The Global Economy

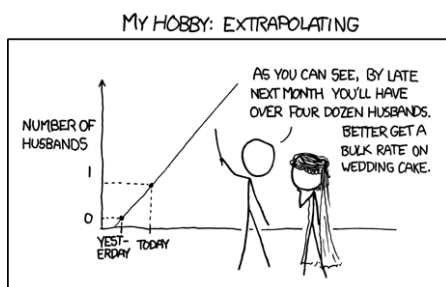*Business Cycle Indicators*

NYU STERN

The idea

- We use patterns in the data to assess
  - Current economic conditions
  - Near-term future economic conditions
- If (say) a jump in housing starts has been associated with good economic performance in the past…
- What if this time is different?

2

The idea (xkcd version)

3

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

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Roadmap

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

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Indicators

1

Indicators of economic activity

- Hundreds of them, more all the time
- Bloomberg and WSJ calendars
- What's your sense of current economic conditions? What indicators would you use to make your case?

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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 precede, **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?
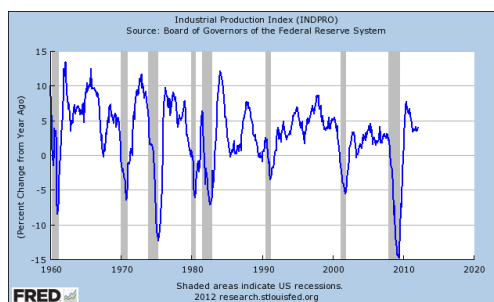 - What does it suggest about current and future conditions?
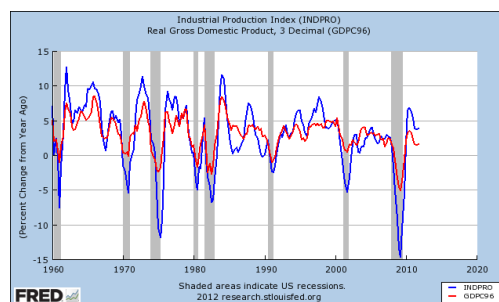
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Indicators: FRED

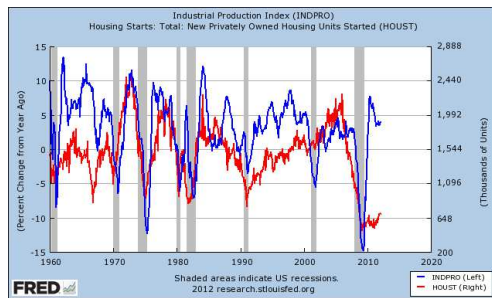- Plot and download data

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Industrial production (yoy growth)

Industrial Production Index (INDPRO)
Source: Board of Governors of the Federal Reserve System
Shaded areas indicate US recessions.
2012 research.stlouisfed.org

11

Industrial production and GDP (yoy)

Industrial Production Index (INDPRO)
Real Gross Domestic Product, 3 Decimal (GDPC96)
Shaded areas indicate US recessions.
2012 research.stlouisfed.org

12

Housing starts

Industrial Production Index (INDPRO)
Housing Starts: Total: New Privately Owned Housing Units Started (HOUST)

Shaded areas indicate US recessions.
2012 research.stlouisfed.org

13

Building permits

Industrial Production Index (INDPRO)
New Private Housing Units Authorized by Building Permits (PERMIT)

Shaded areas indicate US recessions.
2012 research.stlouisfed.org

14

Retail sales (yoy growth)

Industrial Production Index (INDPRO)
Real Retail and Food Services Sales (RRSFS)

Shaded areas indicate US recessions.
2012 research.stlouisfed.org

15

Consumer sentiment

Industrial Production Index (INDPRO)
University of Michigan: Consumer Sentiment (UMCSENT)

