Economics 442
Macroeconomic Policy
10/26-28/2020 (rev'd 10/27)

Instructor: Prof. Menzie Chinn
UW Madison
Fall 2020

Outline

- Fiscal Policy in the New Keynesian Consensus
- Fiscal Policy, Expectations and Aggregate Demand
- Fiscal Policy Evaluation in Practice
- Fiscal Policy Summed Up

Fiscal Policy in the New Keynesian Consensus

New Keynesian Consensus

- New Keynesian Models are built on Real Business Cycle (RBC) core
- Firms, households intertemporally optimize
- Simplest New Keynesian models introduce price stickiness
- But assume agents have rational expectations
- Other types of stickiness introduced (incl. capital adjustment costs, “naïve” consumers

New Keynesian Consensus

- New Keynesian models have attributes in-between RBC and old-style Keynesian
- Output depends on expectations of the future
- But also depends on past prices, wages because of nominal contracts
- Taylor (JPE, 1980), Fischer (JPE, 1977)

New Keynesian Consensus

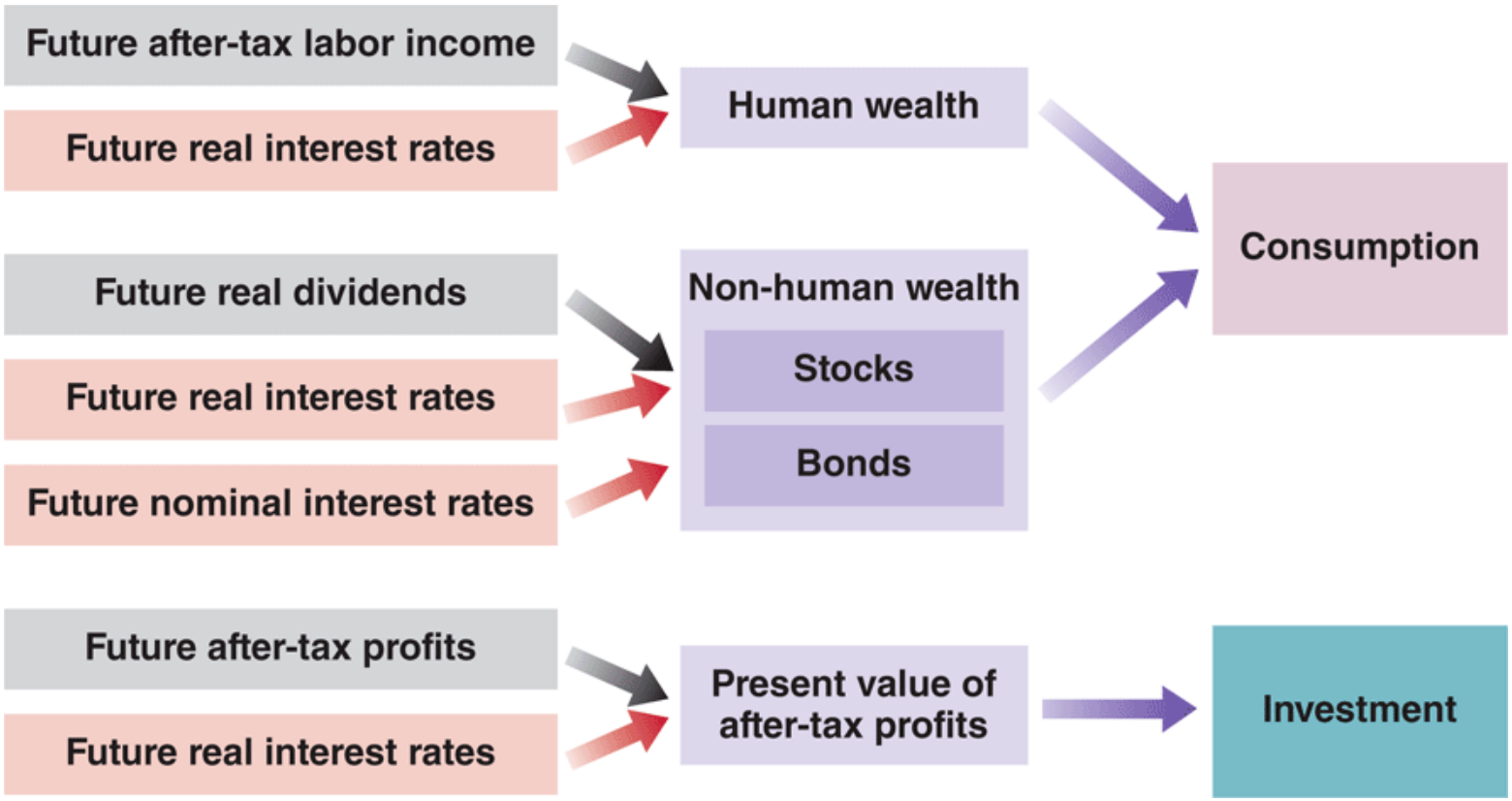
- Models usually closed with Taylor rule for monetary policy
- Monetary policy (via changes in target inflation rate) has an effect
- Fiscal policy relatively ineffective given partial Ricardian Equivalence
- Expectations need more treatment

Fiscal Policy, Expectations & Aggregate Demand

(Textbook Ch. 16)

16.1 Expectations and Decisions: Taking Stock (1 of 5)

Figure 16.1 Expectations and Private Spending: The Channels



16.1 Expectations and Decisions: Taking Stock (2 of 5)

- Recall Chapter 6, the *IS* relation:

$$Y = C(Y - T) + I(Y, r + x) + G$$

- Assume **aggregate private spending** (**private spending**, *A*, equals the sum of consumption and investment spending:

$$A(Y, T, r, x) \equiv C(Y - T) + I(Y, r + x)$$

so the *IS* relation becomes:

$$\underset{(+,-,-,-)}{Y = A(Y, T, r, x)} + G \qquad (16.1)$$

16.1 Expectations and Decisions: Taking Stock (3 of 5)

- Let primes denote future values and the superscript e denote an expectation, so

$$Y = A(Y, T, r, Y'^{e}, T'^{e}, r'^{e}) + G \qquad (16.2)$$
$$(+, -, -, +, -, -)$$

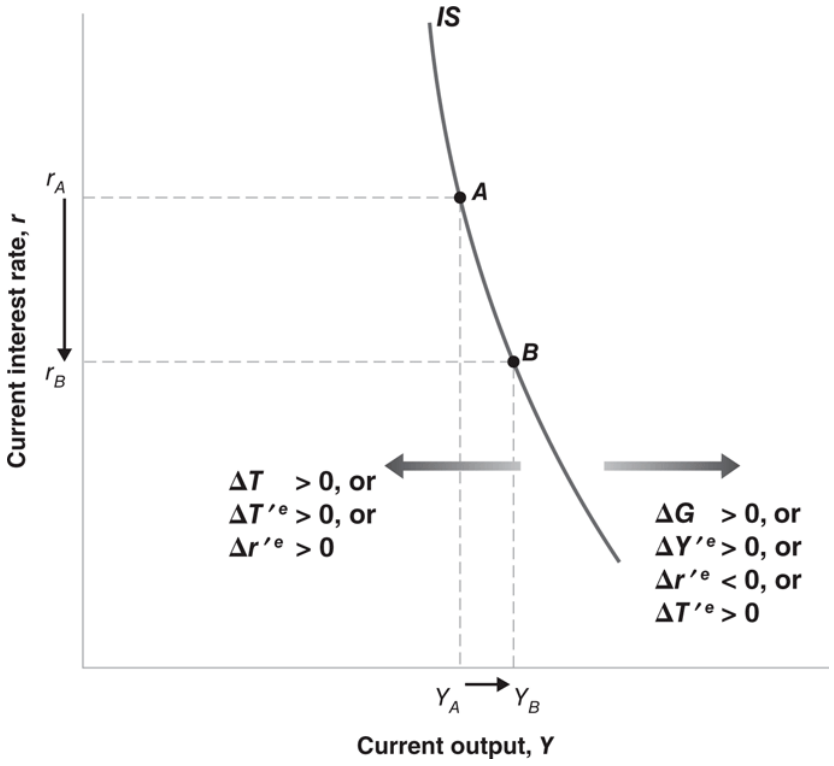
which means that

$$Y \text{ or } Y'^{\mathrm{e}} \text{ increase } \Rightarrow A \text{ increases}$$
$$T \text{ or } T'^{\mathrm{e}} \text{ increase } \Rightarrow A \text{ decreases}$$
$$r \text{ or } r'^{\mathrm{e}} \text{ increase } \Rightarrow A \text{ decreases}$$

16.1 Expectations and Decisions: Taking Stock (4 of 5)

Figure 16.2 The New *IS* Curve

Given expectations, a decrease in the real policy rate leads to a small increase in output. The *IS* Curve is steeply downward sloping. Increases in government spending, or in expected future output, shift the *IS* curve to the right. Increases in taxes, in expected future taxes, or in the expected future real policy rate shift the *IS* curve to the left.



16.1 Expectations and Decisions: Taking Stock (5 of 5)

- The new *IS* curve is much steeper than the *IS* curve in previous chapters, so a decrease in the current policy rate is likely to have only a small effect on equilibrium output.
- A decrease in the current real policy rate, *given unchanged expectations of the future real policy rate*, does not have much effect on private spending.
- The multiplier is likely to be small because a change in current income, given unchanged expectations of future income, is unlikely to have a large effect on spending.

