Macroeconomics

Government Debt & Deficits

NYU STERN

Something to think about

- Has the US government issued too much debt?
- What's too much? How would we know? What are the consequences?

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"?

Roadmap

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

Macroeconomic crises

Macroeconomic crises

- 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…)

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

- "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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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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  - 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. That's very different from a company.
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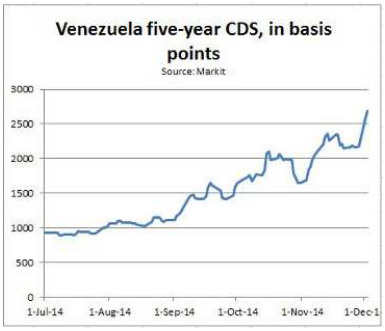

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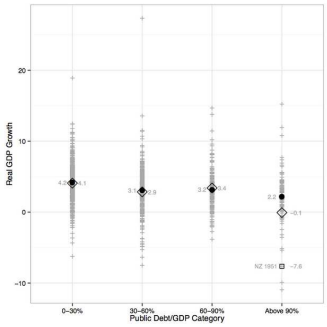

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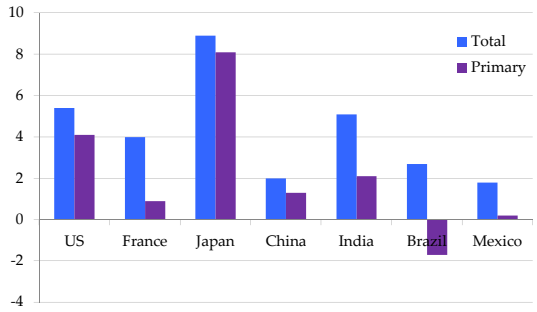
Government deficits (% of GDP, 2013)



Source: EIU CountryData.

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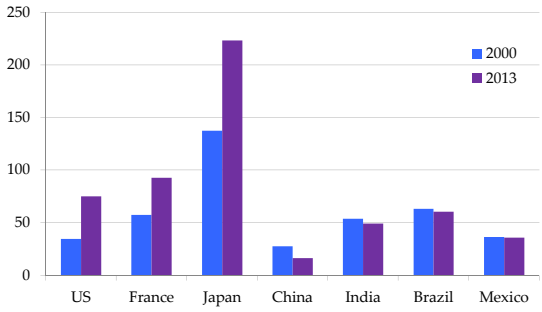

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Debt arithmetic

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}

Government budget: US, $b, 2012

Revenue	**4,259**
Tax revenue	3,041
Social insurance contributions	955
Expenses	**5,621**
Goods, services, and employee comp	2,548
Transfer payments	2,385
Interest on debt	632
Surplus	**–1,362**

For reference: GDP = 16,245

Source: BEA, Table 3.1, consolidated government; numbers may not sum to totals.

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
- ?? Downplay math, the point is what matters

Government budget arithmetic

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

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

$$\Rightarrow B_{t-1} = -D_t/(1+i) + B_{t-1}/(1+i)$$

$$= -D_t/(1+i) - D_{t+1}/(1+i)^2 - D_{t+2}/(1+i)^3 \ \ldots$$

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

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Debt dynamics

Debt dynamics

- Focus: ratio of debt to GDP, B/Y
  - By convention, both are nominal
- What makes B/Y change over time?
- 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

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

- Growth of (nominal) GDP

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

g_t= real GDP growth, π_t = inflation

- Both numerator and denominator of B/Y change

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Debt dynamics

- Reminder:

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

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

- Divide [1] by [2]:

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

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

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

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

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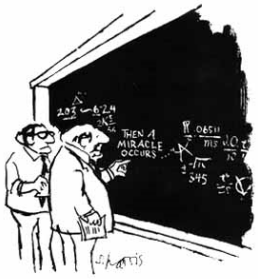
Debt dynamics

- More on that last step



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

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Debt dynamics

- Ok, what are we left with?

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

(A) (B) (C)

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

Debt dynamics

- In case you forgot

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

- 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: 50, not 0.50 (your choice, but that's what we'll do)

Debt dynamics in Greece

Total deficit (% GDP)	2.4
Primary deficit (% GDP)	0.2
Interest rate paid on debt (%) (!)	1.34
Inflation rate (%)	−0.5
Real GDP growth rate (%)	−4.0
Public debt (% GDP, previous year end)	156.9

Is B/Y going up or down? Why?

Source: EIU, Country Risk Report.

Debt dynamics in Greece

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

(A) (B) (C)

- Calculations
  - (A):
  - (B):
  - (C):
  - Total:
- What if we use the 10-year government bond rate (8.31)?

Debt dynamics in Greece

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

(A) (B) (C)

- Calculations
  - (A): (0.0134+0.005)*156.9 = +2.89
  - (B): +0.040*156.9 = +6.28
  - (C): +0.20
  - Total: +9.36 (B/Y rises to 166.3)
- What if we use the 10-year government bond rate (8.31)?

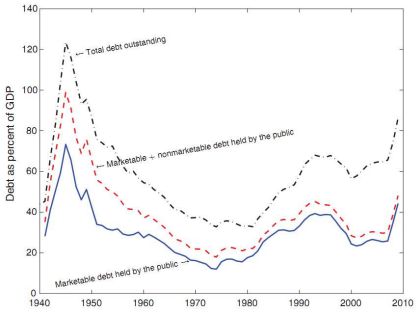
What happened to Peru's debt?

- 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?
  - Financial bailouts
  - Unfunded pensions
  - Other entitlements
  - Implicit guarantees of businesses or regional governments
- Examples?

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?

What's missing?

- The impact of debt on 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?

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?

- What's the problem?
  - Large current deficits
  - Growing debt
  - **Significant increases in future spending in pipeline**
- Blinder (D) and Hubbard (R), WaPo, 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.
- Comment: little of this stems from ACA/Obamacare

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Is the US in trouble?

- See link to CBO report on course outline

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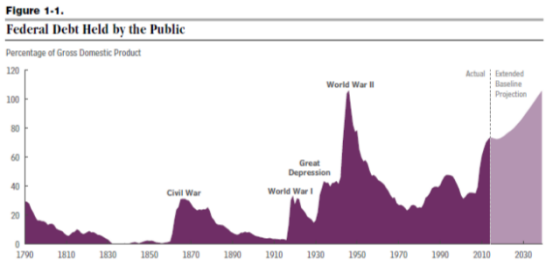
US government debt



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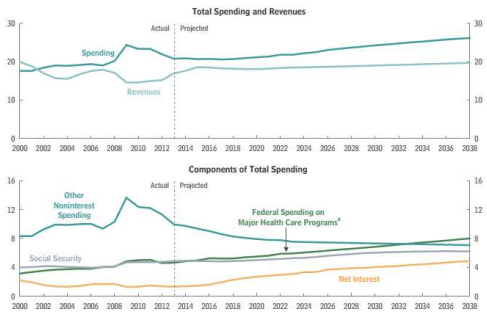
US government expenses & revenues



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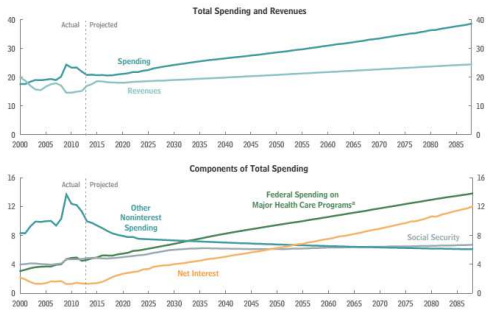

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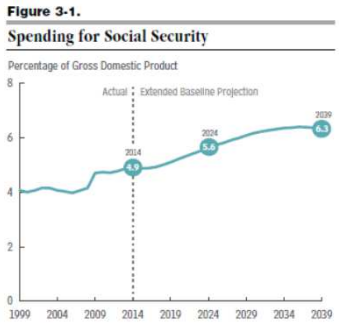
Social security spending



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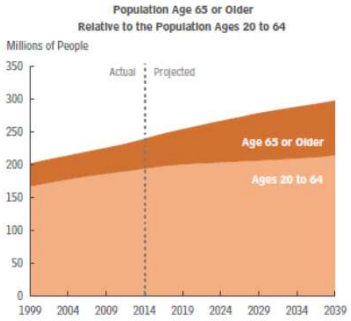
Demography



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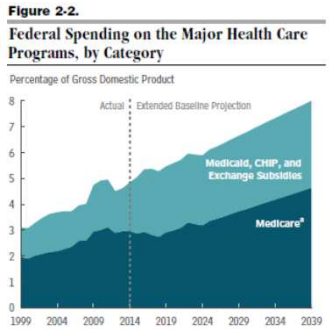
Social Security "fixes"

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

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 >50%
  - States set rules subject to federal approval

Federal healthcare spending



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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 tax revenue: 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 promising to run (primary) surpluses in the future
- Standard tool
  - Debt dynamics equation (look for red box)
- Signs of trouble
  - Too much debt
  - Continuing and/or rising deficits
  - Weak political system
- US faces questions about future healthcare spending

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Roadmap

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- Words and pictures
- Debt arithmetic
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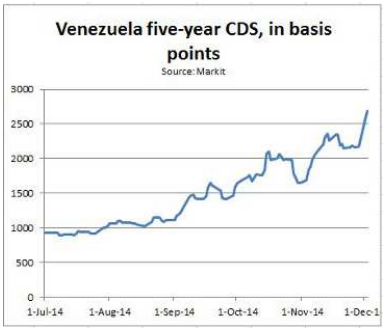

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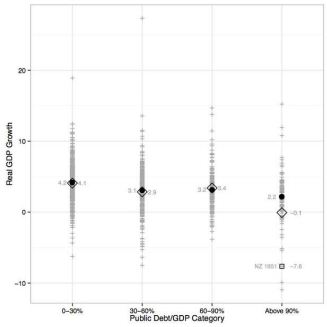

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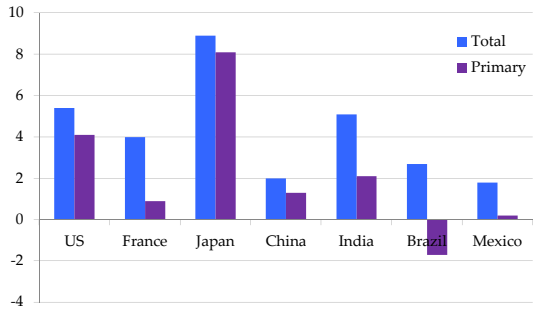

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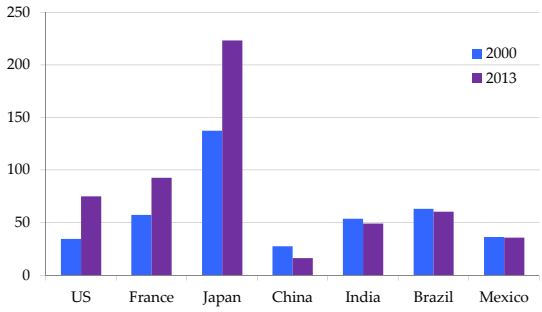

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(replace three symbols with one)

Government budget arithmetic

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- Budget becomes

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- Where does debt lead? [kill t on i_t for simplicity]

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

- Divide [1] by [2]:

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

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

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

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

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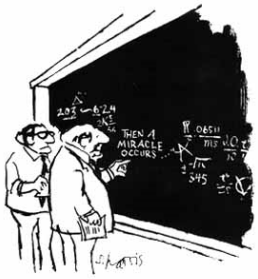
Debt dynamics

- More on that last step



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

30

Debt dynamics

- Ok, what are we left with?

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

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  - (A): interest on debt at (real) interest rate $r = i - \pi$
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Debt dynamics

- In case you forgot

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

- 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: 50, not 0.50 (your choice, but that's what we'll do)

Debt dynamics in Greece

Total deficit (% GDP)	2.4
Primary deficit (% GDP)	0.2
Interest rate paid on debt (%) (!)	1.34
Inflation rate (%)	−0.5
Real GDP growth rate (%)	−4.0
Public debt (% GDP, previous year end)	156.9

Is B/Y going up or down? Why?

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- Calculations
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- What if we use the 10-year government bond rate (8.31)?

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- Debt-to-GDP fell from 47.1% to 25.0% [total change in B/Y = −22.1%]
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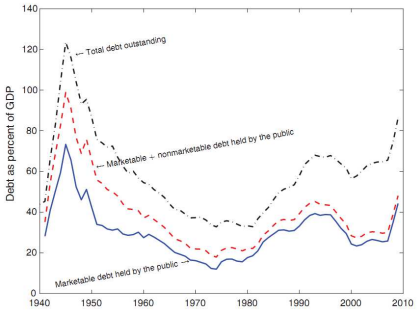
Source: Global Economy book.

What happened to US WW II debt?



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Is the US in trouble?

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- What's the problem?
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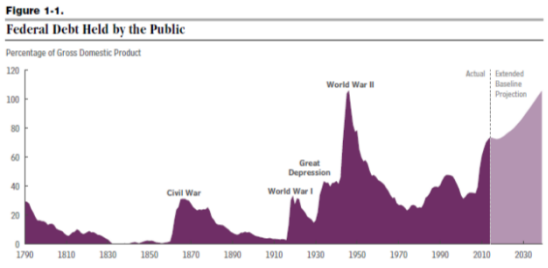
Is the US in trouble?

- See link to CBO report on course outline

46

US government debt



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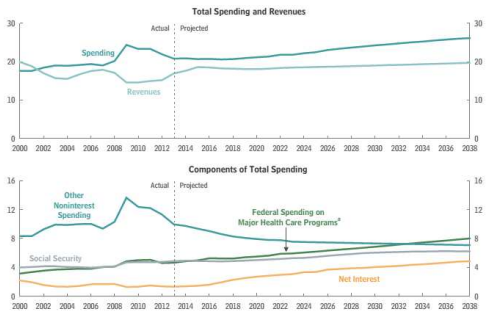
US government expenses & revenues



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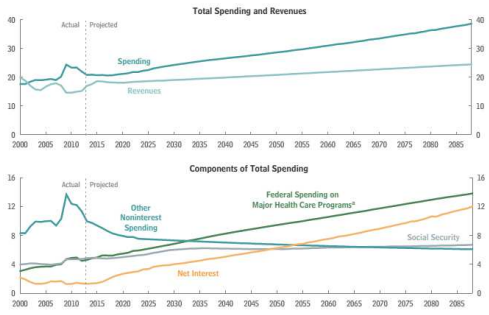
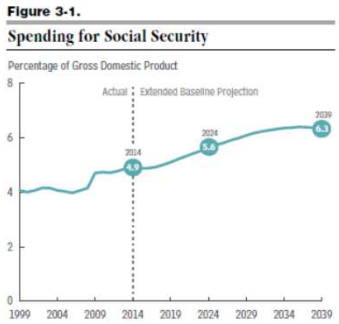


Source: CBO.

Social security spending



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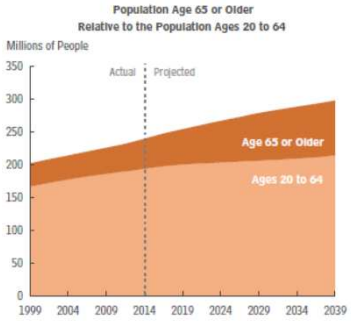
Demography



Source: CBO.

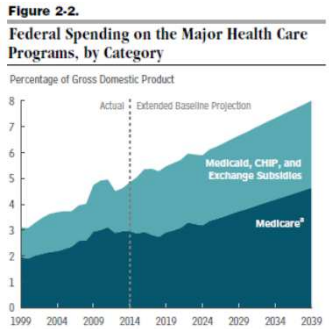
Social Security "fixes"

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

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 >50%
  - States set rules subject to federal approval

Federal healthcare spending



Source: CBO.

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 tax revenue: 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 promising to run (primary) surpluses in the future
- Standard tool
  - Debt dynamics equation (look for red box)
- Signs of trouble
  - Too much debt
  - Continuing and/or rising deficits
  - Weak political system
- US faces questions about future healthcare spending

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Macroeconomics

Government Debt & Deficits

NYU STERN

Something to think about

- Has the US government issued too much debt?
- What's too much? How would we know? What are the consequences?

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"?

Roadmap

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

Macroeconomic crises

Macroeconomic crises

- 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…)

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?

8

Words

- "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?

9

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. That's very different from a company.
- What is he saying? Do you agree?

