Optimal Monetary Policy for the Masses

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Introduction

Inequality and monetary policy

- Interest in income, financial wealth and consumption inequality has increased in the last decade.
- Can monetary policy be conducted in a way that benefits all households even in a world of substantial heterogeneity?
- The answer in this paper is "yes."

Optimal monetary policy

- We construct a stylized economy with considerable wealth, income and consumption inequality.
- The role of monetary policy in this model is to make sure private credit markets are working correctly (i.e., complete).
- Optimal monetary policy in this model looks like "nominal GDP targeting"—that is, countercyclical price-level movements.
- This result continues to hold even when there is "massive" heterogeneity—enough heterogeneity to approximate income, financial wealth and consumption inequality in the U.S.
- Hence, *the main result is that nominal GDP targeting constitutes "optimal monetary policy for the masses" in this environment.*

Some recent literature

- Kaplan, Moll and Violante (*AER*, 2018):
  - NK model with heterogeneous households (HANK); reasonable Gini coefficients.
  - The monetary policy transmission mechanism is substantially altered relative to the representative agent model (RANK).
- Bhandari, Evans, Golosov and Sargent (Working paper, NBER, 2018):
  - Incomplete markets, nominal friction, heterogeneous households (HAIM); reasonable Gini coefficients.
  - Optimal monetary-fiscal policy (Ramsey) substantially altered relative to the standard model.

Additional recent literature

- Bullard and DiCecio (Working paper, St. Louis Fed, 2019):
  - Incomplete markets, nominal friction, heterogeneous households (HAIM); reasonable Gini coefficients.
  - Optimal monetary policy repairs the distortion caused by the friction for all households.
- See also the conference on "Monetary Policy and the Distribution of Income and Wealth," held at the St. Louis Fed on Sept. 11-12, 2015. See the program.

Environment

Life-cycle models

- General-equilibrium life-cycle economy.
  - Each period, a new cohort of households enters the economy, makes economic decisions over the next 241 periods, then exits the economy. The model is therefore "quarterly."
  - Households have log preferences defined over consumption and leisure.
  - Households are randomly assigned one of many possible personal productivity profiles when they enter the model.
  - The profile is symmetric—it begins low, rises and peaks exactly in the middle of life, then declines back to the low level.
  - Productivity units determine the value of an hour worked in a competitive labor market.
  - The production technology is linear. The economy grows over time at a stochastic rate.
  - There is no population growth in this version.
  - We ignore the effective lower bound in this version; see Azariadis et al. (*JEDC*, 2019).

Household credit

- The overlapping-generations structure creates a large private credit market essential to good macroeconomic performance.
- Relatively young households want to borrow to move consumption forward in the life cycle, while middle-aged households wish to save for retirement. So households in the middle of life lend to the relatively young.
- The key variable is therefore *privately issued* household debt. Household debt outstanding in the U.S. is on the order of GDP, around $20 trillion.
- As practical motivation, think of privately issued debt = "mortgage-backed securities."

Non-state contingent nominal contracting

- There is a friction in the credit market: Non-state contingent nominal contracting (NSCNC).
- There are two aspects to this friction:
  - The non-state contingent aspect means that real resources are misallocated via this friction.
  - The nominal aspect means that the monetary authority may be able to fix the distortion to the equilibrium through appropriate monetary policy.

Timing protocol

Period t

Nature	Policymaker	Households
growth rate of aggregate productivity $\Longrightarrow$ real wage	price level	labor/leisure consumption/saving

The equilibrium monetary policy creates

- The monetary policymaker follows a nominal GDP targeting rule that delivers complete-markets consumption allocations—similar to Koenig (*IJCB*, 2013) and Sheedy (*BPEA*, 2014).
- Given this policy rule, households consume equal amounts of available production conditional on their productivity; this is called "*equity share contracting*," and it is optimal under homothetic preferences.
- The nominal GDP targeting rule works because it provides a form of insurance for all households against future aggregate shocks.
- Income, consumption and asset holdings fluctuate from period to period but in proportion to the value of the real wage.
- All households experience the same stochastic consumption growth rate.

