The Signaling Effects of Fiscal Announcements

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Signaling effects

- Established literature on the signaling effects in "**Monetary Policy**" (Melosi, 2017; Nakamura and Steinsson, 2018; Jarocinski and Karadi, 2020)
  - Central bank announcements provide powerful signals on the future of the economy
  - Signals influence the expectations of market participants

- No studies on the signaling effects in "**Fiscal Policy**"
  - Fiscal interventions transfer government's negative outlook to the private sector (e.g., A sizable fiscal packages are announced to weather a possible recession)

- **Our question**: Do fiscal announcements entail "signaling effects"?

Motivation and challenges

- Estimation of signalling effects in fiscal policy is inherently difficult
- Need to establish a benchmark with exogenous fiscal announcements that forego signalling effects
- Compare benchmark against fiscal announcements that might contain signalling effects
- Ideal announcements with signalling effects are those of *unanticipated* and *large* fiscal packages designed to *combat a recession* whose severity is largely *uncertain* at the time of the announcement

What we do

- Construct a novel dataset with narrative records from press releases about supplementary fiscal packages in Japan (2011-2020)
- Study the effect on fiscal announcements on daily stock prices using the local projection method
  - Exogenous fiscal announcements (benchmark)
  - Supplementary fiscal policy measures (signalling)
  - Chief role of macroeconomic uncertainty
- Develop a simple model with imperfect information and signalling effects to explain empirical evidence

Results

Empirical findings

- Announcements of exogenous fiscal spending positive effect on stock prices
- Announcements of supplementary budget negative or insignificant effect on stock prices
- Uncertainty critical to signaling effects

Theoretical findings

- The model shows expansionary fiscal announcements entail two opposing effects on the economy
  - *Demand stimulus* vs *signal of reduction in productivity*
- The strength of the signaling effect depends on the prior uncertainty, signal precision, degree of countercyclical fiscal policy, degree of nominal rigidities and risk aversion

Road map

- Empirical analysis
- Theoretical model
- Conclusion

Empical analysis

- **Data**
  - Novel dataset that uses narrative records on fiscal announcements
  - Sample period: January 2011 – December 2020
  - Sixteen supplementary fiscal announcements for 2011 to 2020 supplementary budget
    - ★ The timing of news releases is identified by reading *Nikkei* newspaper
    - ★ Critical news: release of the size of fiscal intervention
  - Daily returns of Nikkei225 average
  - Uncertainty index: Nikkei Volatility Index (Nikkei VI)

Supplementary fiscal stimulus packages

◂ empirical analysis

Ratification (1)	Type of fiscal packages (2)	Fiscal spending (3)	News release (4)	Indicator (5)
(a) Reconstruction from earthquake and nuclear disaster				
22/04/2011	First supplementary budget	4 trillion	09/04/2011	$\mathbb{I}\{A^{\text{final}}_{1,t}\}$
05/07/2011	Second supplementary budget	2 trillion	25/06/2011	$\mathbb{I}\{A^{\text{final}}_{2,t}\}$
21/10/2011	Third supplementary budget	12.1 trillion	15/10/2011	$\mathbb{I}\{A^{\text{final}}_{3,t}\}$
(b) Against yen appreciation and earthquake reconstruction				
26/10/2012	First economic measures	422.6 billion	25/10/2012	$\mathbb{I}\{A^{\text{final}}_{4,t}\}$
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(c) Abenomics policies				
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Preliminary evidence: exogenous vs supplementary fiscal announcements

(a) Exogenous fiscal spending (b) Supplementary budgets

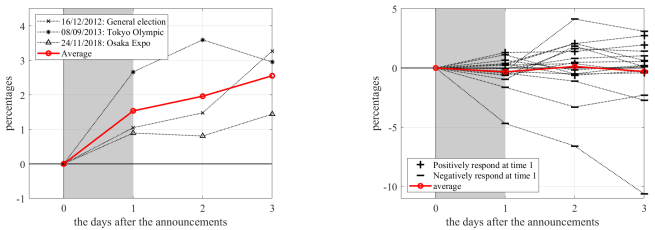


Figure 1: Response of stock prices to fiscal announcement

Exogenous fiscal events in Figure 1a

- Abe wins the General Election: Dec. 16, 2012.
- Host the Tokyo Olympic: Sep. 8, 2013
- Host the Universal Exposition in Osaka: Nov. 24, 2018

Estimation model

$$\sum_{j=0}^{h} \Delta s_{t+j} = \alpha_h \mathbb{I}\{A_t^{\text{final}}\} + \underline{\beta_h \mathbb{I}\{A_t^{\text{final}}\} \times VI_t} + Z_{t-1}\gamma' + \delta_h + e_{t+h} \quad (1)$$

