OPTIMAL MACROECONOMIC POLICIES IN A HETEROGENEOUS WORLD

James Bullard
Purdue University

Riccardo DiCecio
Federal Reserve Bank of St. Louis

Aarti Singh
University of Sydney

Jacek Suda
Narodowy Bank Polski (NBP)

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Mitchell E. Daniels, Jr.
School of Business

A benchmark model

- We study a simple (paper-and-pencil solution) benchmark DSGE heterogeneous-agent life-cycle model.

- The equilibrium features Gini coefficients approaching those in the U.S. data.

- The model features three aggregate shocks as well as permanent and temporary idiosyncratic risk. The permanent idiosyncratic risk is Huggett-Ventura-Yaron-style.

- Macroeconomic policymakers in the model have tools to counter the frictions in the economy. The monetary friction is Doepke-Schneider nominal contracting.

- A welfare theorem states the sense in which these policies can achieve an optimal allocation of resources.

Model-recommended macro policies

- The model equilibrium recommends a "four horsemen" macroeconomic monetary-fiscal policy mix.

- The *monetary authority* should react to aggregate shocks each period and strive to achieve the "Wicksellian natural real rate of interest." Same as NK model.

- The *treasury authority* should issue nominal debt and roll it over at the current nominal interest rate in perpetuity.

- The *labor market authority* should run an unemployment insurance program.

- The *fiscal authority* should use a redistributive tax-transfer scheme to lower the consumption Gini coefficient.

A mapping to actual macro policies?

- These model-recommended macroeconomic policies seem to correspond, broadly speaking, to actual macroeconomic policies in place in many economies around the world today, including the U.S.

- By itself, this finding suggests that current observed macroeconomic policy is, broadly speaking, close to optimal in many countries.

- But does the model fit to the U.S. macro data? Yes!

A calibrated case

- We consider a calibration of the model using U.S. data from 1995 to 2023.
    - We assume that actual observed U.S. macroeconomic policy during this period has essentially been an implementation of the optimal macroeconomic policies recommended by the model.
- We compare the calibrated model equilibrium to the data on key dimensions.
- We argue that the fit to the data is generally good.
- This suggests that actual U.S. macro policy has been close to optimal during this period.
- The model fits less well during periods of very large shocks, such as the GFC or the onset of the pandemic.

The monetary authority

■ The monetary authority controls the price level directly and implements a *targeting criterion*

$$P\left(t\right) = \frac{R^{n}\left(t-1,t\right)}{\delta\left(t-1,t\right)\lambda\left(t-1,t\right)\nu\left(t-1,t\right)}P\left(t-1\right).$$
(1)

■ This targeting criterion calls for countercyclical price level movements relative to the expectation embodied in the contract rate $R^{n}\left(t-1,t\right)$.

■ See Koenig (*IJCB*, 2013) and Sheedy (*BPEA*, 2014) on NGDP targeting.

■ As in Giannoni and Woodford (2004), this targeting criterion can be implemented in a wide variety of ways.

■ The question for this paper: Has actual U.S. monetary policy since 1995 effectively implemented this targeting criterion? The data says yes.

Aggregate consumption growth

- The model is characterized by explicit stochastic growth—no detrending.
- The model equilibrium under the optimal monetary-fiscal policy mix states that real output growth will be perfectly correlated with real aggregate consumption growth, and their nominal counterparts will be similarly correlated.
- In the data, it is not clear what the real-world counterpart is to "output" since the model does not have an international sector or other important dimensions (e.g., inventories and a "large" government sector).
- Accordingly, we consider a variety of output measures.
- Bottom line: The correlations are close to one.
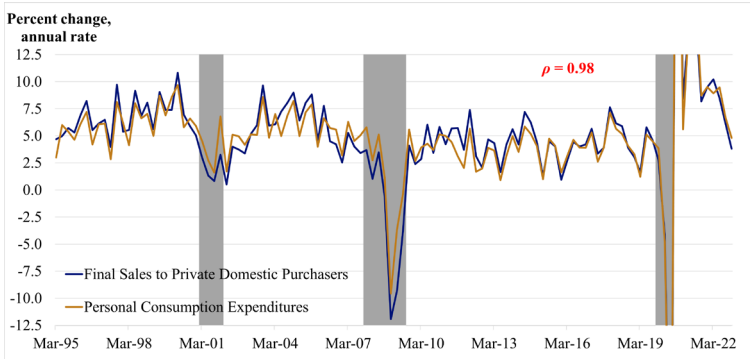
Aggregate consumption growth

Figure: The model equilibrium under the optimal policy mix suggests that the nominal output growth rate and the nominal aggregate consumption growth rate should be equal. This chart shows one measure of nominal output growth and one measure of nominal consumption growth, and the raw correlation is 0.98.

