# The Global Economy

*Business Cycle Indicators*

NYU STERN

## The issue

- How does the US economy look to you right now?
- How can you tell?



## The idea

- Lots of indicators of economic activity
- We use their past patterns to assess
  - Current economic conditions
  - Near-term future economic conditions
- If (say) an increase in housing starts has been associated with good economic performance in the past …
- What if this time is different?



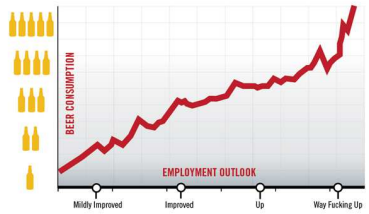
## Joke of the day

- Why do economists add a digit after the decimal point to their forecasts?
- To show they have a sense of humor



## Bonus joke of the day

- "Nation's Unemployment Outlook Improves Drastically After Fifth Beer," The Onion.






## Courses related to today's topic

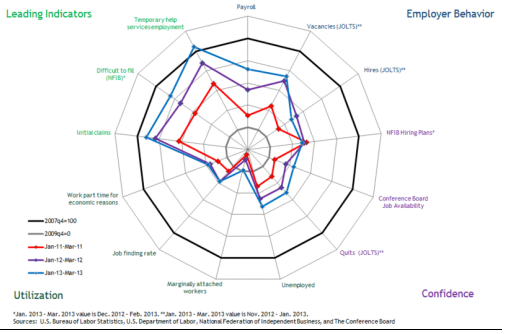
- Real-world analysis of economic data (ECON-GB.2347)
  - Professor Peter D'Antonio, Citi, Director and Head of US Economic Forecasting, does this for a living
- Forecasting time series data (STAT-GB.0018)
  - Professor Cliff Hurvich, expert and pianist
  - Or Professor Rohit Deo, also an expert

## What's happening?

- Employment report released Friday
  - Employment up 88k (consensus: 193k)
  - Unemployment down to 7.6% (same as consensus)
  - More at Bloomberg calendar, data at FRED
- What do we learn from this?



## What's happening?




*Jan. 2013 - Mar. 2013 value is Dec. 2012 - Feb. 2013. **Jan. 2013 - Mar. 2013 value is Nov. 2012 - Jan. 2013.
Sources: U.S. Bureau of Labor Statistics, U.S. Department of Labor, National Federation of Independent Business, and The Conference Board

Source: Macroblog, April 2013.



## What's happening?

- "Auto sales," FOXBusiness, via Alex Rivera:
  - Detroit's "Big Three" automakers reported sharp gains in auto sales on Tuesday as demand for fuel-efficient vehicles ramped up in the U.S. and pickup trucks rebounded. The improvement marked the greatest monthly performance for Chrysler, Ford, and General Motors in more than five years.
- What do we learn from this?



## What's happening?

- "Empty shelves," *Business Week*, via Andrew Bott:
  - Wal-Mart Stores has been cutting staff since the recession—and pallets of merchandise are piling up in its stockrooms as shelves go unfilled. The retailer says reports of stocking problems are overblown: "Our in-stock levels are up significantly."
  - Andrew adds: Customers during the recession were willing to sacrifice decreased service (and product availability) in exchange for low prices. Now that things have improved, service is more of a priority.
- What do we learn from this?



## Roadmap

- Indicators
- The cross-correlation function
- The business cycle scorecard



## *Indicators*

## Indicators of economic activity

- Hundreds of them, more all the time
- See resource page
- Also: Bloomberg and WSJ calendars

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## Indicators: terminology

- A variable is **procyclical** if it moves up and down with the economy, **countercyclical** if it moves in the opposite direction
- A variable **leads** the economy if its ups and downs come before, **lags** if its movements come after, **coincident** if they happen at the same time
- "The economy" = GDP growth

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## Indicators: plan

- Look at monthly data (mostly yoy growth rates)
- Shift from GDP to industrial production
- For each one
  - Is it procyclical? Countercyclical?
  - Does it lead? Lag?
  - What does it suggest about current and future conditions?