The Wicksellian natural real rate of interest

- The equilibrium we study has the following property:
  - *The real interest rate is exactly equal to the output growth rate at every date, even in the stochastic economy.*
- One could think of this as "the Wicksellian natural real rate of interest."
- The proper conduct of monetary policy could be thought of as restoring this Wicksellian real rate, which also characterizes optimal monetary policy in the baseline New Keynesian model.

Life-Cycle Productivity

Life-cycle productivity profiles

- Households entering the economy draw a scaling factor from a uniform distribution and receive a scaled version of the baseline life-cycle productivity profile.
- This process is a stand-in for the human capital development that takes place before age 20 in actual economies, including parenting, schooling and any pre-age 20 job experience.
- Huggett, Ventura and Yaron (*AER*, 2011) argue that differences in initial conditions are more important than subsequent shocks in explaining lifetime income differences.
- Accordingly, to keep the model simple, we assume that shocks to productivity occurring after age 20 are handled by an unmodeled insurance market, which might be thought of as "unemployment insurance."
- We also consider a lognormal distribution for the scaling factor, creating an economy with arbitrarily rich and poor households.

BASELINE LIFE-CYCLE PRODUCTIVITY

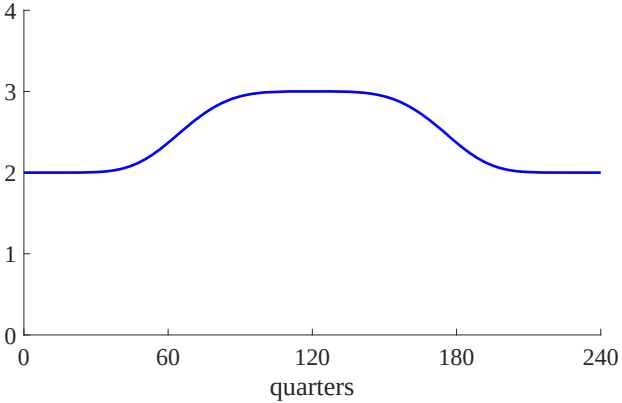

FIGURE: The baseline personal productivity endowment profile. The profile is symmetric and peaks in the middle period of the life cycle at a level about 50% greater than at the beginning or end.

THE MASS OF LIFE-CYCLE PRODUCTIVITY

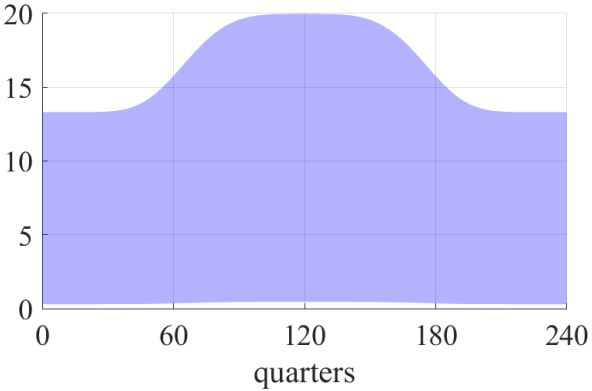

FIGURE: The mass of endowment profiles with the scaling factor drawn from a uniform distribution. Drawing from a lognormal distribution is also possible, in which case the model would include arbitrarily rich and poor households.