16.2 Monetary Policy, Expectations, and Output (1 of 3)

- The Fed affects directly the *current real interest* rate (r), so the *LM* curve is a horizontal line at $\bar{r}$:

$$IS\colon\ Y = A(Y, T, r, Y'^{e}, T'^{e}, r'^{e}) + G \qquad (16.3)$$

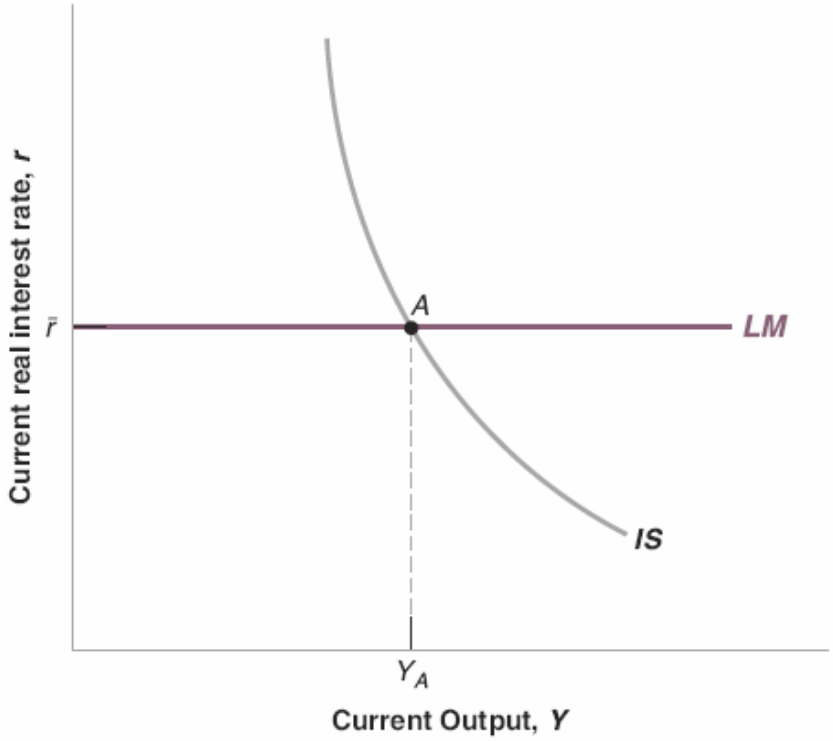
$$LM\colon\ r = \bar{r} \qquad (16.4)$$

- The effects of monetary policy depends on its effects on expectations:
  - If a monetary expansion leads to changes in expectations of future interest rates and output, then the policy effect on output may be large.
  - But if expectations remain unchanged, the policy effects on output will be limited.

16.2 Monetary Policy, Expectations, and Output (2 of 3)

Figure 16.3 The New *IS–LM*

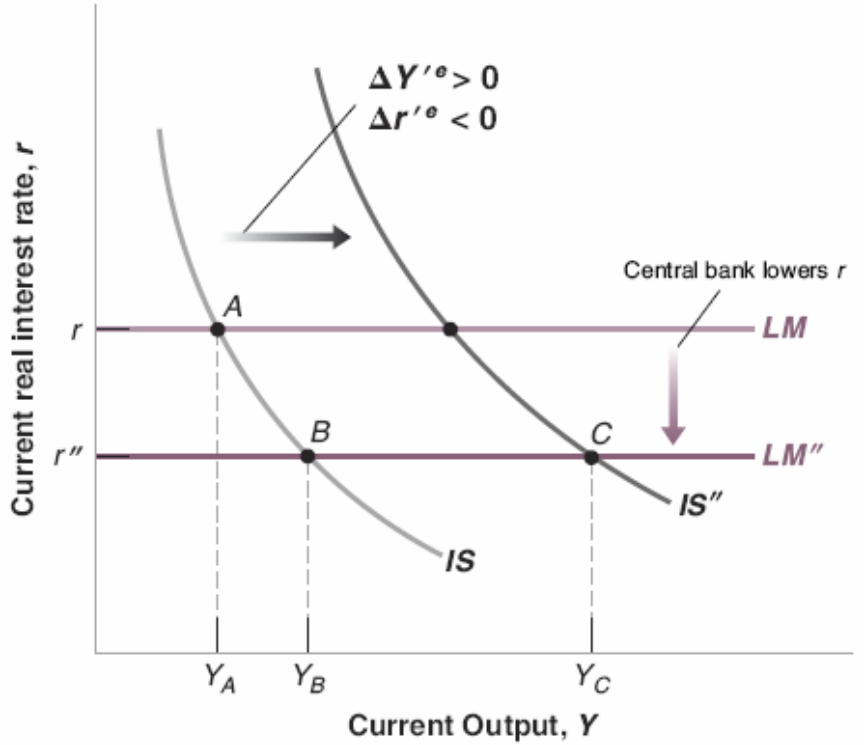
The *IS* curve is steeply downward sloping. Other things being equal, a change in the current interest rate has a small effect on output. Given the current real interest rate set by the central bank, $\bar{r}$, the equilibrium is at point *A*.



16.2 Monetary Policy, Expectations, and Output (3 of 3)

Figure 16.4 The Effects of an Expansionary Monetary Policy

The effects of monetary policy on output depend very much on whether and how monetary policy affects expectations.



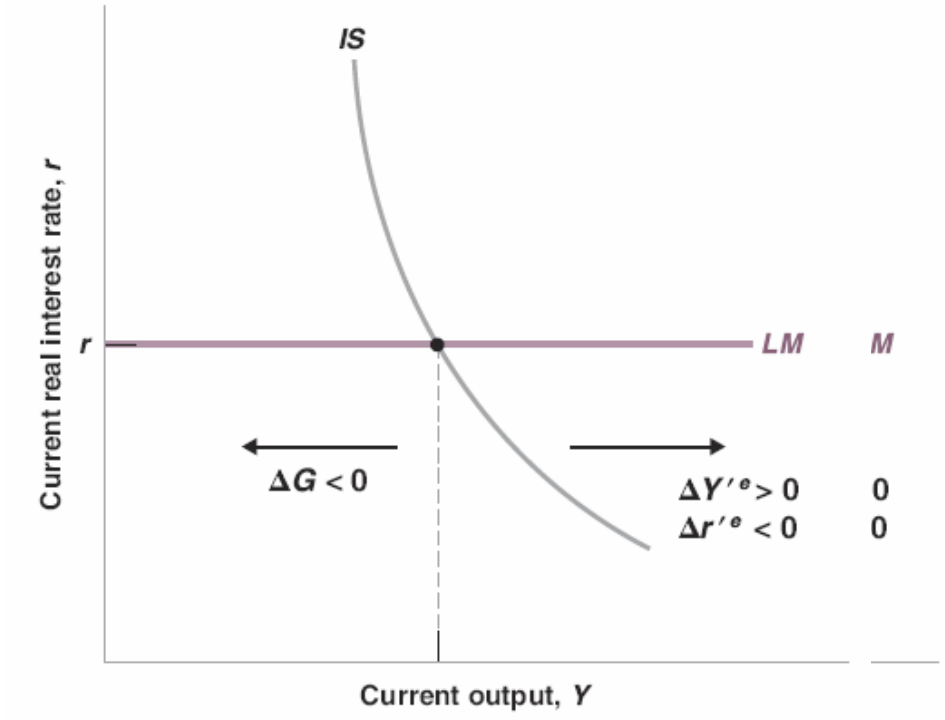
FOCUS: Rational Expectations

- **Rational expectations:** Expectations formed in a forward-looking manner.
- The last 40 years in macroeconomic research are often called the "*rational expectations revolution*."
- Expectations was referred to as **animal spirits** by Keynes in the *General Theory*.
- Economists have also assumed that people form **static expectations** (people expect the future to be like the present), and **adaptive expectations** (people "adapt" by revising their expectations over time).
- In the early 1970s, Robert Lucas and Thomas Sargent argued that people have rational expectations as they look into the future and do the best job they can in predicting it.

16.3 Deficit Reduction, Expectations, and Output (1 of 7)

Figure 16.5 The Effects of a Deficit Reduction on Current Output

When account is taken of its effect on expectations, the decrease in government spending need not lead to a decrease in output.



16.3 Deficit Reduction, Expectations, and Output (2 of 7)

- The net effects of the three shifts in the IS curve depends on:

1. Timing

  - Credibly **backloading** the deficit reduction program toward the future, with small cuts today and larger cuts in the future, is more likely to lead to an increase in output.
  - The program's **credibility** (the perceived probability that the government will do what it has promised when the time comes to it) decreases when the government announces the need for painful cuts in spending, and then leaving them to the future.

16.3 Deficit Reduction, Expectations, and Output (3 of 7)

The net effects of the three shifts in the IS curve depends on:

2. Composition

- If some government spending programs are perceived as "wasteful," cutting these programs today will allow the government to cut taxes in the future.
- Expectations of lower future taxes and lower distortions could induce firms to invest today, thus raising output in the short run.

16.3 Deficit Reduction, Expectations, and Output (4 of 7)

The net effects of the three shifts in the IS curve depends on:

3. The Initial Situation

– If government debt is increasing fast, then a credible deficit reduction program is more likely to increase output in the short run, as the program announcement may well reassure the people that the government has regained control of its budget.

16.3 Deficit Reduction, Expectations, and Output (5 of 7)

The net effects of the three shifts in the IS curve depends on:

4. Monetary Policy

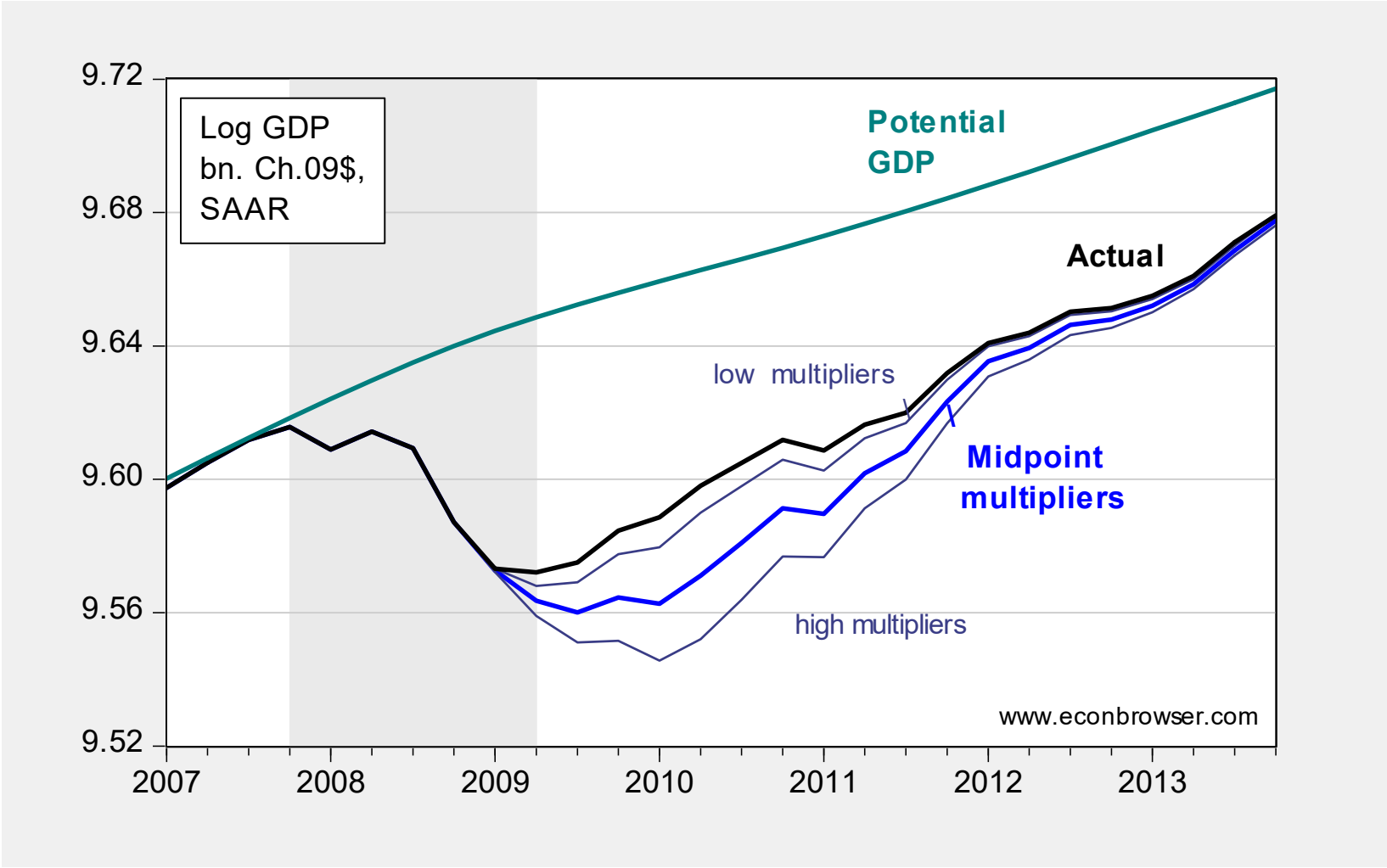
– Even if monetary policy cannot fully offset the effect of an adverse shift in the *IS* curve, a decrease in the policy rate can help reduce the adverse effects of the shift on output.

