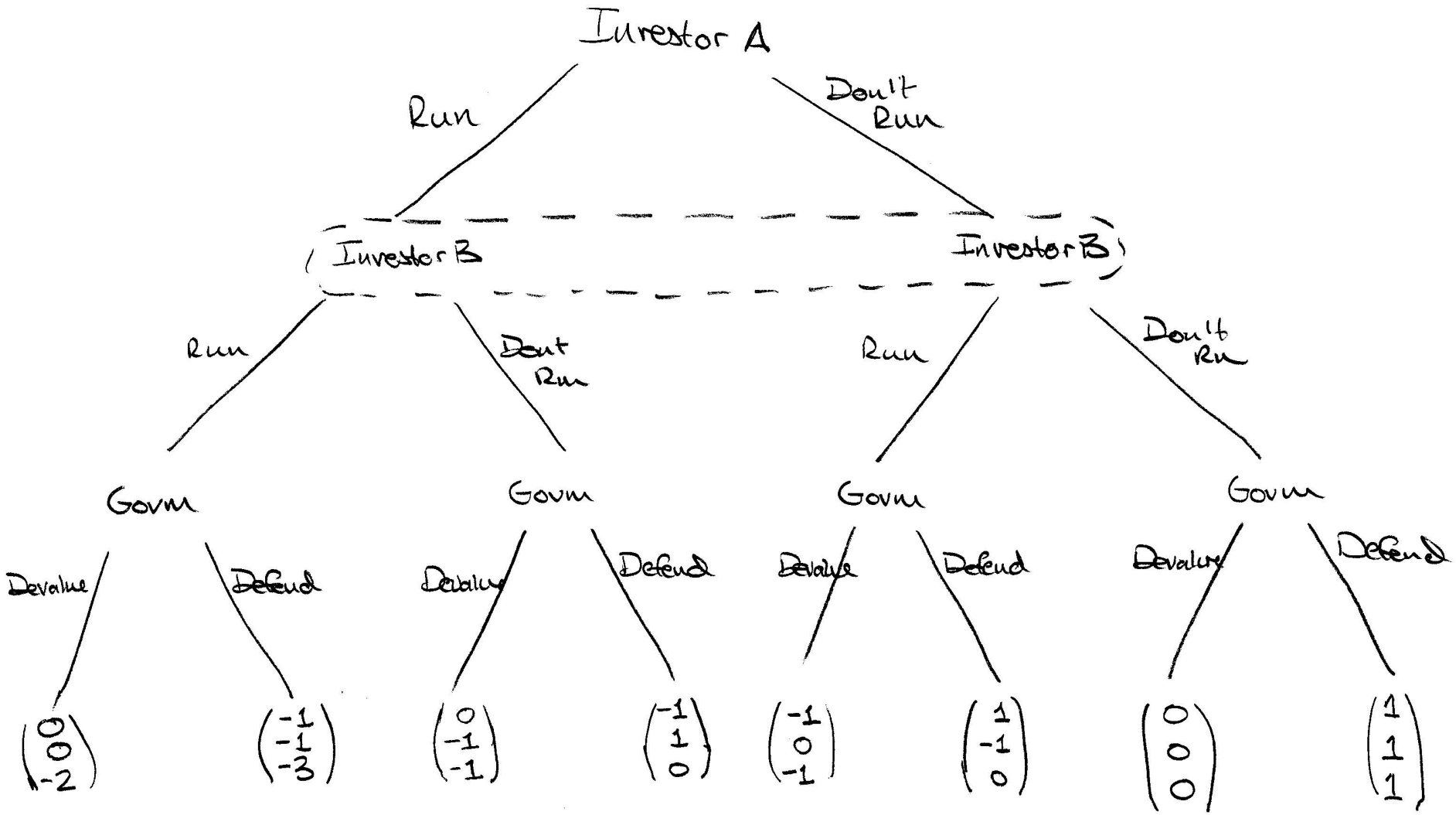
Currency Attack Model

- This simplified model is equivalent to Diamond-Dybvig bank run model
- Model has two Nash equilibria:
  - (Don’t Run, Don’t Run)
  - (Run, Run)
- Just like in bank run case, (Run, Run) equilibrium is bad for everyone, but is nevertheless an equilibrium