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## Indicators: FRED

- Plot and download data

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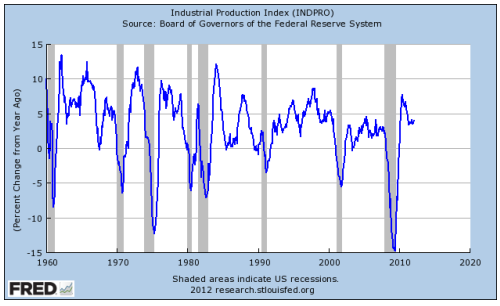
## Industrial production (yoy growth)

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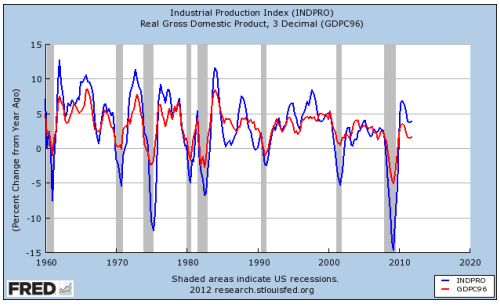
## Industrial production and GDP (yoy)

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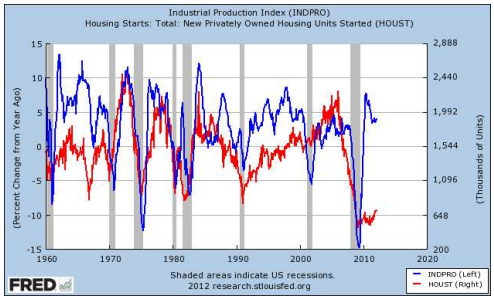
## Housing starts

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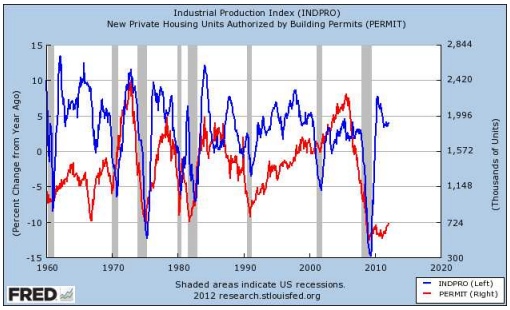
## Building permits

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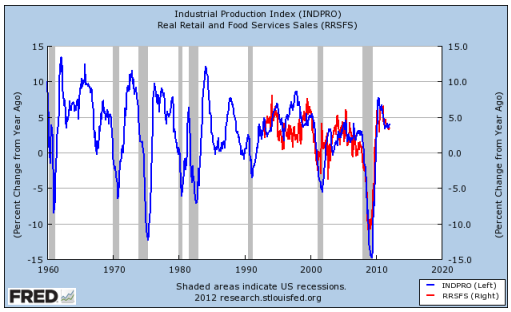
## Retail sales (yoy growth)

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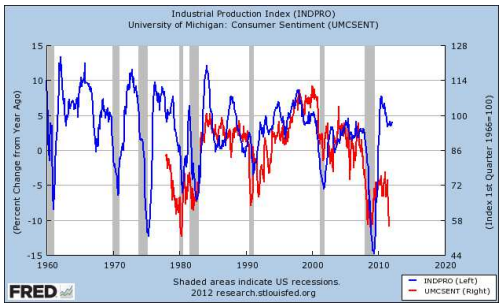
## Consumer sentiment

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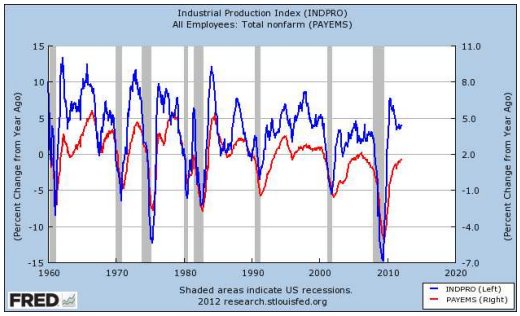
## Employment (yoy growth)

