Fiscal Multipliers in Recessions

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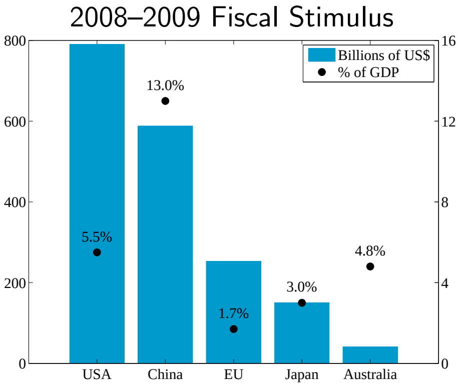
Overview

- Popular policy prescription: Fiscal expansion during recessions as a means of stimulating economic activity
- Example: The recent Great Recession



Overview

- Are fiscal multipliers large? (> 1)
- Does their size depend on the state of the economy? (state dependent)

Overview: Empirics

Empirical Evidence

Problems with the identification of fiscal shocks

In favor of large, state dependent multipliers

- Auerbach and Gorodnichenko [2012]
  1. Regime switching SVAR's
  2. Multipliers: < 1 during expansions and $>> 1$ during recessions
- Bachmann and Sims [2012]: Similar results
- Riera-Crichton, Vegh and Vuletin [2014]
  1. Condition on both the state of the business cycle and the sign/size of the fiscal intervention
  2. Fiscal expansions in recessions are much more expansionary than fiscal expansions in booms
- Nakamura and Steinsson [2014]
  1. REGIONAL fiscal multipliers
  2. The effects of government spending are substantial but also much higher during periods of high slackness (high unemployment) in comparison to other times

Empirical Evidence Cont'ed

No such properties

- Ramey and Zubairy [2012]
    1. Longer time sample and a news based identification scheme
    2. Small multipliers, absence of any state dependence
- Brückner and Tuladhar [2011]
    1. Japanese REGIONAL data
    2. Small multipliers, absence of any state dependence

Overview: Empirics

- The empirical literature seems unsettled and is still evolving
- It needs theoretical guidance in its search for state dependence
- Valuable to explore if and how standard models can produce such effects

Overview: Theory

Theory

Standard models (RBS and NK) have difficulty producing large, state dependent multipliers

- Large multipliers:
  1. Deep habit models, Ravn et al [2012]
- Large and state dependent
  1. Zero lower bound models, Eggertsson [2010] and Christiano et al. [2011]
  2. Results questioned by Cogan at al [2010], Erceg and Linde [2010], Bachmann, Berg and Sims [2014], Dupor and Li [2014]

- Our contribution: Produce, large, cyclically variable multipliers in a model with financial frictions
- Add countercyclical variation in bank intermediation costs to the banking model of Curdia and Woodford [2009, 2010]
- This makes the spread between the bank deposit rate and the bank loan rate fluctuate countercyclically
- It creates a financial accelerator that is stronger in recessions than in expansions

The mechanism

- The onset of a recession exacerbates the financial friction, inhibiting borrowing
- A fiscal stimulus expands output and decreases the spread
- This in turn encourages more borrowing and spending
- This further expands the economy and decreases the spread again, encouraging more borrowing
- The process repeats itself
- The same accelerator is present in an expansion; however, during good times, the spread is lower to begin with, and the accelerator is correspondingly weaker

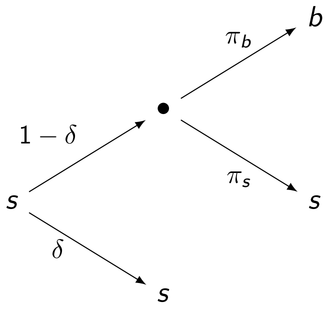
A Model with Financial Frictions

- The model relies on Curdia and Woodford
- Two types of agents: High (impatient, b) and low (patient, s) marginal utility
- Type changes randomly over time
- The patient save while the impatient borrow
- Presence of a financial friction $\Longrightarrow$ Spread between the saving and the borrowing rate
- Ricardian equivalence does not hold $\Longrightarrow$ Public debt matters
- The rest of the model is standard: Monopolistic competition + calvo prices + Taylor rule.