Currency Attack Model

- How can this outcome be avoided?
  - Government can try to convince speculators that it is strong and can defend the currency
- Consider the following alternative situation in which the government is either:
  - "Strong" in the sense of being able to defend at low cost (perhaps because it has lots of reserves)
  - Places high value on maintaining the gold standard

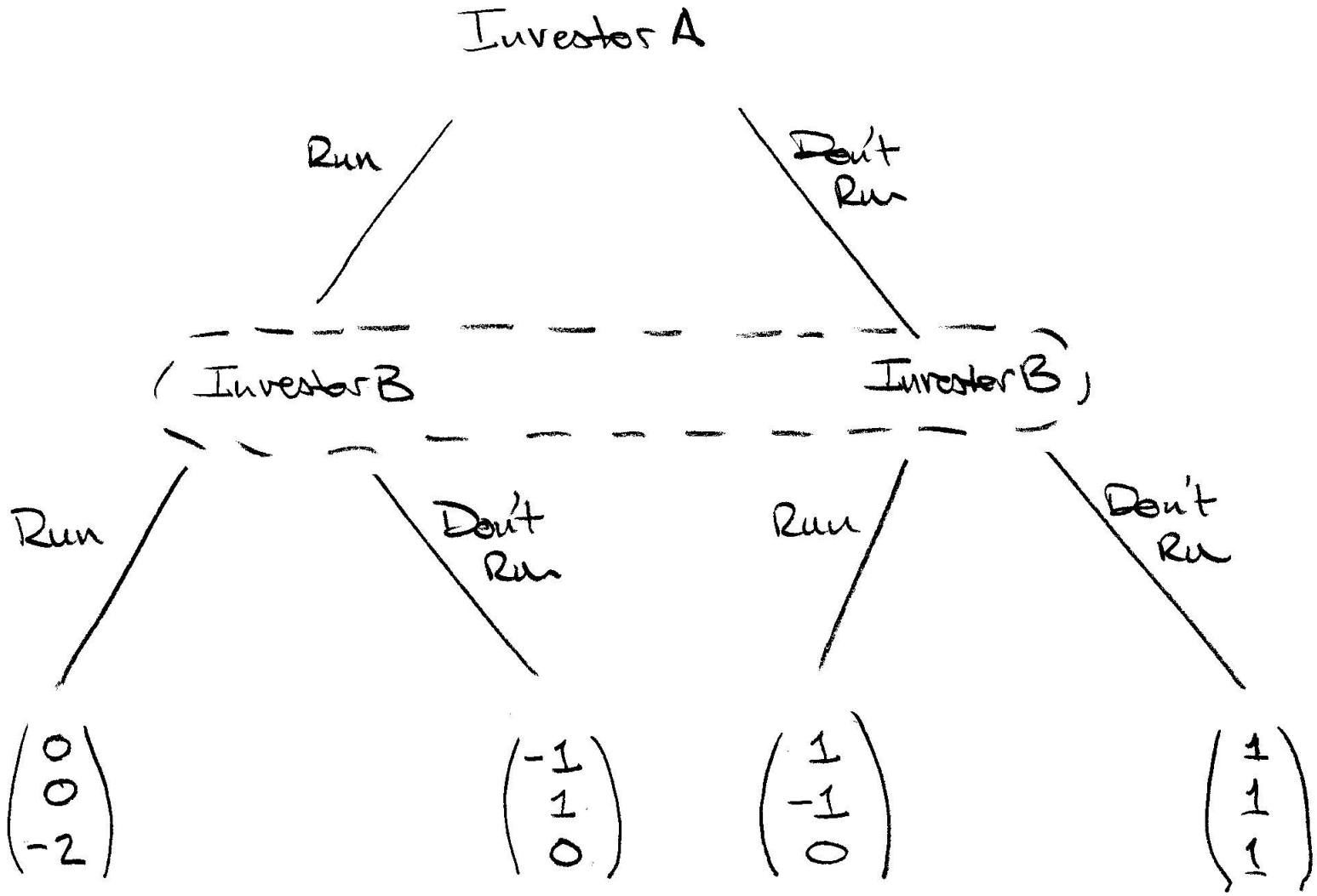
Currency Attack Model



Currency Attack Model

- Only change is that it is less costly for government to defend against a “small” run
- New optimal government strategy:
  - Default if both A and B run
  - Defend otherwise
- Given this strategy by government, model simplifies to …

Currency Attack Model



Currency Attack Model

- This version has a single Nash equilibrium:
  - (Don’t Run, Don’t Run)
- It is actually a dominant strategy for both investors not to run
- Each investor knows that the government is “strong” enough to withstand the other running
- So, each one doesn’t have to run only because the other is running

