# The Public Debt Crisis of the United States

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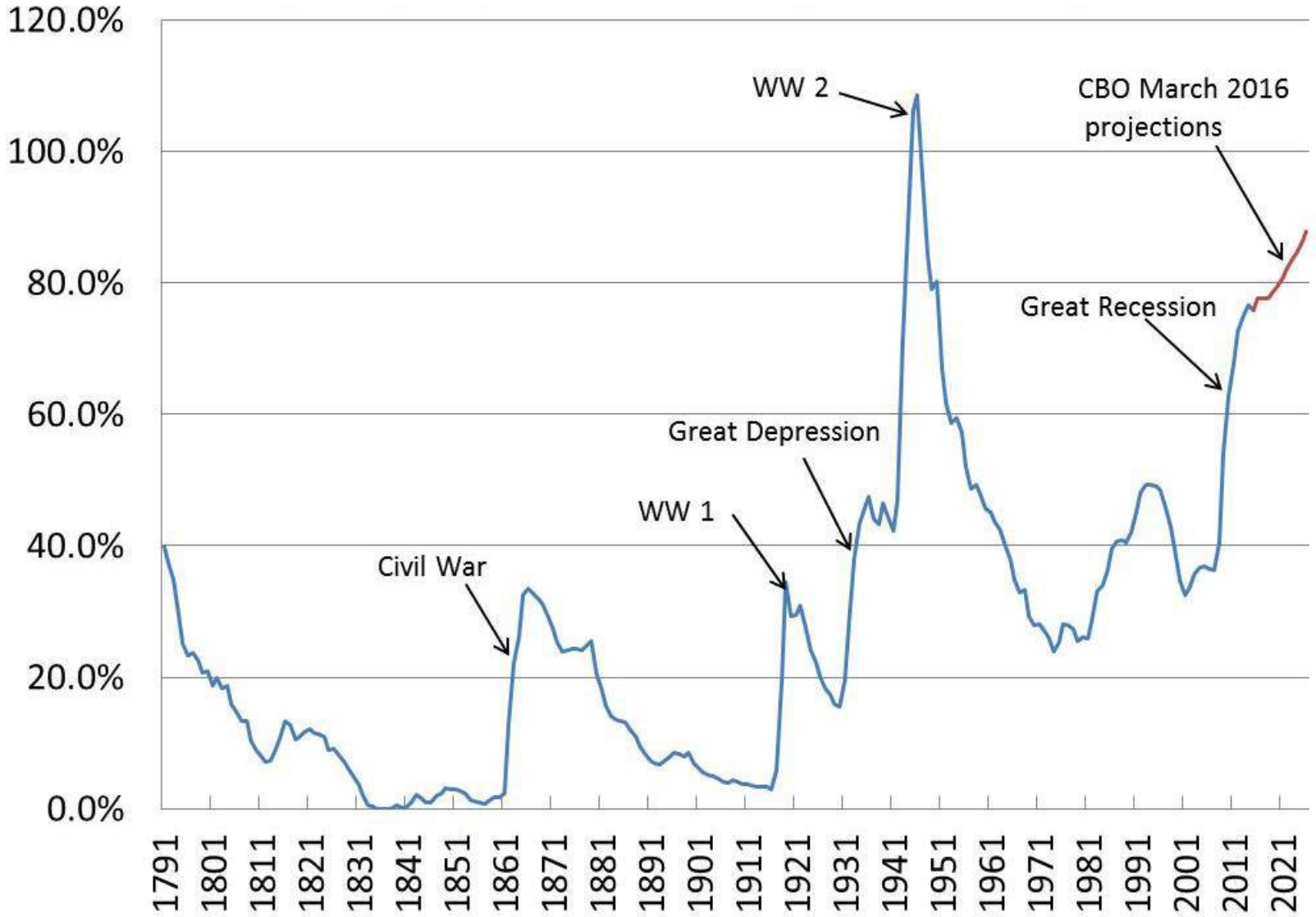
*Seminario sobre Sostenibilidad de la Deuda Pública: AIReF*
September 5, 2017
Madrid, Spain

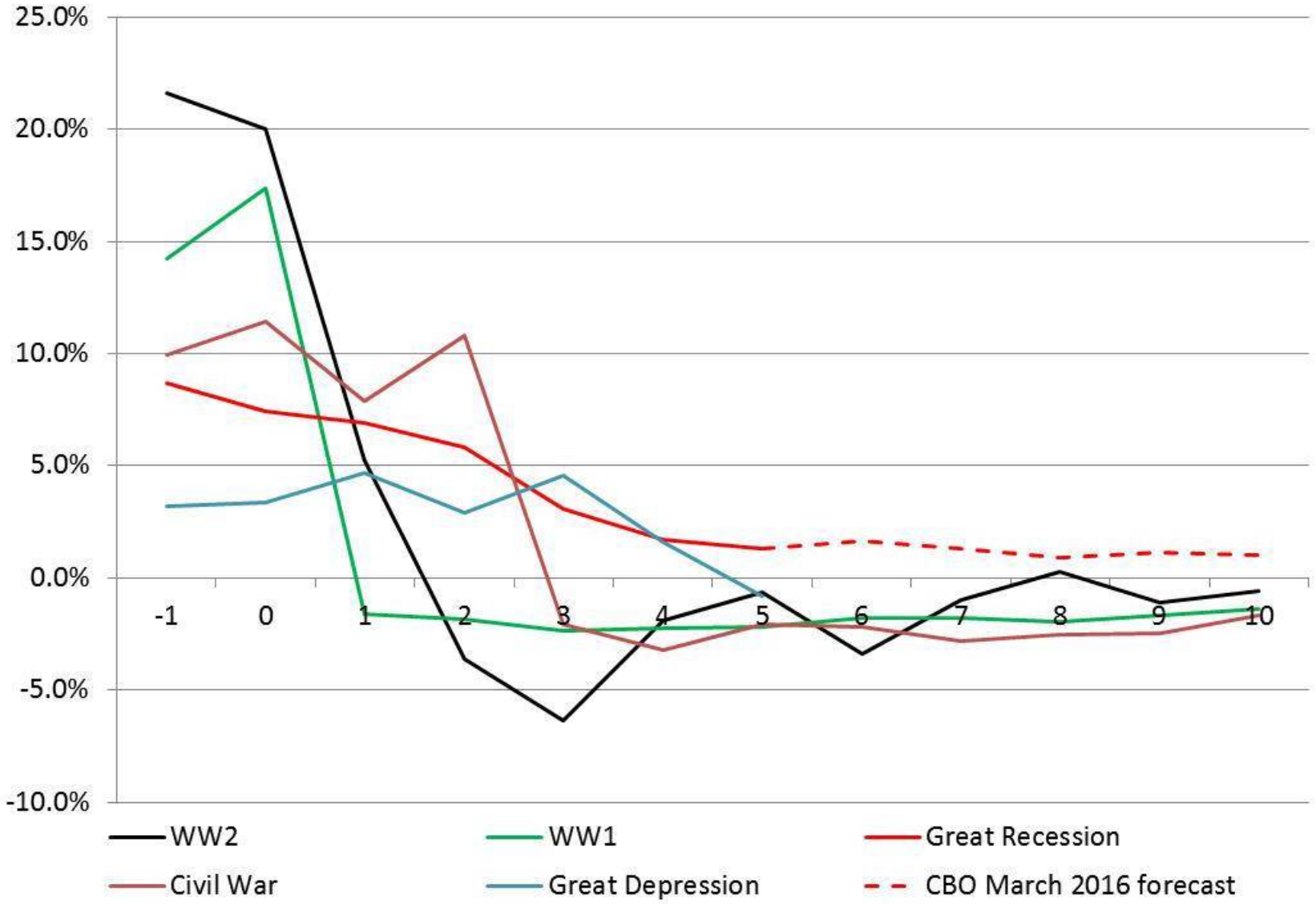
# What debt crisis?