16.3 Deficit Reduction, Expectations, and Output (6 of 7)

- Views about the **fiscal multipliers** (the net effects of fiscal consolidation once direct and expectation effects are taken into account):
  - Those in favor of strong fiscal consolidation argue that fiscal multipliers are likely to be negative, and thus smaller deficits would lead to an increase in output.
  - Those against strong fiscal consolidation argue that fiscal multipliers are likely to be positive and possibly large, thus smaller deficits would lead to a decrease in output.

Fiscal Policy Evaluation in Practice

Fiscal Policy Evaluated in the Great Recession

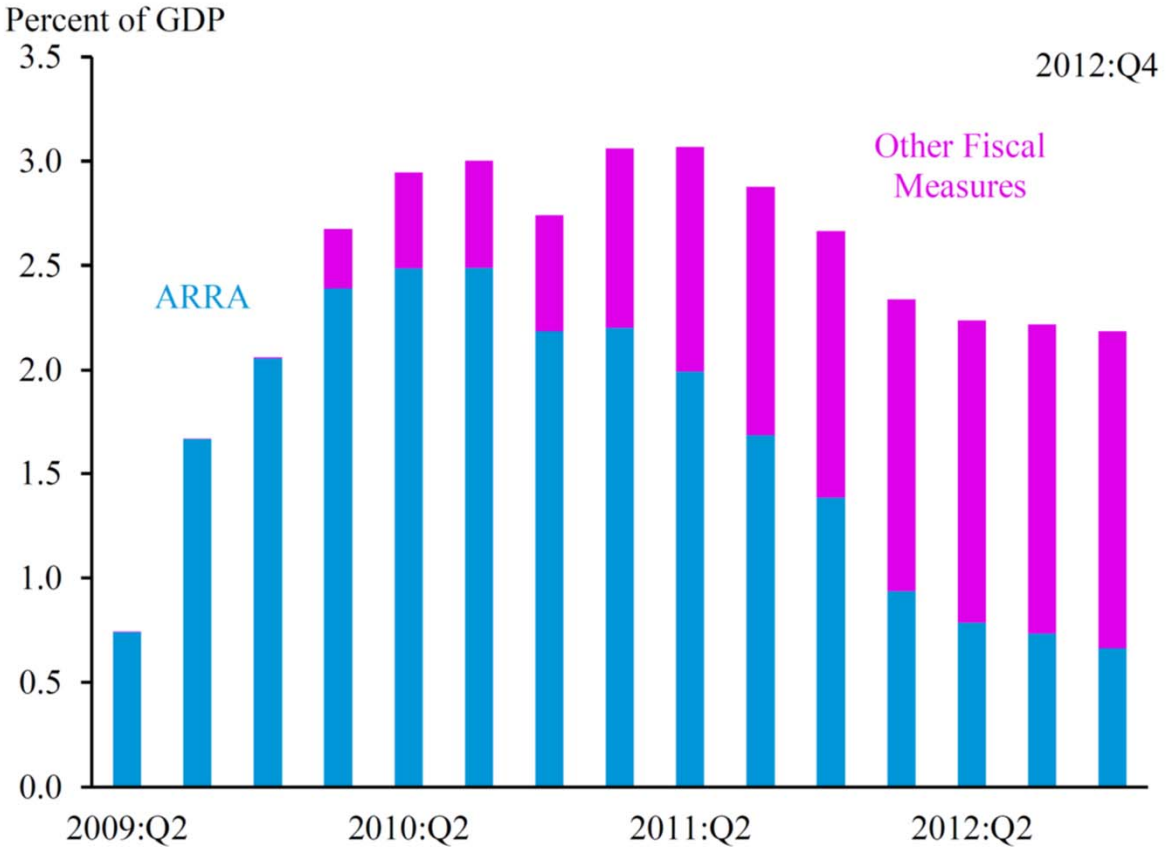


CEA, The Economic Impact of the American Recovery and Reinvestment Act Five Years Later (Feb. 2014)

Fiscal Policy Evaluated in the Great Recession

Figure 7

Quarterly Effect of the Recovery Act and Subsequent Fiscal Measures on GDP, 2009–2012



Source: Bureau of Economic Analysis, National Income and Product Accounts; Congressional Budget Office; CEA calculations.

CEA, The Economic Impact of the American Recovery and Reinvestment Act Five Years Later (Feb. 2014)

Where Do the Multiplier Estimates Come From?

- Macroeconometric models (essentially IS-LM, AD-AS with estimated equations)
- Vector AutoRegressions (VARs)
- Dynamic Stochastic General Equilibrium (DSGE) models

Large Scale Macroeconometric Models

- Examples: Global Insight (subsumes Wharton Econometrics), Standard and Poors (subsumes Data Resources, Inc.), Macroeconomic Advisers, MiniMOD, FRB/US
- Most of these models developed in 1960s-1970s.
- In the 1980s and 1990s, implemented model consistent expectations, as opposed to adaptive expectations.

FRB/US Model

- Used at the Federal Reserve
- Typical of macroeconometric models
- But US focused
- All described here:

http://www.federalreserve.gov/econresdata/frbus/us-models-about.htm

- Will describe in terms of AD, AS

Table 3: Aggregate Consumption Equation (c)

equilibrium relationship: $c^* = 1.0v + .62s_{trans} - .15s_{prop} + .52s_{stock} + 1.28s_o + .013\tilde{x}.$

dynamic adjustment: $\Delta c_t = -.12(c_{t-1} - c^*_{t-1}) + .17 \text{ lags}_1(\Delta c_{t-i}) + .75 \text{ leads}_\infty(\Delta c^{*e}_{t+i}) + .09\Delta y_t.$

span: 63q1-95q4 R^2: .54 SEE: .0032 MRL [a]: 7.9 quarters

definitions:
c - log consumption (including service flow of stock of durables).
Y - income (labor + transfer + property).
y - log Y.
V - wealth = $\text{leads}_\infty(Y^e)$.
v - log V.
s_{trans} - transfer wealth / V.
s_{prop} - property wealth / V.
s_{stock} - value of corp. equity / V.
s_o - other net financial and tangible assets / V.
$\tilde{x}$ - aggregate output gap.

[a] Mean response lag to a surprise.

Table 5: Business Investment Equations (i_{pd} and k_i)

equilibrium relationships:

$$i^*_{pd} = 1.0x_b - 1.0r_{pd} + 1.0z_{pd} + 19.5\Delta x_b.$$

$$k^*_i = 1.0x_b.$$

dynamic adjustment:

$$\Delta i_{pd,t} = -.07(i_{pd,t-2} - i^*_{pd,t-2}) + .26\ \text{lags}_2(\Delta i_{pd,t-i}) + .47\ \text{leads}_\infty(\Delta i^{*e}_{pd,t+i-1}) + .22\ \text{lags}_2(\Delta cf_{t-i}).$$

span: 64q1-94q4 R^2: .40 SEE: .0022 MRL [a]: 7.0 quarters

$$\Delta k_{i,t} = -.23(k_{i,t-1} - k^*_{i,t-1}) + .47\ \text{lags}_3(\Delta k_{i,t-i}) + .53\ \text{leads}_\infty(\Delta k^{*e}_{i,t+i}).$$

span: 62q3-94q4 R^2: .42 SEE: .0065 MRL [a]: 1.3 quarters

remarks:

- dynamic equation for i_{pd} is a weighted average of adjustment model (.78) and cash flow model (.22).
- adjustment model component for i_{pd} includes 1-quarter delivery lag.

definitions:

i_{pd} - log investment in producers' durable equipment (constant dollars).
k_i - log stock of manufacturing and trade inventories (constant dollars).
x_b - log output, business sector (constant dollars).
r_{pd} - log user cost of capital, producer durables.
z_{pd} - log(depreciation rate + mean of Δx_b).
cf - log corporate cash flow (constant dollars).

[a] Mean response lag to a surprise.

Table 2: Aggregate Price Equation (p)

equilibrium relationship: $p^* = .98(w - \rho) + .02p_e - .003u.$

remarks: • equilibrium condition includes also effects of farm and import prices.

dynamic adjustment: $\Delta p_t = -.10(p_{t-1} - p^*_{t-1}) + .57\text{lags}_2(\Delta p_{t-i}) + .43\text{leads}_\infty(\Delta p^{*e}_{t+i})$.

R^2 .88
SEE .0025
span: 63q1-94q4

properties: mean response lag to surprise = 3.3 quarters.

remarks: • dynamic equation includes an accelerated response to energy price inflation.

definitions:
p - log price of final sales plus imports less gov't labor and indirect business taxes.
w - log compensation per hour (ECI).
ρ - log trend labor productivity.
p_e - log crude energy price.
u - demographically-weighted unemployment rate.

