Lecture I:

Foundations of Fiscal Policy Analysis

Ricardian Equivalence

A Basic Set-up (Ljungqvist & Sargent, ch. 10)

Household preferences (over a single consumption good):

$$\sum_{t=0}^{\infty} \beta^t u(c_t) \qquad \text{(I.1)}$$

where $\lim_{c \to 0} u'(c) = \infty$ (Inada's condition). $c \geq 0$ throughout.

Budget constraint: $$c_t + q_t b_{t+1} \leq y_t + b_t \qquad \text{(I.2)}$$

Ricardian Equivalence (cont.)

where: b = risk-free government (or foreign) bond

q_t =1/R= (time-invariant) bond price, with R>1.

Further assume: A1) βR=1 (to eliminate trended consumption)

A2) y_t is deterministic and $\sum_{t=0}^{\infty} \beta^t y_t < \infty$

A3) b_0 is given.

This is our basic set-up on the household side.

Ricardian Equivalence (cont.)

- The ball game at this point is to impose restrictions on $\{b_t\}_0^\infty$ and see what happens to household consumption, c_t, when government enters the picture.

Key: the government will not face the same restrictions on borrowing as the household, so its intervention (e.g. through changes in taxation path) can change c_t.

Ricardian Equivalence (cont.)

But before introducing government, let's develop some intuition as to what restrictions on the sequence of asset (bond) holdings $\{b_t\}_0^\infty$ do to the path of consumption under various scenarios for endownment income (y_t).

As in L-S, consider two forms of borrowing constraints:

i) agents can never borrow, i.e., $b_t \geq 0, \ \vee \text{t.}$

ii) agents can borrow up to a "natural borrowing limit", $\bar{b}_t$

Ricardian Equivalence (cont.)

where $\overline{b}_t = -\sum_{j=0}^{\infty} R^{-j} y_{t+j}$, with Ponzi schemes ruled out.

Hence, under the natural borrowing limit, households can actually borrow in net terms, this implies a less stringent borrowing constraint than (i).

To see the implications, consider the FOC using (1.1) & (1.2):

$$u'(c_t) \geq \beta R u'(c_{t+1}) \qquad \text{(I.3)}$$

$\beta R=1$ and (I.2) imply that $c_t = c_{t+1}$ when $b_{t+1} > 0$ -> c_t is smoothed!

Ricardian Equivalence (cont.)

But when b_{t+1}=0, the borrowing constraint will bind, so

$$u'(c_t) > \beta R u'(c_{t+1}) \therefore c_t < c_{t+1}$$

Since then $c_t = y_t + b_t$, household's consumption is constrained. In particular, if b_o=0 , $c_o = y_o$, so consumption smoothing is not warranted.

Proposition I.1: Under strict no-borrowing constraint $b_t \geq 0, \ \forall t$ the household will **not** be able to stabilize consumption under all possible endownment paths, $\{y_t\}_{t=0}^{\infty}$.

Ricardian Equivalence (cont.)

Illustration of Proposition I.1 (L-S ch. 10, ex. 2):

Let b_0=0 and $\{y_t\}_{t=0}^{\infty} = \{y_l, y_h, y_l, ...\}$. Recall that if the household faces a non-borrowing constraint, b_1=0. From (I.2) $c_o = y_l < PV\{y_t\}_0^{\infty}$. So, consumption in t=0 will be smaller than life-time income, and the household will not be able to smooth consumption for all t. ▯

But full consumption smoothing is achieved if the sequence $\{y_t\}_{t=0}^{\infty} = \{y_h, y_l, y_h, ...\}$. Homework: go through the derivation in L-S!

Ricardian Equivalence (cont.)

Introducing Government

Let fiscal policy be one in which the path of government spending (per household), $\{g_t\}_{t=0}^{\infty}$, is fixed and that of lump-sum taxation, $\{\tau_t\}_{t=0}^{\infty}$ can vary.

The government's budget constraint is:

$$B_t + g_t = \tau_t + R^{-1} B_{t+1} \qquad \text{(I.4)}$$

Solving forward & ruling out Ponzi schemes thus yields:

$$B_t = \sum_{j=0}^{\infty} R^{-j} (\tau_{t+j} - g_{t+j}) \qquad \text{(1.5)}$$

Ricardian Equivalence (cont.)

The household budget constraint is now:

$$c_t + R^{-1}b_{t+1} \leq y_t - \tau_t + b_t$$

Solving forward thus yields: $$b_t = -\sum_{j=0}^{\infty} R^{-j}(y_{t+j} - c_{t+j} - \tau_{t+j}) \qquad \text{(I.6)}$$

Consider now again the natural borrowing limit with government. Set c_t=0 for all t, and the debt limit will be:

$$b_t \geq -\sum_{j=0}^{\infty} R^{-j}(y_{t+j} - \tau_{t+j})$$

Which is clearly absolutely lower than the one without taxes. So, households will typically more constrained in dis-saving!

Ricardian Equivalence (cont.)

This sets us ready for a key Ricardian proposition:

Under the natural debt limit, given (b_0 and B_0), if $\left\{\bar{c}_t, \bar{b}_{t+1}, \bar{g}_t, \bar{\tau}_t, \bar{B}_t\right\}$ is an equilibrium, there is also an equilibrium where $\left\{\bar{c}_t, \hat{b}_{t+1}, \bar{g}_t, \hat{\tau}_t, \hat{B}_t\right\}$ provided that $\sum_{j=0}^{\infty} R^{-j}\hat{\tau}_{t+j} = \sum_{j=0}^{\infty} R^{-j}\bar{\tau}_{t+j}$.

<u>Intuition of the proof</u>: Under the natural debt limit the household budget set depends only on the present value of taxes, rather than on the current tax rate (cf. I.4). Since the present value of taxes is unchanged, so will be consumption for a given path of income. b and B will adjust minus one to one with τ, so c stays put, i.e., $\tau_1 > \tau_0$, $b_{t+1}^1 < b_{t+1}^0$.

Ricardian Equivalence (cont.)

