Monetary Policy Matters

New evidence based on a new shock measure

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[1] Does not necessarily reflect the views of the IMF

Motivation

after a contractionary monetary policy shock, short term interest rates rise, aggregate output, employment, profits and various monetary aggregates fall... monetary policy shocks account for only a very modest percentage of the volatility of aggregate output (Christiano et al., 1999)

- However, results from traditional (VAR and narrative) identification schemes do not replicate this conventional wisdom for the recent period (after the Volcker shock)
- Can this failure be rationalized, and is the conventional wisdom still right?
  - Yes, and (mostly) yes

Failure of Conventional Identification Schemes

- We estimate four benchmark identification schemes for 1998-2008
  - All suggest counterintuitive positive output response to "contractionary" monetary policy shock.
- We use Romer and Romer's (2004) policy reaction function to investigate changing Fed behavior
  - Regress change in policy rate on past policy rate and 17 macro forecasts/estimates
  - Policymaking environment has changed: forecast variables more important post-1988
- This creates simultaneity bias that conventional identification schemes do not sufficiently correct for

What we do

- We use private sector information as a proxy for the Fed's forward-looking information set:
  - if private sector anticipates forward-looking component of policy, new information is shock
  - policy shock proxied by change in Fed Funds futures prices on day of policy announcement
- We can recover "sensible" results for output
  - Output falls in response to contractionary shock, with maximum impact after 2 years
  - However, relative effect is larger than found elsewhere: up to half of output variability at 3 year horizon due to policy shocks

Remainder of Presentation

- Results of conventional identification Schemes:
  - comparing original results for 1960s-1990s with results for recent period
- Accounting for this change:
  - Estimate Romer and Romer (2004) policy reaction function to illustrate changing policymaking behavior
  - In particular more pronounced response to forward-looking information
- Outline our new measure
- Present our main results:
  - Recover "sensible" output results
  - Robust evidence of small "price puzzle"
  - A new puzzle: very high share of output volatility accounted for by policy shocks

Identifying Monetary Policy Shocks

- Literature has focused on identifying the effect of monetary policy **shocks** rather than policy per se:
  - shocks are by definition exogenous, hence not subject to simultaneity concerns
- Following Christiano et al. (1999), monetary policy shocks are given by the disturbance term s_t in an equation of the form:

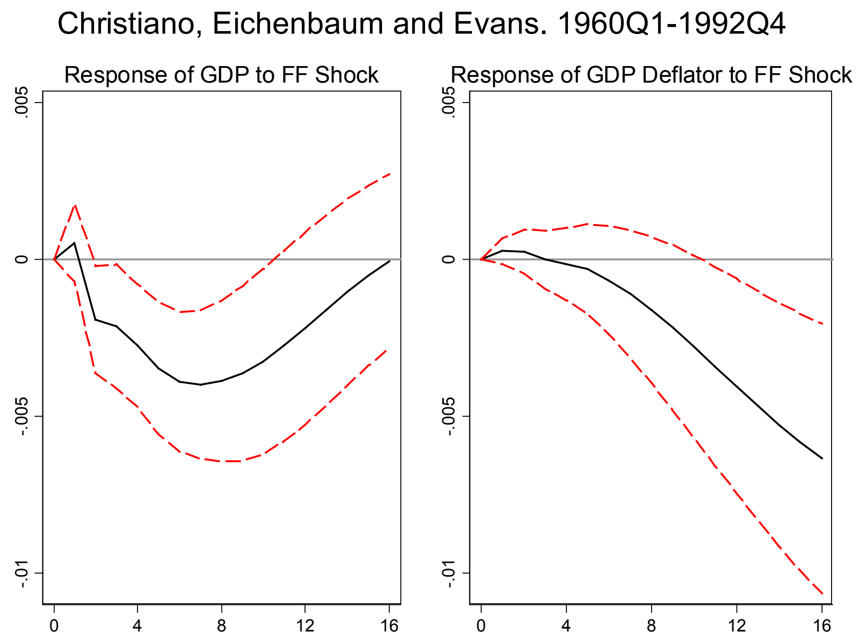
$$S_t = f\left(\Omega_t\right) + s_t \tag{1}$$

- where S_t denotes the monetary stance;
- f is a function relating S_t to the policymaker's information set Ω_t.