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Words

- 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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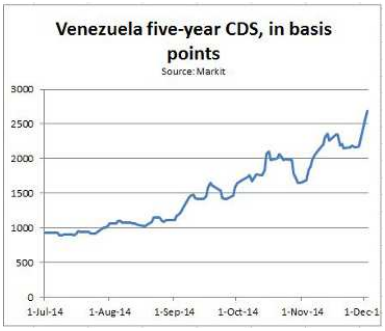
Venezuela



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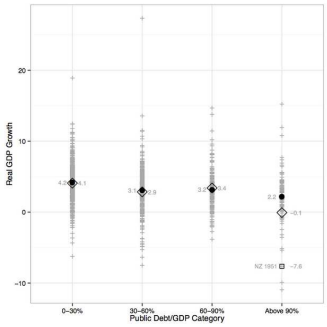
Reinhart-Rogoff data



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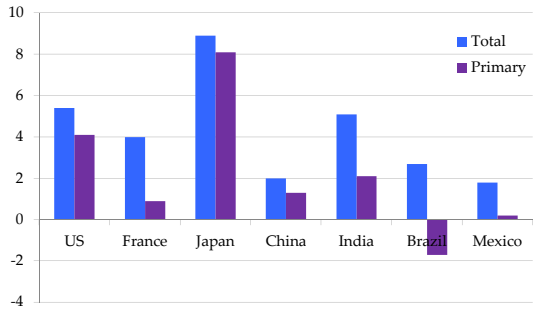
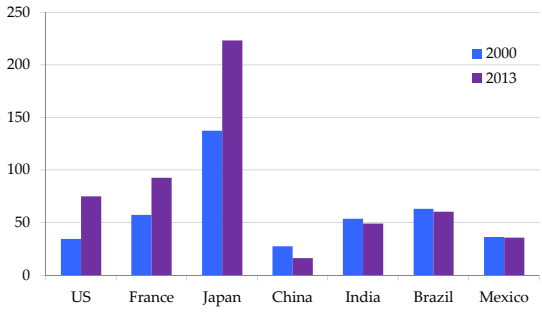
Government deficits (% of GDP, 2013)



Source: EIU CountryData.

15

Government debt (% 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}

Government budget: US, $b, 2012

Revenue	**4,259**
Tax revenue	3,041
Social insurance contributions	955
Expenses	**5,621**
Goods, services, and employee comp	2,548
Transfer payments	2,385
Interest on debt	632
Surplus	**–1,362**

For reference: GDP = 16,245

Source: BEA, Table 3.1, consolidated government; numbers may not sum to totals.

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
- ?? Downplay math, the point is what matters

Government budget arithmetic

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

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

$$\Rightarrow B_{t-1} = -D_t/(1+i) + B_{t-1}/(1+i)$$

$$= -D_t/(1+i) - D_{t+1}/(1+i)^2 - D_{t+2}/(1+i)^3 \ \ldots$$

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

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Debt dynamics

Debt dynamics

- Focus: ratio of debt to GDP, B/Y
  - By convention, both are nominal
- What makes B/Y change over time?
- 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

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

- Growth of (nominal) GDP

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

g_t= real GDP growth, π_t = inflation

- Both numerator and denominator of B/Y change

28

Debt dynamics

- Reminder:

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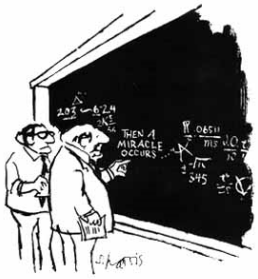

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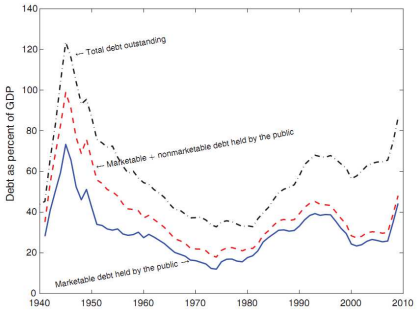

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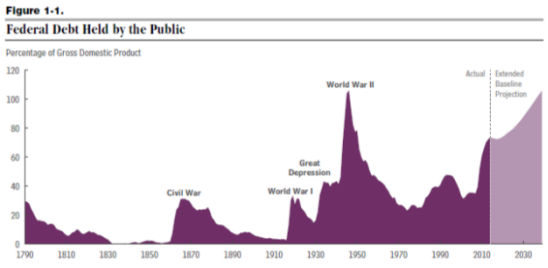

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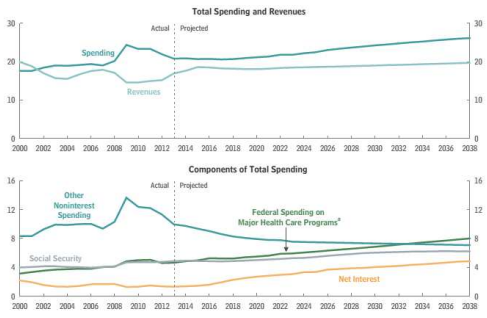
US government expenses & revenues



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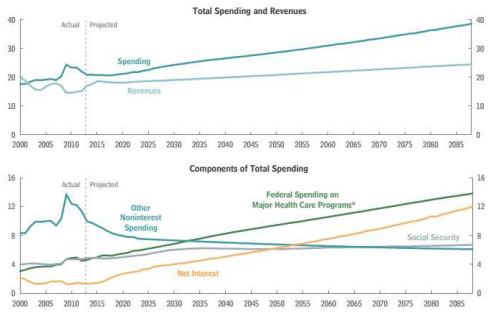
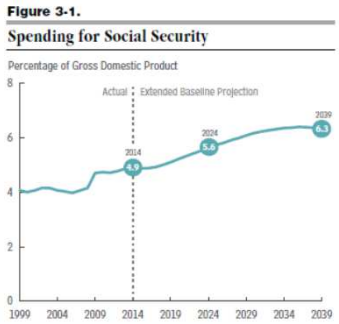
US government expenses & revenues



Source: CBO.

Social security spending



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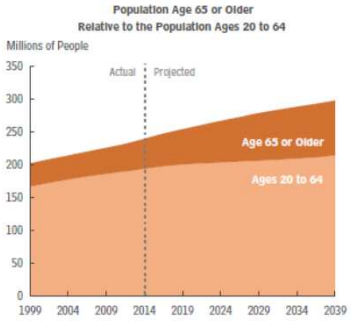

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- Solutions
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- Congressional Budget Office analysis
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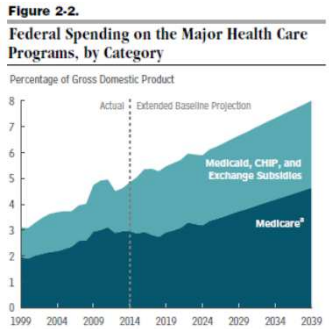
Medicare and Medicaid

- 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 >50%
  - States set rules subject to federal approval

Federal healthcare spending



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- 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 tax revenue: by a lot!
  - Or reduce benefits: but how?
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What have we learned?

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

56

Macroeconomics

Government Debt & Deficits

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Something to think about

- Has the US government issued too much debt?
- What's too much? How would we know? What are the consequences?

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"?

Roadmap

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

Macroeconomic crises

Macroeconomic crises

- 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…)

Words & pictures

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  - 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.
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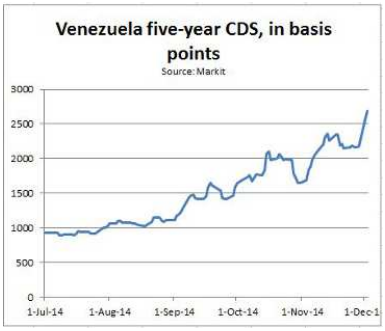

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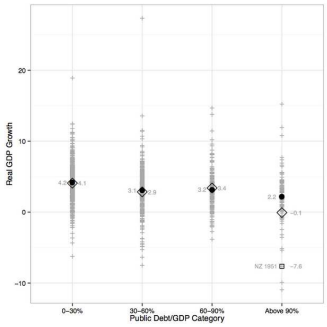

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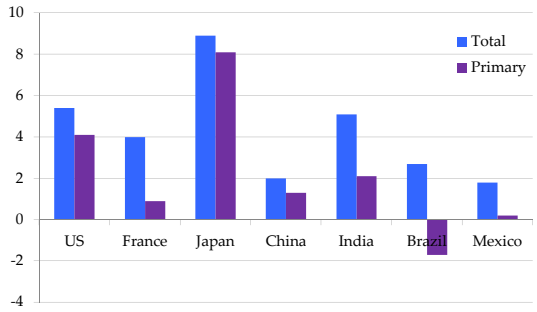
Government deficits (% of GDP, 2013)



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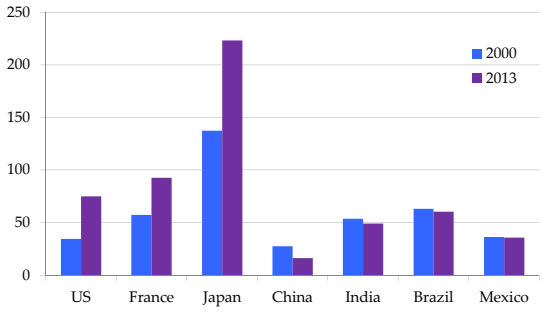

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Debt arithmetic

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}

Government budget: US, $b, 2012

Revenue	**4,259**
Tax revenue	3,041
Social insurance contributions	955
Expenses	**5,621**
Goods, services, and employee comp	2,548
Transfer payments	2,385
Interest on debt	632
Surplus	**–1,362**

For reference: GDP = 16,245

Source: BEA, Table 3.1, consolidated government; numbers may not sum to totals.

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
- ?? Downplay math, the point is what matters

Government budget arithmetic

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

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

$$\Rightarrow B_{t-1} = -D_t/(1+i) + B_{t-1}/(1+i)$$

$$= -D_t/(1+i) - D_{t+1}/(1+i)^2 - D_{t+2}/(1+i)^3 \ \ldots$$

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

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Debt dynamics

Debt dynamics

- Focus: ratio of debt to GDP, B/Y
  - By convention, both are nominal
- What makes B/Y change over time?
- 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

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

- Growth of (nominal) GDP

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

g_t= real GDP growth, π_t = inflation

- Both numerator and denominator of B/Y change

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Debt dynamics

- Reminder:

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

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

- Divide [1] by [2]:

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

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

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

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

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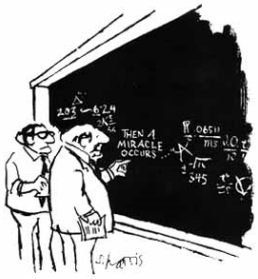
Debt dynamics

- More on that last step



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

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Debt dynamics

- Ok, what are we left with?

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

(A) (B) (C)

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

Debt dynamics

- In case you forgot

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

- 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: 50, not 0.50 (your choice, but that's what we'll do)

Debt dynamics in Greece

Total deficit (% GDP)	2.4
Primary deficit (% GDP)	0.2
Interest rate paid on debt (%) (!)	1.34
Inflation rate (%)	−0.5
Real GDP growth rate (%)	−4.0
Public debt (% GDP, previous year end)	156.9

Is B/Y going up or down? Why?

Source: EIU, Country Risk Report.

Debt dynamics in Greece

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

(A) (B) (C)

- Calculations
  - (A):
  - (B):
  - (C):
  - Total:
- What if we use the 10-year government bond rate (8.31)?

Debt dynamics in Greece

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

(A) (B) (C)

- Calculations
  - (A): (0.0134+0.005)*156.9 = +2.89
  - (B): +0.040*156.9 = +6.28
  - (C): +0.20
  - Total: +9.36 (B/Y rises to 166.3)
- What if we use the 10-year government bond rate (8.31)?

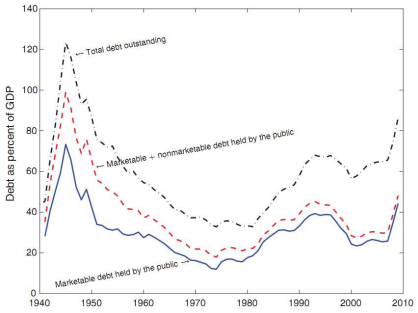
What happened to Peru's debt?

- 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?
  - Financial bailouts
  - Unfunded pensions
  - Other entitlements
  - Implicit guarantees of businesses or regional governments
- Examples?

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?

What's missing?

- The impact of debt on 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?

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?

- What's the problem?
  - Large current deficits
  - Growing debt
  - **Significant increases in future spending in pipeline**
- Blinder (D) and Hubbard (R), WaPo, 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.
- Comment: little of this stems from ACA/Obamacare

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Is the US in trouble?

- See link to CBO report on course outline

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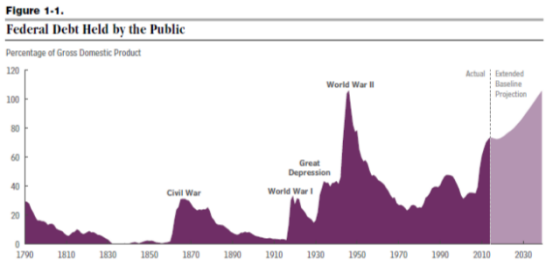
US government debt



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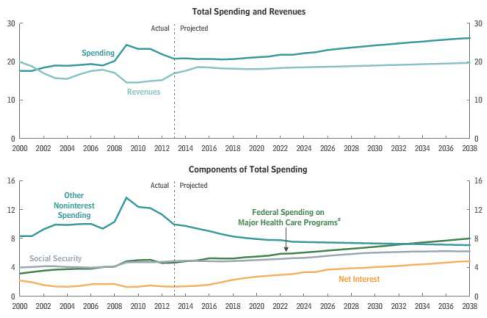

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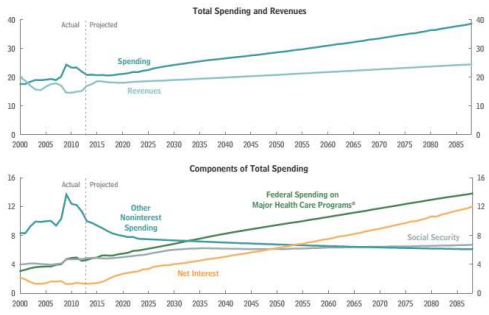

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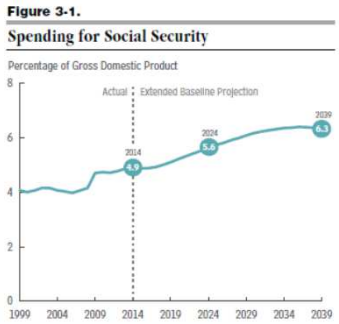

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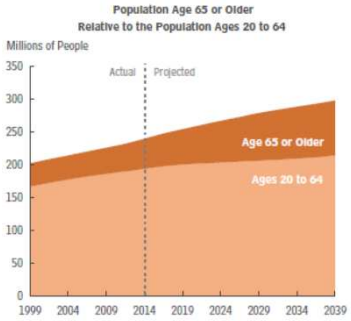

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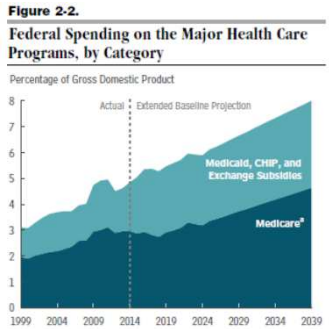

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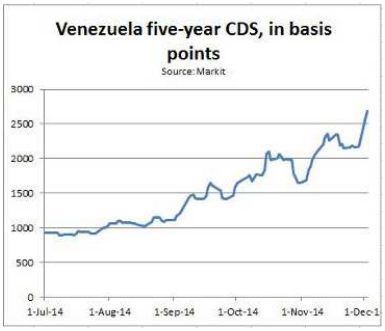

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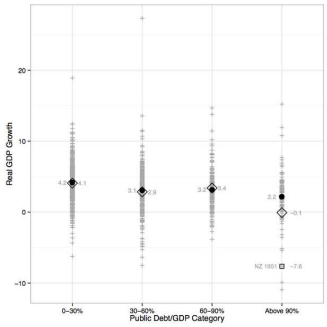

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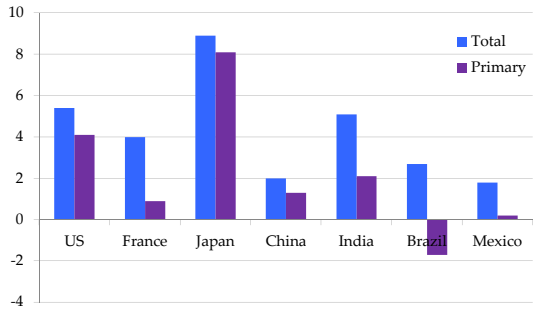
Government deficits (% of GDP, 2013)



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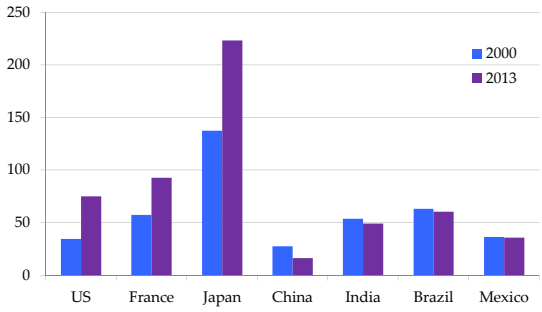

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For reference: GDP = 16,245

Source: BEA, Table 3.1, consolidated government; numbers may not sum to totals.

