Fiscal Policy Uncertainty and Its Macroeconomic Consequences

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Purpose 1: Quantify Fiscal Uncertainty

Existing Contributions

- Time-varying volatility of a DSGE fiscal shock:
  Fernández-Villiverde et. al. (2011), Born and Pfeifer (2011).
- Index based on newspaper headlines and other real world stuff:
  Baker et. al. (2013)

Present Paper

- Every period, agents estimate regressions describing fiscal policy behavior.
- Not unlike early sections of Fernández-Villiverde et. al. (2011), Born and Pfeifer (2011).
- Forecast uncertainty: Fiscal policy uncertainty should be related to the variance of forecasts.

Purpose 2: Estimate Macroeconomic Consequences

Fiscal Policy Variables

1. Government Spending
2. Tax Revenue
3. Net Transfers
4. Government Debt

- *Construct an uncertainty measure for each.*
- *Construct an index for overall fiscal uncertainty*

Impact on Macroeconomy

Incorporate measures of fiscal uncertainty in ARDL models for:

1. Consumption
2. Investment
3. Real GDP
4. Employment
5. Unemployment
6. Inflation

Fiscal Uncertainty Reduces Economic Activity

- General measure for fiscal uncertainty associated with:
  - lower real GDP,
  - lower consumption,
  - lower investment.
- Uncertainty regarding specific fiscal variables
  - Government expenditures, transfer payments, and government debt associated with reductions in employment / increases in unemployment
  - Tax uncertainty associated with increases in investment and real GDP
- General fiscal uncertainty significant drag during the Great Recession:
  - Responsible for a 1% to 3% decrease in real GDP
  - Decreased consumption by about 1% of real GDP
  - Decreased investment by about 1% of real GDP

Constant gain learning mechanism

- Every period, run a least-squares regression for each fiscal policy variable, using data from previous periods.
- Weighted least squares - more recent observations have more weight.
- Regression predicted value serves as expected fiscal policy.
- Root (weighted) mean squared error serves as *fiscal policy uncertainty*.

Ideal situations for constant gain learning

- Precedence of structural changes
- No a-priori knowledge on menu or evolution of structural changes and probability distributions
- Forecasting rule, but no knowledge of parameter values, or the structure of the whole economy.

Four regressions

Fiscal policy variables: $f_t = [g_t \ r_t \ n_t \ b_t]$
Govt Spending (g_t), Tax Revenue (r_t),
Net Transfers (n_t), Government Debt / GDP (b_t)

Regression equation:

$$f_{i,t} = \alpha_{t,0} + \alpha'_{t,f} f_{t-1} + \alpha_{t,y} y_t + \alpha_{t,c} c_t + \alpha_{I,t} I_t + \alpha_{t,u} u_t + \epsilon_t$$

Empirical Model for Fiscal Policy Behavior

Each fiscal policy variable ($f_{i,t}$) responds to:

- Lag of all fiscal policy variables (f_{t-1}).
- Above includes lag of government debt (b_{t-1}).
- Macro outcomes: real GDP (y_t), consumption (c_t), investment (I_t), and unemployment (u_t).
- All quantities real, per capita, ratio of past real GDP.

Understanding Fiscal Policy

$$\hat{\alpha}_t = \left(\sum_{\tau=0}^{t} w_\tau X_\tau X_\tau' \right)^{-1} \left(\sum_{\tau=0}^{t} w_\tau X_\tau' f_{i,\tau} \right)$$

- Time t expected fiscal action: $E_t^* f_{i,t} = X_t' \hat{\alpha}_{t-1}$
- Information set includes *past fiscal behavior* and *current macro conditions*.
- Unexplained policy: $\hat{\epsilon}_t = f_{i,t} - X_t' \hat{\alpha}_{t-1}$

Constant Gain Learning

- Weight on $t - \tau$ observation: $\omega_\tau = (1 - \gamma)\gamma^\tau$.
- **Learning gain**, $\gamma \in (0, 1)$, is constant weight assigned to most recent observation.
- $\gamma \approx 0.02$ (Milani (2008), Slobodyan and Wouters (2008)).

