Estimating Fiscal Multipliers: An SVAR Approach

Gavin Engelstad Samina Stack

Fall 2024

Stat 451: Causal Inference

Big Picture

How does fiscal policy affect overall output in the US?

Background

Fiscal Policy

Fiscal policy is one of the two main tools for policymakers to affect the economy

- Taxes ⇒ Lower Output (Barro and Redlick 2011)
- Spending ⇒ Higher Output (Blanchard and Leigh 2013)

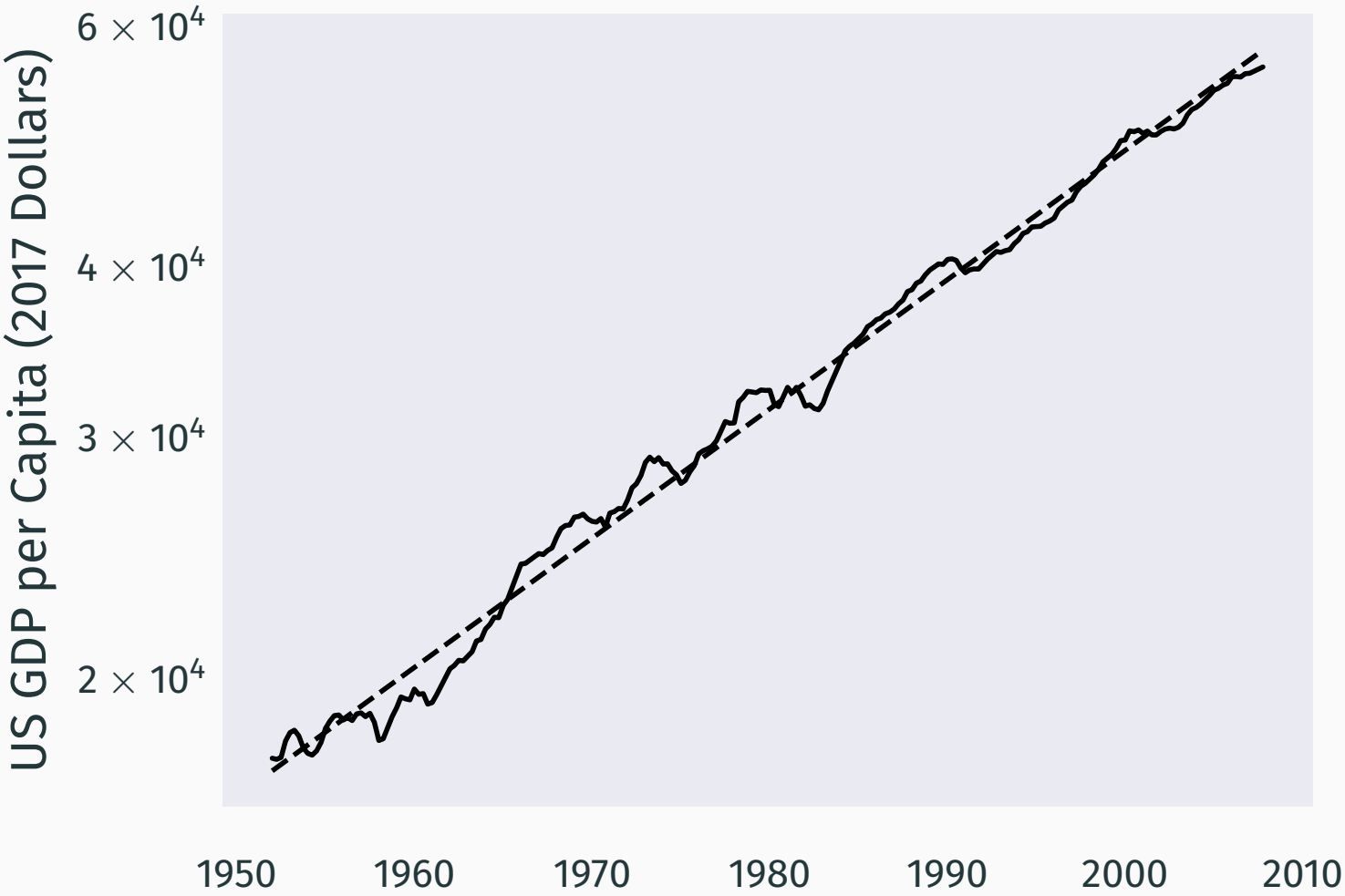
The fiscal multiplier is the magnitude of the effect of fiscal policy