Curdia and Woodford

Households

- Details regarding household types
- 2 classes of agents, $\tau = \{b, s\}$ of size π_b (resp. π_s)
- Evolution of household type



Households

- Household i's preferences:

$$\mathbb{E}_t \sum_{s=0}^{\infty} \beta^s \left[u^{\tau_{t+s}(i)}(c_{t+s}^{\tau_{t+s}(i)}(i); \xi_{t+s}) - \int_0^1 v(h_{t+s}^{\tau_{t+s}(i)}(j); \xi_{t+s}) \mathrm{d}j \right]$$

  where $\tau_t(i) \in \{b, s\}$ indicates household type in period t.
- A critical assumption: marginal utility of consumption of type b agents is larger than that of type s agents for any consumption level

$$u_c^b(c, \xi) > u_c^s(c, \xi)$$

- Agents b are relatively impatient.

Curdia and Woodford

- Households can deposit funds at /borrow from financial intermediaries.
  - Deposits pay a nominal interest rate, i^d_{t-1}
  - Loans pay an interest rate i^b_{t-1} ($i^b > i^d$)
- Type switching $\Longrightarrow$ Infinite $\sharp$ histories
- Assumption: When selected to redraw a type, agents visit an insurance agency which wipes out debts and distributes assets equally. Departing agents of the same type are identical.
- Distribution of types does not matter: Simplifies aggregation

Curdia and Woodford

Firms: Standard New Keynesian Setting

- Final good: $y_t = \left(\int_0^1 y_t(j)^{\frac{\theta-1}{\theta}} \mathrm{d}j \right)^{\frac{\theta}{\theta-1}}$
- Intermediate goods: $y_t(j) = x_t h_t(j)^{\frac{1}{\varphi}}$ with $\varphi \geqslant 1$
- Calvo price setting

Curdia and Woodford

Banks

- Collect deposits, d_t, make loans, b_t, to the households
- When making loans, b_t, banks face a resource cost, $C(b_t, \widetilde{y}_t)$ where

$$\widetilde{y}_t = \frac{y_t - y^\star}{y^\star}$$

- $C_b(\cdot,\cdot) > 0$, $C_{bb}(\cdot,\cdot) > 0$
- $C_{\widetilde{y}}(\cdot,\cdot) < 0$: Intermediation costs are higher in recessions
- Mishkin, 2001: Cyclicality of firm net worth, of household liquidity etc. induces countercyclical variation in moral hazard and adverse selection problems.
- Gromb and Vayanos, 2011: When the wealth of financial intermediaries decreases, intermediation becomes less effective (more costly) because of margin constraints. Spreads increase.

Curdia and Woodford

- Banks select amount of loans that maximizes

$$D_t^{\mathrm{I}} = P_t(d_t - b_t - C(b_t, \widetilde{y}_t))$$

- The revenues from lending, $(1 + i_t^b)b_t$, have to finance the payments on deposits, $(1 + i_t^d)d_t$

$$(1 + i_t^d)d_t = (1 + i_t^b)b_t$$

- Define ω_t as the spread: $1 + i_t^b = (1 + \omega_t)(1 + i_t^d)$
- Profits

$$\omega_t b_t - C(b_t, \widetilde{y}_t)$$

- The spread satisfies

$$\omega_t = C_b(b_t, \widetilde{y}_t)$$

The government

- Government spending follows an exogenous, AR(1) process
- With "active" fiscal policy, govt spending responds by 1%
- Increases in government spending are initially bond financed, but lump sum taxes increase over time to stabilize public debt
- Monetary policy follows a standard interest rate rule

The key equation in the model

$$i_t^b - i_t^d = \xi_{\Psi,t} \eta b_t^{\eta-1} \exp\left(-\alpha \widetilde{y}_t\right) \tag{1}$$

The key parameter in the model: $\alpha = 0.23$.

