# A World of Inflation
# The Billion Prices Project

15.012 Applied Macro and International Economics

Alberto Cavallo

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# Class Outline

- Inflation as a global problem
  - Causes and Expectations

- How to measure inflation
  - The traditional way
  - The Billion Prices Project (BPP) at Sloan
    - Online "data scraping" and real-time inflation indicators
    - Bonus: how to make money with our data

# Why is inflation rising?

- Developing countries surge in demand → increase in commodity prices since 2004

# Rising Commodities



CRUDE OIL
USD/bbl.
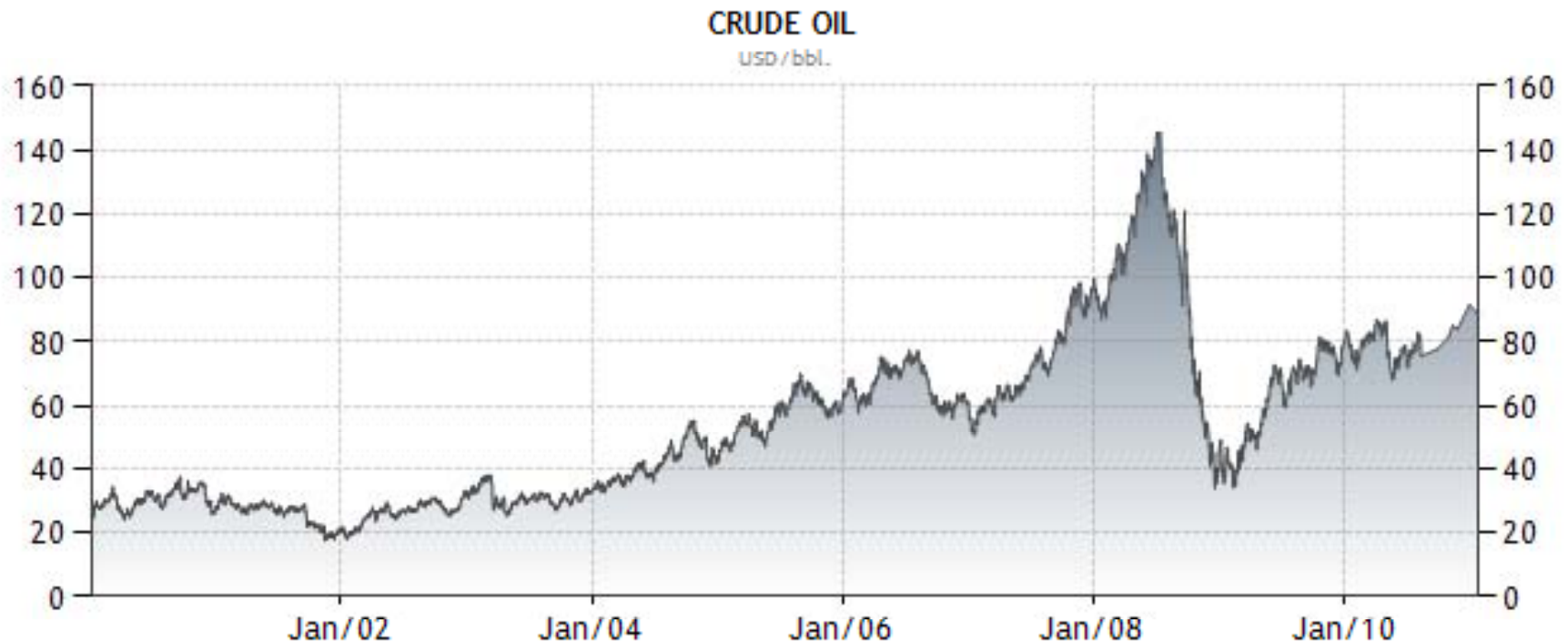
source: TradingEconomics.com; NYMEX

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# Rising Commodities



COPPER
usd/lb.

