

Lecture 3

Fiscal policy

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This lecture

We just introduced the canonical HANK model.

Now: Focus on fiscal policy!

- Switch off all other shocks: TFP $X_t = 1$, no monetary shock $r_t = r = \text{const}$
- Focus on **first order** shocks to fiscal policy: $d\mathbf{G} = \{dG_t\}$, $d\mathbf{T} = \{dT_t\}$ such that

$$\sum_{t=0}^{\infty} (1+r)^{-t} (dG_t - dT_t) = 0$$

- Alternatively: shock $d\mathbf{B} = \{dB_t\}$, $d\mathbf{G} = \{dG_t\}$, and get $d\mathbf{T}$ from

$$d\mathbf{T} = d\mathbf{G} + ((1+r)\mathbf{L} - \mathbf{I}) d\mathbf{B}$$

where $\mathbf{L}$ is lag operator

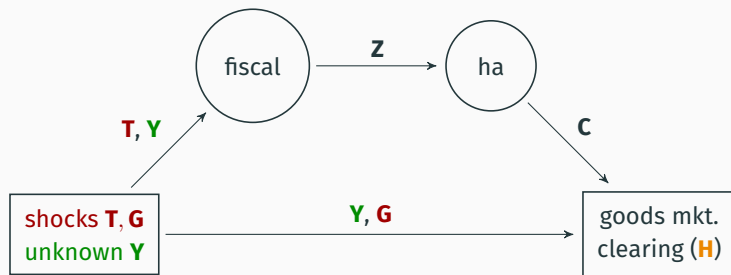
- Main reference for this class is **Auclert et al. (2024)**

- 1 The intertemporal Keynesian cross
- 2 Solving the IKC in our three special cases
- 3 Using iMPCs to discriminate across models
- 4 Sufficient statistics beyond the baseline model
- 5 Fiscal policy in a quantitative environment
- 6 Takeaway

The intertemporal Keynesian cross

DAG for the economy with only fiscal shocks

Switching off monetary shocks, the DAG is simply:



In this case, $\mathbf{H} = 0$ can be written as

$$\mathbf{Y} = \mathbf{G} + \mathcal{C}(\mathbf{Z})$$

To emphasize that $\mathbf{C}$ is a function, write it as $\mathcal{C}$. Here, $\mathcal{C}$ is only a function of $\mathbf{Z}$.

Next: Analyze this equation “by hand”...

The aggregate consumption function

- We call $\mathcal{C}$ the **aggregate consumption function**

$$C_t = \mathcal{C}_t(Z_0, Z_1, Z_2, \dots) = \mathcal{C}_t(\{Z_s\})$$

It's a collection of ∞ many nonlinear functions of ∞ many Z 's!

- It usually also depends on the path of real interest rates, but those are assumed to be constant
- Using the DAG, we can substitute out Z and write goods market clearing as

$$Y_t = G_t + \mathcal{C}_t(\{Y_s - T_s\})$$

$$Y_t = G_t + C_t(\{Y_s - T_s\})$$

- Given shocks $\{dG_t, dT_t\}$, must have

$$dY_t = dG_t + \sum_{s=0}^{\infty} \frac{\partial C_t}{\partial Z_s} \cdot (dY_s - dT_s) \quad (1)$$

→ Response dY_t **entirely** characterized by the **Jacobian** of C function:

$$M_{t,s} \equiv \frac{\partial C_t}{\partial Z_s} \quad \left(= \mathcal{J}_{t,s}^{\mathbf{C}, \mathbf{Z}} \right)$$

We call these **intertemporal MPCs**

- $M_{t,s}$ = how much of an income change at date s is spent at date t
- Note: All income is spent at some point, so $\sum_{t=0}^{\infty} (1+r)^{s-t} M_{t,s} = 1$

The intertemporal Keynesian cross

- Rewrite equation (1) in vector / matrix notation:

$$d\mathbf{Y} = d\mathbf{G} - \mathbf{M}d\mathbf{T} + \mathbf{M}d\mathbf{Y} \quad (2)$$

- This is an **intertemporal Keynesian cross**
 - entire complexity of model is in $\mathbf{M}$
 - with $\mathbf{M}$ from data, could get $d\mathbf{Y}$ without model!
(there is a “correct” $\mathbf{M}$ out there, but it’s very hard to measure...)

Connecting to the standard Keynesian cross...

- Standard IS-LM theory postulates $C_t = \mathcal{C}(Y_t - T_t)$ plus market clearing, so

$$\mathcal{C}(Y_t - T_t) + G_t = Y_t$$

Differentiate around steady state with constant Y, T, G :

$$dY_t = dG_t - mpc \cdot dT_t + mpc \cdot dY_t$$

where $mpc = \mathcal{C}'(Y - T)$. This is the static Keynesian cross.

- The intertemporal Keynesian cross is a vector-valued version of this
- HANK models tend to revive & microfound IS-LM logic

Solving the intertemporal Keynesian cross

- How can we solve (2)? Rewrite as

$$(\mathbf{I} - \mathbf{M}) d\mathbf{Y} = d\mathbf{G} - \mathbf{M}d\mathbf{T} \quad (3)$$

- Standard Keynesian cross solution:

$$dY_t = (1 + mpc + mpc^2 + \dots) (dG_t - mpc \cdot dT_t) = \frac{dG_t - mpc \cdot dT_t}{1 - mpc}$$

Can we do the same, inverting $(\mathbf{I} - \mathbf{M})$? **Not so fast!**

- Why? Multiply both sides of (3) by: $\mathbf{q} \equiv (1, (1+r)^{-1}, (1+r)^{-2}, \dots)'$

$$\mathbf{q}' (\mathbf{I} - \mathbf{M}) d\mathbf{Y} = 0 \qquad \mathbf{q}' d\mathbf{G} - \mathbf{q}' \mathbf{M} d\mathbf{T} = \mathbf{q}' d\mathbf{G} - \mathbf{q}' d\mathbf{T} = 0$$

both left and right hand side have “**zero NPV**” !