But things change under the stricter no-borrowing constraint, i.e., $b_t \geq 0$ for all t. Now the household budget varies period by period, i.e., with $b_{t+1}=0$, we have:

$$c_t = y_t - \tau_t + b_t$$

For c to remain unaltered given y, then changes in b will have to offset changes in tau. But $b_t \geq 0$ requirement means that there is a limit to this offset: some values of τ may require c to change!

<u>In general</u>: if borrowing constraints are tougher than the natural one, Ricardian eq. is less likely to hold.

Ricardian Equivalence (cont.)

But note that when $b_{t+1} > 0$, the RE results can be recovered. In particular, if the agent starts with positive assets, RE will hold for tax changes that do not lead to the corner of $b_{t+1} = 0$

Homework:

1) Show proposition 2 of ch. 10 of L-S
2) Show why RE does not hold with finite horizon but is recovered with a bequest motive that is stringent enough.

Ricardian Eq. & Fiscal Multipliers

- The recent global recession has re-kindled the debate on the neutrality of fiscal policy.

- Under RE, fiscal policy is neutral. E.g. Lowering T today means higher T in the future so that the present value of tax revenues does not change (i.e., $\sum_{j=0}^{\infty} R^{-j}\hat{\tau}_{t+j} = \sum_{j=0}^{\infty} R^{-j}\overline{\tau}_{t+j}$).

- But this means that households will save more by:

$$\overline{c}_t + \frac{b_{t+1}\uparrow}{R} = y_t - \tau_t\downarrow + b_t$$

Ricardian Eq. & Fiscal Multipliers

- But in the aggregate we have $c_t + g_t = y_t$. So, if neither c nor g move, then output remains the same.
- Hence the economy cannot be jump-started by a deficit resulting of lowering taxes → the fiscal multiplier is zero!
- But how about changes in G? And how about if R is no longer constant as previously assumed?
- Clearly, one needs to look at this from a general equilibrium (GE) perspective.

The Government Spending Multiplier

A simple G.E. framework for gauging the spending multiplier

(based on Woodford, 2011)

Preferences: $$\sum_{t=0}^{\infty} \beta^t [u(C_t) - \nu(N_t)] \qquad \text{(I.7)}$$

where $u' > 0, u'' < 0, \nu' > 0, \nu'' > 0$

Let's put some standard functional forms into (I.7):

$$u(C) = \frac{C^{1+\sigma}}{1+\sigma}, \ \text{v(N)} = \frac{N^{1+\rho}}{1+\rho}$$

The Government Spending Multiplier

Production: $Y_t = f(N_t) = A_t N_t$ (I.8)

To simplify, normalize $A_t=1$, so $Y_t=N_t$.

MRS: $\frac{v'}{u'} = \frac{W_t}{P_t}$ (I.9)

Perfect Competition in factor markets: $f'(N_t) = \frac{W_t}{P_t} = A_t = 1$ (I.10)

The Government Spending Multiplier

Combine (I.9) and (1.10) to obtain:

$$u'(C_t) = v'(Y_t) \qquad \text{(I.11)}$$

But in the closed economy, recall that:

$$Y_t = C_t + G_t \qquad \text{(I.12)}$$

(I.12) into (I.11):

$$u'(Y_t - G_t) = v'(Y_t)$$

We are almost there.. Now differentiate:

The Government Spending Multiplier

$$u'' dY_t - u'' dG_t = v'' dY_t$$

Dividing through by u’ and recalling that u’=v’:

$$\frac{u''}{u'} dY_t - \frac{u''}{u'} dG_t = \frac{v''}{v'} dY_t$$

$$.: \quad dY_t \left[\frac{v''}{v'} - \frac{u''}{u'} \right] = -\frac{u''}{u'} dG_t \qquad (I.13)$$

The Government Spending Multiplier

From the chosen functional forms and Y=N, we have:

$$\frac{u''}{u'} = \frac{-\sigma}{C}, \quad \frac{v''}{v'} = \frac{\rho}{N} = \frac{\rho}{Y}$$

Substituting into (I.12):

$$dY_t\left[\frac{\rho}{Y_t} + \frac{\sigma}{C_t}\right] = \frac{\sigma}{C_t} dG_t$$

Dividing it through by C and arranging yields:

$$\frac{dY}{dG} = \frac{\sigma}{\sigma + \rho(\bar{C}/\bar{Y})} < 1 \qquad \text{(I.14)}$$

The Government Spending Multiplier

The multiplier is thus lower the lower the σ and the higher ρ.

- Role of σ : the less risk averse the representative household, the lower the multiplier. Since with CARA utility, the degree of inter-temporal substitution in consumption is 1/σ, this is equivalent to saying that the higher the degree of inter-temporal substitution, the lower the multiplier.

  This is intuitive: if households don't care much about whether they consume now vs. later, they will cut consumption more when government spending is higher, so there is greater "Ricardian offset". *Lower* σ *gets us closer to Ricardian equivalence!*

The Government Spending Multiplier

- Role of ρ: it is also intuitive that higher degree of labor disutility, ρ, gets us closer to Ricardian equivalence.

To see this, recall that (1/ρ) is the elasticity of labor supply. If labor is less elastic, ie. ρ is higher, workers will demand higher wages per unit of employment. So, higher G will raise more the marginal cost of production, crowding out employment. Since Y=f(N), Y will be lower; given A, the multiplier will decline on ρ.

*Hence, Lower labor supply elasticity (=1/*ρ) also *gets us closer to Ricardian equivalence!*

The Government Spending Multiplier

- Let's now consider what dY/dG would roughly be for standard calibrations found in the real business cycle (RBC) literature. E.g.: C/Y=0.8, σ=2, ρ=3.

$$\frac{dY}{dG} = \frac{2}{2+3*0.8} \approx 0.45$$

- So, below 1 but not so low!