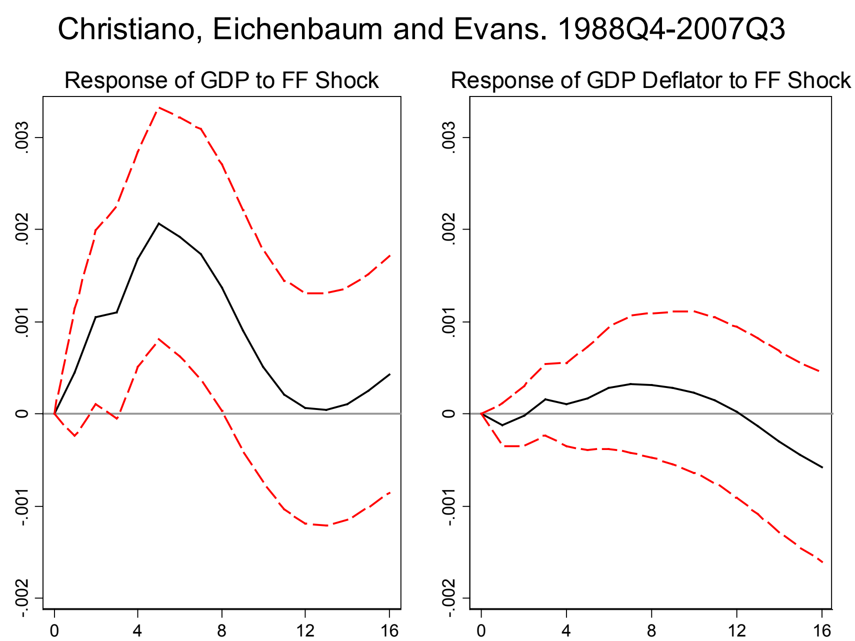
Four Conventional Identification Schemes

- Recursive VAR identification (Christiano, Eichenbaum and Evans, 1996; 1999)
    - basic set of 6 macro variables; quarterly with 4 lags
- Non-recursive VARs:
    - Bernanke and Mihov (1998): model of the Fed's operating procedure
    - Sims and Zha (2006): additional variables plus non-recursive identification
- Narrative Approach (Romer and Romer, 2004)
    - Estimate (1) directly and use the residuals as a proxy for s.

Figure 1.
Panel a.

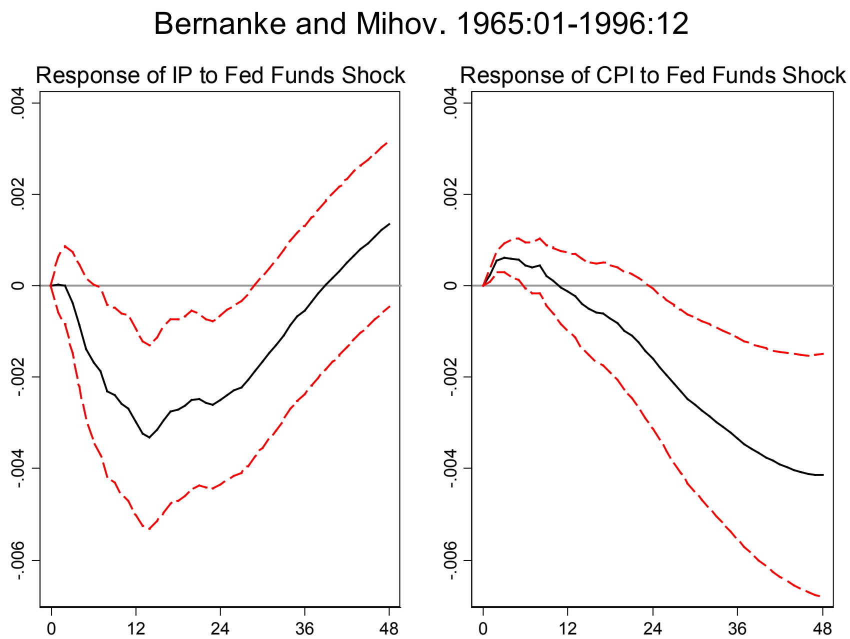


Panel b.