- Five debt-crisis episodes since 1790 (annual increases in *net federal debt* in the 95-percentile).
- Great Recession is 2nd largest, and the only one in which *primary* deficits persist six years later and are expected to persist at least through 2026.
- Persistent deficits sharply at odds with surpluses that contributed to reverse all debt spikes in U.S. history
- …much worse if we add unfunded liabilities: 20% of GDP from state+local govs. (Lutz & Sheiner (14)), 93% of GDP from social sec.+medicare (Moody's (16))

# Debt crises in U.S. history
## (Bohn historical dataset)



# Primary deficits after debt crises



# Accounting for large debt reductions

| | Initial debt ratio | Final debt ratio | Cumulated contribution of | | | | | | annnualized rates | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Change in debt ratio | Overall deficit | Growth effect | Primary deficit | Debt service | Net debt Service | nominal growth | inflation | real growth |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| | | | *I. Peak to Through* | | | | | | | | |
| a) 1792-1812 | 37.5% | 7.2% | -30.3% | -7.2% | -23.1% | -25.2% | 18.0% | -5.1% | 5.8% | 1.4% | 4.3% |
| b) 1866-1916 | 33.5% | 3.0% | -30.5% | -16.7% | -13.8% | -45.0% | 28.3% | 14.5% | 3.3% | -0.6% | 3.9% |
| c) 1919-1930 | 34.6% | 15.6% | -19.0% | 8.8% | -27.8% | -2.7% | 11.6% | -16.3% | 2.6% | 0.1% | 2.5% |
| d) 1946-1974 | 108.7% | 23.9% | -84.8% | 18.5% | -103.3% | -24.1% | 42.6% | -60.7% | 6.9% | 3.3% | 3.5% |
| e) 1994-2001 | 49.2% | 32.5% | -16.7% | 1.0% | -17.7% | -21.5% | 22.4% | 4.8% | 5.6% | 1.8% | 3.7% |
| | | | *II. Per-year averages* | | | | | | | | |
| a) 1792-1812 | | | -1.5% | -0.4% | -1.2% | -1.3% | 0.9% | -0.3% | | | |
| b) 1866-1916 | | | -0.6% | -0.3% | -0.3% | -0.9% | 0.6% | 0.3% | | | |
| c) 1919-1930 | | | -1.7% | 0.8% | -2.5% | -0.2% | 1.1% | -1.5% | | | |
| d) 1946-1974 | | | -3.0% | 0.7% | -3.7% | -0.9% | 1.5% | -2.2% | | | |
| e) 1994-2001 | | | -2.4% | 0.1% | -2.5% | -3.1% | 3.2% | 0.7% | | | |

$$b_t - b_{t-1} = def_t - \left(\frac{\gamma_t}{1+\gamma_t}\right) b_{t-1}$$

$$b_t - b_{t-1} = pr.def_t - \left(\frac{i_t - \gamma_t}{1+\gamma_t}\right) b_{t-1}$$

# What fiscal expansionists say

- High debt is not a concern, more debt is desirable in order to:

1. Finance fiscal expansions to fight protracted recessions, deflation, stagnation
2. Satisfy strong demand for “safe assets”
3. Take advantage of low (negative) borrowing costs, making expansionary fiscal policy even more appealing

# Four arguments to the contrary

1. *Empirical evidence*: Fiscal multipliers are negative & debt sustainability conditions break at high debt ratios.
2. *Unpleasant fiscal arithmetic*: DGE model shows that max of dynamic Laffer curves is below what is needed to restore solvency and there are large international spillovers.
3. *Debt demand instability*: Strong global demand for U.S. debt may be transitory result from globalization in environment in which U.S. has more developed fin. markets & larger expected gov. financing needs
4. *Domestic default risk*: Surges in domestic public debt often end in default (even outright). Governments may choose this "optimally" if "regressive redistribution" exceeds social value of debt (liquidity, self-insurance, risk-sharing)

# I. Empirical evidence: Multipliers

- Chinn (2013): U.S. fiscal multipliers in the 0.1-2.5 range (depending on method and type of expenditure/tax)
- Few studies compare low v. high debt
- Ilsetzki, Mendoza & Vegh (2013): when debt exceeds 60% of GDP, expenditure multiplier is zero on impact and -3 in the long run.
- Consistent with previous theoretical & empirical work on "expansionary austerity:" austerity with high debt creates expectations of solvency and lower future taxes (Blanchard (1990), Alessina and Perotti (1995), etc)

# I. Empirical evidence: Sustainability

- Bohn's fiscal-reaction-function (FRF) test: Positive conditional response of *pb* to debt ( $\rho > 0$ ) is sufficient for intertemporal gov. budget constraint (IGBC) to hold

$$pb_t = \mu_t + \rho b_{t-1} + \varepsilon_t,$$

  - Debt is stationary if $\rho > r$, or diverges to infinity if $0 < \rho < r$ but is still sustainable!
  - Lower response coefficients satisfy IGBC at same initial debt, but with larger deficits & higher long-run debt

- D'Erasmo, Mendoza & Zhang (2016) show test passes with historical data, but has large break post-2008 (lower response, large residuals, large primary deficits)

- Deficits much larger than out-of-sample pre-08 forecast (even allowing for output gap and larger gov. expenditures)