Endogeneity Problem

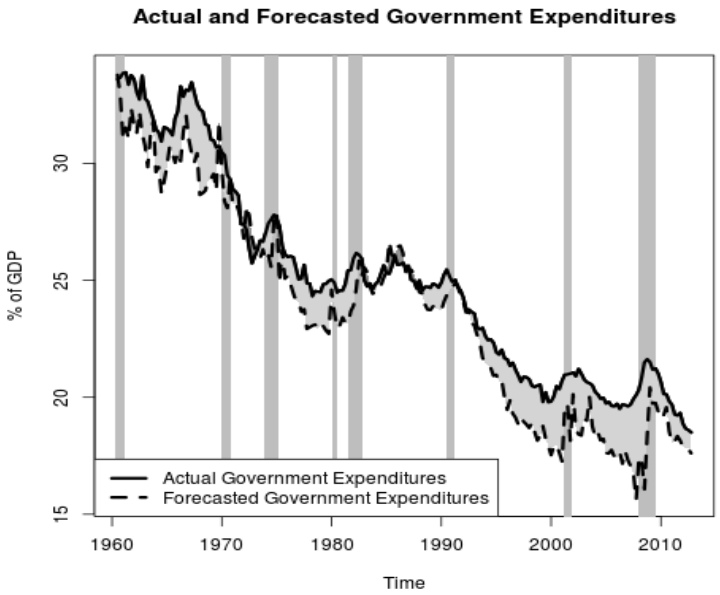
- Macro outcomes (real GDP, consumption, investment, and unemployment) are likely endogenous.
- Use instruments: lags of macro outcomes and fiscal variables
- Two-stage least squares - using constant gain weighting procedure above.

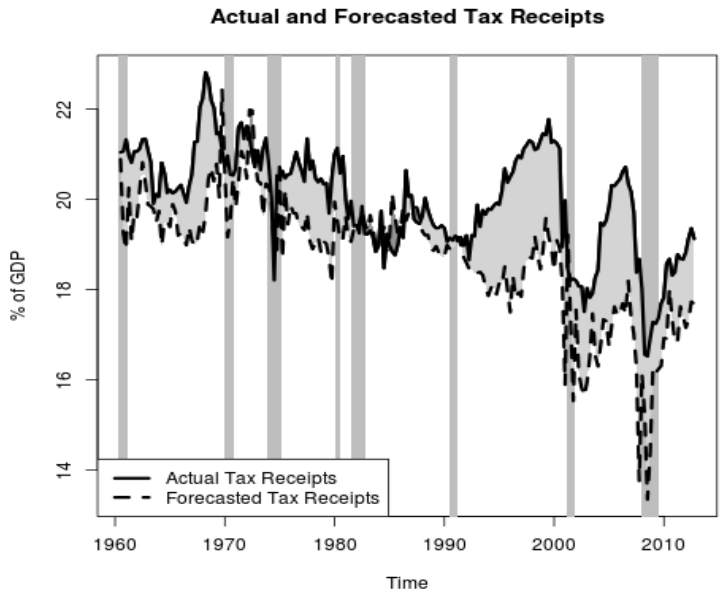
Fiscal Uncertainty

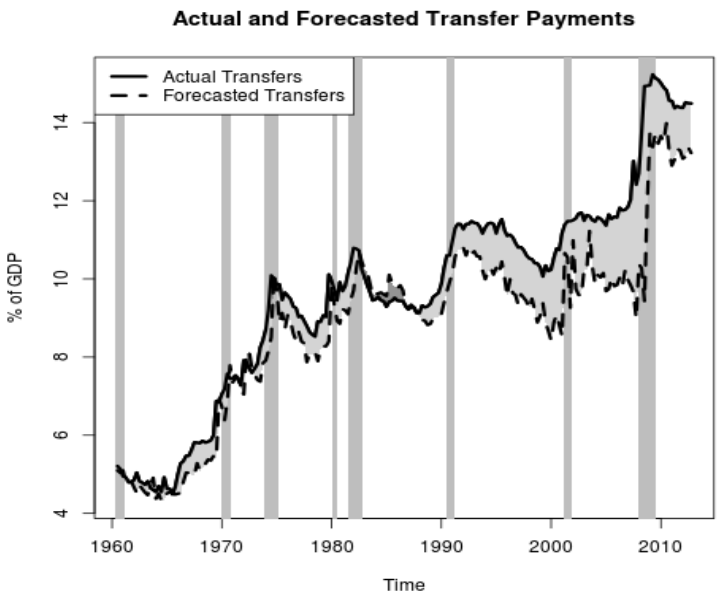
Unexplained fiscal policy: $\epsilon_{i,t} = f_{i,t} - \hat{\alpha}^{IV'}_{i,t-1} X_t$
Fiscal Uncertainty given by Root (weighted) mean squared error:

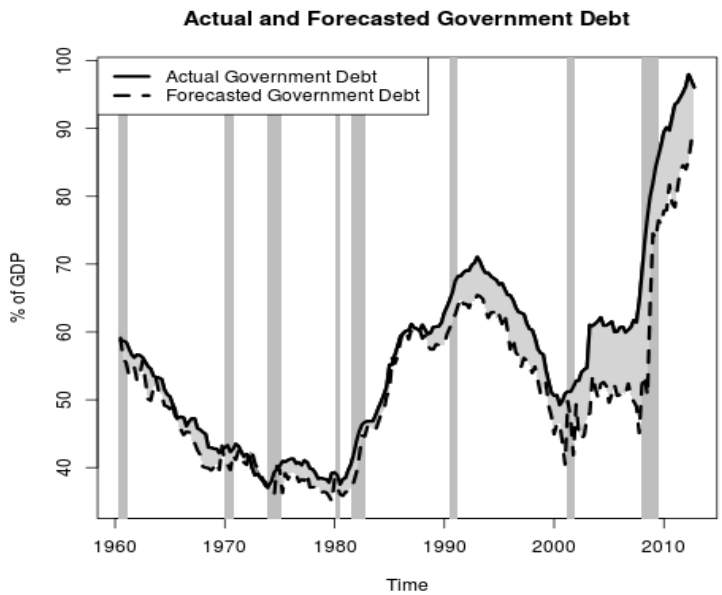
$$m^{IV}_{i,t} = \sqrt{(1-\gamma)\sum_{\tau=1}^{t} \gamma^{\tau} \epsilon^2_{i,t}}$$

