Comments on

Optimal Fiscal and Monetary Policy in a Medium-Scale Macroeconomic Model by S. Schmitt-Grohé & M. Uribe

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The Schmitt-Grohe & Uribe *Oeuvre*

⇒ **"Optimal fiscal & monetary under sticky prices"**
Journal of Economic Theory 2004

⇒ **"Optimal fiscal & monetary under imperfect competition"**
J. Macroeconomics 2004

⇒ **"Optimal Simple & Implementable Monetary & Fiscal Rules"**
NBER Working Paper 2003

⇒ **"Optimized Operational Simple Rules in the CEE Model"**
NBER Working Paper 2004

⇒ **Add citations to Correia & Teles (1998), ACT (2001 ff.)**

Perturbation Methodology

- $\Rightarrow$ **Judd (1992 ff.)**
- $\Rightarrow$ **Sims (2000 ff.)**
- $\Rightarrow$ **Collard & Juillard (2001)**
- $\Rightarrow$ **Schmitt-Grohe & Uribe (*JEDC* 2004) "Solving DGE models using a 2nd-order approximation to the policy function"**
- $\Rightarrow$ **FRB project – Mathematica code to arbitary order**
- $\Rightarrow$ **Dynare – Matlab code to 2nd-order, C++ to arbitrary order**

We wish to write the wage-setting equation in recursive form. To this end, define

$$f_t^1 = \left(\frac{\tilde{\eta}-1}{\tilde{\eta}}\right) \tilde{w}_t E_t \sum_{s=0}^{\infty} (\beta\tilde{\alpha})^s \lambda_{t+s}(1-\tau_{t+s}^h) \left(\frac{w_{t+s}}{\tilde{w}_t}\right)^{\tilde{\eta}} h_{t+s}^d \prod_{k=1}^{s} \left(\frac{\pi_{t+k}}{\pi_{t+k-1}^{\tilde{\chi}}}\right)^{\tilde{\eta}-1}$$

and

$$f_t^2 = -\tilde{w}_t^{-\tilde{\eta}} E_t \sum_{s=0}^{\infty} (\beta\tilde{\alpha})^s w_{t+s}^{\tilde{\eta}} h_{t+s}^d U_{ht+s} \prod_{k=1}^{s} \left(\frac{\pi_{t+k}}{\pi_{t+k-1}^{\tilde{\chi}}}\right)^{\tilde{\eta}}.$$

One can express f_t^1 and f_t^2 recursively as

$$f_t^1 = \left(\frac{\tilde{\eta}-1}{\tilde{\eta}}\right) \tilde{w}_t \lambda_t (1-\tau_t^h) \left(\frac{w_t}{\tilde{w}_t}\right)^{\tilde{\eta}} h_t^d + \tilde{\alpha}\beta E_t \left(\frac{\pi_{t+1}}{\pi_t^{\tilde{\chi}}}\right)^{\tilde{\eta}-1} \left(\frac{\tilde{w}_{t+1}}{\tilde{w}_t}\right)^{\tilde{\eta}-1} f_{t+1}^1, \tag{17}$$

$$f_t^2 = -U_{ht} \left(\frac{w_t}{\tilde{w}_t}\right)^{\tilde{\eta}} h_t^d + \tilde{\alpha}\beta E_t \left(\frac{\pi_{t+1}}{\pi_t^{\tilde{\chi}}}\right)^{\tilde{\eta}} \left(\frac{\tilde{w}_{t+1}}{\tilde{w}_t}\right)^{\tilde{\eta}} f_{t+1}^2. \tag{18}$$

With these definitions at hand, the wage-setting equation becomes

$$f_t^1 = f_t^2. \tag{19}$$

Table 2: Ramsey Steady States

Environment				Steady-State Outcome				
τ_t^ϕ	χ	$\bar{n}$	γ_2	π	R	τ^h	τ^k	profit share
τ_t^k				0.2	4.2	35.4	-6.3	0.6
τ_t^k	1			4.6	8.8	34.7	-6.6	0.6
τ_t^k	1	0		-3.8	0	24.1	-5.3	2.3
τ_t^k		0		-0.2	3.8	23.3	-5.2	2.3
1				0.3	4.3	38.2	-44.3	0.8
1			6850	0.3	4.3	37.8	-84.9	1.4
τ_t^k, τ_t^h				0.5	4.5	30.0	30.0	0.3

Note: The inflation rate, π, and the nominal interest rate, R, are expressed in percent per year. The labor income tax rate, τ^h, and the capital income tax rate, τ^k, are expressed in percent. Unless indicated otherwise, parameters take their baseline values, given in table 1.

Table 3: Cyclical Implications of Optimal Policy Under Income Taxation

Variable	Steady state	Standard deviation	Serial correlation	Correlation with output
τ_t^y	30	1.1	0.62	-0.51
R_t	4.53	1.43	0.74	-0.11
π_t	0.51	1.1	0.55	0.11
y_t	0.3	1.96	0.97	1
c_t	0.21	1.16	0.98	0.89
i_t	0.04	7.87	0.98	0.95
h_t	0.19	1.34	0.75	0.59
w_t	1.17	0.94	0.93	0.80
a_t	0.72	4.44	0.99	0.31

Note: R_t and π_t are expressed in percent per year, and τ_t^y is expressed in percent. The steady-state values of y_t, c_t, i_t, w_t, and a_t are expressed in levels. The standard deviations, serial correlations, and correlations with output of these 5 variables correspond to percent deviations from their steady-state values.

