A New Identification Of Fiscal Shocks Based On The Information Flow

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London Business School

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Tarragona – 26th May 2015
The Obama administration’s plan to reduce the number of U.S. troops in Iraq and Afghanistan will cut the Pentagon’s war budget by $42 billion – a 26 percent decrease from this year’s level, according to government officials. [Bloomberg News, 21 Jan 2011]

Lawmakers voted last night by wide margins to pass legislation ending the shutdown. Obama signed the bill just after midnight. The measure suspends the debt limit, puts government workers back on the job starting today and permits the U.S. to pay its debts, benefits and salaries. [Bloomberg News, 17 Oct 2013]

The economy in the U.S. expanded more than forecast in the third quarter, capping its strongest six months in more than a decade, as gains in government spending and a shrinking trade deficit made up for a slowdown in household purchases. [Bloomberg News, 30 Oct 2014]
The Information Flow on Fiscal Spending

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Based on the Information Flow

Identification of **fiscal spending** shocks:

- *Imperfect information & fiscal foresight*
- New measures of the information flow: *before, upon and after*
- Three orthogonal shocks:

  *names borrowed from the Psychological literature*
A New Identification

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  1. **Expected Fiscal Changes**
     - agents forecast *before* their realisation
  2. **Unexpected Fiscal Changes**
     - agents identify *upon* impact

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  1. Expected Fiscal Changes
     agents forecast before their realisation
  2. Unexpected Fiscal Changes
     agents identify upon impact
  3. Misexpected Fiscal Changes*
     agents learn after the impact

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A New Identification

Identification in the presence imperfect information

**Delayed-information** – e.g., Mankiw and Reis (2002)

...or **Noisy-information** – e.g., Woodford (2001)

- Information slowly absorbed
  - → Forecast errors: current and past shocks
- Correlated expectations revisions
  - → Proxies for shocks (conditional on their past)
- Imperfect knowledge of the state of the Economy
  - → Nowcast errors ("misexpectations")
- Heterogenous beliefs
  - → Aggregation bias

More...
A New Identification
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More...
A New Identification

The approach of this paper

- Use a **large information** set exceeding agents’ one...
A New Identification

The approach of this paper

- Use a large information set exceeding agents’ one...
- and individual forecasts (aggregation bias) to extract...
A New Identification

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- ...“news” (expectation revisions) at different horizons...
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- ... and “**misexpectations**” (nowcast errors)...


A New Identification

The approach of this paper

- Use a **large information** set exceeding agents’ one...
- and **individual forecasts** (aggregation bias) to extract...
- ...“**news**” (expectation revisions) at different horizons...
- ... and “**misexpectations**” (nowcast errors)...
- ...and to identify **expected, unexpected** and **misexpected** fiscal spending changes
A New Identification

Contributions

- **Information matters** in shock identification
- Expected/Unexpected fiscal expansion:
  - **Large output effects**
    
    *The multiplier for government spending is probably between 0.8 and 1.5 [Ramey JEL (2011)]*
  
  - **Investment accelerator**, not consumption
  - Prices increase, **real exchange rate appreciates**
- Misexpected: **reconciliation previous results**
## A New Identification

### Contributions

<table>
<thead>
<tr>
<th>Previous Contrib.</th>
<th>This Paper</th>
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<tr>
<td>Output Mult.</td>
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[Image: London Business School]
A New Identification

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**Note:**
- $\leq$ indicates a non-negative condition.
- $\downarrow$ indicates a decrease.
- $\uparrow$ indicates an increase.
- $\Rightarrow$ indicates a persistent effect.
### Previous Contrib. | This Paper

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A New Identification

The effects of fiscal spending shocks: output

Output Effects of Fiscal Changes

Output elasticity (quarters)

