Pre-recording:
Ricardian equivalence and seigniorage

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Disclaimer

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Ricardian Equivalence

Given a sequence of government expenditures, it is irrelevant for households if such expenditures are financed by levying current taxes, or by raising current debt and levying higher taxes in the future. In other words, the choice of the fiscal policy instrument (debt or taxes) used to finance expenditures is neutral on households consumption allocations - thus, they are 'equivalent'.

- Violante (2015)

Ricardian Equivalence - Budget constraints

Household

$$c_1 + \frac{1}{1+r}c_2 = \underbrace{y_1 - T_1}_{y_1^D} + \frac{1}{1+r}\underbrace{(y_2 - T_2)}_{y_2^D} \tag{1}$$

Government

$$PV^G \equiv G_1 + \frac{1}{1+r}G_2 = T_1 + \frac{1}{1+r}T_2 \equiv PV^T \tag{2}$$

Substitute (2) into (1)

$$c_1 + \frac{1}{1+r}c_2 = y_1 + \frac{1}{1+r}y_2 - PV^T = y_1 + \frac{1}{1+r}y_2 - PV^G \tag{3}$$

The logic of Ricardian Equivalence

- Any T path that funds the (assumed invariant) G path leaves the constraint set unchanged
- Unchanged constraint set and unchanged preferences $\Rightarrow$ unchanged C path
- Consumers are forward-looking, know that a debt-financed tax cut today implies an increase in future taxes that is equal - in present value - to the tax cut
- Consumers save the full tax cut in order to repay the future tax liability
- Private saving rises by the amount public saving falls, leaving national saving unchanged
    - Implies interest rates, investment, net exports etc. also unchanged

Ricardian Equivalence - Assumptions

- Precise predictions depend on (in some cases) strong assumptions
  - Government satisfies a PV budget constraint (reasonable - we hope!)
  - Consumers have infinite (or same as government) planning horizon (can generalize to operational bequest motive)
  - Households are able to borrow and at same rate as government (implausible)
  - Lump sum taxes available (implausible)
  - Households fully understand and perceive the situation (?)

- **But** provides a somewhat realistic check on governments that want to 'borrow to stimulate'
  - Assumptions above can be violated but may still be a good approximation
  - Difficult to test empirically but very influential in practice - especially after Barro (1974)

Ricardian Equivalence - Indeterminacy

- To leave PV of taxes constant, changes in taxes are related by:

$$\Delta T_1 = -\frac{1}{1+r}\Delta T_2 \tag{4}$$

- An infinity of (T_1, T_2) are allowed - only PV is pinned down and not the shape of the tax profile
- Not an especially 'helpful theory' for predictions!
- But a very important benchmark for assessing fiscal policy

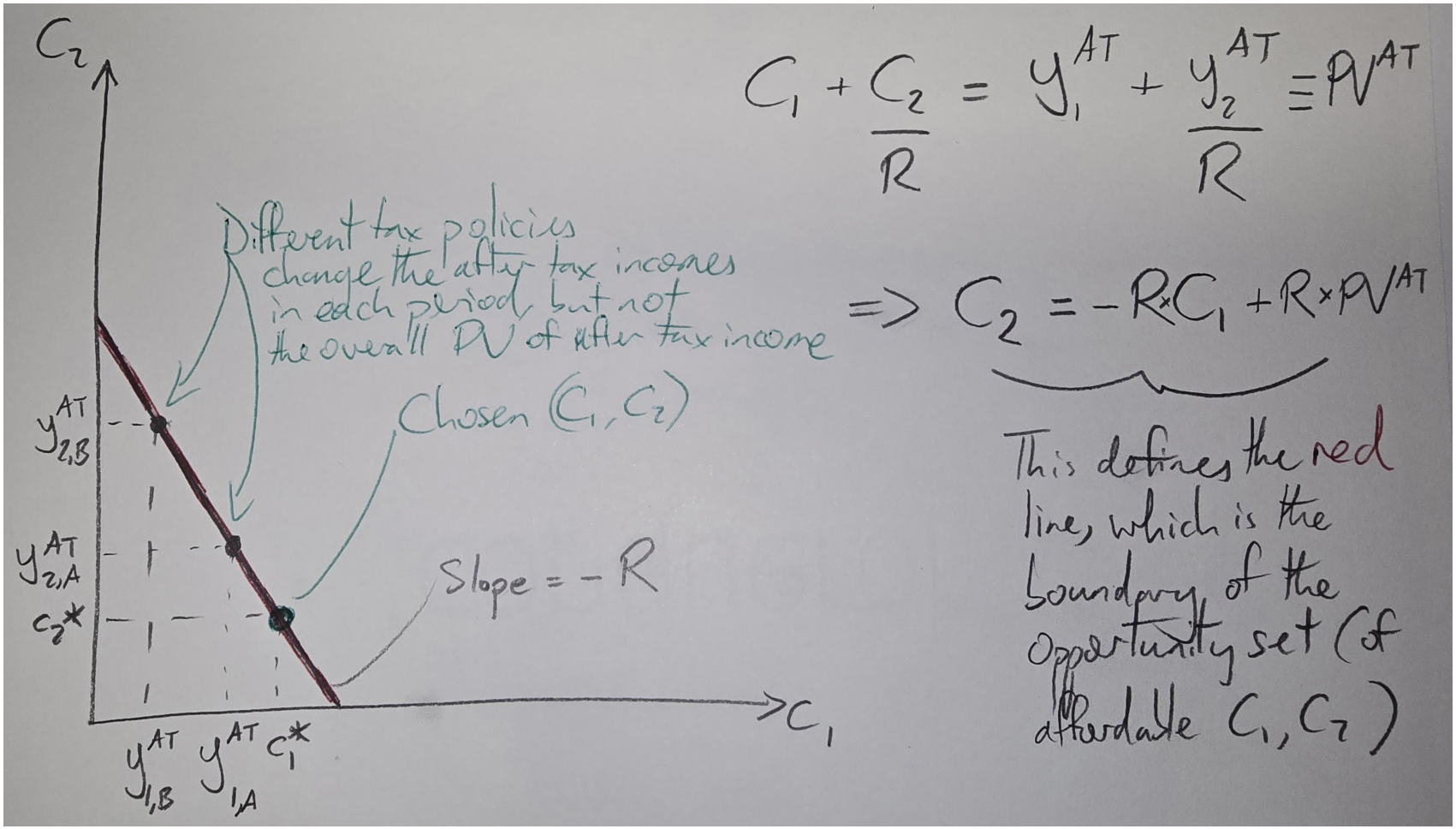
Ricardian Equivalence - Connecting to consumption problem