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
- ?? Downplay math, the point is what matters

Government budget arithmetic

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

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

$$\Rightarrow B_{t-1} = -D_t/(1+i) + B_{t-1}/(1+i)$$

$$= -D_t/(1+i) - D_{t+1}/(1+i)^2 - D_{t+2}/(1+i)^3 \ \ldots$$

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

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Debt dynamics

Debt dynamics

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

27

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

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

g_t= real GDP growth, π_t = inflation

- Both numerator and denominator of B/Y change

28

Debt dynamics

- Reminder:

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

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

- Divide [1] by [2]:

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

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

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

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

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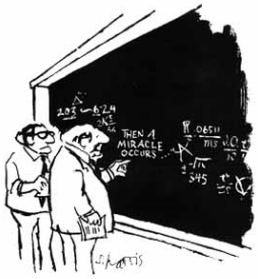
Debt dynamics

- More on that last step



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

30

Debt dynamics

- Ok, what are we left with?

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

(A) (B) (C)

  - (A): interest on debt at (real) interest rate $r = i - \pi$
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Debt dynamics

- In case you forgot

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

- 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: 50, not 0.50 (your choice, but that's what we'll do)

Debt dynamics in Greece

Total deficit (% GDP)	2.4
Primary deficit (% GDP)	0.2
Interest rate paid on debt (%) (!)	1.34
Inflation rate (%)	−0.5
Real GDP growth rate (%)	−4.0
Public debt (% GDP, previous year end)	156.9

Is B/Y going up or down? Why?

Source: EIU, Country Risk Report.

Debt dynamics in Greece

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(A) (B) (C)

- Calculations
  - (A):
  - (B):
  - (C):
  - Total:
- What if we use the 10-year government bond rate (8.31)?

Debt dynamics in Greece

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- Calculations
  - (A): (0.0134+0.005)*156.9 = +2.89
  - (B): +0.040*156.9 = +6.28
  - (C): +0.20
  - Total: +9.36 (B/Y rises to 166.3)
- What if we use the 10-year government bond rate (8.31)?

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
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2004	44.3	0.2	−2.4	−0.6
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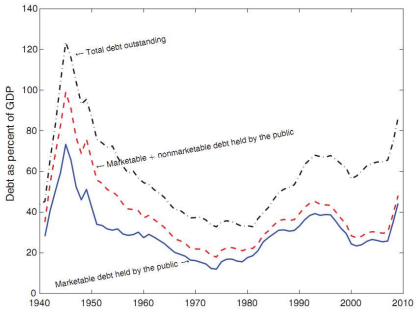
2006	33.1	1.0	−2.9	−2.7
2007	20.9	1.1	−2.9	−0.4
2008	25.0	−0.3	−3.0	−2.5
Sum		3.1	−14.3	−10.9

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?
  - Financial bailouts
  - Unfunded pensions
  - Other entitlements
  - Implicit guarantees of businesses or regional governments
- Examples?

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?

What's missing?

- The impact of debt on 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?

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?

- What's the problem?
  - Large current deficits
  - Growing debt
  - **Significant increases in future spending in pipeline**
- Blinder (D) and Hubbard (R), WaPo, 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.
- Comment: little of this stems from ACA/Obamacare

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Is the US in trouble?

- See link to CBO report on course outline

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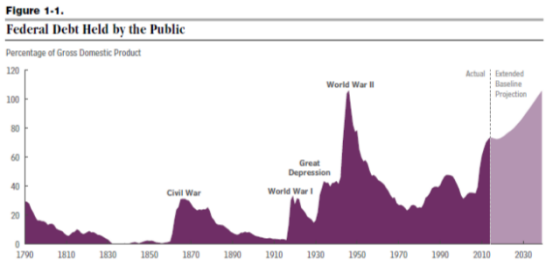
US government debt



Source: CBO.

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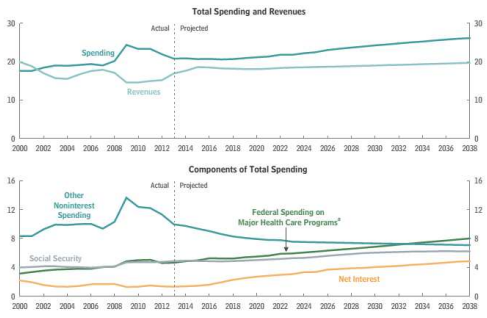
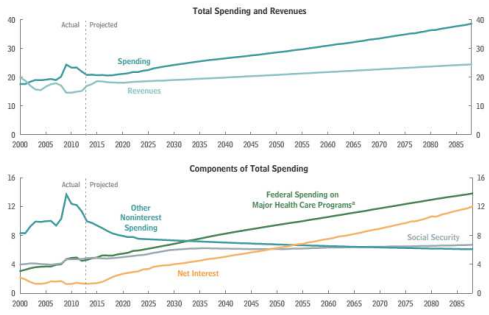
US government expenses & revenues



Source: CBO.

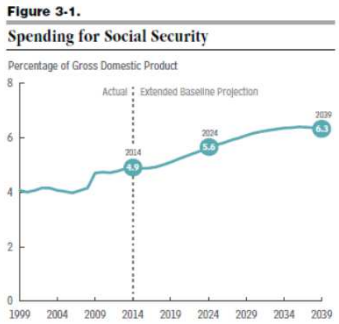
48

US government expenses & revenues



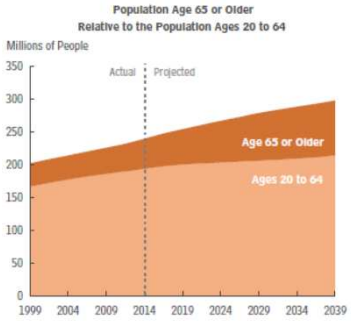
Source: CBO.

Social security spending



Source: CBO.

Demography



Source: CBO.

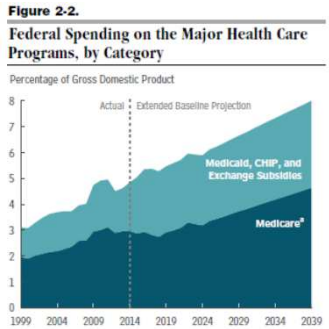
Social Security "fixes"

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

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 >50%
  - States set rules subject to federal approval

Federal healthcare spending



Source: CBO.

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 tax revenue: 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 promising to run (primary) surpluses in the future
- Standard tool
  - Debt dynamics equation (look for red box)
- Signs of trouble
  - Too much debt
  - Continuing and/or rising deficits
  - Weak political system
- US faces questions about future healthcare spending

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Macroeconomics

Government Debt & Deficits

NYU STERN

Something to think about

- Has the US government issued too much debt?
- What's too much? How would we know? What are the consequences?

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"?

Roadmap

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

Macroeconomic crises

Macroeconomic crises

- 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…)

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?

8

Words

- "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?

9

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?

10

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. That's very different from a company.
- What is he saying? Do you agree?

11

Words

- 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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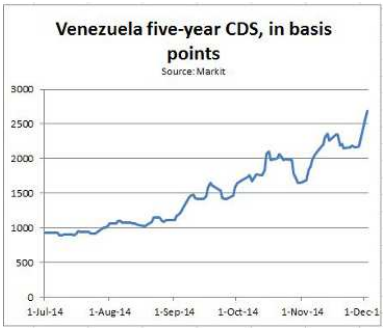
Venezuela



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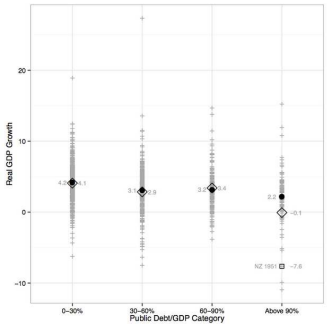
Reinhart-Rogoff data



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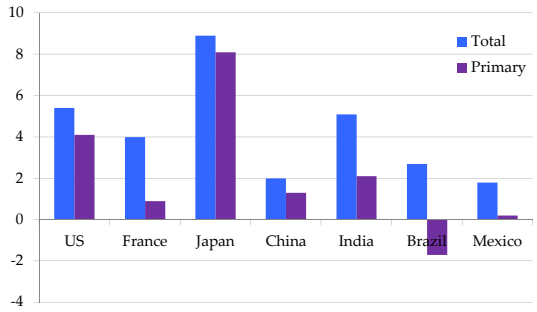
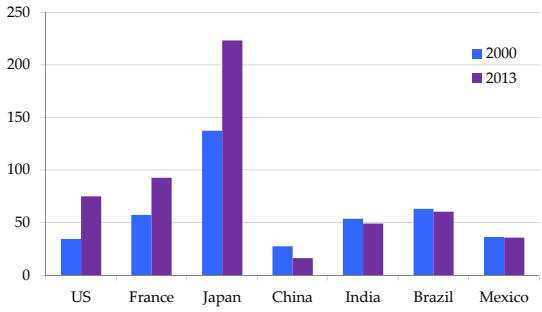
Government deficits (% of GDP, 2013)



Source: EIU CountryData.

15

Government debt (% of GDP)



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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}

Government budget: US, $b, 2012

Revenue	**4,259**
Tax revenue	3,041
Social insurance contributions	955
Expenses	**5,621**
Goods, services, and employee comp	2,548
Transfer payments	2,385
Interest on debt	632
Surplus	**–1,362**

For reference: GDP = 16,245

Source: BEA, Table 3.1, consolidated government; numbers may not sum to totals.

Government budget

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Government budget arithmetic

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Government budget arithmetic

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Debt dynamics

- Reminder:

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Debt dynamics

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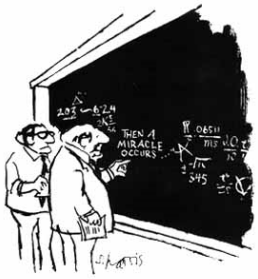

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Debt dynamics

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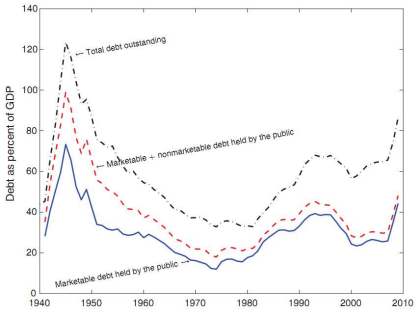

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Is the US in trouble?

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Is the US in trouble?

- See link to CBO report on course outline

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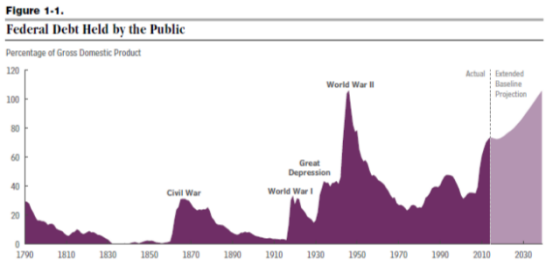
US government debt



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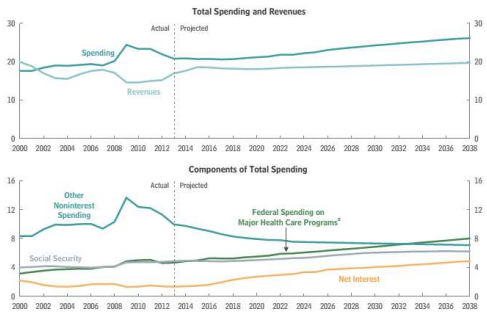
47

US government expenses & revenues



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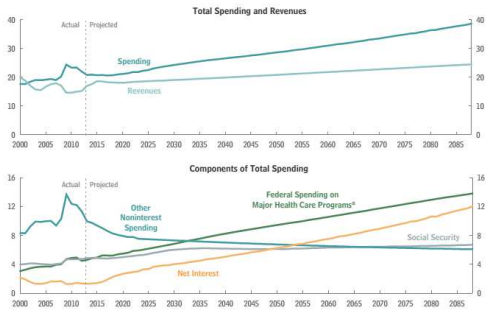

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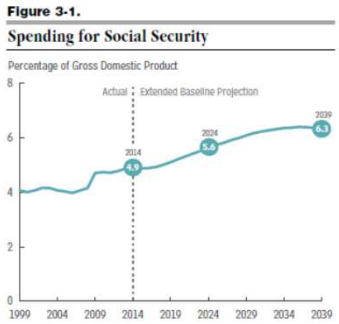
Social security spending



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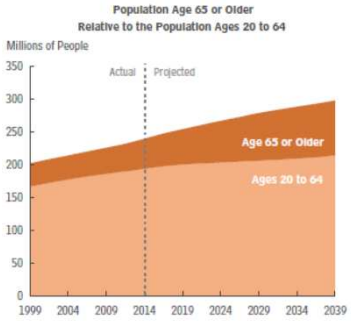

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- Medicare: age 65 and older
  - Parts A&B cover hospital and physician care
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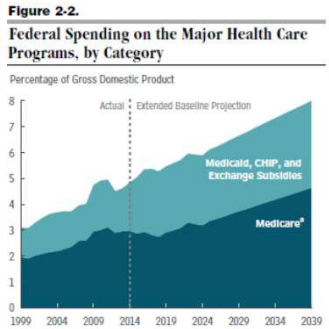

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Medicare and Medicaid "fixes"

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- What can be done for Medicare and Medicaid?
  - Spending needs to be paid for
  - Either raise tax revenue: 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 promising to run (primary) surpluses in the future
- Standard tool
  - Debt dynamics equation (look for red box)
- Signs of trouble
  - Too much debt
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- US faces questions about future healthcare spending

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Macroeconomics

Government Debt & Deficits

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Something to think about

- Has the US government issued too much debt?
- What's too much? How would we know? What are the consequences?

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"?

Roadmap

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

Macroeconomic crises

Macroeconomic crises

- 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?
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  - Europe today? (Greece, Ireland, Portugal, Spain, Italy…)

Words & pictures

Words

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- 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. That's very different from a company.
- What is he saying? Do you agree?

11

Words

- 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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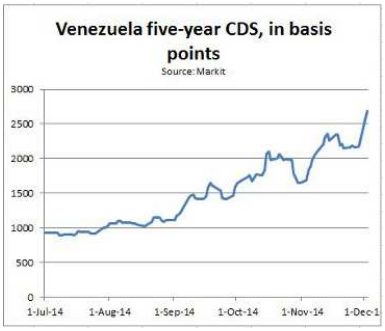
Venezuela



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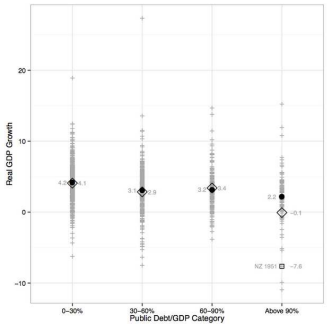
Reinhart-Rogoff data



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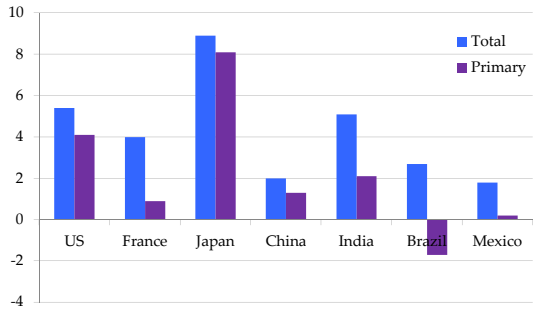
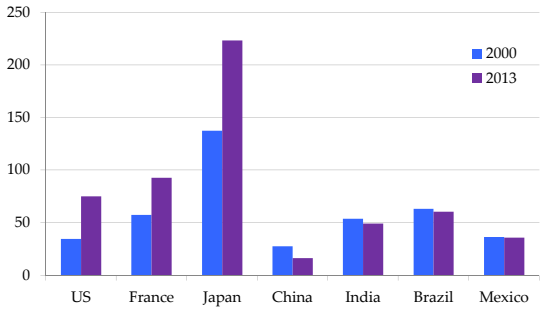
Government deficits (% of GDP, 2013)



Source: EIU CountryData.

15

Government debt (% of GDP)



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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}

Government budget: US, $b, 2012

Revenue	**4,259**
Tax revenue	3,041
Social insurance contributions	955
Expenses	**5,621**
Goods, services, and employee comp	2,548
Transfer payments	2,385
Interest on debt	632
Surplus	**–1,362**

For reference: GDP = 16,245

Source: BEA, Table 3.1, consolidated government; numbers may not sum to totals.