Misexpected Fiscal Change to GDP

Unexpected Fiscal Change to GDP

(quarters)

output elasticity

SVAR  EVAR
A New Identification

The effects of fiscal spending shocks: output

Output Effects of Fiscal Changes

- Misexpected Fiscal Change to GDP
- Unexpected Fiscal Change to GDP

Output elasticity

- Misexp.
  - Large SVAR
  - Large EVAR

- Unexp.
  - Large SVAR
  - Large EVAR

SVAR EVAR
A New Identification

Related literature


The Information Flow
The Information Flow

\[ I_t = \{ g_{t-1}, Y_{t-1}, news_t, \ldots \} \]

\[ E^*_t g_t \]
\[ E^*_t g_{t+1} \]
\[ E^*_t g_{t+2} \]
\[ \vdots \]
\[ E^*_t g_{t+h} \]
The Information Flow

\[ \mathcal{I}_{t+1} = \{ g_t, Y_t, \text{news}_{t+1}, \ldots \} \]

\[ E^*_{t+1} g_{t+1} \]
\[ E^*_{t+1} g_{t+2} \]
\[ \vdots \]
\[ E^*_{t+1} g_{t+h} \]
The Information Flow

\[ \mathcal{I}_{t+2} = \{g_{t+1}, Y_{t+1}, \text{news}_{t+2}, \ldots\} \]

**Figure (3)**

\[
\begin{align*}
\mathbb{E}^*_t g_t + 1 & \\
\vdots & \\
\mathbb{E}^*_t g_t + h & 
\end{align*}
\]
The Information Flow

\[ \mathcal{I}_{t+3} = \{ g_{t+2}, Y_{t+2}, \text{news}_{t+3}, \ldots \} \]
The Information Flow

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

\text{forecast error}

\text{2 periods ahead}

= \begin{align*}
&\left( g_t - \mathbb{E}_t^* g_t \right) + \\
&\left( \mathbb{E}_t^* g_t - \mathbb{E}_{t-1}^* g_t \right) + \\
&\left( \mathbb{E}_{t-1}^* g_t - \mathbb{E}_{t-2}^* g_t \right)
\end{align*}

\text{nowcast error}

\notin \mathcal{I}_t

\text{nowcast revision}

\text{(news at t)} \in \mathcal{I}_t

\text{forecast revision}

\text{(news at t-1)} \in \mathcal{I}_{t-1}
The Information Flow

Nowcast errors

\[ \text{forecast error 2 periods ahead} \]

\[ g_t - \mathbb{E}_t^* g_t \]

\[ \text{nowcast error} \]

\[ (g_t - \mathbb{E}_t^* g_t) \notin \mathcal{I}_t \]

\[ \text{nowcast revision} \]

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

\[ \text{(news at t)} \in \mathcal{I}_t \]

\[ \text{forecast revision} \]

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

\[ \text{(news at t-1)} \in \mathcal{I}_{t-1} \]

- Measure of misexpectations
- Modify agents’ information set at t+h (after)
- Dominate VAR residuals, difficult to interpret
The Information Flow

Nowcast revisions

\[
g_t - \mathbb{E}_{t-2}^* g_t = (g_t - \mathbb{E}_t^* g_t) + \underbrace{(\mathbb{E}_t^* g_t - \mathbb{E}_{t-1}^* g_t)}_{\text{nowcast revision (news at t) } \in I_t} + \underbrace{(\mathbb{E}_{t-1}^* g_t - \mathbb{E}_{t-2}^* g_t)}_{\text{forecast revision (news at t-1) } \in I_{t-1}}
\]

- 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

\[
g_t - E_{t-2}^* g_t = \underbrace{(g_t - E_t^* g_t)}_{\text{nowcast error}} + \underbrace{(E_t^* g_t - E_{t-1}^* g_t)}_{\text{nowcast revision}} + \underbrace{(E_{t-1}^* g_t - E_{t-2}^* g_t)}_{\text{forecast revision}}
\]