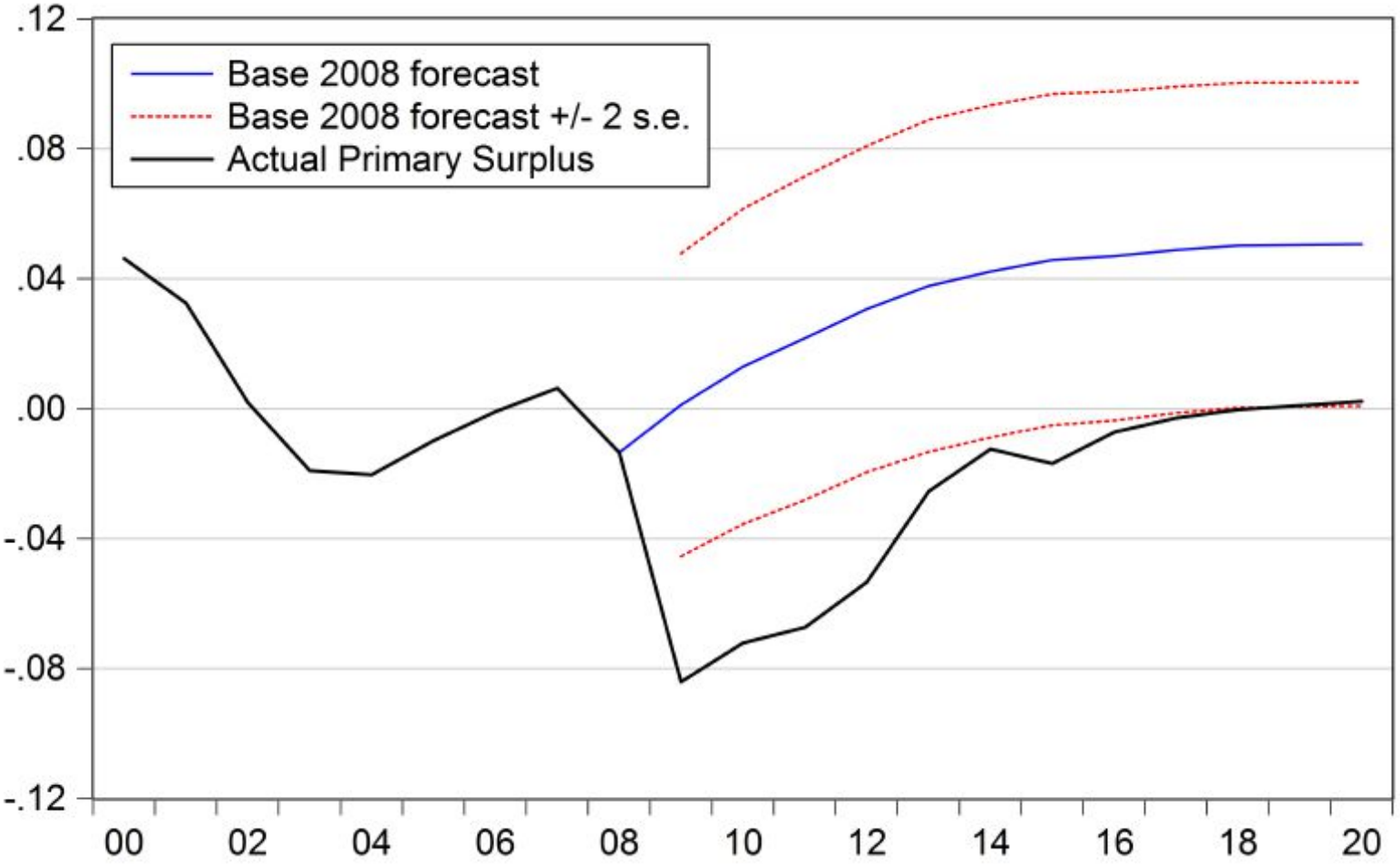
# U.S. FRF Estimates: 1792-2014

| Model: / Coefficient | Base model (1) | Asymmetric response (2) | AR(1) term (3) | Debt Squared (4) | Time trend (5) | Bohn's Sample (1793-2003) (6) | Pre-Recession (1793-2008) (7) |
|---|---|---|---|---|---|---|---|
| Constant | 0.00648<br>(0.004) | 0.00540<br>(0.003)* | 0.00974<br>(0.008) | 0.00653<br>(0.004) | 0.00601<br>(0.006) | 0.00485<br>(0.003)* | 0.00470<br>(0.003) |
| Initial debt $d_t^*$ | 0.07779<br>(0.040)* | 0.08689<br>(0.030)*** | 0.10477<br>(0.032)*** | 0.07715<br>(0.038)* | 0.07674<br>(0.035)** | 0.10498<br>(0.023)*** | 0.10188<br>(0.022)*** |
| GDP gap | 0.07404<br>(0.078) | 0.07300<br>(0.079) | 0.15330<br>(0.043)*** | 0.07390<br>(0.079) | 0.07490<br>(0.077) | 0.07987<br>(0.086) | 0.07407<br>(0.086) |
| Military Expenditure | -0.72302<br>(0.133)*** | -0.72001<br>(0.136)*** | -0.98955<br>(0.110)*** | -0.72320<br>(0.133)*** | -0.72462<br>(0.135)*** | -0.77835<br>(0.135)*** | -0.76857<br>(0.135)*** |
| $\max(0, d_t^* - \bar{d})$ | | -0.14487<br>(0.061) | | | | | |
| AR(1) | | | 0.89154<br>(0.029)*** | | | | |
| $(d_t^* - \bar{d})^2$ | | | | 0.00261<br>(0.044) | | | |
| Time trend | | | | | 6.89E-06<br>(5.9E-05) | | |
| s.e | 0.0239 | 0.0240 | 0.198 | 0.0120 | 0.0240 | 0.0210 | 0.0209 |
| Adj. R-squared: | 0.606 | 0.605 | 0.901 | 0.614 | 0.605 | 0.695 | 0688 |
| Observations: | 223 | 223 | 222 | 223 | 223 | 213 | 217 |

Note: HAC standard errors shown in parenthesis, 2-lag window prewhitening. "*","**", "***" denote that the corresponding coefficient is statistically significant at the 90, 95 and 99 percent confidence levels. Output gap is percent deviation from Hodrick-Prescott trend. Military expenditure includes all Department of Defense and Department of Veterans Affairs outlays.