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
- ?? Downplay math, the point is what matters

Government budget arithmetic

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

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

$$\Rightarrow B_{t-1} = -D_t/(1+i) + B_{t-1}/(1+i)$$

$$= -D_t/(1+i) - D_{t+1}/(1+i)^2 - D_{t+2}/(1+i)^3 \ \ldots$$

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

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Debt dynamics

Debt dynamics

- Focus: ratio of debt to GDP, B/Y
  - By convention, both are nominal
- What makes B/Y change over time?
- 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

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

- Growth of (nominal) GDP

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

g_t= real GDP growth, π_t = inflation

- Both numerator and denominator of B/Y change

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Debt dynamics

- Reminder:

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

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

- Divide [1] by [2]:

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

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

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

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

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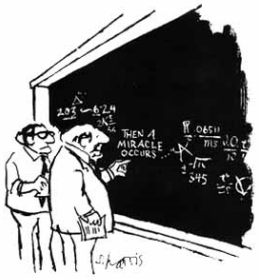
Debt dynamics

- More on that last step



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

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Debt dynamics

- Ok, what are we left with?

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

(A) (B) (C)

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

Debt dynamics

- In case you forgot

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

- 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: 50, not 0.50 (your choice, but that's what we'll do)

Debt dynamics in Greece

Total deficit (% GDP)	2.4
Primary deficit (% GDP)	0.2
Interest rate paid on debt (%) (!)	1.34
Inflation rate (%)	−0.5
Real GDP growth rate (%)	−4.0
Public debt (% GDP, previous year end)	156.9

Is B/Y going up or down? Why?

Source: EIU, Country Risk Report.

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- Calculations
  - (A): (0.0134+0.005)*156.9 = +2.89
  - (B): +0.040*156.9 = +6.28
  - (C): +0.20
  - Total: +9.36 (B/Y rises to 166.3)
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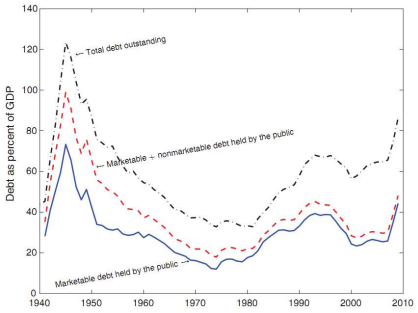
What happened to Peru's debt?

- 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?



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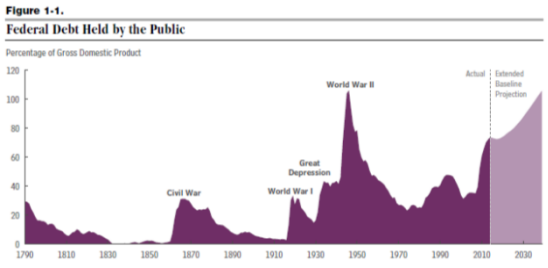

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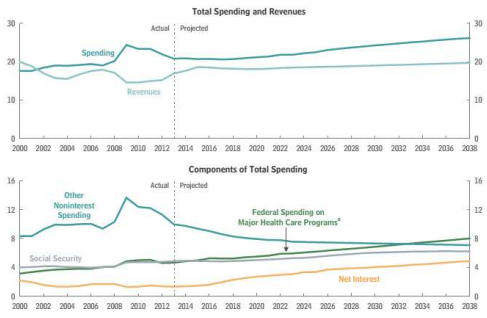

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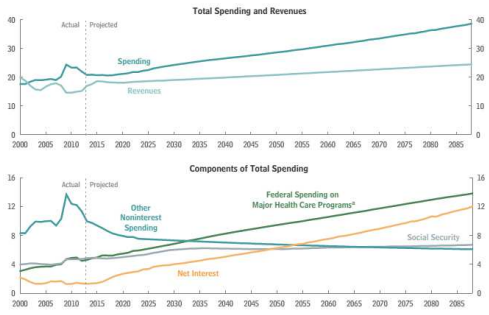

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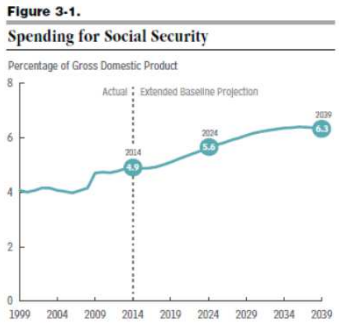

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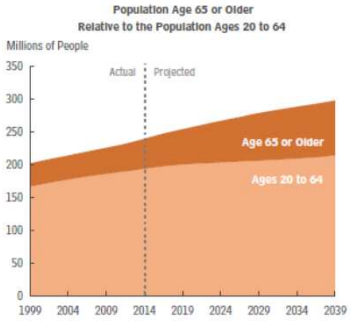

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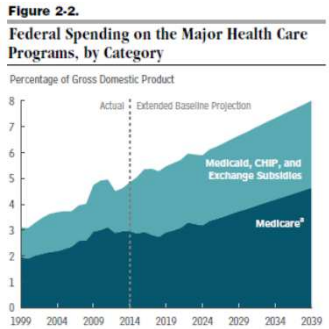

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Macroeconomics

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  - 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. That's very different from a company.
- What is he saying? Do you agree?

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- 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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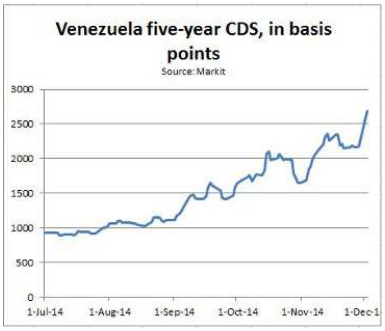
Venezuela



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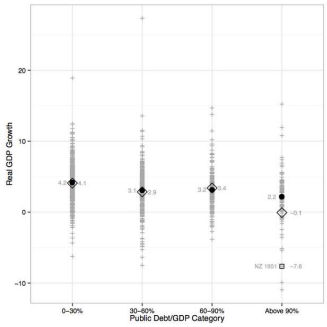
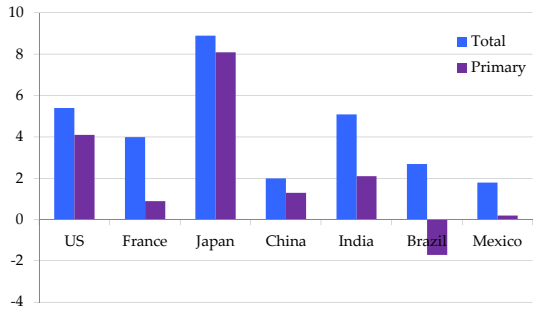


14

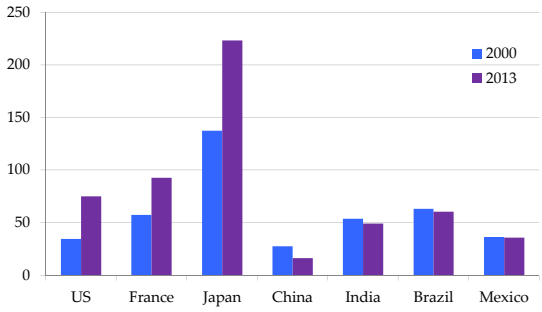
Government deficits (% of GDP, 2013)



Source: EIU CountryData.

15

Government debt (% of GDP)



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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}

Government budget: US, $b, 2012

Revenue	**4,259**
Tax revenue	3,041
Social insurance contributions	955
Expenses	**5,621**
Goods, services, and employee comp	2,548
Transfer payments	2,385
Interest on debt	632
Surplus	**–1,362**

For reference: GDP = 16,245

Source: BEA, Table 3.1, consolidated government; numbers may not sum to totals.

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
- ?? Downplay math, the point is what matters

Government budget arithmetic

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

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

$$\Rightarrow B_{t-1} = -D_t/(1+i) + B_{t-1}/(1+i)$$

$$= -D_t/(1+i) - D_{t+1}/(1+i)^2 - D_{t+2}/(1+i)^3 \ \ldots$$

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

Government budget: Principle #1

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- That's what the arithmetic says

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Debt dynamics

Debt dynamics

- Focus: ratio of debt to GDP, B/Y
  - By convention, both are nominal
- What makes B/Y change over time?
- 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

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

- Growth of (nominal) GDP

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

g_t= real GDP growth, π_t = inflation

- Both numerator and denominator of B/Y change

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Debt dynamics

- Reminder:

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

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

- Divide [1] by [2]:

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

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

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

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

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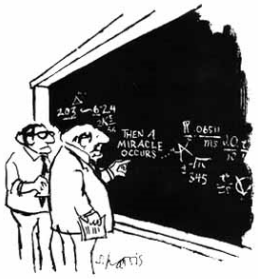
Debt dynamics

- More on that last step



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

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Debt dynamics

- Ok, what are we left with?

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

(A) (B) (C)

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

Debt dynamics

- In case you forgot

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

- 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: 50, not 0.50 (your choice, but that's what we'll do)

Debt dynamics in Greece

Total deficit (% GDP)	2.4
Primary deficit (% GDP)	0.2
Interest rate paid on debt (%) (!)	1.34
Inflation rate (%)	−0.5
Real GDP growth rate (%)	−4.0
Public debt (% GDP, previous year end)	156.9

Is B/Y going up or down? Why?

Source: EIU, Country Risk Report.

Debt dynamics in Greece

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

(A) (B) (C)

- Calculations
  - (A):
  - (B):
  - (C):
  - Total:
- What if we use the 10-year government bond rate (8.31)?

Debt dynamics in Greece

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

(A) (B) (C)

- Calculations
  - (A): (0.0134+0.005)*156.9 = +2.89
  - (B): +0.040*156.9 = +6.28
  - (C): +0.20
  - Total: +9.36 (B/Y rises to 166.3)
- What if we use the 10-year government bond rate (8.31)?

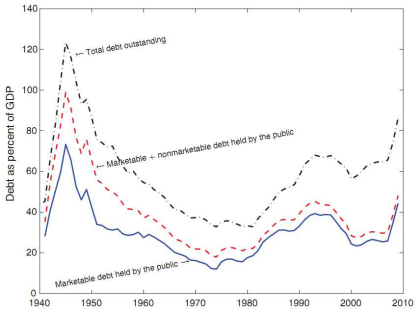
What happened to Peru's debt?

- 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?
  - Financial bailouts
  - Unfunded pensions
  - Other entitlements
  - Implicit guarantees of businesses or regional governments
- Examples?

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?

What's missing?

- The impact of debt on 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?

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?

- What's the problem?
  - Large current deficits
  - Growing debt
  - **Significant increases in future spending in pipeline**
- Blinder (D) and Hubbard (R), WaPo, 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.
- Comment: little of this stems from ACA/Obamacare

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Is the US in trouble?

- See link to CBO report on course outline

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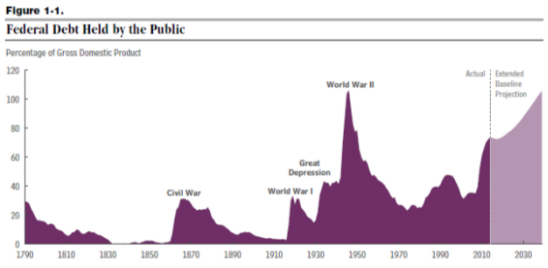
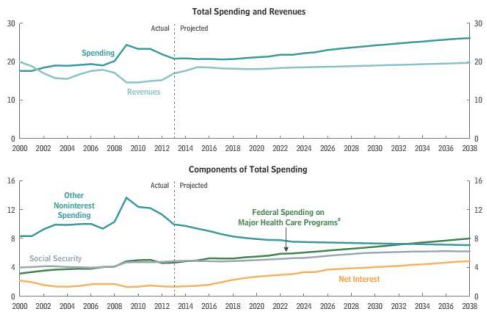
US government debt



Source: CBO.

47

US government expenses & revenues



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48

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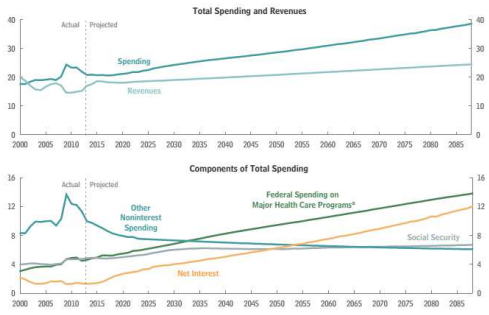

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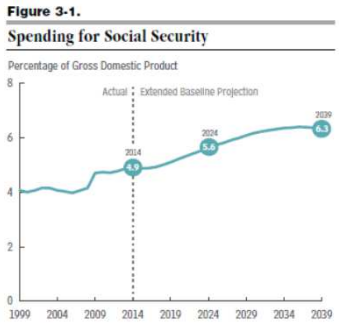
Social security spending



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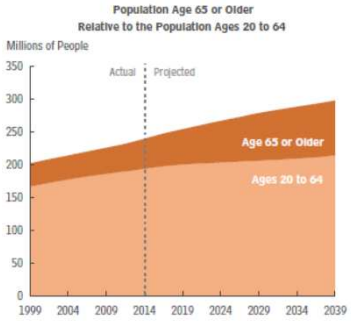
Demography



Source: CBO.

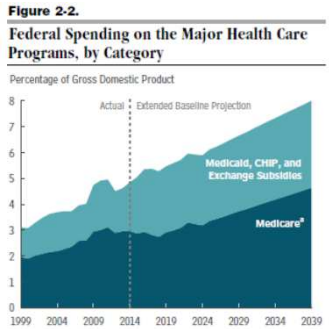
Social Security "fixes"

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

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 >50%
  - States set rules subject to federal approval

Federal healthcare spending



Source: CBO.

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 tax revenue: 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 promising to run (primary) surpluses in the future
- Standard tool
  - Debt dynamics equation (look for red box)
- Signs of trouble
  - Too much debt
  - Continuing and/or rising deficits
  - Weak political system
- US faces questions about future healthcare spending

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Macroeconomics

Government Debt & Deficits

NYU STERN

Something to think about

- Has the US government issued too much debt?
- What's too much? How would we know? What are the consequences?

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"?

Roadmap

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

Macroeconomic crises

Macroeconomic crises

- 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…)

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?

8

Words

- "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?

9

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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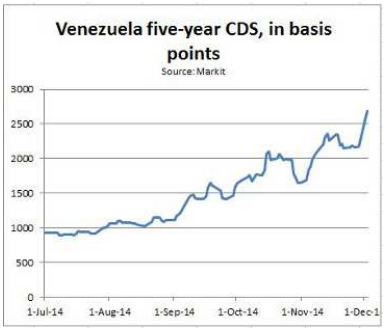

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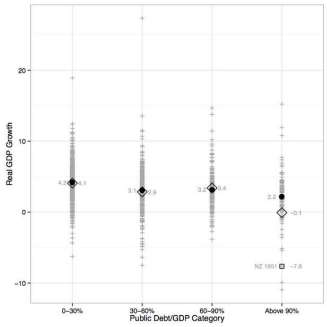

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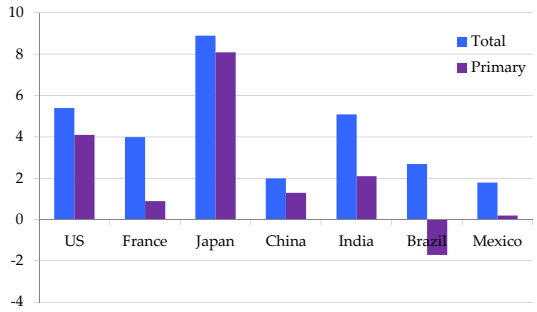
Government deficits (% of GDP, 2013)



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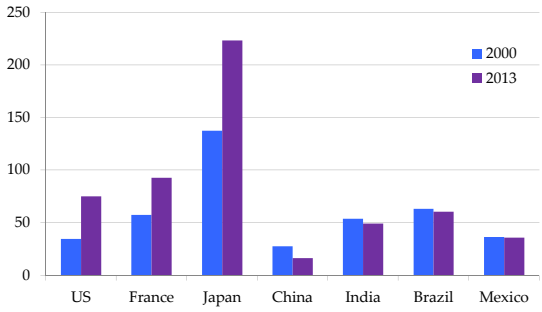
Government debt (% of GDP)



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

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

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Debt dynamics

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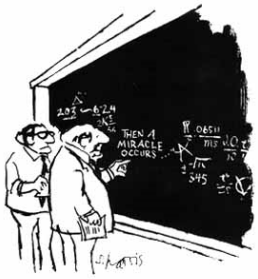

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Debt dynamics

- Ok, what are we left with?