source: TradingEconomics.com; COMEX

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# Rising Commodities

### SUGAR
Sd/lb.



source: TradingEconomics.com; ICE
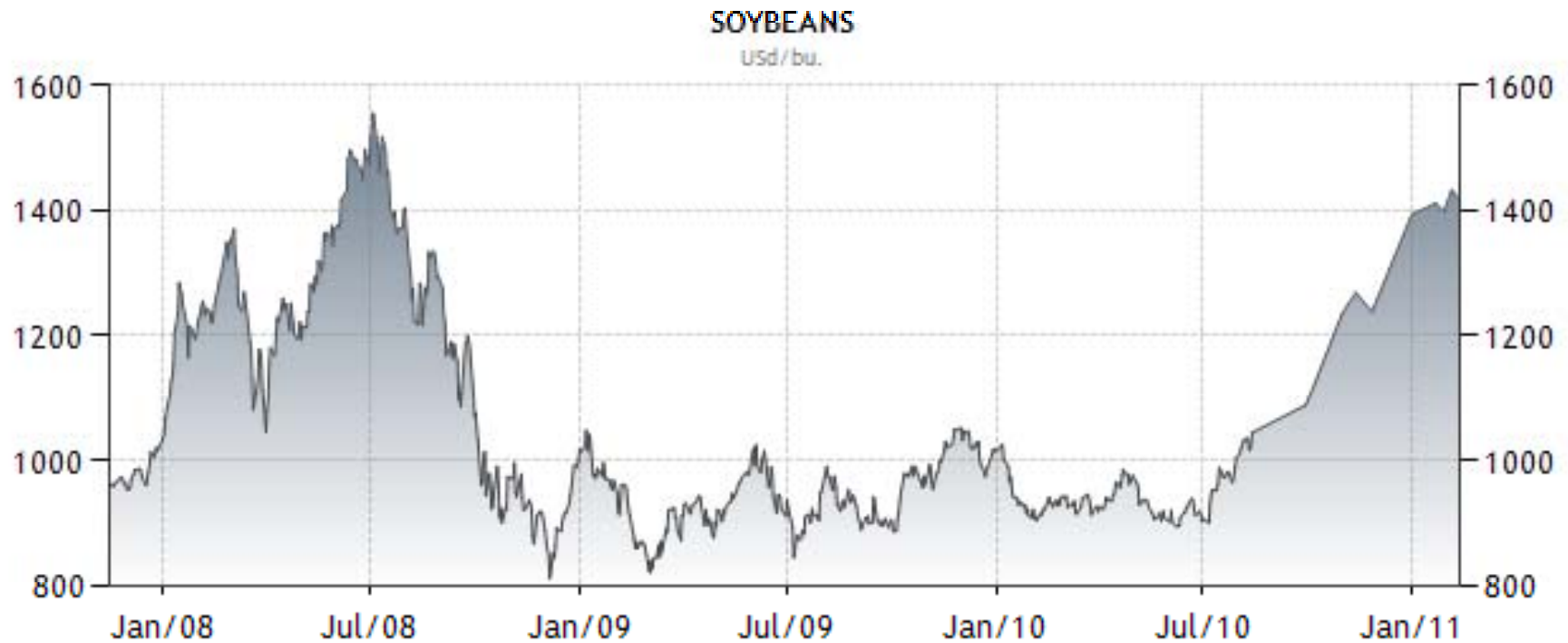
# Rising Commodities

RICE
USD/cwt

# Rising Commodities



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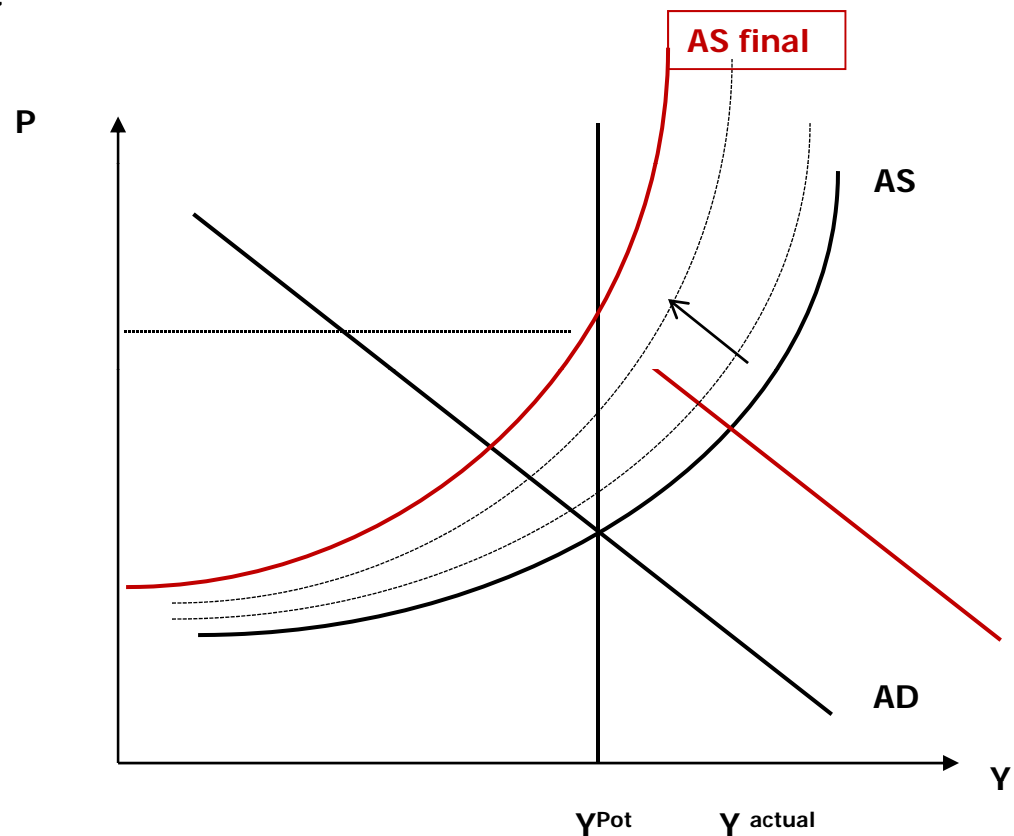
# Why is inflation rising?

