A New Identification Of Fiscal Shocks Based On The Information Flow

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Fiscal Policy

Where do we stand?

Despite some methodological advances, there is absolutely no consensus on even the basic effects of fiscal policy on the macroeconomy. Perotti (2001)
Despite some methodological advances, there is absolutely no consensus on even the basic effects of fiscal policy on the macroeconomy. Perotti (2001)

Almost as useless as no answer, academic economics provided a wide range of answers. As examples, Paul R. Krugman called for much more stimulus spending than actually enacted, [...] while Robert J. Barro argued for no additional spending. Parker (2011)
The Identification of Fiscal Shocks (I)

The classic identification of fiscal shocks

Blanchard, Perotti (2002):

\[ \Delta g_t - \hat{\mathbb{P}}_{t-1}[\Delta g_t | Y_{t-1}, Y_{t-2}, \ldots] = \hat{\varepsilon}_t \propto \text{fiscal shock}_t \]

Underlying assumptions:

- Discretionary policy does not respond to output within a quarter
- Innovations recovered by a small VAR are shocks to agents’ information set (fiscal shocks)
- Fiscal surprises are informative about fiscal plans
Ramey (2011): (professional) forecast errors as proxy for fiscal shocks

$$\Delta g_t - E_{t-1}^* \Delta g_t = \varepsilon_t \propto \text{fiscal shock}_t$$

Underlying assumptions:

- Discretionary policy does not respond to output within a quarter
- Rational Expectations
- Perfect Information
- Fiscal surprises are informative about fiscal plans
Perotti (2012): decomposition of the forecast error into

\[ \Delta g_t - \mathbb{E}_{t-1}^* \Delta g_t = (\Delta g_t - \mathbb{E}_t^* \Delta g_t) + (\mathbb{E}_t^* \Delta g_t - \mathbb{E}_{t-1}^* \Delta g_t) \]

- **forecast error**
- **nowcast error**
- **revision of expectations (news)**

*Government spending forecasts convey little information on future government spending, and so does their revision.* Perotti (2012)
The Information Flow
The Information Flow

Overview

- New measures of the information flow on fiscal policy at different horizons: before, upon and after the actual change
- Account for real time information flow and informational/cognitive limitation
- Embed the new measures into a Large Bayesian VAR
- Identify fiscal changes that are related to shocks to the agents’ information set at different horizons
The Information Flow

Contributions

- Document deviation form full information (Le Bihan, Andrade (2010), Colbion, Gorodnichenko (2012))
- New framework to think of fiscal shocks and some reconciliation
- To understand fiscal policy we need to learn about expected changes (Gambetti (2012), Ben Zeev, Pappa (2014)) - fiscal plans not fiscal surprises (Alesina, Favero, Giavazzi (2012))
- Quite large multipliers, no puzzles on exchange rates (Forni, Gambetti (2014)) and prices
\[ \Delta g_t - E^*_{t-2} \Delta g_t \]

forecast error
2 periods ahead

\[
\Delta g_t - E^*_{t} \Delta g_t
\]

nowcast error
\[ \notin I_t \]

\[
E^*_{t} \Delta g_t - E^*_{t-1} \Delta g_t
\]

nowcast revision
(news at t) \[ \in I_t \]

\[
E^*_{t-1} \Delta g_t - E^*_{t-2} \Delta g_t
\]

forecast revision
(news at t-1) \[ \in I_{t-1} \]
The Information Flow

Nowcast Errors

\[
\Delta g_t - \mathbb{E}_{t-2}^* \Delta g_t = (\Delta g_t - \mathbb{E}_t^* \Delta g_t) + (\mathbb{E}_t^* \Delta g_t - \mathbb{E}_{t-1}^* \Delta g_t) + (\mathbb{E}_{t-1}^* \Delta g_t - \mathbb{E}_{t-2}^* \Delta g_t)
\]

- forecast error 2 periods ahead
- nowcast error \( \not\in I_t \)
- nowcast revision (news at \( t \)) \( \in I_t \)
- forecast revision (news at \( t-1 \)) \( \in I_{t-1} \)

- Measure of misexpectations
- Modify agents’ information set at \( t+h \) (after)
- Dominate VAR residuals, Difficult to interpret (Rodríguez Mora, Schulstad (2007))
The Information Flow

