

# Myopia, Determinacy, and Fiscal Multipliers

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# Overview

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- 2 Model
- 3 Determinacy
- 4 Govt. Spending Multipliers
- 5 Estimation

# Introduction

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There is no strong consensus on the value of the government spending multiplier:

- ▶ Empirical literature has found values reasonable values to be anywhere between 0.5 to 2.0 (Ramey, 2011).
- ▶ Multipliers from new Keynesian models are smaller compared to neoclassical models (Hall, 1980; Barro, 1981, 1987; Baxter & King, 1993; Aiyagari et al., 1992; Cogan et al., 2010).

Government spending multiplier is above unity in the new Keynesian model only when:

- ▶ The share of rule-of thumb households exceeds 0.5. However, Weidner et al. (2014) find evidence that the true proportion of rule-of-thumb households is closer to one third.
- ▶ The labor market is imperfectly competitive (Gali et al., 2007).
- ▶ The nominal interest rate is constrained at the zero lower bound (Christiano et al., 2018; Ramey & Zubairy, 2018; Woodford, 2011; Cogan et al., 2009; Miyamoto et al., 2018).

## Adding Behavioral Features

These prior approaches rely on the FIRE assumption. Do the multipliers change if agents exhibit behavioral biases?

By augmenting a simple NK model with myopic agents, Gabaix (2020) finds fiscal multiplier  $> 1$ .

- ▶ No explicit multiplier computed.
- ▶ Does it work in a model that is typically used for fiscal policy?

## Research Question

- ▶ What role does myopia ( $M$ ) play in determinacy?
- ▶ Does myopia alleviate the need for an unreasonable share of HTM agents ( $\lambda$ )?
- ▶ What is the estimated value of myopia and the government spending multiplier in modern US economic history?

- ▶ Determinacy: Gali, Lopez-Salido, and Valles (2007) + myopic agents
- ▶ Multipliers: GLV (2007) + myopic agents + several shocks and frictions
- ▶ Estimation: multiplier model + Bayesian MCMC



▶ **Determinacy trilemma:**

Choose 2 out of 3: reasonable  $M$ , reasonable  $\lambda$ , active monetary policy

▶ The effect of  $M$  on  $\frac{\Delta Y}{\Delta G}$  is non-linear. After a particular value of  $\lambda$ , the effect of  $M$  reverses.

▶ Estimation results: active monetary policy with  $M \approx 0.52$ .

# Model

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The economy consists of a continuum of households,  $j \in [0, 1]$ , where a proportion  $1 - \lambda$  are optimizing households ( $o$ ) and the remaining proportion  $\lambda$  are rule-of-thumb households ( $r$ ).

All households ( $A$ ) share the same preferences represented by equation:

$$E_0 \sum_{t=0}^{\infty} \beta^t \left[ \log C_t^A(j) - \frac{N_t^A(j)^{1+\kappa}}{1+\kappa} \right]$$

## Budget Constraints

Optimizing households  $j \in (0, 1 - \lambda)$  maximize their utility subject to the following budget constraint and capital accumulation equation:

$$P_t(C_t^o + I_t^o) + R_t^{-1}B_{t+1}^o = W_tP_tN_t^o + R_t^kP_tK_t^o + B_t^o + D_t^o - P_tT_t^o$$

$$K_{t+1}^o = (1 - \delta)K_t^o + \phi\left(\frac{I_t^o}{K_t^o}\right)K_t^o.$$

Since rule-of-thumb households can only consume the labor income they receive net of taxes, they face the budget constraint:

$$P_tC_t^r = W_tP_tN_t^r - P_tT_t^r.$$

Myopia is modeled similar to Gabaix (2020).

Agents form expectations *subjectively* by cognitively discounting the future:

$$\mathbb{E}_t^s x_{t+1} = M \mathbb{E}_t x_{t+1}$$

where  $0 < M < 1$  is the degree of myopia.

## Log-linearized Equations: Consumer Block

$$c_t^o = M \mathbb{E}_t c_{t+1} - (r_t - \mathbb{E}_t \pi_{t+1}) \quad (1)$$

$$c_t^r = \frac{WN^r}{C^r} (w_t + n_t^r) - \gamma_c^{-1} t_t \quad (2)$$

$$c_t = \lambda c_t^r + (1 - \lambda) c_t^o \quad (3)$$

$$n_t = \lambda n_t^r + (1 - \lambda) n_t^o \quad (4)$$

$$w_t = c_t^o + \varphi n_t^o \quad (5)$$

$$w_t = c_t^r + \varphi n_t^r \quad (6)$$

$$i_t = k_{t-1} + \eta q_t \quad (7)$$

$$k_t = (1 - \delta) k_{t-1} + \delta i_t \quad (8)$$

$$q_t = \beta \mathbb{E}_t q_{t+1} + (1 - \beta(1 - \delta)) \mathbb{E}_t r_{t+1}^k - (r_t - \mathbb{E}_t \pi_{t+1}) \quad (9)$$