Table 6: Aggregate Labor Hours, Wages, and Prices (h, w, and p)

equilibrium relationship:

$$h^* = 1.0x_g - .0069t_{47} + .0042t_{73}.$$

$$w^* = 1.0\rho + 1.02p_g - .02p_e - .01u.$$

$$p^* = .98(w - \rho) + .02p_e - .003u.$$

remark: • equilibrium condition for p also includes effects of farm and import prices.

dynamic adjustment:

$$\Delta h_t = -.15(h_{t-1} - h^*_{t-1}) + .38 \text{ lags}_1(\Delta h_{t-i}) + .41 \text{ leads}_\infty(\Delta h^{*e}_{t+i}).$$
$$+ .31\ \Delta h^*_t - .12 \text{ lags}_1(\Delta h^*_{t-i}).$$

span: 63q1-94q4 R^2: .76 SEE: .0046 MRL [a]: 0.7 quarters

$$\Delta w_t = -.03(w_{t-1} - w^*_{t-1}) + .71 \text{ lags}_3(\Delta w_{t-i}) + .29 \text{ leads}_\infty(\Delta w^{*e}_{t+i}).$$

span: 63q1-94q4 R^2: .82 SEE: .0028 MRL [a]: 8.7 quarters

$$\Delta p_t = -.10(p_{t-1} - p^*_{t-1}) + .57 \text{ lags}_2(\Delta p_{t-i}) + .43 \text{ leads}_\infty(\Delta p^{*e}_{t+i}).$$

span: 63q1-94q4 R^2: .88 SEE: .0025 MRL [a]: 3.3 quarters

remarks:
- dynamic equation for h is a weighted average of standard adjustment model (.69) and immediate response model (.31) .
- dynamic equation for w also includes variables for wage and price controls, employer social insurance contributions, and the minimum wage.
- dynamic equation for p also includes an accelerated response to energy price inflation.

definitions:
- h - log hours, nonfarm business sector (employees and self-employed).
- w - log compensation per hour (ECI).
- p - log price of final sales plus imports less gov't labor and indirect business taxes.
- x_g - log output, nonfarm business sector plus oil imports less housing product (constant dollars).
- t_{47} and t_{73}- quarterly time trends starting 47q1 and 73q1.
- ρ - log trend labor productivity.
- p_g - log price of x_g less indirect business taxes.
- p_e - log crude energy price.
- u - demographically-weighted unemployment rate.

[a] Mean response lag to a surprise.

Table 7: Financial Sector Equations (r_5, r_{10}, r_{cb}, and v_s)

5-year gov't bond rate [a]:

$$r_{5,t} = .34 + 1.0\ \text{leads}_{20}(r^e_{t+i}) - .62\ \text{leads}_{20}(\tilde{x}^e_{t+i}) + .83\ \text{lag}_1(\tilde{\mu}_{5,t-i})$$

span: 63q1-94q4 R^2: .97 SEE: .47 MRL [b]: 0 quarters

10-year gov't bond rate [a]:

$$r_{10,t} = .46 + 1.0\ \text{leads}_{40}(r^e_{t+i}) - .79\ \text{leads}_{40}(\tilde{x}^e_{t+i}) + .85\ \text{lag}_1(\tilde{\mu}_{10,t-i})$$

span: 63q1-94q4 R^2: .99 SEE: .32 MRL [b]: 0 quarters

corporate bond rate [a]:

$$r_{cb,t} = 1.21 + 1.0\ \text{leads}_{120}(r^e_{t+i}) - 1.21\ \text{leads}_{120}(\tilde{x}^e_{t+i}) + .87\ \text{lag}_1(\tilde{\mu}_{30,t})$$

span: 63q1-94q4 R^2: .99 SEE: .27 MRL [b]: 0 quarters

stock market wealth:

$$v_{s,t} - p_{g,t} = 4.7 + d_t + 50\ \text{leads}_{\infty}(\Delta d^e_{t+i}) - 50(\ (r_{cb,t}/400) - \text{leads}_{120}(\Delta p^e_{c,t+i})\ )$$

span: 65q1-95q4 R^2: .97 SEE: .20 MRL [b]: 0 quarters

definitions:

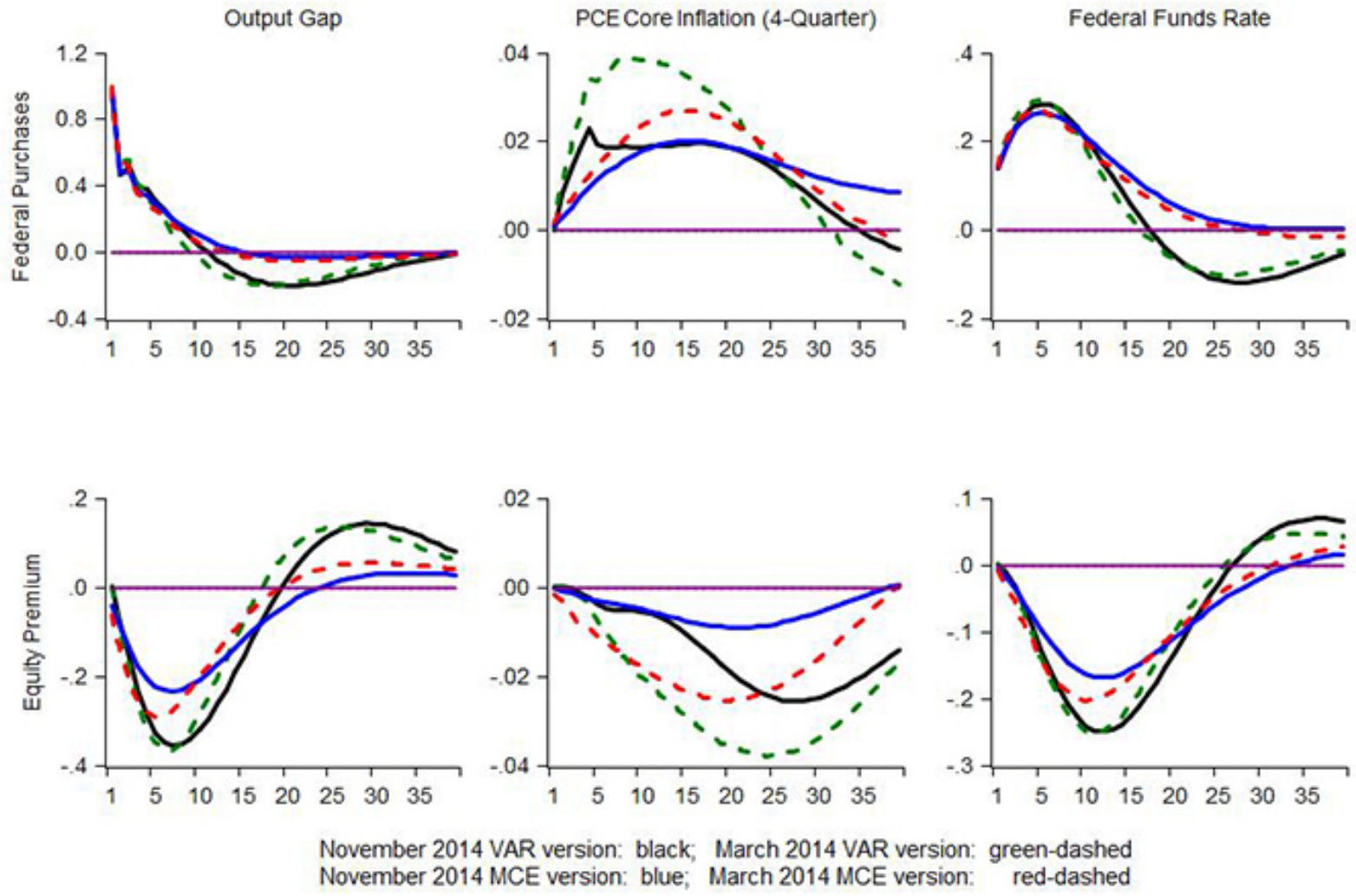
r - federal funds rate.
$\tilde{x}$ - output gap.
$\tilde{\mu}_5$, $\tilde{\mu}_{10}$, and $\tilde{\mu}_{30}$ - term premium residuals for r_5, r_{10}, and r_{cb}.
v_s - log stock market wealth (current dollars, flow of funds accounts).
d - log national income dividends (constant dollars, deflated by p_g).
p_g - log price, business sector output.[c]
Δp_c - inflation rate, household consumption price.[c]

[a] For the three bond equations, the reported SEE and R^2 are computed after adjustment for first-order serial correlation of the term-premium residuals.
[b] Mean response lag to a surprise.
[c] Price indexes divided by 100 before taking logarithms.

Expectations

- Model consistent expectations (the closest that one can come to rational expectations)
- Learning is built in
- Or, use a VAR

Impulse Response Function



http://www.federalreserve.gov/econresdata/notes/feds-notes/2014/november-2014-update-of-the-frbus-model-20141121.html

VARs

- The various equations are estimated using OLS, etc.
- Obtaining unbiased or consistent estimates of the coefficients requires correct identification so error term is uncorrelated the RHS variables
- But in principle all equations should have same RHS variables, so omitted variables bias
- Sims: “Incredible identification”

VARs

The mathematical representation of a VAR is:

$$y_t = A_1 y_{t-1} + \cdots + A_p y_{t-p} + B x_t + \epsilon_t \tag{18.1}$$

where y_t is a k vector of endogenous variables, x_t is a d vector of exogenous variables, $A_1, \ldots, A_p$ and B are matrices of coefficients to be estimated, and ϵ_t is a vector of innovations that may be contemporaneously correlated but are uncorrelated with their own lagged values and uncorrelated with all of the right-hand side variables.

Example of bivariate VAR, using industrial production, money, with 2 lags

$$\begin{aligned} IP_t &= a_{11} IP_{t-1} + a_{12} M1_{t-1} + b_{11} IP_{t-2} + b_{12} M1_{t-2} + c_1 + \epsilon_{1t} \\ M1_t &= a_{21} IP_{t-1} + a_{22} M1_{t-1} + b_{21} IP_{t-2} + b_{22} M1_{t-2} + c_2 + \epsilon_{2t} \end{aligned} \tag{18.2}$$

where a_{ij}, b_{ij}, c_i are the parameters to be estimated.