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Debt dynamics

- In case you forgot

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

- 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: 50, not 0.50 (your choice, but that's what we'll do)

Debt dynamics in Greece

Total deficit (% GDP)	2.4
Primary deficit (% GDP)	0.2
Interest rate paid on debt (%) (!)	1.34
Inflation rate (%)	−0.5
Real GDP growth rate (%)	−4.0
Public debt (% GDP, previous year end)	156.9

Is B/Y going up or down? Why?

Source: EIU, Country Risk Report.

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- Debt-to-GDP fell from 47.1% to 25.0% [total change in B/Y = −22.1%]
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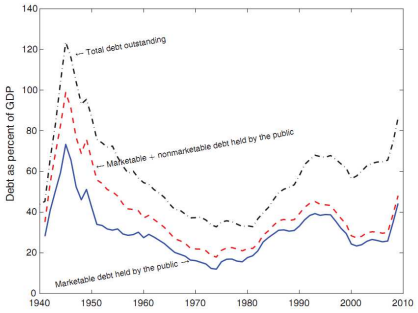
Source: Global Economy book.

What happened to US WW II debt?



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Is the US in trouble?

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- What's the problem?
  - Large current deficits
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  - **Significant increases in future spending in pipeline**
- Blinder (D) and Hubbard (R), WaPo, Sept 19, 2011
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- Comment: little of this stems from ACA/Obamacare

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Is the US in trouble?

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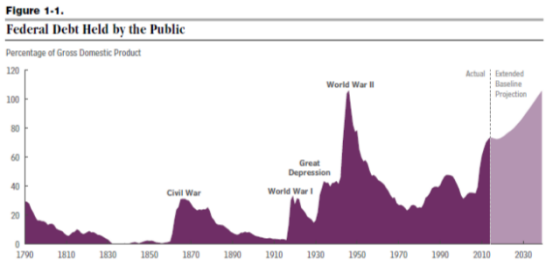
US government debt



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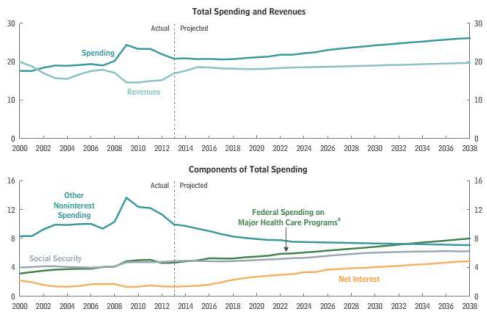
US government expenses & revenues



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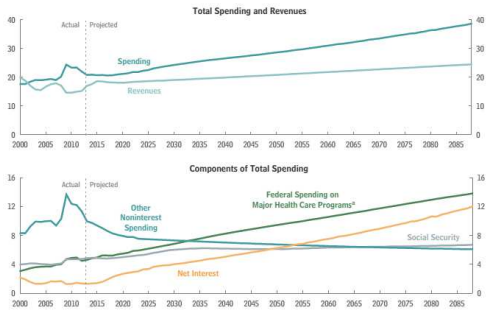
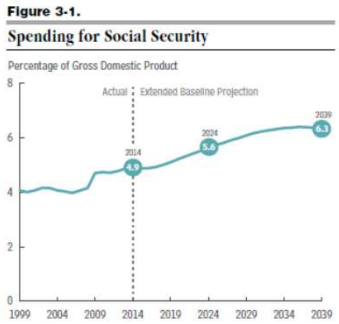


Source: CBO.

Social security spending



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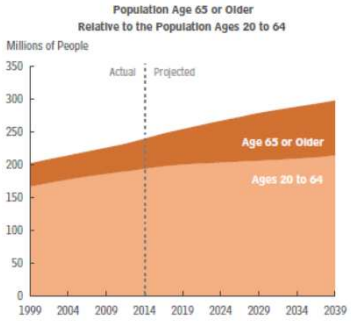

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Social Security "fixes"

- Solutions
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- Congressional Budget Office analysis
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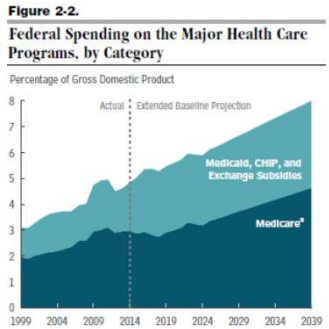
Medicare and Medicaid

- 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 >50%
  - States set rules subject to federal approval

Federal healthcare spending



Source: CBO.

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 tax revenue: 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 promising to run (primary) surpluses in the future
- Standard tool
  - Debt dynamics equation (look for red box)
- Signs of trouble
  - Too much debt
  - Continuing and/or rising deficits
  - Weak political system
- US faces questions about future healthcare spending

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Macroeconomics

Government Debt & Deficits

NYU STERN

Something to think about

- Has the US government issued too much debt?
- What's too much? How would we know? What are the consequences?

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"?

Roadmap

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

Macroeconomic crises

Macroeconomic crises

- 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…)

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?

8

Words

- "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?

9

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. That's very different from a company.
- What is he saying? Do you agree?

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Words

- 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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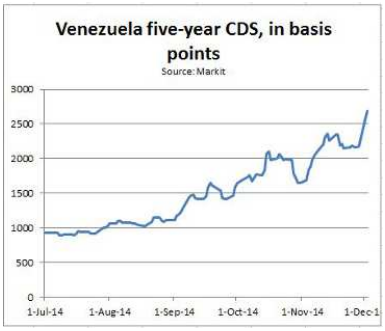
Venezuela



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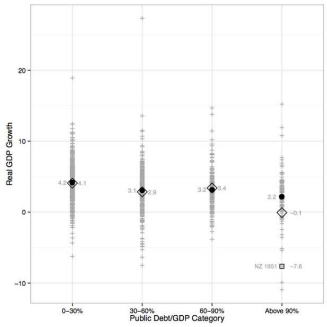
Reinhart-Rogoff data



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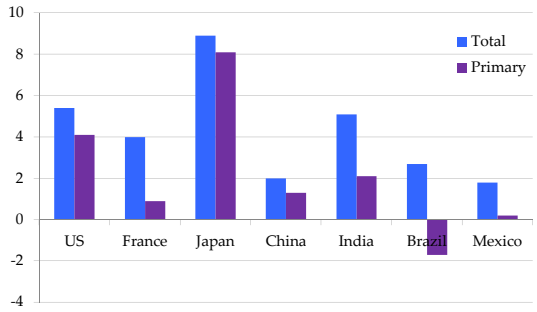
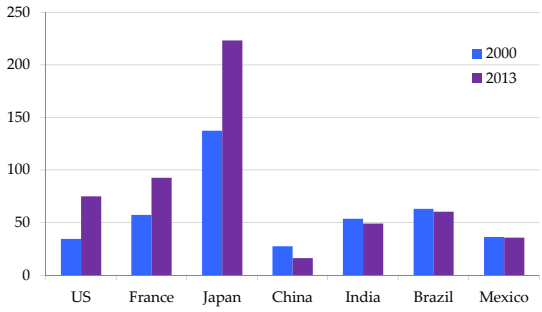
Government deficits (% of GDP, 2013)



Source: EIU CountryData.

15

Government debt (% of GDP)



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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}

Government budget: US, $b, 2012

Revenue	**4,259**
Tax revenue	3,041
Social insurance contributions	955
Expenses	**5,621**
Goods, services, and employee comp	2,548
Transfer payments	2,385
Interest on debt	632
Surplus	**–1,362**

For reference: GDP = 16,245

Source: BEA, Table 3.1, consolidated government; numbers may not sum to totals.

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
- ?? Downplay math, the point is what matters

Government budget arithmetic

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

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

$$\Rightarrow B_{t-1} = -D_t/(1+i) + B_{t-1}/(1+i)$$

$$= -D_t/(1+i) - D_{t+1}/(1+i)^2 - D_{t+2}/(1+i)^3 \ \ldots$$

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

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Debt dynamics

Debt dynamics

- Focus: ratio of debt to GDP, B/Y
  - By convention, both are nominal
- What makes B/Y change over time?
- 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

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

- Growth of (nominal) GDP

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

g_t= real GDP growth, π_t = inflation

- Both numerator and denominator of B/Y change

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Debt dynamics

- Reminder:

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

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

- Divide [1] by [2]:

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

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

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

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

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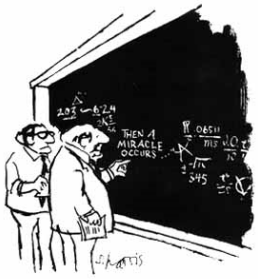
Debt dynamics

- More on that last step



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

30

Debt dynamics

- Ok, what are we left with?

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

Debt dynamics

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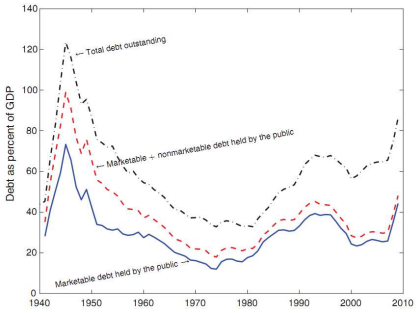

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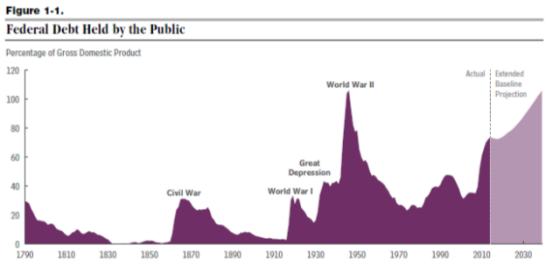

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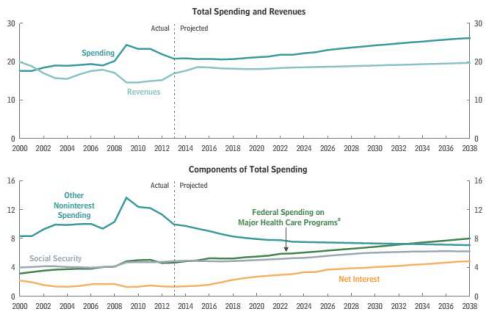

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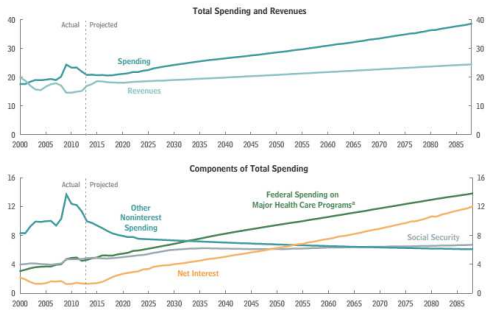

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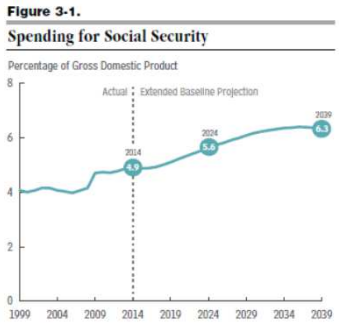

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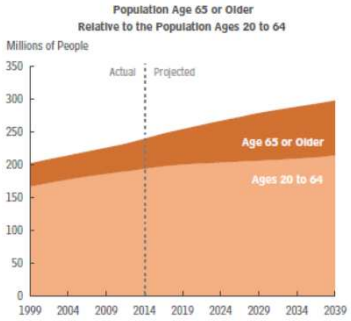

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  - States set rules subject to federal approval

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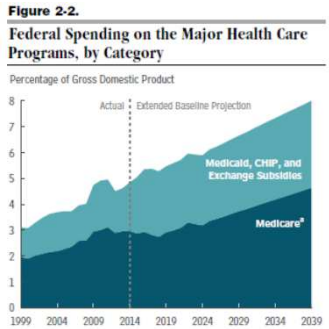

Source: CBO.

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 tax revenue: by a lot!
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What have we learned?

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

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Macroeconomics

Government Debt & Deficits

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Something to think about

- Has the US government issued too much debt?
- What's too much? How would we know? What are the consequences?

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"?

Roadmap

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

Macroeconomic crises

Macroeconomic crises

- 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…)

Words & pictures

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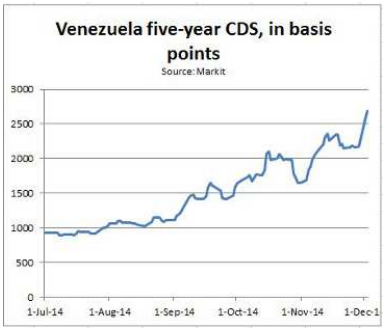

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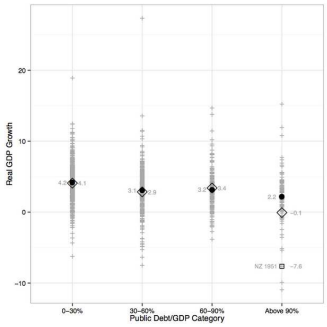

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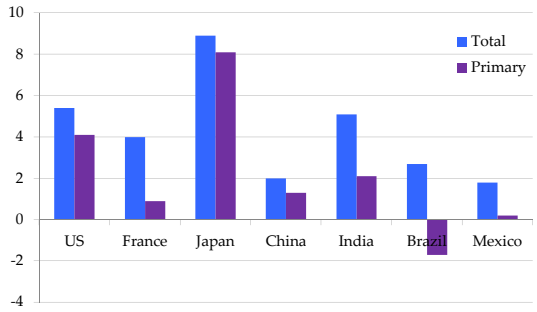
Government deficits (% of GDP, 2013)



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15

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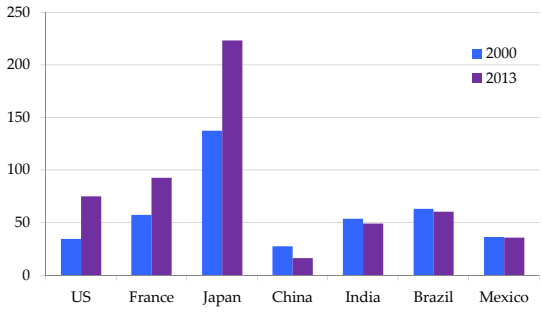

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Debt arithmetic

Government budget: Principle #1

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

18

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}

Government budget: US, $b, 2012

Revenue	**4,259**
Tax revenue	3,041
Social insurance contributions	955
Expenses	**5,621**
Goods, services, and employee comp	2,548
Transfer payments	2,385
Interest on debt	632
Surplus	**–1,362**

For reference: GDP = 16,245

Source: BEA, Table 3.1, consolidated government; numbers may not sum to totals.

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
- ?? Downplay math, the point is what matters

Government budget arithmetic

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

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

$$\Rightarrow B_{t-1} = -D_t/(1+i) + B_{t-1}/(1+i)$$

$$= -D_t/(1+i) - D_{t+1}/(1+i)^2 - D_{t+2}/(1+i)^3 \ \ldots$$

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

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Debt dynamics

Debt dynamics

- Focus: ratio of debt to GDP, B/Y
  - By convention, both are nominal
- What makes B/Y change over time?
- 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

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

- Growth of (nominal) GDP

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

g_t= real GDP growth, π_t = inflation

- Both numerator and denominator of B/Y change

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Debt dynamics

- Reminder:

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

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

- Divide [1] by [2]:

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

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

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

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

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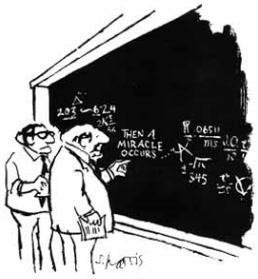
Debt dynamics

- More on that last step



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

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Debt dynamics

- Ok, what are we left with?

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

(A) (B) (C)

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

Debt dynamics

- In case you forgot

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

- 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: 50, not 0.50 (your choice, but that's what we'll do)

Debt dynamics in Greece

Total deficit (% GDP)	2.4
Primary deficit (% GDP)	0.2
Interest rate paid on debt (%) (!)	1.34
Inflation rate (%)	−0.5
Real GDP growth rate (%)	−4.0
Public debt (% GDP, previous year end)	156.9

Is B/Y going up or down? Why?

Source: EIU, Country Risk Report.

Debt dynamics in Greece

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

(A) (B) (C)

- Calculations
  - (A):
  - (B):
  - (C):
  - Total:
- What if we use the 10-year government bond rate (8.31)?

Debt dynamics in Greece

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

(A) (B) (C)

- Calculations
  - (A): (0.0134+0.005)*156.9 = +2.89
  - (B): +0.040*156.9 = +6.28
  - (C): +0.20
  - Total: +9.36 (B/Y rises to 166.3)
- What if we use the 10-year government bond rate (8.31)?

