



OPTIMAL FISCAL AND MONETARY POLICY WITH NOMINAL RIGIDITIES

DECEMBER 5, 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 result: Fiscal Theory of the Price Level (FTPL) underpinnings
- ❑ 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**

STICKY-PRICE RAMSEY MODELS

- ❑ Flexible prices and wages
 - ❑ Optimal inflation highly volatile – makes nominal government debt state-contingent in real terms
 - ❑ **An insurance mechanism**

- ❑ Schmitt-Grohe and Uribe (2004 *JET*) and Siu (2004 *JME*)
 - ❑ **Pit insurance value of generating state-contingent debt vs. deadweight costs associated with nominal price rigidity**
 - ❑ **A quantitative test**

- ❑ Key elements of SGU model
 - ❑ Standard NK separation into intermediate and final goods
 - ❑ Menu costs of nominal price adjustment

Can map Calvo adjustment probability into parameter ψ

$$\frac{\psi}{2} \left(\frac{P_{it}}{P_{it-1}} - 1 \right)^2$$

Every firm CAN adjust price every period. Quadratic cost limits SIZE of price adjustments.

- ❑ A real resource cost (i.e., appears in economy-wide resource constraint)
- ❑ Rotemberg (1982 *JPE*)
- ❑ Alternative to Calvo and Taylor

SGU MODEL

Intermediate firm profit-maximization problem

$$\max_{P_{it}} \left\{ (P_{it} - P_t mc_t) y_{it} - \frac{\psi}{2} \left(\frac{P_{it}}{P_{it-1}} - 1 \right)^2 P_t + E_t \left[\Xi_{t+1|t} \left[(P_{it+1} - P_{t+1} mc_{t+1}) y_{it+1} - \frac{\psi}{2} \left(\frac{P_{it+1}}{P_{it}} - 1 \right)^2 P_{t+1} \right] \right] \right\}$$

$$\text{s.t. } y_{it} = \left[\frac{P_{it}}{P_t} \right]^{-\varepsilon} y_t$$

FOC (in symmetric equilibrium) – no price dispersion in Rotemberg

$$[(1 - \varepsilon) + \varepsilon mc_t] y_t - \psi (\pi_t - 1) \pi_t + \psi E_t \left[\Xi_{t+1|t} (\pi_{t+1} - 1) \pi_{t+1} \right] = 0 \quad \text{New Keynesian Phillips Curve}$$

Money demand motivated by transactions cost function

Formulation of Ramsey problem

□ **Primal form:** eliminate all prices/policies, solve for optimal allocations, then construct supporting prices/policies

□ **Dual form:** optimize directly with respect to only policies

□ **PVIC is no longer the only Ramsey constraint (apart from resource constraint)**

□ Because NK Phillips Curve imposes sequence of constraints on evolution of nominal P_t , which is the heart of the FTPL-esque Ramsey mechanism

Puts additional restrictions on the time-path of the price level beyond that implied by the FTPL

STICKY-PRICE RAMSEY MODELS

Friedman
deflation on
average

Near-zero
inflation on
average

Friedman
deflation on
average

	SGU flex-price model	SGU (2004 JET)	Siu (2004 JME)		
Mean	-3.390	-0.160	-2.835		
SD	7.470	0.171	0.323		
Persistence	-0.028	0.037	0.033		

Flexible prices/flexible wages:
(large) fluctuations in P_t not so costly...

Sticky prices/flexible wages:
(large) fluctuations in P_t quite costly...

STICKY-PRICE RAMSEY MODELS

- ❑ **Friedman Rule not optimal in SGU model**
 - ❑ Due to absence of profit tax
 - ❑ Positive nominal interest rate indirectly taxes monopoly rents, which are a “fixed factor” of production (hence non-distortionary)
 - ❑ **Ramsey framework useful in identifying rents**
 - ❑ Siu (*JME* 2004): allows profit tax and recovers optimality of Friedman Rule

- ❑ **Inflation volatility dramatically lower than in flex-price model**
 - ❑ Insurance value of ex-post (non-zero) inflation dominated by resource cost of non-zero inflation
 - ❑ Supports “standard” New Keynesian prescription of stabilizing inflation