Consumption growth across households

- The model also predicts that under the optimal monetary-fiscal policy mix, consumption growth rates for all households—rich and poor, relatively young and relatively old—will be equalized.

- To address this, we consider weekly data from January 2020 to March 2023 on credit card expenditure by zip code, with median income in the various zip codes distinguishing between rich and poor.

- The spending growth week-by-week in the lowest income quartile of zip codes is highly correlated with spending growth week-by-week in the highest income quartile, consistent with the model equilibrium.
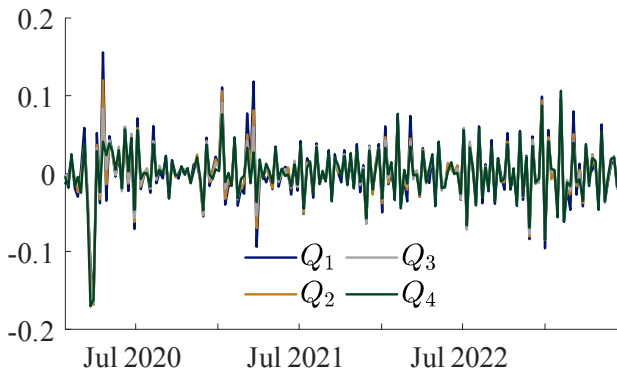
Consumption growth across households

Figure: Credit card spending by income group, weekly, January 2020 to March 2023. The model equilibrium predicts that nominal spending growth rates across society should be equalized. The correlation in consumption growth between the groups is indeed very high, as predicted by the model.

Consumption growth across households

Correlations in growth rates
Household zip code income distribution

	Q_1	Q_2	Q_3	Q_4
Q_1	1.000	0.980	0.957	0.901
Q_2	—	1.000	0.984	0.940
Q_3	—	—	1.000	0.972
Q_4	—	—	—	1.000

Table: Correlation in consumption growth rates across the household zip code income distribution, January 2020 to March 2023, as measured by credit card expenditure indexed to the home address of the credit card. The correlations between the richest and poorest quartiles are high, close to the model prediction of 1.0.

Carneiro-Heckman-type
labor supply

- Carneiro and Heckman (discussion paper, 2003, p. 67): "Estimated intertemporal labor supply elasticities are small, and welfare effects from labor supply adjustment are negligible."

    - See also Ljungqvist and Sargent (unpublished manuscript, 2014).

- Labor supply in this model does not depend on real wages or other income, providing *prima facie* evidence that the model will match the micro-labor evidence.

Marginal propensities to consume

- Hand-to-mouth implies that agents consume only out of labor income each period and do not use asset markets.
- In the model equilibrium, life-cycle agents will sometimes consume only out of labor income, in particular when they are asset-poor and again when they are asset-rich.
- There will be a wide variety of MPCs in this economy, as in the U.S. data.
- The MPCs *per se* are not the key input into the success of the optimal monetary-fiscal policy mix.

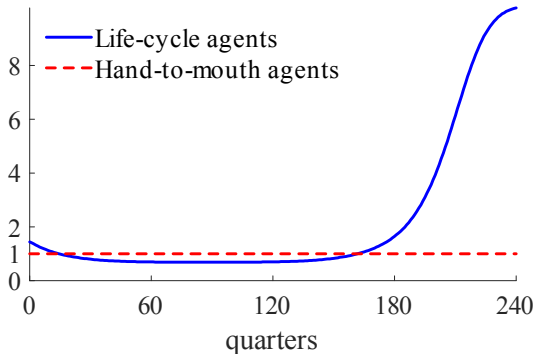# Marginal propensities to consume

Figure: A cross-section diagram of marginal propensities to consume out of labor earnings at each date in the model equilibrium. Relatively young (asset poor) and older (asset rich) life-cycle agents have an MPC larger than one. The MPC of life-cycle agents during the middle of life is 0.69.