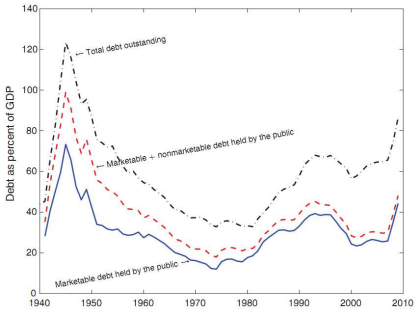
What happened to Peru's debt?

- 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?
  - Financial bailouts
  - Unfunded pensions
  - Other entitlements
  - Implicit guarantees of businesses or regional governments
- Examples?

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?

What's missing?

- The impact of debt on 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?

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?

- What's the problem?
  - Large current deficits
  - Growing debt
  - **Significant increases in future spending in pipeline**
- Blinder (D) and Hubbard (R), WaPo, 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.
- Comment: little of this stems from ACA/Obamacare

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Is the US in trouble?

- See link to CBO report on course outline

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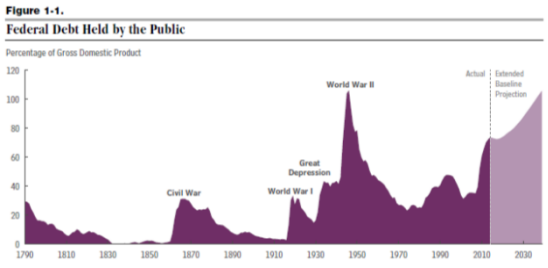
US government debt



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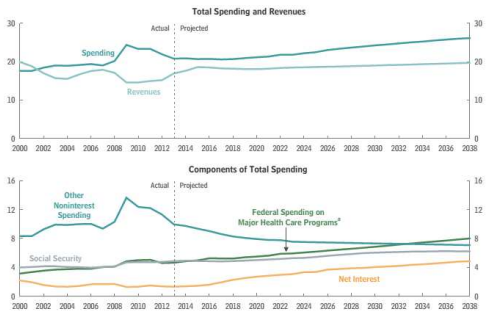
US government expenses & revenues



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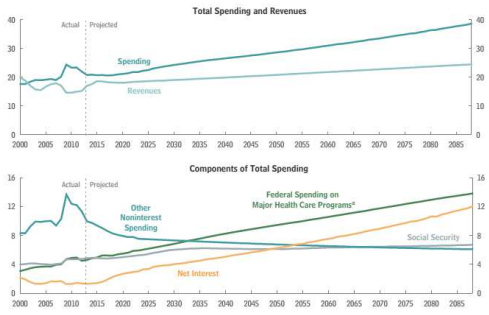

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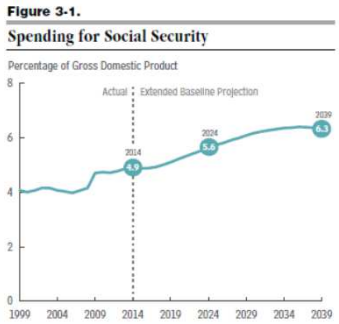
Social security spending



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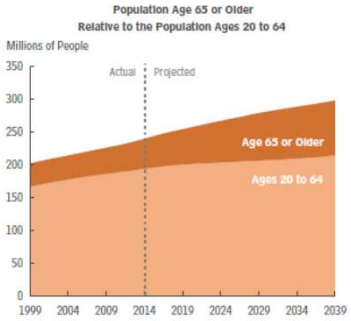

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Social Security "fixes"

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

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 >50%
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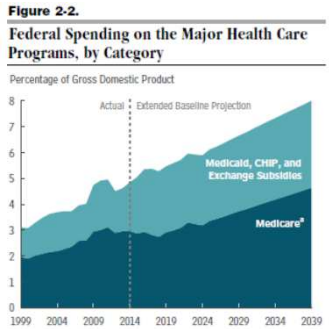

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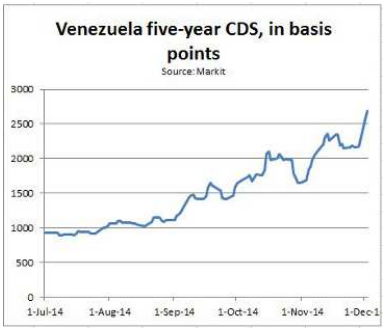

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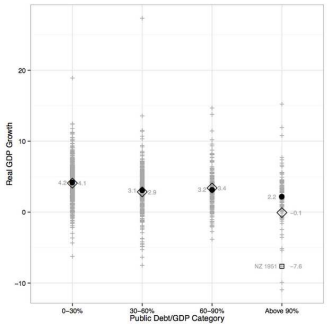

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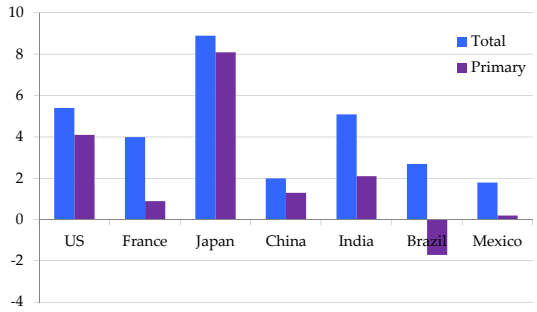
Government deficits (% of GDP, 2013)



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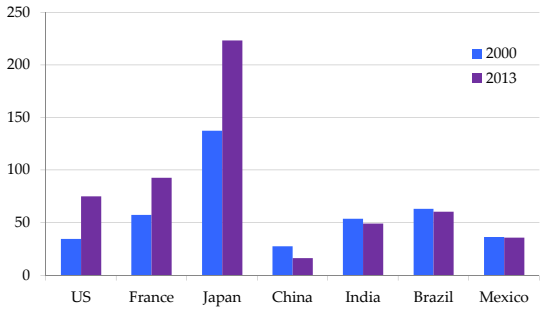

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Government budget: Principle #1

- 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

25

Debt dynamics

Debt dynamics

- Focus: ratio of debt to GDP, B/Y
  - By convention, both are nominal
- What makes B/Y change over time?
- 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

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

- Growth of (nominal) GDP

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

g_t= real GDP growth, π_t = inflation

- Both numerator and denominator of B/Y change

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Debt dynamics

- Reminder:

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

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

- Divide [1] by [2]:

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

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

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

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

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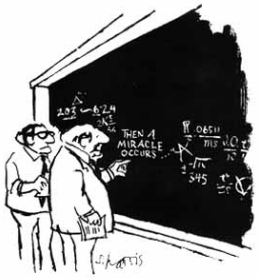
Debt dynamics

- More on that last step



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

30

Debt dynamics

- Ok, what are we left with?

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

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  - (A): interest on debt at (real) interest rate $r = i - \pi$
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Debt dynamics

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  - We need to convert (i, π, g) to numbers: 0.05, not 5
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Debt dynamics in Greece

Total deficit (% GDP)	2.4
Primary deficit (% GDP)	0.2
Interest rate paid on debt (%) (!)	1.34
Inflation rate (%)	−0.5
Real GDP growth rate (%)	−4.0
Public debt (% GDP, previous year end)	156.9

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Source: EIU, Country Risk Report.

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- Calculations
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  - Total:
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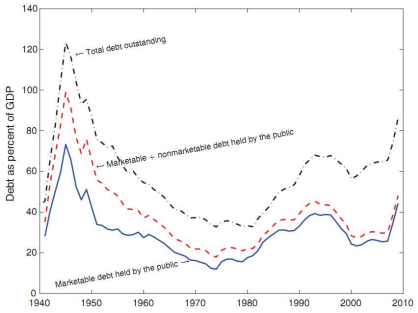
Source: Global Economy book.

What happened to US WW II debt?



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Is the US in trouble?

Is the US in trouble?

- What's the problem?
  - Large current deficits
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  - **Significant increases in future spending in pipeline**
- Blinder (D) and Hubbard (R), WaPo, 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?

- See link to CBO report on course outline

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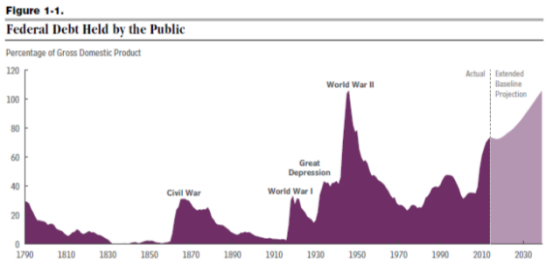
US government debt



Source: CBO.

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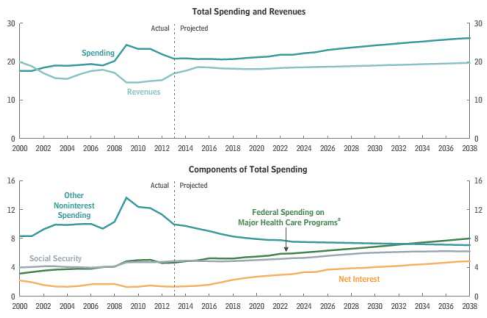
US government expenses & revenues



Source: CBO.

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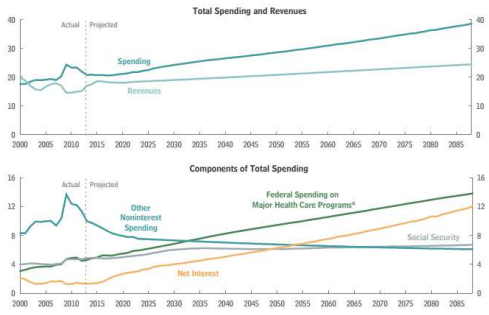
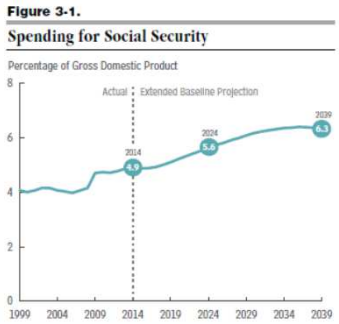


Source: CBO.

Social security spending



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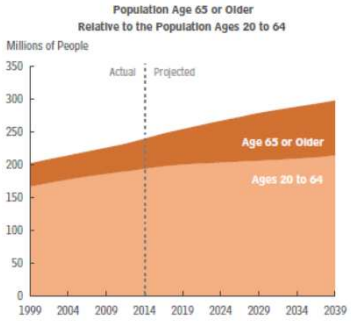
Demography



Source: CBO.

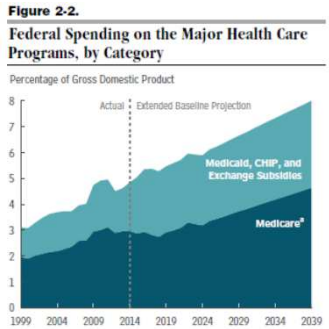
Social Security "fixes"

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

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 >50%
  - States set rules subject to federal approval

Federal healthcare spending



Source: CBO.

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 tax revenue: 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 promising to run (primary) surpluses in the future
- Standard tool
  - Debt dynamics equation (look for red box)
- Signs of trouble
  - Too much debt
  - Continuing and/or rising deficits
  - Weak political system
- US faces questions about future healthcare spending

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Macroeconomics

Government Debt & Deficits

NYU STERN

Something to think about

- Has the US government issued too much debt?
- What's too much? How would we know? What are the consequences?

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"?

Roadmap

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

Macroeconomic crises

Macroeconomic crises

- 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…)

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?

8

Words

- "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?

9

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. That's very different from a company.
- What is he saying? Do you agree?

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Words

- 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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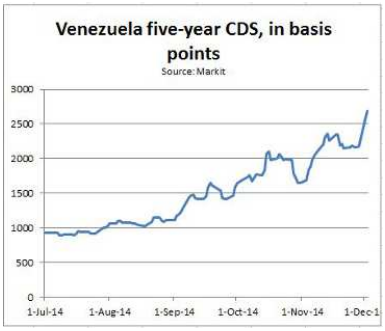
Venezuela



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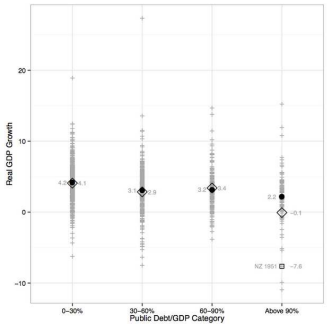
Reinhart-Rogoff data



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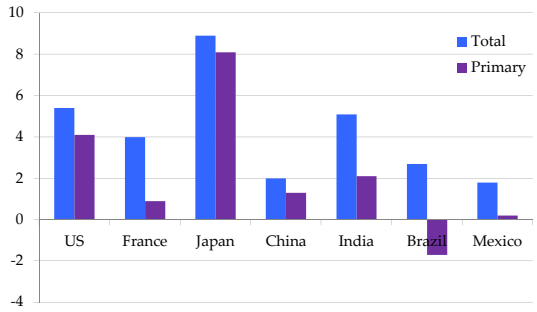
Government deficits (% of GDP, 2013)



Source: EIU CountryData.

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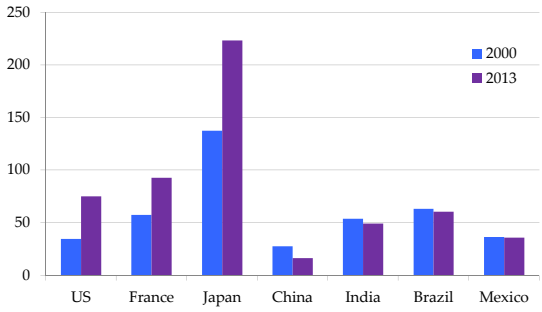
Government debt (% of GDP)



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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}

Government budget: US, $b, 2012

Revenue	**4,259**
Tax revenue	3,041
Social insurance contributions	955
Expenses	**5,621**
Goods, services, and employee comp	2,548
Transfer payments	2,385
Interest on debt	632
Surplus	**–1,362**

For reference: GDP = 16,245

Source: BEA, Table 3.1, consolidated government; numbers may not sum to totals.

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
- ?? Downplay math, the point is what matters

Government budget arithmetic

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

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

$$\Rightarrow B_{t-1} = -D_t/(1+i) + B_{t-1}/(1+i)$$

$$= -D_t/(1+i) - D_{t+1}/(1+i)^2 - D_{t+2}/(1+i)^3 \ \ldots$$

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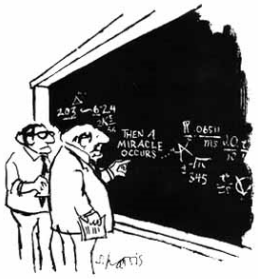

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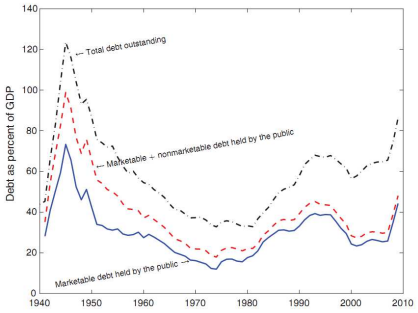

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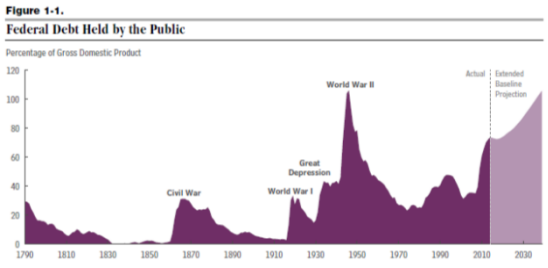
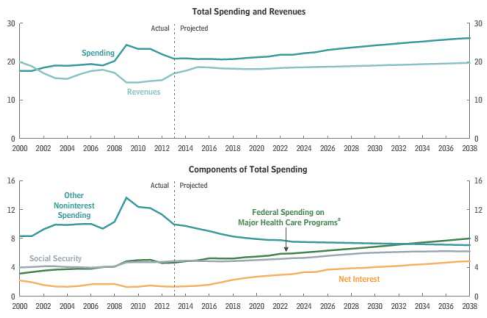
US government debt



Source: CBO.