- Intuition: present value of mpc is 1, dY is 0/0... What to do?

Solving the intertemporal Keynesian cross in asset space

- Let $\mathbf{K} = -\sum_{t=1}^{\infty} (1+r)^{-t} \mathbf{F}^t$ where $\mathbf{F}$ is the forward operator. Multiplying:

$$\mathbf{K}(\mathbf{I} - \mathbf{M}) d\mathbf{Y} = \mathbf{K}(d\mathbf{G} - \mathbf{M}d\mathbf{T})$$

now, $\mathbf{K}(\mathbf{I} - \mathbf{M})$ may be invertible (!)

Theorem

There exists a unique solution to the IKC for any $d\mathbf{G}, d\mathbf{T}$ satisfying $\mathbf{q}'d\mathbf{G} = \mathbf{q}'d\mathbf{T}$, iff $\mathbf{K}(\mathbf{I} - \mathbf{M})$ is invertible. Then, the solution is:

$$d\mathbf{Y} = \mathcal{M}(d\mathbf{G} - \mathbf{M}d\mathbf{T})$$

where $\mathcal{M} \equiv (\mathbf{K}(\mathbf{I} - \mathbf{M}))^{-1} \mathbf{K}$ is a bounded linear operator (“multiplier”)

Why **K**?

- Why **K**? Recall budget constraint:

$$a_{it} + c_{it} = z_{it} + (1 + r) a_{it-1}$$

Aggregating and defining $A_{ts} = \frac{\partial A_t}{\partial Z_s}$, we have:

$$(\mathbf{I} - (1 + r) \mathbf{L}) \mathbf{A} = \mathbf{I} - \mathbf{M}$$

Now, $\mathbf{K} = -\sum_{t=1}^{\infty} (1 + r)^{-t} \mathbf{F}^t$ is left inverse of $(\mathbf{I} - (1 + r) \mathbf{L})$ so

$$\mathbf{A} = \mathbf{K}(\mathbf{I} - \mathbf{M})$$

- IKC rewrites:

$$\mathbf{A}(d\mathbf{Y} - d\mathbf{T}) = \mathbf{K}(d\mathbf{G} - d\mathbf{T}) = d\mathbf{B} \tag{4}$$

where $\{dB_t\}$ is the path of government debt

- This is the asset market clearing condition!
- Solving in the asset market is also numerically more stable

Winding number test

- We have:

$$\mathbf{A} = \mathbf{K}(\mathbf{I} - \mathbf{M})$$

how do we know when $\mathbf{A}$ is invertible?

1. Analytical models: $\mathbf{A}$ has closed form solution, can check directly
2. Quantitative models: $\mathbf{A}$ has “quasi-Toeplitz” structure

$$A_{t,s} \xrightarrow[t,s \rightarrow \infty]{} a_{t-s}$$

- (Generic) invertibility iff “winding number” of $a(z) = \sum_{j=-\infty}^{\infty} a_j z^j$ is zero
- This is sequence-space equivalent of Blanchard-Kahn condition
 - For recursive (Toeplitz) models see [Onatski \(2006\)](#)
 - For stationary het. agent (quasi-Toeplitz) models see [Auclert et al. \(2023\)](#)

The balanced budget multiplier

- Suppose $d\mathbf{G} = d\mathbf{T}$ (balanced budget) and $\text{wind}(\mathbf{K}(\mathbf{I} - \mathbf{M})) = 0$ (determinacy)
- **Result:** We always have $d\mathbf{Y} = d\mathbf{G}$!
- Irrespective of **all** household heterogeneity, holds for any path of spending
- IS-LM antecedents: Gelting (1941), Haavelmo (1945)
- Proof is trivial: $d\mathbf{Y} = d\mathbf{G}$ is unique solution to

$$d\mathbf{Y} = (\mathbf{I} - \mathbf{M}) \cdot d\mathbf{G} + \mathbf{M} \cdot d\mathbf{Y}$$

Deficit financed fiscal policy

- With deficit financing $d\mathbf{G} \neq d\mathbf{T}$ we have

$$d\mathbf{Y} = d\mathbf{G} + \underbrace{\mathcal{M} \cdot \mathbf{M} \cdot (d\mathbf{G} - d\mathbf{T})}_{d\mathbf{C}} \quad (5)$$

Consumption $d\mathbf{C}$ depends on **primary deficits** $d\mathbf{G} - d\mathbf{T}$

- Interaction term: Deficits matter precisely when $\mathbf{M}$ is “large” (in practice “large” will mean very different from RA model)
- **Next:** Go over three examples and then compare multipliers to full HA model
- Define:
 - initial multiplier: dY_0/dG_0
 - cumulative multiplier: $\frac{\sum (1+r)^{-t} dY_t}{\sum (1+r)^{-t} dG_t}$