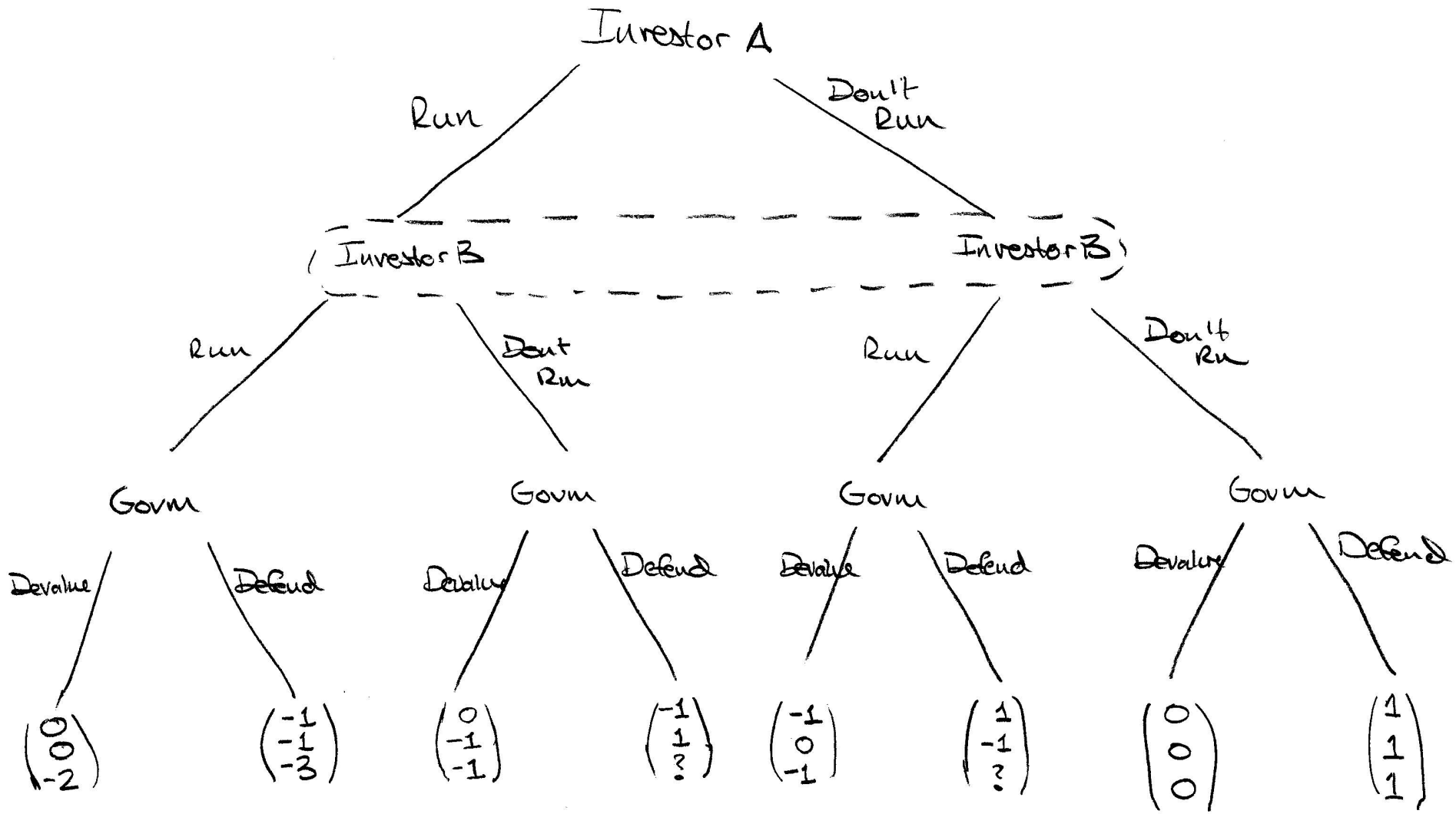
Speculative Attacks

- Countries on a fixed exchange rate can face speculative attacks
- This happened to many countries in the Great Depression
- Has happened frequently in the last 50 years
  - E.g., UK 1992, Mexico 1994, Thailand 1997, Argentina 2001, etc.

Value of Maintaining Fixed Rate

- Value of maintaining a fixed rate is unclear
- In most cases, there is short term pain:
  - High interest rates
  - A recession
- But then there may be longer term gains:
  - Investors more willing to invest in the country because they are confident currency will not loose value
  - Lower interest rates
- Hard to value long term gains

Will Government Defend?



Uncertainty about government "strength"

Speculation and Credibility

- If a fixed exchange rate has high credibility, speculators will act to stabilize exchange rate
  - Suppose exchange rate falls a bit for some reason
  - Speculators, expecting that it will rise back, see this as an opportunity to buy currency
  - Thus speculators help currency move back to fixed rate (central bank needs not do much since speculators do all the heavy lifting)

Speculation and Credibility

- However, if a fixed exchange rate has low credibility, speculators will act to destabilize exchange rate
  - Suppose exchange rate falls a bit for some reason
  - Speculators will see this as a sign of weakness and perhaps start expecting further decline