- Developing countries surge in demand → increase in commodity prices since 2004

- Expansionary policies since 2008:
  - Local effect→ AS-AD → upward pressure on prices

# Inflation, expectations and AS

- The expected rate of inflation affects the position and slope of AS curve in short run

- ↑expectations of inflation:
  - AS moves up faster
  - AS becomes steeper (prices are more flexible)

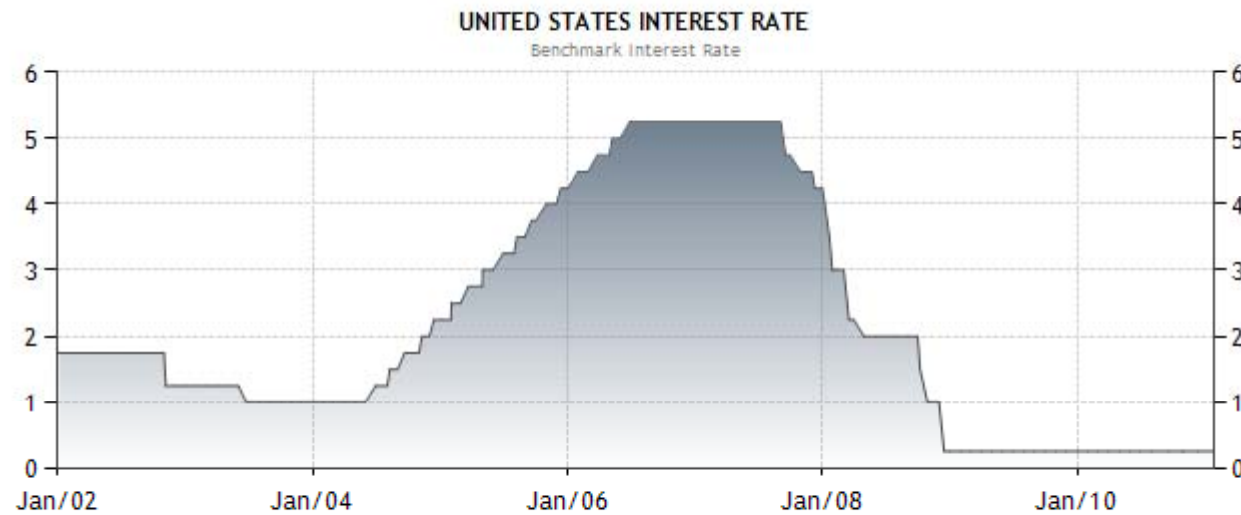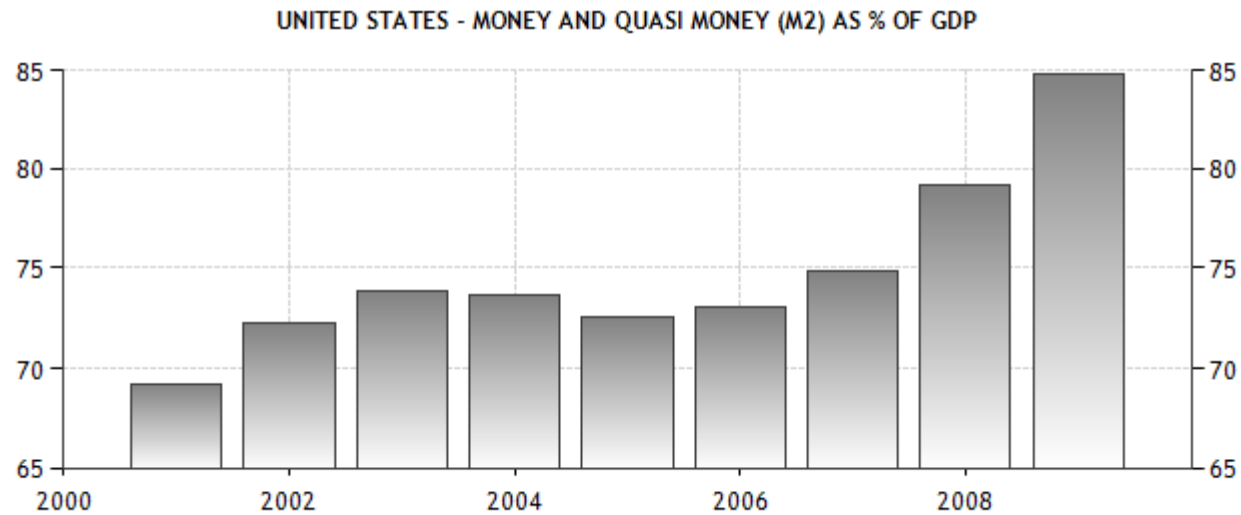- Policy looses its ability to affect output → it just leads to inflation