VARs

- Standard approach: recursive, via Cholesky decomposition of the residual covariance matrix
- Can identify shocks using theory (long run/short run, e.g., Blanchard-Quah)
- No instantaneous impact (Blanchard-Perrotti)
- Can identify shocks using narrative approach (Romer-Romer)

Multipliers in Advanced Economies (panel)

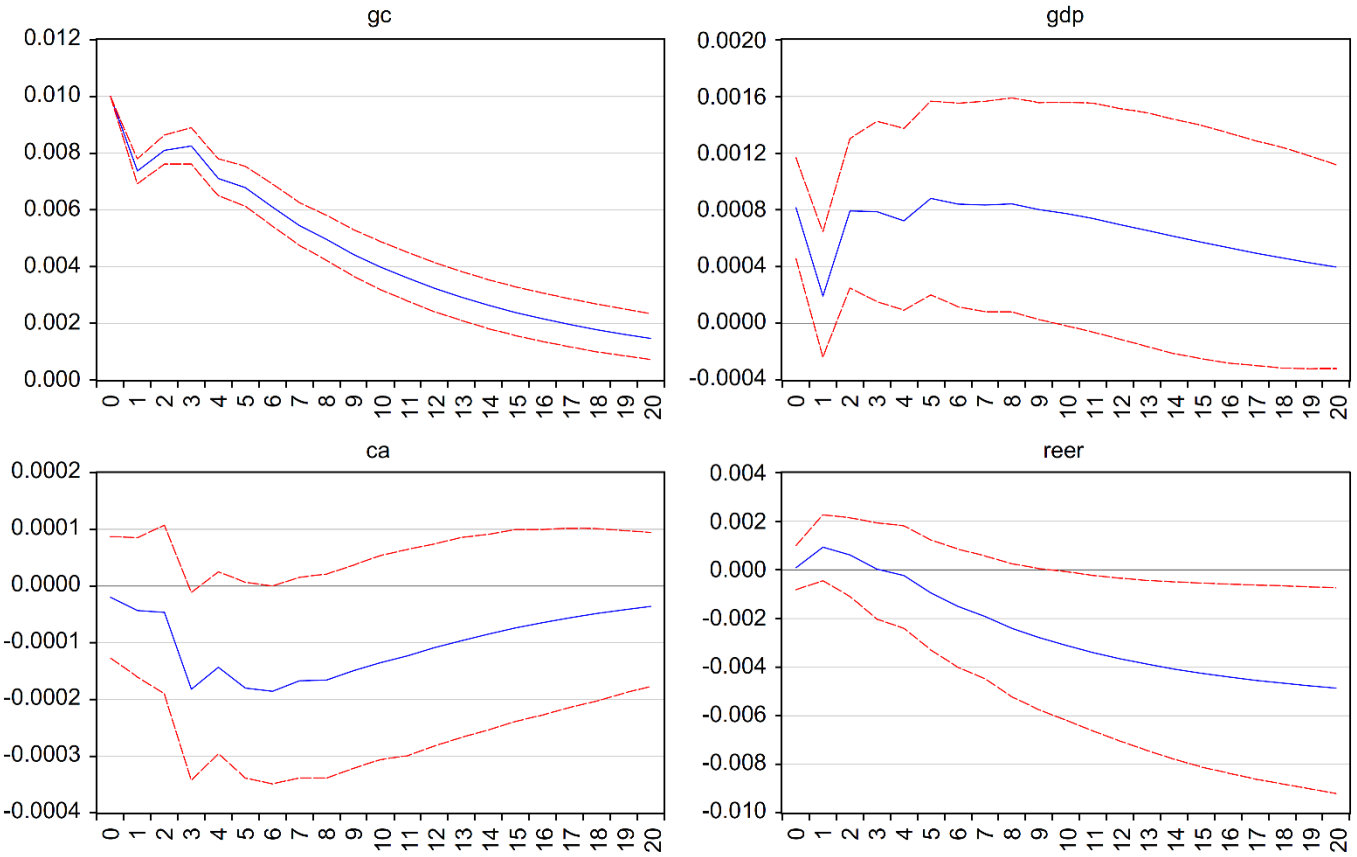


Fig. 1. Impulse responses to a 1% shock to government consumption in high-income countries. Responses are: gc, government consumption; gdp, real gross domestic product; ca, the current account as a percentage of GDP; reer, the real effective exchange rate. Dotted lines represent 90% confidence intervals based on Monte Carlo simulations.

Ilzetzki, et al. (2012)

Cumulative Multipliers

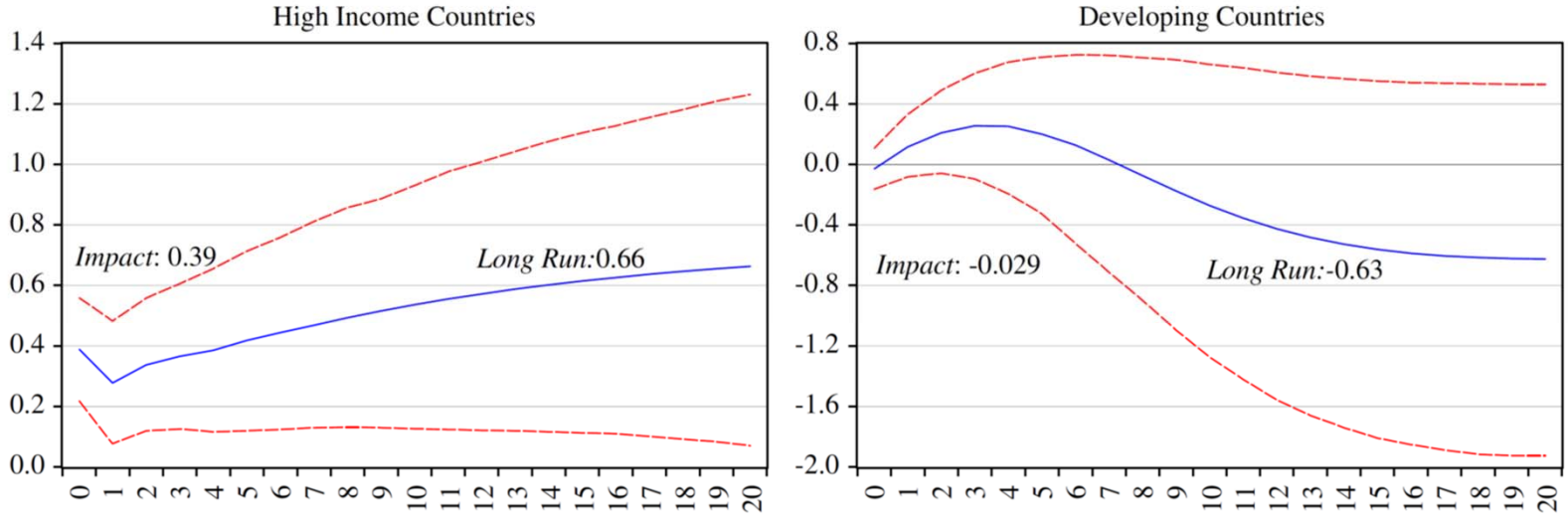


Fig. 3. Cumulative multiplier: high-income and developing countries. Ratio of the cumulative increase in the net present value of GDP and the cumulative increase in the net present value of government consumption, triggered by a shock to government consumption. Dotted lines represent 90% confidence intervals based on Monte Carlo simulations.

$$\text{impact multiplier} = \frac{\Delta y_0}{\Delta g_0} \qquad \text{cumulative multiplier}(T) = \frac{\sum_{t=0}^{T}(1+i)^{-t}\Delta y_t}{\sum_{t=0}^{T}(1+i)^{-t}\Delta g_t}$$

Ilzetzki, et al. (2012)

Cumulative Multipliers: Govt Investment

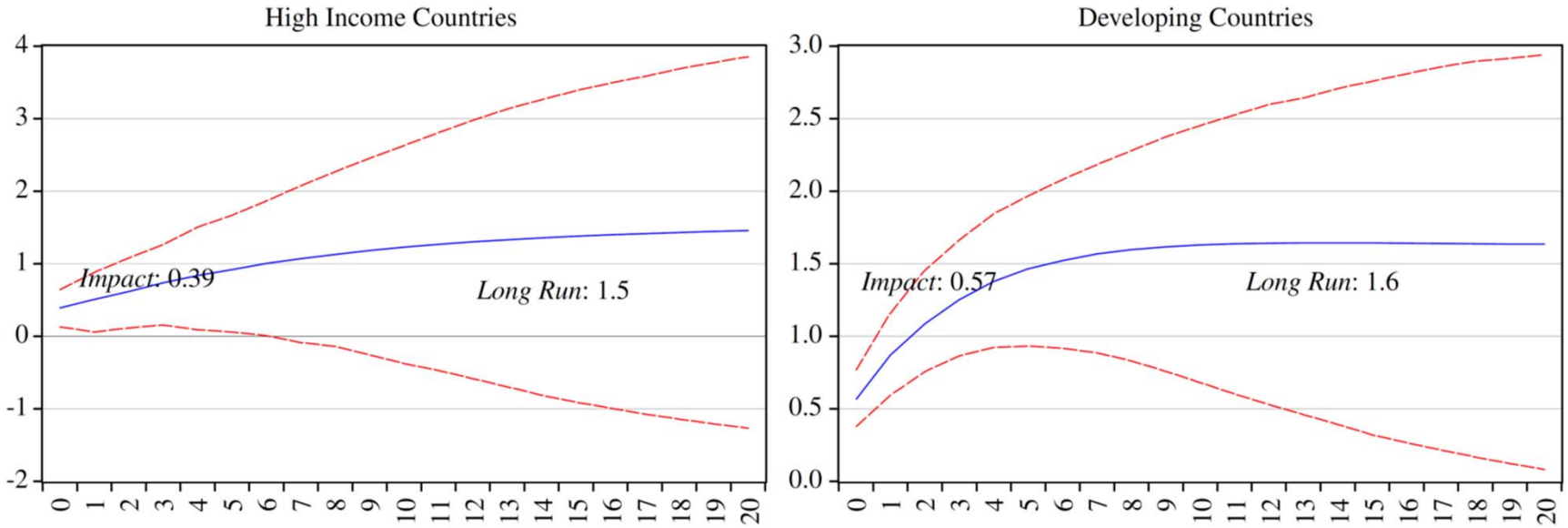


Fig. 9. Cumulative multiplier to a "pure" public investment shock: high-income and developing countries. Ratio of the cumulative increase in the net present value of GDP and the cumulative increase in the net present value of government investment, triggered by a shock to government investment. This response controls for public consumption, but does not allow for endogenous responses of GDP or public investment to government consumption. Dotted lines represent 90% confidence intervals based on Monte Carlo simulations.

