The Global Economy

Government Debt & Deficits

NYU STERN

The idea

- Governments issue debt when spending exceeds revenue. When they issue too much debt, investors bail out, possibly triggering a crisis.
- Open question: how much is "too much"?

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The US

- Do we have budget problems?
- How would you make a case either way?
- What evidence would you point to?

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The US

- "Krugman declares bankruptcy," *Daily Currant*, March 2013
  - Economist and columnist Paul Krugman declared personal bankruptcy today following a failed attempt to spend his way out of debt. … Rather than tighten his belt, the economist decided to "stimulate" his way to a personal recovery by investing in expenses he hoped would one day boost his income.
- What are they saying? Do you agree?

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Roadmap

- Macroeconomic crises
- Words and pictures
- Debt arithmetic
- **Debt dynamics**
- What's missing?
- Is the US in trouble?

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Macroeconomic crises

1

Macroeconomic crises

- New module
- The classic crisis triggers
  - Sovereign debt ("debt crisis")
  - Financial fragility ("financial crisis")
  - Fixed exchange rates ("exchange rate crisis")
- What was/is the trigger in
  - Japan in the 1990s?
  - Mexico in 1994?
  - The US in 2008?
  - Europe today? (Greece, Ireland, Portugal, Spain, Italy…)

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Words & pictures

Words

- Alexander Hamilton, *Second Report on Public Credit*, 1795
  - Every system of Public Credit must assume as a fundamental principle the ability to pay the debt which it contracts. With the creation of debt should be incorporated the means of extinguishment.
- What is he saying? Do you agree?

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Words

- Thomas Sargent, October 2011:
  - Here's a phrase that you hear. You hear that US fiscal policy is unsustainable. You hear it from both parties. What they mean is that certain promises people have made – taxes, entitlements, medicare, medicaid – those are incredible, they don't fit together. So US fiscal policy is very uncertain. It's uncertain because it's not clear which of these promises is going to be broken first.
- What is he saying? Do you agree?

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Words

- Walter Wriston, 1987:
  - Countries don't go out of business. ... The infrastructure doesn't go away, the productivity of the people doesn't go away, the natural resources don't go away. And so their assets always exceed their liabilities, which is the technical reason for bankruptcy. And that's very different from a company.
- What is he saying? Do you agree?
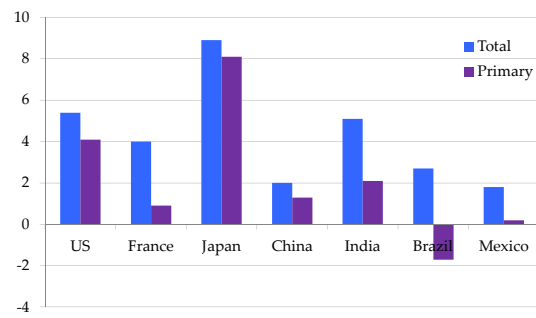
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Libertad

- October 2012
  - The ARA Libertad, a training ship owned by the Argentine navy, was detained in Ghana at the request of Elliott Capital Management, a hedge fund run by Paul Singer.
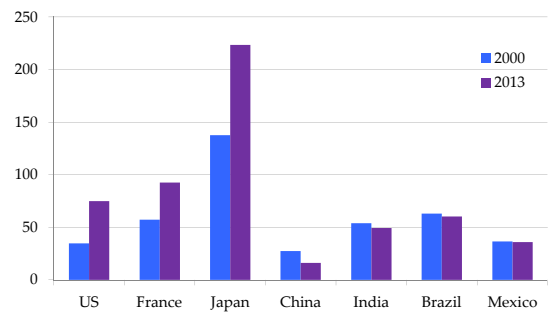- What's going on here?

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Government deficits (% of GDP, 2013)

Chart: Bar chart with Total (blue) and Primary (purple) series for US, France, Japan, China, India, Brazil, Mexico. Y-axis from -4 to 10.

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Government debt (% of GDP)

Chart: Bar chart with 2000 (blue) and 2013 (purple) series for US, France, Japan, China, India, Brazil, Mexico. Y-axis from 0 to 250.

