
The Global Economy

Government Debt & Deficits



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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Roadmap

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

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Macroeconomic crises

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
 - The US in 2008?
 - Mexico in 1994?
 - Europe today? (Greece, Ireland, Spain, ...)

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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?

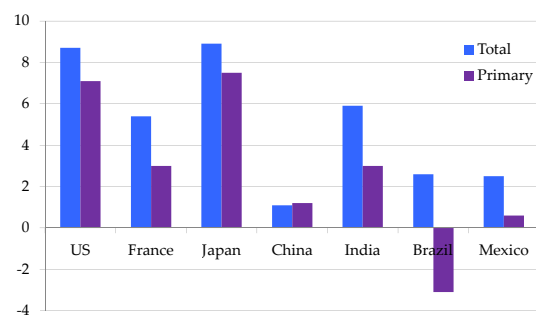
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Words

- Angela Merkel, *Financial Times*, March 2009
 - The German chancellor warns world leaders against pumping too much money into reviving global growth, saying such action would create an “unsustainable” recovery. She rejected calls to spend more public money in Germany as part of a coordinated stimulus program.
- What is she saying? Do you agree?

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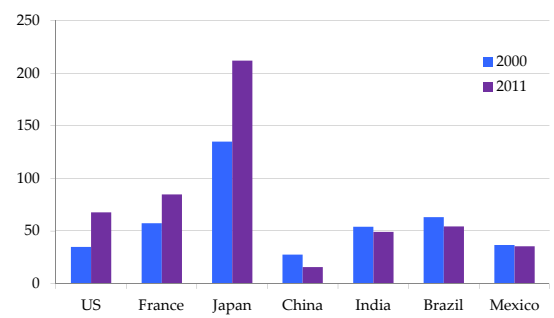
Government deficits (2011, % of GDP)



Source: EIU CountryData.

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Government debt (2000, 2011, % of GDP)



Source: EIU CountryData.

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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

- Budget (cash flow out = cash flow in)

$$G_t + V_t + i_t B_{t-1} = T_t + B_t - B_{t-1}$$

$$\text{Spending} = \text{Tax Revenue} + \text{Change in Debt}$$

- 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)

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Government budget: US, 2011, \$b

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

Source: BEA, Table 3.1, aggregated.

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Government budget

- Reminder

$$G_t + V_t + i_t B_{t-1} = T_t + B_t - B_{t-1}$$

$$\text{Spending} = \text{Tax Revenue} + \text{Change in Debt}$$

- How can spending be financed?

- Tax revenue
- Debt [but is there a limit?]

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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

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Government budget arithmetic

- Looking back in time

- Where does debt come from?

$$D_t + i_t B_{t-1} = B_t - B_{t-1}$$

$$\Rightarrow B_t = D_t + (1+i_t) B_{t-1}$$

$$= D_t + (1+i_t) D_{t-1} + B_{t-2}$$

- Answer: debt = past primary deficits plus interest

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Government budget arithmetic

- Looking forward in time
- Where does debt lead? [kill t on i_t for simplicity]

$$\begin{aligned} D_t + iB_{t-1} &= B_t - B_{t-1} \\ \Rightarrow B_{t-1} &= -D_t/(1+i) + B_{t-1}/(1+i) \\ &= -D_t/(1+i) - D_{t+1}/(1+i)^2 + B_{t+2}/(1+i)^2 \end{aligned}$$

- Answer: debt = present value of future primary surpluses
 - Debt today is a promise to run surpluses in the future

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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

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Debt dynamics

Debt dynamics

- What makes ratio of debt B to GDP Y change over time?
- Both numerator and denominator can change
- Two ways to reduce B/Y
 - Decrease debt
 - Increase output
- Here's how that works ...