- Measure of fiscal foresight
- Modify agents’ information set at t-h (before)
- Have predictive power and are easy to interpret
## 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>$\mathcal{I}_t$</td>
</tr>
<tr>
<td>nowcast errors</td>
<td>$g_t - \mathbb{E}_t^* g_t$</td>
<td></td>
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| Perceived on impact | | Expected Fiscal Changes |
|---------------------|--------------------------|
| **Unexpected Fiscal Changes** | $\in \mathcal{I}_t$ | $\not\in \mathcal{I}_t$ |
| proxy: | nowcast revisions | forecast revisions |
| $\mathbb{E}_t^* g_t - \mathbb{E}_{t-1}^* g_t$ | $\mathbb{E}_t^* g_{t+h} - \mathbb{E}_{t-1}^* g_{t+h}$ |
New Measures of Expectations
### Quarterly SPF forecasts:

- **current** quarter and **four quarters ahead**
- information sets: **previous quarter GDP** and components (advance estimate)
- deadline: **third week of the middle month**
- U.S. Fed Spending from 1981:Q3 to 2012:Q4

---

1BEA advance estimate
Do Agents Have Full Information?

Granger causation test with factors from a large dataset \# 128

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<thead>
<tr>
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<th>Factor2</th>
<th>Factor3</th>
<th>Factor4</th>
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<tr>
<td>Forecast Err.</td>
<td>2.99** (0.05)</td>
<td>0.57 (0.64)</td>
<td>3.95*** (0.01)</td>
<td>2.97 (0.04)</td>
</tr>
<tr>
<td>Nowcast Err.</td>
<td>1.07 (0.35)</td>
<td>0.00 (1.00)</td>
<td>6.21*** (0.00)</td>
<td>1.24 (0.29)</td>
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- Forecast and nowcast errors are **forecastable**
- Forecast revisions (‘news’) and forecast errors are **correlated**

**Presence of information rigidities!** [Coibion and Gorodnichenko (2010, 2012), Andrade and Le Bihan (2012)]
Empirical Measures of Fiscal News

Aggregate economy

Nowcast Errors

\[ \hat{\text{n.c.err}}_t = \text{Median}(g_t - E_t^ig_t) \]

Fiscal News on the current quarter

\[ \hat{\text{news}}_t(0) = \text{Median}(E_t^ig_t - E_{t-1}^ig_t) \]

Fiscal News three quarters ahead

\[ \hat{\text{news}}_t(1, 3) = \text{Median} \left( \sum_{h=1}^{3} (E_t^ig_{t+h} - E_{t-1}^ig_{t+h}) \right) \]
SPF Implied News and Nowcast Errors

Current quarter
SPF Implied News
Current and future quarters

SPF Implied News
SPF Forecasts Revisions Current Quarter

SPF Forecasts Revisions One Year Head

% Growth Rate − SPF Forecasts Revisions

Gulf War
ERTA
Balanced Budget
Berlin Wall Fall
Fed Shutdown
Kosovo War
EGTRRA
War Afghanistan
Gulf War II − JTRRA
Hur. Katrina
Iraq Troop Surge
Stimulus 2008
Stimulus 2009
Health Care Act
Debt−ceiling Crisis
R. Reagan (II)
H.W.Bush
B.Clinton (I)
B.Clinton (II)
G.W.Bush (I)
G.W.Bush (II)
B.Obama (I)

−4 −2 0 2 4

Individual vs Aggregated...
SPF Implied News

Current and future quarters
The Empirical Model: Large Bayesian EVAR
Large EVAR

- *Expectational Variables 1*: News & Nowcast Errors
- *Expectational Variables 2*: Forecasts for 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, . . .

Large VAR [Banbura et al. (2010)] with Litterman priors and sum-of-coefficients priors. Hyperpriors [Giannone, Lenza, Primiceri (2012)]
Identification of Fiscal Changes

A last spin

Structural Identification – Assumptions

1. fiscal policy doesn’t respond to contemporaneous macro-shocks
2. new information before, upon and after actual change
3. new information slowly absorbed
4. spending forecasts incorporate systematic policy responses
5. three shocks are orthogonal

Recursive identification

$$\left( \text{news}_t(0) \quad n.c.err_t \quad \hat{E}_t^* \text{GDP}_t \quad \hat{E}_t^* \text{U}_t \quad \text{news}_t(1, 3) \quad Y_t \right)'$$
Empirical Results
Unexpected Fiscal Changes

Unexpected Federal Fiscal Change

Fed Spend

S&L Spend

Marginal Tax Rate

GDP

Output Per Hour

Real Wages

Consumer Price Index

Total Worked Hours

Civilian Unemployment Rate

Durables Consumption

Nondurables Consumption

Services Consumption

Nonresidential Fixed Investment

Residential Fixed Investment

S&P 500 (%)

Real Exchange Rate

Real Rates

Consumer Sentiment Index

CB CEO Confidence Index

90% C.I.