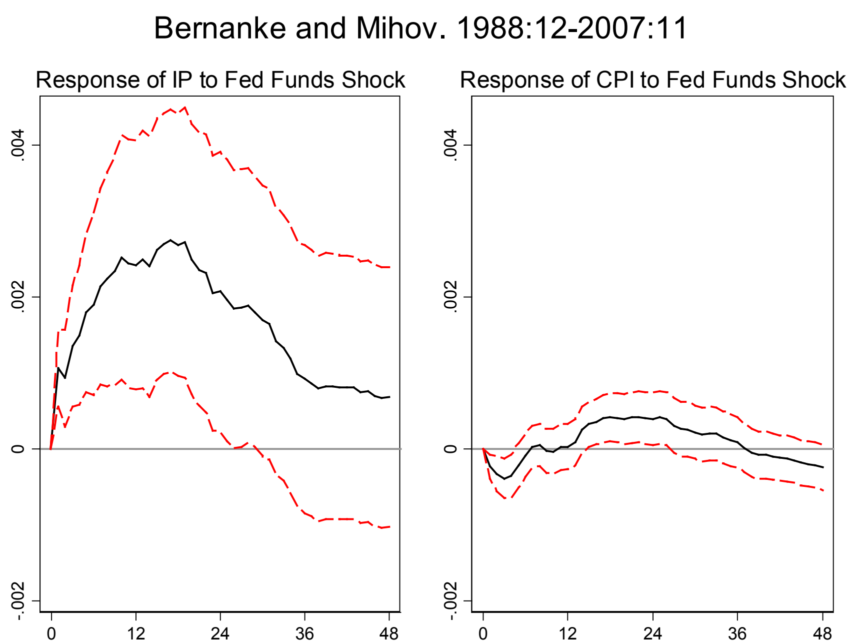


Structural VAR (quarterly data, 6 endogenous variables plus constant and linear time trend, 4 lags) as described in text.
Variables ordered as GDP, GDP deflator, commodity prices, non-borrowed reserves, Fed Funds rate, total reserves. All variables except for the Fed Funds rate are in logs and seasonally adjusted. Graphs show response of GDP and GDP deflator to a one standard deviation positive shock to the Fed Funds rate.
Structural shocks obtained via Cholesky decomposition.
Two Standard Error bands produced by parametric bootstrapping (500 replications).