  - They will thus sell the currency contributing to the further decline
  - In this case, central bank must do a lot more trading to maintain fixed rate (perhaps more than it can or is willing to do)

Gold Standard and Credibility

- Argument for going back on gold today: Gold standard would take away ability of Fed/Treasury to create inflation
- Is this convincing?
- Only if we can credibly commit not to go off the gold standard when things get tough
- Not clear that this is possible
- What would prevent us from going off gold again when things are tough?

Gold Standard and Credibility

- Classical gold standard worked well because it was very credible
  - Overwhelming political support
  - Devaluing unthinkable
- Interwar gold standard much weaker
  - Less political support due to rise of left wing politics
- Post WWII fixed exchange rates unstable:
  - Bretton Woods, ERM crisis of 1992, Asian financial crisis of 1997-8, Mexican Tequila crisis of 1994-5, Argentina 2001-2, etc., etc.

Fixed Exchange Rate and Credibility

- Ex ante:
  - Want to commit to maintain fixed rate even in bad times. Why?
    - This lowers expected inflation and thereby interest rates. (Italy back in 1990's)
    - Country more desirable destination for investment.
- Ex post (e.g., recession, gov. debt crisis):
  - Want to renege and devalue. Why?
  - This creates inflation and thereby lowers real wages (increases competitiveness) and real value of debts (Greece/Italy/Spain/Portugal around 2012)