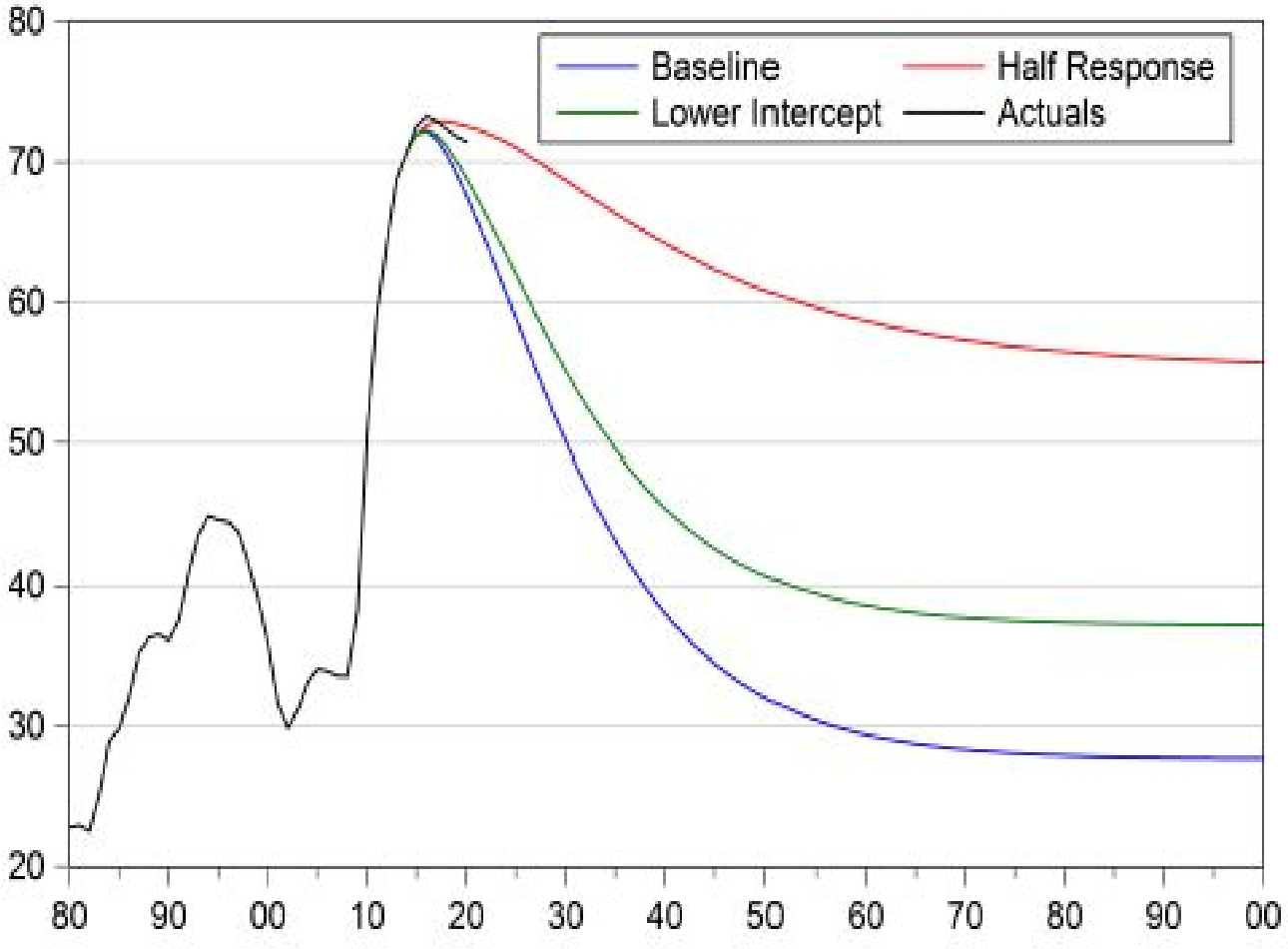
# U.S. Primary Balance Post-2008 Forecast

(2009-2020 forecast from 1791-2008 FRF regression)




Out-of-sample forecast uses actual values for the independent variables for 2009-2014 and 2016 President's Budget for 2015-2020

# U.S. Debt projections: Alternative FRFs




*Note*: For the US: Model (3) in table 1 is used in conjunction with estimated AR(2) processes for the output gap and military expenditure, plus the government budget constraint. For Europe: Model (5) in table 2 is used in conjunction with estimated AR(1) processes for the output gap and government consumption gap in each country, and a simple average among advanced European countries is taken.

# II. Unpleasant fiscal arithmetic

- FRFs with different parameters satisfy IGBC for *same* initial debt, but macro dynamics and welfare differ and FRFs can't compare them
- Mendoza, Tesar & Zhang (2016) use calibrated variant of workhorse two-country dynamic DGE model to compare fiscal adjustment policies in response to higher initial debt
- Match estimated tax elasticities by introducing utilization and limited depreciation tax allowance

# Key model elements

1. Deterministic setup with exogenous long-run growth driven by labor-augmenting technological change
2. Fiscal sector includes taxes on capital, labor and consumption, gov. purchases, transfers and debt
3. Utilization choice & limited depreciation tax allowance
4. Trade in goods and bonds (residence-based taxation)
5. Capital immobile across countries, but trade in bonds arbitrages post-tax returns & induces capital reallocation
6. Unilateral tax changes have cross-country externalities (relative prices, wealth distribution, tax revenues)

# Government constraints & dynamic Laffer curves

- Period budget constraint:

$$d_t - (1+\gamma) q_t^g d_{t+1} = pb_t$$

$$\equiv \tau_C c_t + \tau_L w_t l_t + \tau_K (r_t m_t - \theta\bar{\delta}) k_t - (g_t + e_t)$$

- IGBC:

$$\frac{d_0}{y_{-1}} = \psi_0 \left[ \frac{pb_0}{y_0} + \sum_{t=1}^{\infty} \left( \left[ \prod_{i=0}^{t-1} \upsilon_i \right] \frac{pb_t}{y_t} \right) \right]$$

$$\upsilon_i \equiv (1+\gamma)\psi_i q_i^g,$$

$$\psi_i \equiv y_{i+1}/y_i$$

- Dynamic Laffer curves (DLCs) plot change in PDV of *pb/y* (i.e. sustainable debt) as tax rate changes
- Gov. purchases and transfers are exogenous and kept constant at initial steady-state levels

# Tax distortions and spillovers

- Asset markets arbitrage (ignoring capital adj. costs):

$$\frac{(1+\gamma)u_1(c_t, 1-l_t)}{\tilde{\beta}u_1(c_{t+1}, 1-l_{t+1})} = (1-\tau_K)F_1(m_{t+1}k_{t+1}, l_{t+1})m_{t+1} + 1 - \delta(m_{t+1}) + \tau_K\theta\bar{\delta}$$

$$= \frac{1}{q_t} = \frac{1}{q_t^g}$$

$$= (1-\tau_K^*)F_1(m_{t+1}^*k_{t+1}^*, l_{t+1}^*)m_{t+1}^* + 1 - \delta(m_{t+1}^*) + \tau_K^*\theta\bar{\delta} = \frac{(1+\gamma)u_1(c_t^*, 1-l_t^*)}{\tilde{\beta}u_1(c_{t+1}^*, 1-l_{t+1}^*)}$$