Shaded areas indicate US recessions.
2012 research.stlouisfed.org
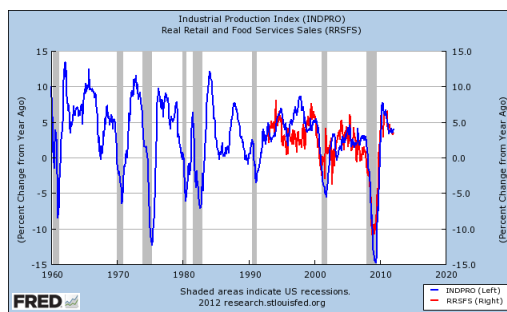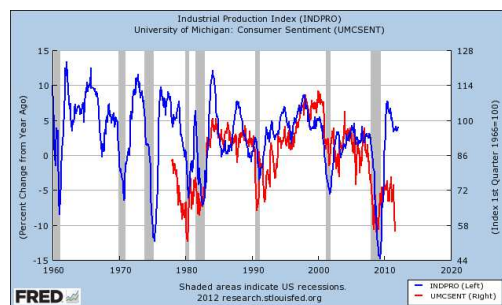
16

Employment (yoy growth)

Industrial Production Index (INDPRO)
All Employees: Total nonfarm (PAYEMS)

Shaded areas indicate US recessions.
2012 research.stlouisfed.org

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Unemployment rate

Industrial Production Index (INDPRO)
Civilian Unemployment Rate (UNRATE)

Shaded areas indicate US recessions.
2012 research.stlouisfed.org

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Initial claims for UI

Industrial Production Index (INDPRO)
Initial Claims (ICSA)

19

C & I loans (yoy growth)

Industrial Production Index (INDPRO)
Commercial and Industrial Loans at All Commercial Banks (BUSLOANS)

20

S&P 500 (yoy growth)

Industrial Production Index (INDPRO)
S&P 500 Index (SP500)

21

Term spread (10y – fed funds)

Industrial Production Index (INDPRO)
GS10-FEDFUNDS
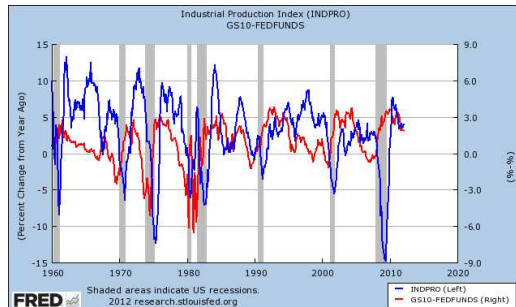
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Indicator summary

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

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Cross-correlations

4

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

Correlation r = 0   Correlation r = –0.3   Correlation r = 0.5

Correlation r = –0.7   Correlation r = 0.9   Correlation r = –0.99
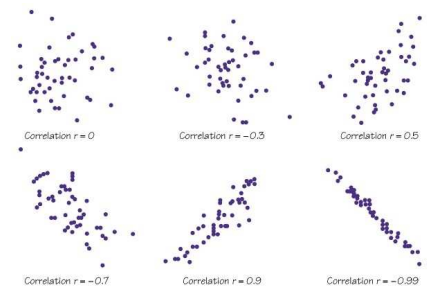
The cross-correlation function

- 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

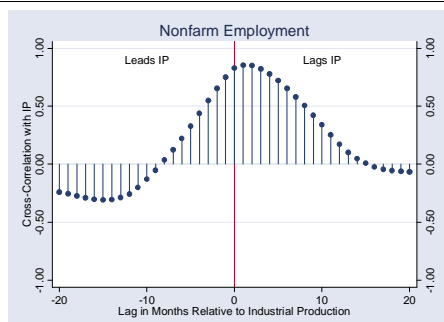## Cross correlation graphs

- Pictures: plot ccf(k) against k
  - y = IP growth
  - x = indicator
- Sample period: 1960 to present
- Does indicator lead or lag IP growth?

Does employment lead or lag?