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Debt dynamics

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

$$\begin{aligned} [1] \quad B_t &= (1+i) B_{t-1} + D_t \\ &= (1+r+\pi) B_{t-1} + D_t \end{aligned}$$

- Growth of (nominal) GDP

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

- Both numerator and denominator of B/Y change

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Debt dynamics

- Reminder:

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

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

- Summary

$$\begin{aligned} B_t/Y_t &= [(1+r+\pi)/(1+g+\pi)] B_{t-1}/Y_{t-1} + D_t/Y_t \\ &\approx (1+r-g) B_{t-1}/Y_{t-1} + D_t/Y_t \\ &\approx B_{t-1}/Y_{t-1} + r B_{t-1}/Y_{t-1} - g B_{t-1}/Y_{t-1} + D_t/Y_t \\ \Delta(B_t/Y_t) &= r B_{t-1}/Y_{t-1} - g B_{t-1}/Y_{t-1} + D_t/Y_t \end{aligned}$$

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Debt dynamics

- Ok, what are we left with?

$$\Delta(B_t/Y_t) = r B_{t-1}/Y_{t-1} - g B_{t-1}/Y_{t-1} + D_t/Y_t$$

(A) (B) (C)

- (A): interest on debt
- (B): growth in the economy
- (C): (primary) deficit

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Debt dynamics in Brazil

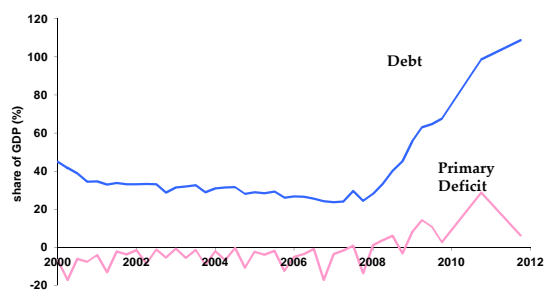
Primary deficit (% GDP)	–2.9
Interest on debt (%)	5.4
Interest rate (money market, %)	9.4
Inflation rate (%)	5.5
Real GDP growth rate (%)	3.3
Public debt (% GDP, 2010 year end)	53.2

Is B/Y going up or down? Why?

Source: EIU, Country Report.

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Debt dynamics in Ireland



Source: EIU, Country Report.

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Debt dynamics in Ireland

Primary deficit (% GDP)	7.0
Interest on debt (%)	2.1
Interest rate (money market, %)	1.1
Inflation rate (%)	1.1
Real GDP growth rate (%)	–1.0
Public debt (% GDP, 2010 year end)	105.4

Is B/Y going up or down? Why?

Source: EIU, Country Report.

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What happened to Peru's debt?

- Debt-to-GDP fell from 47.1% to 25.0%
- Why?

	Debt/GDP B_{t-1}/Y_{t-1}	Interest $(i - \pi)B_{t-1}/Y_{t-1}$	Growth $-gB_{t-1}/Y_{t-1}$	Primary 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

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What happened to US WW II debt?

- Debt-to-GDP fell from 66% in 1945 to 11% in 1974
- Why?

	Interest $(i - \pi)B_{t-1}/Y_{t-1}$	Growth $-gB_{t-1}/Y_{t-1}$	Primary Deficit D_t/Y_t
1945-1974	–12.5	–21.6	–20.8

Source: Hall and Sargent.

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What's missing?

What's missing?

- The impact of growth on tax revenue
- GDP growth
 - Affects B/Y directly
 - Also raises tax revenue, reduces primary deficit
 - The best cure for debt problems (and reverse)
- 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?

- Hidden liabilities
- Like what?
 - Unfunded pensions
 - Financial bailouts
 - Implicit guarantees of business or regional governments
- 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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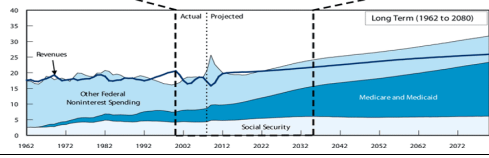
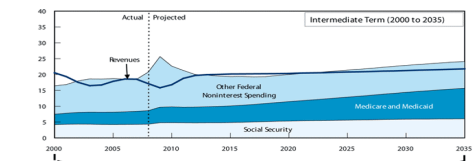
Is the US in trouble?

Is the US in trouble

- Large current deficits
- Growing debt
- Significant increases in future spending in the 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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US government expenses & revenues

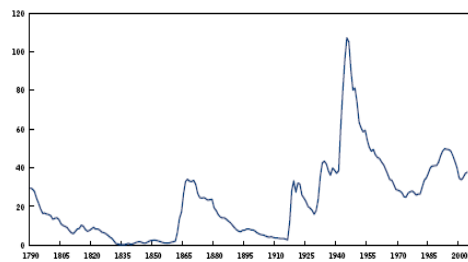


Source: CBO.