Nowcast Revisions

\[
\Delta g_t - \mathbb{E}_{t-2}^* \Delta g_t = \left( \Delta g_t - \mathbb{E}_t^* \Delta g_t \right) + \mathbb{E}_t^* \Delta g_t - \mathbb{E}_{t-1}^* \Delta g_t + \mathbb{E}_{t-1}^* \Delta g_t - \mathbb{E}_{t-2}^* \Delta g_t
\]

- Forecast error 2 periods ahead
- Nowcast error \( \notin \mathcal{I}_t \)
- Nowcast revision (news at t) \( \in \mathcal{I}_t \)
- Forecast revision (news at t-1) \( \in \mathcal{I}_{t-1} \)

- Measure of fiscal news on the current quarter
- Modify agents’ information set at t (upon)
- Have predictive power and are easy to interpret
The Information Flow

Forecast Revisions

\[ \Delta g_t - E^*_t \Delta g_t = (\Delta g_t - E^*_t \Delta g_t) + \]

\[ + (E^*_t \Delta g_t - E^*_t-1 \Delta g_t) + \]

\[ + (E^*_t-1 \Delta g_t - E^*_t-2 \Delta g_t) \]

forecast error
2 periods ahead

\[ \text{nowcast error} \in I_t \]

\[ \text{nowcast revision} \]
(news at t) \in I_t

\[ \text{forecast revision} \]
(news at t-1) \in I_{t-1}

▶ Measure of fiscal foresight (Gambetti 2012)
▶ Modify agents’ information set at t-h (before)
▶ Have predictive power and are easy to interpret
Identification

- Nowcast Errors and News are observed proxy for shocks to agents’ information set

We would like to identify

- ?????????? Fiscal Changes – not forecasted and misidentified upon impact
- ????????? Fiscal Changes – not forecasted but correctly identified upon impact
- Expected Fiscal Changes – forecasted changes
If you have time to anticipate an event and do so correctly, then you cannot be surprised. [...] Surprise is triggered both by unexpected and misexpected events. [...] An unexpected surprise is triggered by an unexpected event, that is an event that happens at the moment the surprised person was not expecting anything in particular to happen. A misexpected surprise is triggered by an event that happens in contrast to some specific anticipation for something different to happen at that moment.
Identification

- Nowcast Errors and News are observed proxy for shocks to agents’ information set

We identify

- **Misexpected Fiscal Changes** – not forecasted and misidentified
- **Unexpected Fiscal Changes** – not forecasted but correctly identified
- **Expected Fiscal Changes** – forecasted changes
## Fiscal Changes

<table>
<thead>
<tr>
<th>Misperceived on impact</th>
<th>Unanticipated</th>
<th>Anticipated</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Misexpected Fiscal Changes</strong></td>
<td>$\not\in \mathcal{I}_t$</td>
<td>$\sim$ proxy: nowcast error $\Delta g_t - \mathbb{E}_t^* \Delta g_t$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Perceived on impact</th>
<th>Unexpected Fiscal Changes</th>
<th>Expected Fiscal Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\in \mathcal{I}_t$</td>
<td>$\sim$ proxy: nowcast revision $\mathbb{E}<em>t^* \Delta g_t - \mathbb{E}</em>{t-1}^* \Delta g_t$</td>
<td>$\sim$ proxy: forecast revision $\mathbb{E}<em>t^* \Delta g</em>{t+h} - \mathbb{E}<em>{t-1}^* \Delta g</em>{t+h}$</td>
</tr>
</tbody>
</table>
New Measures of Expectations
Survey of Professional Forecasters Data

- Professional forecasters provide quarterly forecasts for the current quarter and four quarters ahead
- Panelists’ information sets include advance report of GDP (and components) for the previous quarter
- Deadlines for responses at late in the second to third week of the middle month of each quarter (since 1990:Q2 survey)
# Survey of Professional Forecasters Data

## The Dataset

<table>
<thead>
<tr>
<th>Survey Date</th>
<th>History(^1)</th>
<th>Quarterly Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Q_{-1})</td>
<td>(Q_0)</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>2012Q2</td>
<td>(G_{2012Q1})</td>
<td>(G_{2012Q2})</td>
</tr>
<tr>
<td>2012Q3</td>
<td>(G_{2012Q2})</td>
<td>(G_{2012Q3})</td>
</tr>
<tr>
<td>2012Q4</td>
<td>(G_{2012Q3})</td>
<td>(G_{2012Q4})</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