Characterizing the Equilibrium

HOURS WORKED OVER THE LIFE CYLE

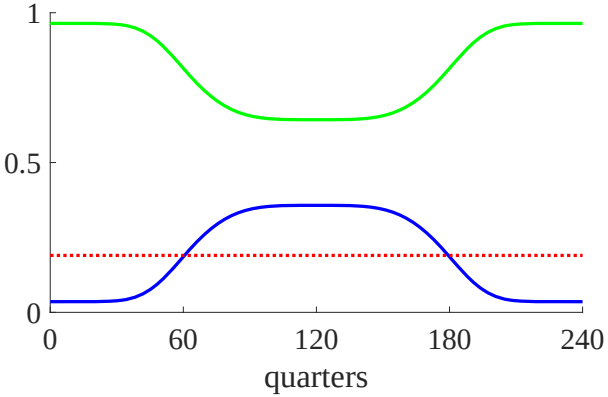

FIGURE: Cross section: Leisure decisions by age (green), labor supply by age (blue), and fraction of work time in U.S. data, 19% (red). The labor/leisure choices depend on age only. High-income households work the same hours as low-income households at each age.

LABOR INCOME MASS

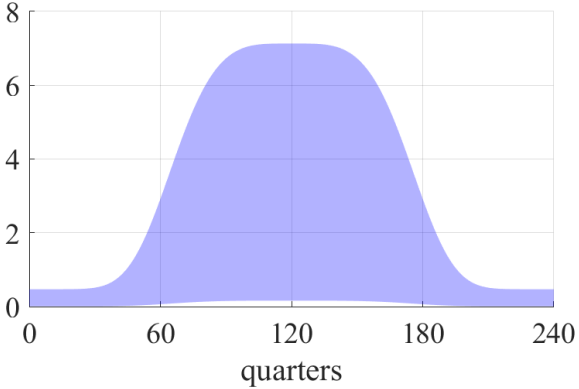

FIGURE: Cross section: Labor income profiles. Personal productivity peaks at the middle of the life cycle, and households work more at that time as well, making income even more concentrated in the peak earning years.

CONSUMPTION MASS

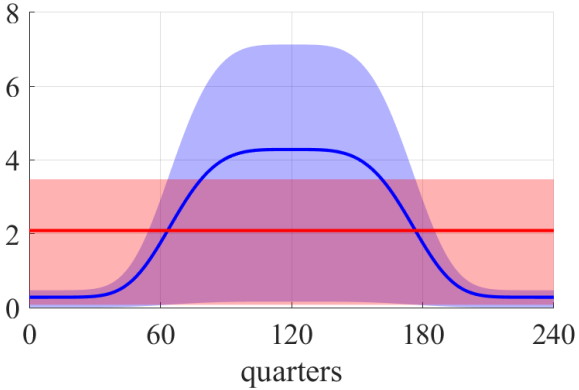

FIGURE: Cross section: Consumption mass (red) and labor income mass (blue) along the complete-markets balanced growth path. Under optimal monetary policy, the private credit market reallocates uneven labor income into perfectly equal consumption for each productivity profile. The consumption Gini is 31.8%, similar to values calculated from U.S. data.

NET ASSET HOLDING MASS

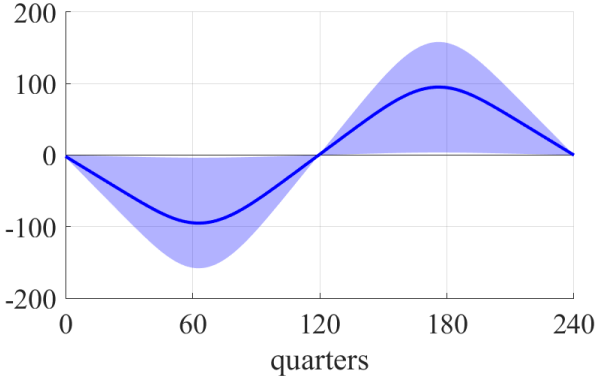

FIGURE: Cross section: Net asset holding mass by cohort along the complete markets balanced growth path. Borrowing, the negative values to the left, peaks at stage 60 of the life cycle (age $\sim$ 35), while positive assets peak at stage 180 of life (age $\sim$ 65). The financial wealth Gini is 72.7%, similar to values calculated in U.S. data.