- ❑ **Quantitative: sticky-price distortion dominates**
 - ❑ King and Wolman (1999) result: sticky-price distortion should be **completely** eliminated with zero inflation all the time absent any other distortions
 - ❑ Weber (2012 *JMCB*): product turnover (ala BGM 2012) makes steady state inflation > 0

A STICKY-WAGE RAMSEY MODEL

Renewed interest in sticky-*wage* models since EHL (2000) and CEE (2005)

Hypothesis: Nominal rigidity in wages alone may make Ramsey inflation stable

Conjectured Mechanism:

If efficient path of real wage is not very volatile → any concern for stabilizing nominal *wage inflation* will translate into concern for stabilizing nominal *price inflation*

Because Ramsey government tries to come close to the *efficient* path of real wages (since the Ramsey government *does* care about efficiency...)

Via the equilibrium restriction

$$\frac{w_t}{w_{t-1}} = \frac{\pi_t^w}{\pi_t}$$

$$\text{Growth of real wage} = \frac{\text{Nominal wage inflation}}{\text{Nominal price inflation}}$$

A STICKY-WAGE RAMSEY MODEL

- ❑ “Final labor” and “intermediate labor” (standard EHL)
 - ❑ Monopolistic competition in intermediate labor markets
 - ❑ Each household faces Rotemberg menu cost of changing its nominal wage

- ❑ Money demand motivated by cash/credit structure

- ❑ **Key equilibrium condition (and hence Ramsey constraint):** $\frac{w_t}{w_{t-1}} = \frac{\pi_t^w}{\pi_t}$
 - ❑ Non-trivial in sticky-wage models

- ❑ Formulation of Ramsey problem
 - ❑ PVIC again does not capture all equilibrium conditions
 - ❑ So formulate a problem hybrid between the primal and dual approaches

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	SGU flex-price model	SGU (2004 <i>JET</i>)	Siu (2004 <i>JME</i>)	Chugh (2006 <i>RED</i>)	
Mean	-3.390	-0.160	-2.835	-0.113	
SD	7.470	0.171	0.323	0.911	
Persistence	-0.028	0.037	0.033	-0.019	

Flexible prices/flexible wages:
(large) fluctuations in P_t not so costly...

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(large) fluctuations in P_t quite costly...

Flexible prices/sticky wages:
(large) fluctuations in P_t costly...because they would induce large fluctuations in REAL wages GIVEN THAT Ramsey stabilizes W_t ...

LABOR MARKET RELATIONSHIPS?

Goodfriend and King (2001): "...potential allocative inefficiencies from [costly] setting of nominal wages are likely to be offset in the context of long-term employment relationships.." and "...unlikely to influence recommendations for policy."

How might policy prescriptions change when we **model long-term labor market relationships?**

In **ongoing (i.e., not spot)** relationships, "prices" (wages) may play a very different role than in neoclassical models – and may be determined by very different forces than neoclassical (i.e., supply and demand) market forces...

Is Walrasian-based view fundamentally the most natural way to think about labor markets?

(Or even some other markets?...)

A STICKY-WAGE RAMSEY MODEL II

Arseneau and Chugh (2008 JME) Model

- ❑ Labor market with search and matching frictions
 - ❑ Determines quantity of labor (a non-Walrasian allocation mechanism)
 - ❑ Search frictions → when workers and firms do find each other, they have an incentive to remain together – a *long-term employment relationship*

- ❑ Wage payment determined by Nash bargaining between individuals and firms
 - ❑ Determines price of labor (a non-Walrasian pricing mechanism)
 - ❑ Bargaining over the nominal wage

- ❑ Costly wage adjustment – modeled using simple Rotemberg cost
 - ❑ Embedded inside wage bargaining problem

- ❑ Key equilibrium restriction (and hence Ramsey constraint): $\frac{w_t}{w_{t-1}} = \frac{\pi_t^w}{\pi_t}$
- ❑ Money demand motivated by cash/credit structure
- ❑ Key Ramsey constraints: PVIC, wage Phillips Curve, vacancy-creation condition, Nash wage outcome (and standard Ramsey monetary constraints)

A STICKY-WAGE RAMSEY MODEL II

	SGU flex-price model	SGU (2004 <i>JET</i>)	Siu (2004 <i>JME</i>)	Chugh (2006 <i>RED</i>)	Arseneau and Chugh (2008)
Mean	-3.390	-0.160	-2.835	-0.113	0.574
SD	7.470	0.171	0.323	0.911	5.575
Persistence	-0.028	0.037	0.033	-0.019	0.017

Friedman deflation on average

Near-zero inflation on average

Friedman deflation on average

Near-zero inflation on average

Near-zero inflation on average

Flexible prices/flexible wages: (large) fluctuations in P_t not so costly...