The Government Spending Multiplier

Extensions & Modifications to the above neo-classical setting

- Introducing monopolistic competition in goods markets: No change (but do check the formalization in Woodford, 2011 pp.4-6)

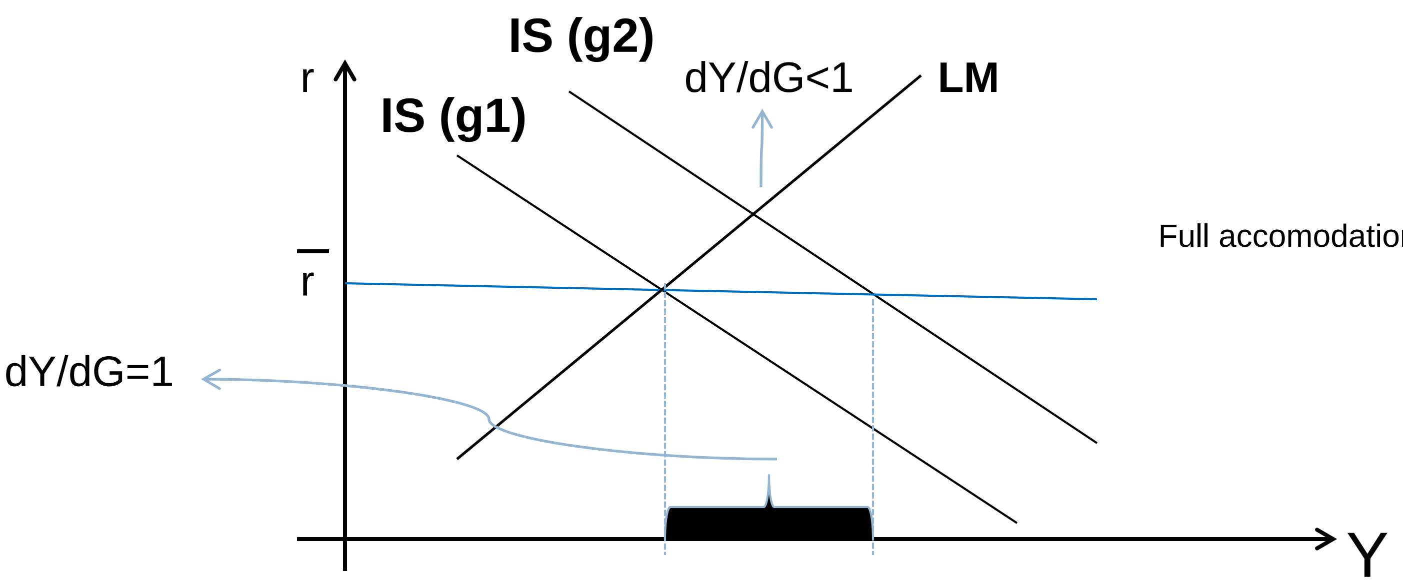
  Intuition: monopolistic competition introduces a wedge (mark-up) in the relation between prices and marginal costs; if this wedge is fixed, it will wash out in the differentiation.

The Government Spending Multiplier

Extensions & Modifications to the neo-classical setting (cont.)

- <u>Allowing for sticky prices and distinct monetary accommodation</u>:

The good old IS-LM



Full accomodation. E.g. fixed exchange rate cum free K mobility

The Government Spending Multiplier

- When there is full accommodation: $r = \bar{r}$.

- With r unchanged and βR=1, $C_t = C_{t+1} = \bar{C}$. Hence, $Y_t = \bar{C} + G_t$ and the multiplier is thus dY/dG=1.

- This is the standard Keynesian textbook case: there is no crowding out of private expenditure, but there is also no additional stimulus of additional private consumption.

- For private spending to react positively, you need dY/dG >1.

The Government Spending Multiplier

Some interesting features about this familiar result in an optimizing setting.

- One is that it is independent from the degree of wage and price rigidity. *It only matters that there is some rigidity, so as to enable a central bank to stabilize r despite rising G.*

- If prices are fully flexible, then when G rises, inflation will go up, and to stabilize prices the central bank will have to increase i by more than π (as per the Taylor rule), raising r.

- *We are then back to the neo-classical setting where $dY/dG<1$*

The Government Spending Multiplier

- Another important point is that the new Keynesian model with price rigidity can also generate $dY/dG<1$ and in fact $dY/dG<<1$!

- *That is, the new Keynesian model can produce multipliers larger* ***as well as*** smaller than in the neo-classical model!

- All will depend on the degree of monetary policy accommodation of the fiscal expansion.

- <u>In the zero bound</u>: $i=0$, higher G will raise $E(\pi)$. Hence $r=i-E(\pi)\downarrow$.

  So, now $C_t>C_{t-1}$, i.e., $dY/dG>1$!

The Fiscal Multiplier: Empirical Evidence

- Highly topical, hotly debated issue.
- Very complex too, so one can get easily confused with too many analytical layers.
- So, a good illustration for the kind if analytical and practical problems faced by the economic analyst in using theory to make sense of data…
- and for the policy maker trying to distill implications for policy design.

The Fiscal Multiplier: Empirical Evidence

- <u>First analytical cut</u>: Spending vs. the Tax multiplier
- <u>Second analytical cut</u>: Short vs. Long-Run Multiplier
- <u>Third analytical cut</u>: Average vs. Peak Multiplier
- <u>Fourth analytical cut</u>: Length of the fiscal stimulus and implications for the sustainability of fiscal policy. If unsustainable, **r** higher and the multiplier smaller.
- <u>Fifth analytical cut</u>: Closed vs. Open Economy (2^{nd} half)

The Fiscal Multiplier: Empirical Evidence

Summary of Findings of Existing Studies

- Estimates for tax multipliers (over both short and long run) have large variance: -0.5 to -5!
- Estimates for spending multipliers are also disparate (again over both short and long run) but usually within a narrower range: 0.5 to 2.
- Length of the fiscal stimulus matters: "Long run" (cumulative multipliers) are often larger than short-run ones
- A higher long-run multiplier is consistent with textbook Keynesian model $dY/dG=1/(1-mgpc)$, mgpc higher in long-run.

The Fiscal Multiplier: Empirical Evidence

- Interestingly (as noted in Ramey, 2011, p.679), the range of estimates *within* studies is almost as wide as *across* studies.
- Hence studies concur that estimation is imprecise but spending multipliers are not trivially low, nor crazily high.
- Also consistent with theory, spending multipliers tend to be lower when financed by distortionary taxation.
- Because of the complex effects of distortionary taxes on the multiplier (e.g. effects on labor supply decisions), some studies control for taxation changes. Ramey then gets dY/dG~1.