CALIBRATION

- Set it so the model can reproduce cyclicality in spreads, a corporate bond rate –AAA or BAA– minus a money market rate – federal funds rate or Treasury bill rate
- Generate initial expansion (recession) of 1.16% (average deviation from HP-trend) by some shock. Solve model for b. Search for α that produces a spread of 1.65% for expansions and 2.8% for recessions (the average, corresponding $AAA - TBR$ spreads over 1960-2008)

ESTIMATION

$$\widehat{\omega}_t = \theta_b \widehat{b}_t - \theta_y \widehat{y}_t + u_t$$

- Output is measured by real GDP. The output gap uses HP–filtered output.
- Loans correspond to total loans at commercial banks
- Spread equation estimated using a variety of instruments for the output gap: real price of oil, fiscal variables (the growth rate in defense spending, the Ramey estimate of exogenous changes in government spending and the Forni and Gambetti measure of fiscal news shocks), etc.
- The elasticities are

$$\eta - 1 = \theta_b \qquad (2)$$

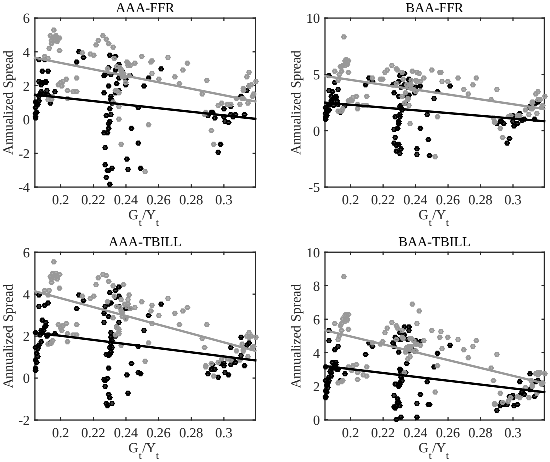
$$\alpha = \theta_y \qquad (3)$$

Table : IV Regressions of the spread

	AAA-FFR		BAA-FFR		AAA-TBILL		BAA-TBILL	
	(I)	(II)	(I)	(II)	(I)	(II)	(I)	(II)
η	0.01	5.04	1.45	5.76	1.01	4.84	2.06	5.54
	(0.69)	(1.69)	(0.58)	(1.39)	(0.56)	(1.30)	(0.49)	(1.13)
α	32.88	23.52	28.69	24.69	25.05	20.76	23.23	22.50
	(4.47)	(14.12)	(3.72)	(11.60)	(3.59)	(10.87)	(3.13)	(9.46)

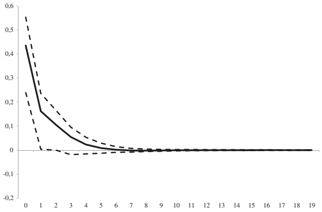
- Empirical evidence that fiscal policy has a disproportionate effect on spreads during recessions?
- Empirical evidence that size of multipliers varies with credit markets "tightness"
  1. Ferraresi et al [2014]: TVARS. Multipliers are large when spreads are large

Figure : Spreads and Government Expenditure

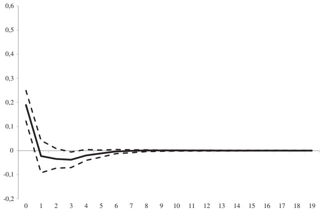


Note: Dark points expansions; light points mark contractions (HP filter)

Figure : Government Expenditure, Spreads and Multipliers



(a)



(b)

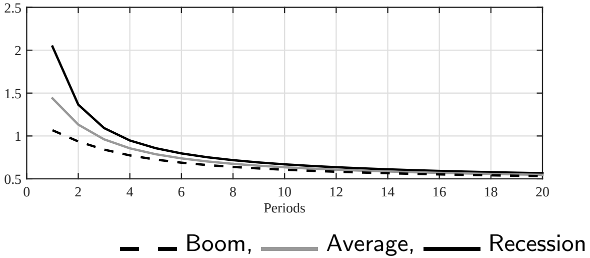
Note: (a) tight credit regime, (b) ordinary regime. Source: Ferraresi et al [2014] JAE.