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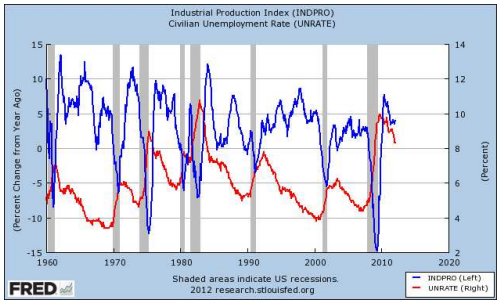
## Unemployment rate

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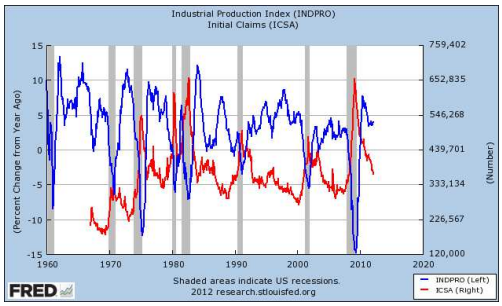
## Initial claims for UI

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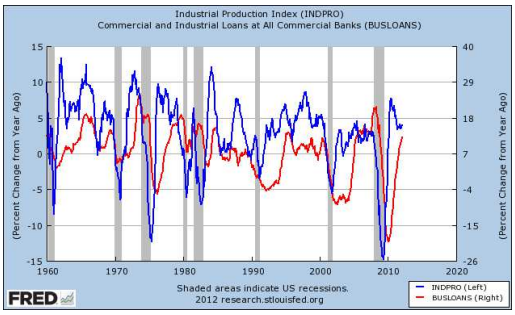
## Commercial & Industrial loans (yoy growth)

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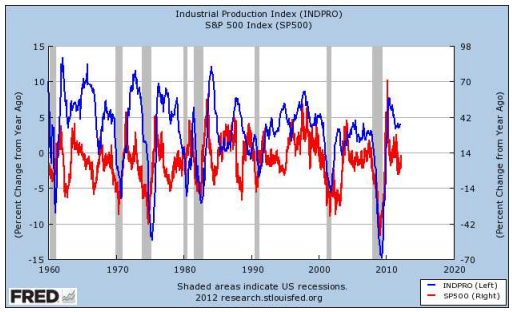
## S&P 500 (yoy growth)

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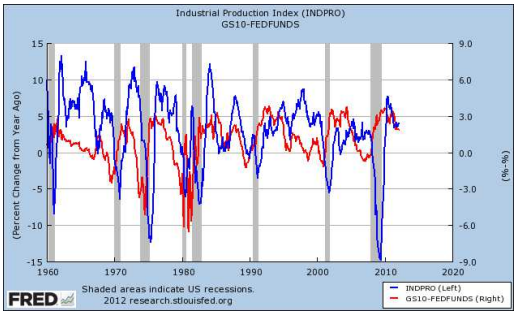
## Term spread (10y – fed funds)

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## Indicator summary

- Think about which indicators are
  - Procyclical
  - Countercyclical
  - Leading
  - Lagging
  - Coincident
- Which ones do you like best?

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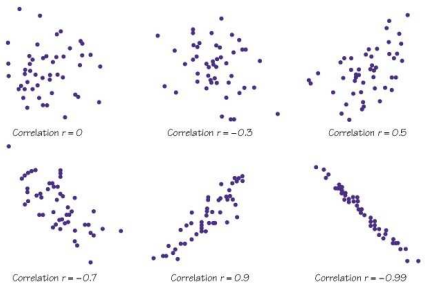
*Cross-correlations*

## Review: correlations

- Correlations: a measure of (linear) association between two variables
- Conveniently scaled between –1 and +1
- The farther from zero, the stronger the association