47

US government expenses & revenues



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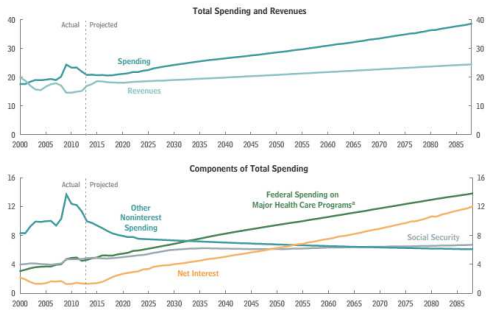

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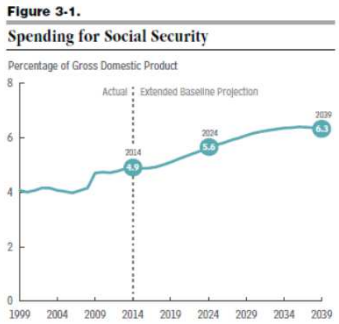

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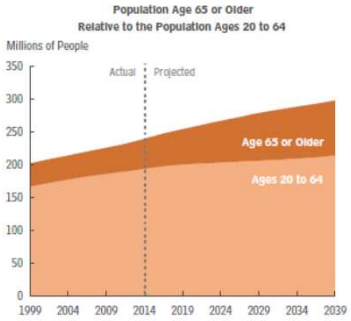

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  - Reduce benefits
  - Raise retirement age
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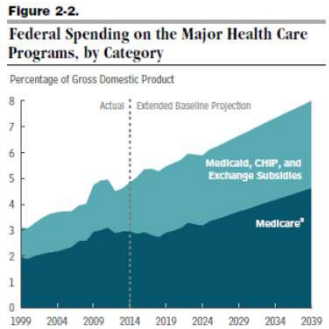
Medicare and Medicaid

- 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 >50%
  - States set rules subject to federal approval

Federal healthcare spending



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- 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 tax revenue: by a lot!
  - Or reduce benefits: but how?
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What have we learned?

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

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Macroeconomics

Government Debt & Deficits

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Something to think about

- Has the US government issued too much debt?
- What's too much? How would we know? What are the consequences?

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"?

Roadmap

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

Macroeconomic crises

Macroeconomic crises

- 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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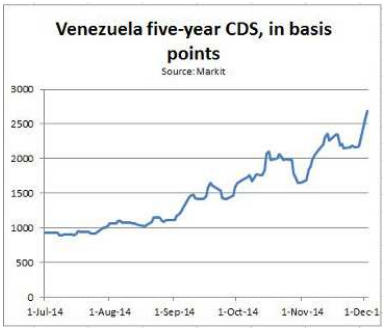

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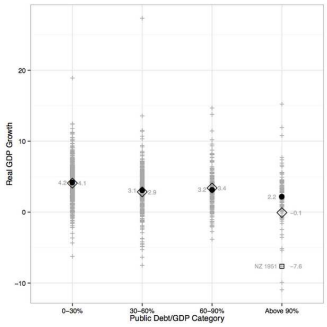

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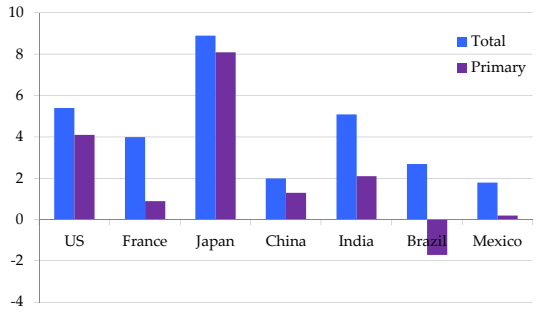
Government deficits (% of GDP, 2013)



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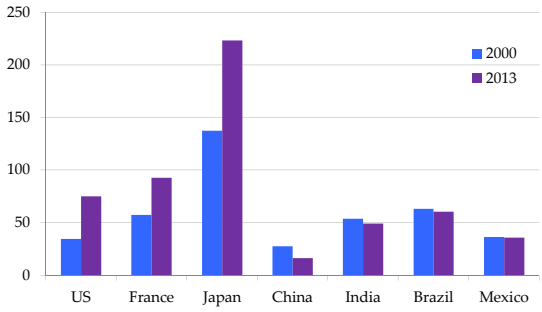

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Debt arithmetic

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}

Government budget: US, $b, 2012

Revenue	**4,259**
Tax revenue	3,041
Social insurance contributions	955
Expenses	**5,621**
Goods, services, and employee comp	2,548
Transfer payments	2,385
Interest on debt	632
Surplus	**–1,362**

For reference: GDP = 16,245

Source: BEA, Table 3.1, consolidated government; numbers may not sum to totals.

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
- ?? Downplay math, the point is what matters

Government budget arithmetic

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

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

$$\Rightarrow B_{t-1} = -D_t/(1+i) + B_{t-1}/(1+i)$$

$$= -D_t/(1+i) - D_{t+1}/(1+i)^2 - D_{t+2}/(1+i)^3 \ \ldots$$

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

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Debt dynamics

Debt dynamics

- Focus: ratio of debt to GDP, B/Y
  - By convention, both are nominal
- What makes B/Y change over time?
- 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

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

- Growth of (nominal) GDP

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

g_t= real GDP growth, π_t = inflation

- Both numerator and denominator of B/Y change

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Debt dynamics

- Reminder:

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

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

- Divide [1] by [2]:

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

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

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

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

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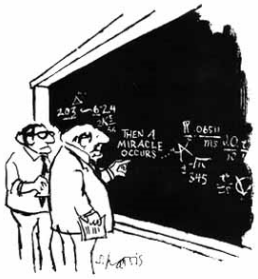
Debt dynamics

- More on that last step



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

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Debt dynamics

- Ok, what are we left with?

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

(A) (B) (C)

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

Debt dynamics

- In case you forgot

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

- 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: 50, not 0.50 (your choice, but that's what we'll do)

Debt dynamics in Greece

Total deficit (% GDP)	2.4
Primary deficit (% GDP)	0.2
Interest rate paid on debt (%) (!)	1.34
Inflation rate (%)	−0.5
Real GDP growth rate (%)	−4.0
Public debt (% GDP, previous year end)	156.9

Is B/Y going up or down? Why?

Source: EIU, Country Risk Report.

Debt dynamics in Greece

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

(A) (B) (C)

- Calculations
  - (A):
  - (B):
  - (C):
  - Total:
- What if we use the 10-year government bond rate (8.31)?

Debt dynamics in Greece

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

(A) (B) (C)

- Calculations
  - (A): (0.0134+0.005)*156.9 = +2.89
  - (B): +0.040*156.9 = +6.28
  - (C): +0.20
  - Total: +9.36 (B/Y rises to 166.3)
- What if we use the 10-year government bond rate (8.31)?

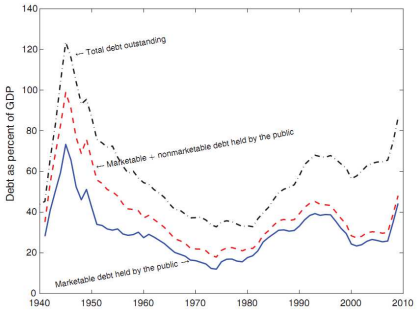
What happened to Peru's debt?

- 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?
  - Financial bailouts
  - Unfunded pensions
  - Other entitlements
  - Implicit guarantees of businesses or regional governments
- Examples?

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?

What's missing?

- The impact of debt on 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?

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?

- What's the problem?
  - Large current deficits
  - Growing debt
  - **Significant increases in future spending in pipeline**
- Blinder (D) and Hubbard (R), WaPo, 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.
- Comment: little of this stems from ACA/Obamacare

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Is the US in trouble?

- See link to CBO report on course outline

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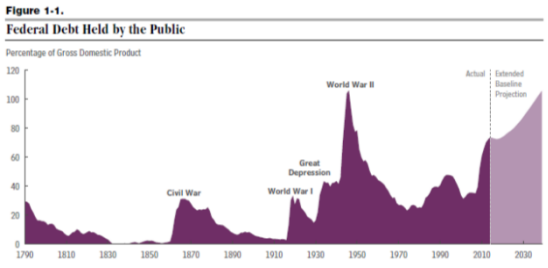

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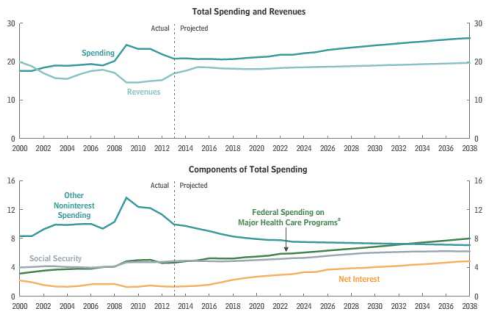

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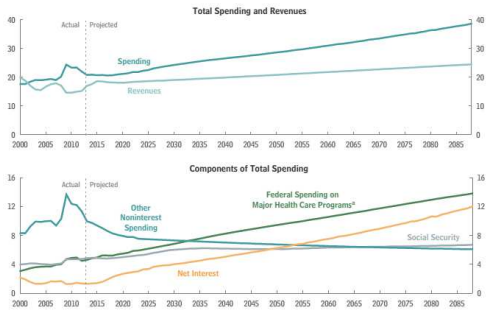

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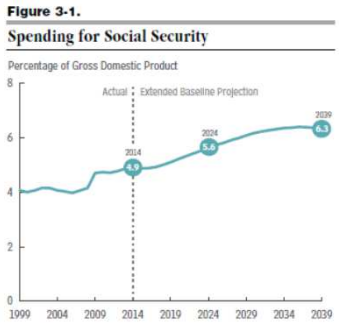

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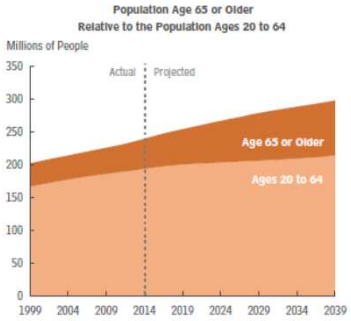

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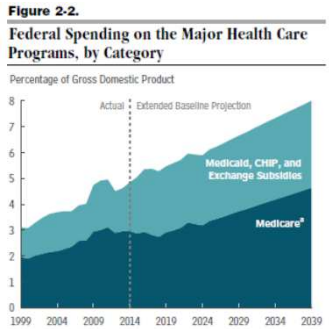

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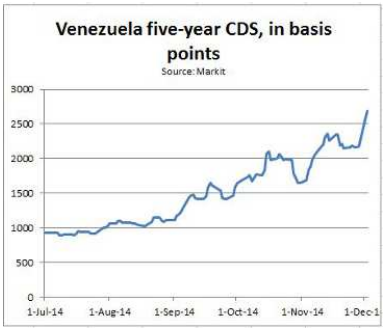

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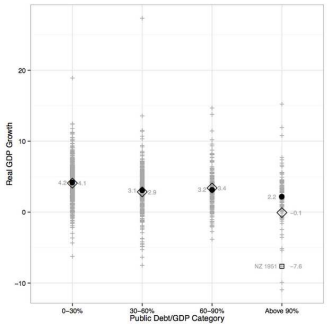

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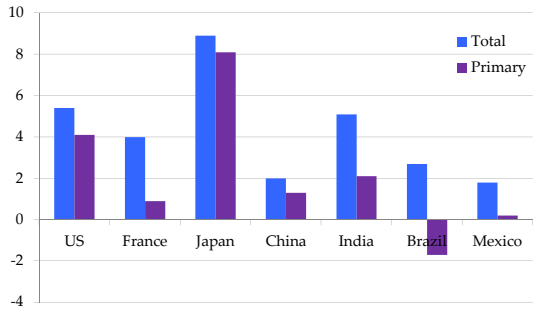
Government deficits (% of GDP, 2013)



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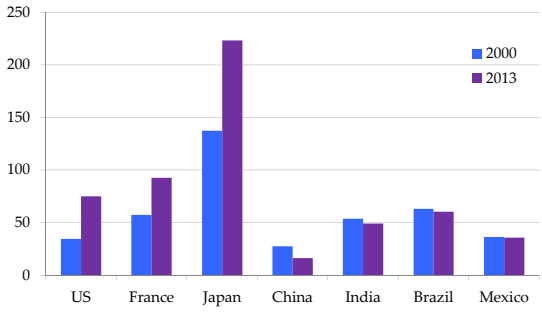
Government debt (% of GDP)



Source: EIU CountryData.

16

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

18

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}

Government budget: US, $b, 2012

Revenue	**4,259**
Tax revenue	3,041
Social insurance contributions	955
Expenses	**5,621**
Goods, services, and employee comp	2,548
Transfer payments	2,385
Interest on debt	632
Surplus	**–1,362**

For reference: GDP = 16,245

Source: BEA, Table 3.1, consolidated government; numbers may not sum to totals.

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
- ?? Downplay math, the point is what matters

Government budget arithmetic

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

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

$$\Rightarrow B_{t-1} = -D_t/(1+i) + B_{t-1}/(1+i)$$

$$= -D_t/(1+i) - D_{t+1}/(1+i)^2 - D_{t+2}/(1+i)^3 \ \ldots$$

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

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Debt dynamics

Debt dynamics

- Focus: ratio of debt to GDP, B/Y
  - By convention, both are nominal
- What makes B/Y change over time?
- 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

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

- Growth of (nominal) GDP

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

g_t= real GDP growth, π_t = inflation

- Both numerator and denominator of B/Y change

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Debt dynamics

- Reminder:

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

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

- Divide [1] by [2]:

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

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

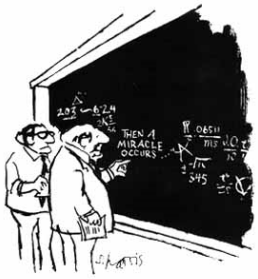
$$\approx B_{t-1}/Y_{t-1} + (i_t-\pi_t)B_{t-1}/Y_{t-1} - g_tB_{t-1}/Y_{t-1} + D_t/Y_t$$

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

29

Debt dynamics

- More on that last step



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

30

Debt dynamics

- Ok, what are we left with?

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

(A) (B) (C)

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

Debt dynamics

- In case you forgot

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

- 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: 50, not 0.50 (your choice, but that's what we'll do)

Debt dynamics in Greece

Total deficit (% GDP)	2.4
Primary deficit (% GDP)	0.2
Interest rate paid on debt (%) (!)	1.34
Inflation rate (%)	−0.5
Real GDP growth rate (%)	−4.0
Public debt (% GDP, previous year end)	156.9

Is B/Y going up or down? Why?

Source: EIU, Country Risk Report.

Debt dynamics in Greece

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(A) (B) (C)

- Calculations
  - (A):
  - (B):
  - (C):
  - Total:
- What if we use the 10-year government bond rate (8.31)?

Debt dynamics in Greece

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- Calculations
  - (A): (0.0134+0.005)*156.9 = +2.89
  - (B): +0.040*156.9 = +6.28
  - (C): +0.20
  - Total: +9.36 (B/Y rises to 166.3)
- What if we use the 10-year government bond rate (8.31)?

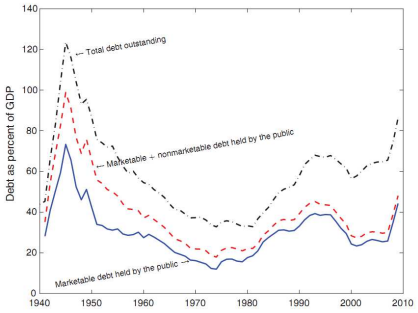
What happened to Peru's debt?

- 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?
  - Financial bailouts
  - Unfunded pensions
  - Other entitlements
  - Implicit guarantees of businesses or regional governments
- Examples?

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?

What's missing?

- The impact of debt on 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?

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?

- What's the problem?
  - Large current deficits
  - Growing debt
  - **Significant increases in future spending in pipeline**
- Blinder (D) and Hubbard (R), WaPo, 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.
- Comment: little of this stems from ACA/Obamacare

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Is the US in trouble?

- See link to CBO report on course outline

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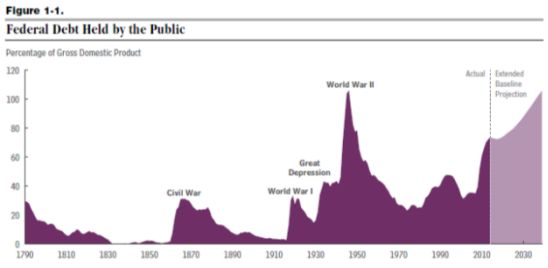
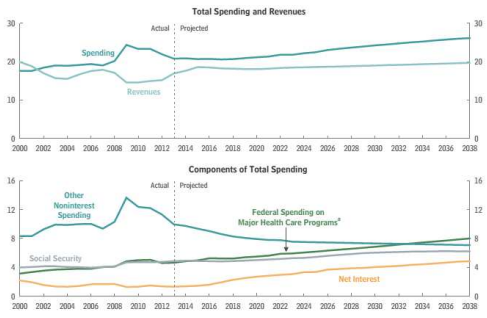
US government debt



Source: CBO.

