Ricardian Equivalence

— Week 6 —

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Summary

1. The enormous controversy about Ricardian Equivalence
2. The nature of the controversy
3. Agents and constraints
4. Competitive Equilibrium

I – Tremendous controversy

Blog of John Cochrane

The Grumpy Economist

John Cochrane's blog

SATURDAY, DECEMBER 31, 2011

Krugman on stimulus

I usually don't respond to Paul Krugman's blog posts. But last week he wrote about Stimulus and Ricardian Equivalence. The post gives a revealing view of his ideas, so it's worth making an exception.

Paul explains:

> ...think about what happens when a family buys a house with a 30-year mortgage.
>
> Suppose that the family takes out a $100,000 home loan .... If the house is newly built, that's $100,000 of spending that takes place in the economy. But the family has also taken on debt, and will presumably spend less because it knows that it has to pay off that debt.

ABOUT ME AND THIS BLOG

John H. Cochrane

I'm a professor at th
Chicago Booth Sch
This is a blog of ne
commentary, from a
free-market point of
many rants at the dinner table, my
"the grumpy economist," and hen
title. I'm not really grumpy by the w

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- Commentary (32)

Blog of Paul Krugman

The Conscience of a Liberal

PAUL KRUGMAN

March 13, 2011, 12:57 PM

Cockroach Ideas

Way back, when I spent a year in the government, an old hand told me that fighting bad ideas is like flushing cockroaches down the toilet; they just come right back. I'm having that feeling a lot lately, on at least two fronts.

One is the crowding out issue. I keep encountering both the same old misunderstanding of Ricardian equivalence, and people citing evidence from periods when the economy was nowhere near the zero lower bound. The latter was, perhaps, excusable when the idea of a liquidity trap was still new; but folks, we've been at the ZLB for two and a half years now:

Blog of Noah Smith

Noahpinion

My commenters can beat up your commenters.

SUNDAY, MARCH 25, 2012

Cochrane blasts austerity AND stimulus...???

Another salvo in the Macro Wars. In a newish blog post, John Cochrane declares that austerity is hurting Europe:

Noahpinion

My commenters can beat up your commenters.

THURSDAY, DECEMBER 29, 2011

The Great Ricardian Equivalence Throwdown!

Y'all know I cannot resist wading into a good macro throwdown.

Defending Ricardian Equivalence

"“Fiscal stimulus” is the proposition that by borrowing money and spending it, the government can raise the overall state of the economy, raising output and lowering unemployment. Can it work? Do the arguments for it make any sense? ...[No, because] most fiscal stimulus arguments are based on fallacies."
John Cochrane (2009).

1. Why a fallacy? Because of Ricardian Equivalence

"Ricardian Equivalence": More public spending today, implies more taxes in the future, which leads to more private savings today, and less private spending today

John Cochrane (2009). "Fiscal Stimulus, Fiscal Inflation, or Fiscal Fallacies?" University of Chicago Booth School of Business, Feb 2009.

Attacking Ricardian Equivalence

There have been a lot of shockingly bad performances among macroeconomists in this crisis; but if I had to pick the one that is most startling, it is the way freshwater economists have demonstrated that they don't understand one of their own doctrines, that of Ricardian equivalence...How could anyone who thought about this for even a minute — let alone someone with an economics training — get this wrong? And yet as far as I can tell almost everyone on the freshwater side of this divide did get it wrong, and has yet to acknowledge the error.

Paul Krugman (2009). "A Note On The Ricardian Equivalence Argument Against Stimulus" New York Times, December 26, 2011.

II -The nature of the controversy

The nature of the problem

1. From the definition of GDP

$$GDP = Agregate\ Expenditure \equiv C + I + G + XN$$

2. **Contraction in aggregate expenditure:** is the usual culprit in most recessions
3. **The forces that affect** the components above are:

$$GDP = Expenditure = C(\underset{+}{Y}, \underset{-}{T}, \underset{-}{r}) + I(\underset{-}{r}) + G(\underset{+}{\bar{G}}) + XN(\underset{+}{Y_X}, \underset{-}{e})$$

Y = income, T = taxes, r = interest rate, G = public expenditure, Y_X = foreign income, e = real exchange rate

The nature of the problem (cont.)