Sticky prices/flexible wages: (large) fluctuations in P_t quite costly...

Flexible prices/sticky wages: (large) fluctuations in P_t costly...because they would induce large fluctuations in REAL wages GIVEN THAT Ramsey stabilizes W_t ...

Unless the underlying model of the labor market is non-Walrasian

DYNAMICS OF *REAL WAGE* THE KEY

Walrasian labor market

- ❑ Efficient real wage is relatively stable
→ any desire to stabilize nominal wages translates into desire to stabilize nominal prices

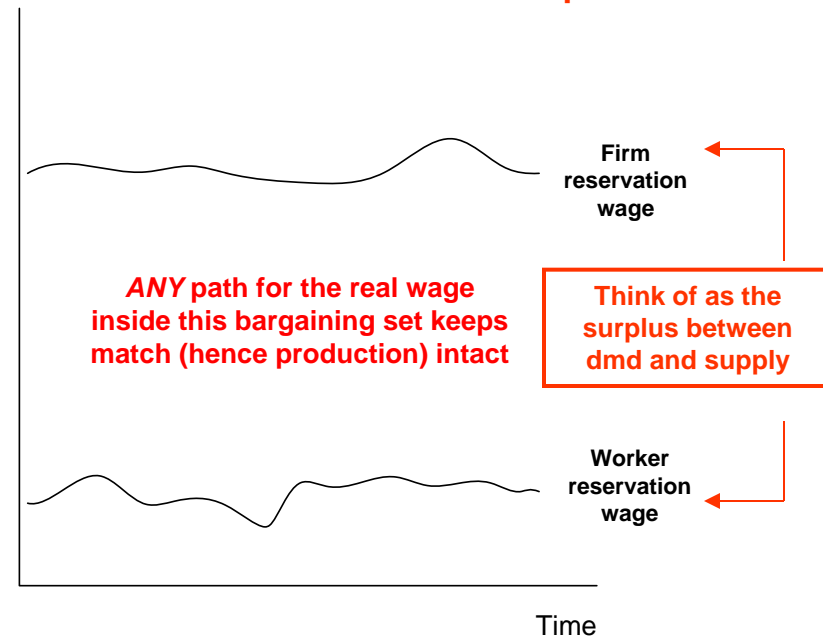
Labor market with search and bargaining

- ❑ Bargained real wage
 - ❑ Divides match surplus
 - ❑ Path does not affect current allocations
- Price inflation stability **not** so important even with sticky nominal wages

Via the equilibrium restriction

$$\frac{w_t}{w_{t-1}} = \frac{\pi_t^w}{\pi_t}$$

$$\text{Growth of real wage} = \frac{\text{Nominal wage inflation}}{\text{Nominal price inflation}}$$



SUMMARY

- ❑ The Ramsey Monetary Model
 - ❑ A **testing ground** for frictions/features that make inflation stability an important goal of policy

- ❑ Which frictions are important?
 - ❑ Sticky prices? Clearly...
 - ❑ Sticky nominal wages?
 - ❑ Depends on underlying view of the labor market
 - ❑ Relative price distortions must stem from more deep-rooted reasons than ad-hoc “sticky prices”...
 - ❑ ...because (old and New) Keynesian intuition continues to ring true
 - ❑ Aruoba and Chugh (2010 *JET*): frictions underlying monetary exchange
 - ❑ Other (non-monetary) search frictions in goods markets? (in progress)

- ❑ Other Interesting Future Directions
 - ❑ Heterogeneity/*dynamic* redistributive effects of inflation
 - ❑ Political considerations: separate the fiscal and monetary authority?