Keynesian Multiplier $1 increase in spending ⇒ >$1 increase in output (Barro and Redlick 2011)

Crowding Out $1 increase in spending ⇒ <$1 increase in output (Baum 2012)

Empirical Strategy

Growth vs. Business Cycle Effects



We're interested in understanding Business Cycles

Vector Autoregression (1/2)

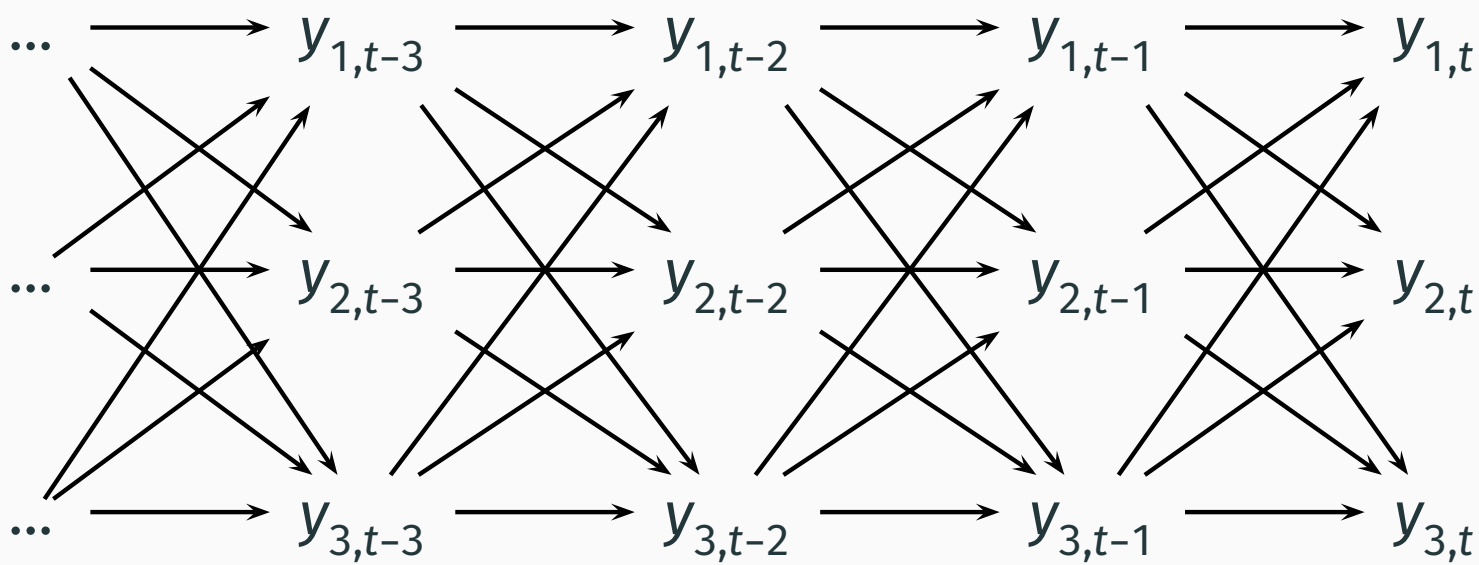
Model a vector of outputs as an autoregressive process

$$Y_t = \sum_{\ell=1}^{p} B_\ell Y_{t-\ell} + u_t$$

Where:

- Y_t Vector of Outputs
- B_ℓ Coefficient Matrix
- u_t Vector of Errors

Vector Autoregression (2/2)



Causal Inference (1/2)

Variance covariance matrix of u_t is symmetric and dense

VARs measure correlations, not causation (Nakamura and Steinsson 2018)

Ex: Measured effect of interest rate on GDP could be:

- The interest rate responding to forecasts about GDP
- GDP actually responding to the interest rate

Causal Inference (2/2)

A structural shock is an exogenous shock to one of the variables in the model

Could be caused by

- International events
- Other series movements
- ...