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US government debt

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

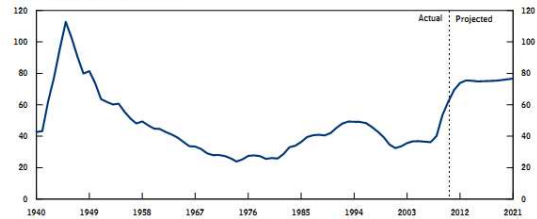


Source: CBO.

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US government debt

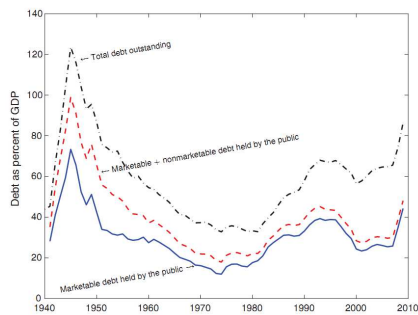
Figure 1-2.
Federal Debt Held by the Public
(Percentage of gross domestic product)



Source: CBO.

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US government debt

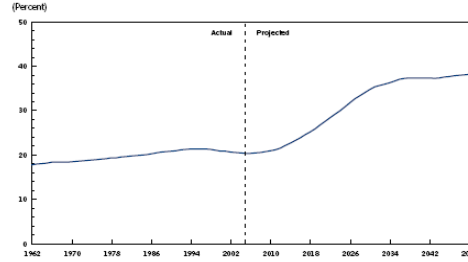


Source: Hall and Sargent.

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Demographics

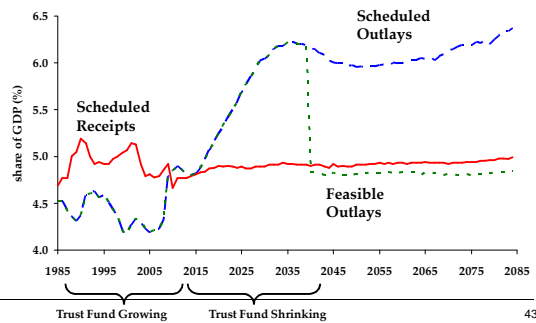
Figure 2-2.
The Population Age 65 or Older as a Percentage of the Population Ages 20 to 64
(Percent)



Source: Congressional Budget Office.

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Social Security outlays and receipts



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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>

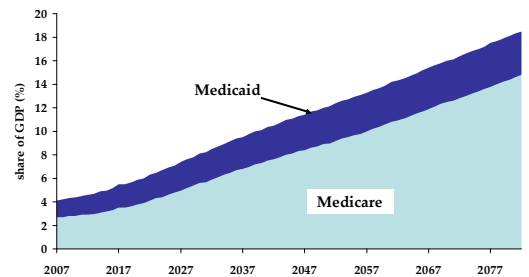
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Medicare and Medicaid

- 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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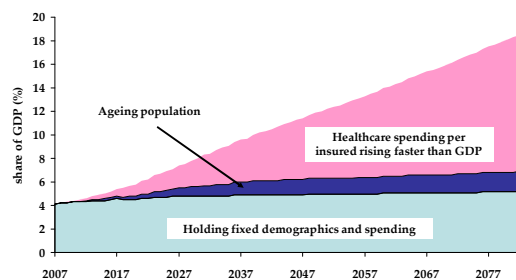
Medicare and Medicaid



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

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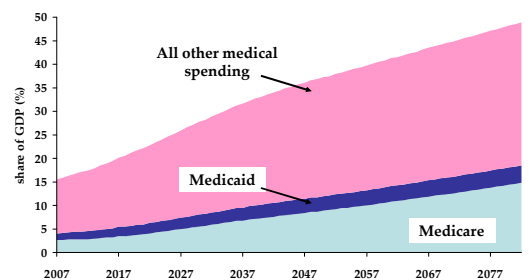
Medicare and Medicaid



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
- Signs of trouble
 - Too much debt
 - Continuing deficits
 - Weak political system
- US faces questions about future healthcare spending

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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

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Roadmap

- Announcement and reminder
- In the news
- Heineken USA
- Words and pictures
- Exchange rates and prices (“PPP anchor”)
- Exchange rates and interest rates (“carry trade”)