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 indicator

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

Use data marked
- Red for x
- Blue for y

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Leading indicator

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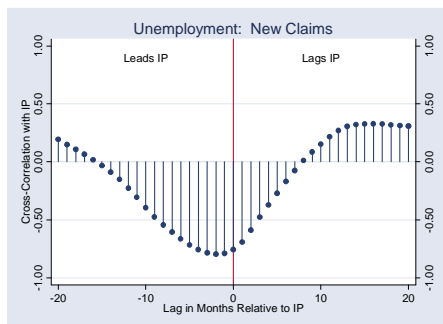- ccf(1) = corr[x(t),y(t+1)]
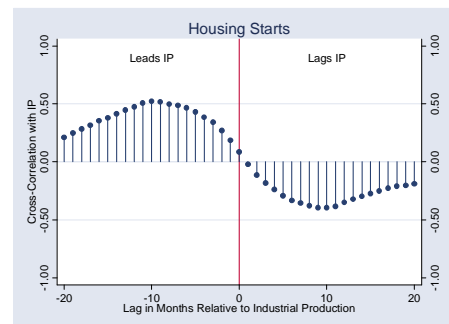- Means: x leads y

Use data marked
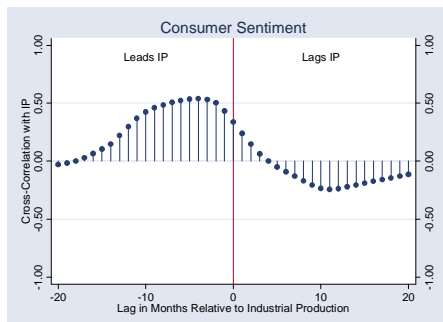- Red for x
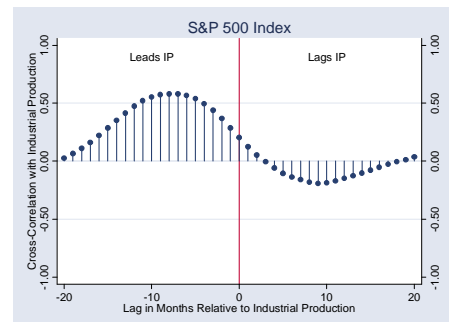- Blue for y

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Initial ("new") claims (yoy)

Unemployment: New Claims

Leads IP   Lags IP

Cross-Correlation with IP

Lag in Months Relative to IP

33

Housing starts

Housing Starts

Leads IP   Lags IP

Cross-Correlation with IP

Lag in Months Relative to Industrial Production

34

Consumer sentiment (yoy)

Consumer Sentiment

Leads IP   Lags IP

Cross-Correlation with IP

Lag in Months Relative to Industrial Production

35

S&P 500 (yoy)

S&P 500 Index

Leads IP   Lags IP

Cross-Correlation with Industrial Production

Lag in Months Relative to Industrial Production

36

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Yield spread

Yield Spread (10y - Fed Funds)

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

Good indicators

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

Business cycle scorecard

Business cycle scorecard

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

Business cycle scorecard

Indicator	Strong Negative	Weak Negative	Weak Positive	Strong Positive
Industrial production			x	
Employment			x	
New Claims		x		
Housing starts	x			
Summary	1	1	2	0

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 even future conditions
- Useful tools
  - Cross-correlation function
  - Business cycle scorecard
- Where can I learn more?
  - Forecasting course: B90.2302, Deo and Hurvich

The Global Economy

Hyperinflation

NYU STERN

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.
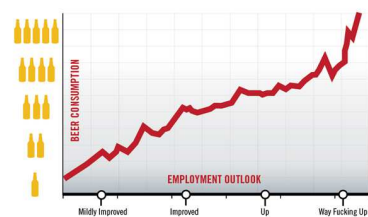- What is he saying? Does it make sense to you?

Roadmap

- In the news
- Inflation
- Hyperinflation show and tell
- Quantity theory
- Money supply mechanics
- How deficits enter the picture

In the news

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

In the news

- "Revolution in retreat," The Economist, March 24, 2012, via Mike Morand:
  - Raúl Castro, who formally took over as Cuba's president in February 2008 and as first secretary of the Communist Party in April 2011, is trying to revive the island's moribund economy by transferring a substantial chunk of it from state to private hands, with profound social and political implications.
- What's going on? Good or bad?