## Expansionary policies & transition to Long - Run

AS final

P

AS

AD
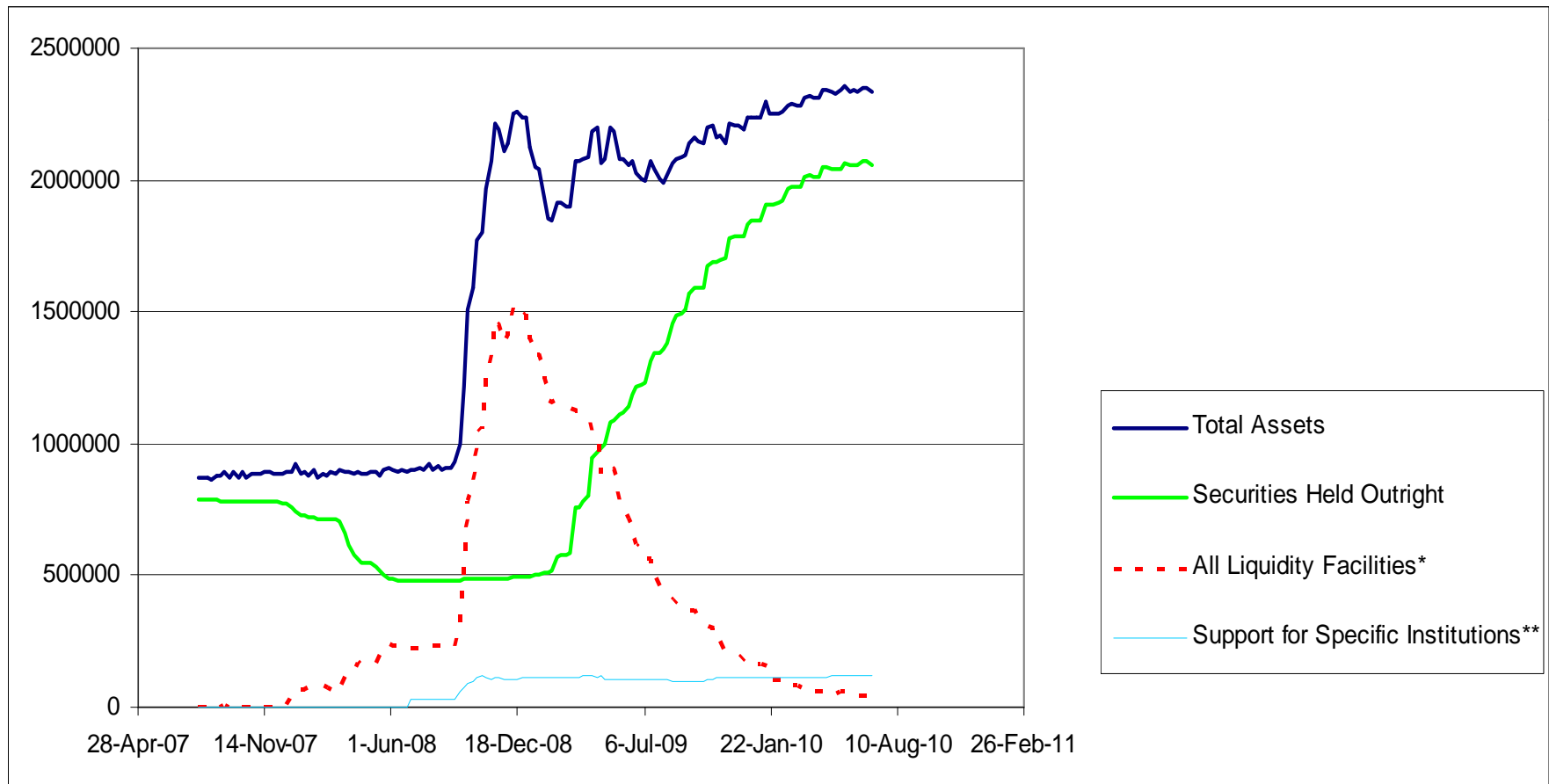
Y

$Y^{Pot}$   $Y$ actual

# Why is inflation rising?

- Developing countries surge in demand → increase in commodity prices since 2004

- Expansionary policies since 2008:
  - Local effect→ AS-AD → upward pressure on prices
  - International effect → excess liquidity flows to other countries→ with dollars coming