Solving the IKC in our three special cases

Representative-agent model

Let's get an intuition for all this in the RA model. Last lecture we derived consumption function for RA model when $\beta(1+r) = 1$

$$C_t = (1 - \beta) \sum_{s \geq 0} \beta^s Z_s + r a_{-1}$$

In particular

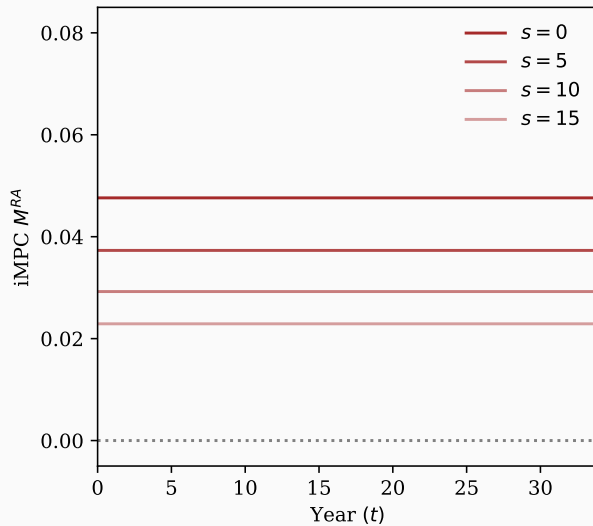
$$M_{t,s} = \frac{\partial C_t}{\partial Z_s} = (1 - \beta) \beta^s$$

Thus iMPC matrix is given by

$$\mathbf{M}^{RA} = \begin{pmatrix} 1 - \beta & (1 - \beta)\beta & (1 - \beta)\beta^2 & \dots \\ 1 - \beta & (1 - \beta)\beta & (1 - \beta)\beta^2 & \dots \\ 1 - \beta & (1 - \beta)\beta & (1 - \beta)\beta^2 & \dots \\ \vdots & \vdots & \vdots & \ddots \end{pmatrix} = \frac{\mathbf{1}\mathbf{q}'}{\mathbf{1}'\mathbf{q}}$$

Easy to verify that $\mathbf{q}'\mathbf{M} = \mathbf{q}'$, and also that $\mathbf{M}\mathbf{w} = \mathbf{0}$ for any zero NPV $\mathbf{w}$

Representative-agent model



Fiscal policy in the RA model

- Let's solve the IKC for the RA model
- Calculate:

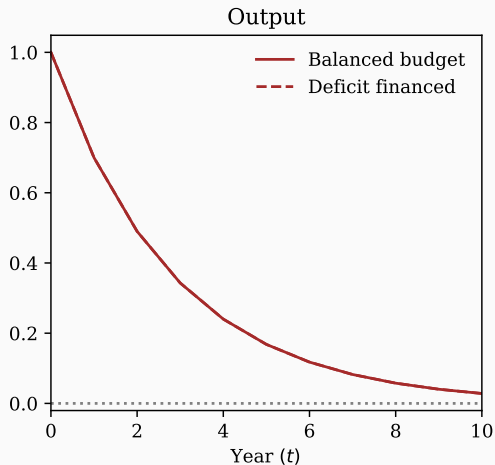
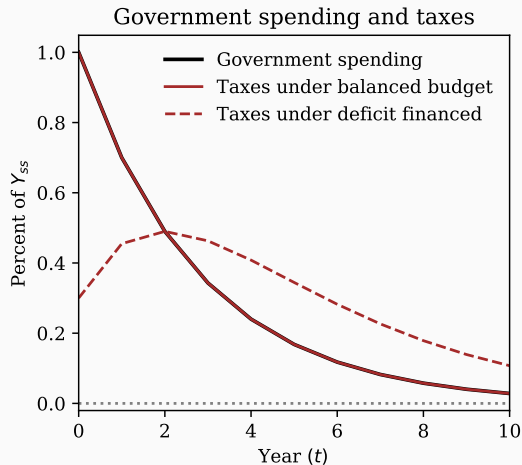
$$\begin{aligned}d\mathbf{C} &= \mathcal{M} \cdot \mathbf{M} \cdot (d\mathbf{G} - d\mathbf{T}) \\ &= \mathcal{M} \cdot (1 - \beta) \mathbf{1}\mathbf{q}' (d\mathbf{G} - d\mathbf{T})\end{aligned}$$

But government budget balance implies $\mathbf{q}' (d\mathbf{G} - d\mathbf{T}) = 0$! So:

$$d\mathbf{Y} = d\mathbf{G}$$

- Can prove this directly, too (eg **Woodford 2011**).
- **Deficits are irrelevant in RA!**

Impulse response to dG shock in RA model



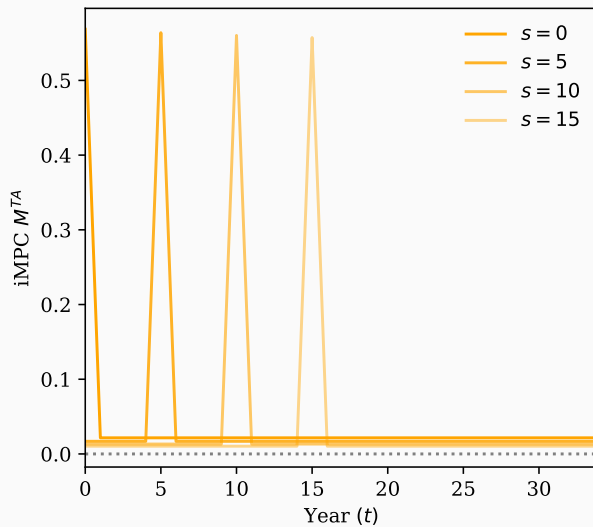
Two agent model

- $1 - \mu$ share of agents behave like RA agent, μ are hand to mouth
 $\Rightarrow \mathbf{M}$ matrix is simple linear combination

$$\mathbf{M}^{TA} = (1 - \mu)\mathbf{M}^{RA} + \mu\mathbf{I}$$

- Issue: Only strong **contemporaneous** spending effect

iMPCs in TA model



Fiscal policy in TA model

- In Keynesian cross:

$$\left(\mathbf{I} - \mathbf{M}^{TA}\right) d\mathbf{Y} = d\mathbf{G} - \mathbf{M}^{TA}d\mathbf{T} \quad \Leftrightarrow \quad \left(\mathbf{I} - \mathbf{M}^{RA}\right) d\mathbf{Y} = \frac{1}{1 - \mu} [d\mathbf{G} - \mu d\mathbf{T}] - \mathbf{M}^{RA}d\mathbf{T}$$