\(^1\)BEA advance estimate
Survey of Professional Forecasters Data

Number of Respondents

ASA/NBER SPF  Philadelphia Fed SPF  SPF Tighter Timing
0 10 20 30 40 50 60
Number of Resp. in Two Consecutive Quarters
Total Respondents

Number of Respondents in Two Consecutive Quarters

- ASA/NBER SPF
- Philadelphia Fed SPF
- SPF Tighter Timing

Legend:
- Number of Resp. in Two Consecutive Quarters
- Total Respondents
Empirical Measures of Fiscal News

Aggregate Economy

Nowcast Errors

\[ \text{n.c.err}_t = \text{Median}(\text{n.c.err}^i_t) \]

Fiscal News on the current quarter

\[ \text{news}_t(0) = \text{Median}(\text{news}^i_t(0)) \]

Fiscal News three quarters ahead

\[ \text{news}_t(1, 3) = \text{Median}(\sum_{h=1}^{3} \text{news}^i_t(h)) \]
SPF Implied News

Current and Future Quarters

[Graph showing economic events and SPF forecasts revisions]
SPF Implied News

Future Quarters

SPF Real Federal Government Spending Growth – Implied News $Q_3/Q_0$

- R. Reagan (II)
- H.W. Bush
- B. Clinton (I)
- B. Clinton (II)
- G.W. Bush (I)
- G.W. Bush (II)
- B. Obama (I)

- Balanced Budget
- Berlin Wall Fall
- Fed Shutdown
- Kosovo War
- War Afghanistan
- War II – JTRRA
- EGTRRA
- Gulf War
- Hurr. Katrina
- Iraq War
- Stimulus 2008
- Health Care Act
- Debt ceiling Crisis
- Stimulus 2009
- Stimulus 2008
- Health Care Act
- Debt ceiling Crisis

SPF Real Federal Government Spending Growth – Implied News $Q_3/Q_0$

- Ramey Military Spend News
- Mean from individual data

- Balanced Budget
- Berlin Wall Fall
- Fed Shutdown
- Kosovo War
- War Afghanistan
- War II – JTRRA
- EGTRRA
- Gulf War
- Hurr. Katrina
- Iraq War
- Stimulus 2008
- Health Care Act
- Debt ceiling Crisis
- Stimulus 2009
- Stimulus 2008
- Health Care Act
- Debt ceiling Crisis
SPF Implied News

Aggregated and Individual SPF Data Median News

SPF News Distribution Skwness

Distance Aggr.–Ind. Median News

Simulated Data

Linear Fit Sim Data

95% band

Median SPF News Size

SPF News Distribution Skwness

Distance Aggr.–Ind. Median News

Median SPF News Size
### SPF Implied News

**Informational Content**

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>F-stat</th>
<th>Prob &gt; F</th>
<th>reg. coeff.</th>
<th>t-stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\hat{\text{news}}(0))</td>
<td>7.54</td>
<td>0.007</td>
<td>0.620</td>
<td>2.75</td>
</tr>
<tr>
<td>(\hat{\text{news}}(0)) (aggr. data)</td>
<td>3.50</td>
<td>0.064</td>
<td>0.448</td>
<td>1.87</td>
</tr>
<tr>
<td>(\hat{\text{news}}(1, 3))</td>
<td>6.76</td>
<td>0.011</td>
<td>0.783</td>
<td>2.60</td>
</tr>
<tr>
<td>(\hat{\text{news}}(1, 3)) (aggr. data)</td>
<td>3.57</td>
<td>0.062</td>
<td>0.457</td>
<td>1.89</td>
</tr>
</tbody>
</table>
Are Forecasts Forecastable?