in→ either local currency appreciates (bad for exports) or CB buys the dollars, increases Reserves, prints money….inflation

# Expansionary Monetary Policy



UNITED STATES - MONEY AND QUASI MONEY (M2) AS % OF GDP

UNITED STATES INTEREST RATE
Benchmark Interest Rate

source: TradingEconomics.com; Federal Reserve
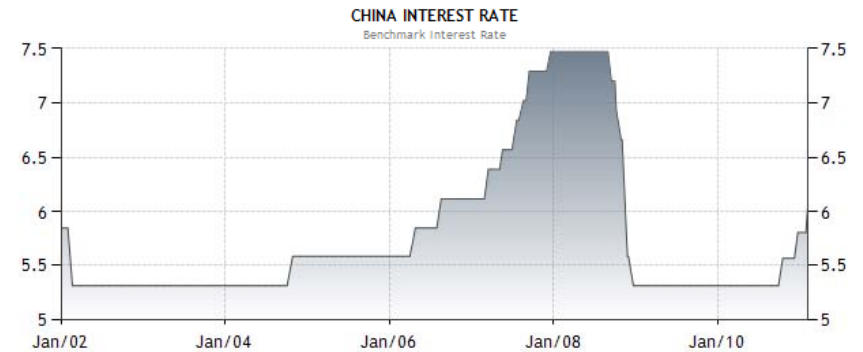
# Expansionary Monetary Policy
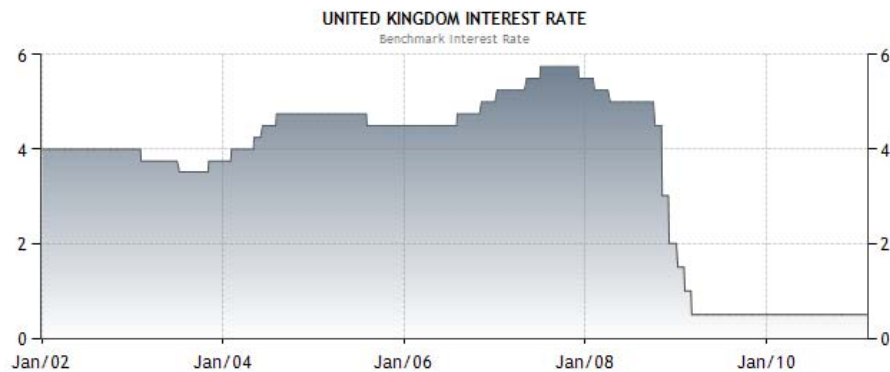