Tax progressivity and Gini coefficients

	Model 1	**Model 2**	**U.S. data**
σ_{lc}	1.42	0.52	–
$A/(4Y)$	3.79	3.79	4.52
G_W	0.78	0.55	0.78
G_Y	0.71	0.41	0.63
G_C	0.69	0.32	0.32

Table: Gini coefficients in the model equilibrium with no progressive taxation (Model 1) and sufficient within-cohort scaling variance to match the wealth Gini in the U.S. data, and with progressive taxation (Model 2), which lowers the within-cohort scaling variance sufficiently to match the observed consumption Gini in the U.S. data.

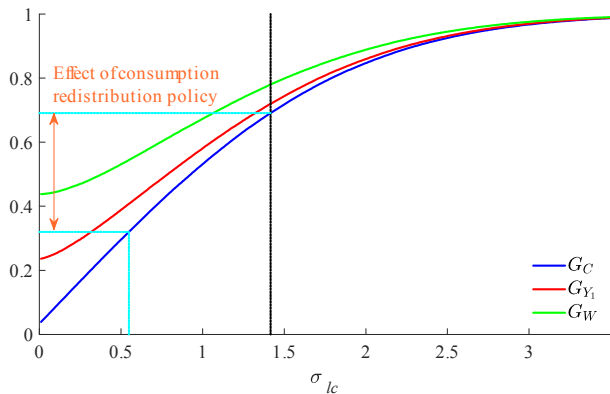# Tax progressivity and Gini coefficients

Figure: The consumption, income and financial wealth Gini coefficients in the model equilibrium for values of $\sigma_{lc} \geq 0$. The progressive tax is lowering the consumption Gini from 0.69 to 0.32, matching the U.S. data, but missing other Ginis.

Nominal returns to asset holding

- The model equilibrium states that nominal consumption growth will be equal to the nominal rate of return on asset holding.
- There are three assets in the model (MBS, federal government debt and corporate debt), but these assets are not further differentiated.
- We consider the seven-year high-quality corporate bond as a measure of the return to capital.
- The equilibrium condition is met on this metric, except during periods of extreme market turmoil.
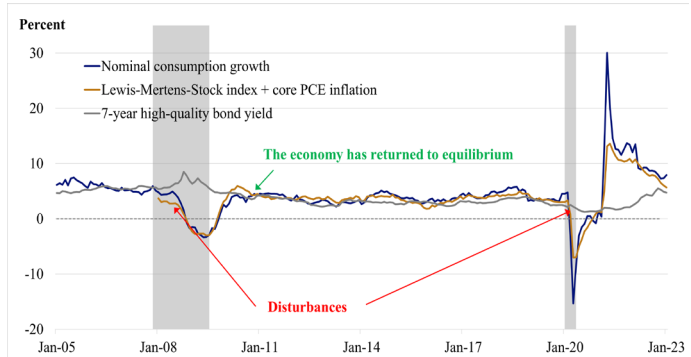
Nominal returns

Figure: The model with optimal policy predicts the gray line will coincide with nominal consumption growth and nominal GDP growth. This prediction broadly holds in the figure outside of the two large disturbances.

A benchmark model

- We studied a benchmark DSGE model with "massive" heterogeneity.
- The model recommends a set of macroeconomic policies which, if jointly implemented, can achieve a first-best allocation of resources.
- The recommended macroeconomic policies resemble those in place in the U.S. and other countries in recent decades.
- The calibration to U.S. data suggests that the model equilibrium assuming the optimal monetary-fiscal macroeconomic policies are in place fits the data relatively well, except for periods of exceptionally high volatility.
- The recommended macroeconomic policies seem unlikely to substitute for one another—all policies have to be working together simultaneously.
- The monetary policy portion of the optimal macroeconomic policy mix can be thought of as a version of nominal GDP targeting.