In the news

- "Revolution in retreat," The Economist, March 24, 2012, via Mike Morand:
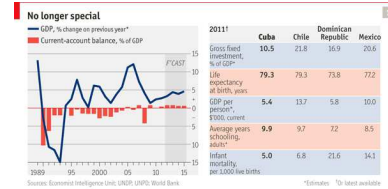
- What's going on? Good or bad?

In the news

- 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?

Inflation

- The price level P is the quantity of currency you need to buy a representative basket of goods and services
- Inflation = increases in P
  - Goods cost more currency
  - Or: currency buys less (same thing, of course)
- Deflation = decreases in P
- Hyperinflation = annual inflation > 100%

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?
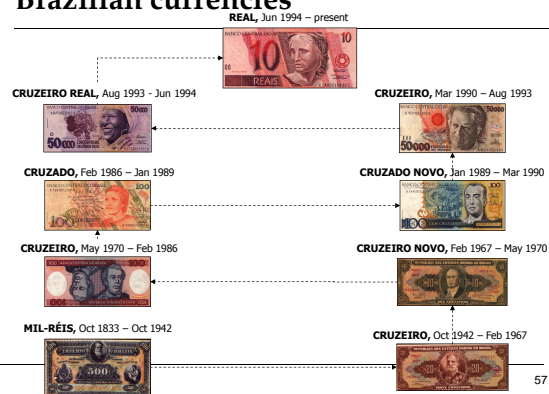
55

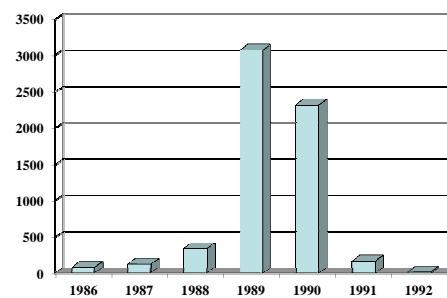## Turkish currencies

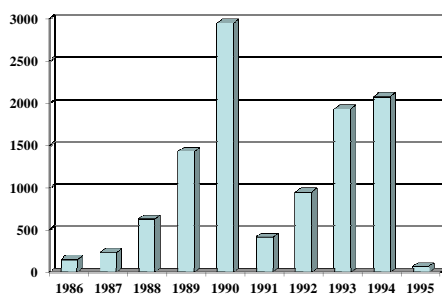

After 2008

Before 2008

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Brazilian currencies

REAL, Jun 1994 – present

CRUZEIRO REAL, Aug 1993 - Jun 1994

CRUZEIRO, Mar 1990 – Aug 1993

CRUZADO, Feb 1986 – Jan 1989

CRUZADO NOVO, Jan 1989 – Mar 1990

CRUZEIRO, May 1970 – Feb 1986

CRUZEIRO NOVO, Feb 1967 – May 1970

MIL-RÉIS, Oct 1833 – Oct 1942

CRUZEIRO, Oct 1942 – Feb 1967

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Inflation in Argentina (annual %)

Source: EIU database.

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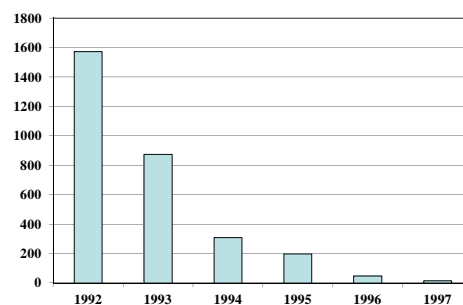## Inflation in Brazil (annual %)

Source: EIU database.

59

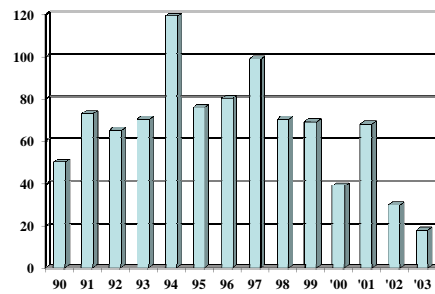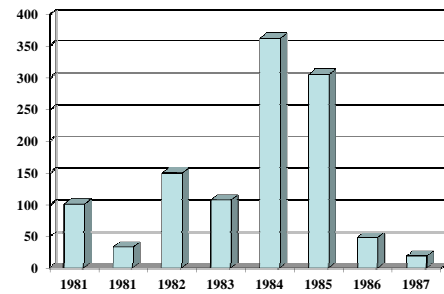## Inflation in Russia (annual %)

Source: EIU database.