Multiplier:

$$M_h^z(\xi_x) = \frac{\sum_{i=0}^{h}(z_{t+i}(\xi_x, g) - z_{t+i}(\xi_x))}{\sum_{i=0}^{h}(g_{t+i} - g^{\star})} \quad (4)$$

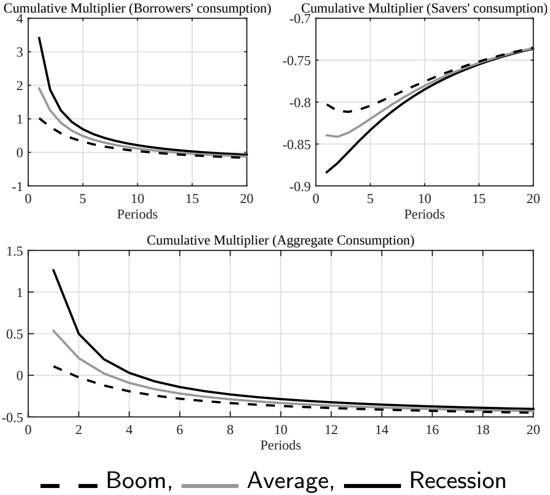
The main result

Figure : Output Multipliers (Benchmark Experiment)



The key channel: No crowding out of C

Figure : Consumption Multipliers (Benchmark Experiment)



Sensitivity of multipliers to

- The source of the business cycle
- The cyclicality of financial intermediation costs
    1. Replacing the output gap with an employment gap or a profits gap
    2. Other measures of the output gap: Flexible, efficient
    3. CRITICAL: Output gap must be sensitive to fiscal policy
- Debt vs tax finance of government spending. Former gives stronger output effects
- The size of the fiscal shock
- Amplitude of the business cycle

Sensitivity of multipliers to

- The conduct of monetary policy (strictness of inflation targeting)
  - More aggressive reaction of policy to inflation lowers the size of the multiplier
- The measure of the output gap in the monetary policy equation. It matters for the effectiveness of fiscal policy
  - More counter-cyclically variable gaps increase the size of the multiplier
- The degree of price rigidity: A non-monotone relationship
- The size of the steady state spread

Conclusions

- Cyclicality in financial frictions induces state dependence on fiscal multipliers
- Multipliers during recessions can significantly exceed unity
- Nominal aspects (monetary policy reactions, price rigidity) matter much for the effectiveness of fiscal policy (size of multiplier)

Figure : Output Multipliers (Balanced Budget)

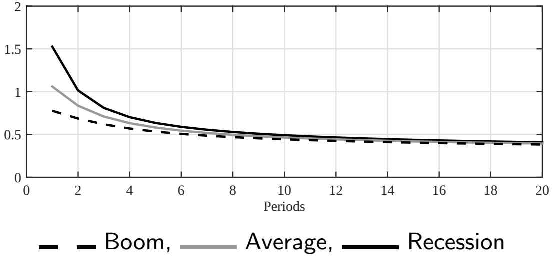


Figure : Output Multipliers: Size of Fiscal Shock

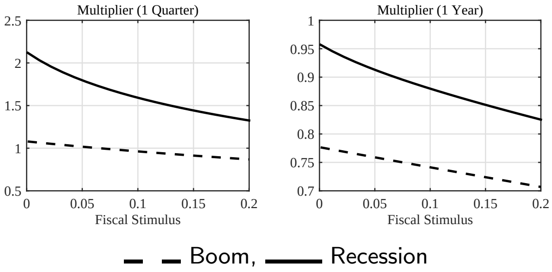


Figure : Multipliers and Monetary Policy (κ_π)