## Review: correlations






## The cross-correlation function

- Look at the correlation between x and y
- **Plus: shift y back and forth in time (to see leads and lags)**
- Formally

$$ccf(k) = corr[x(t),y(t-k)]$$

  - If k<0: x leads y [or y lags x]
  - If k>0: x lags y [or y leads x]
- Why? Makes a great picture



## Contemporaneous correlation

| Date | x(t) | y(t) |
|---|---|---|
| 1 | 2.43 | 8.47 |
| 2 | 1.19 | 2.29 |
| 3 | 0.13 | 7.36 |
| 4 | 0.56 | 6.39 |
| 5 | 0.38 | 6.02 |
| 6 | 0.96 | 0.22 |
| 7 | 1.87 | 3.60 |

Reminder:
- ccf(k) = corr[x(t),y(t-k)]

For k = 0:
- ccf(0) = corr[x(t),y(t)]

Use data marked
- Red for x
- Blue for y



## Lagging correlation

| Date | x(t) | y(t-1) |
|---|---|---|
| 1 | 2.43 | 8.47 |
| 2 | 1.19 | 2.29 |
| 3 | 0.13 | 7.36 |
| 4 | 0.56 | 6.39 |
| 5 | 0.38 | 6.02 |
| 6 | 0.96 | 0.22 |
| 7 | 1.87 | 3.60 |

Reminder:
- ccf(k) = corr[x(t),y(t-k)]

For k = +1:
- ccf(1) = corr[x(t),y(t-1)]
- Means: x lags y

Use data marked
- Red for x
- Blue for y
- Note lost observation



## Leading correlation

| Date | x(t) | y(t+1) |
|---|---|---|
| 1 | 2.43 | 8.47 |
| 2 | 1.19 | 2.29 |
| 3 | 0.13 | 7.36 |
| 4 | 0.56 | 6.39 |
| 5 | 0.38 | 6.02 |
| 6 | 0.96 | 0.22 |
| 7 | 1.87 | 3.60 |

Reminder:
- ccf(k) = corr[x(t),y(t-k)]

For k = -1:
- ccf(1) = corr[x(t),y(t+1)]
- Means: x leads y

Use data marked
- Red for x
- Blue for y
- Note lost observation

## Cross correlation graphs

- Pictures: plot ccf(k) against k
  - y = IP growth
  - x = indicator
- Sample period: 1960 to present [why?]
- Most variables are yoy growth rates [why?]
- Does indicator lead or lag IP growth?

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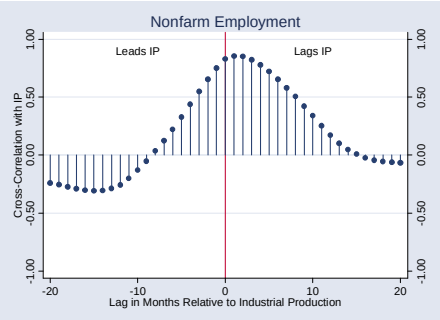
## Does employment lead or lag?

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## How to tell

- Find the largest correlation
- Procyclical or countercyclical?
  - If positive, procyclical
  - If negative, countercyclical
- Leading or lagging
  - If to the left, leading
  - If to the right, lagging

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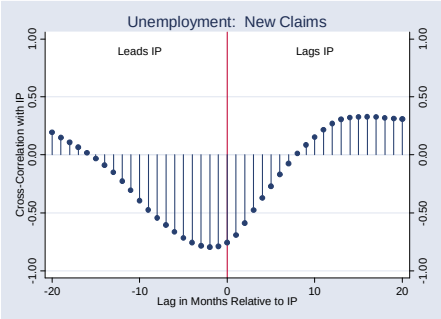
## Initial ("new") claims for UI (yoy)

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## Housing starts (yoy)


