Optimal Fiscal and Monetary Policy

December 3, 2013

OUTLINE

- Basics of Ramsey optimal policy problem (the microeconomics)
- Applying the Ramsey framework to macroeconomic policy
- Modern benchmark Ramsey (monetary policy) results
  - Optimality of the Friedman Rule
  - Inflation very volatile and serially uncorrelated
  - Dynamic results: Fiscal Theory of the Price Level (FTPL) foundations
- How palatable is the strict Ramsey approach for monetary policy prescriptions?
- Nominal price rigidity in the Ramsey environment (SGU 2004 *JET*)
- Nominal wage rigidity in the Ramsey environment
  - Chugh (2006 *RED*): embedded in Walrasian labor markets
  - Arseneau and Chugh (2008 *JME*): embedded in labor markets with search and matching frictions

THE ORIGINAL RAMSEY PROBLEM

- Static problem – no lump-sum taxes
- Optimally finance exogenous government spending by levying proportional taxes on a vector of *N* goods – use *N* – 1 taxes

Consumer budget constraint (endowment model)

$$\sum_{i=1}^{N}(1+\tau^i)p^i c^i = y$$

NO TAX ON ONE GOOD

- Household optimality: $\frac{u_i(.)}{u_j(.)} = \frac{(1+\tau^i)p^i}{(1+\tau^j)p^j}$ For any pair *i*, *j* EXCEPT FOR ONE GOOD
- A straightforward formulation of policy problem: choose $\{\tau^i\}_{i=1}^{N}$ to maximize household utility subject to
  - Resource constraint
  - All household optimality conditions
  - Government budget constraint (equivalently, hh budget constraint)

Condenses

- Primal formulation: implementability constraint $\sum_{i=1}^{N} u_i(.)c^i = 0$
  - Choose allocations $\{c^i\}_{i=1}^{N}$ directly

THE ORIGINAL RAMSEY PROBLEM

- **Basic Result**
  - Tax most heavily the good(s) with the least elastic demand
  - Basic (now, undergraduate…) intuition: taxing goods with low price elasticity of demand creates smallest deadweight losses
  - Ramsey problem one of optimally spreading distortions/deadweight losses across markets/commodities

- **Uniform Commodity Taxation Theorem**
  - If preferences are homothetic in goods *X* and *Y*, tax them at equal rates – Atkinson and Stiglitz (1980)
  - Homothetic function
    - Monotone transformation of a homogenous function
    - Income expansion paths are rays through origin
    - $\frac{u_i(t \cdot \mathrm{c})}{u_j(t \cdot \mathrm{c})} = \frac{u_i(\mathrm{c})}{u_j(\mathrm{c})}$ for $t > 0$
    - Homogeneity a cardinal property of a function
    - Homotheticity an ordinal property of a function

RAMSEY FRAMEWORK APPLIED TO MACRO POLICY

- **Use Ramsey framework to study (joint) monetary and fiscal policy**
  - **Consolidated (flow) government budget constraint**

$$\tau_t^n P_t w_t n_t + M_t - M_{t-1} + B_t - R_{t-1} B_{t-1} = P_t g_t$$

Nominally risk-free, one period bonds (key for dynamic results)

  - **Original formulation by Lucas and Stokey (1983 *JME*)**
  - **Quantitatively studied by Chari, Christiano, and Kehoe (1991 *JMCB*)**
    - **Basic model and results summarized in Chari and Kehoe (1999 *Macro Handbook*)**

- **Basic model elements**
  - **Cash good/credit good environment**
  - **No capital accumulation**
  - **Assets: fiat money and one-period nominal government bonds**
  - **Flexible prices and wages**
  - **Stochastic government spending and TFP**

- **Policy tools: labor income tax, nominal debt, money creation**

BASELINE DSGE RAMSEY MONETARY MODEL

- **Ramsey Problem: maximize lifetime utility of consumer subject to**
  - **Resource constraint**
  - **Government (intertemporal) budget constraint (primal formulation: present-value implementability constraint (PVIC))**

$$E_0 \sum_{t=0}^{\infty} \beta^t \left[u_1(c_{1t}, c_{2t}) c_{1t} + u_2(c_{1t}, c_{2t}) c_{2t} - v'(n_t) n_t \right] = A_0$$

Initial real liabilities of government

  - **In principle, also a zero-lower-bound (ZLB) constraint (i.e., $R_t = u_1(.)/u_2(.) >= 1$), but can show this is always satisfied in the less-constrained Ramsey problem**