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Debt arithmetic

Government budget: Principle #1

- Principle #1 of fiscal policy
  - Government spending must be financed with tax revenue, either now or in the future

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Government budget: ingredients

- Government spending in year t

$$G_t + V_t + i_t B_{t-1}$$

  - G = government purchases of goods and services
  - V = government spending on transfers
  - i = interest rate on debt B
- Government tax revenue in year t

$$T_t$$

- Government debt at end of year t-1, start of year t

$$B_{t-1}$$

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Government budget: US, $b, 2011

Revenue	4,120
Tax revenue	3,230
Social insurance contributions	931
Expenses	**5,410**
Goods, services, and employee comp	2,611
Transfer payments	2,371
Interest on debt	428
Surplus	**−1,249**

For reference: GDP = 15,094

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Government budget

- Budget (cash flow out = cash flow in)
$$G_t + V_t + i_t B_{t-1} = T_t + B_t - B_{t-1}$$
  Spending = Tax Revenue + Change in Debt
- Government deficit
$$(G_t + V_t + i_t B_{t-1}) - T_t$$
- Primary deficit (excl interest)
$$D_t = G_t + V_t - T_t$$
  (replace three symbols with one)

Government budget arithmetic

- Primary deficit (excl interest)
$$D_t = (G_t + V_t) - T_t$$
- Budget becomes
$$G_t + V_t + i_t B_{t-1} - T_t = B_t - B_{t-1}$$
$$D_t + i_t B_{t-1} = B_t - B_{t-1}$$
- The point: this is how debt is connected to deficits
  - Past debt incurs interest expense
  - Current deficits lead to increases in debt

Government budget arithmetic

- Looking back in time
- Where does debt come from?
$$D_t + i_t B_{t-1} = B_t - B_{t-1}$$
$$\Rightarrow \ B_t = D_t + (1+i_t)B_{t-1}$$
$$= D_t + (1+i_t) D_{t-1} + (1+i_t)(1+i_{t-1})D_{t-2} \ldots$$
- Answer: debt = past primary deficits plus interest

Government budget arithmetic

- Looking forward in time
- Where does debt lead? [kill t on i_t for simplicity]
$$D_t + i B_{t-1} = B_t - B_{t-1}$$
$$\Rightarrow \ B_{t-1} = -D_t/(1+i) + B_{t-1}/(1+i)$$
$$= -D_t/(1+i) - D_{t+1}/(1+i)^2 - D_{t+2}/(1+i)^2 \ldots$$
- Answer: debt = present value of future primary surpluses
  - Debt today is a promise to run surpluses in the future

Government budget: Principle #1

- Principle #1 of fiscal policy
  - Government spending must be financed with tax revenue, either now or in the future.
- That's what the arithmetic says

Debt dynamics

Debt dynamics

- Focus: ratio of debt to GDP – B/Y
- What makes B/Y change over time?
- Two ways to reduce B/Y
  - Decrease debt
  - Increase output
- Here's how that works …

Debt dynamics

- We usually look at debt and deficits as ratios to GDP
- How do they change over time?
- Growth of (nominal) debt

$$[1] \quad B_t = (1+i_t)B_{t-1} + D_t$$

- Growth of (nominal) GDP

$$[2] \quad Y_t = (1+g_t+\pi_t) Y_{t-1}$$

- Both numerator and denominator of B/Y change

Debt dynamics

- Reminder:

$$[1] \quad B_t = (1+i_t)B_{t-1} + D_t$$
$$[2] \quad Y_t = (1+g_t+\pi_t)Y_{t-1}$$

- Summary [1]/[2]

$$B_t/Y_t = [(1+i_t)/(1+g_t+\pi_t)] B_{t-1}/Y_{t-1} + D_t/Y_t$$
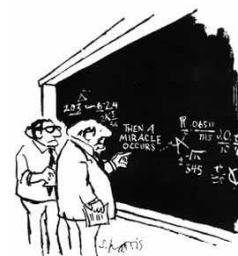$$\approx [1+i_t-(g_t+\pi_t)] B_{t-1}/Y_{t-1} + D_t/Y_t$$
$$\approx B_{t-1}/Y_{t-1} + (i_t-\pi_t)B_{t-1}/Y_{t-1} - g_tB_{t-1}/Y_{t-1} + D_t/Y_t$$
$$\Delta(B_t/Y_t) = (i_t-\pi_t)B_{t-1}/Y_{t-1} - g_tB_{t-1}/Y_{t-1} + D_t/Y_t$$

Debt dynamics

- More on that last step

"I think you should be more explicit here in step two."