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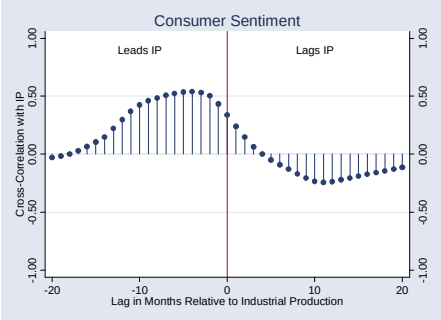
## Consumer sentiment (yoy)

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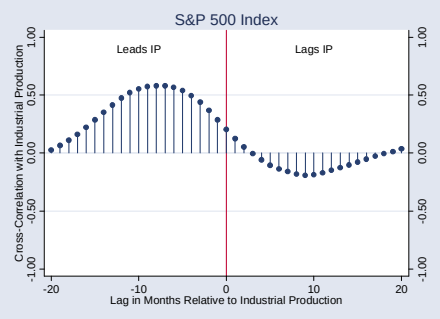
## S&P 500 (yoy)

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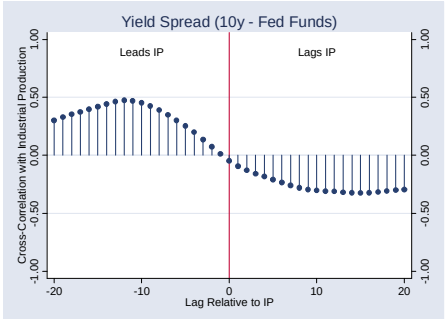
## Yield spread

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## The Conference Board indicators

| Indicator |
|---|
| Average weekly hours, manufacturing |
| Average weekly initial claims for unemployment insurance |
| Manufacturers new orders, consumer goods |
| Vendor performance, slower deliveries index |
| Manufacturers new orders, non-defense capital goods |
| Building permits, new private housing units |
| Stock prices, 500 common stocks |
| Money supply, M2 |
| Interest spread, 10 year T-bond less Federal Funds rate |
| Index of consumer expectations |

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## Good indicators

- Which ones have high correlations?
- Which ones lead?
- Which ones do you like best?
- Warning: even the best indicators forecast the future imperfectly [poorly?]

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## Computing cross-correlations

- How do we compute them?
  - Method 1: use Excel to calculate each point [see link]
  - Method 2: use some kind of statistical software

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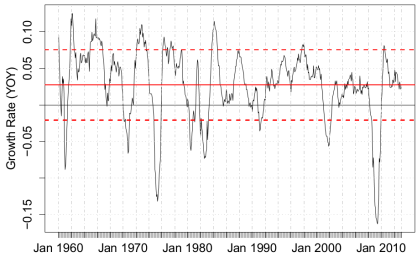
## *Business cycle scorecard*

## Business cycle scorecard

- Useful summary of lots of indicators
- For each one:
  - Graph indicator over time
  - Add lines for mean, +/- one std deviation
  - Rate indicator as strong positive, positive, negative, strong negative



## Business cycle scorecard: example






## Business cycle scorecard

| Indicator | Strong Negative | Negative | Positive | Strong Positive |
|---|---|---|---|---|
| Ind. Prod. | | | | |
| | | | | |
| | | | | |
| **Total** | | | | |



## Business cycle scorecard

- Coming up: Problem Set #3
  - Download indicators (FRED recommended)
  - Compute cross-correlation functions
  - Construct business cycle scorecard
  - Start soon!



## What have we learned?

- Lots of things move up and down with the economy
- We can use these patterns to assess current and near-term future conditions
- Useful tools
  - Cross-correlation function
  - Business cycle scorecard
- Where can I learn more?
  - Indicators course: ECON-GB.2347, D'Antonio
  - Forecasting course: STAT-GB.0018, Deo and Hurvich



## The Global Economy

*Inflation and Monetary Policy*

NYU STERN

# The Global Economy

## *Hyperinflation*

NYU STERN

## Midterm

- Mean: 87
- 90 and above: 38%
- 75 and below: 10%
  [you might think about why you had difficulty]
- Exam had 105 points, but grades are out of 100
- Answers posted



## Terminology

- The **price level** is a measure of average prices
  - We label it P
  - Measured in units of currency (how many dollars to buy…)
- **Inflation** is the rate of growth of the price level
  - Buying goods takes more currency
  - Or: currency buys less (same thing, of course)
- We call it **deflation** if growth rate is negative
- **Hyperinflation** is inflation > 100% per year



## The idea

- Tom Sargent, interview, October 2011
  - The way to start a hyperinflation is run sustained government deficits and then have the monetary authority print money to pay for it. That always works. How do you stop a hyperinflation? You stop doing it. This isn't high economic theory.
- What is he saying? Does it make sense to you?