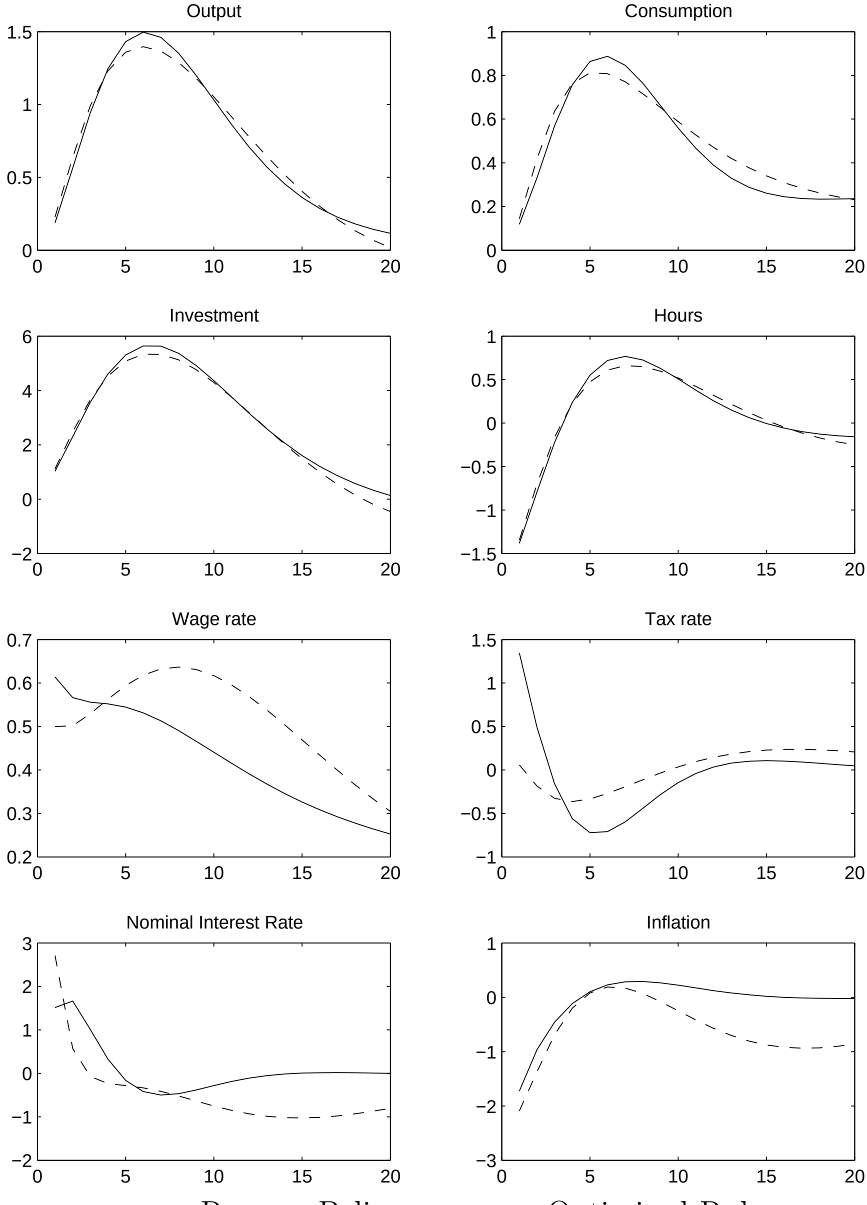
The optimized rule is given by

$$\ln(R_t/R^*) = -1.4\ln(\pi_t/\pi^*) + 1.68\ln(\pi_t^W/\pi^*) - 0.077\ln(y_t/y^*) + 0.42\ln(R_{t-1}/R^*)$$

and

$$\tau_t^y - \tau^{y*} = -0.26\ln(a_t/a^*) + 0.18\ln(y_t/y^*) + 0.29\ln(\tau_{t-1}^y - \tau^{y*})$$

Figure 1: Impulse Response To A Productivity Shock



Ramsey Policy   Optimized Rule

Welfare Costs of Fluctuations

Policy	Welfare
Ramsey policy	-1.4
Wage inflation rule	-1.5
Price inflation rule	-1.9

- Welfare costs of fluctuations are large. Driven by sticky wages.
- Best wage inflation rule: $r_t = r_{t-1} + 3.8$(wage inflation)
- Best price inflation rule: $r_t = r_{t-1} + 2.1$(price inflation)

Specification Uncertainty: Wage Setting

Experiment	Ramsey Policy	Wage Inf* Rule	Price Inf* Rule
Benchmark	-1.4	-1.5	-1.9
Wage-wage indexation	-1.2	-1.7	-1.5
Taylor wage contracts	-0.3	-0.6	-0.3
Taylor wage & price	-0.2	-0.6	-0.4
No wage dispersion	-0.1	-0.4	-0.3

*Optimized to benchmark specification.