- $\sum_{j=0}^{h} \Delta s_{t+j}$: the cumulative response of the change in stock prices for the horizons h
- $\mathbb{I}\{A_t^{\text{final}}\}$: an indicator variable of the fiscal announcements
- VI_t: normalized so as to have zero mean and unit variance
- Z_{t-1}: ΔVI_{t-1}, $\Delta DJIA_{t-1}$, $\Delta spread^{sl}_{t-1}$, $\Delta spread\_yield_{t-1}$, $\Delta neer_{t-1}$, Δs_{t-1}
- $\alpha_h + \beta_h \cdot VI_t$: the cumulative response of stock prices at time $t + h$

Impact effects of fiscal announcements on stock prices

▸ Impulse responses

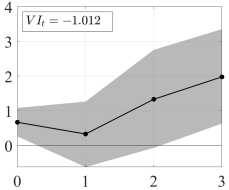
VARIABLES	Δs_t		
	(1)	(2)	(3)
$\mathbb{I}\{A_t\}$	0.002	−0.308	−0.081
	(0.228)	(0.322)	(0.292)
$\mathbb{I}\{A_t\} * VI_t$	−0.660**		−0.070
	(0.330)		(0.322)
Control	yes	yes	no
Interaction term	yes	no	yes
Observations	2,445	2,445	2,445
Adj. R-squared	0.210	0.208	-0.000

Notes: Newey-West HAC standard errors are in parentheses. The 1%, 5% and 10% significant levels are denoted by $***$, $**$ and $*$, respectively.

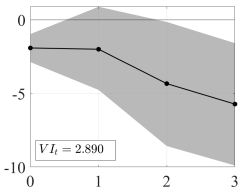
Resp. of stock prices: COVID-19 emergency period

estimation results

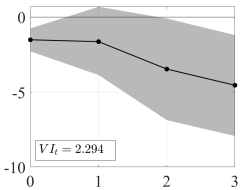
(a) Feb.14, 2020



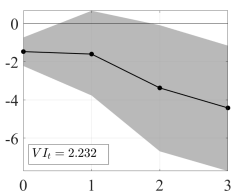
(b) Mar.22, 2020



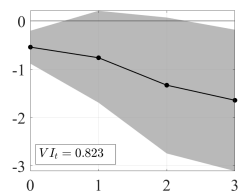
(c) Apr.7, 2020



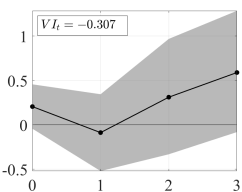
(d) Apr.16, 2020



(e) May 27, 2020



(f) Dec. 9, 2020

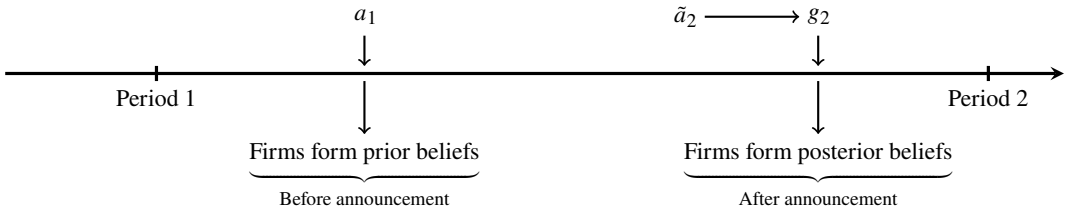


Model

Sketch of the model

- Two period model
- Agents: private sector, benevolent government (countercyclical policy)
- Sticky prices (future productivity important for profits)
- Imperfect information on a_2
- Govt receives signal on a_2 and announces g_2
- Private sector uses the announcement to update beliefs on a_2
- Stock prices depends on beliefs about a_2

Imperfect information and beliefs



1. Private sector observes productivity a_1 and forms prior belief on a_2
2. Government receives a noisy signal on a_2, sets g_2 and announces it
3. Private sector updates their posterior beliefs on productivity for period 2

Information structure

Prior belief on productivity

$$a_2 = a_1 + u, u \sim N(0, \sigma_u^2) \tag{2}$$

$(\sigma_u^2)^{-1}$: prior confidence of private agents in their own belief

Noisy signal received by government

$$\tilde{a}_2 = a_2 + v, v \sim N(0, \sigma_v^2) \tag{3}$$

$(\sigma_v^2)^{-1}$: precision of the information received by the government

- Government sets the spending plan for period 2 based on the received signal
- Private sector can recover the signal received by government from public announcement

Information structure (cont'd)

Posterior distribution of beliefs on period 2's productivity

$$a_2 \mid g_2 \sim N(\hat{a}_2, \hat{\sigma}^2) \tag{4}$$

where

$$\hat{a}_2 = \frac{\hat{\sigma}^2}{\sigma_u^2} a_1 + \frac{\hat{\sigma}^2}{\sigma_v^2} \tilde{a}_2, \text{ and } \hat{\sigma}^2 = \left(\frac{1}{\sigma_u^2} + \frac{1}{\sigma_v^2} \right)^{-1}$$

Proposition 1

Given the fiscal announcement (g_2), the expected level of productivity in period 2 ($\hat{a}_2$) increases with the signal of productivity received by the fiscal authority ($\tilde{a}_2$) and it decreases with the confidence of private agents in their own beliefs ($1/\sigma_u^2$).