THREE NOTIONS OF INCOME

- Three notions of income:
  1. Labor income (Y_1).
  2. Labor income plus non-negative capital income (Y_2).
  3. The non-negative component of total income (Y_3).
- Gini coefficients of the various income distributions: $G_{Y_1} = 56.2\%$, $G_{Y_2} = 51.6\%$, $G_{Y_3} = 59.6\%$.

LABOR INCOME + NON-NEGATIVE CAPITAL INCOME

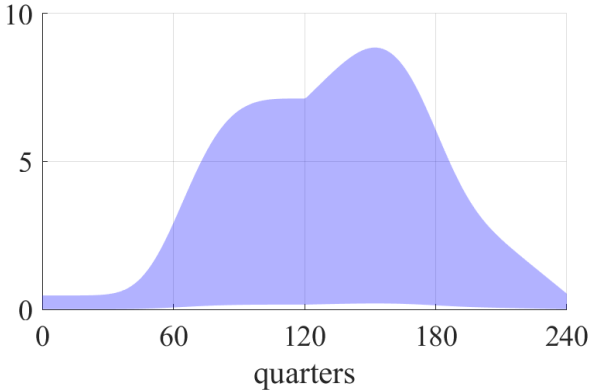

FIGURE: Cross section: Profiles of labor income and non-negative capital income.

Non-negative total income

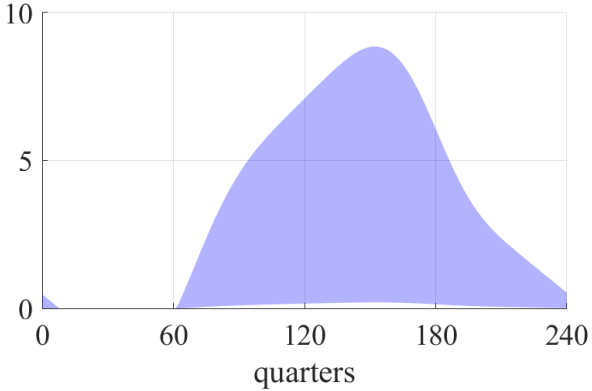

Figure: Cross section: Profiles of non-negative total income.

Inequality

DATA ON INEQUALITY IN THE U.S.

- Consumption (Heathcote, Perri and Violante, *RED*, 2010): $G_{C,\text{U.S.}} = 32\%$.
- Income (CBO, 2016): pre-taxes/transfers $G_{Y,\text{U.S.}} = 51\%$; post-taxes/transfers $G_{Y,\text{U.S.}} = 43\%$.
- Financial wealth (Davies, Sandström, Shorrocks and Wolff, *EJ*, 2011): $G_{W,\text{U.S.}} = 80\%$.

Inequality in the model

- There is a large amount of heterogeneity in the model that depends in part on life-cycle productivity dispersion and in part on the life cycle itself.
- Financial wealth is defined as the non-negative part of net assets.
- We also consider lognormal productivity:
  - This allows for arbitrarily rich and poor households.
  - All distributions (wealth, income and consumption) are mixtures of lognormals (and delta functions).
  - Gini coefficients can be computed with "paper and pencil."

GINI COEFFICIENTS

	Wealth	**Income**			**Consumption**
	W	Y_1	Y_2	Y_3	C
U.S. data	80%		51%		32%
Uniform	72.7%	56.2%	51.6%	59.6%	31.8%
Lognormal	72.4%	55.7%	51.1%	59.0%	32%

TABLE: Gini coefficients in the U.S. data and in the model with uniform and lognormal productivity.