$$\pi_t = M\beta\mathbb{E}_t\pi_{t+1} - \frac{(1-\beta\theta)(1-\theta)}{\theta}\mu_t^p \quad (10)$$

$$\mu_t^p = (y_t - n_t) - w_t \quad (11)$$

$$r_t^k = (y_t - k_{t-1}) - \mu_t^p \quad (12)$$

$$y_t = (1-\alpha)n_t + \alpha k_{t-1} + a_t \quad (13)$$

## National Accounting Identity

$$y_t = \gamma_c c_t + \gamma_i i_t + g_t \quad (14)$$

$$(15)$$

## Central Bank and Government

$$b_t = \beta^{-1}[(b_{t-1} + g_t - t_t)] \quad (16)$$

$$t_t = \phi_b b_{t-1} + \phi_g g_t \quad (17)$$

$$r_t = \phi_\pi \pi_t + \varepsilon_t \quad (18)$$



$$\text{Government spending: } g_t = \rho_g g_{t-1} + \varepsilon_t^g \quad (19)$$

$$\text{Monetary policy: } \varepsilon_t = \varepsilon_t \quad (20)$$

$$\text{Technology: } a_t = \rho_a a_{t-1} + \varepsilon_t^a \quad (21)$$

## Imperfectly Competitive Labor Market

Alternatively, wages may be set by unions. In the aggregate:

$$N_t^r = N_t^o = N_t$$

Replace eqn (5) with:

$$w_t = c_t + \varphi n_t \quad (22)$$

Replace eqn (6) with:

$$n_t^o = n_t^r \quad (23)$$

# Determinacy

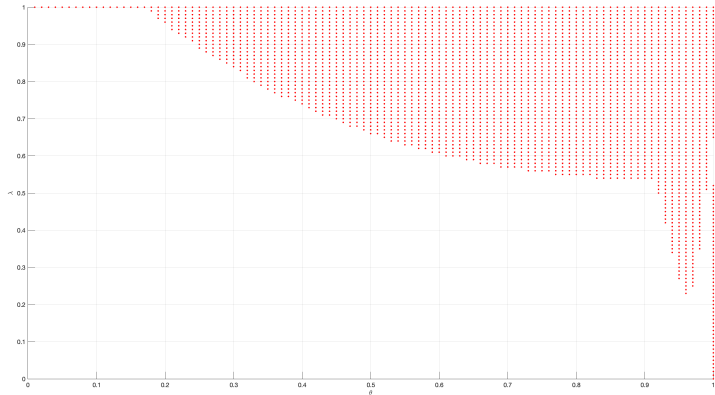
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# Calibrated Parameters

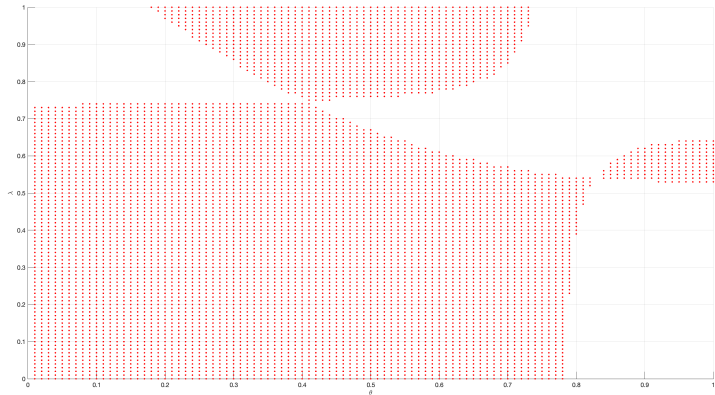
All parameters calibrated to GLS (2007) values as follows:

Parameter	Value	Details
$\beta$	0.99	Discount rate
$\delta$	0.025	Depreciation rate
$\alpha$	0.33	Effective share of capital
$\lambda$	0.35	Fraction of HTM agents
$\theta$	0.75	Calvo pricing
$\varphi$	0.2	Inverse Frisch elasticity of labor supply
$\eta$	1	Elasticity of investment adjustment
$\phi_{\pi}$	1.5	MP inflation weight
$\phi_g$	0.1	FP govt. spending weight
$\phi_b$	0.33	FP debt weight
$\gamma_c$	0.6	Consumption share
$\gamma_i$	0.2	Investment share