**Federal Reserve Assets (Billions of US$)**
**Source: Board of Governors**

Graph: Roberto Chang, "Financial Volatility and Prospects for Inflation Targeting"
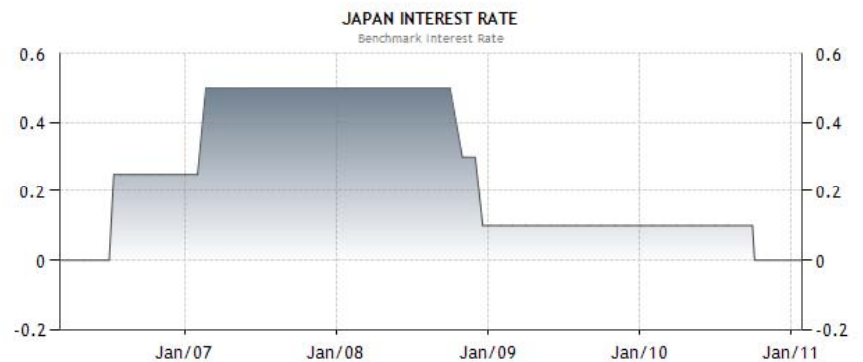
# Expansionary Monetary Policy



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# Expansionary Monetary Policy
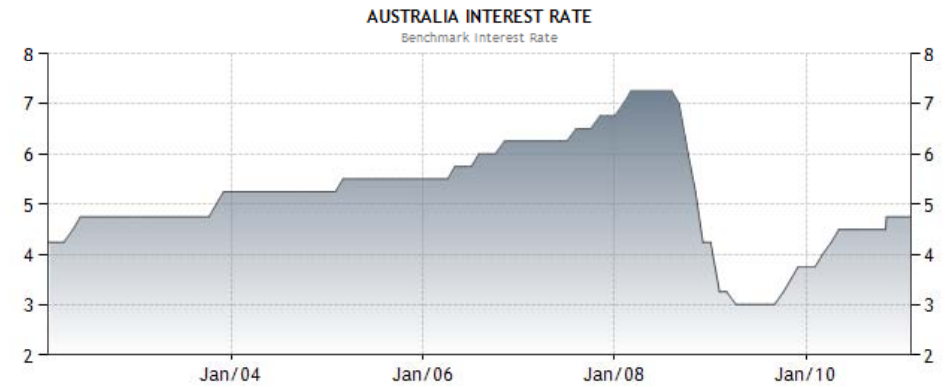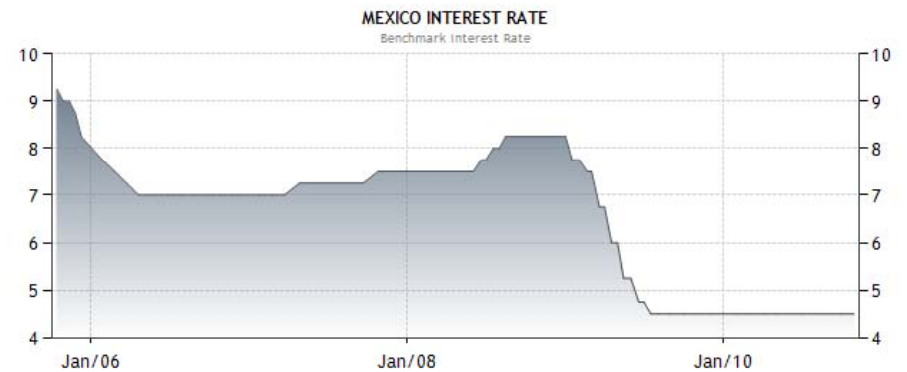


Courtesy of Trading Economics, www.tradingeconomics.com. Used with permission.

# Annual Inflation Rates

| Country | Inflation Rate | Country2 | Inflation Rate3 |
|---|---|---|---|
| Venezuela | 26.80% | Denmark | 2.60% |
| Pakistan | 15.48% | Euro Area | 2.50% |
| Argentina | 10.90% | Finland | 2.50% |
| Russia | 9.60% | Chile | 2.50% |
| India | 9.47% | Iceland | 2.50% |
| Indonesia | 7.02% | Canada | 2.40% |
| Brazil | 5.99% | Luxembourg | 2.31% |
| Saudi Arabia | 5.80% | Sweden | 2.30% |
| Estonia | 5.72% | Portugal | 2.30% |
| Turkey | 4.90% | Peru | 2.17% |
| Greece | 4.90% | Italy | 2.10% |
| Hungary | 4.70% | Norway | 2.00% |
| China | 4.60% | Malaysia | 2.00% |
| Singapore | 4.60% | Germany | 1.90% |
| South Korea | 4.10% | Austria | 1.80% |
| New Zealand | 4.00% | France | 1.70% |
| Mexico | 3.78% | Czech Republic | 1.70% |
| United Kingdom | 3.70% | Netherlands | 1.60% |
| South Africa | 3.50% | United Arab Emirates | 1.56% |
| Spain | 3.30% | United States | 1.50% |
| Colombia | 3.17% | Slovenia | 1.40% |
| Poland | 3.10% | Taiwan | 1.25% |
| Thailand | 3.03% | Ireland | 0.60% |
| Hong Kong | 2.90% | Slovakia | 0.60% |
| Belgium | 2.86% | Switzerland | 0.30% |
| Australia | 2.70% | Japan | 0.00% |
| Israel | 2.70% | | |