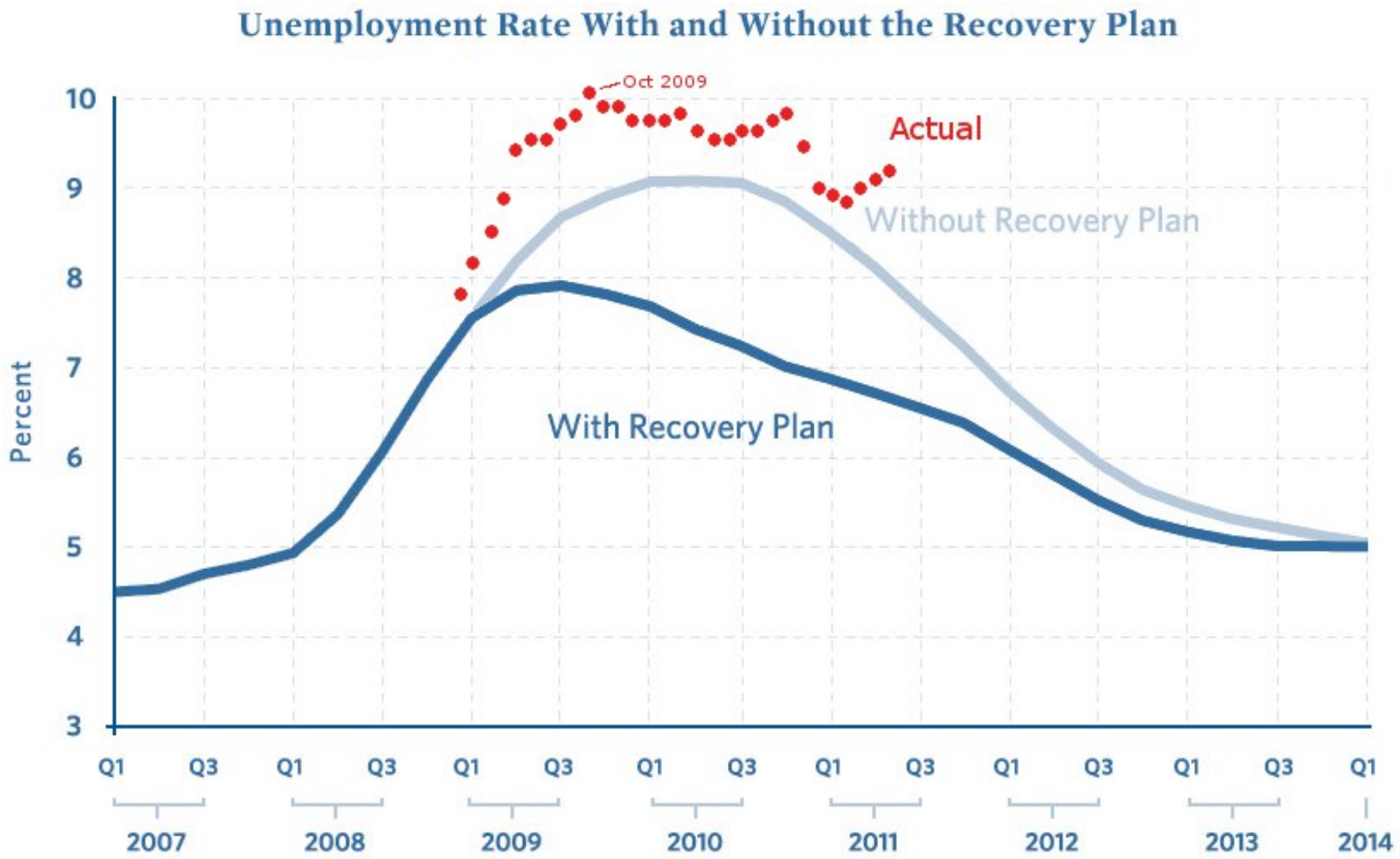
$$GDP = Expenditure = C(\underset{+}{Y}, \underset{-}{T}, \underset{-}{r}) + I(\underset{-}{r}) + G(\underset{+}{\bar{G}}) + XN(\underset{+}{Y_X}, \underset{-}{e})$$