The Fiscal Multiplier: Empirical Evidence

- As often in Economics, a key difficulty in pinning down dG -> dY is reverse causality, esp in advanced countries where G increases as Y goes down (e.g. unemployment and social benefits) .

- So, a common approach is to set-up a VAR of the form:

$$Y_{n,t} = \sum_{k=1}^{K} A_k Y_{n,t-k} + Bu_{n,t} \qquad \text{(I.15)}$$

where $Y_{n,t} = (g_{n,t}, y_{n,t}, others)$

The Fiscal Multiplier: Empirical Evidence

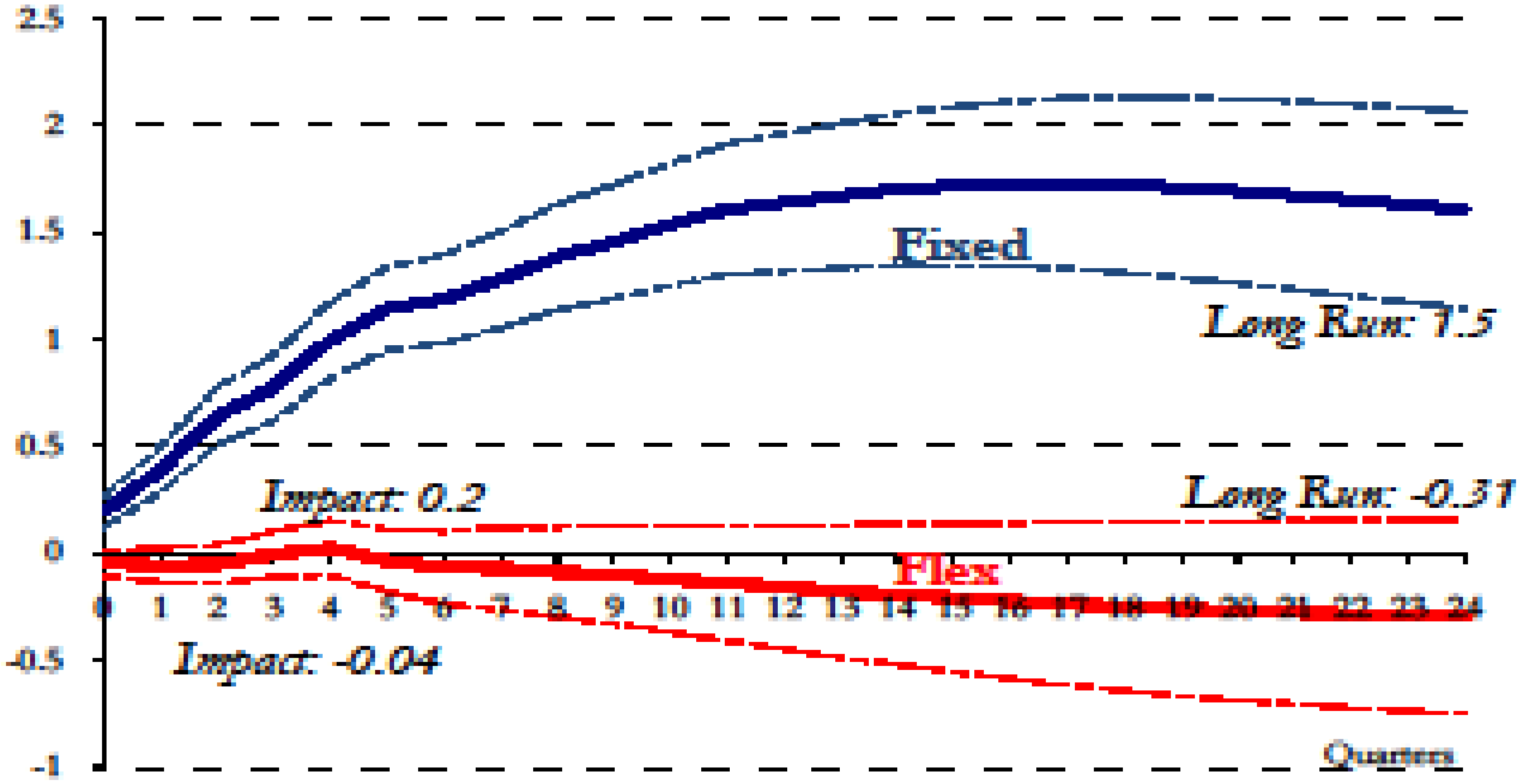
- Short-run ("impact") multiplier: $\equiv \dfrac{\Delta Y_0}{\Delta G_0}$

- Long-run multiplier: $\equiv \dfrac{\sum_{j=0}^{N} \Delta Y_{t+j}}{\sum_{j=0}^{N} \Delta G_{t+j}}$

- Peak Multiplier: $\equiv \max_{N} \dfrac{\Delta Y_{t+N}}{\Delta G_t}$

The Fiscal Multiplier: Empirical Evidence

Figure 1: Fiscal Expenditure Multipliers Across Monetary Regimes
(from Itzezlki, Mendoza and Vegh, NBER WP, 2010)



The Fiscal Multiplier: Empirical Evidence

- But two main problems with this VAR approach.

- One is identify the "autonomous" g shock: Ilzetzki, Mendoza and Vegh (2010) use lags and Cholesky identification schemes, but these are strong assumptions

- Another way is to look for exogenous drivers ("instruments") of G. One is military spending (Ramey, 2011 and Barro & Redlick, 2011). Another is the "narrative approach" of Romer and Romer. See the you tube video by Valerie Ramey: http://www.youtube.com/watch?v=eSQN-mMjJd4

- Another problem is what to put in "others", e.g. the kind of monetary policy or regime will influence dY/dG, as just seen.

The Fiscal Multiplier: Empirical Evidence

- The other is that if the fiscal estimulus is sufficiently recurrent and persistent, debt will built-up.