This equation has same shape as for RA, hence:

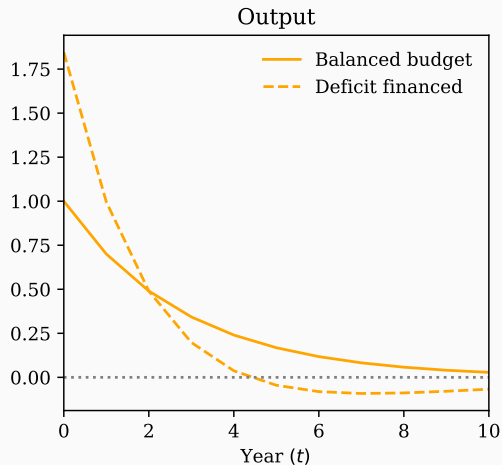
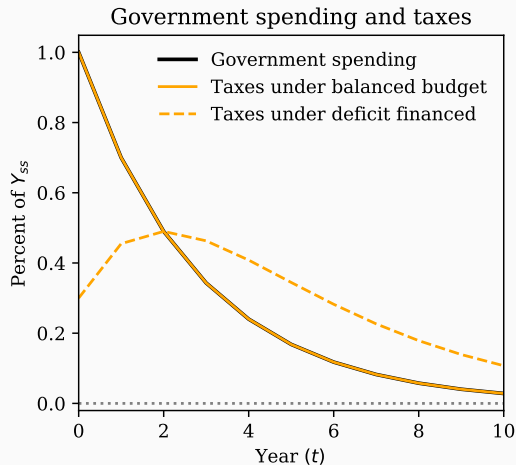
$$d\mathbf{Y} = \frac{1}{1 - \mu} [d\mathbf{G} - \mu d\mathbf{T}]$$

- cf classic Keynesian cross: spending multiplier $1/(1 - \mu)$ and transfer multiplier $\mu/(1 - \mu)$. So: μ is “effective” MPC, ignoring RA
- Can also write:

$$d\mathbf{Y} = d\mathbf{G} + \frac{\mu}{1 - \mu} \underbrace{[d\mathbf{G} - d\mathbf{T}]}_{\text{primary deficit}}$$

- Only **current** deficit matters. Initial multiplier can be large $\in [1, \frac{1}{1-\mu}]$, but cumulative multiplier is always equal to 1!

Impulse response to dG shock in TA model



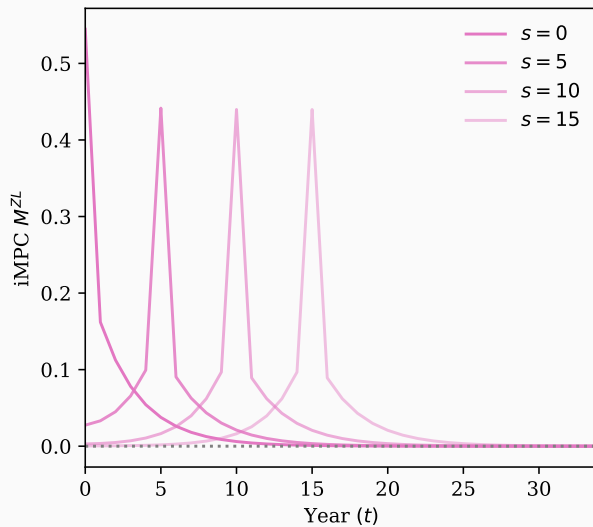
Zero-liquidity model

- What about iMPCs in the ZL model?
- We can calculate (see IKC paper)

$$M_{t0}^{ZL} = \mu 1_{t=0} + (1 - \mu) \left(1 - \frac{\lambda}{1 + r} \right) \cdot \lambda^t$$

$$M_{0s}^{ZL} = (1 - \mu) \frac{1 - \beta\lambda}{\beta(1 + r)} \cdot (\beta\lambda)^s$$

- Intuitively, it's a mix of a “constrained agent” with mass μ and agents that spend down assets at constant rate λ
 - Latter are also the iMPCs of a bond-in-utility model (and an OLG model!)
- Note, given known M_{00} and M_{10} , can solve for μ and λ



Fiscal policy in ZL model

- Can solve above model explicitly

$$dY_t = \underbrace{\frac{1}{1-\mu} [dG_t - \mu dT_t]}_{\text{as in TA model}} + \underbrace{\frac{\beta(1+r)-1}{1-\mu} dB_t + (1+r) \frac{1-\beta\lambda}{1-\mu} \left(\frac{1}{\lambda} - 1\right) \sum_{s=0}^{\infty} dB_{t+s}}_{\text{new terms}}$$