## The idea

- La Nacion, via Google translate, March 25, 2012
  - [Argentina's] Central Bank president, Mercedes Marco del Pont, said it "is totally false to say that the issue [of money] generates inflation." She continued: "only in Argentina does the idea remain that the expansion of the money [supply] generates inflation."
- What is she saying? Does it make sense to you?



## Roadmap

- Terminology
- Hyperinflation show and tell
- Money and inflation: the quantity theory
- Money supply mechanics
- How deficits enter the picture

*Hyperinflation show and tell*

## German currency

October 1923: 20 USD = 1 billion RM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## Argentine currency


This note dates from 1980s. What's it worth now?

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## Turkish currencies


After 2008


Before 2008

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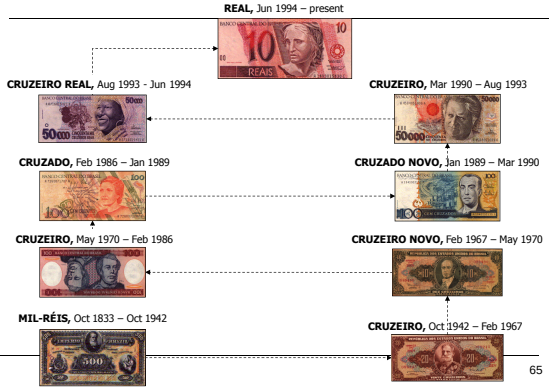
## Brazilian currencies

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## Highest inflation rates ever

| Example | Highest Daily Inflation |
|---|---|
| Hungary, Jul 1946 | 207% |
| Zimbabwe, Nov 2008 | 98% |
| Yugoslavia, Jan 1994 | 65% |
| Germany, Oct 1923 | 21% |

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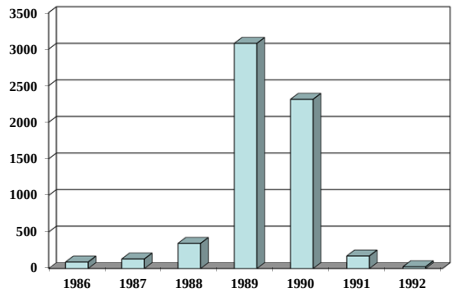
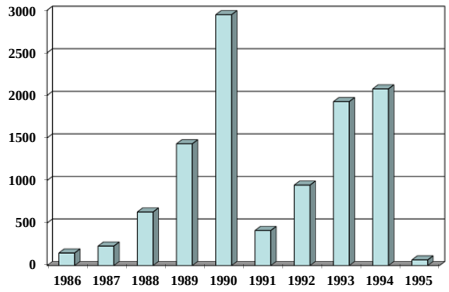
## Inflation in Argentina (annual %)




Source: EIU database.



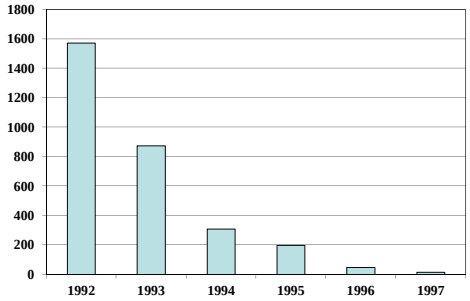
## Inflation in Brazil (annual %)




Source: EIU database.



