Evaluating Fiscal Stimulus Packages: Before and After

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Based on joint research with
John Cogan, Tobias Cwik, and Volker Wieland

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Federal Reserve Bank of Atlanta
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Fiscal Stimulus Packages

U.S.A.:
- 2008: Mostly tax rebates
- 2009: ARRA: larger and more focus on G
europe:
- 2008/9
  ➔ The European Economic Recovery Plan
  ➔ National plans: for example, in Germany, Konjunkturpaket 1 und 2

Other G20 countries: (IMF)
Two approaches to policy evaluation

(1) Simulations of models with counterfactuals

   ➔ Natural to use *before* policy is implemented
     • Cogan, Cwik, Taylor, Wieland, forthcoming *JEDC* 2010
   ➔ But also used *after* policy is implemented
     • Some seem to think there is new information.

(2) Look at what actually happened and try to see if the policy worked

   ➔ “Real time” policy evaluation: new information
   ➔ Possible disadvantages
     • May be too early to tell
     • Only one patient, but…
GDP Effect of Permanent 1% Increase in Government Purchases

Evidence of a lack of robustness?
The Government Purchases Multiplier

- Romer/Bernstein used **1.6 for 4 years**
  - average 2 models: unnamed firm & Fed
  - assume permanent increase in G
  - assume permanent interest rate peg

- Because of modelling uncertainty policy evaluations should be robust to alternative models and assumptions.
  - use new platform for a comparative approach to model-based policy analysis.
Alternative Model and Assumptions

- Model: Smets and Wouters (AER, 2007)
  - Estimated New-Keynesian DSGE model
  - Based on Christiano, Eichenbaum, Evans
  - Highlighted in Woodford’s AEJ-Macro review

- Assumptions:
  - Interest rates constant for 1 (or 2) years then return to Taylor rule.
  - Actual ARRA spending plan.

- Range of sensitivity exercises.
Romer-Bernstein (09) vs Smets-Wouters (07)

- 1% permanent increase in government spending.
- 1 year of constant interest rates (2009), anticipated.

<table>
<thead>
<tr>
<th></th>
<th>Percentage increase in real GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2009Q1</td>
</tr>
<tr>
<td>Romer/Bernstein</td>
<td>1.05</td>
</tr>
<tr>
<td>Smets/Wouters</td>
<td>0.96</td>
</tr>
</tbody>
</table>
Romer-Bernstein (09) vs Smets-Wouters (07)

- 1% permanent increase in government spending.
- 2 years of constant interest rates (2009 and 2010), anticipated.

<table>
<thead>
<tr>
<th></th>
<th>2009Q1</th>
<th>2009Q4</th>
<th>2010Q4</th>
<th>2011Q4</th>
<th>2012Q4</th>
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<tbody>
<tr>
<td>Romer/Bernstein</td>
<td>1.05</td>
<td>1.44</td>
<td>1.57</td>
<td>1.57</td>
<td>1.55</td>
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<tr>
<td>Smets/Wouters</td>
<td>1.03</td>
<td>0.89</td>
<td>0.61</td>
<td>0.44</td>
<td>0.40</td>
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## ARRA 2009

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Increase in Federal Purchases</th>
<th>Increase in Transfers to States, Localities</th>
<th>Increase in Federal Deficit*</th>
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</thead>
<tbody>
<tr>
<td>2009</td>
<td>21</td>
<td>48</td>
<td>184</td>
</tr>
<tr>
<td>2010</td>
<td>47</td>
<td>107</td>
<td>400</td>
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<tr>
<td>2011</td>
<td>46</td>
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<td>134</td>
</tr>
<tr>
<td>2012</td>
<td>36</td>
<td>8</td>
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<tr>
<td>2013</td>
<td>25</td>
<td>4</td>
<td>27</td>
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<td>27</td>
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<td>2015</td>
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<td>0</td>
<td>5</td>
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<tr>
<td>2016</td>
<td>-2</td>
<td>0</td>
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<td>2017</td>
<td>-3</td>
<td>0</td>
<td>-7</td>
</tr>
<tr>
<td>2018</td>
<td>-2</td>
<td>0</td>
<td>-6</td>
</tr>
</tbody>
</table>
Figure 2. Estimated Output Effects of Government Purchases in the February 2009 Stimulus Legislation. (Government purchases equal federal purchases plus 60 percent of transfers to state and local governments for purchases of goods and services)
Effect on Private Spending