68% C.I.

IRF

S&L Spend

Fed Spend

Marginal Tax Rate
Unexpected Fiscal Changes: Gov’t Spending

- CB CEO Confidence Index
- Consumer Sentiment Index
- Real Exchange Rate
- 10-Year Treasury Rate
- Real Rates
- S&P 500 (%)
- Residential Fixed Investment
- Nonresidential Fixed Investment
- Services Consumption
- Nondurables Consumption
- Durables Consumption
- Civilian Unemployment Rate
- Total Worked Hours
- Consumer Price Index
- Real Wages
- Output Per Hour
- GDP
- Marginal Tax Rate
- S&L Spend
- Fed Spend

Graphs show various economic indicators over time, illustrating the impact of unexpected fiscal changes on key economic metrics.
Unexpected Fiscal Changes: GDP
Unexpected Fiscal Changes: CPI Inflation
Unexpected Fiscal Changes: Worked Hours
Unexpected Fiscal Changes: Consumption

- Consumer Sentiment Index
- CB CEO Confidence Index
- Unemployment Rate
- Total Worked Hours
- Consumer Price Index
- Real Wages
- Output Per Hour
- GDP
- Marginal Tax Rate
- S&P 500 (%)
- Residential Fixed Investment
- Nonresidential Fixed Investment
- Services Consumption
- Nondurables Consumption
- Durables Consumption

Graphs showing time series data for various economic indicators.
Unexpected Fiscal Changes: Consumption

Unemployment Rate

Consumer Price Index

Total Worked Hours

Civilian Unemployment Rate

Services Consumption

Nondurables Consumption

Durables Consumption

Nonresidential Fixed Investment

Real Exchange Rate

10-Year Treasury Rate

Real Rates

GDP

Marginal Tax Rate

S&P 500 (%)

Residential Fixed Investment

Nonresidential Fixed Investment

S&L Spend

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IRF

90% C.I.

68% C.I.
Unexpected Fiscal Changes: Investment

---

**Fed Spend**

**S&L Spend**

**Marginal Tax Rate**

**Output Per Hour**

**Real Wages**

**GDP**

**Services Consumption**

**Nondurables Consumption**

**Durables Consumption**

**Civilian Unemployment Rate**

**Total Worked Hours**

**Consumer Price Index**

**Output Per Hour**

**S&P 500 (%)**

---

**Nonresidential Fixed Investment**

**Residential Fixed Investment**

---

**Unexpected Federal Fiscal Change**

- 90% C.I.
- 68% C.I.
- IRF

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**CB CEO Confidence Index**

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**Consumer Sentiment Index**

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**Real Exchange Rate**

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**10-Year Treasury Rate**

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**Real Rates**

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**Services Consumption**

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**Nondurables Consumption**

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**Durables Consumption**

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**Real Wages**

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**Output Per Hour**

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**GDP**

---

**Marginal Tax Rate**

---

**S&L Spend**

---

**Fed Spend**

---
Unexpected Fiscal Changes: 10-Year Rate
Unexpected Fiscal Changes: Real Exchange Rate

Fed Spend

S&L Spend

Marginal Tax Rate

Consumer Price Index

Durables Consumption

Nonresidential Fixed Investment

Real Rates

Total Worked Hours

Civilian Unemployment Rate

Nonresidential Fixed Investment

10-Year Treasury Rate

S&P 500 (%)