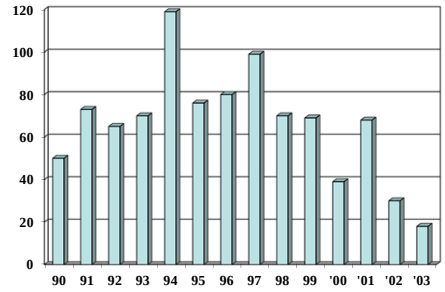
## Inflation in Russia (annual %)




Source: EIU database.



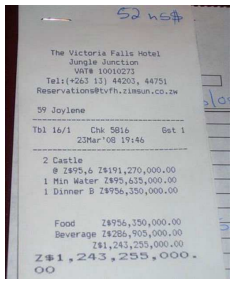
## Inflation in Turkey (annual %)




Source: EIU database.



## Buying lunch in Zimbabwe

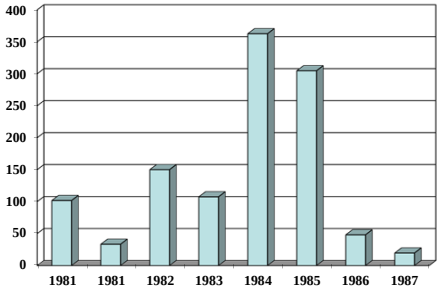





## Zimbabwe timeline

- December 2006: inflation over 1000%
- February 2007: inflation ruled illegal
- October 2008: inflation over 200 million percent!
- January 2009:
  - Transactions permitted in foreign currency
  - Soldiers and teachers to be paid in USD
- February 2009: 12 zeros knocked off
- April 2009: government abandons currency, people use USD (also South African rand – ZAR)

## Inflation in Israel (annual %)




Source: EIU database.



## Israel in the 1980s

- American Rabbi visiting Israel:
  - During Israel's hyperinflation, I had a mortgage at a 5% fixed annual interest rate. As inflation increased, fixed rate mortgage payments became laughably easy to make, because salaries more or less kept pace with inflation. Finally, I received a notice canceling my mortgage, because the cost of record-keeping had become more than the monthly payment.



## Iran

- Graeme Wood, "Hyperinflation vacation," The Atlantic, April 2013:
  - The Iranian rial was hovering under 40,000 to one U.S. dollar, weaker by nearly half compared with six months earlier. Authorities tried to ban currency trading for a few weeks in October, when the inflation rate peaked, but they failed.
  - Wood's First Rule of Budget Travel applies here: where there is runaway inflation, there are great deals for travelers with hard cash. So in January, I boarded a flight from Dubai to Kish, an Iranian holiday resort in the Persian Gulf.



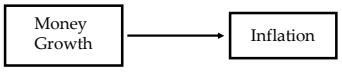
## Other examples

- Personal experiences with hyperinflation?



## *The quantity theory of money*

## Quantity theory: picture



## Quantity theory: words

- The more currency (money) in circulation, the less each unit is worth

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## Quantity theory: math

- One equation (a production function for transactions)

$$M\,V = P\,Y$$

  - M = stock of money in circulation (amount of currency)
  - V = velocity (how often a unit of currency is used in a year)
  - P = price level (the GDP deflator or other price index)
  - Y = real GDP

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## Quantity theory: math

- One equation (technology for transactions)

$$M\,V = P\,Y$$

- In growth rates

$$\gamma_M + \gamma_V = \gamma_P + \gamma_Y$$

  - $\gamma_M$ = growth of money supply (think: currency)
  - $\gamma_V$ = growth of velocity
  - $\gamma_P$ = growth of price level (the inflation rate)
  - $\gamma_Y$ = growth of real GDP