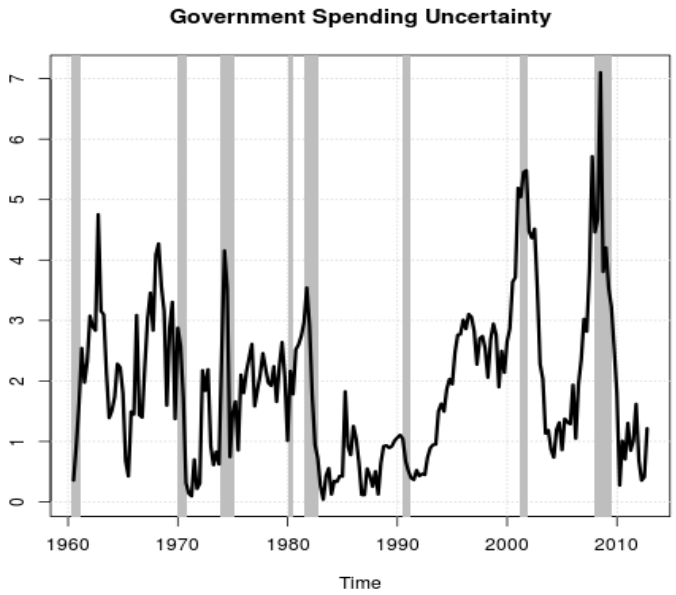
Fiscal Policy - Actual and Predicted

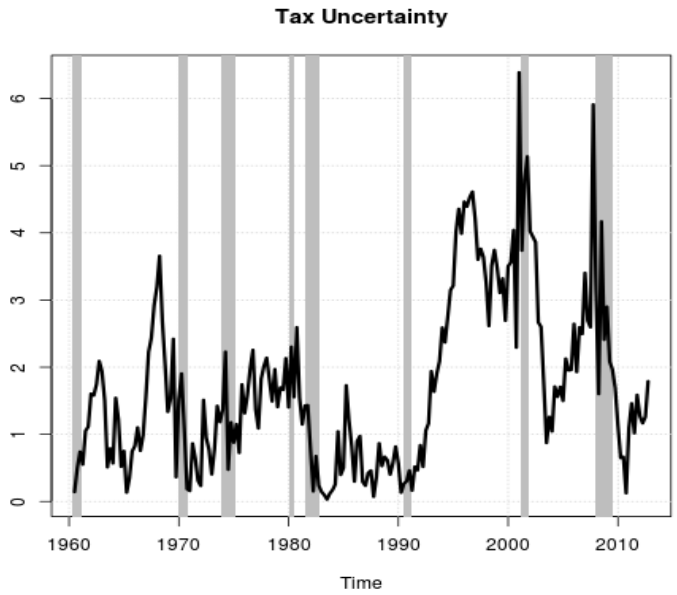









Government Spending Uncertainty
0
1
2
3
4
5
6
7
1960
1970
1980
1990
2000
2010
Time


Tax Uncertainty
0
1
2
3
4
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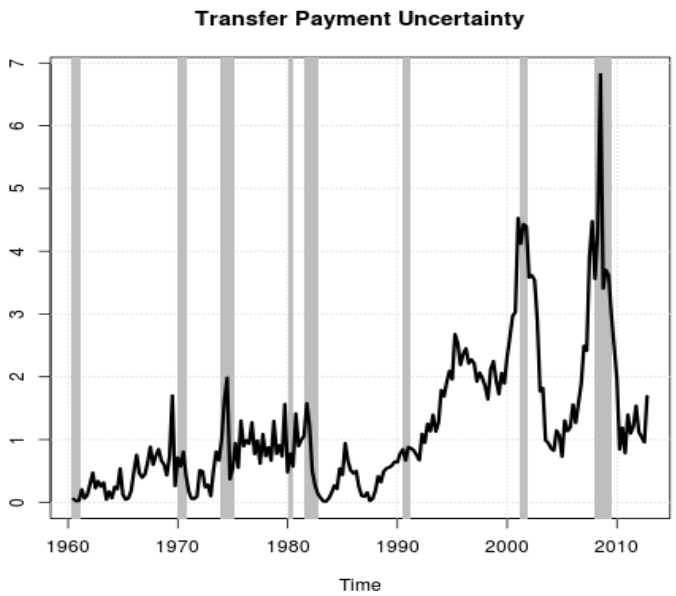
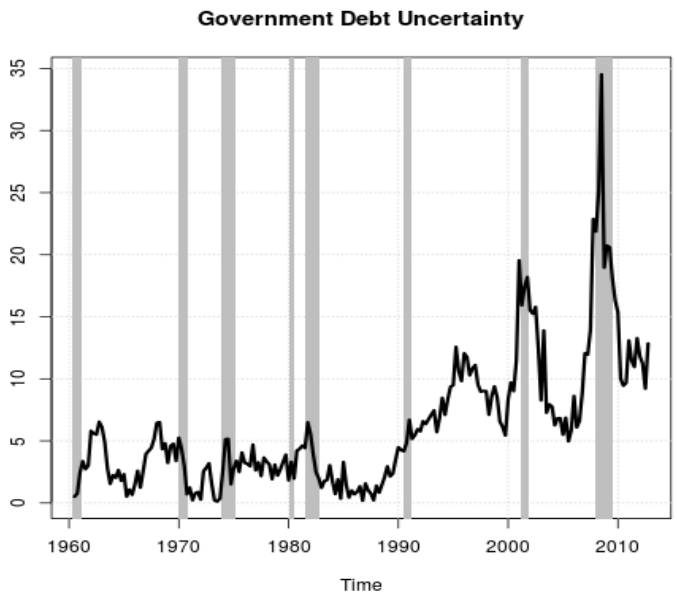
6
1960
1970
1980
1990
2000
2010
Time


Transfer Payment Uncertainty
0
1
2
3
4
5
6
7
1960
1970
1980
1990
2000
2010
Time


Government Debt Uncertainty
0
5
10
15
20
25
30
35
1960
1970
1980
1990
2000
2010
Time

- Uncertainty concerning transfers and debt reached unprecedented levels during Great Recession.
  - Government expenditures uncertainty: Nearly 7% of GDP
  - Tax uncertainty: Nearly 6% of GDP
  - Transfers uncertainty: Nearly 7% of GDP
  - Government debt uncertainty: Nearly 35% of GDP
- Uncertainty seems to run up for several years preceding recessions:
  - Early 1980s, 2001, 2007.
  - Not the rule though (eg: declines prior to 1970s, little volatility prior to 1991)

Pearson Correlation Coefficient

	Gov Spending	Tax Revenue	Transfers	Government Debt
Gov Spending	1.00	-	-	-
Tax Revenue	0.75	1.00	-	-
Transfers	0.74	0.78	1.00	-
Government Debt	0.64	0.65	0.90	1.00

- All highly correlated.
- Common (latent) factor?