The effect of a structural shock to a variable is the causal effect of changes in that variable

Structural VAR (1/2)

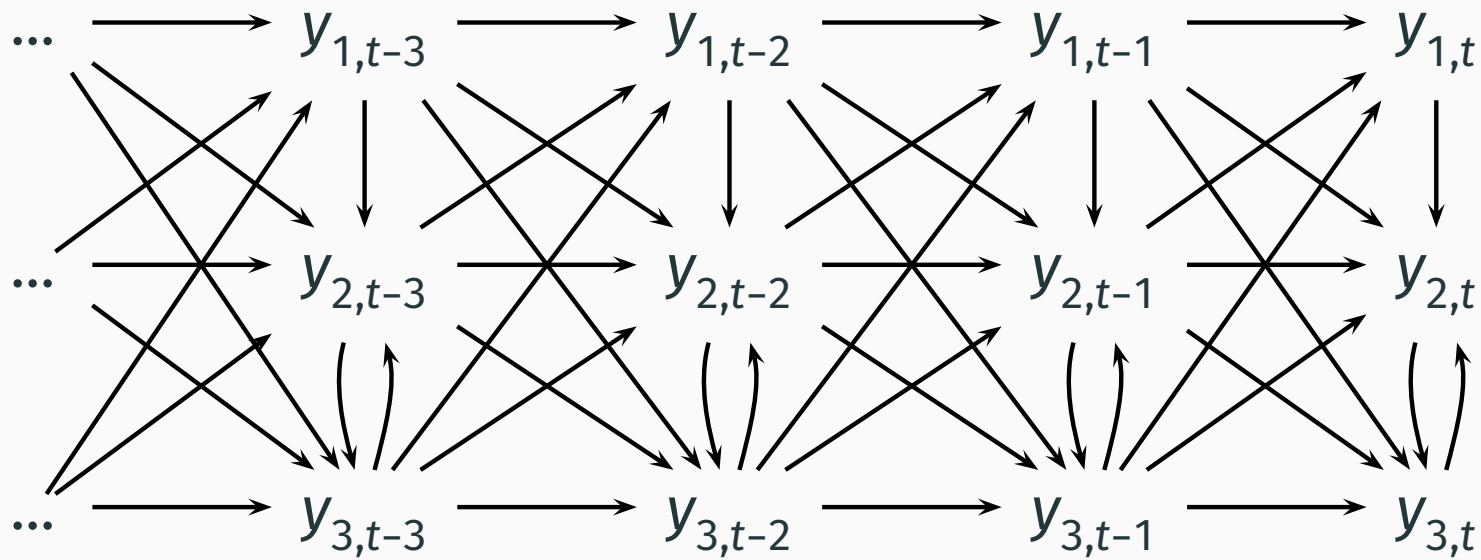
Add a contemporaneous relationship to the VAR

$$A_0 Y_t = \sum_{\ell=1}^{p} A_\ell Y_{t-\ell} + \varepsilon_t$$

Where:

- Y_t Vector of Outputs
- A_ℓ Coefficient Matrix
- ε_t Vector of Structural Errors (Var Cov Matrix I_n)

Structural VAR (2/2)



Our Model (1/2)

Estimate the order 4 VAR

$$Y_t = \sum_{\ell=1}^{p} B_\ell Y_{t-\ell} + u_t$$

Where Y_t is the vector of

- GDP (x_t)
- Government Spending (g_t)
- Government Revenue (t_t)

