The impact of monetary policy shocks on commodity prices

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Introduction

- Commodity prices have been a major source of concern for policymakers
- Wide strand of literature on the impact of commodity prices on macroeconomic variables
  - US recessions preceded by oil price shocks (Hamilton 1984)
  - Response of monetary policy (Bernanke, Gertler and Watson 1997)
  - Stagflationary impact of oil price shocks (Barsky and Kilian 2002)?
- Less work on the impact of monetary conditions on commodity prices
Motivation

- Global liquidity has often been mentioned as a cause of commodity price surge
- Frankel (1986) derives a theoretical no-arbitrage link between oil prices and monetary policy
- Frankel and Rose (2009) assessed empirically the link by using interest rates
- Interest rates may not fully represent the impact of a monetary policy shock
  - Their movements can reflect the endogenous response of monetary policy
Goal and results of the paper

- We identify a monetary policy shock in a VAR system and assess its impact on commodity prices
- We then project each of the commodity prices on this shock
- We find empirical evidence of a significant impact of monetary policy on commodity prices
  - It however seems to be of rather limited magnitude
- We also try to shed some light on the channel through which monetary policy shocks affect commodity prices
Monetary policy and commodity prices

**DIRECT CHANNEL** (Frankel 2007)
1. Lower opportunity cost of carrying inventories, hence increasing demand
2. Incentive to postpone extraction of exhaustible commodities
3. Lower carrying cost of speculative positions, hence pressure on futures prices

**INDIRECT CHANNEL** (Barsky and Kilian 2004)
- (Expectations of) Stronger inflation and growth
The data

- Monthly US variables from Jan1970 to Sep2009:
  - Federal funds rate
  - Money stock (M2)
  - CPI
  - Industrial production index
  - Commodity price index (in USD)
  - Specific commodity index: crude oil, metals and food (only included after having identified the monetary policy shock)
- VAR system with 12 lags
Identification scheme

- KIM (1999)
  1. Money supply equation:
  2. CPI and industrial production are not available to policymaker
  3. Money demand equation:
  4. depends on real activity and the nominal interest rate
  5. Real activity responds to price and financial signals with a lag
  6. The interest rate, money, and the commodity price index are assumed not to affect real activity contemporaneously
  7. Arbitrage equation which describes equilibrium in the commodity market
  - All variables are assumed to have contemporaneous effects on the commodity price
Response to a 100 bp monetary policy easing

**Federal funds rate**

**Consumer price index**

**Monetary aggregate**

**Industrial production**

**Commodity price index**
Results from the 5-variables VAR system

- All responses have the expected sign except M2 (but it’s not significant) and are significant expect CPI (but the sign is correct)
- Response to the monetary shock is significant and persistent
- It takes 36 months for it to converge back
- The monetary policy shock leads to an increase of the commodity price index of roughly 2.5%, in the first 24 months
- Temporary effect on relative prices which is reabsorbed in the medium run
- The hump-shaped response of commodity prices testifies an initial overshooting
Enlarging the system

- We re-estimate the system adding the oil price or the individual commodity price

\[
\begin{bmatrix}
\eta_{ms}^t \\
\eta_{md}^t \\
\eta_{cpi}^t \\
\eta_{ip}^t \\
\eta_{com}^t \\
\eta_{oil}^t \\
\end{bmatrix}
= 
\begin{bmatrix}
1 & g_{12} & 0 & 0 & g_{15} & 0 \\
g_{21} & 1 & g_{23} & g_{24} & 0 & 0 \\
0 & 0 & 1 & g_{34} & 0 & 0 \\
0 & 0 & 0 & 1 & 0 & 0 \\
g_{51} & g_{52} & g_{53} & g_{54} & 1 & 0 \\
g_{61} & g_{62} & g_{63} & g_{64} & g_{65} & 1 \\
\end{bmatrix}
\begin{bmatrix}
\varepsilon_{ms}^t \\
\varepsilon_{md}^t \\
\varepsilon_{cpi}^t \\
\varepsilon_{ip}^t \\
\varepsilon_{com}^t \\
\varepsilon_{oil}^t \\
\end{bmatrix}
\]
IRFs of selected commodities
Variance decomposition

Commodity price index

Oil

Metals

Food
The transmission channels

- What is the channel through which monetary policy exerts its impact?
- Indirect impact through expectations of inflation and growth
- Other direct channels: ‘inventory channel’, ‘supply channel’, ‘financial channel’ (Frankel 2007)
Data description