Services Consumption

Nondurables Consumption

Real Exchange Rate

Residential Fixed Investment

CB CEO Confidence Index

Durables Consumption

GDP

Marginal Tax Rate

Output Per Hour

Nondurables Consumption

S&P 500 (%)

Residential Fixed Investment

Civilian Unemployment Rate

GDP

Marginal Tax Rate

Services Consumption

Nondurables Consumption

Output Per Hour

Nonresidential Fixed Investment

Consumer Price Index

Total Worked Hours

Civilian Unemployment Rate

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Nonresidential Fixed Investment

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Total Worked Hours

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GDP
Unexpected Fiscal Changes: Consumers Confidence

- CB CEO Confidence Index
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- Nonresidential Fixed Investment
- Residential Fixed Investment
- Real Exchange Rate
- Real Wages
- Output Per Hour
- GDP
- Marginal Tax Rate
- S&P 500 (%)
- Real Rates
- Services Consumption
- Nondurables Consumption
- Services Consumption
- S&L Spend
- Fed Spend
- Civilian Unemployment Rate
- Total Worked Hours

[Graphs showing various economic indicators over time with confidence intervals and IRF lines]
Expected Fiscal Changes
Expected Fiscal Changes: Gov’t Spending

Fed Spend

S&L Spend

Marginal Tax Rate

Expected Federal Fiscal Change

S&P 500 (%)

Real Exchange Rate

Civilian Unemployment Rate

Consumer Price Index

Durables Consumption

Nondurables Consumption

Services Consumption

Nonresidential Fixed Investment

Residential Fixed Investment

10-Year Treasury Rate

CB CEO Confidence Index

Output Per Hour

Total Worked Hours

Real Wages

Consumer Price Index

GDP

IRF

68% C.I.

90% C.I.

Fed Spend

quarters

quarters

quarters

quarters

quarters

quarters

quarters
Expected Fiscal Changes: GDP

- CB CEO Confidence Index
- Consumer Sentiment Index
- Real Exchange Rate
- 10-Year Treasury Rate
- Real Rates
- S&P 500 (%)
- Residential Fixed Investment
- Nonresidential Fixed Investment
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- Consumer Price Index
- Real Wages
- Output Per Hour
- GDP
- Marginal Tax Rate
- S&L Spend
- Fed Spend
Expected Fiscal Changes: Output per Hour
Expected Fiscal Changes: CPI Inflation
Expected Fiscal Changes: Worked Hours

- Fed Spend
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- Fed Spend
- S&L Spend
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- 68% C.I.
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90% C.I.
68% C.I.
IRF
Expected Fiscal Changes: Consumption
Expected Fiscal Changes: Investment
Expected Fiscal Changes: 10-Year Rate

- Fed Spend
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Expected Fiscal Changes: Consumers Confidence
Expected Fiscal Changes: CEO Confidence

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90% C.I.
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IRF
Misexpected Fiscal Changes

Federal Misexpected Fiscal Change

- Fed Spend
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- Residential Fixed Investment
- Real Rates
- 10-Year Treasury Rate
- Real Exchange Rate
- S&P 500 (%)
- Total Worked Hours
- Non HUD
- 90% C.I.
- 68% C.I.

CB CEO Confidence Index

Visa

London Business School

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Misexpected Fiscal Changes vs Large SVAR & Ramey

Large SVAR, Ramey Large EVAR, and Misexpected Fiscal Changes

- Fed Spend
- S&L Spend
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- Output Per Hour
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- Consumer Price Index
- Total Worked Hours
- Civilian Unemployment Rate
- Nonresidential Fixed Investment
- Residential Fixed Investment
- Services Consumption
- S&P 500 (%)
- Real Exchange Rate
- Consumer Sentiment Index
- CB CEO Confidence Index
- Durables Consumption
- Nondurables Consumption

90% C.I.
68% C.I.
Misexpected Fiscal Change
Large SVAR Fiscal Shock
‘Ramey’ Large EVAR Shock
Misexpected Fiscal Changes: Gov’t Spending
Misexpected Fiscal Changes: GDP