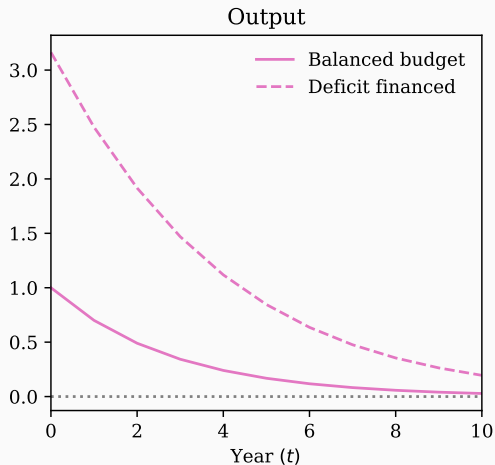
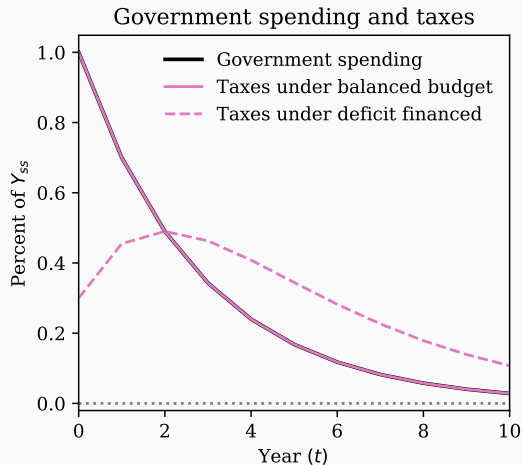
Future fiscal policy extremely powerful here.

- Why? Dynamic income-consumption feedback from “spending down” effect
- In particular, can show:

Theorem

Holding β , r , and M_{00} fixed in the ZL model, a higher M_{10} increases the cumulative multiplier whenever $d\mathbf{B} \geq 0$ and $dB_t > 0$ for some t .

Impulse response to dG shock in ZL model



Using iMPCs to discriminate across models

Nested models of households

Household i solves:

$$\max \mathbb{E} \left[\sum_{t \geq 0} \beta^t \{ u(c_{it}) - v(n_{it}) \} \right]$$

$$c_{it} + a_{it} = z_{it} + (1 + r)a_{it-1}$$

- **RA**: no risk in e (or complete markets)
- **TA**: share μ of agents with $c_{it} = z_{it}$
- **HA-one**: one account model, constraint $a_{it} \geq 0$

Nested models of households

Household i solves:

$$\max \mathbb{E} \left[\sum_{t \geq 0} \beta^t \{ u(c_{it}) - v(n_{it}) \} \right]$$

$$c_{it} + a_{it}^{liq} = z_{it} + (1+r)(1-\zeta)a_{it-1}^{liq} - d_{it} \cdot \mathbf{1}_{\{adj_{it}=1\}}$$

$$a_{it}^{illiq} = (1+r)a_{it-1}^{illiq} + d_{it} \cdot \mathbf{1}_{\{adj_{it}=1\}}$$

- **RA**: no risk in e (or complete markets)
- **TA**: share μ of agents with $c_{it} = z_{it}$
- **HA-one**: one account model, constraint $a_{it} \geq 0$
- **HA-two**: two account model w. $\Pr(\mathbf{1}_{\{adj_{it}=1\}}) = \nu < 1, \zeta > 0, a_{it}^{illiq} \geq 0, a_{it}^{liq} \geq 0$

Nested models of households

Household i solves:

$$\max \mathbb{E} \left[\sum_{t \geq 0} \beta^t \{u(c_{it}) - v(n_{it}) + \chi(a_{it})\} \right]$$

$$c_{it} + a_{it} = z_{it} + (1 + r)a_{it-1}$$

- **RA**: no risk in e (or complete markets)
- **TA**: share μ of agents with $c_{it} = z_{it}$
- **HA-one**: one account model, constraint $a_{it} \geq 0$
- **HA-two**: two account model w. $\Pr(1_{\{adj_{it}=1\}}) = \nu < 1, \zeta > 0, a_{it}^{illiq} \geq 0, a_{it}^{liq} \geq 0$
- **BU/WU**: no risk in e , extra additive term $\chi(a_{it})$ in utility

Measuring aggregate iMPCs using individual iMPCs

- Object of interest: **(aggregate) iMPCs**

$$M_{t,s} = \frac{\partial C_t}{\partial Z_s}$$

where $C_t = \int c_{it} di$ and $Z_s = \int z_{is} di$

- Direct evidence on $M_{t,s}$ is hard to come by for general s
- More work on column $s = 0$ (unanticipated income shock)
 - Can write

$$M_{t,0} = \int \underbrace{\frac{z_{i0}}{Z_0}}_{\text{income weight}} \cdot \underbrace{\frac{\partial c_{it}}{\partial z_{i0}}}_{\text{individual iMPC}} di$$

→ aggregate iMPCs are **weighted individual iMPCs**

Obtain date-o iMPCs from cross-sectional microdata

- Two sources of evidence on $\frac{\partial \mathbb{E}_o[c_{it}]}{\partial z_{io}}$:

1. Fagereng Holm Natvik (2021) measure in Norwegian data

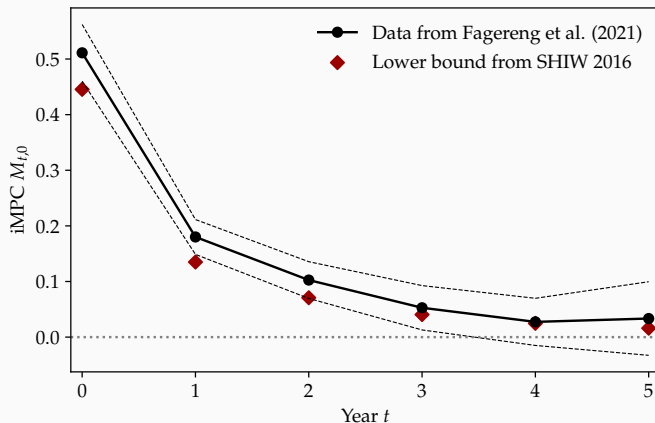
$$c_{it+k} = \alpha_i + \tau_{t+k} + \gamma_k \text{lottery}_{it} + \delta X_{it} + \epsilon_{it}$$