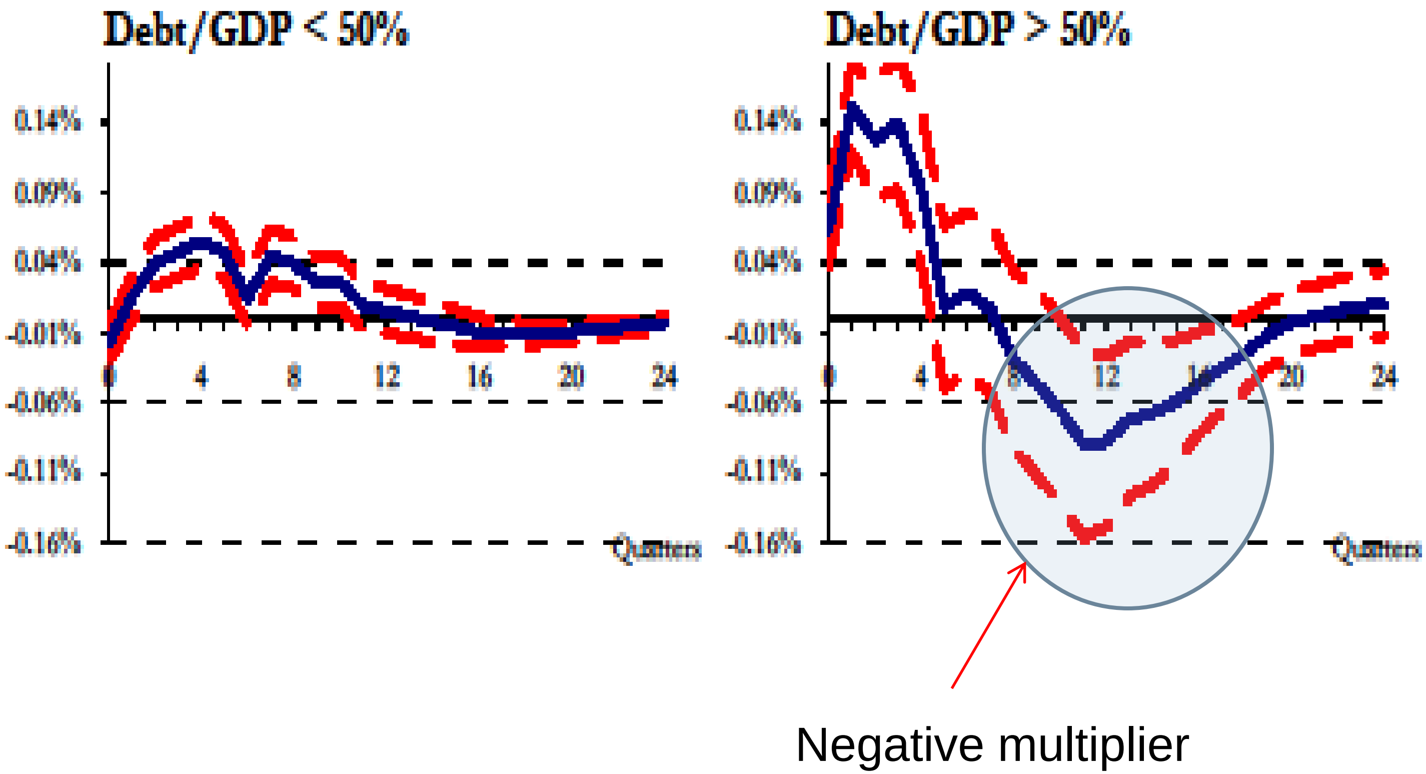
- This may raise the risk of government insolvency (more on solvency and tests thereof in a few minutes).

- Greater solvency/default risk will raise r: as we saw this is like having a steeper LM curve, reducing the multiplier.

- In short: one might expect the multiplier to be lower (or even negative) for more indebted countries.

The Fiscal Multiplier: Empirical Evidence

Figure 2: Fiscal Expenditure Multipliers under Lower vs. Higher Debt
(from Itzezlki, Mendoza and Vegh, NBER WP, 2010)



The Fiscal Multiplier: Some Bottom Line

- Bottom-line: multiplier not zero – so full-fledge Ricardian equivalence fails -- but not >1 to many estimates.

- In many empirical/simulation applications (as we will see in the second half of the course), it is common to assume or impose a "*Ricardian offset*" of around 0.5.

- That is, if government consumption rises by one dollar, private consumption declines by by 50 cents.

- There is also concern that multipliers may be negative (as seen in Figure 2) if fiscal sustainability is jeopardized by prolonged fiscal stimuli. We turn to this next.