Large SVAR, Ramey Large EVAR, and Misexpected Fiscal Changes

Fed Spend

S&L Spend

Marginal Tax Rate

Output Per Hour

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Consumer Price Index

Total Worked Hours

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Total Worked Hours

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Nonresidential Fixed Investment

Residential Fixed Investment

10-Year Treasury Rate

CB CEO Confidence Index
Misexpected Fiscal Changes: CPI Inflation
Misexpected Fiscal Changes: Worked Hours

Large SVAR, Ramey Large EVAR, and Misexpected Fiscal Changes

- Fed Spend
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- Misexpected Fiscal Change
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Misexpected Fiscal Changes: Consumption

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Misexpected Fiscal Changes: Real Exchange Rate

Large SVAR, Ramey Large EVAR, and Misexpected Fiscal Changes

90% C.I.
68% C.I.
Misexpected Fiscal Change
Large SVAR... Spend
quarters
0 4 8 12 16
−0.2
−0.1
0
0.1
Fed Spend
quarters
0 4 8 12 16
0
0.5
1
Misexpected Fiscal Changes: Consumers Confidence

Large SVAR, Ramey Large EVAR, and Misexpected Fiscal Changes

Fed Spend

S&L Spend

Marginal Tax Rate

Consumer Price Index

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Nondurables Consumption

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Residential Fixed Investment

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What are the Nowcast Errors?

- Slow absorption of information
- Data revisions
- Model misspecifications/Higher order terms
- Forecasters’ aggregate bias
- Accounting issues
- Deviations from rational expectations
- Optimism or pessimism? [Enders et al (2013)]
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Fiscal Cumulated Multipliers

Cumulative output multiplier for Expected Fiscal Changes around 1.5

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

S&L Adjusted Multipliers
Conclusions

- Identification in the presence of **foresight** and **imperfect information**
- Novel empirical measures **fiscal information flow** at different horizons
- Fiscal spending have **large effect**
- **Investment accelerator**
- Other applications: **monetary policy**, forward guidance
Appendix
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.
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The Identification of Fiscal Spending Shocks
The Identification of Fiscal Spending Shocks (I)

The “classic” identification of fiscal shocks

Blanchard, Perotti (2002):

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

Assumptions:

▶ “Little information” on future government spending
▶ Discretionary policy does not respond to output within a quarter

Surprises informative of discretionary measures effects
The Identification of Fiscal Spending Shocks (II)

The fiscal foresight issue [Leeper et al. (2013)]

Ramey (2011): (professional) forecast errors as proxy for fiscal shocks

\[ \Delta g_t - E_{t-1}^* \Delta g_t = \hat{\epsilon}_t \propto \text{fiscal shock}_t \]

Assumptions:

▶ Rational Expectations
▶ Full Information
▶ Discretionary policy does not respond to output within a quarter

Surprises informative of discretionary measures effects
The Identification of Fiscal Spending Shocks (III)

The “classic” identification strikes back

Decomposition of the one-step-ahead 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

surprise

revision of expectations (noise)

Perotti (2012): Government spending forecasts convey little information on future government spending, and so does their revision.
Decomposition of the two-step-ahead forecast error into

\[ \Delta g_t - E_{t-2}^* \Delta g_t = (\Delta g_t - E_t^* \Delta g_t) + (E_t^* \Delta g_t - E_{t-1}^* \Delta g_t) + (E_{t-1}^* \Delta g_t - E_{t-2}^* \Delta g_t) \]

- Forecast error
- Nowcast error
- Revision of expectations (news)
- Revision of expectations (news)

- Information frictions modify the agents’ decision problem
- ... and the econometric identification problem
- Forecast revisions are informative: “news”
- Nowcast errors: “misexpectations”
The Survey of Professional Forecasters
Survey of Professional Forecasters Data