- Data on oil inventories:
  - US industry stocks of crude oil (EIA), Jan1970 to Sep09
- Data on oil supply:
  - World production of crude oil (IEA) Feb1984 to Sep09
- Measure of speculative activity:
  - Non-commercial net long positions (difference between the number of long and short positions held by agents not related to physical oil)
    - Positive net positioning should suggest that non-commercial agents are mostly bullish
The transmission channel

<table>
<thead>
<tr>
<th>Dep. Variable:</th>
<th>Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coefficient</td>
<td>N = 296</td>
</tr>
<tr>
<td>MP Shock</td>
<td>0.394</td>
</tr>
<tr>
<td>Supply (-1)</td>
<td>0.030</td>
</tr>
<tr>
<td>Supply (-2)</td>
<td>-0.143</td>
</tr>
<tr>
<td>Supply (-3)</td>
<td>-0.132</td>
</tr>
<tr>
<td>Std. error</td>
<td>0.215</td>
</tr>
<tr>
<td>t-stat</td>
<td>1.83</td>
</tr>
<tr>
<td>P-value</td>
<td>0.068</td>
</tr>
<tr>
<td>DW</td>
<td>2.01</td>
</tr>
<tr>
<td>adj-$R^2$</td>
<td>0.04</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dep. Variable:</th>
<th>Stocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coefficient</td>
<td>N = 468</td>
</tr>
<tr>
<td>MPShock</td>
<td>-0.455</td>
</tr>
<tr>
<td>Std. error</td>
<td>0.263</td>
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<tr>
<td>t-stat</td>
<td>-1.73</td>
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<tr>
<td>P-value</td>
<td>0.085</td>
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<tr>
<td>DW</td>
<td>1.96</td>
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<tr>
<td>adj-$R^2$</td>
<td>0.004</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dep. Variable:</th>
<th>Net long</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coefficient</td>
<td>N = 141</td>
</tr>
<tr>
<td>MPShock</td>
<td>-1057660</td>
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<tr>
<td>Std. error</td>
<td>590704</td>
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<tr>
<td>t-stat</td>
<td>-1.79</td>
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<tr>
<td>P-value</td>
<td>0.076</td>
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<tr>
<td>DW</td>
<td>2.05</td>
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<tr>
<td>adj-$R^2$</td>
<td>0.10</td>
</tr>
</tbody>
</table>
Robustness checks

- We tried to assess results using different identification schemes for the monetary policy shock:
  - Plain Choleski (Bernanke and Blinder 1992)
  - Sign restrictions (Uhlig 2005)
  - Financial market measure (Kuttner 2001)
  - Narrative approach (Romer and Romer 2004)
Robustness checks
### Robustness checks

<table>
<thead>
<tr>
<th>Dep. Variable: Supply</th>
<th>Boivin &amp; Giannoni</th>
<th>Kuttner</th>
<th>Romer &amp; Romer</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP Shock</td>
<td>0.563***</td>
<td>-0.0000</td>
<td>0.0002</td>
</tr>
<tr>
<td>MP Shock (-1)</td>
<td>–</td>
<td>0.0001**</td>
<td>–</td>
</tr>
<tr>
<td>MP Shock (-3)</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Supply (-1)</td>
<td>0.030</td>
<td>-0.120*</td>
<td>0.043</td>
</tr>
<tr>
<td>Supply (-2)</td>
<td>-0.148***</td>
<td>-0.150**</td>
<td>-0.143*</td>
</tr>
<tr>
<td>Supply (-3)</td>
<td>-0.134***</td>
<td>-0.079</td>
<td>-0.150*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dep. Variable: Stocks</th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MP Shock</td>
<td>-0.435</td>
<td>-0.0002</td>
<td>-0.001</td>
</tr>
<tr>
<td>MP Shock (-1)</td>
<td>-0.019</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>MP Shock (-2)</td>
<td>0.243</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dep. Variable: Net long</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MP Shock</td>
<td>-2174230***</td>
<td>232.28</td>
<td>–</td>
</tr>
<tr>
<td>MP Shock (-1)</td>
<td>-998205</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>MP Shock (-2)</td>
<td>1933667***</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Net long (-1)</td>
<td>0.037</td>
<td>0.015</td>
<td>–</td>
</tr>
<tr>
<td>Net long (-2)</td>
<td>-0.245***</td>
<td>-0.275***</td>
<td>–</td>
</tr>
</tbody>
</table>
Conclusions

- US monetary policy shocks has an impact on commodity prices
- The effect of these shocks does not appear to be overwhelmingly large
- We find some evidence supportive of the Frankel (1986) argument
- The bulk of monetary policy effects on commodity prices seem to be due to the indirect channels as in Barsky and Kilian (2004)