Figure 2.
Panel a



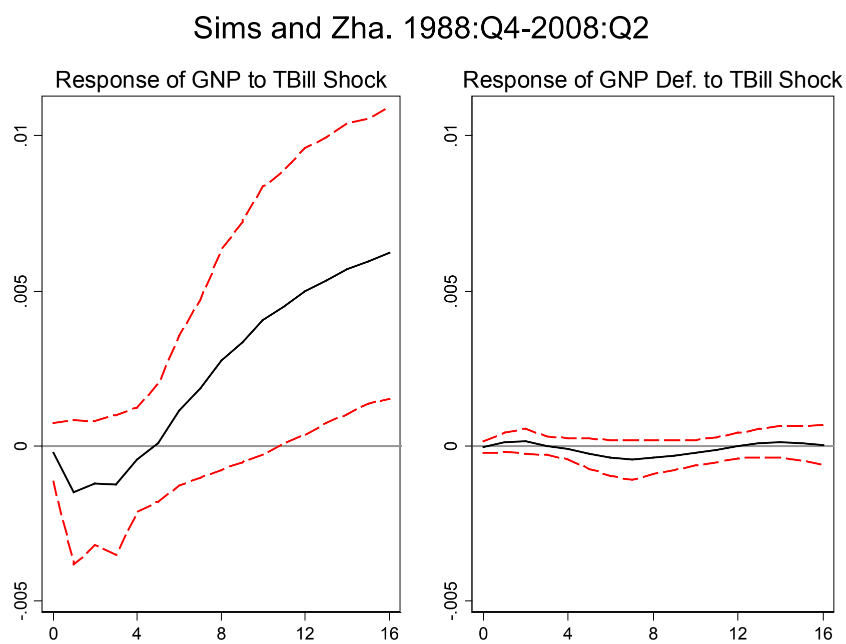
Panel b



Structural VAR (monthly data, 6 endogenous variables plus constant and linear time trend, 13 lags) as described in text. Variables include industrial production, consumer price index, commodity prices, Fed Funds rate, total reserves, non-borrowed reserves. The first 3 variables are in logs and seasonally adjusted. The last two variables are seasonally adjusted and normalized by dividing by the 36-month moving average of total reserves. Graphs show response of output and CPI to a one standard deviation positive shock to the Fed Funds rate. Structural Shocks obtained by imposing the structural decomposition discussed in the text (1 overidentifiying restriction) Two Standard Error bands produced by parametric bootstrapping (500 replications).

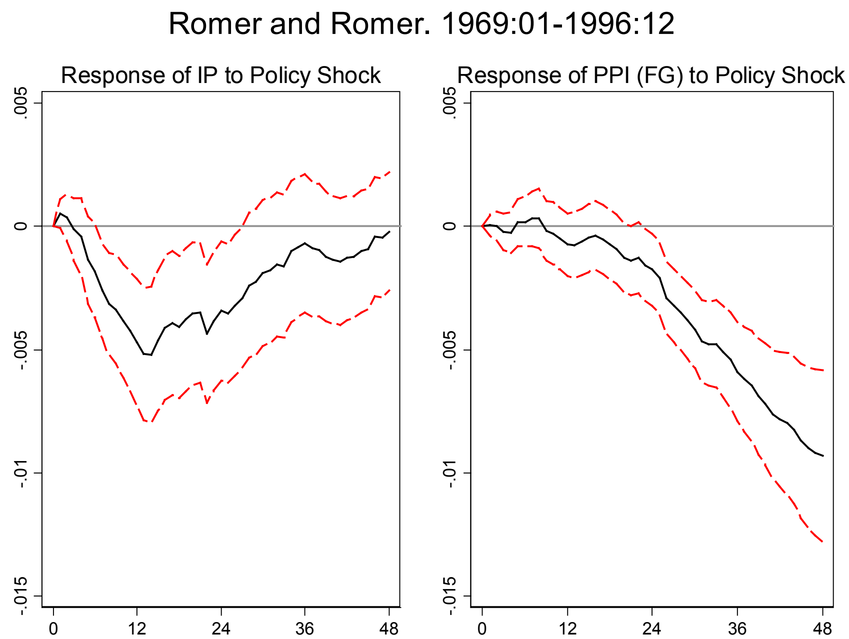
Figure 3.
Panel a.

Panel b.