Objective

- Strip out the common component of fiscal uncertainty
- Construct a general measure of fiscal uncertainty
- Take care of potential multicolinearity problem
- Compare to Baker, Bloom, and Davis (2013) (BBD)

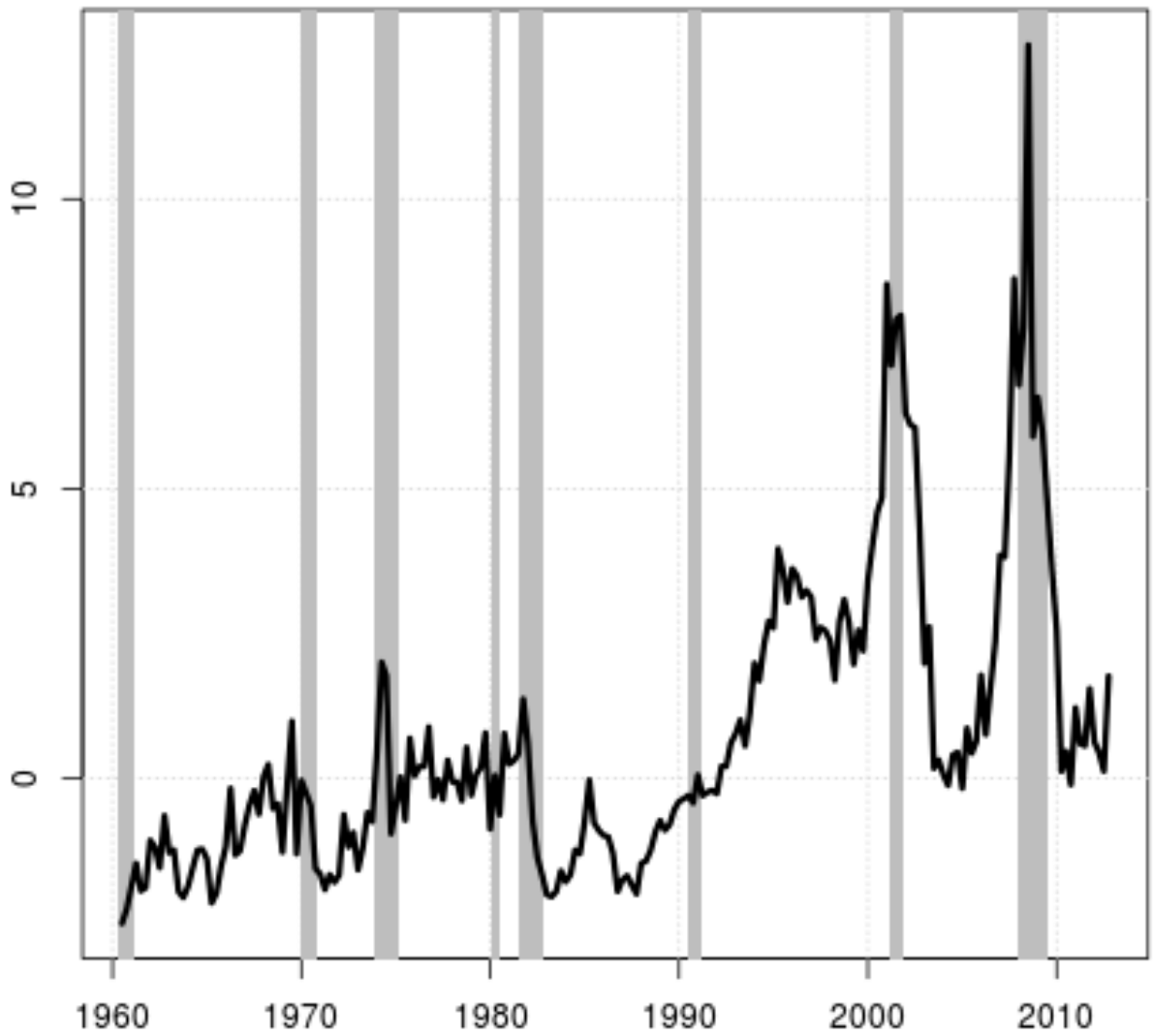
Stock and Waston (1989) coincident indicator model