Debt dynamics

- Ok, what are we left with?

$$\Delta(B_t/Y_t) = (i_t-\pi_t)B_{t-1}/Y_{t-1} - g_tB_{t-1}/Y_{t-1} + D_t/Y_t$$
$$\qquad\qquad\qquad (A) \qquad\quad (B) \qquad (C)$$

  - (A): interest on debt at (real) interest rate r = i−π
  - (B): real GDP growth at rate g
  - (C): (primary) deficit D

Debt dynamics

- In case you forgot

$$\Delta(B_t/Y_t) = (i_t-\pi_t)B_{t-1}/Y_{t-1} - g_tB_{t-1}/Y_{t-1} + D_t/Y_t$$

- Dealing with percentages
  - We need to convert (i, π, g) to numbers: 0.05, not 5\%
  - But it's convenient to keep (B/Y) and (D/Y) as percentages of GDP

Debt dynamics in Brazil

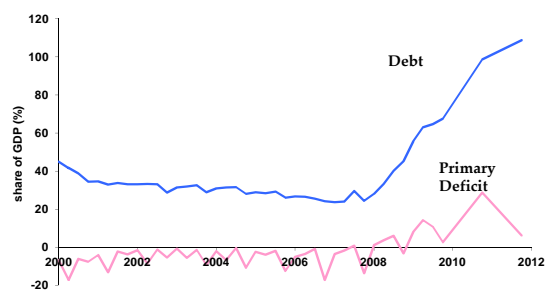|	
Total deficit (% GDP)	2.5
Primary deficit (% GDP)	−2.9
Interest rate (money market, %)	9.4
Inflation rate (%)	5.5
Real GDP growth rate (%)	3.3
Public debt (% GDP, previous year end)	53.2

Is B/Y going up or down? Why?

Debt dynamics in Brazil

$$\Delta(B_t/Y_t) = (i_t - \pi_t)B_{t-1}/Y_{t-1} - g_t B_{t-1}/Y_{t-1} + D_t/Y_t$$

Debt dynamics in Ireland

Debt dynamics in Ireland

Total deficit (% GDP)	9.1
Primary deficit (% GDP)	7.0
Interest rate (money market, %)	1.1
Inflation rate (%)	1.1
Real GDP growth rate (%)	−1.0
Public debt (% GDP, previous year end)	105.4

Is B/Y going up or down? Why?

Debt dynamics in Ireland

$$\Delta(B_t/Y_t) = (i_t - \pi_t) B_{t-1}/Y_{t-1} - g_t B_{t-1}/Y_{t-1} + D_t/Y_t$$

Debt dynamics in Portugal

Total deficit (% GDP)	6.4
Primary deficit (% GDP)	2.3
Interest rate (money market, %)	0.6
Inflation rate (%)	2.8
Real GDP growth rate (%)	−3.2
Public debt (% GDP, 2012 year end)	108.1

Is B/Y going up or down? Why?

Debt dynamics in Portugal

$$\Delta(B_t/Y_t) = (i_t - \pi_t) B_{t-1}/Y_{t-1} - g_t B_{t-1}/Y_{t-1} + D_t/Y_t$$

Debt dynamics in Portugal

- From the EIU report
  - Portugal faces a severe economic adjustment. Its bail-out via the EU/IMF/European Central Bank (ECB) ("Troika") entails tough fiscal consolidation and structural reforms, which could threaten political stability.
  - A decision by the Constitutional Court in April 2013 to strike down public-sector wage and pension cuts will force the government to find new expenditure savings, jeopardising budget targets.
  - Despite a substantial hike in taxes, the deficit is likely to remain around 6% of GDP in 2013, above the agreed target of 5% of GDP.
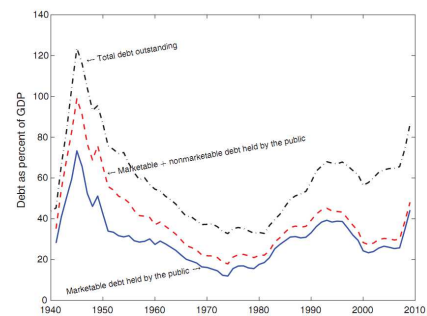
What happened to Peru's debt?