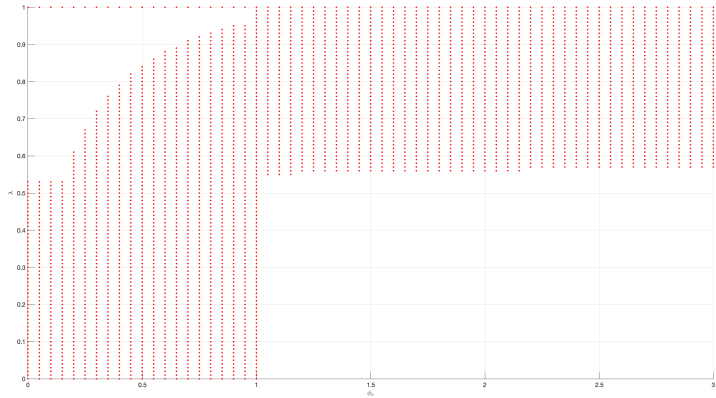
# GLV(2007) + ILM, $M = 1$



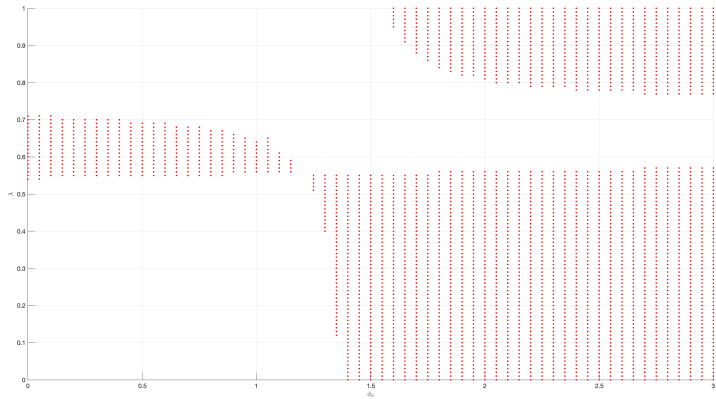
# GLV(2007) + ILM, $M = 0.85$



# GLV(2007) + ILM, $M = 1$

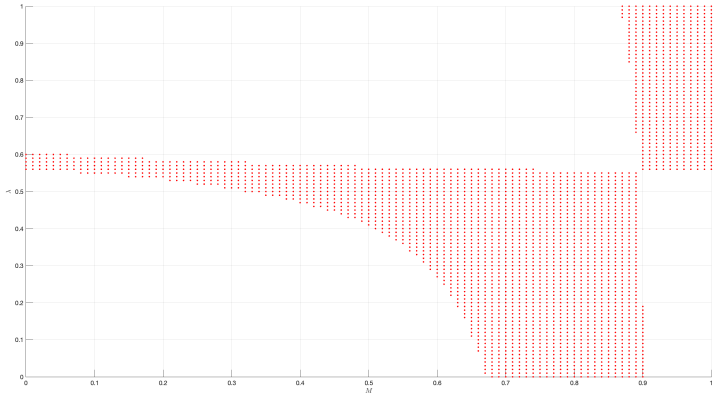


# GLV(2007) + ILM, $M = 0.85$

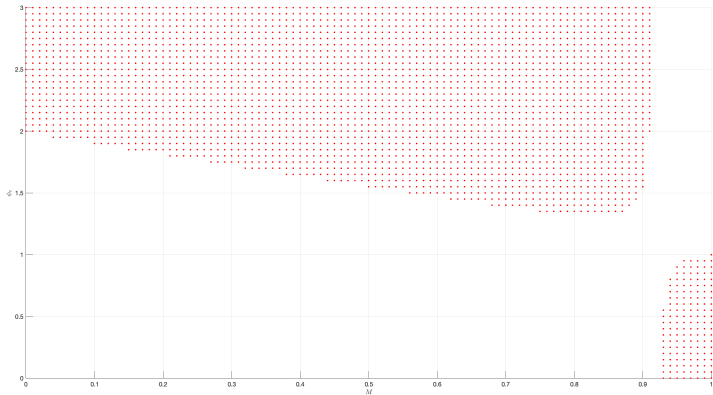




# GLV(2007) + ILM, $\phi_\pi = 1.5$



# GLV(2007) + ILM, $\lambda = 0.35$



# Govt. Spending Multipliers

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## Model Additions

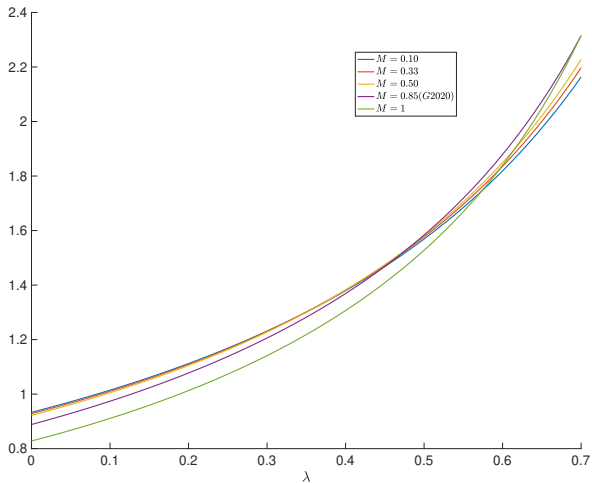
Include variety of frictions for empirical analysis:

- ▶ Habit formation
- ▶ Wage stickiness
- ▶ Price/wage indexation
- ▶ Variable capital utilization
- ▶ Backward-looking Taylor rule

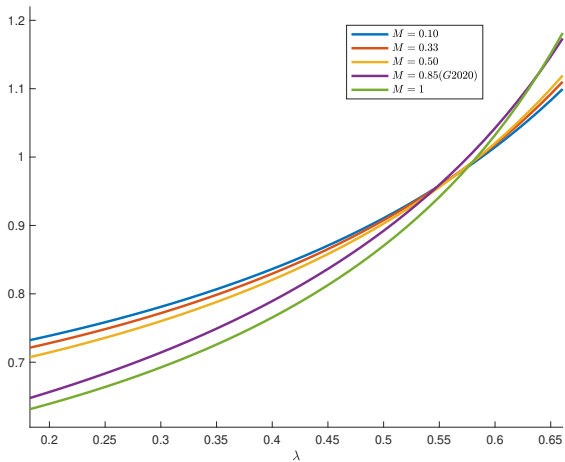
Include variety of shocks for empirical analysis:

- ▶ Monetary policy
- ▶ Preference
- ▶ Price/wage markup

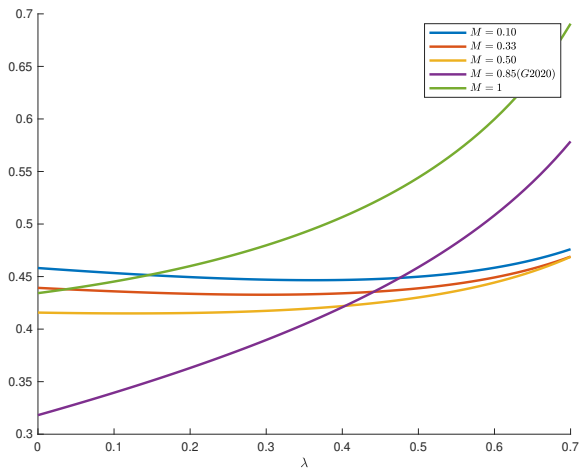
# Fiscal Multiplier: Y, Q1



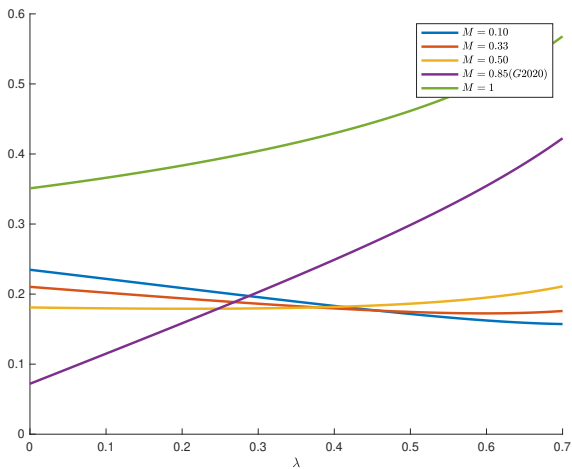
# Fiscal Multiplier: Y, Q4



# Fiscal Multiplier: Y, Q8

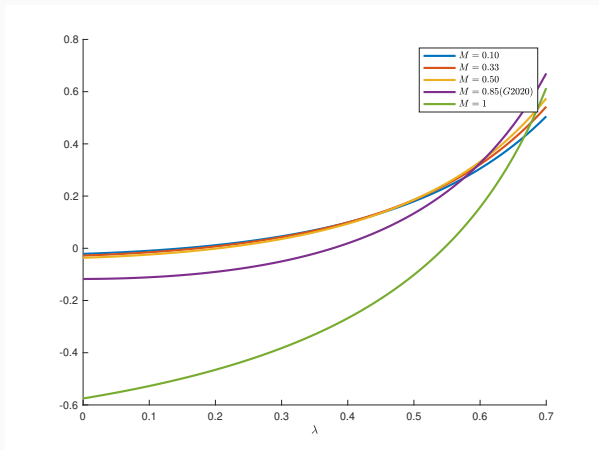


# Fiscal Multiplier: Y, Q20

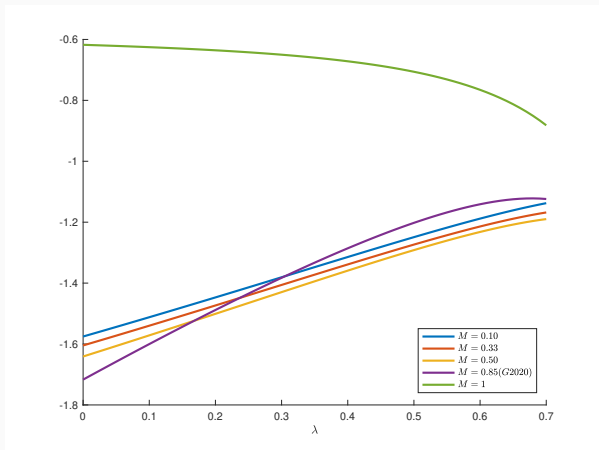




# Fiscal Multiplier: C, Q4



# Fiscal Multiplier: I, Q4



# Estimation

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7 U.S. time series from Q1 1984 to Q4 2019:

- ▶ Gross domestic product
- ▶ Fixed private investment
- ▶ Personal consumption expenditures
- ▶ Government expenditures
- ▶ Wages per hour: Non-farming business sectors
- ▶ Inflation (GDP deflator)
- ▶ Federal Funds Rate

All data series are converted to real terms and growth rates prior to estimation.

# Posterior Distribution: Parameters

$$\lambda = 0.35$$

Parameter	Description	Prior			Posterior		
		Dist.	Mean	Dev.	Mean	10%	90%
$\varphi$	Inverse Frisch elas.	Normal	4.00	1.50	4.54	4.10	4.92
$h$	Habit formation	Beta	0.70	0.10	0.52	0.47	0.57
$\theta_p$	Calvo prices	Beta	0.50	0.10	0.65	0.62	0.67
$\theta_w$	Calvo wages	Beta	0.50	0.10	0.60	0.55	0.66
$\iota_p$	Price indexation	Beta	0.50	0.15	0.50	0.48	0.52
$\iota_w$	Wage indexation	Beta	0.50	0.15	0.65	0.62	0.67
$\sigma_l$	Labor supply elas.	Normal	2.00	0.75	1.29	1.06	1.53
$\psi$	Capital util. elas.	Beta	0.50	0.15	0.04	0.01	0.07
$\alpha$	Capital share	Normal	0.30	0.05	0.25	0.23	0.26
$M$	Myopia	Beta	0.85	0.10	0.52	0.47	0.59
$\chi_\pi$	MP inflation	Normal	1.50	0.25	1.52	1.42	1.60
$\chi_y$	MP output	Normal	0.12	0.05	0.15	0.13	0.18
$\phi_g$	FP govt. spending	Normal	0.10	0.05	0.26	0.23	0.29
$\phi_b$	FP debt	Normal	0.33	0.10	0.03	0.02	0.03
$y^*$	Trend	Normal	0.40	0.10	0.38	0.24	0.36
$\pi^*$	Trend	Normal	0.60	0.10	0.58	0.54	0.62
$i^*$	Trend	Normal	0.75	0.10	0.54	0.45	0.63

# Posterior Distribution: Shock Processes

Parameter	Description	Prior			Posterior		
		Dist.	Mean	Dev.	Mean	10%	90%
Persistence							
$\rho_\chi$	Preference	Beta	0.50	0.20	0.61	0.58	0.64
$\rho_w$	Wage markup	Beta	0.50	0.20	0.99	0.98	1.00
$\rho_p$	Price markup	Beta	0.50	0.20	0.97	0.95	0.99
$\rho_a$	Technology	Beta	0.50	0.20	0.62	0.55	0.68
$\rho_g$	Govt. Spending	Beta	0.50	0.20	1.00	0.99	1.00
$\rho_i$	Investment specific	Beta	0.50	0.20	0.36	0.28	0.45
$\rho_r$	Monetary Policy	Beta	0.50	0.20	0.45	0.42	0.48
Deviation							
$\sigma_\chi$	Preference	Gamma <sup>-1</sup>	0.30	1.00	0.08	0.07	0.09
$\sigma_w$	Wage markup	Gamma <sup>-1</sup>	0.30	1.00	0.08	0.07	0.10
$\sigma_p$	Price markup	Gamma <sup>-1</sup>	0.30	1.00	0.04	0.04	0.04
$\sigma_a$	Technology	Gamma <sup>-1</sup>	0.30	1.00	0.11	0.10	0.13
$\sigma_g$	Govt. Spending	Gamma <sup>-1</sup>	0.30	1.00	0.04	0.04	0.04
$\sigma_i$	Investment specific	Gamma <sup>-1</sup>	0.30	1.00	0.04	0.04	0.04
$\sigma_r$	Monetary Policy	Gamma <sup>-1</sup>	0.30	1.00	0.04	0.04	0.04