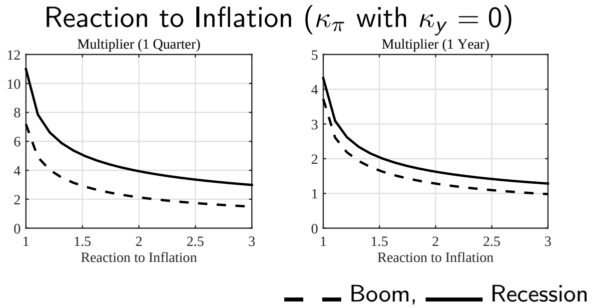


Figure : Multipliers: Degree of Nominal Rigidity

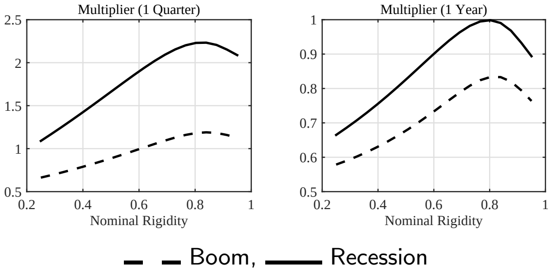


Figure : Multipliers: Size of Premium ($\omega^{\star}$)

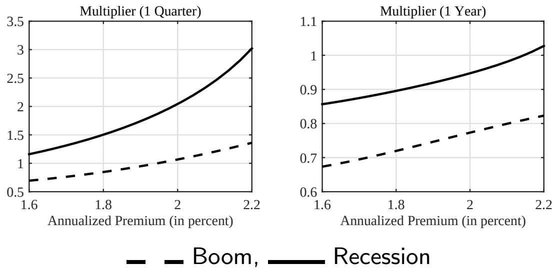


Table : Parameters

Parameter		Value
	Household	
Discount Factor	β	0.9874
Intertemporal Elasticity (Borrowers)	σ_b	12.2209
Intertemporal Elasticity (savers)	σ_s	2.4442
Inverse Frisch Labor Elasticity	ν	0.1048
Disutility of Labor Parameter (Borrowers)	ψ_b	1.1492
Disutility of Labor Parameter (Savers)	ψ_s	0.9439
Probability of Drawing Borrowers type	π_b	0.5000
Probability of Keeping Type	δ	0.9750
Debt Share	$b^\star/y^\star$	4×0.8
Preference Shock (Average, Borrowers)	$\log(\overline{\xi}_c^b)$	8.0133
Preference Shock (Average, Savers)	$\log(\overline{\xi}_c^s)$	0.8123
	Production	
Elasticity of Substitution between Goods	θ	7.6667
Inverse Labor Elasticity	$1/\varphi$	0.7500
	Financial Costs	
Elasticity of Loans	η	5.000
Output Gap (deviation from SS) Elasticity	α	23.0000
Constant	$\overline{\xi}_\Psi$	1.2720e-06
	Nominal Aspects	
Annual Premium (Gross)	$(1+\omega)^4$	1.0200
Degree of Nominal Rigidities	γ	0.6667
Persistence (Taylor Rule)	ρ_i	0.8000
Reaction to Inflation (Taylor Rule)	κ_π	1.5000
Reaction to Output Gap –deviation from SS– (Taylor Rule)	κ_y	0.0500
	Shocks	
Government Shock (Persistence)	ρ_g	0.9700
Government Share	$g^\star/y^\star$	0.2000
Persistence (Other shocks: x)	ρ_x	0.9500
Debt feedback	ϱ	0.0200