Informational sufficiency test (Forni, Gambetti (2012))

<table>
<thead>
<tr>
<th></th>
<th>Factor1</th>
<th></th>
<th>Factor2</th>
<th></th>
<th>Factor3</th>
<th></th>
<th>Factor4</th>
</tr>
</thead>
<tbody>
<tr>
<td>n.c.err</td>
<td>Fstat</td>
<td>p-value</td>
<td>Fstat</td>
<td>p-value</td>
<td>Fstat</td>
<td>p-value</td>
<td>Fstat</td>
</tr>
<tr>
<td></td>
<td>1.07</td>
<td>(0.35)</td>
<td>0.00</td>
<td>(1.00)</td>
<td>6.21***</td>
<td>(0.00)</td>
<td>1.24</td>
</tr>
<tr>
<td>news(0)</td>
<td>2.85**</td>
<td>(0.06)</td>
<td>1.04</td>
<td>(0.36)</td>
<td>1.77*</td>
<td>(0.17)</td>
<td>0.02</td>
</tr>
<tr>
<td>news(1, 3)</td>
<td>0.01</td>
<td>(0.99)</td>
<td>0.04</td>
<td>(0.96)</td>
<td>0.08</td>
<td>(0.92)</td>
<td>2.55**</td>
</tr>
</tbody>
</table>

- Factors are extracted from a large dataset of 128 macroeconomic variables
- Granger causation test to assess informational content of the forecasts
- News and Nowcast Errors are forecastable using large information (Le Bihan, Andrade (2010))
The Empirical Model: Large Bayesian EVAR
Large EVAR

- Large Cross-Section for structural identification (Giannone & Reichlin 2006)
- Large VAR (Banbura et al. (2010))
- Litterman priors, Sum-of-coefficients priors
- Hyperpriors (Giannone, Lenza, Primiceri (2012))

- Expectational Variables 1: Nowcast Errors and News
- Expectational Variables 2: Forecasts for the variables entering the Gov’t response function: GDP and Unemployment
- Expectational Variables 3: Forward looking variables: prices, inventories, CEO confidence, consumer confidence, ... 
- Macroeconomic variables: Federal spending, S&L spending, Barro-Redlick tax rate, GPD, wages, durables, nondurables and services consumption, investment, real rates, 10-y rates, real exchange rates, ...
Identification

**Structural Identification – Assumptions**

1. fiscal policy do not respond to macroeconomic shocks within a quarter

2. forecasted future government spending incorporate the discretionary policy response to the expected values for output and unemployment as well as government spending for the present quarter

3. fiscal shocks are orthogonal

**Recursive identification**

\[
\begin{pmatrix}
\text{news}_t(0) & \hat{E}_t^{*}\text{GDP}_t & \hat{E}_t^{*}\text{U}_t & \text{news}_t(1, 3) & \text{n.c.err}_t & \text{Y}_t'
\end{pmatrix}'
\]
Large EVAR Empirical Results
The Output Effect of Fiscal Changes

Output Effects of Fiscal Changes

- Misexpected Fiscal Change to GDP
- Unexpected Fiscal Change to GDP
- Expected Fiscal Change to GDP
Misexpected Fiscal Changes
Misexpected Fiscal Changes vs Large SVAR & Ramey
Misexpected Fiscal Changes

Fed Spend

Consumer Price Index

Real Rates

S&L Spend

Nondurables Consumption

10-Year Treasury Rate

Federal Misexpected Fiscal Change

Nonresidential Fixed Investment

GDP

Fed Spend

Real Exchange Rate
Misexpected Fiscal Changes vs Large SVAR & Ramey

Ramey & Large SVAR Shock vs Misexpected Fiscal Change

- Fed Spend
- S&L Spend
- GDP
- Consumer Price Index
- Nondurables Consumption
- Nonresidential Fixed Investment
- Real Rates
- 10-Year Treasury Rate
- Real Exchange Rate
What Does Enter in Nowcast Errors?

- Model mispecifications/Higher order terms
- Data revisions
- Noisy signalling
- Forecasters’ aggregate bias
- Accounting issues
- Deviations from rational expectations
- ...
- ...
- Structural fiscal shocks
Unexpected Fiscal Changes

Fed Spend

Federal Unexpected Fiscal Change

S&L Spend

GDP

Consumer Price Index

Nondurables Consumption

Nonresidential Fixed Investment

Real Rates

10-Year Treasury Rate

Real Exchange Rate
Expected Fiscal Changes

Fed Spend

Federal Expected Fiscal Change
S&L Spend

GDP

Consumer Price Index

Nondurables Consumption

Nonresidential Fixed Investment

Real Rates

10-Year Treasury Rate

Real Exchange Rate
## Large EVAR Informational Sufficiency

Informational sufficiency test (Forni, Gambetti (2012))