## Next Steps

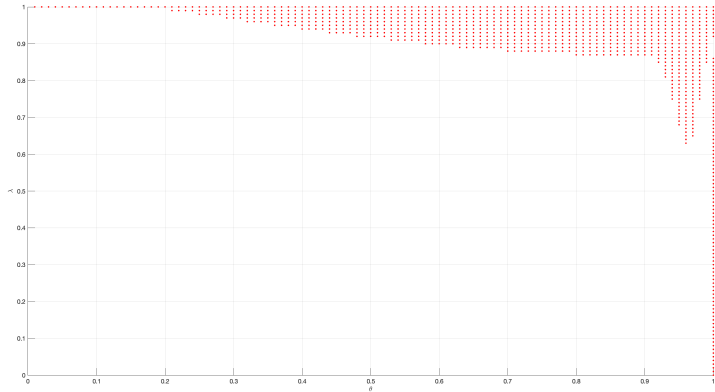
- ▶ Expand lit review for behavioral fiscal policy papers.
- ▶ Formalize into 1 or 2 papers.
- ▶ Generate IRFs from estimated posterior means.
- ▶ Compute implied multiplier from estimation results.
- ▶ Include SPF forecasts of govt. spending to estimation.

**Thank you.**

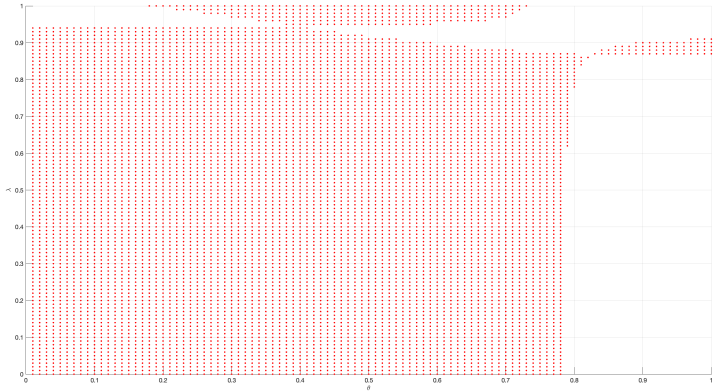
**Questions?**



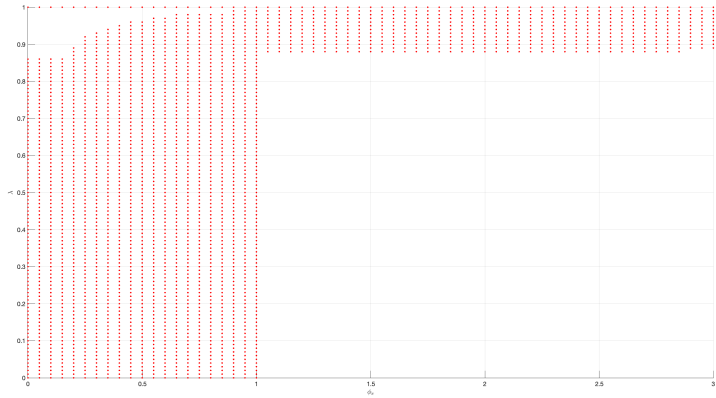