- Labor market:

$$\frac{u_2(c_t, 1-l_t)}{u_1(c_t, 1-l_t)} = \frac{1-\tau_L}{1+\tau_C}F_2(k_t, l_t)$$

- Capacity utilization :

$$F_1(m_tk_t, l_t) = \frac{1+\Phi_t}{1-\tau_K}\delta'(m_t),$$

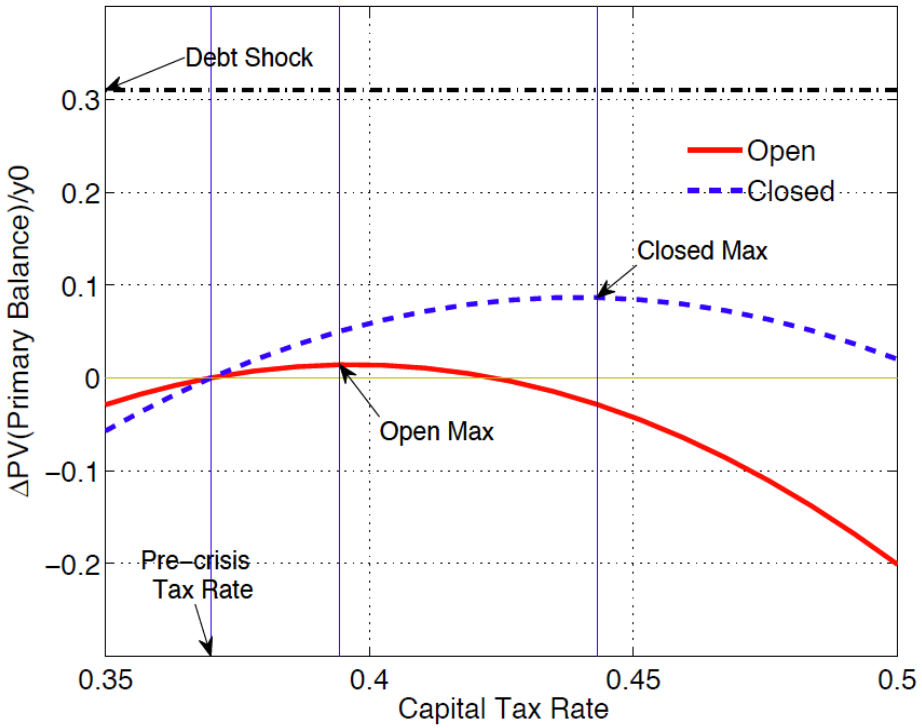
# Calibration U.S. & Europe
## (from D'Erasmo, Mendoza & Zhang (2016))

| | GDP-weighted | |
|---|---|---|
| | EU15 | US |
| (a) Macro Aggregates | | |
| $\tau_C$ | 0.17 | 0.04 |
| $\tau_L$ | 0.41 | 0.27 |
| $\tau_K$ | 0.32 | 0.37 |
| $c/y$ | 0.57 | 0.68 |
| $x/y$ | 0.21 | 0.21 |
| $g/y$ | 0.21 | 0.16 |
| $tb/y$ | 0.00 | −0.05 |
| Rev$/y$ | 0.45 | 0.32 |
| Total Exp$/y$ | 0.47 | 0.39 |
| (b) Debt Shocks | | |
| $d_{2007}/y_{2007}$ | 0.38 | 0.43 |
| $d_{2011}/y_{2011}$ | 0.58 | 0.74 |
| $\Delta d/y$ | 0.20 | 0.31 |

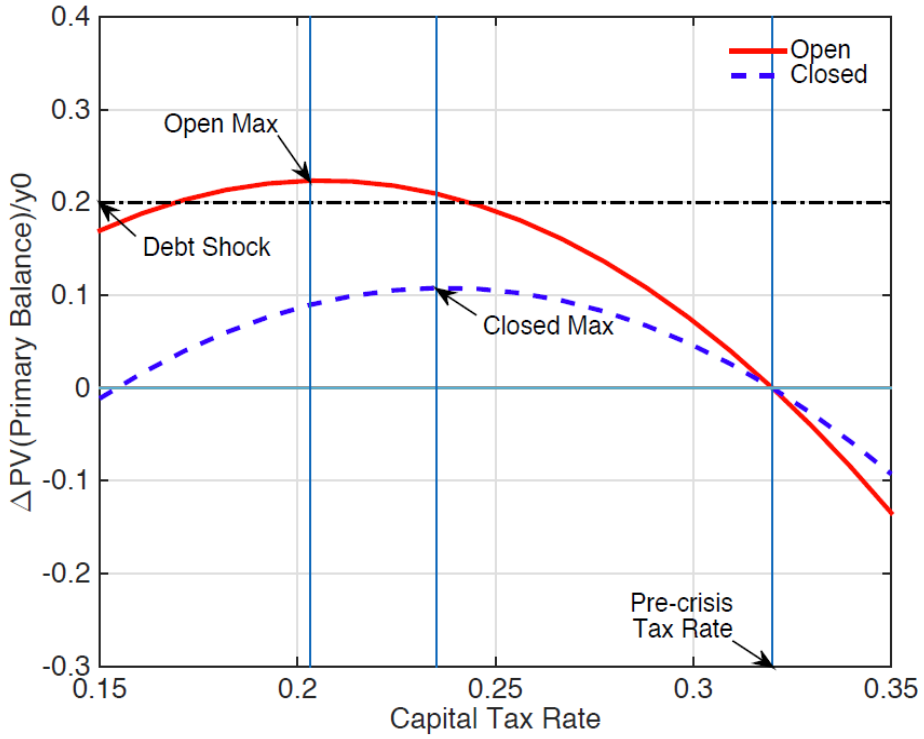
# Main findings

- Capital taxes:
  1. Large spillovers (strong strategic incentives)
  2. US: debt *not* sustainable (DLC max below required level)
  3. EU15: inefficient side of DLC (tax cut makes debt sustainable but via external effects--closed-economy DLC also peaks below required level)
  4. Without utilization and limited allowance short-run tax elasticity has wrong sign and DLC is linearly increasing!
- Labor taxes:
  1. Small spillovers
  2. US low initial taxes yield DLCs that sustain higher debt
  3. EU15: DLCs (closed or open) peak below required level