- Weighting by income in year of lottery receipt $\Rightarrow M_{t,o}$

2. Italian survey data (SHIW 2016) on $\frac{\partial c_{io}}{\partial z_{io}}$

- Lower bound for $M_{t,o}$ using distribution of MPCs
- Example: income-weighted average of $(1 - MPC_i)MPC_i \Rightarrow$ lower bound for $M_{1,o}$

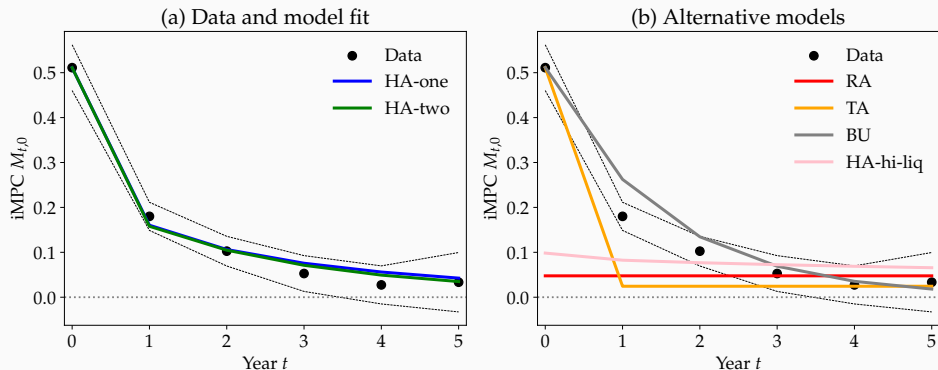
iMPCs in the data: first column $M_{t,0}$



- Annual $M_{0,0}$ consistent with evidence from other sources

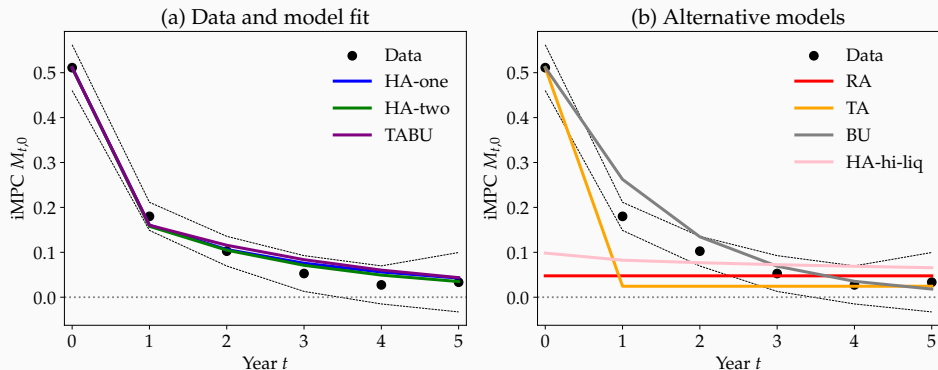
- Models with standard calibration $r = 5\%$, $EIS = 1$, $A/Y = 4.1$ [Kaplan-Violante]
 - **RA**, calibrated to $r = 5\%$
 - **HA-hi-liq**: one-account HA, calibrated to $\frac{A}{Y}$
- Models with one free parameter, calibrated to match $M_{0,0}$
 - **TA**: adjusting share of hand-to-mouth μ
 - **BU**: adjusting curvature $\chi''(A)$
 - **HA-one**: adjusting level of assets A
 - **HA-two**: adjusting Calvo freq of adjustment ν

iMPCs across models



- Useful discrimination device! Rule in HA-one and HA-two, out others
- Can a tractable model fit too?

iMPCs across models including TABU

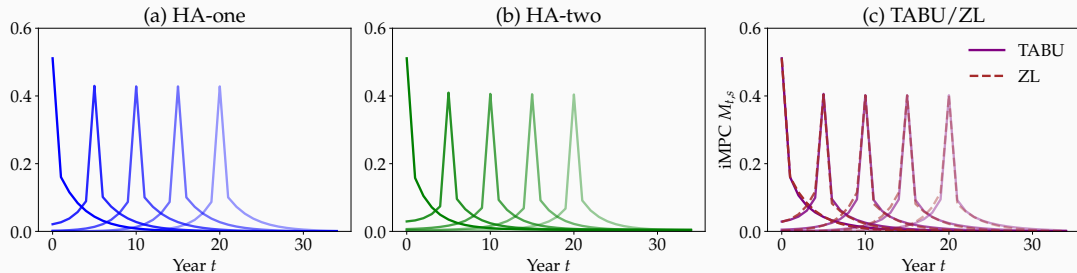


- Yes! **TABU** provides another great fit (parameterize with $M_{0,0}$ and $M_{1,0}$)
- Why? TABU has same first column as zero liquidity model (vs **HA-one** ~ 0)

What about non-date-o iMPCs?