Public Debt and Fiscal Sustainability

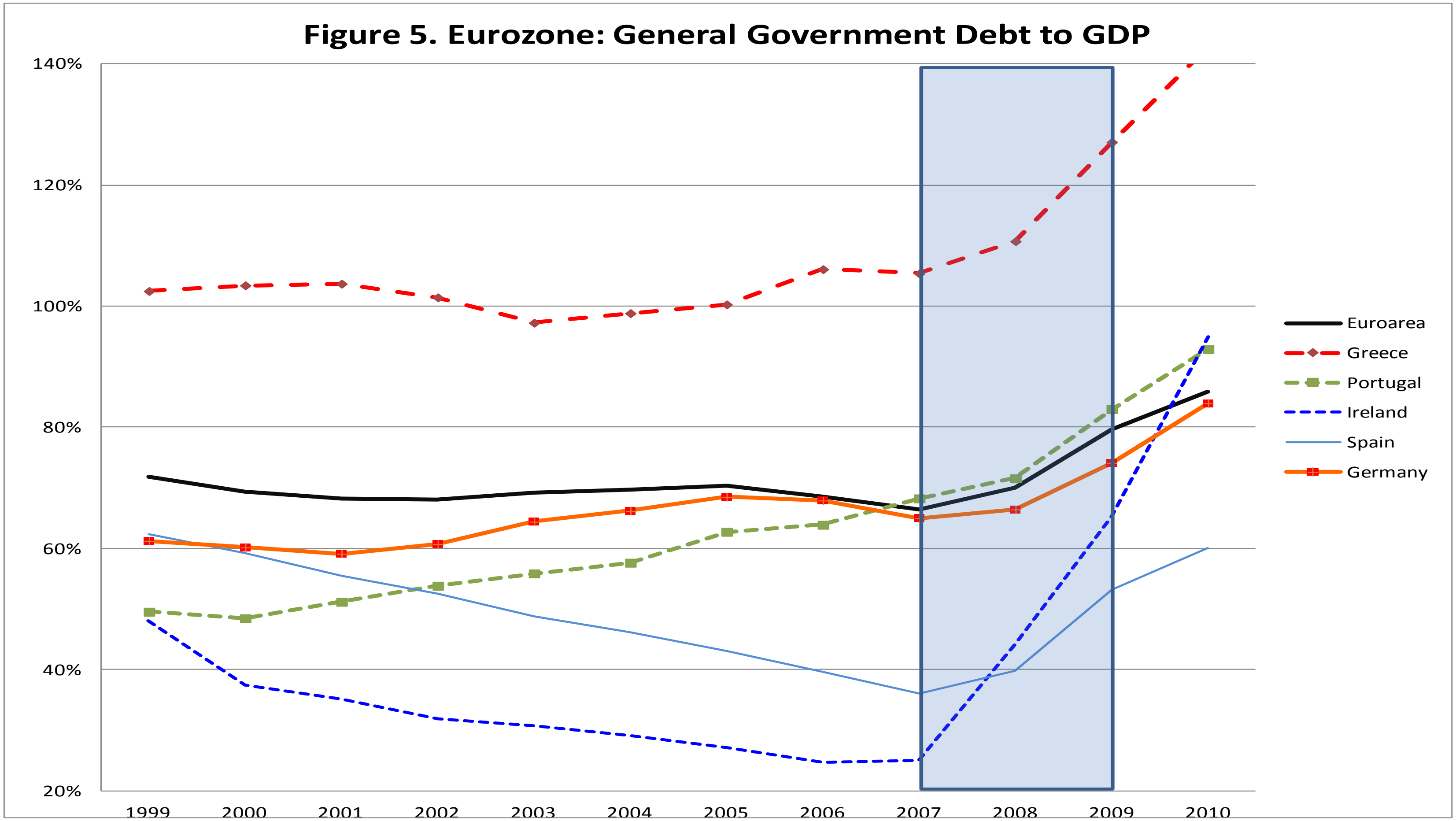
- A main problem with persistent fiscal stimulus is the build-up of public debt.

- If debt/GDP ratio is too high, markets start doubting government solvency.

- If the risk of a default on public bonds rises, then markets will demand higher interest rates, i.e., a higher ***spread*** over the “risk-free” interest rate (the so-called “default” or “risk” premium).

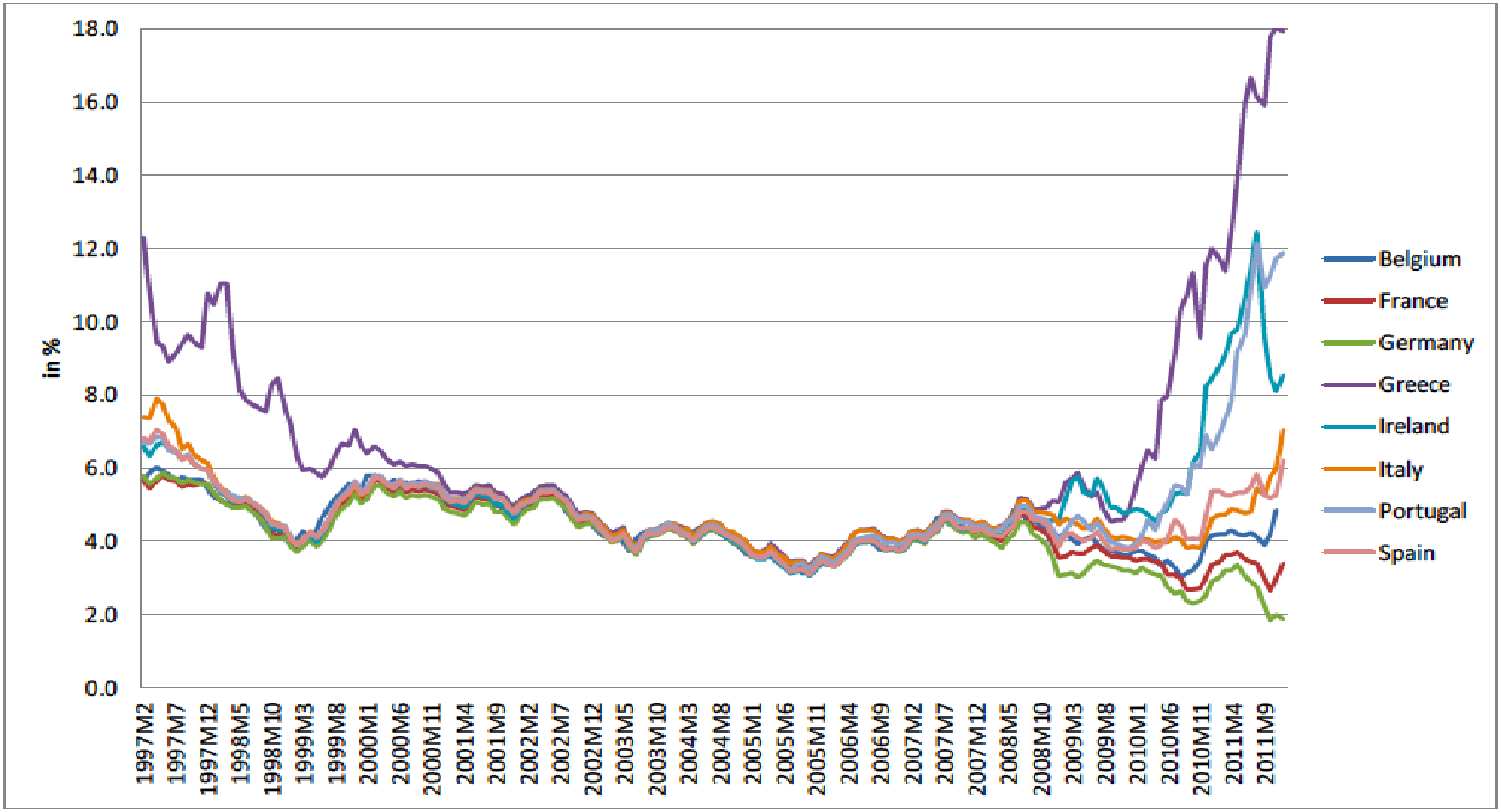
Public Debt and Fiscal Sustainability

Figure 3. Public Debt in the Eurozone
(from Catão, Fostel, Ranciere, 2012)



Public Debt and Fiscal Sustainability

Figure 4. Interest Rates on Public Bonds in Selected Eurozone Countries
(from Catão, Fostel, Ranciere, 2012)



Public Debt and Fiscal Sustainability

- To examine government solvency, a first step is to start with the government budget constraint.