# Capital tax dynamic Laffer curves




(a) US




(b) EU15

# Effects of using DLC maximum U.S. capital tax

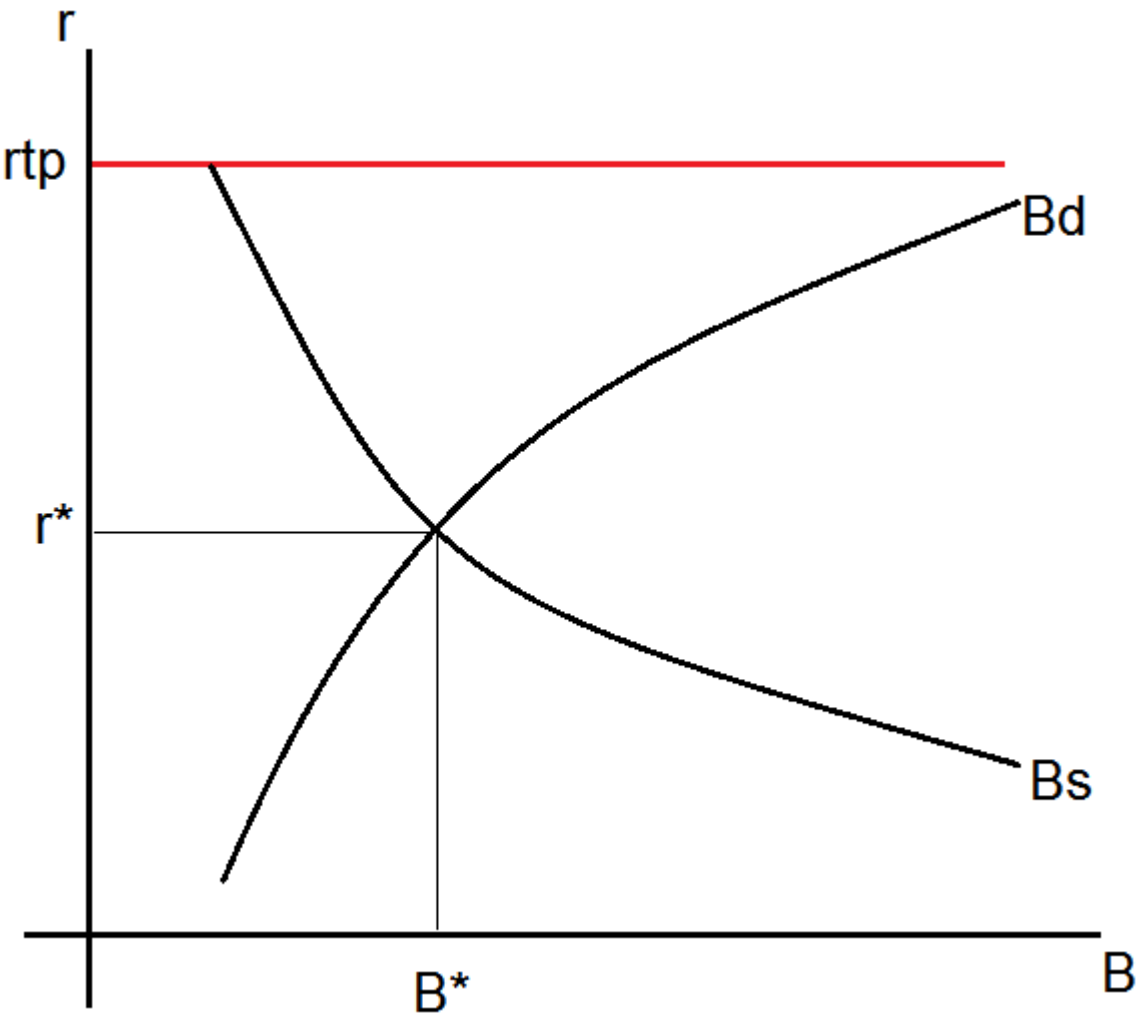
| | Open Economy | | | |
|---|---|---|---|---|
| | Home | | Foreign | |
| **Tax rates** | Old | New | Old | New |
| $\tau_K$ | 0.37 | 0.40 | 0.32 | 0.32 |
| $\tau_C$ | 0.04 | 0.04 | 0.17 | 0.17 |
| $\tau_L$ | 0.27 | 0.27 | 0.41 | 0.40 |
| $\Delta$PV(Primary Bal.)/$y_0$ | | 0.014 | | 0.00 |
| Welfare Impact | | −2.19 | | 0.74 |
| $\Delta y_{ss}$ | | −3.87 | | 1.25 |