Figure 3. Crowding Out of Consumption and Investment in the February 2009 Stimulus Legislation (Government purchases are as in Figure 2)
CCTW: Impact of Total Package by 2010 Q4

+ .46 percent of GDP (due to G)

+ .19 percent of GDP (due to TaxTransfer, back-of-the envelope calculation)

= .65 percent of GDP

i.e. closer to ½ rather than 3 ½ million additional jobs as estimated by Romer/Bernstein.
Sensitivity Analysis

1. Make model more Old Keynesian by adding rule-of-thumb households

2. Use alternative method to impose zero bound: simulate a state of deep recession where rate cannot go below zero-interest-rate floor.
1. More Old Keynesian

- Extend the Smets-Wouters model to allow for two types of consumers.
  - Rational‘s: forward-looking, optimizing consumption-savings choice.
  - Ricardian-equivalence fails: path of taxes matters, even though still lump-sum.
  - Include government debt and tax policy rule.
Estimate: 28 Percent Are of Households are Rule-of-Thumb

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</thead>
<tbody>
<tr>
<td></td>
<td>post. mean</td>
<td>prior mean</td>
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<tr>
<td>$\omega$</td>
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<tr>
<td>$\sigma_c$</td>
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<tr>
<td>$h$</td>
<td>0.713</td>
<td>0.700</td>
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<tr>
<td>$\xi_p$</td>
<td>0.652</td>
<td>0.500</td>
</tr>
</tbody>
</table>

Share of non-Ricardian households
Inverse of intertemporal elasticity of substitution
Degree of habit formation
Sticky prices (Calvo parameter)
Effects of ARRA Spending

- GDP (Smets-Wouters Model)
- GDP (Extended Model with Rule-of-Thumb Consumers)
- Consumption (SVV Model)
- Consumption (Extended Model)
- Consumption + Investment (SVV Model)
- Cons. + Inv. (Extended Model)
2. Recession and zero bound

☐ Baseline scenario:

⇒ Simulate SW model with actual US data up to and including 2009:Q1.
⇒ then project forward from 09:Q1 onwards with and without fiscal stimulus.
⇒ Compute difference.
⇒ with Fed following Taylor rule, the zero bound is not binding when simulating the SW 07 model. If SW rule instead...
Impact of ARRA Spending

Real GDP

- Smets-Wouters Rule, Start in Recession State, Zero Bound Endogenous
- Constant Interest Rate in 2009 (Figure 2)
What if recession was deeper?
Now on to the “after” question: “Is It Working?”

☐ Most attempts to answer this question continue to look at the same model simulations

 ➔ The answer is built into the model just as much “after” as “before”

☐ Consider the following example based on a news article from last November
The accumulation of hard data and real-life experience has allowed more dispassionate analysts to reach a consensus that the stimulus package, messy as it is, is working.

*New York Times* November 12, 2009
The chart illustrates the trends in disposable personal income and personal consumption expenditures over the years from January 2007 to July 2009.

- **Disposable personal income** shows a steady increase until a peak in July 2008, followed by a sharp decline due to the stimulus package.
- **Personal consumption expenditures** initially rise slowly, reaching a peak in mid-2008 due to the stimulus. Thereafter, it decreases, partially due to the cash for clunkers program.

The chart indicates the significant impact of government stimulus programs on both income and consumption levels.
Change in growth and contributions - 1\textsuperscript{st} to 2\textsuperscript{nd} quarter
Percentage points

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real GDP</td>
<td>5.7</td>
</tr>
<tr>
<td>Consumption</td>
<td>-1.1</td>
</tr>
<tr>
<td>Investment</td>
<td>5.9</td>
</tr>
<tr>
<td>Net Exports</td>
<td>-1.0</td>
</tr>
<tr>
<td>Government</td>
<td>1.9</td>
</tr>
<tr>
<td>Defense</td>
<td>1.0</td>
</tr>
<tr>
<td>Non Defense</td>
<td>0.2</td>
</tr>
<tr>
<td>State and Local</td>
<td>0.7</td>
</tr>
</tbody>
</table>
Real GDP growth

Investment contribution
Percent

Consumption contribution

Real GDP growth

2007Q1 2007Q3 2008Q1 2008Q3 2009Q1 2009Q3