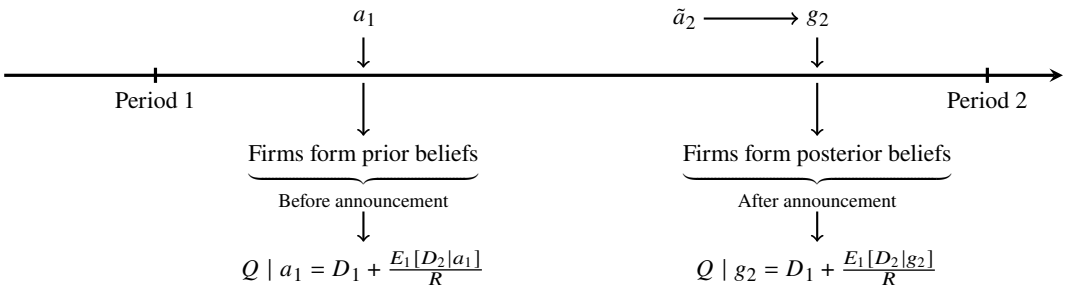
Countercyclical fiscal policy rule

$$\left(\frac{g_t}{g_{ss}}\right) = \left(e^{\tilde{a}_t}\right)^{\psi}, \ \psi < 0 \tag{5}$$

- Government spending for period 2 is set based on the noisy signal $\tilde{a}_2$ in period 1
- Assume that fiscal authority adopts counter-cyclical fiscal rule by setting $\psi < 0$
- ψ: the strength in counter-cyclical fiscal policy

▸ households & firms

Stock prices change to reflect the announcement



- Derive analytical properties
  - Log-linearizing the system around the stationary steady state

Signaling effect

Proposition 2

The response of dividends in period 2 ($\hat{D}_2^g$) and stock prices in period 1 ($\hat{Q}^g$) to the announcement of government spending for period 2 ($\hat{g}_2$) are equal to:

$$\hat{D}_2 = \frac{1}{\Psi}\left\{\kappa^{No\ Signal} + \kappa^{Signal}\right\}\hat{g}_2, \tag{6}$$

$$\hat{Q} = \frac{\beta}{1+\beta}\hat{D}_2, \tag{7}$$

where:

$$\Psi = \{\varepsilon + (1-\varepsilon)\alpha\}\{(1-\theta)(1-\alpha)(1-\zeta) + \alpha\gamma\} > 0, \tag{8}$$

$$\kappa^{No\ Signal} = \gamma\theta\{(1-\alpha)(1-\zeta)\varepsilon + \alpha\} > 0, \tag{9}$$

$$\kappa^{Signal} = [(1-\theta)(1-\zeta)\{\varepsilon + (1-\varepsilon)\alpha\} + \gamma\{(\varepsilon-1)\alpha - \varepsilon(1-\zeta)\}] \cdot \frac{\omega}{(1+\omega)\psi} \gtreqless 0, \tag{10}$$

and $\omega = \sigma_u^2/\sigma_v^2$ is the prior uncertainty of the private sector relative the imprecision of the signal received by the government.

Strength of the signaling effect

Proposition 3

The (negative) signaling effects of fiscal policy on stock prices ***increase*** *with:*

(i) *the prior uncertainty of agents for a given precision of the information received by the government* ($\omega = \sigma_u^2/\sigma_v^2$), *and*

(ii) *the cyclicality in the systematic response of fiscal policy* (ψ).

Lemma 1

The signaling effects of fiscal policy increase in the degree of nominal rigidities (ζ) *and risk aversion* (γ).

Two opposing effects of fiscal announcement

$$\underbrace{\text{Expansionary effect}}_{\text{Increase in demand}(\kappa_g^{\text{no signal}})} \quad \text{v.s.} \quad \underbrace{\text{Contractionary effect}}_{\text{Signal of reduction in productivity}(\kappa_g^{\text{signal}})}$$

- The strength of the signaling effects is determined by

1. prior uncertainty of agents and precision of information received by the government
2. the counter-cyclicality of fiscal policy rule
3. price rigidities and risk aversion

▸ prior uncertainty & countercyclicality ▸ price riditities & risk aversion

Conclusion

Results

- We find evidence of signaling effect linked with uncertainty
- Empirical results consistent with a simple model of imperfect information

Future work

- Is signaling effect important for alternative fiscal tools (debt, taxes) and what's the role of credibility?
- Is communication important for the signaling effect? Can strategic communication alleviate signaling effects?