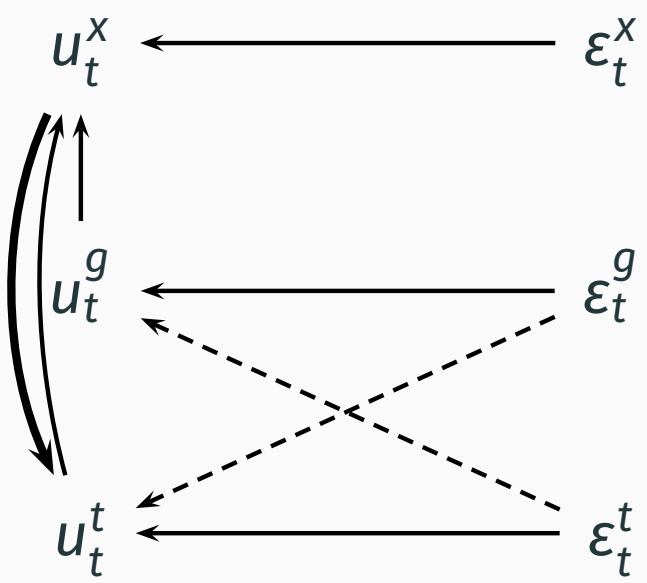
Our Model (2/2)

Structural relationship:

$$u_t^x = a_1 u_t^g + a_2 u_t^t + \varepsilon_t^x$$
$$u_t^g = b_1 u_t^x + b_2 \varepsilon_t^t + \varepsilon_t^g$$
$$u_t^t = c_1 u_t^x + c_2 \varepsilon_t^g + \varepsilon_t^t$$

Assume:

- $b_1 = 0$, Government response is delayed
- $c_1 = 1.7$, Lutz and Follette (2010)
- b_2 or $c_2 = 0$, identification restriction



(Blanchard and Perotti 2002)

Data

Data (1/2)

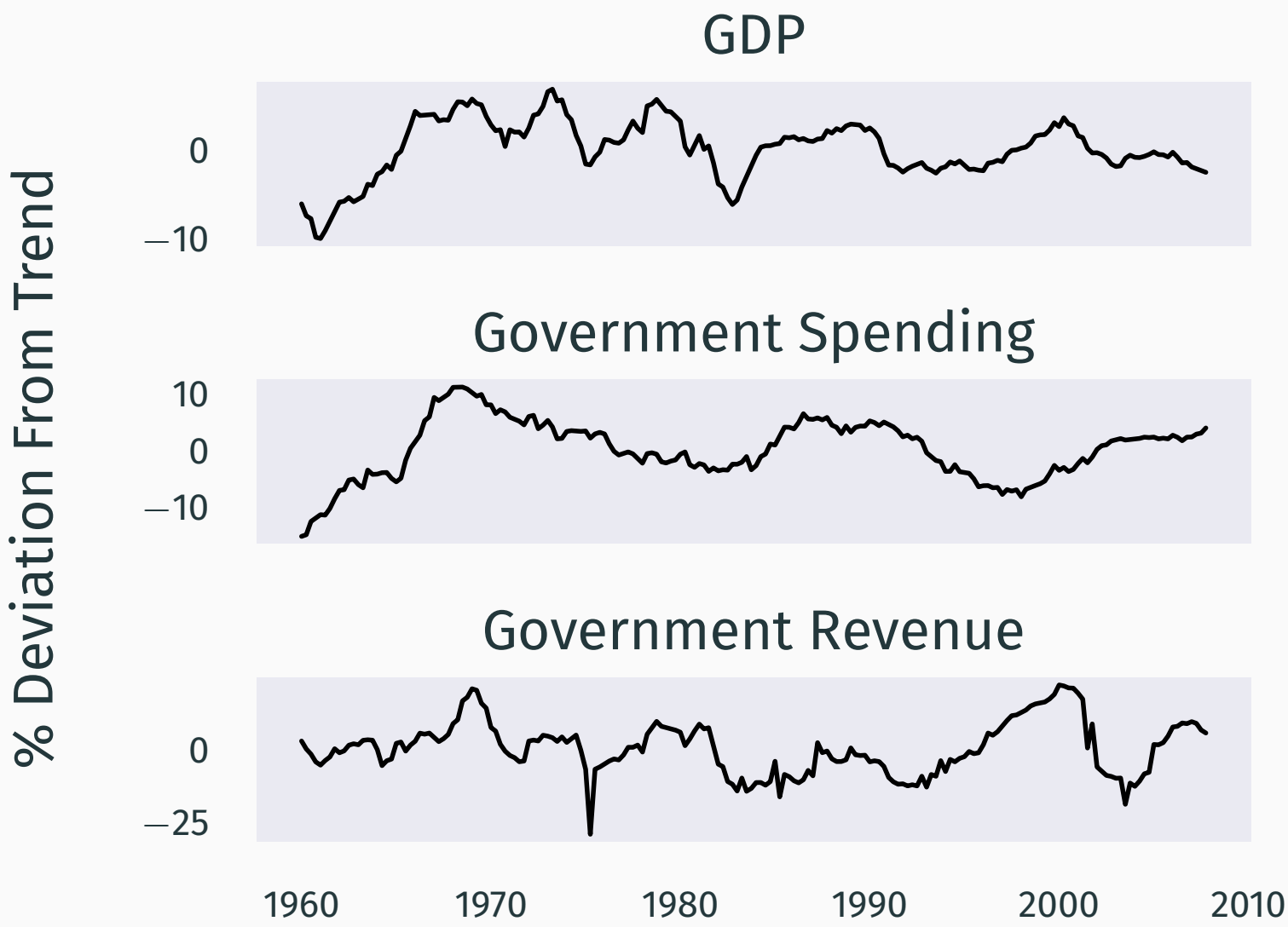
Get data on GDP, Government Spending, and Tax Revenues from FRED between 1960 and 2007