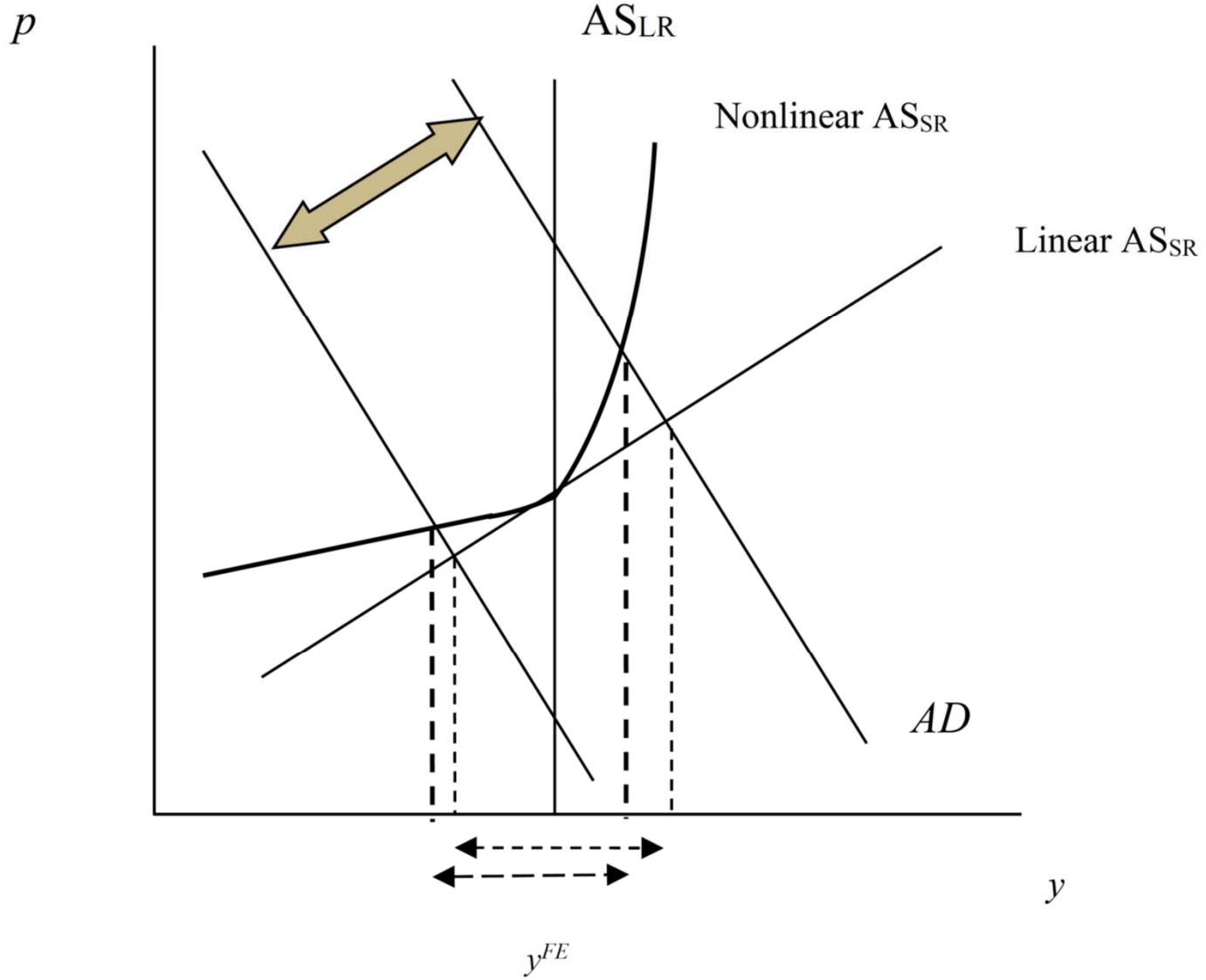
Ilzetzki, et al. (2012)

CBO

Type of Activity	Estimated Output Multipliers[a]	
	Low Estimate	High Estimate
Purchases of Goods and Services by the Federal Government	0.5	2.5
Transfer Payments to State and Local Governments for Infrastructure	0.4	2.2
Transfer Payments to State and Local Governments for Other Purposes	0.4	1.8
Transfer Payments to Individuals	0.4	2.1
One-Time Payments to Retirees	0.2	1.0
Two-Year Tax Cuts for Lower- and Middle-Income People	0.3	1.5
One-Year Tax Cut for Higher-Income People	0.1	0.6

CBO, 2012a, *Estimated Impact of the American Recovery and Reinvestment Act on Employment and Economic Output from October 2011 through December 2011*

Complications



Complications

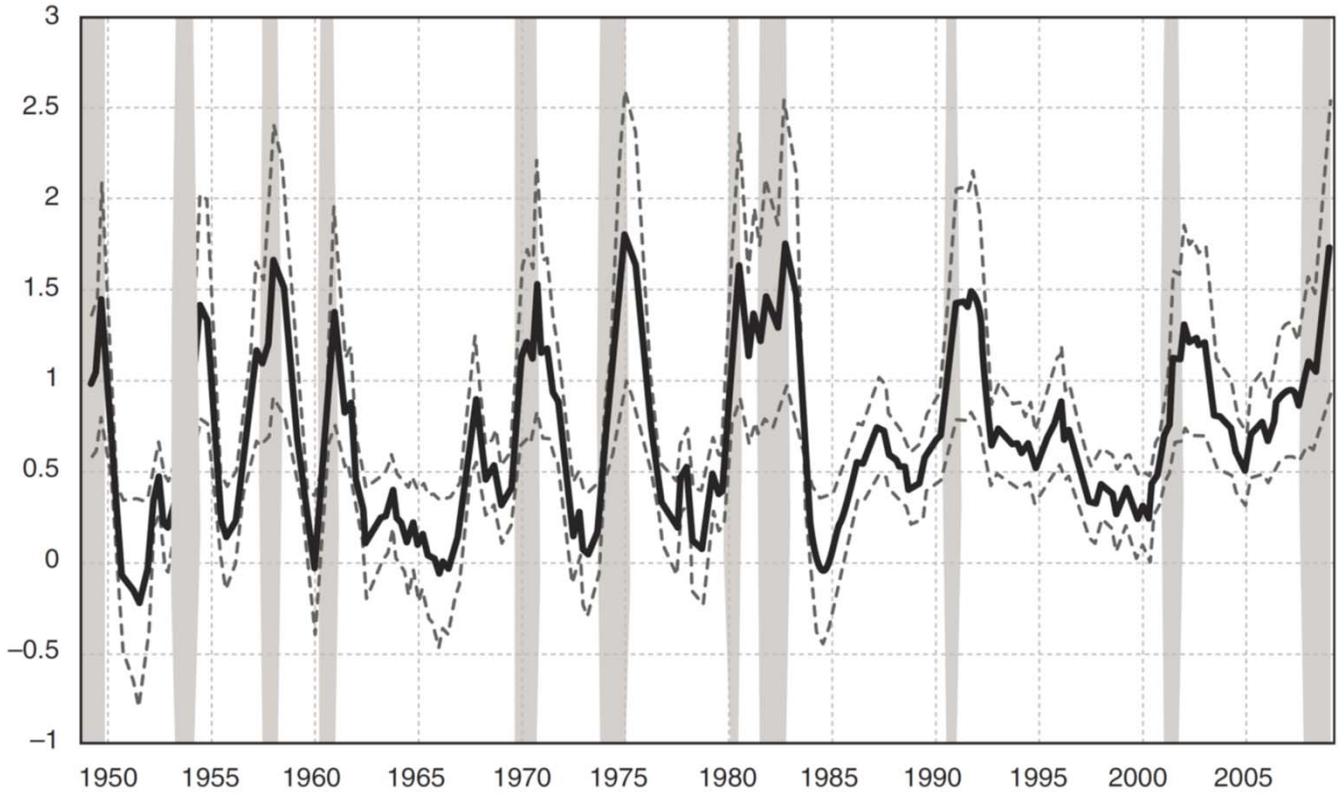


Figure 1 Historical multiplier for total government spending (Source: Auerbach and Gorodnichenko (2012b)).

CBO, Again

Table 3. Direct Effects on Overall Demand From One Dollar of Budgetary Cost Incurred in the Second Quarter of 2020

Dollars

	2020			2021				
	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Total
Enhanced Unemployment Compensation								
High Estimate								
Without social distancing	0.89	0	0	0	0	0	0	0.89
With social distancing and partially recovered spending	0.54	0.08	0.06	0.04	0.03	0	0	0.75
Low Estimate								
Without social distancing	0.75	0	0	0	0	0	0	0.75
With social distancing and partially recovered spending	0.45	0.06	0.05	0.04	0.03	0	0	0.63
Recovery Rebates to Individuals								
High Estimate								
Without social distancing	0.60	0	0	0	0	0	0	0.60
With social distancing and partially recovered spending	0.36	0.05	0.04	0.03	0.02	0	0	0.51
Low Estimate								
Without social distancing	0.50	0	0	0	0	0	0	0.50
With social distancing and partially recovered spending	0.30	0.04	0.04	0.02	0.02	0	0	0.42
Direct Assistance to State and Local Governments								
High Estimate								
Without social distancing	0.81	0	0	0	0	0	0	0.81
With social distancing and partially recovered spending	0.49	0.07	0.06	0.04	0.03	0	0	0.68
Low Estimate								
Without social distancing	0.63	0	0	0	0	0	0	0.63
With social distancing and partially recovered spending	0.38	0.05	0.05	0.03	0.02	0	0	0.53
Business Tax Provisions Primarily Affecting Cash Flow								
High Estimate								
Without social distancing	0.16	0	0	0	0	0	0	0.16
With social distancing and partially recovered spending	0.10	0.01	0.01	0.01	0.01	0	0	0.13
Low Estimate								
Without social distancing	0	0	0	0	0	0	0	0
With social distancing and partially recovered spending	0	0	0	0	0	0	0	0

Source: Congressional Budget Office.

Seliski, et al. Key Methods That CBO Used to Estimate the
Effects of Pandemic-Related Legislation on Output, CBO WP 2020-07, October 2020.

Sometimes Econometrics Isn't Enough

Table 2. Changes in Output From One Dollar of Direct Effects on Overall Demand When Output Is Well Below Potential and the Federal Reserve's Responses Are Limited

Dollars

			Under Social Distancing[a]	
Quarter	Low Estimate	High Estimate	Low Estimate	High Estimate
1	0.50	1.45	0.31	0.89
2	0	0.60	0	0.48
3	0	0.30	0	0.26
4	0	0.15	0	0.14
Cumulative Effect Over 4 Quarters	0.50	2.50	0.31	1.78

Source: Congressional Budget Office.

a. The effects under social distancing correspond to the changes in output resulting from an additional dollar of direct effects on demand in the second quarter of 2020, when social distancing was at its peak.