47

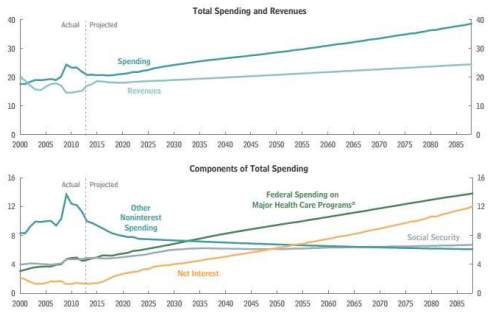
US government expenses & revenues



Source: CBO.

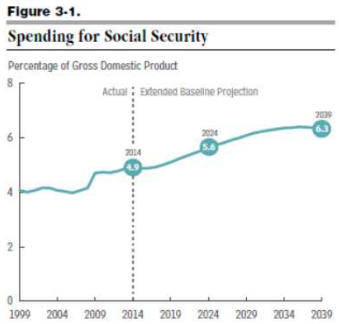
48

US government expenses & revenues



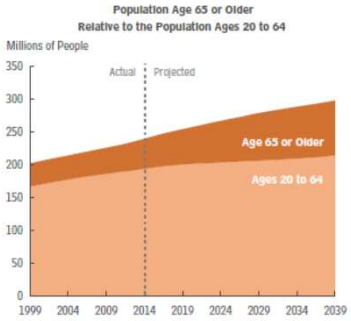
Source: CBO.

Social security spending



Source: CBO.

Demography



Source: CBO.

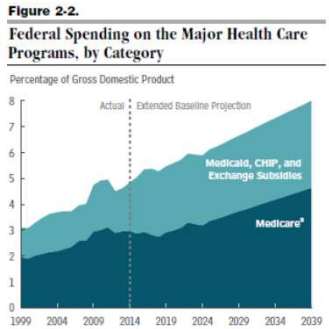
Social Security "fixes"

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

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 >50%
  - States set rules subject to federal approval

Federal healthcare spending



Source: CBO.

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 tax revenue: 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 promising to run (primary) surpluses in the future
- Standard tool
  - Debt dynamics equation (look for red box)
- Signs of trouble
  - Too much debt
  - Continuing and/or rising deficits
  - Weak political system
- US faces questions about future healthcare spending

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Macroeconomics

Government Debt & Deficits

NYU STERN

Something to think about

- Has the US government issued too much debt?
- What's too much? How would we know? What are the consequences?

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"?

Roadmap

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

Macroeconomic crises

Macroeconomic crises

- 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…)

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?

8

Words

- "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?

9

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?

10

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. That's very different from a company.
- What is he saying? Do you agree?

11

Words

- 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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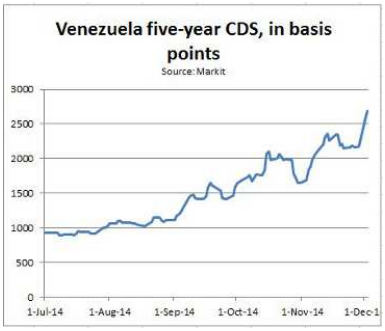
Venezuela



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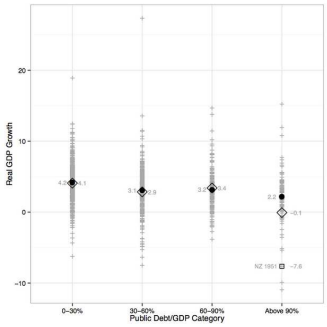
Reinhart-Rogoff data



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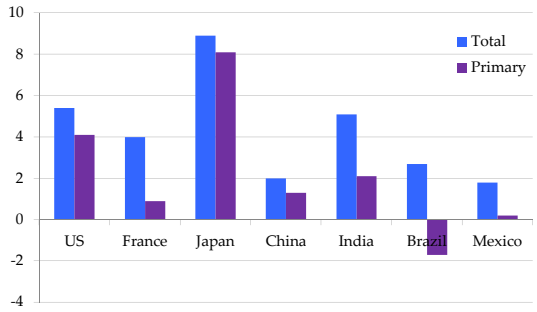
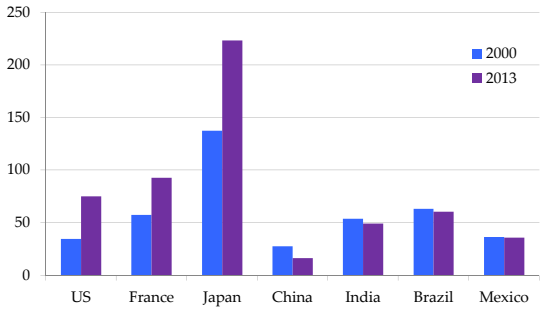
Government deficits (% of GDP, 2013)



Source: EIU CountryData.

15

Government debt (% of GDP)



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Government budget arithmetic

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- Looking forward in time
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Debt dynamics

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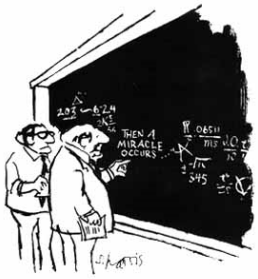

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Debt dynamics

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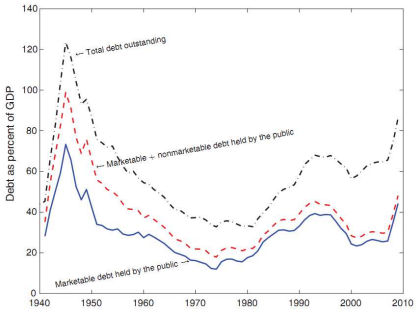
Sum		3.1	−14.3	−10.9

Source: Global Economy book.

What happened to US WW II debt?



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Is the US in trouble?

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  - **Significant increases in future spending in pipeline**
- Blinder (D) and Hubbard (R), WaPo, 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.
- Comment: little of this stems from ACA/Obamacare

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Is the US in trouble?

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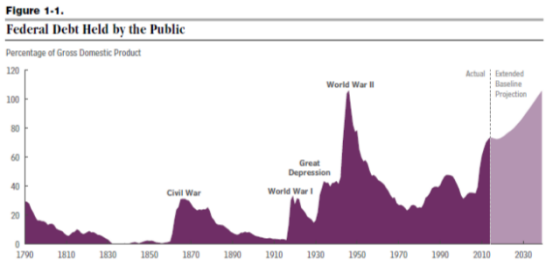
US government debt



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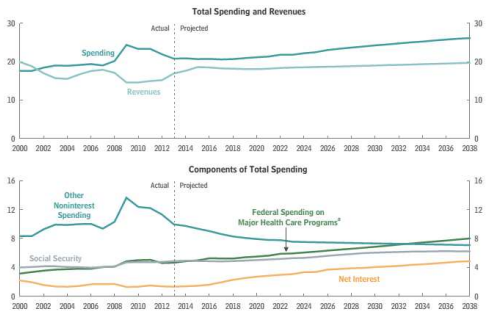
US government expenses & revenues



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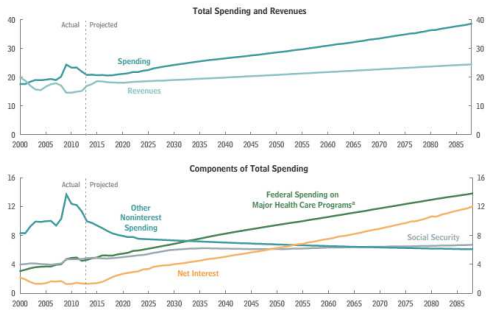

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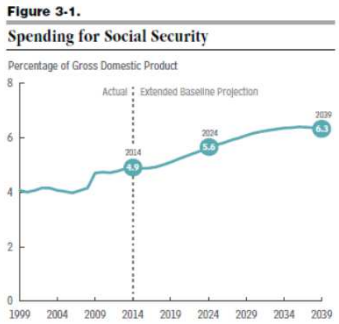
Social security spending



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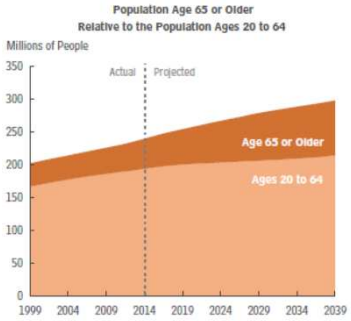

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Medicare and Medicaid

- Medicare: age 65 and older
  - Parts A&B cover hospital and physician care
  - Part D (2006) covers drugs
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- Medicaid: poor (joint state-federal program)
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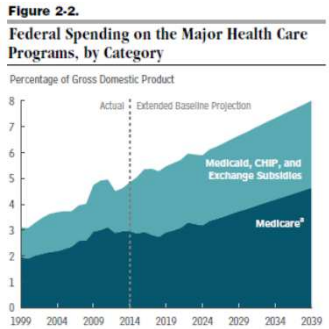

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  - Or reduce benefits: but how?
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What have we learned?

- Government budgets: deficits are financed by
  - By issuing debt today
  - And promising to run (primary) surpluses in the future
- Standard tool
  - Debt dynamics equation (look for red box)
- Signs of trouble
  - Too much debt
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Macroeconomics

Government Debt & Deficits

NYU STERN

Something to think about

- Has the US government issued too much debt?
- What's too much? How would we know? What are the consequences?

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"?

Roadmap

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

Macroeconomic crises

Macroeconomic crises

- 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…)

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?

8

Words

- "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?

9

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?

10

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. That's very different from a company.
- What is he saying? Do you agree?

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Words

- 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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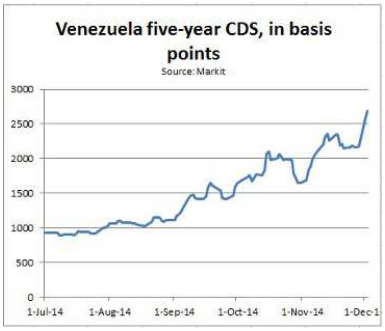
Venezuela



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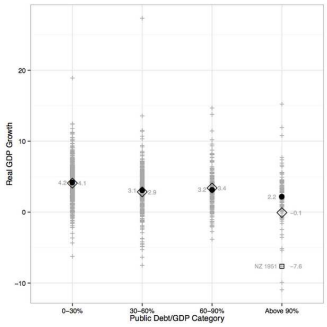
Reinhart-Rogoff data



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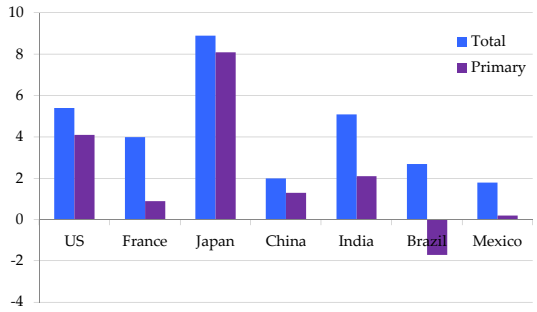
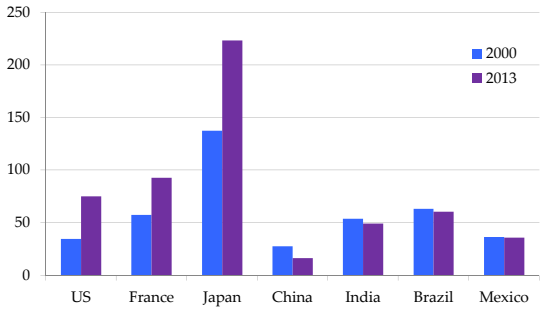
Government deficits (% of GDP, 2013)



Source: EIU CountryData.

15

Government debt (% of GDP)



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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}

Government budget: US, $b, 2012

Revenue	**4,259**
Tax revenue	3,041
Social insurance contributions	955
Expenses	**5,621**
Goods, services, and employee comp	2,548
Transfer payments	2,385
Interest on debt	632
Surplus	**–1,362**

For reference: GDP = 16,245

Source: BEA, Table 3.1, consolidated government; numbers may not sum to totals.

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
- ?? Downplay math, the point is what matters

Government budget arithmetic

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

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

$$\Rightarrow B_{t-1} = -D_t/(1+i) + B_{t-1}/(1+i)$$

$$= -D_t/(1+i) - D_{t+1}/(1+i)^2 - D_{t+2}/(1+i)^3 \ \ldots$$

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

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Debt dynamics

Debt dynamics

- Focus: ratio of debt to GDP, B/Y
  - By convention, both are nominal
- What makes B/Y change over time?
- 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

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

- Growth of (nominal) GDP

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

g_t= real GDP growth, π_t = inflation

- Both numerator and denominator of B/Y change

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Debt dynamics

- Reminder:

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

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

- Divide [1] by [2]:

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

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

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

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

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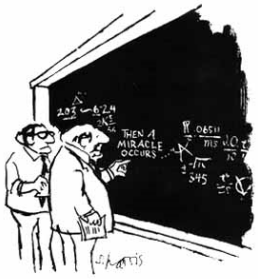
Debt dynamics

- More on that last step



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

30

Debt dynamics

- Ok, what are we left with?

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

(A) (B) (C)

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

Debt dynamics

- In case you forgot

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

- 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: 50, not 0.50 (your choice, but that's what we'll do)

Debt dynamics in Greece

Total deficit (% GDP)	2.4
Primary deficit (% GDP)	0.2
Interest rate paid on debt (%) (!)	1.34
Inflation rate (%)	−0.5
Real GDP growth rate (%)	−4.0
Public debt (% GDP, previous year end)	156.9

Is B/Y going up or down? Why?

Source: EIU, Country Risk Report.

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- Calculations
  - (A): (0.0134+0.005)*156.9 = +2.89
  - (B): +0.040*156.9 = +6.28
  - (C): +0.20
  - Total: +9.36 (B/Y rises to 166.3)
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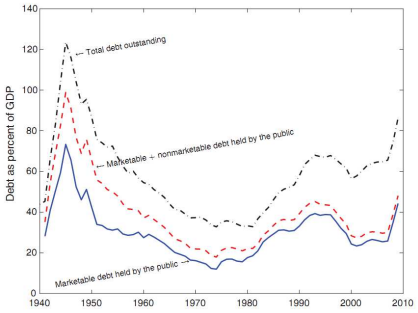

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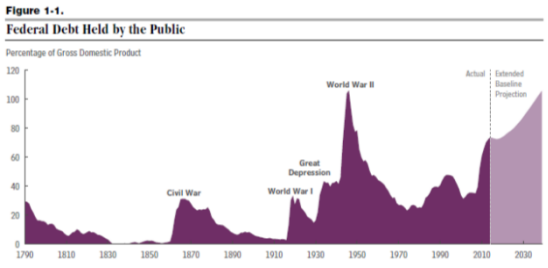

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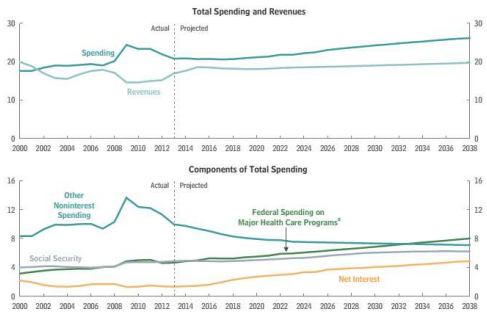

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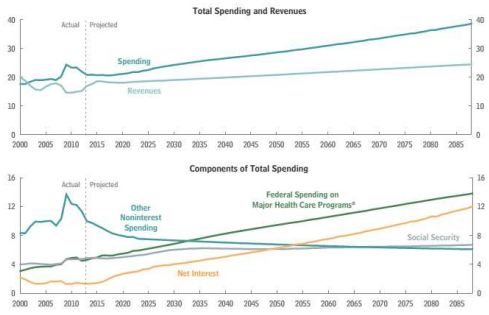

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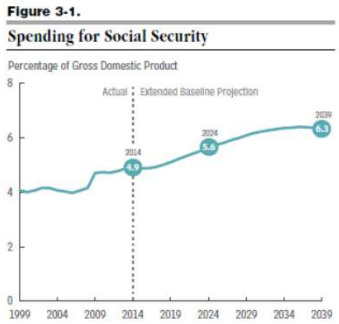

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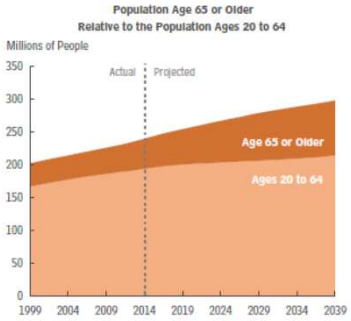

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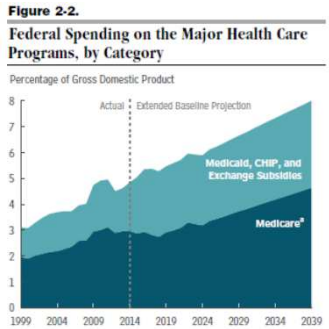

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