- **Main Result #1: Friedman Rule always optimal (i.e., $R_t = 1$)**
  - **Interpretation: completely relax consumers' CIA constraints**
  - **In all dates and states – i.e., not just a steady-state result**
  - **In steady-state, implies $\pi = \beta$ (deflate at rate of time preference)**
    - **DOES NOT MEAN $\pi_t = \beta$ OUT OF STEADY STATE!**

UNDERSTANDING THE FRIEDMAN RULE

- **Standard Ramsey theory: all final goods should be taxed**
  - Spread distortions/deadweight loss across all goods
  - Basic Ramsey monetary model: labor income tax taxes *both* cash goods *and* credit goods *at the same rate*

- **Standard Ramsey theory: uniform commodity taxation**
  - Cash and credit goods enter preferences homothetically, so tax them at equal rates
    - Alvarez, Kehoe, and Neumeyer (2004): any cash/credit model that exhibits balanced growth must have c_1 and c_2 homothetic in $u(.)$
  - Because both c_1 and c_2 already taxed by labor income tax, do *not* tax cash good further by deviating from Friedman Rule

- **Phelps (1973) conjecture**
  - Friedman Rule would not be optimal in a full public finance framework
  - Intuition behind conjecture: activities requiring money ought to be taxed → positive nominal interest rate a natural way to tax them
  - Basic intuition correct – but homotheticity makes $R > 1$ unnecessary

DYNAMICS OF OPTIMAL POLICY

- **Main Result #2: Inflation and money supply highly volatile**
  - **In face of business-cycle magnitude (TFP and/or government spending) shocks (i.e., numerically solve and simulate)**

Friedman deflation on average

	SGU (2004 *JET*) flex-price model				
Mean	-3.390				
SD	7.470				
Persistence	-0.028				

***OPTIMAL* inflation rate varies between -11 percent and +4 percent two-thirds of the time!**

***Opposite* of NK prescription of having (virtually) zero variability in inflation over the business cycle.**

Zero persistence in optimal inflation – stems from lack of any endogenous state/accumulation variables. Chugh (2007 *JME*): introduce capital accumulation and/or habit persistence → high persistence in Ramsey-optimal inflation

FISCAL THEORY OF THE PRICE LEVEL (FTPL)

- **Present-value government budget constraint (aka PVIC)**

$$\frac{B_t}{P_t} = \text{present value of (future government primary surpluses + seignorage revenue)}$$

- **FTPL supposes current *and future* fiscal surpluses are exogenous (aka non-Ricardian fiscal policy)**

- **Shock revealed at time *t* (about *t* or beyond)**
  - **Fluctuations in contemporaneous price level accommodate shocks…**
  - **…via variations in money supply process**
  - **(Nominal *P* adjusts because dollar value of bonds outstanding is pre-determined – assuming no defaults on face value here….)**

- **Christiano and Fitzgerald (Cleveland Fed *Economic Review*, 2000) provide good introduction to FTPL**

RAMSEY OPTIMALLY EXPLOITS THE FTPL

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- **Ramsey government**
  - **Doesn't take current and future surpluses as exogenous**
  - **Chooses them optimally!**

- **Shock revealed at time *t* (about *t* or beyond)**
  - **Ramsey government faces tradeoff**
    - **Adjust current or future fiscal surpluses via changes in tax rates?**
    - **Or respond via (state-contingent) changes in P_t (achieved through state-contingent variations in the nominal money stock…a quantity-theoretic mechanism)?**
    - **Depends on relative deadweight losses stemming from the two…**

RAMSEY OPTIMALLY EXPLOITS THE FTPL

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Main Result #3: Optimal labor income tax constant over time

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- **CCK result: with flexible *P* and *W*, changes in *P* much less welfare-diminishing, so engineer high volatility in *P* (and hence *π*)**

A Theory of Monetary Policy?

- Should optimal monetary policy be driven by fiscal considerations?
  - Maybe…
  - …but strikes many as crazy to recommend high inflation variability and high money supply variability
- Why is high inflation variability undesirable? Undergrad answers:
  - Causes unintended redistributions between borrowers and savers?
    - If so, requires heterogeneous-agent model to think about…
  - Causes undesirable relative-price distortions?
    - If so, from where do such relative-price effects stem?
    - New Keynesian view: some nominal prices simply do not adjust
      - Immediate implication: inflation distorts relative prices (relative quantities), hence optimal to stabilize inflation following shocks
- Ramsey framework a quantitative test of the power of some friction in the economy to make stabilizing inflation an important goal
  - Isolates mechanisms (potentially) important for the objectives of cyclical monetary policy
  - Useful even if don't literally want to formulate monetary policy on the basis of fiscal considerations