<table>
<thead>
<tr>
<th></th>
<th>Factor1</th>
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<th>Factor4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$F_{stat}$</td>
<td>$p$-value</td>
<td>$F_{stat}$</td>
<td>$p$-value</td>
</tr>
<tr>
<td><strong>Nowcast Err.</strong></td>
<td>1.07</td>
<td>(0.35)</td>
<td>0.00</td>
<td>(1.00)</td>
</tr>
<tr>
<td><strong>EVAR Res.</strong></td>
<td>0.00</td>
<td>(1.00)</td>
<td>0.00</td>
<td>(1.00)</td>
</tr>
<tr>
<td><strong>News Q0</strong></td>
<td>2.85**</td>
<td>(0.06)</td>
<td>1.04</td>
<td>(0.36)</td>
</tr>
<tr>
<td><strong>EVAR Res.</strong></td>
<td>0.03</td>
<td>(0.97)</td>
<td>0.03</td>
<td>(0.97)</td>
</tr>
<tr>
<td><strong>News Q1-Q3</strong></td>
<td>0.01</td>
<td>(0.99)</td>
<td>0.04</td>
<td>(0.96)</td>
</tr>
<tr>
<td><strong>EVAR Res.</strong></td>
<td>0.17</td>
<td>(0.85)</td>
<td>0.17</td>
<td>(0.84)</td>
</tr>
<tr>
<td><strong>SVAR Residuals</strong></td>
<td>0.02</td>
<td>(0.98)</td>
<td>0.00</td>
<td>(1.00)</td>
</tr>
</tbody>
</table>

- EVAR Shocks are not forecastable using a larger information set
- Structural Shocks appear to be fundamental for the Large EVAR
Fiscal (Adjusted) Multipliers

<table>
<thead>
<tr>
<th></th>
<th>Unexpected</th>
<th>Misexpected</th>
<th>Expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP</td>
<td>1.28 (0.63)</td>
<td>0.98 (0.29)</td>
<td>3.06 (1.24)</td>
</tr>
<tr>
<td>D Cons</td>
<td>0.54 (0.2)</td>
<td>0.17 (0.13)</td>
<td>0.21 (0.31)</td>
</tr>
<tr>
<td>ND Cons</td>
<td>0.28 (0.12)</td>
<td>0.07 (0.08)</td>
<td>0.19 (0.21)</td>
</tr>
<tr>
<td>S Cons</td>
<td>0.21 (0.18)</td>
<td>0.04 (0.09)</td>
<td>-0.28 (1.44)</td>
</tr>
<tr>
<td>NRes Inv</td>
<td>0.34 (0.19)</td>
<td>0.12 (0.14)</td>
<td>0.89 (0.49)</td>
</tr>
<tr>
<td>Res Inv</td>
<td>-0.15 (0.15)</td>
<td>0.08 (0.07)</td>
<td>0.90 (1.12)</td>
</tr>
</tbody>
</table>

Multipliers are adjusted to take into account the direct effect of Fed spending only.
Conclusions

- “Quantitative” assessment of fiscal foresight
- Indication of the relevance of fiscal “signalling forward guidance” - well signalled fiscal measures have stronger effects
- Some reconciliation of (or a way to look at) previous results (SVARs vs EVARs)
Adjusted Fiscal Multipliers

The impulse response function of a variable, e.g., output, to the news shock $N_t$ can be expressed as follow

$$\frac{d \log Y_{t+h}}{d N_t} = \frac{G_{t+h}^{Fed}}{Y_{t+h}} \left[ \frac{\partial Y_{t+h}}{\partial G_{t+h}^{Fed}} + \frac{\partial Y_{t+h}}{\partial G_{t+h}^{S&L}} \frac{\partial G_{t+h}^{S&L}}{\partial G_{t+h}^{Fed}} \right] \frac{d \log G_{t+h}^{Fed}}{d N_t}$$

Rearranging (and approximating)

$$\mathcal{M}^{peak} \equiv \frac{\bar{Y}_{Fed} \text{IRF}^{peak}(Y)}{1 + \bar{G}_{Fed}^{S&L} \text{IRF}^{peak}(G_{S&L})}$$