1. **Countercyclical fiscal policy**:
   1. If aggregate expenditure drops because $(C, XN, I) \downarrow$
   2. the government should counterbalance by:
      1. Increasing public expenditure $(\uparrow \bar{G})$
      2. Decrease taxes $(\downarrow T)$
2. **Should we use countercyclical fiscal policy** to manage short term business cycles?
3. **Two major positions** currently exist in macroeconomics:
   1. Keynesians (after John M. Keynes, 1936)
   2. Classicals (after Robert Lucas, 1972)

Keynesian position

1. **Without reservations**: countercyclical fiscal policy should be used ... in extreme situations
2. **In the current context** monetary policy is in a liquidity trap (not efficient) ... fiscal policy ought to be used
3. **"Fiscal Multiplier" larger than 1:**
   1. More 1 dollar in public expenditure, more than 1 dollar in GDP
   2. The multiplier only works in the short term
4. **Bibliography**: vide DeLong (2009a,b) e Krugman (2009) aqui

Keynesians: "Active fiscal policy is good for you"



Classical position

1. For the Classical school in macroeconomics:
   1. Fiscal policy **does not work** and should never be used to manage short term business cycles
   2. Not even ... in extreme situations like the one we are living in
2. The arguments are basically two:

$$PIB = Despesa = C(\underset{+}{Y}, \underset{+}{T}, \underset{-}{r}) + I(\underset{-}{r}) + G(\underset{+}{\bar{G}}) + XN(\underset{+}{Y_X}, \underset{-}{e})$$

   1. **Ricardian Equivalence**
   2. **Fiscal multiplier**: is not significantly different from zero
3. **Ultimate result**: more public expenditure, more inflation, more public debt
4. **Bibliography**: vide Cochrane (2009) and Taylor (2009) aqui

Frase 4. The fiscal multiplier

1. Definição do multiplicador fiscal

$$m = \frac{\Delta PIB}{\Delta G}$$

"The central question is whether fiscal stimulus can do anything to raise the level of output. **The question is not** *whether the "multiplier" exceeds one – whether deficit spending raises output by more than the value of that spending.* **The baseline question is whether the multiplier exceeds zero**."

John H. Cochrane (2009). "Fiscal Stimulus, Fiscal Inflation, or Fiscal Fallacies?", University of Chicago Booth School of Business, 2009.

Classicals: "Countercyclical fiscal policy is bad for you" (John Taylor, 2009)

III – Agents and constraints

Agents

1. We have two **major agents** in the model:
    1. Consumers
        1. Live for two periods (period 1, period 2)
        2. Work when young (period 1) and save for period 2
        3. Rtirement at period 2
        4. Consumer's consumption/savings decision – responds to changes in income and interest rates.
    2. Government
        1. Lives for ever
        2. Government budget deficits and the Ricardian Equivalence Theorem.

Consumers: constraints

1. There is a representative consumer
2. Each consumer has a budget constraint for each period $(t = 1, 2)$
3. At the beginning of $t = 1$, the representative consumer has a given level of financial wealth (a_0) plus interest on this wealth

$$= r \times a_0 + a_0$$

4. The **agent's disposable income** at the beginning of $t = 1$

$$\begin{aligned} Income &= y_1 + ra_0 + a_0 \\ &= \underbrace{y_1}_{wage\ income} + \underbrace{(1+r)a_0}_{financial\ wealth} \end{aligned}$$

5. The agent's **expenditure** in period 1 is

$$Expenditure = c_1 + a_1 + \tau_1$$

c_1 = consumption, a_1 = new bonds, and τ_1 = taxes (lump sum taxes) paid to the government

Consolidated intertemporal constraint

1. The budget constraint for $t = 1$ was given by:

$$c_1 + a_1 + \tau_1 = y_1 + (1 + r)a_0$$

2. The budget constraint for $t = 2$, the end of life, is very similar:

$$c_2 + a_2 + \tau_2 = y_2 + (1 + r)a_1$$

3. The consolidated intertemporal budget constraint is obtained by cancelling out a_1 in both equations above

$$\underbrace{c_1 + \frac{c_2}{1+r}}_{\text{PDV of lifetime consumption}} = \underbrace{(y_1 - \tau_1) + \frac{(y_2 - \tau_2)}{1+r} + (1 + r)a_0}_{\text{PDV of lifetime disposable income}} \quad (1)$$

4. "PDV" represents the present discounted value or the current value.