# How is inflation measured?

- Price Index
  - Basket of goods →monitor price over time

| Product | Price January | Price February | Price March |
|---------|---------------|----------------|-------------|
| Coca-Cola | $1.50 | $1.50 | $2.00 |
| Muffin | $1.20 | $1.40 | $1.80 |
| Slice Pizza | $2 | $3 | $4 |
| Total Cost | $4.70 | $5.90 | $7.80 |
| | | | |
| Price Index | 100 | 125 | 166 |
| Inflation | | 25% | 32.8% |

# How is inflation measured?

- Consumer Price Index (CPI) : representaive basket of goods and services consumed→ used to adjust for cost of living

# How is inflation measured?

- Traditional Data Collection method:
  - Hundreds of government employees go to physical stores and check the prices for 80 thousand items, once or twice a month
  - Delay of 15 days in the US (so January's inflation is reported on March 15th) → often worse in other countries
  - High Cost: BLS budget 2011 = $645 millions, ~$234 millions to construct the CPI.

# Critiques to CPI

- Quality changes in a product → hedonics
- New products → introduced much later in index
- True cost of living? No account for product substitution → e.g. meat becomes more expensive → people buy chicken instead
- Subject to manipulation by some governments

# The Case of Argentina

- Inflation grew steadily until 2006, peaking at 12%.
- In January 2007, the government replaced the people responsible for constructing the CPI.
- Since then, official statistics have reported a steady inflation rate of 8-9%
- Widespread suspicion that these numbers are unreliable.
  - INDEC introduced "methodological changes" that were not disclosed
  - Prices from "government approved" lists appear to be used
  - Some series stopped being reported altogether
  - Employees of INDEC denounced a manipulation of price series
  - Increasingly disconnected from consumer's perceptions

# The Case of Argentina



ARGENTINA INFLATION RATE
Annual Change on Consumer Price Index

source: TradingEconomics.com; Instituto Nacional de Estadist

Courtesy of Trading Economics, www.tradingeconomics.com. Used with permission.



Inflation Expectations (Di Tella University)
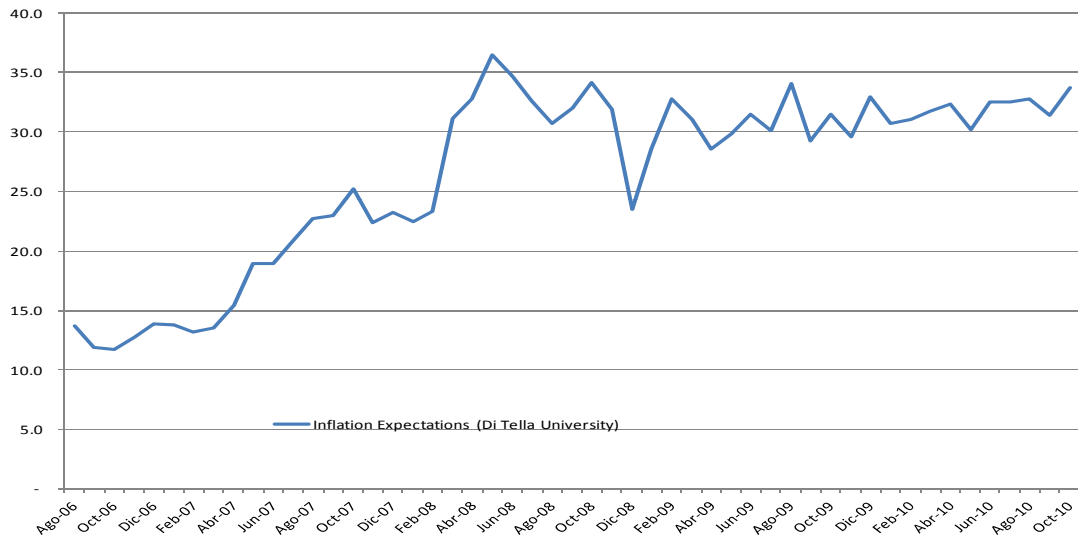
# How is inflation measured?