- Debt-to-GDP fell from 47.1% to 25.0% [total change in B/Y = −22.1%]
- Why?

	Debt B_t/Y_t	Interest $(i_t - \pi_t)B_{t-1}/Y_{t-1}$	Growth $-g_t B_{t-1}/Y_{t-1}$	Deficit D_t/Y_t
2003	47.1			
2004	44.3	0.2	−2.4	−0.6
2005	37.7	1.1	−3.0	−4.6
2006	33.1	1.0	−2.9	−2.7
2007	20.9	1.1	−2.9	−0.4
2008	25.0	−0.3	−3.0	−2.5
Sum		3.1	−14.3	−10.9

Source: Global Economy book.

What happened to US WW II debt?

Source: Hall and Sargent.

What happened to US WW II debt?

- Debt-to-GDP fell from 66% in 1945 to 11% in 1974 [a change of −55%]
- Why?

	Interest $(i_t - \pi_t)B_{t-1}/Y_{t-1}$	Growth $-g_t B_{t-1}/Y_{t-1}$	Primary Deficit D_t/Y_t
1945-1974	−12.5	−21.6	−20.8

Source: Hall and Sargent.

What's missing?

What's missing?

- Hidden liabilities
- Like what?
  - Unfunded pensions
  - Financial bailouts
  - Implicit guarantees of businesses or regional governments
- Examples?

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What's missing?

- The impact of growth on tax revenue
- GDP growth
  - Affects B/Y directly
  - Also raises tax revenue, reduces primary deficit
  - Overall: the best cure for debt problems (also the converse)
- Examples?

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What's missing?

- The impact of debt in the interest rate
- Interest rate can rise sharply if investors become concerned with repayment
  - Direct impact on changes in debt through $r = i - \pi$
- When does it happen?
- Examples?

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What's missing?

- Maturity of debt
- Short debt needs to be rolled over
  - Interest rate could rise quickly
  - Or you could be shut out of markets altogether
- Examples?

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Is the US in trouble?

Is the US in trouble?

- Large current deficits
- Growing debt
- **Significant increases in future spending in pipeline**
- Blinder and Hubbard, Wash Post, Sept 19, 2011
  - The (total) deficit is forecast by the CBO to reach 15.5% of GDP by 2035. By then, the national debt would be 187% of GDP. The main culprit is increased health care spending, which CBO projects to rise from 5.6% of GDP now to 10.4% by 2035.
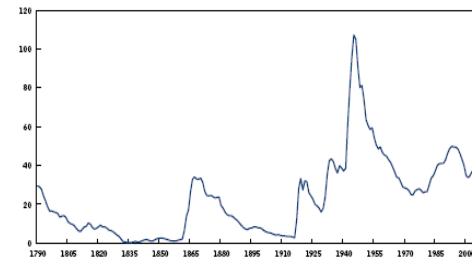
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Is the US in trouble?

- Helpful resource: CBO reports
  - http://www.cbo.gov/publication/43288
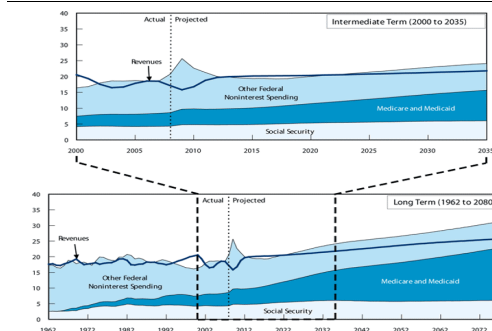
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US government debt