Government

1. The government can incur in expenditures on goods and services (g).
2. These expenditures have to be financed by imposing:
   1. Taxes (τ) : lump-sum tax τ_1 in $t = 1$ and τ_2 in $t = 2$
   2. Issuing bonds (b) : borrower $(b > 0)$ or a lender $(b < 0)$
3. **Spending**. The government spends g_1 in $t = 1$ and g_2 in $t = 2$. These amounts are exogenously set by a political decision.
4. To make clear what the Ricardian proposition is all about, let's consider two scenarios:
   1. **Scenario A**: only taxes to finance public expenditures
   2. **Scenario B**: taxes + bonds to finance public expenditures

Government constraints: scenario A

1. Government expenditures are financed only with lump-sum taxes (τ_1, τ_2)
2. Notice that no public debt is issued now, neither in the past, so that

$$a_0 = 0$$

3. In $t = 1$ and $t = 2$, in order to have a government balanced budget the following conditions should hold

$$g_1 = \tau_1 \quad (2)$$

and

$$g_2 = \tau_2 \quad (3)$$

4. Let's consolidate the budget constraints to the entire economy: insert eq. (2) and (3) into eq. (1).

The whole economy intertemporal constraint

1. Inserting eq. (2) and (3) into eq. (1), and considering that $a_0 = 0$, leads to

$$\underbrace{c_1 + \frac{c_2}{1+r}}_{\text{PDV of all lifetime expenditure}} = \underbrace{(y_1 - g_1) + \frac{(y_2 - g_2)}{1+r}}_{\text{PDV of all ifetime disposable income}}$$

2. The former can be rewritten as

$$\underbrace{c_1 + \frac{c_2}{1+r}}_{\text{PDV of all lifetime expenditure}} = \underbrace{y_1 + \frac{y_2}{1+r} - \left(g_1 + \frac{g_2}{1+r}\right)}_{\text{PDV of all ifetime disposable income}} \quad (4)$$

3. Notice that under this choice of fiscal policy, what matters for the total PDV of households resources is the PDV of government expenditures, not how expenditures are financed.
4. Is it really irrelevant how the government finances its expenditures? Let see what happens in scenario B.

Government constraints: scenario B

1. Suppose now that the government changes its fiscal policy and decides to reduce taxes and issue bonds in $t = 1$

$$\tau_1 \ \ to \ \ \hat{\tau}_1, \ \ \text{with} \ \ \begin{array}{rcl} \hat{\tau}_1 & < & \tau_1 \\ b_1 & > & 0 \end{array}$$

2. In the two periods, the budget constraints of the government become

$$\begin{array}{rcl} g_1 & = & \hat{\tau}_1 + b_1 \\ g_2 + (1+r)b_1 & = & \hat{\tau}_2 \end{array}$$

3. Cancelling out b_1 above, the government consolidated intertemporal budget constraint

$$g_1 + \frac{g_2}{1+r} = \hat{\tau}_1 + \frac{\hat{\tau}_2}{1+r} \tag{5}$$

4. Let's insert eq. (5) into (eq. 1), in order to obtain the constraint for the entire economy.

The whole economy intertemporal constraint

1. Remember that eq. (1) is given by

$$c_1 + \frac{c_2}{1+r} = (y_1 - \tau_1) + \frac{(y_2 - \tau_2)}{1+r} + (1+r)\underbrace{a_0}_{=0}$$

2. Inserting eq. (5) into this equation, and taking into account that no public bonds were issued in the past ($a_0 = 0$), leads to

$$\underbrace{c_1 + \frac{c_2}{1+r}}_{\text{PDV of all lifetime expenditure}} = \underbrace{y_1 + \frac{y_2}{1+r} - \left(g_1 + \frac{g_2}{1+r}\right)}_{\text{PDV of all ifetime disposable income}} \quad (6)$$

3. **Uauh!** It is exactly the same result as in **scenario A**.
4. This result establishes that consumers face the same PDV of resources independently of the fiscal policy chosen by the government to finance expenditures.