Seliski, et al. Key Methods That CBO Used to Estimate the
Effects of Pandemic-Related Legislation on Output, CBO WP 2020-07, October 2020.

Fiscal Policy Summed Up

(Chapter 22)

Chapter 22 Outline

Fiscal Policy: A Summing Up

Fiscal Policy: A Summing Up

- In most advanced economies, the crisis has led to large budget deficits and a large increase in debt-to-GDP ratios.
- This calls for governments to reduce deficits, stabilize the debt, and reassure investors.
- The purpose of this chapter is to review what we have learned about fiscal policy so far, to explore in more depth the dynamics of deficits and debt, and to shed light on the problems associated with high public debt.

22.2 The Government Budget Constraint: Deficits, Debt, Spending, and Taxes (1 of 8)

- The budget deficit (**inflation-adjusted deficit**) equals spending, including real interest payments on the debt (rB_{t-1}), minus taxes net of transfers ($G_t - T_t$):

$$\text{deficit}_t = rB_{t-1} + G_t - T_t$$

- **Government budget constraint**: The change in government debt during year *t* equals the deficit during year *t*:

$$B_t - B_{t-1} = rB_{t-1} + G_t - T_t \qquad (22.2)$$

22.2 The Government Budget Constraint: Deficits, Debt, Spending, and Taxes (2 of 8)

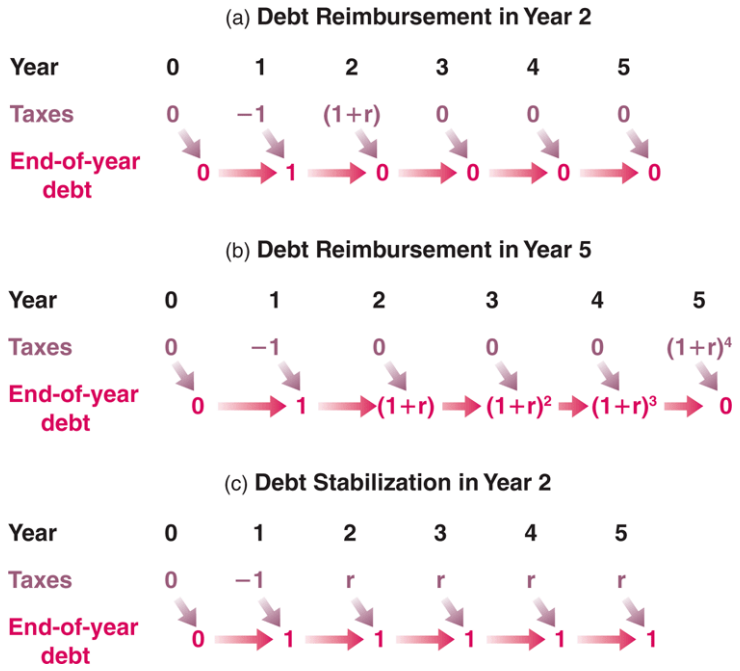
- The term $(G_t - T_t)$ is called the **primary deficit** and $(T_t - G_t)$ is called the **primary surplus**, so:

$$\overbrace{B_t - B_{t-1}}^{\text{changeinthedebt}} = \overbrace{rB_{t-1}}^{\text{Interestpayments}} + \overbrace{(G_t - T_t)}^{\text{PrimaryDeficit}}$$

$$B_t = (1 + r)B_{t-1} + \overbrace{(G_t - T_t)}^{\text{PrimaryDeficit}} \qquad (22.3)$$

22.2 The Government Budget Constraint: Deficits, Debt, Spending, and Taxes (3 of 8)

Figure 22.1 Tax Cuts, Debt Repayment, and Debt Stabilization



(a), If the debt is fully repaid during year 2, the decrease in taxes of 1 in year 1 requires an increase in taxes equal to $(1 + r)$ in year 2. (b), If the debt is fully repaid during year 5, the decrease in taxes of 1 in year 1 requires an increase in taxes equal to $(1 + r)^4$ during year 5. (c), If the debt is stabilized from year 2 on, then taxes must be permanently higher by r from year 2 on.

22.2 The Government Budget Constraint: Deficits, Debt, Spending, and Taxes (4 of 8)

- From equation (22.3), debt at the end of year 2:

$$B_2 = (1 + r)B_1 + 0 = (1 + r)1 = (1 + r)$$

and at the end of year 3:

$$B_3 = (1 + B_t = (1 + r)B_{t-1} + (G_t - T_t) = (1 + r)^2)$$

- As long as the primary deficit equals zero, debt grows at:

$$B_{t-1} = (1 + r)^{t-2} \quad (22.4)$$

22.2 The Government Budget Constraint: Deficits, Debt, Spending, and Taxes (5 of 8)

- If debt is fully repaid during year *t*, then equation (22.4) becomes:

$$0 = (1 + r)(1 + r)^{t-2} + (G_t - T_t)$$

which implies:

$$T_t - G_t = (1 + r)^{t-1}$$

- If government spending is unchanged, a decrease in taxes must eventually be offset by an increase in taxes in the future.
- The longer the government waits to increase taxes, or the higher the real interest rate is, the higher the eventual increase in taxes must be.

22.2 The Government Budget Constraint: Deficits, Debt, Spending, and Taxes (6 of 8)

- The legacy of past deficits is higher government debt today.
- To stabilize the debt, the government must eliminate the deficit.
- To eliminate the deficit, the government must run a primary surplus equal to the interest payments on the existing debt. This requires higher taxes forever.

22.2 The Government Budget Constraint: Deficits, Debt, Spending, and Taxes (7 of 8)

- Now consider the **debt-to-GDP ratio** (or **debt ratio**) instead of the *level* of debt.
- Divide equation (22.3) by real output

$$\frac{B_t}{Y_t} = (1 + r)\,\frac{B_{t-1}}{Y_t} + \frac{G_t - T_t}{Y_t}$$

which can be rewritten as:

$$\frac{B_t}{Y_t} = (1 + r)\left(\frac{Y_{t-1}}{Y_t}\right)\frac{B_{t-1}}{Y_{t-1}} + \frac{G_t - T_t}{Y_t}$$

22.2 The Government Budget Constraint: Deficits, Debt, Spending, and Taxes (8 of 8)

- Assume that output Y grows at a constant rate of g:

$$\frac{B_t}{Y_t} = (1 + r - g)\frac{B_{t-1}}{Y_{t-1}} + \frac{G_t - T_t}{Y_t}$$

or

$$\frac{B_t}{Y_t} - \frac{B_{t-1}}{Y_{t-1}} = (r - g)\frac{B_{t-1}}{Y_{t-1}} + \frac{G_t - T_t}{Y_t} \quad (22.5)$$

which implies that the increase in the ratio of debt to GDP is larger:

- the higher the real interest rate
- the lower the growth rate of output
- the higher the initial debt ratio
- the higher the ratio of the primary deficit to GDP

22.3 Ricardian Equivalence, Cyclical Adjusted Deficits, and War Finance (1 of 4)

- **Ricardian equivalence** proposition (**Ricardo-Barro proposition**): Once the government budget constraint is taken into account, neither deficit nor debt have an effect on economic activity.
- If a government finances a given path of spending through deficits, private saving will increase one-for-one with the decrease in public saving, leaving total saving unchanged.

22.3 Ricardian Equivalence, Cyclical Adjusted Deficits, and War Finance (2 of 4)

- The benchmark against which to judge the direction of fiscal policy: **full-employment deficit, mid-cycle deficit, standardized employment deficit, structural deficit,** or **cyclically adjusted deficit.**
- If the actual deficit is large but the cyclically adjusted deficit is zero, then current fiscal policy is consistent with no systematic increase in debt overtime.
- The debt will increase as long as output is below its potential level.

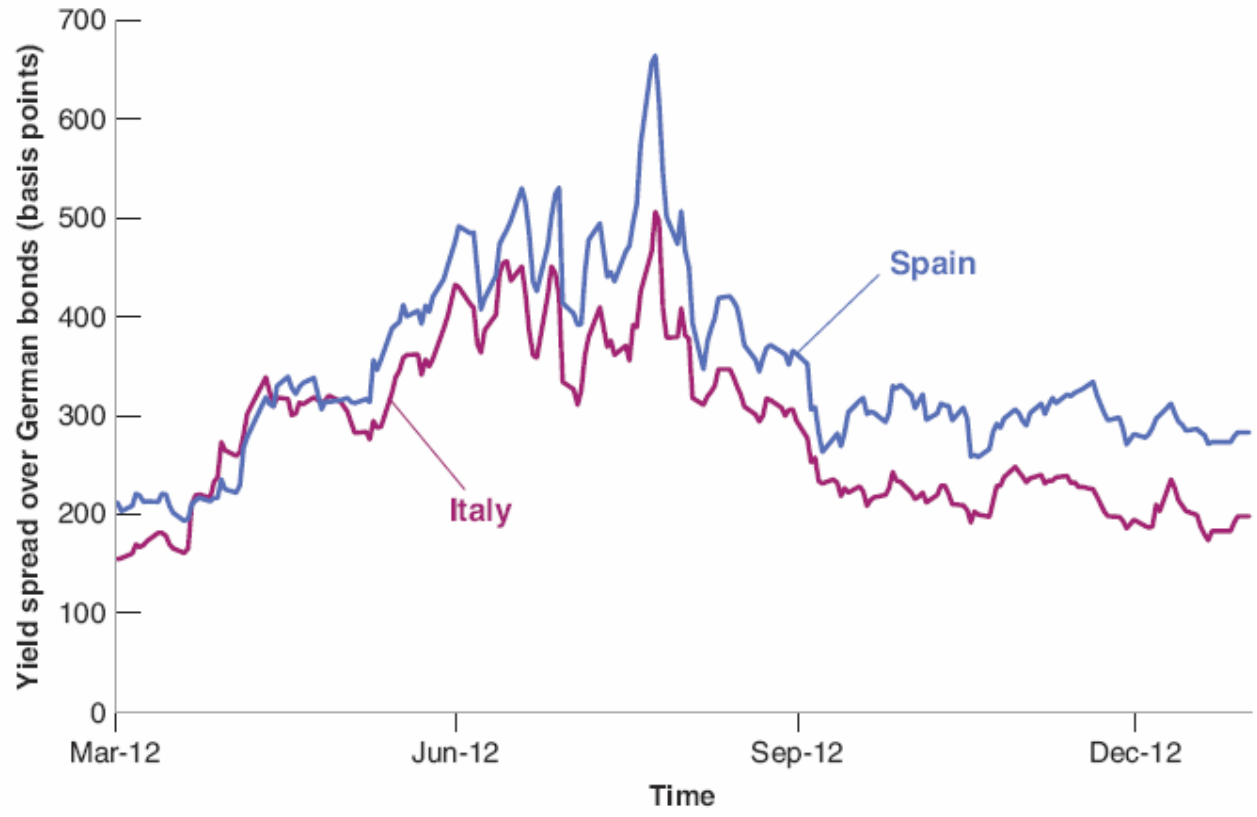
22.3 Ricardian Equivalence, Cyclical Adjusted Deficits, and War Finance (4 of 4)

- Wars typically bring about large deficits because:
  - Deficit finance is a way to pass some of the burden of the war to those alive after the war
  - Deficit spending helps reduce tax distortions—**tax smoothing** implies that large deficits when government spending is exceptionally high, and small surplus the rest of the time.