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Announcement

- Special class meetings at Amity Hall
 - Saturday class: April 28, after class
 - Monday class: May 7, after the exam
 - Amity Hall, 80 West 3rd Street, probably downstairs

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Reminder

- Problem Set #4 due next class
 - Email questions
 - We'll post answers to all on the announcements page

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In the news

- "Yuan band widening," WSJ, April 16, 2012
 - The People's Bank of China said Saturday it was widening the yuan's daily trading band against the US dollar to 1.0% above and below a daily reference exchange rate, up from a previous band of 0.5%. It last expanded the dollar/yuan trading band from 0.3% in May 2007.
 - China's move to widen the yuan trading band is a key step in its exchange rate reform, the Ministry of Commerce said Tuesday. Commerce ministry spokesman Shen Danyang said the yuan's trend is set to become less predictable.
- What's going on here? Why?

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In the news

- "Real rallies, Dow Jones, April 20, 2012
 - Brazil's currency opened stronger Friday. The real appeared poised to bounce back from Thursday's steep sell-off, when the currency market reacted strongly to indications that the Brazilian Central Bank could cut interest rates further. On Wednesday, central bankers reduced the benchmark Selic base interest rate to 9.0%, as expected.
- What's going on here? Why?

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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?

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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.

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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.

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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.

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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?

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Yen per dollar



Source: Fed via FRED.

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Dollars per euro



Source: Fed via FRED.

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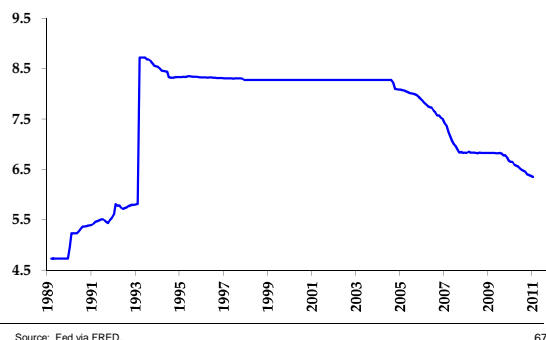
Pesos per dollar



Source: Fed via FRED.

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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

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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^*

$$P \stackrel{?}{=} eP^*$$

$$e \stackrel{?}{=} P/P^*$$

$$RER = eP^*/P \stackrel{?}{=} 1$$

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Exchange rates and prices

Region	USD Price of Big Mac (Jan 2012)
US	4.20
Euro area	4.43
Japan	4.16
China	2.44
India	1.62
Brazil	5.68
Mexico	2.70

Source: The Economist.

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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?

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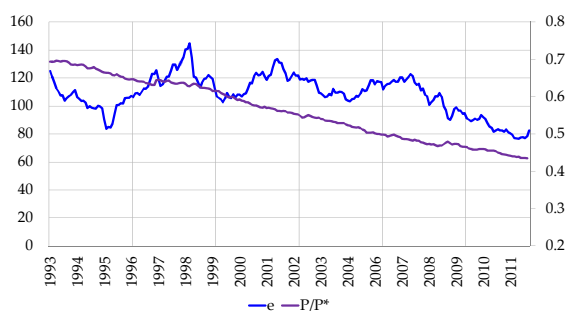
Exchange rates and prices

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

$$e = P/P^*$$

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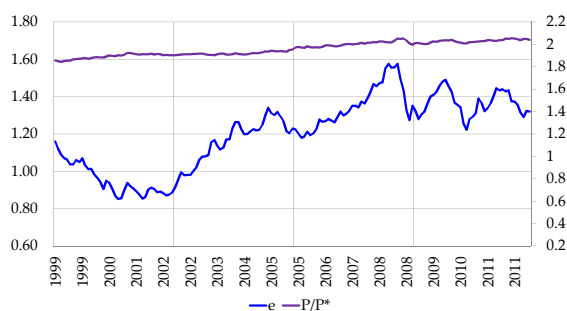
Yen per dollar



Source: Fed via FRED.