60

Inflation in Turkey (annual %)

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Inflation in Israel (annual %)

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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.

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Buying lunch in Zimbabwe

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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)
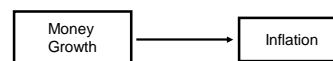
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Highest inflation rates ever

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

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The quantity theory of money

Quantity theory: picture

Quantity theory: words

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

---

Quantity theory: math

- One equation (technology 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

Quantity theory: math

- One equation (technology for transactions)

$$M V = P Y$$

- In growth rates

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

  - γ_M = growth of money supply (think: currency)
  - γ_V = growth of velocity
  - γ_P = growth of price level (inflation rate)
  - γ_Y = growth of real GDP

Quantity theory

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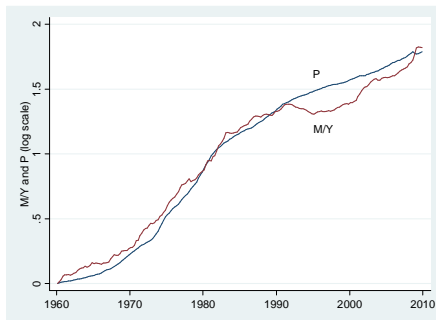 - Y not affected by changes in M [long-run approximation]
- One conclusion
  - Money growth causes inflation
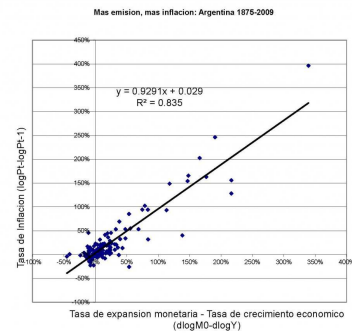
$$\gamma_P = \gamma_M - \gamma_Y$$
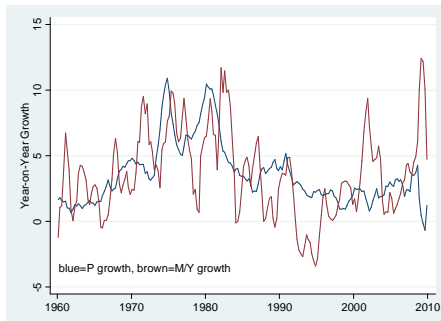
Quantity theory: long-run evidence

Quantity theory: long-run evidence

Mas emision, mas inflacion: Argentina 1875-2009

$y = 0.9291x + 0.029$
$R^2 = 0.835$

Quantity theory: short-run evidence

blue=P growth, brown=M/Y growth

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

Money supply mechanics

Money supply mechanics

- How the central bank manages the money supply
  - Money = currency for our purposes
- Look at balance sheets for
  - Treasury
  - Central bank
  - Private agents (households and firms)

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

Government Deficit → Money Growth → Inflation
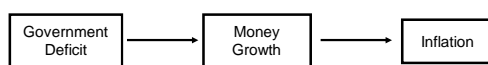
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Hyperinflation recap

- Hyper inflations stem from
  - Lack of fiscal discipline
  - Accommodation by central bank
- How to stop them: stop doing it
  - Balance government budget
  - Make central bank independent, prohibit it from buying debt directly from Treasury

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What have we learned?

- Big inflation comes from
  - Big increases in money supply
  - Triggered by government deficits that can't be financed any other way
- Solution: Stop doing it.
- Essential tools
  - Quantity theory
  - Central bank balance sheet

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For the ride home

- Would Argentina be better off using USD? Would the US be better off with gold?
- Bonus topic: Google trends as indicators
  - Can search popularity be used to make better forecasts?
  - See (or search "ny fed search data") http://libertystreeteconomics.newyorkfed.org/2012/01/forecasting-with-internet-search-data.html

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