# GLV(2007), $M = 1$



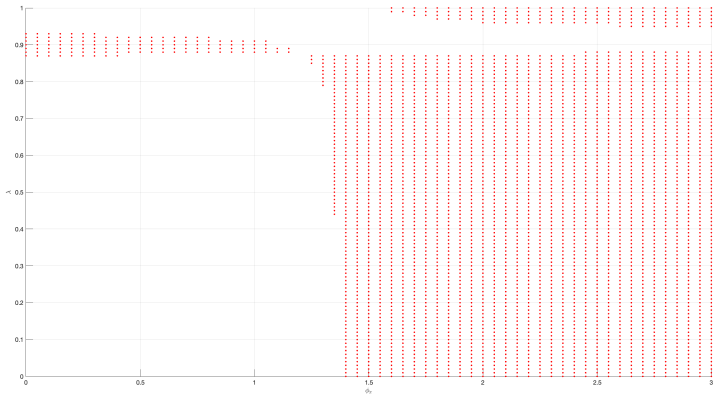
# GLV(2007), $M = 0.85$



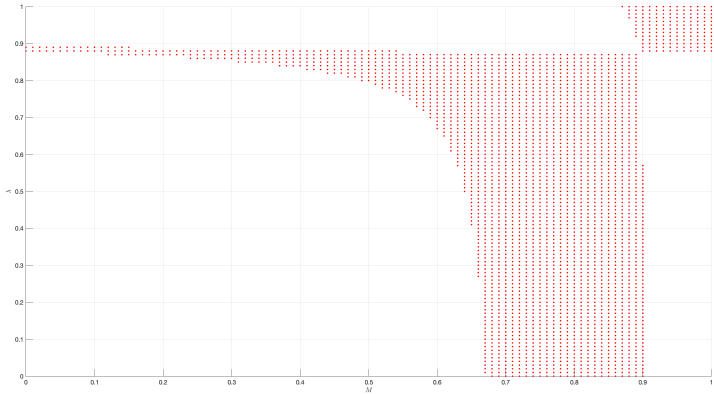
# GLV(2007), $M = 1$



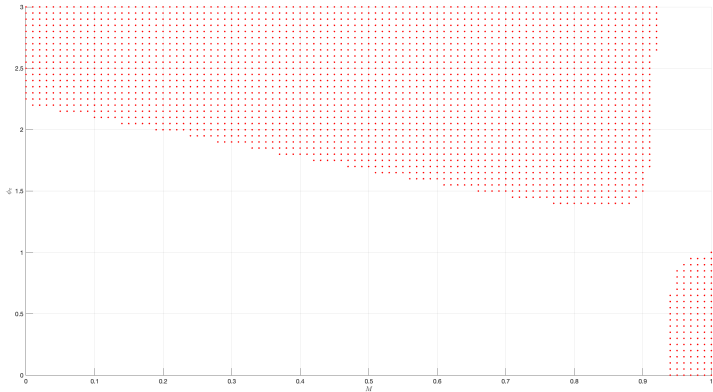
# GLV(2007), $M = 0.85$



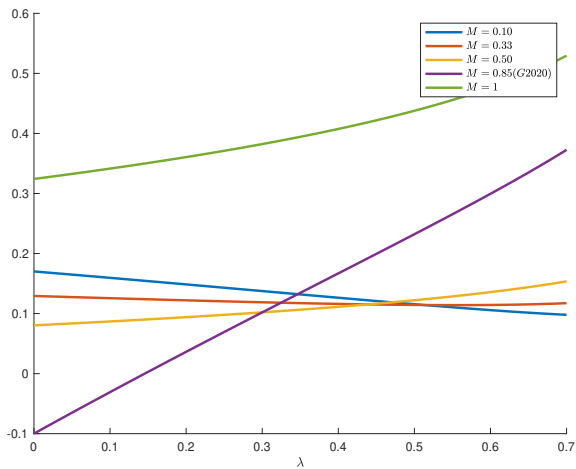
GLV(2007),  $\phi_\pi = 1.5$



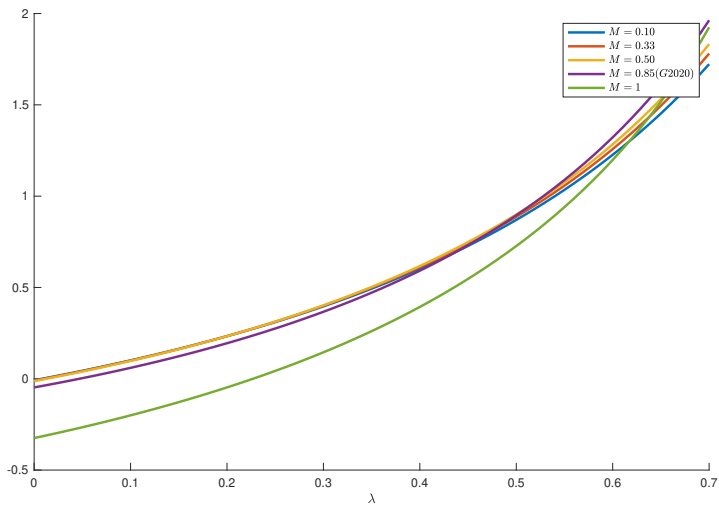
# GLV(2007), $\lambda = 0.35$



# Fiscal Multiplier: Y, Q40

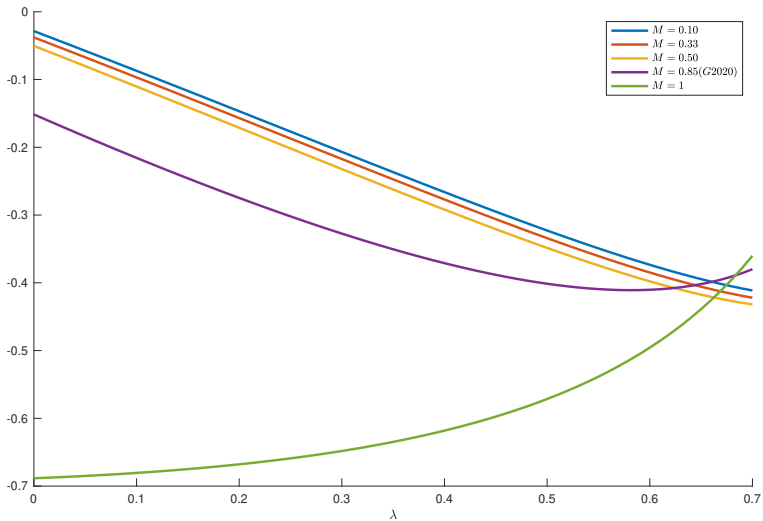