Then we:

Inflation Adjust Divide by GDP deflator

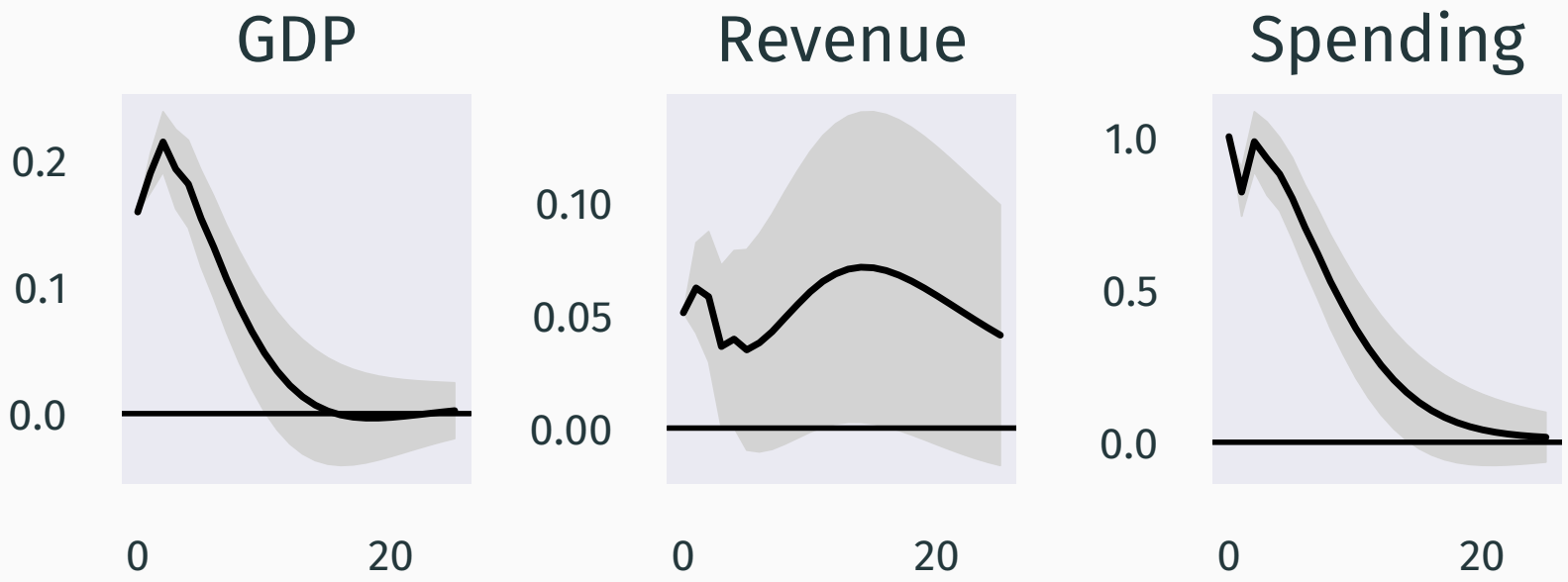
Detrend Get business cycle effects

Data (2/2)