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## Quantity theory

- Two hypotheses
  - V is constant ($\gamma_V = 0$)
  - Y not affected by changes in M [long-run approximation]
- One conclusion
  - Money growth causes inflation

$$\gamma_P = \gamma_M - \gamma_Y$$

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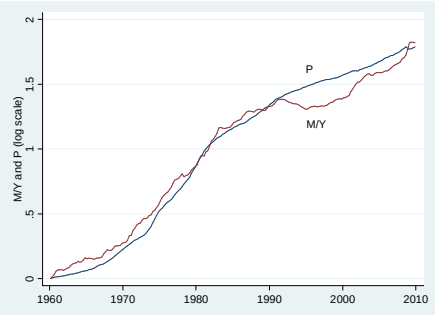
## Quantity theory: long-run evidence

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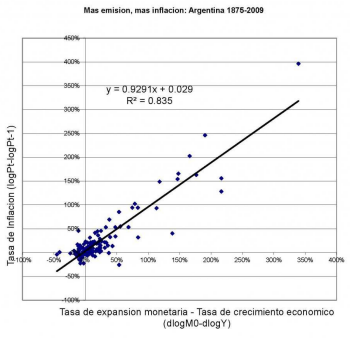
## Quantity theory: long-run evidence

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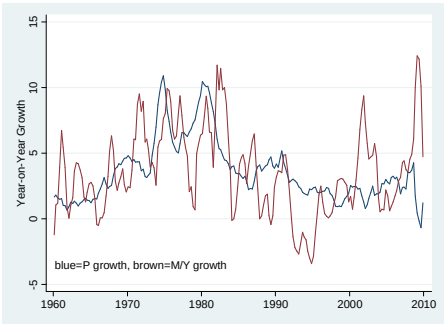
## Quantity theory: short-run evidence

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## Quantity theory: small inflations

- Lots of other things relevant in small inflations
- Link between money and prices not as tight
- More on this next week

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## *Money supply mechanics*

## Money supply mechanics

- How the central bank manages the money supply
  - Money = currency for our purposes
  - Supply changed by buying/selling bonds in market
- Works through balance sheets for
  - Treasury
  - Central bank
  - Private agents (households and firms)

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## Money supply mechanics

**Treasury**

| Assets | | Liabilities | |
|---|---|---|---|
| | | Bonds | 200 |

**Central bank**

| Assets | | Liabilities | |
|---|---|---|---|
| Bonds | 20 | Money | 20 |

**Households and firms**

| Assets | | Liabilities | |
|---|---|---|---|
| Money | 20 | | |
| Bonds | 180 | | |

- Where does treasury debt come from?
- How does central bank increase money supply?
- Why do households go along?

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## Money supply mechanics

**Treasury**

| Assets | | Liabilities | |
|---|---|---|---|
| | | Bonds | 200 |

**Central bank**

| Assets | | Liabilities | |
|---|---|---|---|
| Bonds | 20 | Money | 20 |

**Households and firms**

| Assets | | Liabilities | |
|---|---|---|---|
| Money | 20 | | |
| Bonds | 180 | | |

- Where do deficits come in?
- Does there need to be a connection with money growth?
- Why so in hyperinflations?

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## Quantity theory: revised picture




## Hyperinflation recap

- Hyperinflations – always! – stem from
  - Lack of fiscal discipline [= government deficit]
  - Accommodation by central bank [= printing money]
- How to end them: "stop doing it"
  - Balance government budget
  - Make central bank independent, prohibit it from buying debt directly from Treasury



## Fiscal dominance in the US and EU

- **Fiscal dominance** means
  - Government debt and deficit are so large that the only alternative to explicit default is printing money
- US/Fed view of the world
  - Need aggressive monetary policy to recover from crisis
- EU/ECB view of the world
  - Need to resist inflation with tight monetary policy
  - US guilty of "soft fiscal dominance"



## What have we learned?

- Hyperinflation comes from
  - Large increases in money supply
  - Triggered by government deficits
- Solution: Stop doing it.
- Essential tools
  - Quantity theory
  - Central bank balance sheet



## For the ride home

- Would Argentina be better off using USD?
- Would the US be better off with gold?



## Inflation and property rights

- Unexpected inflation is a way to abrogate property rights. [why unexpected?]
- Many claims are measured in currency. By lowering the value of currency, you lower the value of those claims.