Number of Respondents

ASA/NBER SPF  Philadelphia Fed SPF  SPF Tighter Timing


Number of Resp. in Two Consecutive Quarters

Total Respondents
SPF Implied News

SPF News & Ramey military spending news

Individual Median News One Year Ahead and Ramey Military News

% Growth Rate

Gulf War 9/11
ERTA
Balanced Budget
Tax Reform
Balanced Budget (II)
Berlin Wall Fall
Fed Shutdown
Kosovo War
EGTRRA
War Afghanistan
Gulf War II − JTRRA
Hurr. Katrina
Iraq Troop Surge
Stimulus 2008
Stimulus 2009
Health Care Act
Debt−ceiling Crisis


−10 −5 0 5

Median from aggregated data
Median from individual data

SPF News Skwness

Back...
Other Macro Shocks

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<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
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</thead>
<tbody>
<tr>
<td>Nowcast Errors (median)</td>
<td>0.77</td>
<td>0.00</td>
<td>0.06</td>
<td>-0.10</td>
<td>-0.09</td>
<td>-0.04</td>
<td>0.11</td>
<td>-0.04</td>
<td>-0.07</td>
</tr>
<tr>
<td>News Q0 (median)</td>
<td>0.33</td>
<td>0.01</td>
<td>-0.01</td>
<td>0.15</td>
<td>0.03</td>
<td>-0.08</td>
<td>0.02</td>
<td>-0.06</td>
<td>-0.19</td>
</tr>
<tr>
<td>News Q1-Q3 (median)</td>
<td>-0.02</td>
<td>-0.01</td>
<td>0.02</td>
<td>-0.02</td>
<td>0.07</td>
<td>0.00</td>
<td>0.07</td>
<td>0.06</td>
<td>-0.16</td>
</tr>
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</table>

**Correlations of News and Nowcast Errors with Other Proxy Variables:**
SPF Implied News and Nowcast Errors

Spectra

Nowcast Errors and News Spectral Density

Fed Goverment Spend Growth

SPF Implied News $Q_0/Q_{-1}$

Implied News $Q_3/Q_0$
SPF Implied News

Informational content

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<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>
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</table>

Individual vs Aggregated...
Heterogenous Beliefs and Aggregation Bias
Heterogenous Beliefs and Aggregation Bias

SPF news from individual and aggregated data

Median News One Year Ahead from Individual and Aggregated Data

% Growth Rate

Gulf War 9/11
ERTA
Balanced Budget
Tax Reform
Balanced Budget (II)
Berlin Wall Fall
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−4 −2 0 2 4
Median from aggregated data
Median from individual data
SPF News Skwness
Heterogeneous Beliefs and Aggregation Bias

SPF news from individual and aggregated data

MC Simulations  Military News  Back...
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<th>(3)</th>
<th>(4)</th>
<th>SPF data</th>
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<td>Correlation Ind.–Aggr. Data Median News</td>
<td>1.000</td>
<td>1.00</td>
<td>0.87</td>
<td>0.86</td>
<td>0.82</td>
</tr>
<tr>
<td>Mean Abs Dist. Ind.–Aggr. Data Median News</td>
<td>0.00</td>
<td>0.01</td>
<td>0.21</td>
<td>0.20</td>
<td>0.36</td>
</tr>
<tr>
<td>Corr. of Av. Dist. Ind.–Aggr. News w/ Dist. Mean</td>
<td>-0.04</td>
<td>0.09</td>
<td>0.52</td>
<td>0.51</td>
<td>0.37</td>
</tr>
<tr>
<td>Corr. of Av. Dist. Ind.–Aggr. News w/ Dist. Std</td>
<td>0.02</td>
<td>-0.12</td>
<td>0.14</td>
<td>0.15</td>
<td>0.31</td>
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<td>0.04</td>
<td>-0.07</td>
<td>0.77</td>
<td>0.77</td>
<td>0.41</td>
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<tr>
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<td>0.04</td>
<td>0.04</td>
<td>0.01</td>
<td>0.01</td>
<td>0.13</td>
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**Heterogenous Beliefs and Aggregation Bias**