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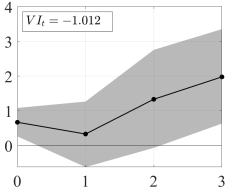

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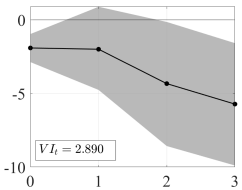

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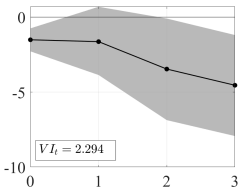

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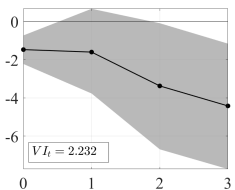

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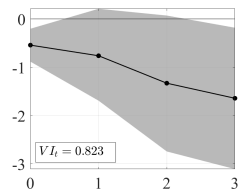

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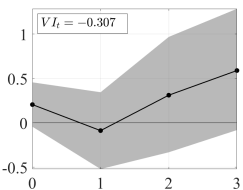


Households and Firms

- Households

$$E_1\left[\left\{\frac{c_1^{1-\gamma}}{1-\gamma}-\chi n_1\right\}+\beta\left\{\frac{c_2^{1-\gamma}}{1-\gamma}-\chi n_2\right\}\right]$$

s.t.

$$P_1c_1+\frac{P_2c_2}{R_1}=W_1n_1+\frac{W_2n_2}{R_1}+D_1+\frac{D_2}{R_1}-P_1\tau_1-\frac{P_2\tau_2}{R_1}.$$

- Production functions

- Final good firm

$$y_t=\left(\int_0^1 y_t(j)^{\frac{\epsilon-1}{\epsilon}}dj\right)^{\frac{\epsilon}{\epsilon-1}}.$$

- Intermediate goods firms

$$y_t(j)=\exp\{a_t\}n_t(j)^{\alpha}.$$

◂ Gov. rule

Price setting

- $P_2(j)$ is set at $t=1$ before observing a_2.
- $1-\zeta$ of the firm can reset the price optimally.

- Profit maximization problem

$$\max_{P_2^*(j)} E_1\left[(1/c_2)\left\{P_2^*(j)y_2(j)-W_2n_2(j)\right\}\right],$$

s.t.

$$y_t(j)=\left(\frac{P_t(j)}{P_t}\right)^{-\varepsilon}y_t.$$

→ Optimal price

$$P_2^*=\frac{\epsilon}{\epsilon-1}E_1\frac{W_2}{\alpha\exp\{a_2\}n_2^{\alpha-1}}.$$

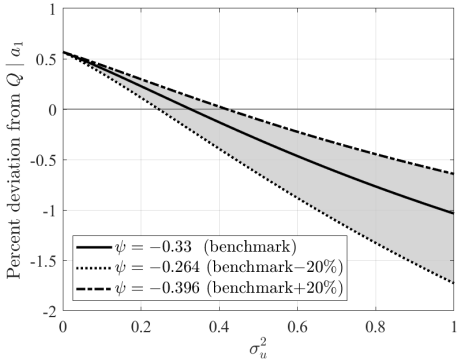
→ Aggregate price

$$P_2^{1-\varepsilon}=\zeta P_1^{1-\varepsilon}+(1-\zeta)(P_2^*)^{1-\varepsilon}.$$

Stock prices and prior uncertainty: $P_1 = 1$ and $\sigma_v^2 = 1$

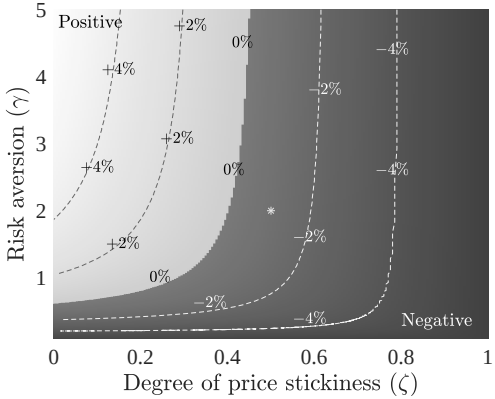
analytical results

5% increase in government spending: $(g_2/g_{ss} = 1.05)$



Signaling effects, risk aversion and price stickiness: $\sigma_u^2 = 1$

analytical results



- The combination of ζ and γ in the dark-shaded area generate negative signaling effects on stock prices