- The MIT Sloan way:
  - Billion Prices Project  http://bpp.mit.edu
  - Use online prices to construct real-time inflation indicators around the world
  - Started in 2007
  - Groceries, Household goods, Electronics, Apparel, Drugstores, Furniture, Entertainment and Real Estate
  - Currently monitoring 5 million daily items in 70 countries

# How do we collect data?

- Our prices are collected from public online sources, using a technique called "web scraping."

- A software downloads a webpage, analyses the html code, "scrapes" price data, and stores it in a database.

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# The Billion Prices Project @ MIT

Search

The Billion Prices Project is an academic initiative that collects prices from hundreds of online retailers around the world on a daily basis to conduct economic research. We currently monitor daily price fluctuations of ~5 million items sold by ~300 online retailers in more than 70 countries.

This webpage showcases examples of average inflation indexes that we created to illustrate the type of statistical work that can be done with this type of data. Our team is currently working on developing econometric models that leverage the data to forecast future trends and conduct economic research.

## BPP Geographic Coverage



Daily Price Index Available    Collecting Data
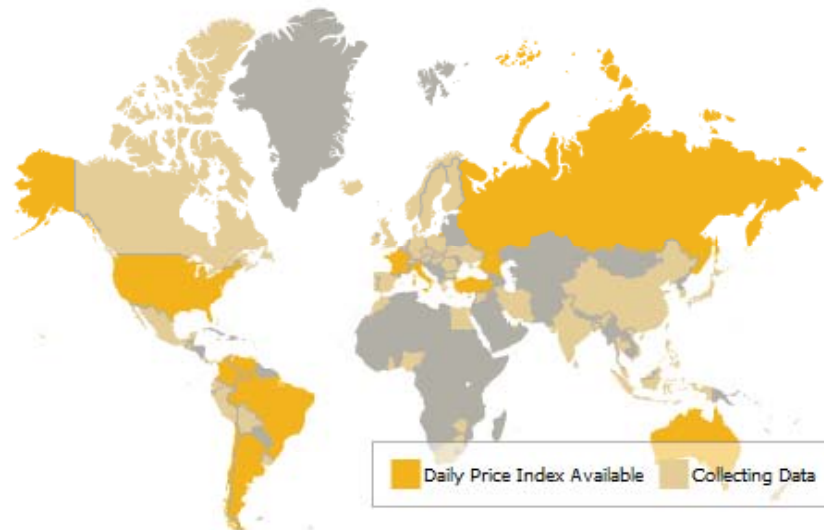
## Annual Inflation
(daily estimate based on the previous 365 days)
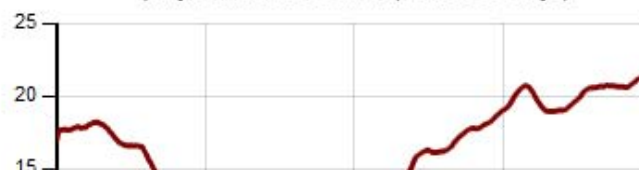


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-Click on each graph's legend icons to show/hide a variable
-Place the mouse over the graph lines to see daily values
-Click and drag the mouse to zoom in on a range of dates

### BPP DATABASE KEY FACTS
-Statistics updated every day
-5 million individual items
-70 countries
-Started in October of 2007
-Supermarkets, electronics, apparel, furniture, real estate, and more

### FINANCIAL AND RESEARCH SUPPORT

**MIT**Sloan
MANAGEMENT

**Massachusetts Institute of Technology**

MIT's Undergraduate Research Opportunities Program  **UROP**

### LINKS

# Advantages of the BPP

- Inflation Measurement
  - Daily information
  - Faster access to data→ detect changes in trend very quickly
  - Larger samples for some categories of goods (500K items in the US alone, vs 80K by the BLS)
  - Identical methodology across countries

- We can also study sticky-prices over time→ slope of AS and expectations→ effects of policies on inflation and output

# Some Results

- [US inflation](#)
- [Argentina](#)
- China, price controls, tightening

# Next Classes

- Friday: Banks
- Tuesday: Exchange rates (theory)
- Wednesday: Argentina's Case
  - Look for these dimensions in each crisis:
    - Fiscal policy
    - Monetary policy
    - Debt
    - Social problems

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