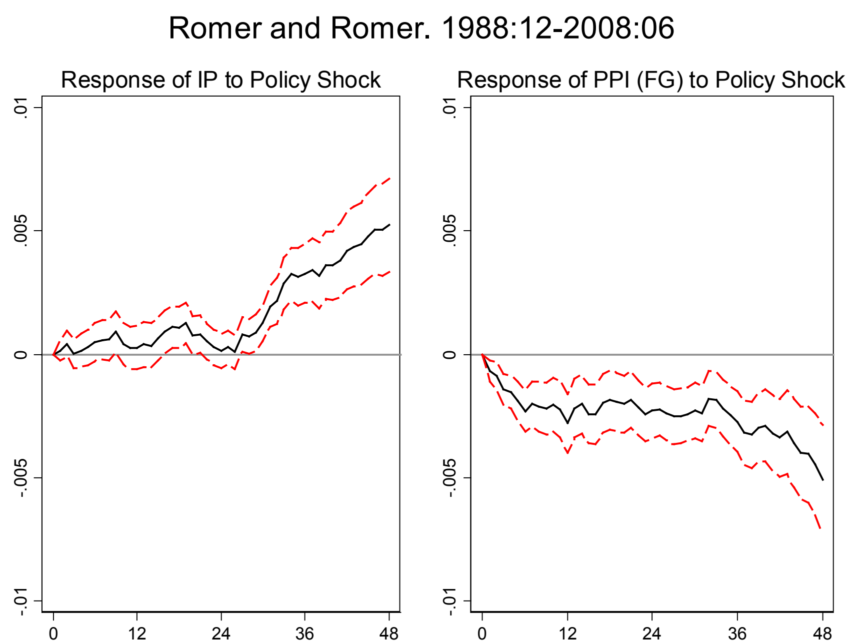


Structural VAR (Quarterly data, 7 endogenous variables plus constant and linear time trend, 4 lags) as described in text.
Variables include Crude Materials Prices, M2, T Bill Rate, Intermediate Materials Prices, GNP Deflator, Wages (private sector workers) and GNP. All variables except the T Bill Rate are in logs and seasonally adjusted. Graphs show response of GNP and GNP Deflator to a one standard deviation positive shock to the T Bill Rate.
Structural Shocks obtained by imposing the structural decomposition discussed in the text (2 overidentifying restrictions).
Two Standard Error bands produced by parametric bootstrapping (500 replications).

Figure 4.
Panel a.



Panel b.



Structural VAR (Monthly data, 3 endogenous variables plus constant and linear time trend, 36 lags).
Variables ordered as industrial production, producer price index (finished goods), both seasonally adjusted and in logs, and Romer and Romer's shock measure, cumulated. Graphs show response of industrial production and PPI (finished goods) to a one standard deviation positive shock to the policy measure.
Structural shocks obtained via Cholesky decomposition.
Two Standard Error bands produced by parametric bootstrapping (500 replications).

Broad changes in policymaking

- We analyze broad changes in policymaking by estimating Romer and Romer's policy equation
  - 17 macro forecasts/estimates include:
  - current quarter (t) unemployment estimate
  - t-1, t, t+1 and t+2 estimates/forecasts of output and prices (8 variables)
  - changes since last meeting of these 8 variables
- Analyze residuals to see show shocks have changed
- Analyze structural stability (across regime periods defined by Bagliano and Favero, 1998)
- Analyze changing weights on forward- and backwards-looking variables

What do we learn?

- Analyze residuals to see show shocks have changed:
  - residuals have become much smaller: shocks are harder to identify
- Analyze structural stability (across regime periods defined by Bagliano and Favero, 1998)
  - parameters are unstable: assuming constant parameters gives inconsistent shock estimates
- Analyze changing weights on forward- and backwards-looking variables
  - More weight on forward-looking variables post-1988
  - i.e. simultaneity is a bigger problem in the later period
  - **policy tightening in response to expected boom will show up as positive output response to contractionary policy**