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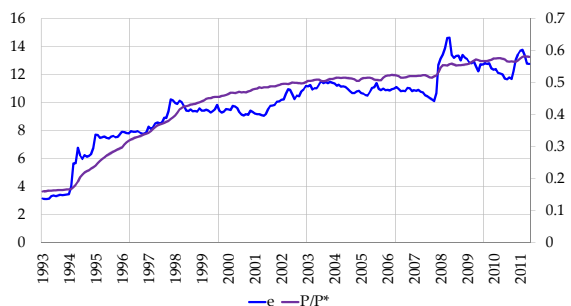
Dollars per euro



Source: Fed via FRED.

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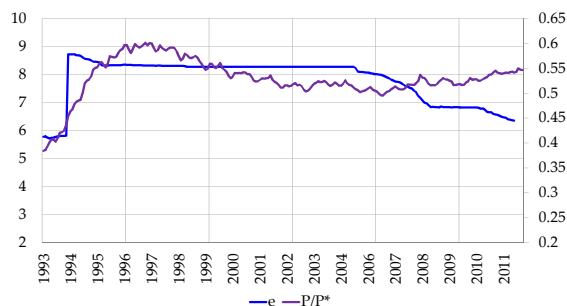
Pesos per dollar



Source: Fed via FRED.

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Yuan per dollar



Source: Fed via FRED.

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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

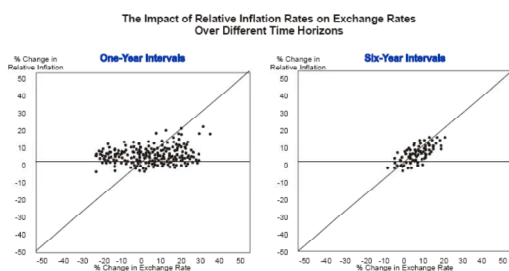
$$e = P/P^*$$

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

- Let's look at this over different time intervals

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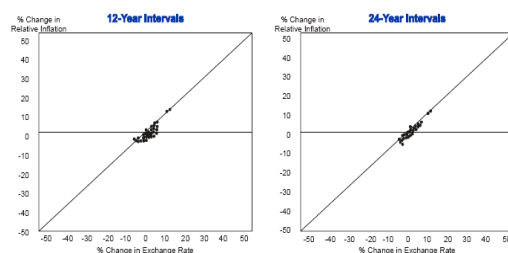
Exchange rates and prices



Source: Deutsche Bank FX Guide.

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Exchange rates and prices



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Exchange rates and prices

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

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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
- R2 small (<0.05) but that's enough to make money from
- More coming ...

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Exchange rates and interest rates

Region	Money market rate (local currency)
US	0.47
Euro area	0.74
Japan	0.20
China	4.78
India	8.35
Brazil	8.74
Mexico	4.73

Source: The Economist.

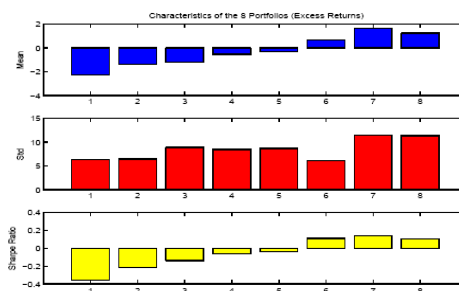
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Exchange rates and interest rates

- 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

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Exchange rates and interest rates

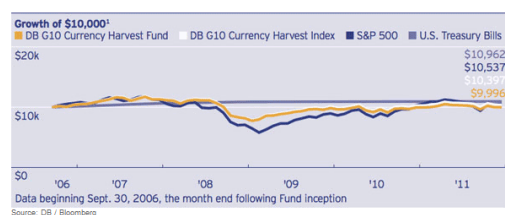


Source: Lustig and Verdelhan.

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Exchange rates and interest rates

Fund and Index Data as of December 31, 2011



Source: Deutsche Bank G10 Currency Harvest Fund.

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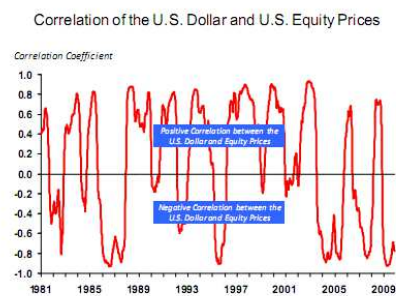
Exchange rates & anything else?

Exchange rates and ...

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

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Exchange rates and stock prices



Source: Michael Rosenberg, Bloomberg.

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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?
- How could we tell?

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