Figure 1-3.
Federal Debt Held by the Public as a Percentage of GDP, 1790 to 2004

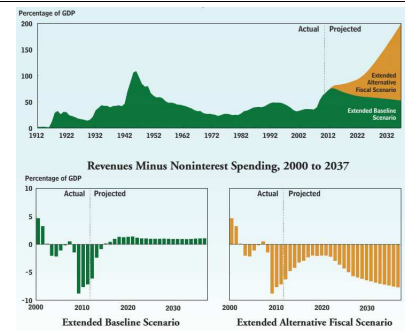Source: CBO.   50

US government expenses & revenues

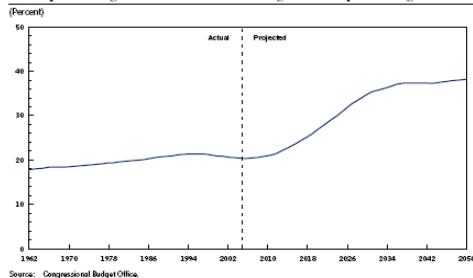Source: CBO.   51

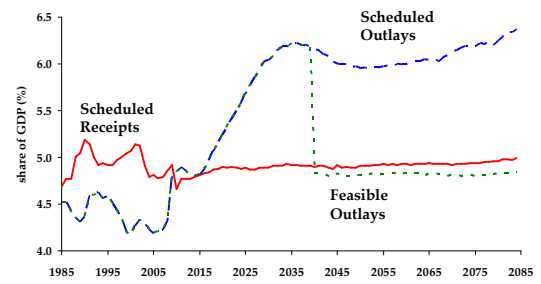## US government expenses & revenues

Source: CBO.   52

Demographics

Figure 2-2.
The Population Age 65 or Older as a Percentage of the Population Ages 20 to 64

Source: CBO.   53

Social Security outlays and receipts

Source: CBO.   54

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Social Security "fixes"

- Solutions
  - Increase the payroll tax – or other taxes
  - Reduce benefits
  - Raise retirement age
  - Reduce cost-of-living adjustments
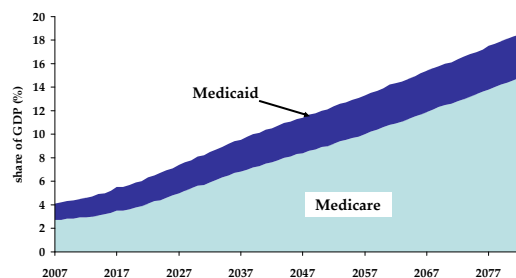- Congressional Budget Office analysis (2010)
  - http://www.cbo.gov/doc.cfm?index=11580

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Medicare and Medicaid

- Medicare: age 65 and older
  - Parts A&B cover hospital and physician care
  - Part D (2006) covers drugs
  - Funded by payroll tax and general revenues
- Medicaid: poor (joint state-federal program)
  - Federal government share about 57%
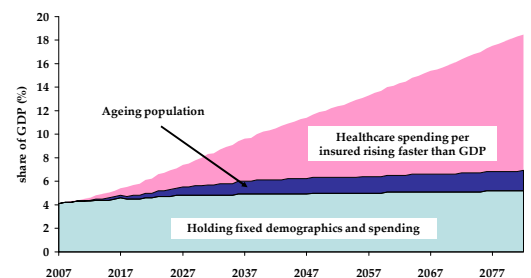 - States set rules subject to federal approval

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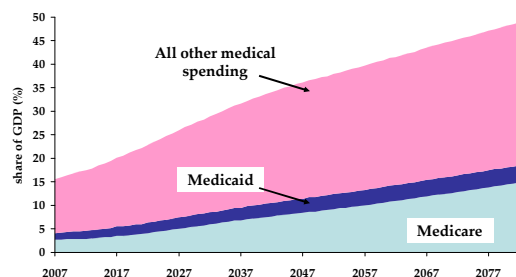## Medicare and Medicaid

Source: CBO, http://www.cbo.gov/ftpdocs/87xx/doc8758/11-13-LT-Health.pdf

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Medicare and Medicaid

Source: CBO, http://www.cbo.gov/ftpdocs/87xx/doc8758/11-13-LT-Health.pdf

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Medicare and Medicaid

source: http://www.cbo.gov/ftpdocs/87xx/doc8758/11-13-LT-Health.pdf

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Medicare and Medicaid "fixes"

- Health care system as a whole is a mess
- What can be done for Medicare and Medicaid?
  - Spending needs to be paid for
  - Either raise taxes: by a lot!
  - Or reduce benefits: but how?
- The central budget issue of our time

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What have we learned?

- Government budgets: deficits are financed by
  - By issuing debt today
  - And running (primary) surpluses in the future
- Standard tool
  - Debt dynamics equation (look for red box)
- Signs of trouble
  - Too much debt
  - Continuing deficits
  - Weak political system
- US faces questions about future healthcare spending

The Global Economy

Foreign Exchange

NYU STERN

The ideas

- Exchange rates are …
  - Relative prices of currencies [dollar price of one euro]
  - Source of variation in costs, revenues, etc
  - Where sensible theories come to die

The question

- What do you think will happen to the euro over the next six months?