Go back to the deterministic 2-period consumption-savings note (tech note 1)

- See where we derived the 'intertemporal budget constraint'
- RE is the stark implication of *that*, combined with the government respecting *its* IBC
- Consider the classic savings diagram (showing budget constraint and intertemporal preferences)

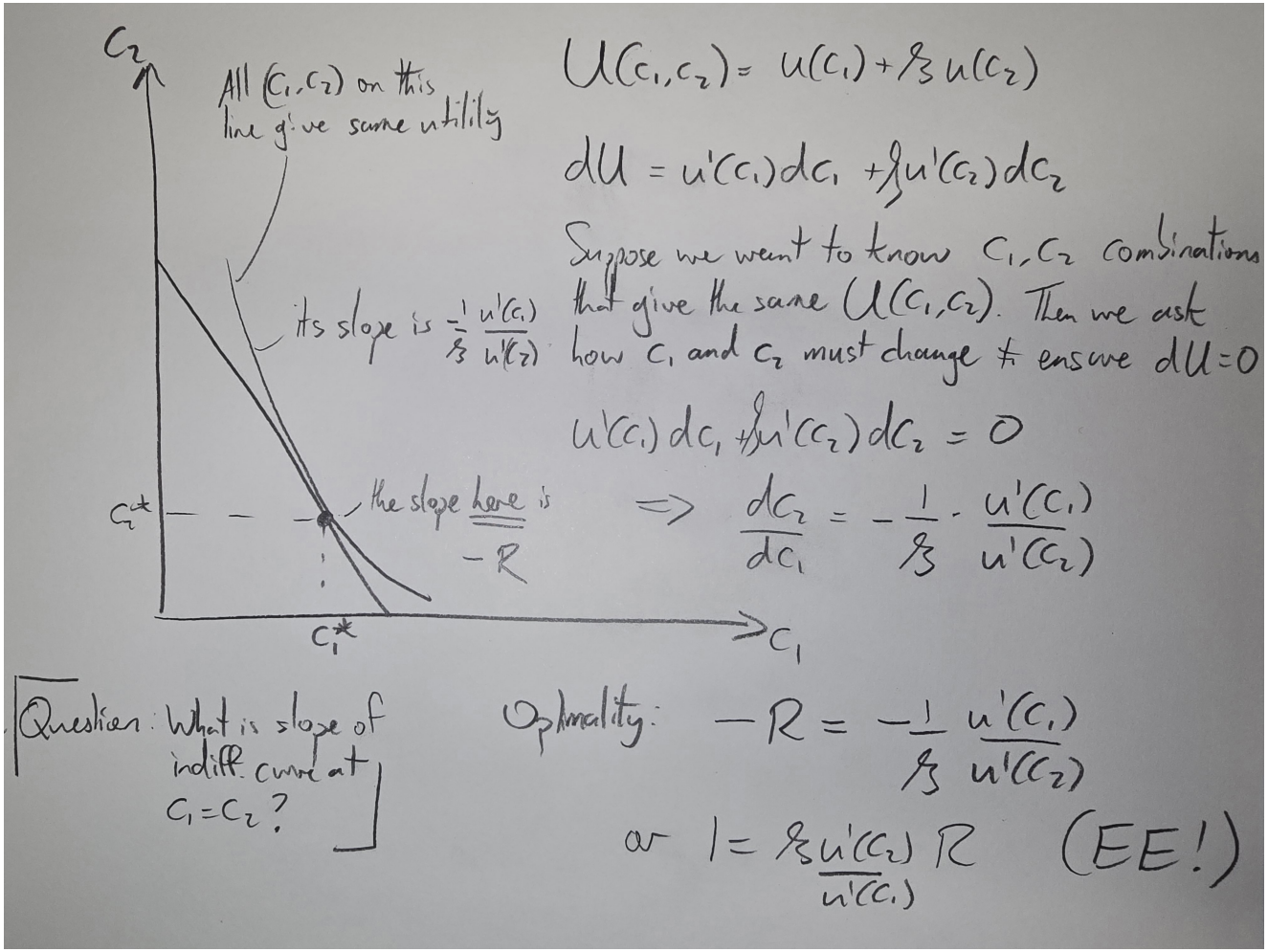
Ricardian Equivalence - Consumption problem diagram - I