- Latent variable: General fiscal uncertainty

$$m_t = m_0 + A\lambda_t + e_t$$
$$\lambda_t = b_1\lambda_{t-1} + b_2\lambda_{t-2} + \upsilon_t$$
$$e_t = Ce_{t-1} + \eta_t$$

  - m_t: 4x1 vector of fiscal uncertainty variables
  - λ_t: general fiscal uncertainty
  - $m_0 + e_t$: idiosyncratic component of fiscal uncertainty.

Coincident Indicator: General Fiscal Uncertainty



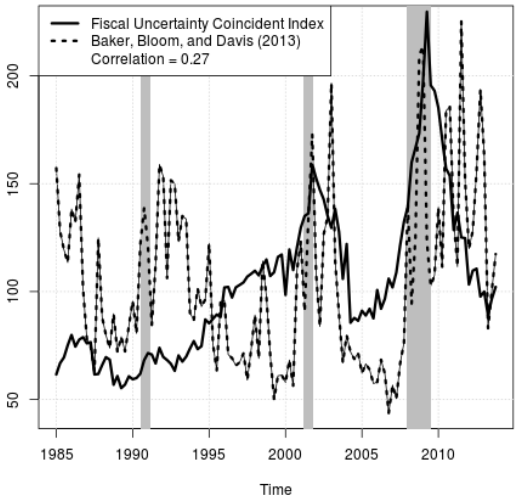
Idiosyncratic Fiscal Uncertainty - Pearson Correlations

	Gov Spending	Tax Revenue	Transfers	Government Debt
Gov Spending	1.00	-	-	-
Tax Revenue	0.40	1.00	-	-
Transfers	-0.17	-0.23	1.00	-
Government Debt	-0.21	-0.32	-0.18	1.00

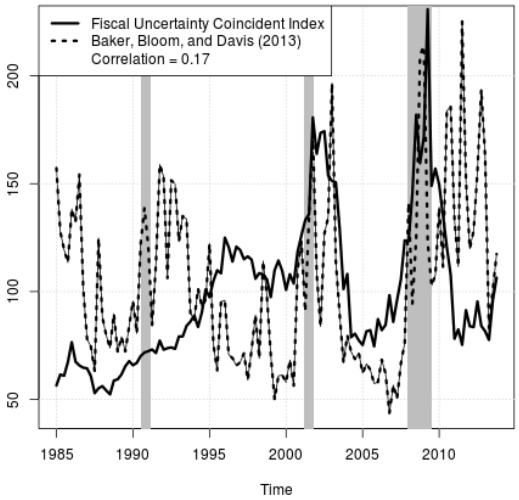
Correlation of RMSE with Coincident Index

	Gov Spending	Tax Revenue	Transfers	Government Debt
Coincident Index	0.75	0.78	0.99	0.91

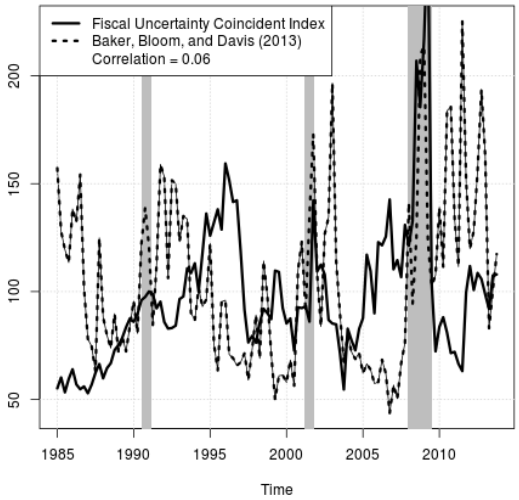
Relationship with Baker et. al. (2013)