Announcement

- Special class meetings
  - Right after final exam
  - Malt House, 206 Thompson, just north of Bleecker

What's happening?

- Vincent Reinhart, Adam Parker, and Neil McLeish of Morgan Stanley"
  - Key takeaways from Morgan Stanley's 13th annual DC Macro Forum, include: As long as Global Monetary Expansion rules, we stick with our strategic preference for equities over credit over government bonds.
- What's going on here? Do you agree?

Roadmap

- Heineken USA
- Words and pictures
- Exchange rates and prices ("PPP anchor")
- Exchange rates and interest rates ("carry trade")

Heineken USA

- What's your margin at the current exchange rate?
- How likely is a rise in the euro of 10-15%? A fall?
- What happens to your margin if the euro rises 15%?
- What response do you recommend?

Words & pictures

Words

- Alan Greenspan, "The euro as an international currency," November 2001
  - Having endeavored to forecast exchange rates for more than half a century, I have developed significant humility about my ability in this area, a sentiment I suspect many in this room share.

Words

- Warren Buffett, Letter to Shareholders, 2005
  - Berkshire owned about $21.4 billion of foreign exchange contracts at yearend, spread among 12 currencies. Holding of this kind are a change for us. But the evidence grows that our trade [deficit] will put unremitting pressure on the dollar for many years to come.
- Positions closed 2 years later at a loss.

Words

- Jean-Paul Villain, head of strategy, ADIA, 2010
  - We came to a very firm conclusion: we simply don't know how to trade currencies.

Words

- Anonymous hedge fund trader, n+1, 2008:
  - From time to time, the dollar's been very weak; from time to time it's strong. … Over the very long term, currency prices tend to be fairly stable and mean reverting. So the dollar's weak today, but that's no reason to believe it's going to be weak forever. It's amazing how many brilliant investors have gotten egg on their faces trading G-7 crosses.
- What is he saying? Does it make sense?

Words

- Michael Feroli, Chief US Economist, JP Morgan Chase
  - No framework works very well. Currency prices remain somewhat of a mystery.
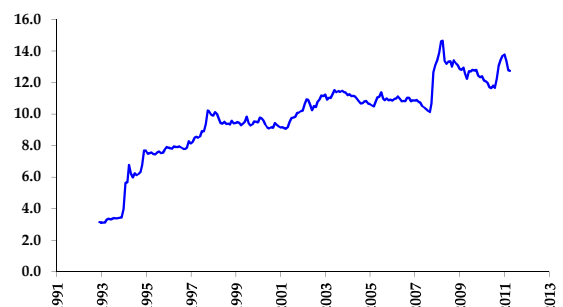- What is he saying? Does it make sense?

Yen per dollar
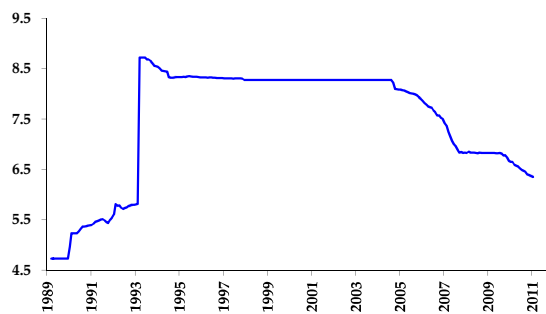

Source: Fed via FRED.

Dollars per euro

Source: Fed via FRED.

Dollars per euro

Source: Ticker sense.

Pesos per dollar

Source: Fed via FRED.

Yuan per dollar

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Exchange rates & prices

Exchange rates

- Exchange rate terminology
  - e = **exchange rate** : dollar price of one unit of euro
  - If e rises, we say the dollar has **depreciated** (declined in value)
  - If e falls, we say the dollar has **appreciated** (increased in value)
  - The reverse, of course, for the euro
- The facts
  - e's for many currencies move around a lot
  - Annual std dev of stock market ~18%, dollar/euro ~12%
- Why?