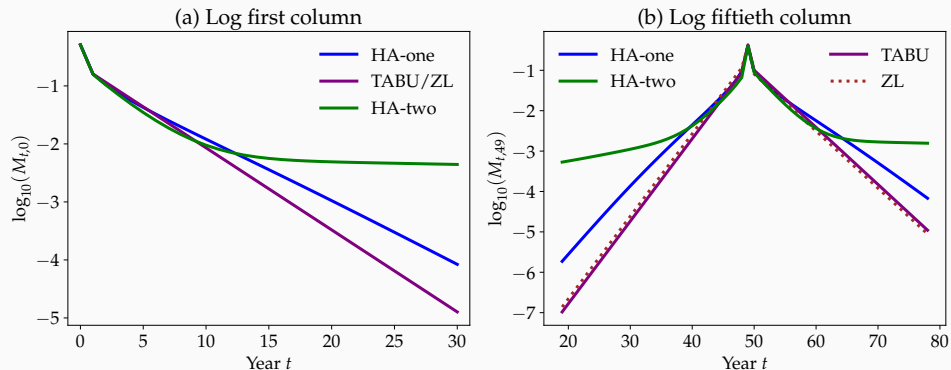
- Existing evidence useful for response to date-o income shocks, $\{M_{t,o}\}$
 - What about response to future shocks?
- rely on calibrated models fitting iMPCs to fill in the blanks

Response to other income shocks



- Reassuring: all models that fit first column imply similar later columns

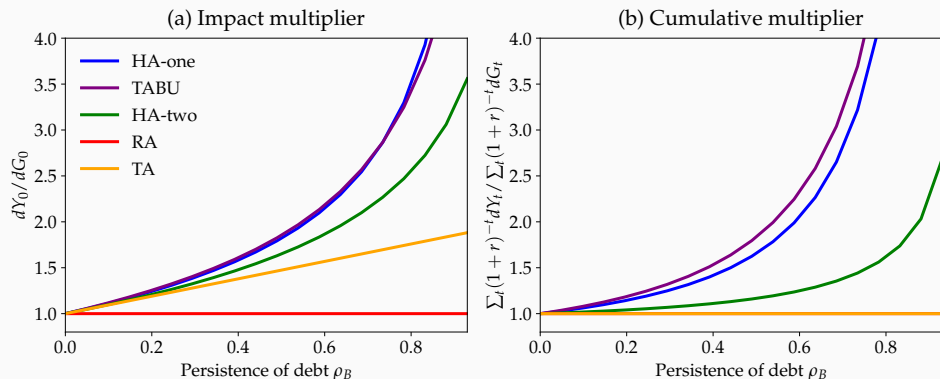
Zooming in



- Zooming in, some subtle differences appear...
- This will turn out to matter quantitatively (though not qualitatively)

Simulate model responses for more general shocks

- Parametrize: $dG_t = \rho_G dG_{t-1}$ and $dB_t = \rho_B (dB_{t-1} + dG_t)$, vary ρ_B [with $\rho_G = 0.76$]



- Data-consistent iMPCs $\Rightarrow$ cumulative multipliers above 1, rise with ρ_B
- HA-two multipliers below HA-one $\sim$ TABU (long-term savers more ricardian)

Sufficient statistics beyond the baseline model

Broader models

- In broader models, IKC no longer enough to characterize equilibrium
- But if heterogeneity is all at household level, still 3 sufficient statistics:

$$d\mathbf{C} = \mathbf{M}d\mathbf{Z} + \mathbf{m}^{cap}d\text{cap} + \mathbf{M}^r d\mathbf{r}$$

- $\mathbf{m}^{cap}$ is response of C to capital gains, $\mathbf{M}^r$ to interest rate changes
- Some data on former, not much on latter! Yet we prove: [cf Werning, 2015]

Theorem

For RA, TA, HA-one, and HA-two, if $EIS = 1$ and equal initial portfolio shares:

$$\mathbf{M}^r = -C \left(\mathbf{I} - \left(1 - \frac{rA}{C} \right) \mathbf{M} \right) \mathbf{U} + (1+r)A \mathbf{m}^{cap} \mathbf{1}'$$

where $\mathbf{U}$ the matrix with ones on and above the diagonal

- iMPCs still sufficient statistics, provided you include capital gains!

Fiscal policy in a quantitative environment

- **Government:**

- still has spending shock $dG_t = \rho_G dG_{t-1}$ and fiscal rule $dB_t = \rho_B (dB_{t-1} + dG_t)$
- now follows Taylor rule $i_t = r + \phi \pi_t$, $\phi > 1$

- **Supply side:**

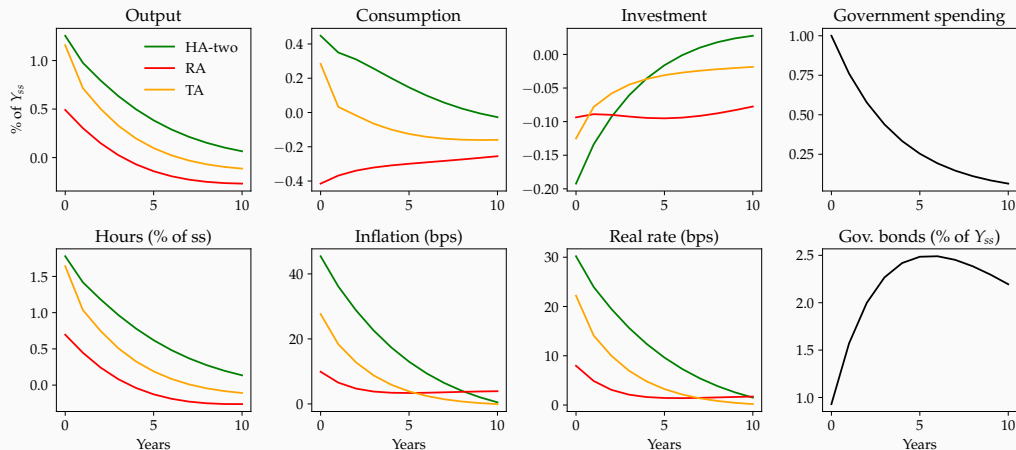
- Cobb-Douglas production, $Y_t = K_t^\alpha N_t^{1-\alpha}$
- K_t subject to quadratic capital adjustment costs
- sticky prices à la Calvo, $\pi_t = \kappa^P m c_t + \frac{1}{1+r_t} \pi_{t+1}$