**Note: Capital tax increase to maximum point of open-economy Laffer curve. Fore neutrality by lowering labor tax.**

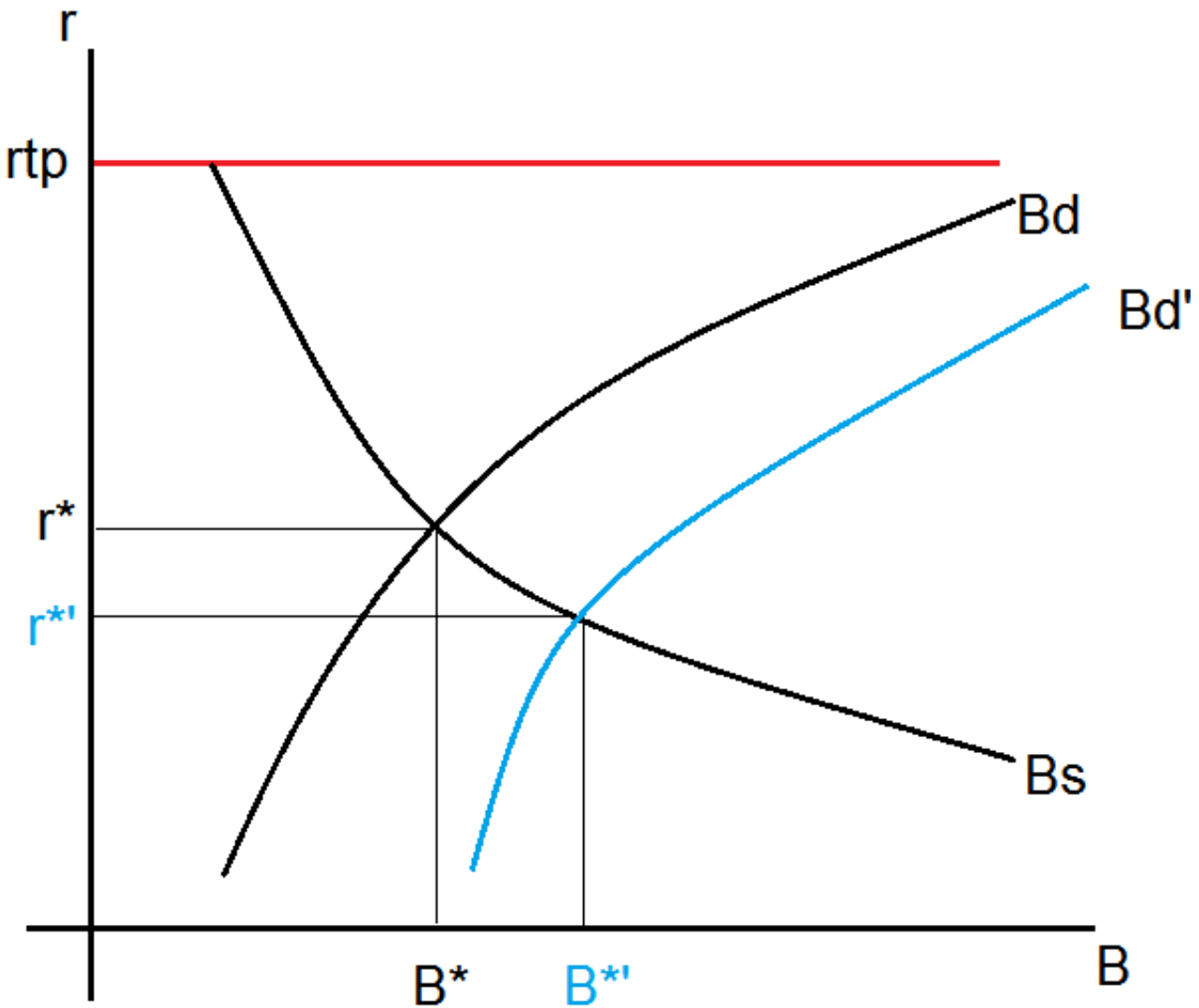
# III. Demand instability

- Market of safe assets (gov. debt) in economies with heterogeneous agents & uninsurable risks
- Higher actual or perceived volatility (aggregate or individual) increases demand
  - If volatility is high, demand rises, yields fall, but low rates may cause fin. instability (Mendoza & Quadrini (2010)) causing higher volatility (self-fulfilling crises?)
- Financial integration also increases demand:
  1. Countries heterogeneous in financial development: more developed supply more than they demand, hold negative NFA (Mendoza, Quadrini, Rios-Rull (2009))
  2. Countries heterogeneous in long-run debt: those with higher debt supply more than they demand, hold negative NFA