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Exchange rates and prices

- The idea
  - Exchange rates reflect differences in prices of goods
  - Prices look high in Paris, but if we convert them to dollars using the exchange rate, they should be about the same as New York
  - We call this "purchasing power parity" (PPP)
- What we'll find
  - Crude approximation, but useful as long-term anchor
- What we say
  - If prices are high in Paris, we say the euro is overvalued [it's all relative: we also say dollar is undervalued]

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Exchange rates and prices

- Define
  - P = domestic price (measured in dollars)
  - P* = foreign price (measured in euros)
  - e = exchange rate (dollar price of one euro)
- Compare P with eP*

$$P \ ?=? \ e \ P^*$$

$$e \ ?=? \ P/P^*$$

$$RER = e \ P^*/P \ ?=? \ 1$$

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Exchange rates and prices

Region	USD Price of Big Mac (Jan 2013)
US	4.37
Euro area	4.88
Japan	3.51
China	2.57
India	1.67
Brazil	5.64
Mexico	2.90

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Exchange rates and prices

- Big Macs
  - Why are prices so low in China?
  - Ditto India?
  - Why so high in Brazil?
- How would you expect exchange rates to change?
- How fast?
- Are Big Macs typical?

Exchange rates and prices

The Big Mac index
Local currency under(-)/over(+) valuation against the dollar, %

	Big Mac price*, $
Norway	7.84
Switzerland	7.12
Brazil	5.64
Canada	5.39
Australia	4.90
Euro area†	4.88
United States‡	4.37
Britain	4.25
Japan	3.51
Mexico	2.90
Indonesia	2.86
China§	2.57
Russia	2.43
Egypt	2.39
Hong Kong	2.19
South Africa	2.03
India**	1.67

*At market exchange rates (Jan 30th 2013)
†Weighted average of member countries
‡Average of four cities §Average of five cities
Sources: McDonald's; *The Economist*   **Maharaja Mac

- Which currencies are "overvalued"?
- Which currencies are "undervalued"?
- Why?

Exchange rates and prices

- Suppose we used price indexes instead of Big Macs
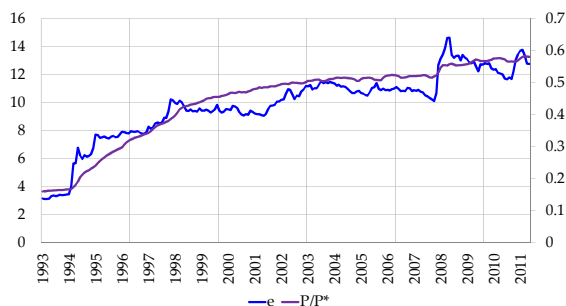- Do we see

$$e \;=\; P/P^*?$$

Exchange rates and prices

- Convention: home is country fx is quoted in
  - Dollars per pound: home=US, foreign=UK
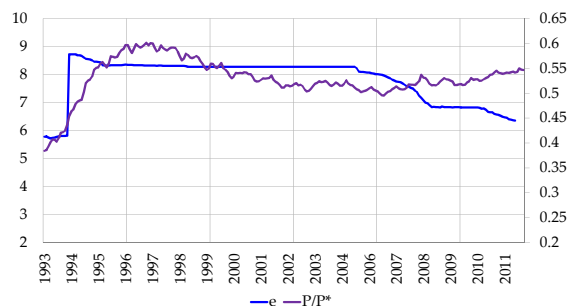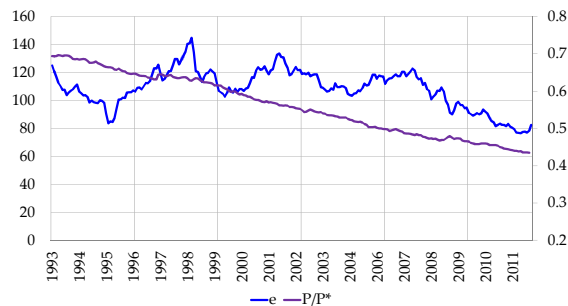 - Yen per dollar: home=Japan, foreign=US

Pesos per dollar

Legend: e — P/P*

Yuan per dollar

Legend: e — P/P*

Yen per dollar

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Dollars per euro
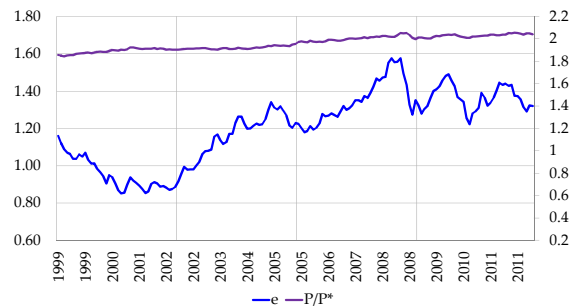
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Exchange rates and prices