Learning Gain = 0.01
Correlation = 0.27



Learning Gain = 0.02
Correlation = 0.17



Learning Gain = 0.04
Correlation = 0.06

- Close match post-2000
- Higher correlation with more empirically plausible learning gains
- BBD - Headline news is likely endogenous
- BBD - Tax policy expiration is forward looking
- BBD is a general economic policy uncertainty index

Autoregressive Distributed Lag Model

Dependent Variables: Macroeconomic Outcomes

- Real GDP
- Consumption
- Investment
- Inflation
- Employment
- Unemployment

Explanatory Vars: Common and Idiosyncratic Fiscal Uncertainty

- Government Exp
- Tax Receipts
- Transfer Payments
- Government Debt
- Coincident Index

(First lag to avoid endogeneity)

Controls

- Lags of all the dependent variables in every model.
- Lags of all the fiscal policy variables

ARDL Results (Learning Gain = 0.02, Lags = 2)

Fiscal Uncertainty - Row Headings -	**Dependent Variables (Column Headings)**					
	Real GDP	Consumption	Investment	Employment	Unemployment	Inflation
Government Exp	−0.04	0.06	−0.06	−0.68**	0.55***	0.02
(Standard Error)	(0.11)	(0.07)	(0.08)	(0.28)	(0.13)	(0.25)
Tax Receipts	0.36***	0.07	0.26***	0.39	−0.22	0.05
(Standard Error)	(0.11)	(0.06)	(0.09)	(0.28)	(0.14)	(0.15)
Transfer Payments	−0.01	−0.03	0.01	−0.49**	0.19***	0.01
(Standard Error)	(0.08)	(0.04)	(0.04)	(0.23)	(0.06)	(0.12)
Government Debt	0.05	−0.03	0.09	−1.27	0.25	0.12
(Standard Error)	(0.10)	(0.06)	(0.06)	(0.88)	(0.16)	(0.17)
Coincident Index	−0.41***	−0.21***	−0.19***	0.13	−0.22*	−0.36**
(Standard Error)	(0.10)	(0.05)	(0.07)	(0.38)	(0.14)	(0.16)
Joint Wald	4.02***	3.80***	2.54**	3.21***	4.27***	1.29
Adjusted R-square	0.32	0.98	0.96	0.83	0.87	0.81
AIC	466.15	198.35	257.72	666.99	398.54	632.69
BIC	549.83	282.03	341.40	750.67	482.22	716.37

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1. Fiscal uncertainty influences everything but inflation

ARDL Results (Learning Gain = 0.02, Lags = 2)

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2. Common fiscal uncertainty dampens aggregate demand

ARDL Results (Learning Gain = 0.02, Lags = 2)

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3. Transfers and Spending uncertainty drags on employment

ARDL Results (Learning Gain = 0.02, Lags = 2)

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4. Debt uncertainty drags on employment (significant in most other specifications)

ARDL Results (Learning Gain = 0.02, Lags = 2)

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5. Tax uncertainty (mostly unexpectedly low) boosts investment and real GDP

Magnitude of Extreme Change in Coincident Fiscal Uncertainty (Learning Gain = 0.02)

Largest Value Coincident Fiscal Uncertainty = 4.77	Date: 2009 Quarter 2
Smallest Value in Decade Preceding = -0.34	Date: 2005 Quarter 4

Estimated Impact - ARDL(2)

Variable	Impact	95% Lower Bound	95% Upper Bound
Real GDP	−2.07***	−3.04	−1.11
Consumption	−1.06***	−1.57	−0.54
Investment	−0.96***	−1.64	−0.29
Employment	0.65	−3.15	4.45
Unemployment	−1.14*	−2.49	0.21
Inflation	−1.85**	−3.50	−0.20

Fiscal Uncertainty Reduces Economic Activity

- General measure for fiscal uncertainty associated with:
  - lower real GDP,
  - lower consumption,
  - lower investment.
- Uncertainty regarding specific fiscal variables
  - Government expenditures, transfer payments, and government debt associated with reductions in employment / increases in unemployment
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- General fiscal uncertainty significant drag during the Great Recession:
  - Responsible for a 1% to 3% decrease in real GDP
  - Decreased consumption by about 1% of real GDP
  - Decreased investment by about 1% of real GDP