Household's intertemporal utility maximization

1. We know that the intertemporal constraint is the same independently from the particular fiscal policy defined by the government
2. Suppose that the utility function is given by

$$U(c_1, c_2) = \ln c_1 + \beta \ln c_2$$

3. Applying the Euler equation

$$u'(c_1) = \beta(1+r)u'(c_2)$$

4. If the constraint is the same in both scenarios, implies that

$$\frac{c_2}{c_1} = \beta(1+r), \quad \text{and} \quad \frac{\hat{c}_2}{\hat{c}_1} = \beta(1+r)$$

5. Therefore, the pattern of consumption is the same in the two different fiscal policies:

$$\frac{c_2}{c_1} = \frac{\hat{c}_2}{\hat{c}_1}$$

Government constraints: scenario C

1. Suppose the government inherits from $t = 0$ a certain amount of public debt (b_0)
2. In periods 1 and 2, the budget constraints of the government are

$$\begin{aligned} g_1 + (1+r)b_0 &= \tau_1 + b_1 \\ g_2 + (1+r)b_1 &= \tau_2 + b_2 \end{aligned}$$

3. To avoid a Ponzi game (rolling over debt and consequently default, if time stops at $t = 2$), the following condition should apply

$$b_2 = 0$$

4. Cancelling out b_1 above, the consolidated intertemporal budget constraint of the government is

$$g_1 + \frac{g_2}{1+r} + (1+r)b_0 = \tau_1 + \frac{\tau_2}{1+r} \tag{7}$$

Government constraints: scenario C (cont.)

1. Will this new scenario change the Ricardian principle that we obtained above?
2. **No**. Just apply the same procedure as before.
3. As b_0 is given, for both the government and households, the principle is not changed.
4. So when is the Ricardian result not valid?

When is Ricardian Equivalence violated?

It does not apply whenever:

1. Households **are heterogeneous, not all** affected in the same way by the tax cut: redistribution exists in reality
2. Taxes **are** distortionary (VAT, income taxes, etc.)
3. The additional debt raised by the government **is not** paid back within the lifetime of **every** household
4. Credit markets **are not** perfect: government and households face different borrowing constraints and different borrowing costs
5. Agents **do not** have rational expectations: mistakes about forecasting the future are common

IV – Competitive equilibrium

What is a competitive equilibrium?

1. A competitive equilibrium is defined by 3 conditions:
   1. Each consumer chooses c_1, c_2 , a_1, a_2 taking as given

$$(g_1, g_2), \ (\tau_1, \tau_2), \ r \text{ and } b_0$$

   2. The government intertemporal budget constraints holds

$$g_1 + \frac{g_2}{1+r} + (1+r)b_0 = \tau_1 + \frac{\tau_2}{1+r}$$

   3. The bonds market clears in each period

$$a_1 = b_1 \quad , \quad a_2 = b_2$$

   4. The goods market clears

$$c_1 + g_1 = y_1 \quad , \quad c_2 + g_2 = y_2$$

Competitive equilibrium: the formal problem

1. The representative consumers maximizes

$$\max_{c_1,c_2,a_1,a_2} u(c_1) + \beta u(c_2)$$

subject to the 2 constraints

$$\begin{aligned} c_1 + a_1 + \tau_1 &= y_1 + (1+r)a_0 \\ c_2 + a_2 + \tau_2 &= y_2 + (1+r)a_1 \end{aligned}$$

2. With the unknown variables

$$c_1, c_2, a_1, a_2$$

3. And the following are given

$$(g_1, g_2), (\tau_1, \tau_2), \ r \text{ and } b_0$$

Ricardian equivalence:summary

1. Imagine that the government wants to cut taxes in $t = 1$ but does not want to change the spending profile (g_1, g_2). To keep the same level of spending, the government can issue more bonds in $t = 1$ to finance the tax cut. Does this bond financing method change the equilibrium value of any of the real variables such as consumption, asset holdings, and asset prices?
2. The answer to this question is

$$No!$$

3. The fundamental principle:

For a given initial level of public debt (b_0), if g_1 and g_2 are unchanged, changing the pattern or the timing of taxes is neutral (issuing more bonds at $t = 1$ to compensate for the tax cuts), will not affect (c_1, c_2), (a_1, a_2) or b_1, if the two government budget constraints are satisfied (no default).

VI - Bibliography

Bibliography

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