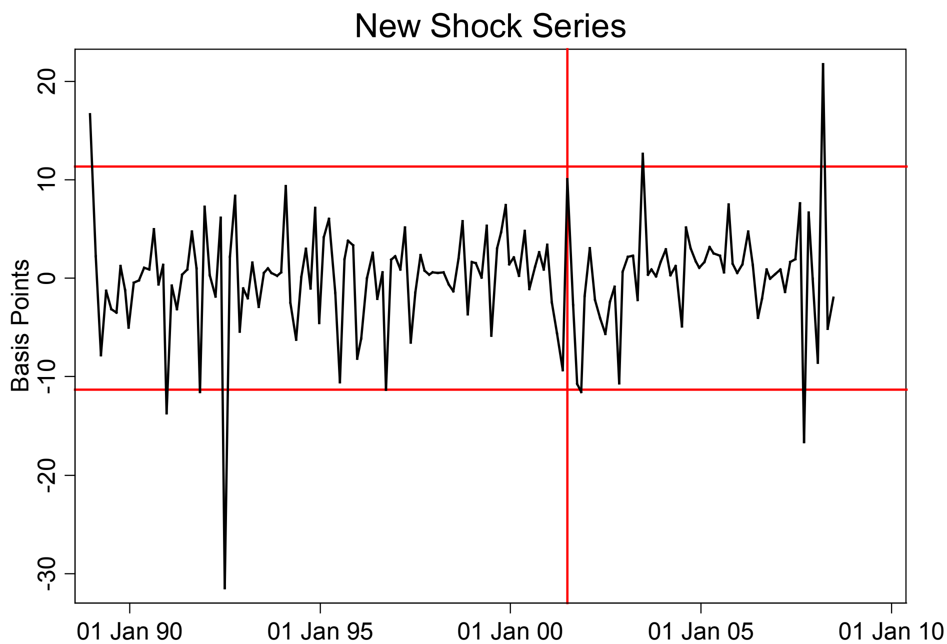
Our measure: intuition

- VAR methods only include past information in Ω_t: do not capture forward-looking policy
- Narrative method attempts to capture forward-looking policy; but imposes restrictions on $f\left(\Omega_t\right)$
- Our method assumes that the private sector and Fed share the same information set Ω_t
  - Fed's private information is white noise
- Hence "surprise" component of policy announcement (S) is a good proxy for policy shock s

Fed Funds futures market

- Following Kuttner (2001); Gurkaynak (2005); Gurkaynak et al (2005), we focus on the Fed Funds futures market
- Market established at CBOT in October 1988
- Price of a contract for month $m+h$ negotiated in month m is a bet on the monthly average effective Fed Funds rate in that month (i.e. horizon h months ahead)
- Change in price on day of policy announcement gives estimate of surprise in policy announcement
  - Assuming no systematic change in risk premia
- Unlike previous studies, we use common (levels) factor from contracts at horizons 0-5, not horizon 0 surprise only
  - averaging reduces noise
  - captures shocks to medium-term level of rates, not just timing of change

Figure 6.



New shock series, in basis points. To make it comparable in size to the 6 underlying shocks, the first factor (SD=1 by construction) is divided by the sum of the 6 coefficients from the factor model. Two standard error bands shown by horizontal lines; vertical line identifies the June 2001 FOMC meeting discussed in Section 4.5.