22.4 The Dangers of High Debt (1 of 5)

- The **spread** is the difference between two interest yields, measured in **basis points** (a hundredth of a percent).

Figure 22.2 The Increase in European Bond Spreads



Source: Haver Analytics

22.4 The Dangers of High Debt (2 of 5)

- When a government finds itself unable to repay the outstanding debt, it may decide to default.
- **Haircut**: The percentage that creditors will not received compared to what they were owed.
- Default also comes under different names: **debt restructuring, debt rescheduling, private sector involvement**

22.4 The Dangers of High Debt (3 of 5)

- The government can also finance itself by printing money.
- **Money finance, debt monetization, or fiscal dominance** of monetary policy: The government issues bonds and then forces the central bank to buy its bonds in exchange for money.
- **Seignorage**: The revenue, in real terms, that the government generates with money creation (ΔH).

$$\text{seignorage} = \frac{\Delta H}{P}$$

22.4 The Dangers of High Debt (4 of 5)

- The relation between seignorage, the rate of nominal money growth, and real money balances (relative to GDP):

$$\frac{\text{seignorage}}{Y} = \frac{\Delta H}{P}\left(\frac{H/P}{Y}\right) \qquad (22.6)$$

- This implies that to finance a deficit of say 10% of GDP through seignorage, given a ratio of central bank money to GD P of 1, the growth rate of nominal money must be equal to 10%.
- As money growth increases, inflation typically follows. **Hyperinflation** refers to very high inflation.

22.4 The Dangers of High Debt (5 of 5)

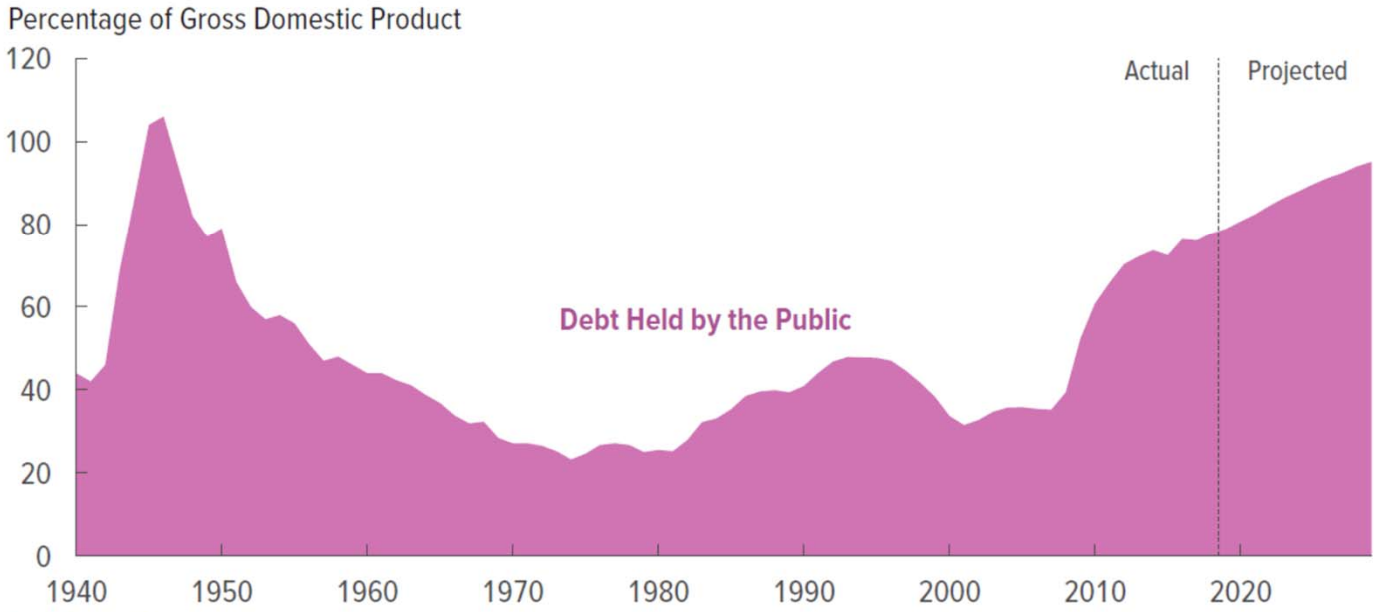
- Today, debt is indeed high in many advanced economies, often in excess of 100% of GDP.
- It is now widely accepted that the strong fiscal consolidation that took place in Europe from 2011 on, known as **fiscal austerity**, was excessive.

22.5 The Challenges Facing US Fiscal Policy Today (1 of 4)

- How bad is the debt situation in the United States today? In 2020Q2, the debt issued by the federal government—the number that is typically quoted in newspapers, called **gross debt**—stood at $26,477 billion, or 135.6% of GDP.
- However, debt held by the public, called **net debt**, stood at $20,583 billion, or 105.3% of GDP.
- The federal deficit stood at $5647.6 billion in 2020Q2 SAAR, or 28.9% of GDP. The ratio of interest payments to GDP was 2.9%, so the primary deficit was equal to 28.9% - 2.9% = 26.0%

Debt Accumulation

Debt Federal debt held by the public is projected to rise steadily over the coming decade, from 79 percent of GDP in 2019 to 95 percent of GDP in 2029. It would continue to grow after 2029.



See Figure 1-4

Relative to the size of the economy, federal debt in 2019 is projected to be nearly twice its average over the past 50 years. At the end of 2029, debt is projected to reach a higher level than it has at any point since just after World War II.

CBO, Update to Econ and Budget Outlook, August 2020

22.5 The Challenges Facing US Fiscal Policy Today (2 of 4)

- However, looking forward, two major government spending items look set to substantially increase:

1. Social security payments are projected to increase from 4.9% of GDP in 2018 to 6.0% in 2029, reflecting the aging of America
2. Medicare (the program that provides health care to retirees) and Medicaid (the program that provides health care to poor people) are projected to increase from 5.4% of GDP in 2018 to 7.2% in 2029

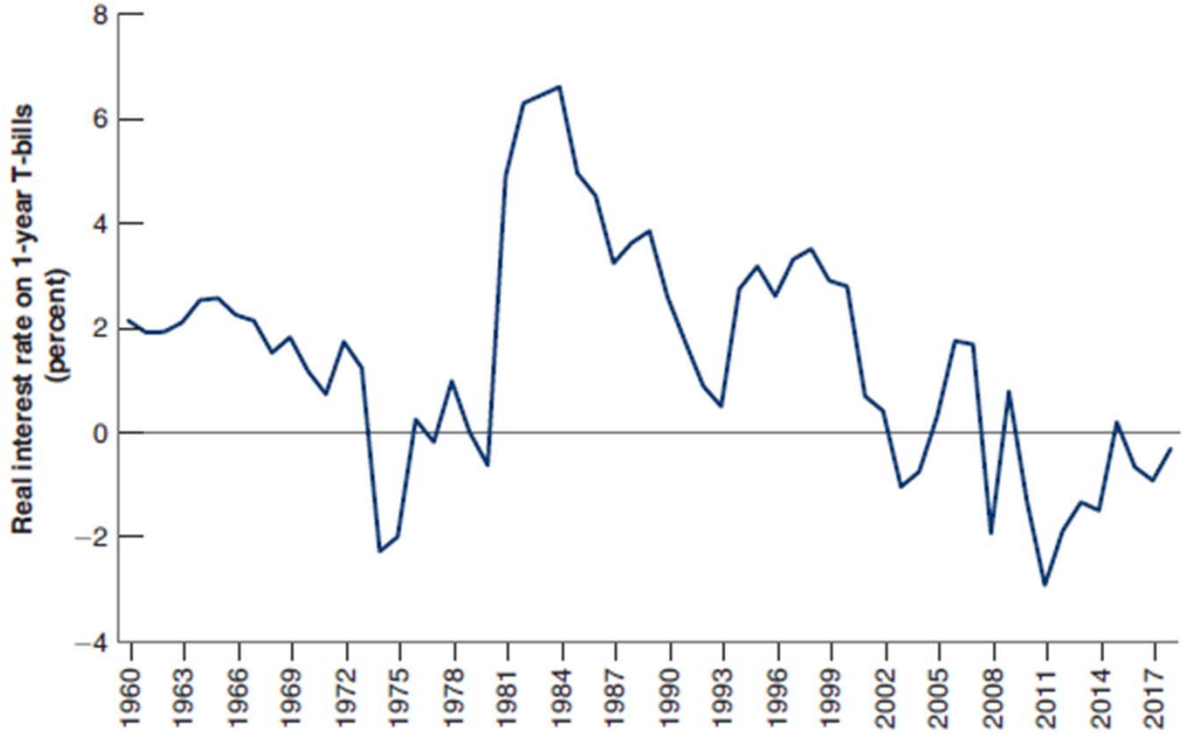
22.5 The Challenges Facing US Fiscal Policy Today (3 of 4)

- How much and at what rate should primary deficits be reduced? There are three relevant arguments here.

1. The first is that the real interest rate the government pays on its debt is currently very low, indeed lower than the growth rate.
2. The second argument focuses on public investment. In 2018, the ratio of government investment to GDP was the lowest it had been since 1950. There is a strong case for increasing it given the fact that the cost of borrowing for the government is very low.
3. The third argument is that to avoid a decrease in output in response to a reduction in the budget deficit the central bank must decrease the interest rate. At the time of this writing interest rates are near the zero-bound limit.

22.5 The Challenges Facing US Fiscal Policy Today (4 of 4)

- **Figure 22-3** The Evolution of the Real Interest Rate on One- Year T-Bills since 1960



- *Source:* FRED: TB1YR, CPIAUCSL

Government Borrowing Costs Are Low