- To simplify, assume away money ("seignorage") financing. (We will discuss that later), so as in (I.4):

$$B_t + G_t^P - T_t = R_{t+1}^{-1} B_{t+1} \qquad \text{(I.16)}$$

where G^P is government primary expenditure (total G - interest payments on public debt, B) in nominal Reais or dollars, T stands for general tax revenues and R=(1+r).

Public Debt and Fiscal Sustainability

Beware of Notation and Measurement Units!

- If all variables in (I.16) are expressed in nominal terms, then r is the **nominal** interest rate.

- If all variables in (I.16) are expressed in terms of units of a good, i.e., inflation free, then r is the **real** interest rate. This is the notation in Ljungqvist and Sargent!

- Often, people denote the nominal interest rate as $\boldsymbol{i_t}$. This is the notation in Walsh's textbook.

Public Debt and Fiscal Sustainability

Also careful how you denote "t" for stock variables!

- In Ljungqvist and Sargent, "t" means the stock variable (e.g. B) at the beginning of the year and "t+1" at the end of the year.
- In Walsh B_t is public debt at the **end** of the year and B_{t-1} at the **beginning** of the year.
- Finally, different authors use the interest rate capitalization differently.

Public Debt and Fiscal Sustainability

- For instance, Walsh and many others write the budget constraint as:

$$G_t^P + i_{t-1}B_{t-1} = T_t + (B_{t+1} - B_t)$$

$$.:(1+i_{t-1})B_t + G_t^P - T_t = B_{t+1}$$

- Compare that with (I.16):

$$B_t + G_t^P - T_t = R_{t+1}{}^{-1}B_{t+1}.:$$

$$R_{t+1}(B_t + G_t^P - T_t) = B_{t+1}$$

- The capitalization factor R_{t+1} is applied on the G-T flow too!

Public Debt and Fiscal Sustainability

- Back to (I.16): It is useful to express fiscal variables and the government budget constraint as ratios to GDP (Y):

$$\frac{B_t}{Y_t} + \frac{G_t^P}{Y_t} - \frac{T_t}{Y_t} = R_t^{-1} \frac{B_{t+1}}{Y_{t+1}} \frac{Y_{t+1}}{Y_t}$$

- Which can be re-expressed as:

$$g_t^P - \tau_t + d_t = \frac{(1+\Delta y_{t+1})}{(1+r_{t+1})} d_{t+1} \qquad \text{(I.16a)}$$

Bohn's (1998) eq. 1

Or:

$$d_{t+1} = \frac{(1+r_{t+1})}{(1+\Delta y_{t+1})}[g_t^P - \tau_t + d_t] = x_{t+1}[d_t - s_t] \qquad \text{(I.16.b)}$$

Public Debt and Fiscal Sustainability

- where s=τ-g is the government's *primary* surplus as a ratio to GDP.

- Integrating forward and imposing non-Ponzi the inter-temporal budget constraint (**IBC**) is:

$$d_t = \sum_{j=0}^{\infty} \frac{1}{x^j} s^{t+j} = s_t + \sum_{j=1}^{\infty} \frac{1}{x^j} s^{t+j} \quad \text{(I.17)}$$

$$.: s_t = d_t - \sum_{j=1}^{\infty} \frac{1}{x^j} s^{t+j} \quad \text{(I.18)}$$

- Taking expectations at t yields:

Public Debt and Fiscal Sustainability

$$s_t = d_t - E_t \sum_{j=1}^{\infty} \frac{1}{x^j} s^{t+j} \qquad (I.19)$$

- This says that the primary surplus this year (say) will respond to the stock of debt at the beginning of the period (d_t) and the expected path of the discounted value of primary surpluses.

- Note that this sequence is only bound if x>1 and so r>g.

- If so, Bohn (1998, 2007) argues that if a regression of s on d yields a positive coefficient on d, then this is a *sufficient* condition for fiscal solvency.

Public Debt and Fiscal Sustainability

- In particular, Bohn (1998) runs the following regression:

$$s_t = \alpha_o + \rho d_t + \boldsymbol{\alpha}'_g \mathbf{z}_t + \varepsilon_t$$

where **z** is a vector of additional "controls" that he calls GVAR and YVAR.

- He then finds for historical US data, $\rho \sim 0.05$. That is, a rise in the public debt of 20 percentage points of GDP (i.e. from 80% to 100%) requires an increase in the primary surplus of 1% of GDP. [he gives his calculation in dollar terms]

Public Debt and Fiscal Sustainability

- Another important application of expression (I.16) is to use it to compute the required primary surplus to stabilize the debt to GDP ratio.

- To compute this, set $d_{t+1} = d_t$ to obtain:

$$d_{t+1} - d_t = 0 = (x_{t+1} - 1)d_t - x_{t+1}s_t$$

- This implies:

$$(1 - 1/x_{t+1})d_t = s_t$$

$$.: s_t \approx (r_{t+1} - \Delta y_{t+1})d_t \qquad \text{(I.20)}$$

Public Debt and Fiscal Sustainability

- Two salient implications.
- One is that if the d is high, small increases in r, especially if combined with reduction in GDP growth rate, can require a large increase in the primary fiscal surplus to prevent D/Y from soaring.
- Since in many countries r and g are negatively correlated, fiscal solvency can be put at risk during periods of low growth.
- For periods in which g>r, debt stabilization is compatible with a primary deficit.