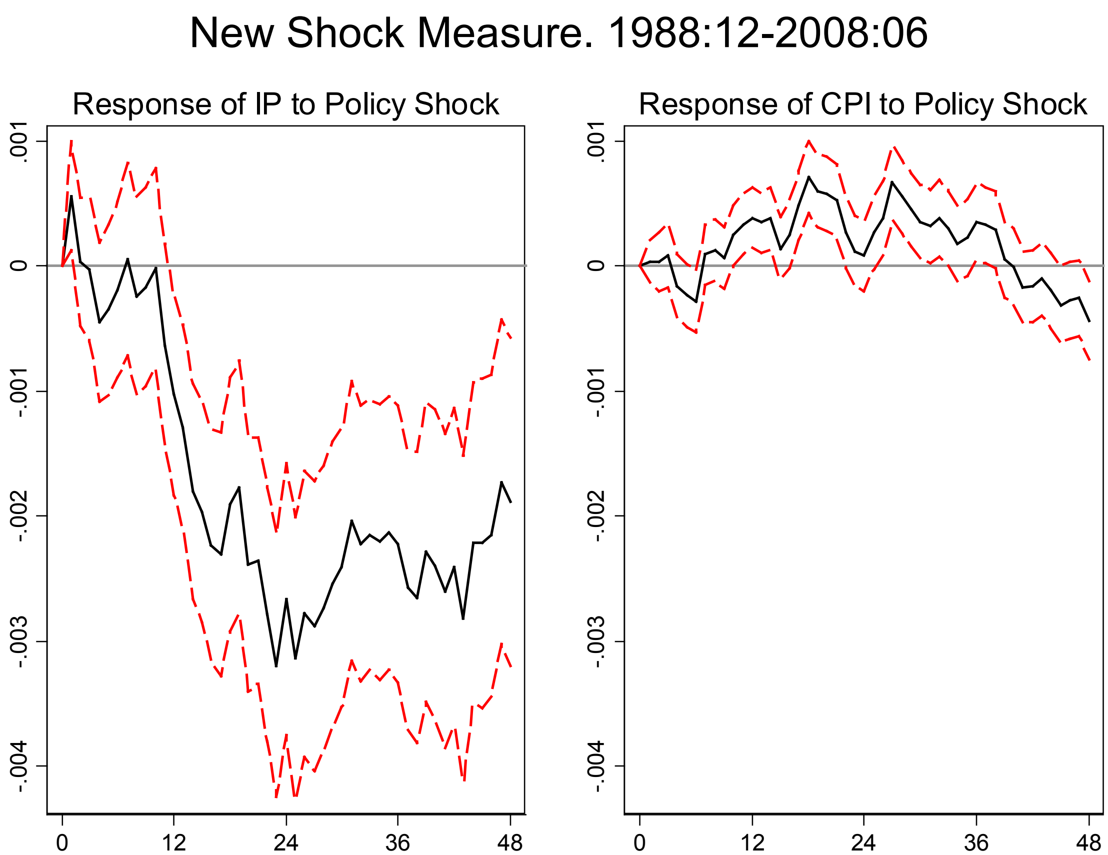
An illustrative observation

- FOMC meeting on June 26-27, 2001: 25 bps reduction in policy rate
- Followed 5 successive 50 bps cuts; markets expected more
  - Our shock measure shows a 10 bp **contractionary** shock
  - RR and CEE show expansionary shock
- Market reaction is more in keeping with the shock being contractionary:
  - dollar strengthened
  - bond yields rise

Estimating impulse responses

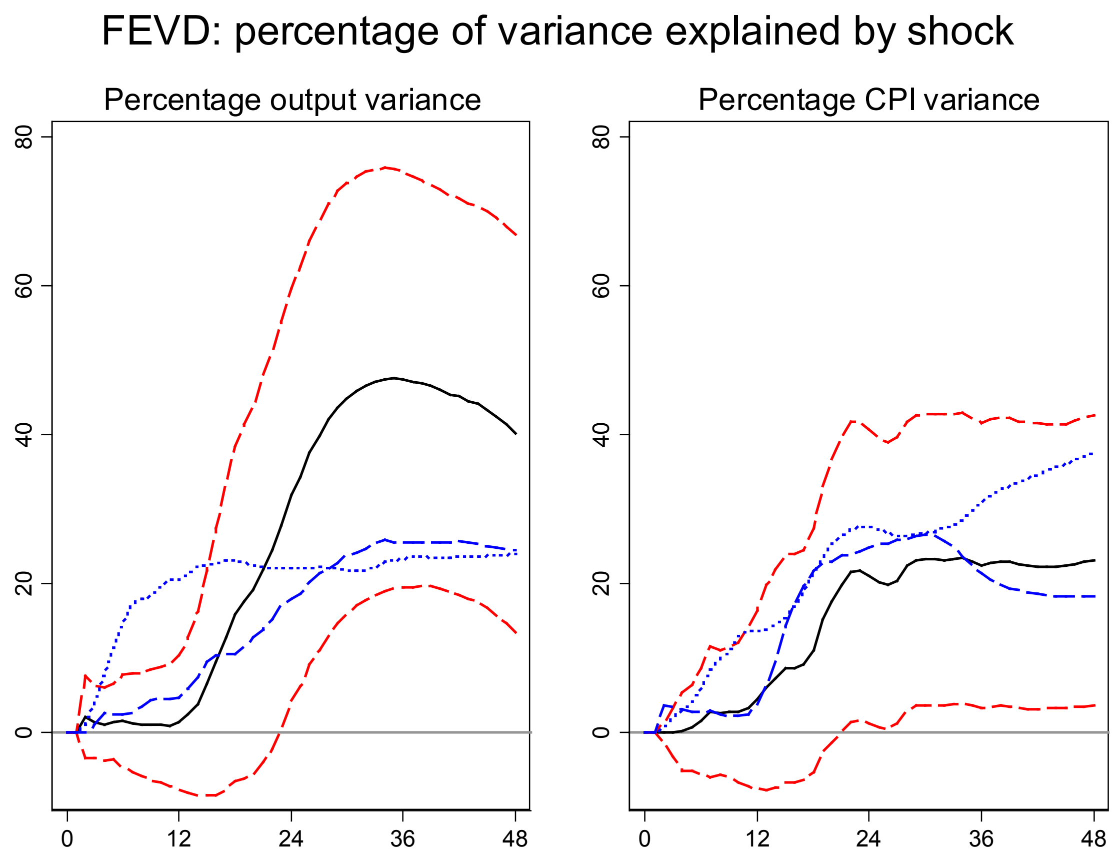
- Following Romer and Romer (2004), we cumulate our shock measure and enter in a 3-variable recursive VAR in levels:
- Ordering: (log) industrial production; (log) CPI; cumulative shock measure
- 36 lags; estimated monthly over 1988M12-2008M06
- We recover conventional results for output
- Also find evidence for a modest "price puzzle" (in line with Thapar, 2008).