GDP
Government Spending
Government Revenue
% Deviation From Trend
0
−10
10
0
−10
0
−25
1960
1970
1980
1990
2000
2010

Results

IRFs



▸ Coefficients

Multiplier

Take the maximum increase in GDP following the structural shock

Adjust for relative size of GDP and government spending

Estimate multiplier is

$$1.035$$

$$(0.115)$$

Robustness

Results are robust to

- Setting $b_2 = 0$ ▸ Setting $b_2 = 0$
- Different responsiveness of revenue to GDP ▸ Changing c_1
- Using a different number of lags ▸ VAR Order
- Allowing the effect to change over time ▸ Time Trends

Conclusion

Conclusion

Using an SVAR, we estimated the fiscal multiplier for the US economy

Found fiscal spending has approximately a 1-1 effect

Limitations:

- Structural assumptions
- Simplistic linear detrending
- Revenue-side effects

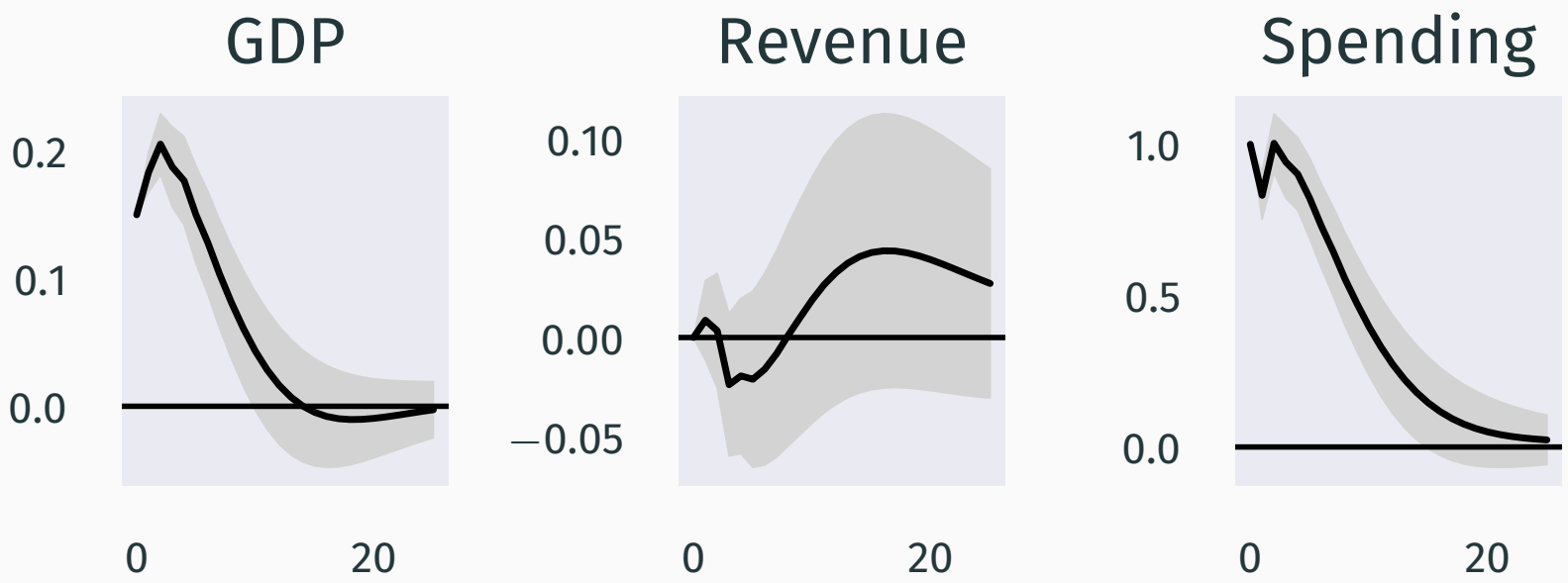
Questions?