PRODUCTIVITY DISPERSION AND GINI COEFFICIENTS

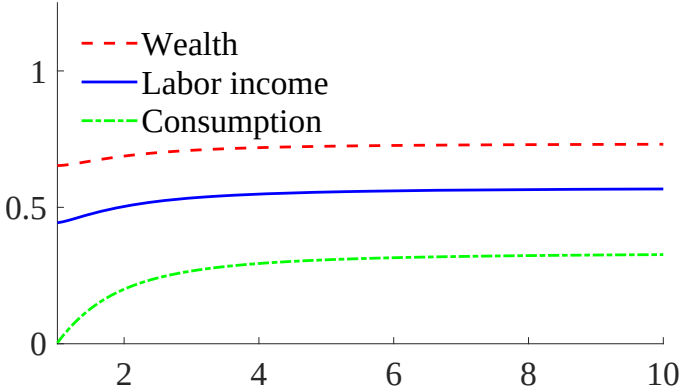

FIGURE: As the dispersion of productivity profiles increases, the Gini coefficients increase. The ordering $G_W > G_Y > G_C$ is preserved.

Policy

Interpreting monetary policy

- The nominal GDP targeting rule characterizes policy by "countercyclical price-level" movements.
- But the policy can also be interpreted more conventionally in interest rate terms.

Policy characterization

- The nominal rate is determined one period in advance as the expected rate of nominal GDP growth.
- The nominal rate is always ratified ex post by the policymaker.
- This makes the real rate = aggregate productivity growth rate = Wicksellian natural real rate of interest.
- "Just like the simple New Keynesian model"—that is, the policymaker seeks to restore the Wicksellian natural real rate.

Nominal GDP targeting

- How can we interpret these results as nominal GDP targeting?
  - No persistence in aggregate productivity growth: The expected rate of nominal GDP growth never changes, and the economy never deviates from the nominal GDP path. "Perfect nominal GDP targeting."
  - Persistence in aggregate productivity growth: The expected rate of nominal GDP growth fluctuates persistently with the shock, and it takes longer to return to the balanced growth nominal GDP path.
  - Nominal and real rates fall in a recession.

EFFECTS OF A SHOCK

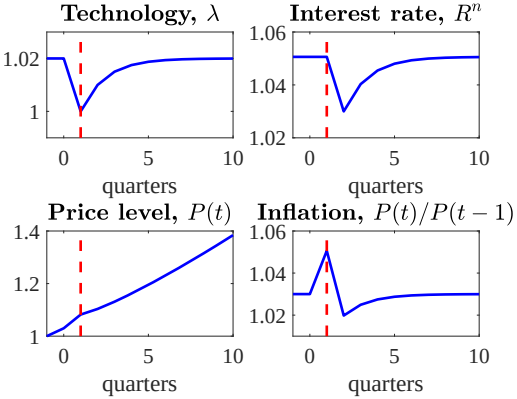

FIGURE: Monetary policy responds to a decrease in aggregate productivity growth by increasing the inflation rate in the period of the shock. Subsequently, inflation converges to its long-run equilibrium value from below. The nominal interest rate drops in the period after the shock.

Conclusions

SUMMARY

- Actual households have peak earning years, so they have to use credit markets to smooth life-cycle consumption.
- In this paper, we study a simple and stylized economy where these credit markets do not work perfectly because of a friction called "non-state contingent nominal contracting."
- The monetary authority can repair the distortionary effects of this friction by conducting monetary policy in a manner recommended by Koenig (*IJCB*, 2013) and Sheedy (*BPEA*, 2014)—nominal GDP targeting.
- In doing so, the monetary authority restores the Wicksellian natural real rate of interest, which is the real rate of interest that would occur if there were no frictions in the economy at all.

Monetary policy and inequality

- This policy works well for all households in this economy—young and old, rich and poor—because they all face a life-cycle consumption smoothing problem.
- Hence, we say that this is "optimal monetary policy for the masses."
- Does monetary policy affect inequality?
  - Relative to an incomplete-markets benchmark, the optimal monetary policy improves consumption allocations, alters the asset holding distribution and alters the income distribution by altering hours worked.