Figure 7.



Structural VAR (Monthly data, 3 endogenous variables plus constant and linear time trend, 36 lags).
Variables ordered as industrial production, consumer prices, both seasonally adjusted and in logs, and our shock measure, cumulated.
Graphs show response of industrial production and CPI to a one standard deviation positive shock to the policy measure.
Structural shocks obtained via Cholesky decomposition.
Two Standard Error bands produced by parametric bootstrapping (500 replications).

Figure 8.



Structural VAR (Monthly data, 3 endogenous variables plus constant and linear time trend, 36 lags).
Variables ordered as industrial production, consumer prices, both seasonally adjusted and in logs, and one of three policy measures: our shock measure; Romer and Romer's measure (both cumulated); and the Federal Funds rate.
Graphs show Cholesky FEVDs: the percentage of the forecast error for output and CPI accounted for by each policy measure. The FEVD for our shock measure is shown in bold, with two standard error bands produced by parametric bootstrapping. FEVDs for the Fed Funds rate (dashed line) and Romer and Romer shock (dotted line) are shown for comparison (SE bands not shown).

Eight robustness checks

1. Order shock measure first in VAR
2. Use RR's price measure (log PPI for finished goods)
3. Modify lag structure (6, 12 or 24 lags)
4. Look at subsamples
5. Include commodity price index
6. Include inflationary expectations (Castelnuovo and Surico, 2006)
7. Dummies for 3 FOMC meetings that coincided with release of Employment Report
8. Estimate single-equation systems for output and prices (RR)

Results

1. No significant effects on results
2. No significant effects
3. No significant effects
4. No significant effects
5. Does not eliminate price puzzle; shocks do not impact commodity prices
6. Does not eliminate price puzzle
7. No significant effects on results
8. Like RR, output effect is now permanent (negative) not U-shaped (borderline sig.).

Are our "shocks" just revelation of Fed's accurate private information?

- If the Fed had better information than the private sector, then simultaneity problem would remain
- Romer and Romer (2000) show that Fed's private information is better than consensus
  - However consensus forecast will tend to be inefficient; may not be a fair test
- We regress our shock measure on the Fed's private information (difference between Fed's and consensus forecasts)
  - Decompose into **explained** and **residual**
  - Enter both in VAR: effects on output are similar

Implications for our results

- If the **explained** portion included Fed's response to (accurate) information about future output:
  - **bias should lead to less significant results**
  - we are likely **underestimating** true effect
  - i.e. this bias cannot explain our results
- In any case, Fed's private forecasts are mostly noise (i.e. not genuine information advantage):
  - only 5-20 percent of Fed's private information on output explained by actual outcomes
- **Residual portion should capture all the measurement error**
  - Hence, bias due to simultaneity appears of same magnitude (likely small) as that due to measurement error.

Conclusions

- We show that conventional identification strategies give results for recent period that are inconsistent with conventional wisdom
- Using a new identification scheme based on Fed Funds futures prices, we can recover conventional wisdom
- But we find policy shocks account for a relatively large share of output volatility in this period
- Our rationale for this:
  - The Fed prevented high and volatile inflation and kept output growth stable (up to 2008) by active monetary policy
  - e.g. policy that respected the Taylor principle
  - But active policy increases role of policy shocks in explaining remaining volatility.