Coefficients

Parameter	a_1	a_2	c_2
Estimate	-0.182	-0.150	0.040

Back

Setting $b_2 = 0$



Multiplier: **0.990 (0.115)**

Back

Changing c_1

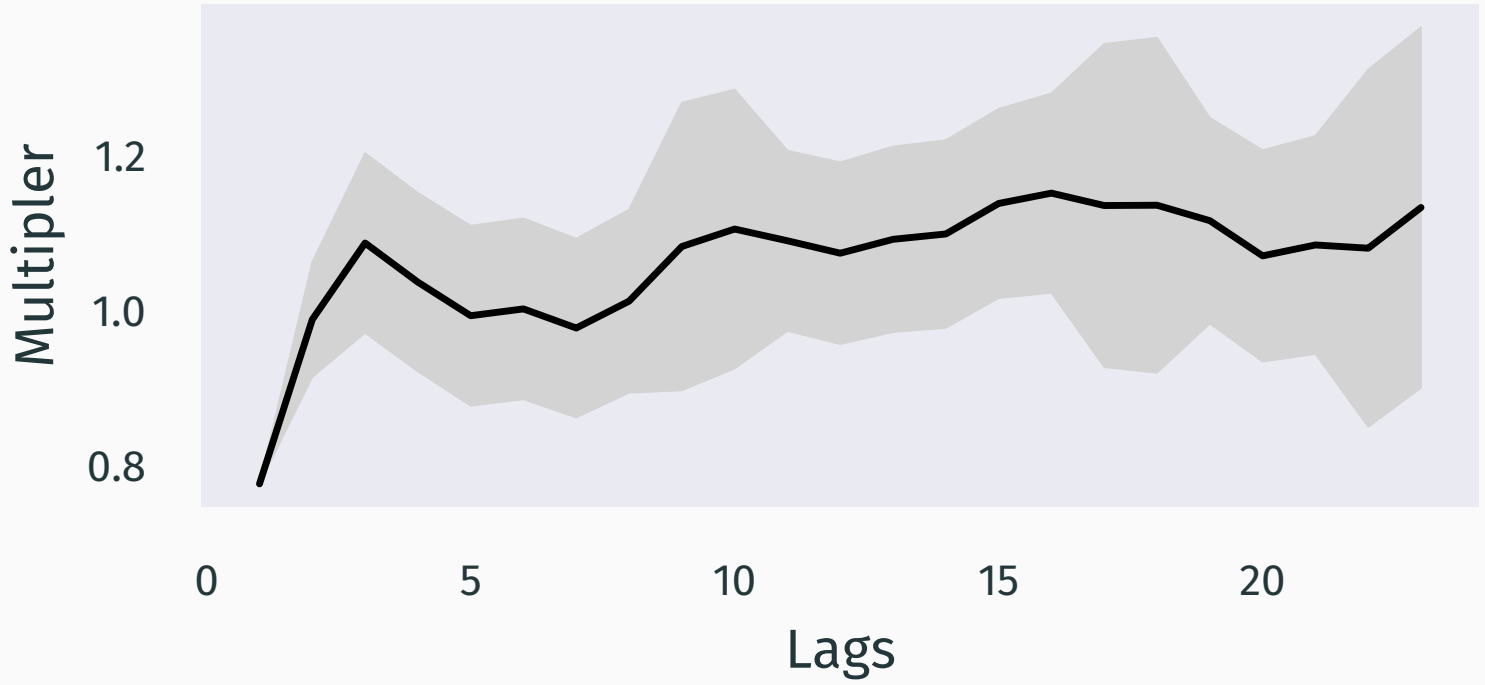
Follow Blanchard and Perotti (2002), set $c_1 = 2.08$

Parameter			Mutiplier		
a_1	a_2	c_2	Value	Std. Er.	Time
-0.182	-0.150	0.040	1.126	0.115	2