Invariance of consumption choice to change in tax profile



Ricardian Equivalence - Consumption problem diagram - II

Optimal consumption choice



Government Budget Constraint

$$G_t^C + G_t^I + rB_{t-1} = T_t + S_t + R_t^I + D_t$$

- Uses:
  - Government consumption G_t^C
  - Government investment G_t^I
  - Interest payment on past government debt B_{t-1}
- Sources:
  - Tax revenue minus transfer payments T_t
  - Seignorage S_t (revenue from printing money)
  - Government investment revenue R_t^I $(\equiv (1 + r_G) G_{t-1}^I)$
  - Government budget deficit D_t $(\equiv B_t - B_{t-1})$
- Re-express:

$$G_t^C + G_t^I + (1 + r) B_{t-1} = T_t + S_t + (1 + r_G) G_{t-1}^I + B_t \quad \text{(GBC)}$$

Seignorage

If the private sector is willing to hold paper money that the government supplies, the government can buy real goods and services that the private sector produces with money that is (virtually) costless for the government to print. The real resources that the government acquires in this way equal its seigniorage revenue.

- Obstfeld (2012)

- We will abstract from seignorage from now on

Seignorage and inflation tax

- Seignorage is given by (neglecting tiny issuance cost)

$$S_t \equiv \frac{M_t - M_{t-1}}{P_t} \tag{5}$$

- Intuition: Government (or CB that remits to government) creates $M_t - M_{t-1}$. What can it buy in real terms? Divide by P_t
- We can re-express (do this) as

$$S_t \equiv \underbrace{m_t - m_{t-1}}_{Gr.\ Real\ balances} + \underbrace{\hat{\pi}_t m_{t-1}}_{Inflation\ tax} \tag{6}$$

  where $m_t \equiv M_t/P_t$ and $\hat{\pi}_t \equiv (P_t - P_{t-1})/\mathbf{P_t}$

- If real balances $\approx$ constant, then seignorage $\approx$ inflation tax
  - Unlikely if excessive inflation (or hyper-inflation) as people try to avoid holding money (see 'Laffer curve' intuition)

Seignorage and inflation tax

- Why use a 'weird' inflation definition?

$$\hat{\pi}_t \equiv \frac{P_t - P_{t-1}}{\mathbf{P_t}} \tag{7}$$

- Fraction of an agent's real balances that is 'confiscated' through a rise in the price level
  - M_{t-1} implicit in m_{t-1} valued in real terms in t as M_{t-1}/P_t
  - Compare M_{t-1}/P_t vs m_{t-1}

$$\frac{M_{t-1}/P_t - m_{t-1}}{m_{t-1}} = -\frac{P_t - P_{t-1}}{P_t}$$

  - $\hat{\pi}_t > 0 \Rightarrow$ initial holdings (of govt. liabilities) declines in real value (note: $\hat{\pi}_t > 0 \Leftrightarrow \pi_t > 0$)
  - Anything that reduces government liabilities by taking from the public can be interpreted as a 'tax'

Seignorage and inflation tax

Seignorage varies across countries

TABLE 1—INFLATION AND SEIGNIORAGE: AVERAGE 1971–1982 (PERCENTAGE)

Country	Inflation	Seigniorage
Australia	10.4	3.0
Austria	6.2	2.7
Belgium	7.5	1.8
Bolivia	30.3	21.6
Botswana	11.4	3.6
Brazil	47.4	17.7
Burma	9.9	15.2
Burundi	12.1	6.4
Cameroon	10.8	5.1
Canada	8.6	3.0
Central African Republic	10.5	20.0
Chad	10.1	9.5
Chile	147.6	17.5
Colombia	22.0	17.1
Congo, Peoples Republic	9.7	4.6
Côte d'Ivoire	11.5	1.1
Denmark	10.0	0.7
Dominican Republic	10.0	6.7
Ecuador	13.2	14.4
El Salvador	11.2	11.4
Ethiopia	9.0	9.6
Finland	11.2	1.6
France	10.1	2.1

- See Cukierman *et al*, AER (2011)
- Can be an alternative to ineffective 'standard' tax collection
- Often associated with (maybe cause of?) political instability