# Fiscal Multiplier: C, Q1

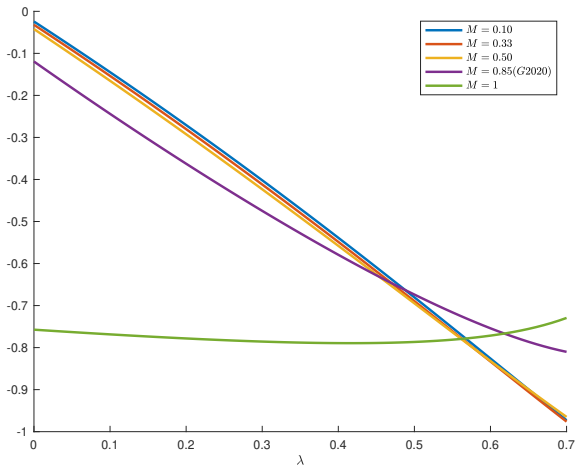




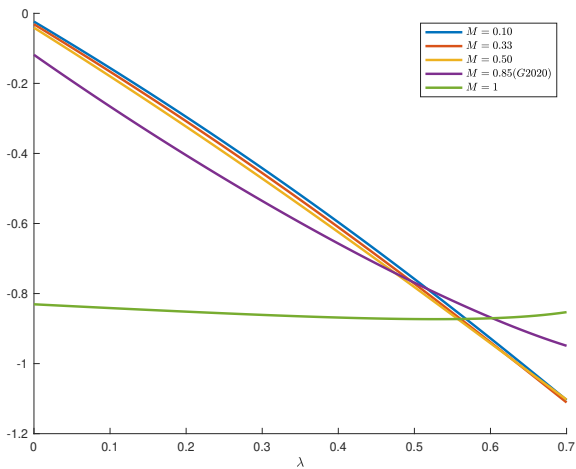
# Fiscal Multiplier: C, Q8



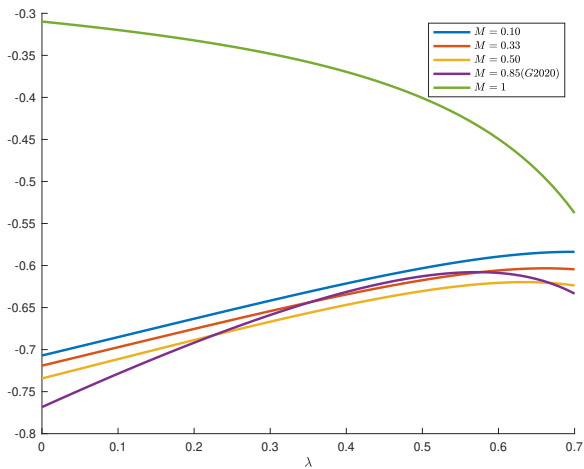
# Fiscal Multiplier: C, Q20



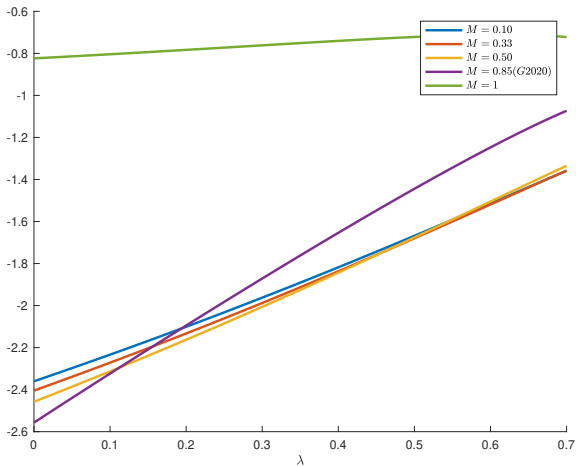
# Fiscal Multiplier: C, Q40



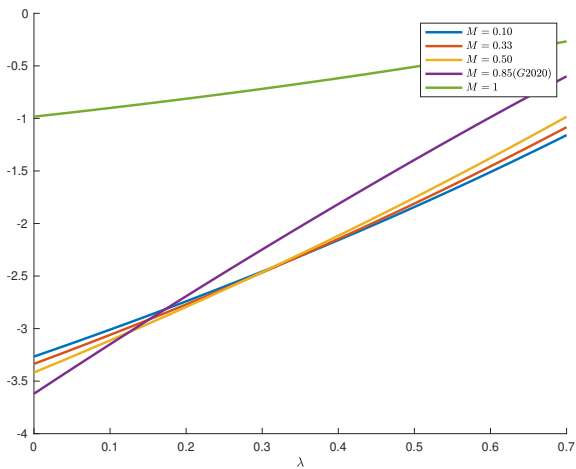
# Fiscal Multiplier: I, Q1



# Fiscal Multiplier: I, Q8



# Fiscal Multiplier: I, Q20



# Fiscal Multiplier: I, Q40