- **Two reasons for lower multipliers** relative to IKC environment:

- distortionary taxation & crowding-out of consumption and investment via r

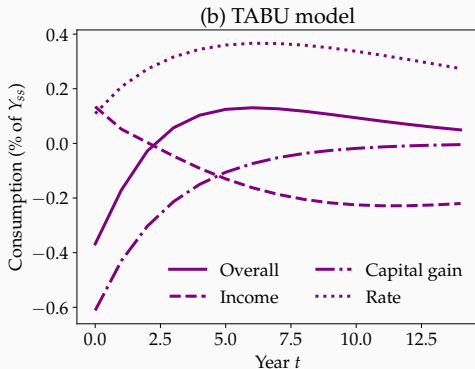
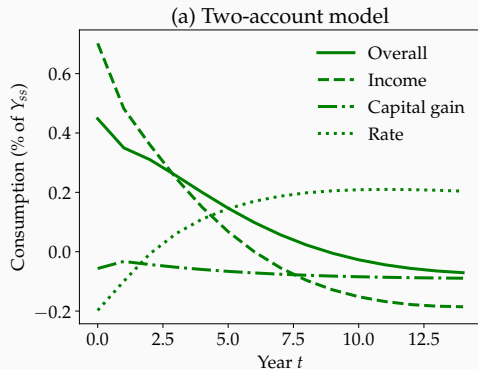
Sizable output response to deficit-financed G in HA-two

► Other



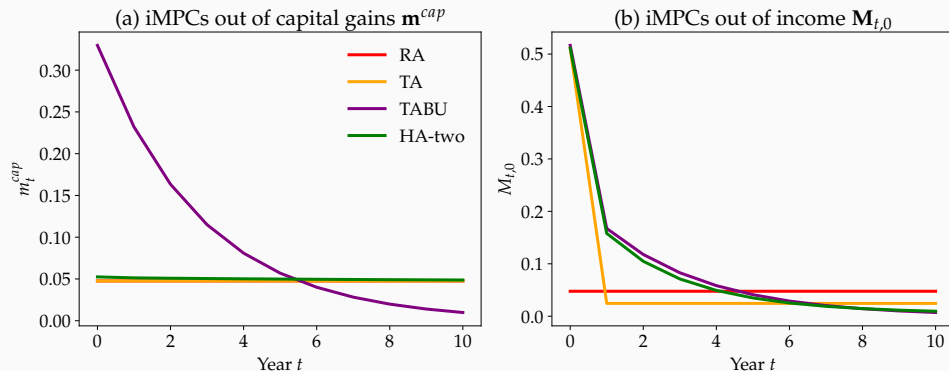
Calibration: $\rho_G = 0.76$, $\kappa^W = 0.03$, $\kappa^P = 0.23$, $\phi = 1.5$; vary ρ_B in $dB_t = \rho_B (dB_{t-1} + dG_t)$

Output response shaped by iMPCs from income and capital gains



Calibration: $\rho_G = 0.76$, $\rho_G = 0.93$, $\kappa^W = 0.03$, $\kappa^P = 0.23$, $\phi = 1.5$

Tractable models calibrated to income MPCs imply implausibly large m^{cap} !



- Empirical evidence suggests MPC out of capital gains small, $\sim$ RA
[di Maggio, Kermani and Majlesi 2018, Chodorow-Reich-Nenov-Simsek 2021, ...]

Summary: TA, HA-two have large **initial** deficit-financed multipliers

► graph

Initial multipliers $\frac{dY_0}{dG_0}$

Fiscal rule	Model	RA	TA	TABU	HA-one	HA-two
bal. budget	IKC	1.0	1.0	1.0	1.0	1.0
	quantitative	0.5	0.4	0.3	—	0.5
deficit-financed	IKC	1.0	1.9	5.6	6.9	3.6
	quantitative	0.5	1.2	0.4	—	1.3

Calibration: $\rho_G = 0.76$, $\kappa^W = 0.03$, $\kappa^P = 0.23$, $\phi = 1.5$

... but only HA-two has large **cumulative** multipliers in quantitative model

$$\text{Cumulative multipliers } \frac{\sum_t (1+r)^{-t} dY_t}{\sum_t (1+r)^{-t} dG_t}$$

Fiscal rule	Model	RA	TA	TABU	HA-one	HA-two
bal. budget	IKC	1.0	1.0	1.0	1.0	1.0
	quantitative	0.4	0.3	0.2	—	0.4
deficit-financed	IKC	1.0	1.0	15.5	16.6	2.7
	quantitative	-0.4	0.5	0.8	—	1.3

Calibration: $\rho_G = 0.76$, $\kappa^W = 0.03$, $\kappa^P = 0.23$, $\phi = 1.5$

Takeaway

- Fiscal policy in HANK is very different from RANK and TANK
- Why? Large **off-diagonal IMPCs**: households spend down past savings
- Consequence: deficit financing has persistent effects on output
 - Both initial **and** cumulative fiscal multipliers are large
- Let's see this in action in the tutorial!

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