- Summary
- Dollar v peso
  - Large movements in P/P* reflected in e
  - Still lots of variation in RER
- Dollar v euro
  - Little variation in P/P*
  - Movements in e therefore similar to movements in RER

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Exchange rates and prices
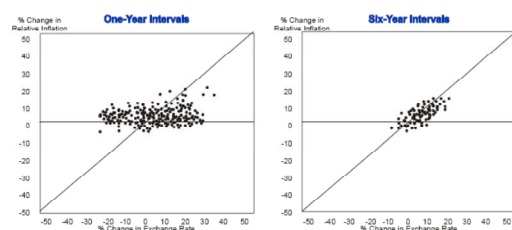
- One last try
- PPP says

$$e = P/P^*$$

Rate of Change of e = Rate of Change of P/P*

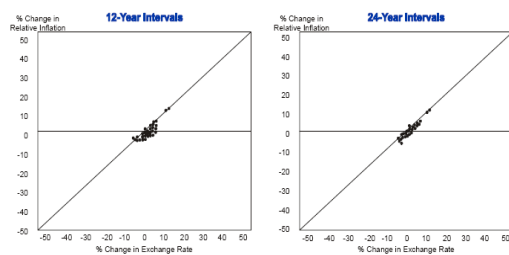- Let's look at this over different time intervals

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Exchange rates and prices

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Exchange rates and prices

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Exchange rates and prices

- Summary of PPP
- An approximation that works best
  - When there are large differences in inflation rates
  - And over long periods of time

Exchange rates & interest rates

Exchange rates and interest rates

- If two countries have different interest rates, the one with the higher rate will tend to appreciate
- R^2 small (<0.05) but that's enough to make money
- More coming …

Exchange rates and interest rates

Region	Money market rate (local currency)
US	0.28
Euro area	0.21
Japan	0.16
China	3.89
India	7.68
Brazil	7.47
Mexico	4.33

Source: The Economist.

Exchange rates and interest rates

- Why do interest rates differ across countries/currencies?
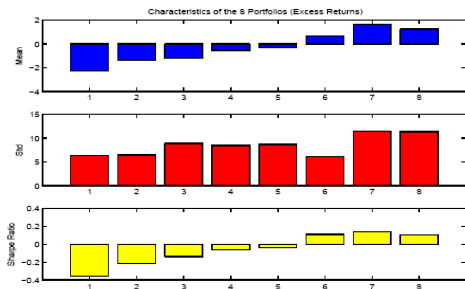- Do global capital markets equate expected returns?

Exchange rates and interest rates

- The "carry trade"
  - Long position in high interest rate currency
  - Short position in low interest rate currency
  - Carry: collect difference in interest rates
  - Risk: the low-rate currency will rise
- Does it work?
  - Most of the time, yes
  - Why?

Exchange rates and interest rates

Characteristics of the 8 Portfolios (Excess Returns)
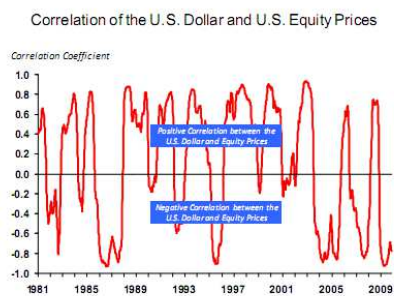
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Exchange rates and interest rates

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Exchange rates & anything else?

Exchange rates and …

- Trade balance?
- GDP growth?
- Stock market?

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Exchange rates and stock prices

Correlation of the U.S. Dollar and U.S. Equity Prices

Correlation Coefficient

Positive Correlation between the U.S. Dollar and Equity Prices

Negative Correlation between the U.S. Dollar and Equity Prices

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What have we learned?

- Exchange rates are variable, affect costs, revenues, etc, in international transactions
- In the short run, most of this variation is unpredictable, even inexplicable
- In the long run, exchange rates roughly mirror ratios of prices (PPP)

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For the ride home

- Is China's currency "too cheap"?

- What does that mean?

- What evidence would tell us one way or the other?