▸ Back

Different VAR Orders

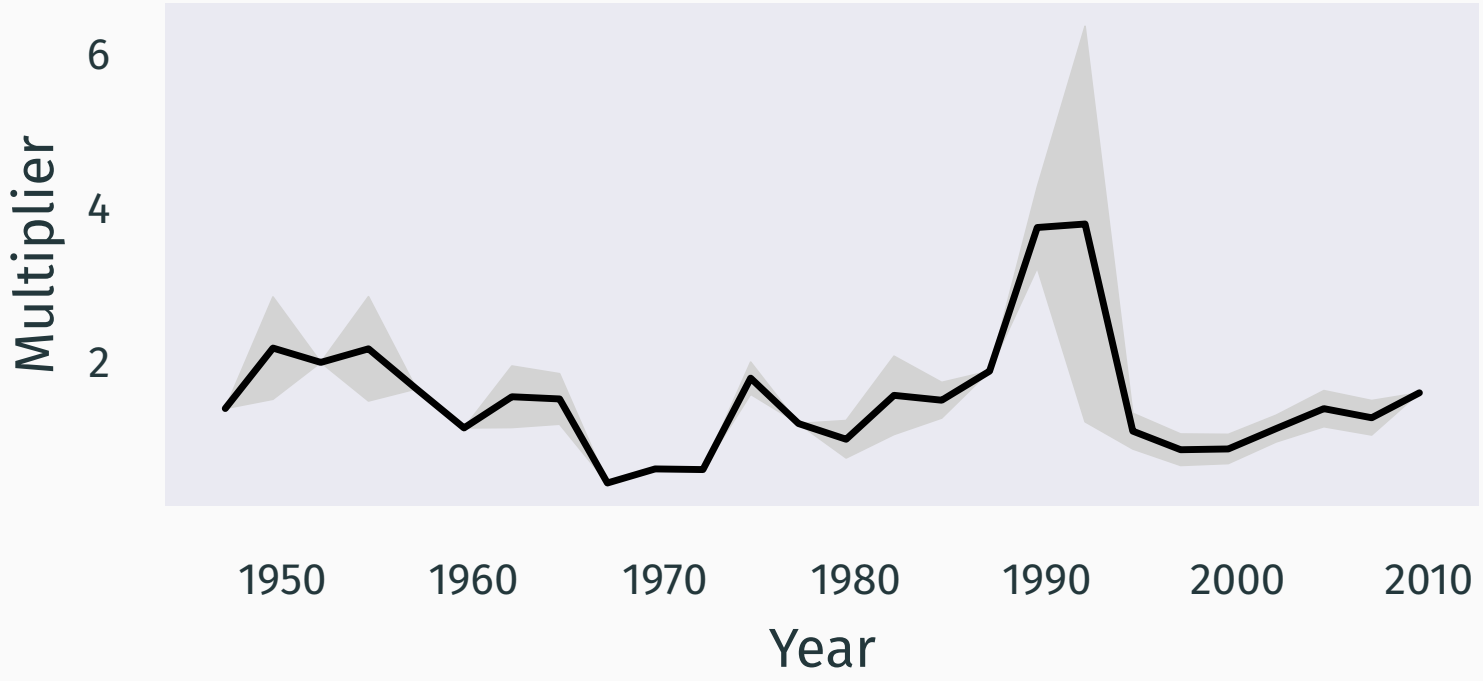
Estimate multiplier using VAR with order 1-24 (1 Quarter - 6 Years)



Back

Time Trends

Estimate multiplier within 10 year rolling windows



Back

References i

Barro, Robert J, and Charles J Redlick. 2011. "Macroeconomic effects from government purchases and taxes." *The Quarterly Journal of Economics* 126 (1): 51–102.

Baum, A. 2012. *Fiscal Multipliers and the State of the Economy*. Number.

Blanchard, Olivier, and Roberto Perotti. 2002. "An empirical characterization of the dynamic effects of changes in government spending and taxes on output." *the Quarterly Journal of economics* 117 (4): 1329–1368.

References ii

Blanchard, Olivier J, and Daniel Leigh. 2013. “Growth forecast errors and fiscal multipliers.” *American Economic Review* 103 (3): 117–120.

Lutz, Byron F, and Glenn R Follette. 2010. “Fiscal policy in the United States: Automatic stabilizers, discretionary fiscal policy actions, and the economy.” *Discretionary Fiscal Policy Actions, and the Economy (June 28, 2010).*

Nakamura, Emi, and Jón Steinsson. 2018. “Identification in macroeconomics.” *Journal of Economic Perspectives* 32 (3): 59–86.