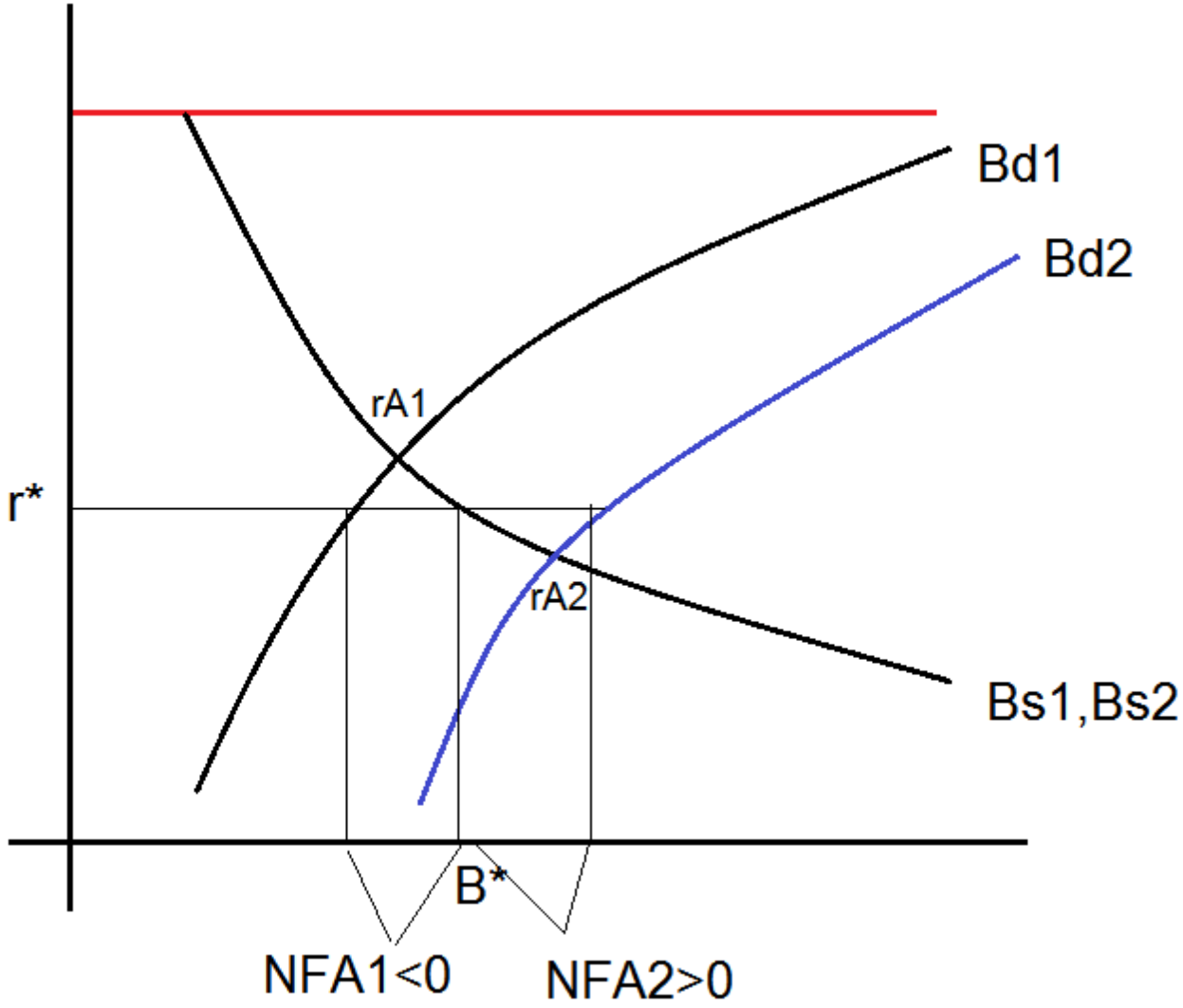
# Safe assets market: Closed Economy



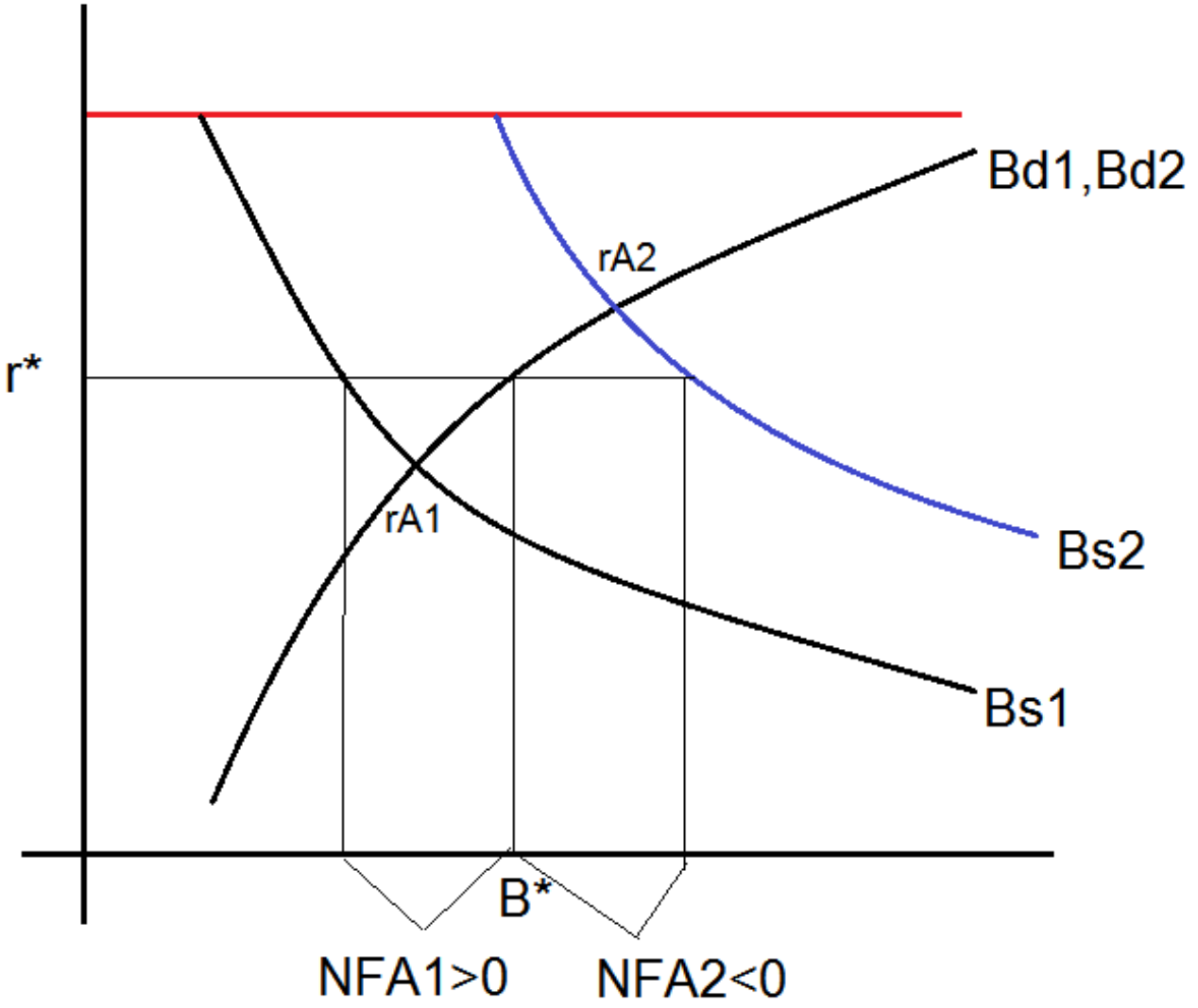
# Higher volatility lowers yields, increases debt



# Integration & Financial Development



# Integration & sustainanable debt



# IV. Domestic default risk

- Outright domestic default is rare but does happen (Reihart & Rogoff (2009), Hall & Sargent (2014))
- Risk of de-facto or de-jure default is worth considering: Debt at historical highs, unstable FRF, DGE model suggests tax austerity can't restore solvency, and strong global demand may be temporary or unstable
- D'Erasmo & Mendoza (2015a,b): Domestic default is optimal if cost of "regressive redistribution" by repaying exceeds social value of debt for liquidity, self-insurance & risk-sharing

# D'Erasmo-Mendoza framework

- Continuum of agents face idiosyncratic income shocks, agg. govt. expenditure shocks, pay income taxes, collect transfers, and save using domestic public debt
- Individual budget & liquidity constraints:
  - If government repays:

$$c_t + q_t b_{t+1} = y_t(1 - \tau^y) + b_t + \tau_t$$

$$b_{t+1} \geq 0$$

  - If government defaults:

$$c_t = y_t(1 - \tau^y) - \phi(g_t) + \tau_t$$

# Redistributive effects of public debt

- Re-write agents' constraints using GBC and $\tilde{b} \equiv (b - B)$

$$c = y + \tilde{b} - q(B', g)\tilde{b}' - \tau^y(y - Y) - g$$

$$\tilde{b}' \geq -B'$$

- Because of incomplete markets and prec. savings, agents distribution of bond holdings is endogenous (a'la Bewley)
- Public debt induces two kinds of redistribution:
  1. *Regressive*: repaying outstanding debt requires lowering transfers for all agents to pay debt holders, hurting more agents with $\tilde{b}$ <0
  2. *Progressive*: issuing new debt provides higher transfers using the savings of debt buyers, benefitting more agents with $\tilde{b}'$ <0

# Social value of debt

1. Liquidity: Issuing debt provides liquidity (i.e. resources) to agents who are endogenously liquidity-constrained
2. Self-insurance: Debt is the safe asset agents use to build prec. savings (high-income agents buy debt, low income agents sell)
3. Risk-sharing: Progressive redistribution improves risk-sharing by transferring resources from debt-holders to non-debt-holders

- Debt is imperfect risk-sharing mechanism, useful only if other means of private & social insurance are limited (e.g. 100% income tax insures idiosyncratic risk fully)

# Optimal domestic default

- Utilitarian govt. aggregates welfare of all agents, defaults if welfare under default is higher than under repayment
- Rich dynamic feedback
  - Regressive & progressive redistribution are linked: Issuing more debt increases default risk, lowers debt prices, weakens progressive redistribution
  - Default risk=>debt prices=>demand for debt=>distribution of debt holdings=>default choice
- Quantitatively: defaults have 1% prob., social value of debt is high, debt is risk-free most of the time, debt crises seem sudden events after periods of low spreads even at high, stable debt ratios

# Conclusions

1. 1st or 2nd largest debt crisis in U.S. history, and the only one with persistent primary deficits
2. Zero or negative fiscal multiplier, and changed debt dynamics predict much higher long-run debt
3. Capital taxes cannot make debt sustainable (labor taxes, entitlement cuts politically difficult) & incentives for tax competition are strong
4. Strong world demand for U.S. debt should not be viewed as structural base for debt sustainability
5. In light of the above, risk of "benevolent" domestic default (de facto or de jure) cannot be ignored