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Full Information vs Imperfect Information
Agents have a complete information set $\mathcal{I}_{t-h}$

$$E[g_t|\mathcal{I}_{t-h}] + u_t + u_{t-1} + \cdots + u_{t-h+1} = \Delta g_t$$

→ Align the econometric information set to the agents’ one

Agents’ forecast errors are combinations of structural shocks

$$g_t - E[g_t|\mathcal{I}_{t-1}] = u_t$$

→ Agents’ forecast errors are proxy for structural shocks

Agents have perfect knowledge of the state of the world

$$g_t - E[g_t|\mathcal{I}_t] = 0$$

→ No additional information in nowcast errors

Agents have the same information set

→ No aggregation issue
Agents have a complete information set $\mathcal{I}_{t-h}$

$$E[g_t|\mathcal{I}_{t-h}] + u_t + u_{t-1} + \cdots + u_{t-h+1} = \Delta g_t$$

→ Align the econometric information set to the agents’ one

Agents’ forecast errors are combinations of structural shocks

$$g_t - E[g_t|\mathcal{I}_{t-1}] = u_t$$

→ Agents’ forecast errors are proxy for structural shocks

Agents have perfect knowledge of the state of the world

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Full Information Rational Expectations

- Agents have a complete information set $\mathcal{I}_{t-h}$

\[ \mathbb{E}[g_t|\mathcal{I}_{t-h}] + u_t + u_{t-1} + \cdots + u_{t-h+1} = \Delta g_t \]

→ Align the econometric information set to the agents’ one

- Agents’ forecast errors are combinations of structural shocks

\[ g_t - \mathbb{E}[g_t|\mathcal{I}_{t-1}] = u_t \]

→ Agents’ forecast errors are proxy for structural shocks

- Agents have perfect knowledge of the state of the world

\[ g_t - \mathbb{E}[g_t|\mathcal{I}_t] = 0 \]

→ No additional information in nowcast errors

- Agents have the same information set

→ No aggregation issue
Two classes of models:

- **Delayed-information models** – agents update their information set infrequently but arrive at perfect information once they do [Mankiw and Reis (2002) and Reis (2006a,b)]

- **Noisy-information models** – agents continuously update their information but observe only noisy signals about the true state [Woodford (2001), Sims (2003) and Mackowiak and Wiederholt (2009)]

incorporate deviations from full information
The new information is only partially absorbed over time

\[ g_t - \mathbb{E}_{t-h}^*g_t = \frac{1 - \kappa}{\kappa} \left( \mathbb{E}_{t-h}^*g_t - \mathbb{E}_{t-h-1}^*g_t \right) + u_{t-h+1,t} \]

Forecast errors combine current and past shocks

Expectations revisions may be correlated

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

but are good proxies for shocks (conditional on their past)

Nowcast errors ("misexpectations")

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

May contain additional information

Agents have heterogeneous beliefs

Potential aggregation bias
Identification with Imperfect Information

- The new information is only partially absorbed over time

\[ g_t - \mathbb{E}_{t-h}^* g_t = \frac{1 - \kappa}{\kappa} (\mathbb{E}_{t-h}^* g_t - \mathbb{E}_{t-h-1}^* g_t) + u_{t-h+1, t} \]

→ Forecast errors combine current and past shocks

- Expectations revisions may be correlated

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

→ but are good proxies for shocks (conditional on their past)

- Nowcast errors ("misexpectations")

\[ g_t - \mathbb{E}_{t}^* g_t = \frac{1 - \kappa}{\kappa} (\mathbb{E}_{t}^* g_t - \mathbb{E}_{t-1}^* g_t) \]

→ May contain additional information

- Agents have heterogenous beliefs

→ Potential aggregation bias
The new information is only partially absorbed over time

\[ g_t - \mathbb{E}^*_t h g_t = \frac{1 - \kappa}{\kappa} (\mathbb{E}^*_t h g_t - \mathbb{E}^*_{t-h-1} g_t) + u_{t-h+1,t} \]

Forecast errors combine current and past shocks

Expectations revisions may be correlated

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

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May contain additional information

Agents have heterogenous beliefs

Potential aggregation bias
Multipliers
### Fiscal (S&L 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>
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<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>
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)

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