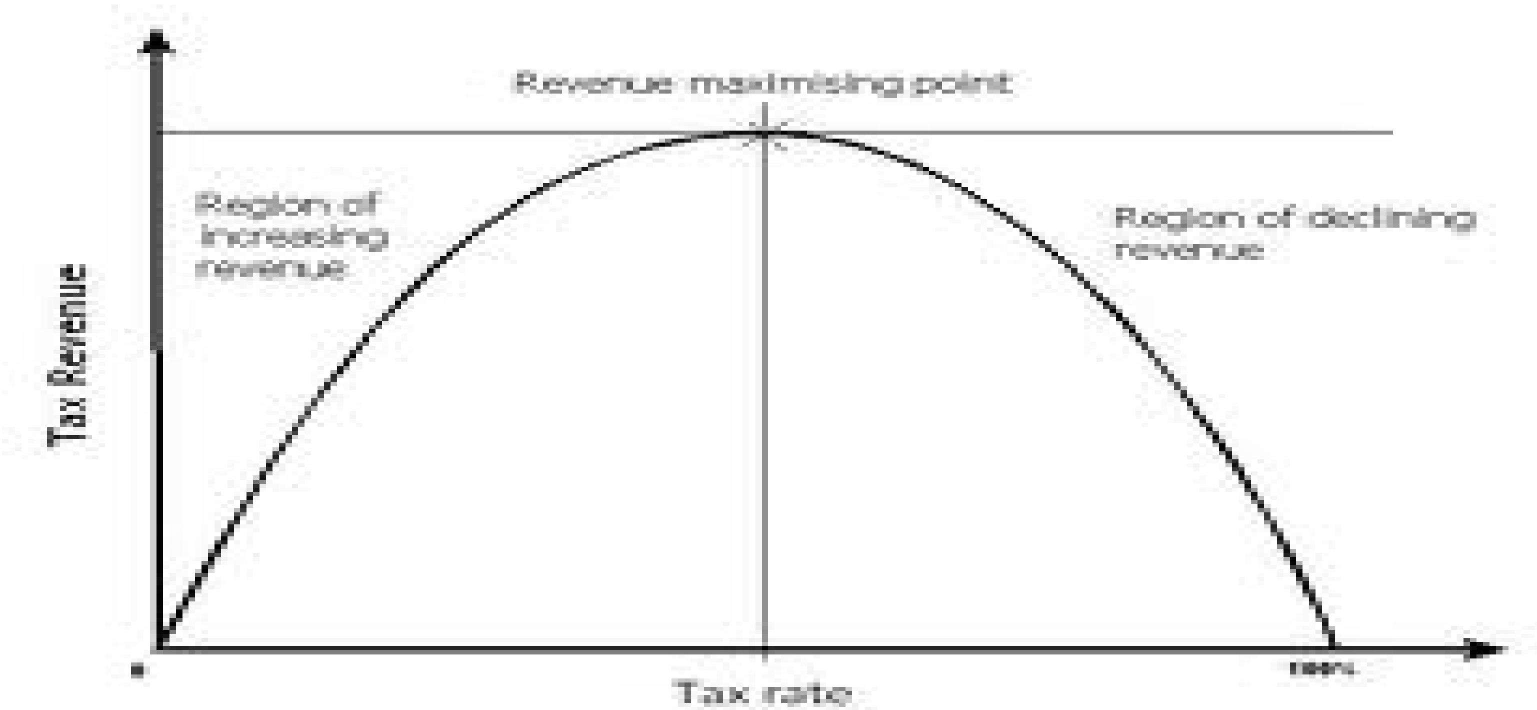
Public Debt and Fiscal Sustainability

- For countries which have high debt and face high interest rate, possibly compromising fiscal sustainability, this discussion has been silent as to whether the required improvement in s should come from revenue improvement and/or spending cuts.

- There is widespread view that tax increases make it costly collect revenues.

- That is, if the fiscal authority hikes up tax rates, evasion will rise and the government may end up collecting less tax revenues, perversely as it may seem.

- This idea is embedded in the so-called ***Laffer curve***:



Public Debt and Fiscal Sustainability

- Barro, 1979: An influential formalization of the idea that, once the top the Laffer curve is reached, the government should not move too much around with tax rates.

- That is, tax smoothing should be a desirable feature of fiscal policy.

- A formalization is as follows.

Tax Smoothing and Public Debt

- Let the cost of tax collection be given by:

$$C(t)=u_1\tau_t+\frac{u_2}{2}\tau_t^{\,2} \qquad \text{(I.21)}$$

- The government seeks to minimize:

$$E\sum_{t=0}^{\infty}\beta^t C(t)$$

- s.t (I.16), where (to simplify let growth be zero so $x_t=R_t=R$):

$$d_{t+1}=R[g_t-\tau_t+d_t]$$

Tax Smoothing and Public Debt

- The solution to this stochastic dynamic programming problem is:

$$C'(\tau_t) = R\beta E_t[C'(\tau_{\tau+1})]$$

- Since $$C'(\tau) = u_1 + u_2\tau$$

- The solution yields: $$\mathrm{u}_1 + \mathrm{u}_2\tau = \mathrm{R}\beta[\mathrm{u}_1 + \mathrm{u}_2 E_t(\tau_{t+1})]$$

- Under the familiar assumption of $R\beta=1$. : $$E_t(\tau_{t+1}) = \tau_t \qquad \text{(I.22)}$$

Tax Smoothing and Public Debt

- With government expenditure following an exogenous process, say $g = \bar{g}$, and $T = \tau Y$, this means that as Y goes down, so will overall tax revenues T and fiscal deficit widens.

- Hence governments should "optimally" build up debt during recessions, and surpluses during "good times".

- This is sometimes observed, but not always.

- Yet, sometimes the downfall in activity is so sharp, that fiscal solvency requires government spending to be cut too.

Tax Smoothing and Public Debt

- Yet, if the fiscal spending multiplier is large, then this may aggravate the drop in Y, reducing further revenue collection, and thus worsening further the fiscal balance.

- These trade-offs are non-trivial.

- Whether one opts for drastic "fiscal consolidation" or allow public debt to build up rapidly will depend on economy-specific fiscal multiplier parameters.

- Will also depend on the expected severity/length of the recession, as well as other considerations.