Discussion of:

The Economic Impact of Oil on Industry Portfolios

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Objective: Study the effect of oil price shocks on industry portfolios

Model with multiple transmission channels. Oil impacts

- Interest rates
- Risk premia
- Current and future cash flows

Estimation by maximum likelihood on 13 industry portfolios

Main finding: Significant impact of oil price shocks on returns

- Positive for oil industry
- Negative for non-oil industries
The model

▶ Pricing kernel

\[
\frac{d\Lambda_t}{\Lambda_t} = -r_t dt - \lambda_t dZ_{1,t} \\

r_t = \alpha_0 + \alpha_S \log(S_t) + \alpha_y y_t \\
\lambda_t = \theta_0 + \theta_S \log(S_t) + \theta_y y_t
\]

▶ Dynamics of oil price and other macro factor

\[
\frac{dS_t}{S_t} = \kappa_S (\bar{s} - \log(S_t)) dt + \sigma_S dZ_{2,t} \\
\frac{dy_t}{dy_t} = -\kappa_y y_t dt + dZ_{3,t}
\]

▶ Firm cash flows

\[
D^i(X^i, q^i, S_t) = X_t^i (q_t^i)^{\gamma_i} - S_t q_t^i \\
\frac{dX_t^i}{X_t^i} = (\mu_0^i + \mu_S^i \log(S_t)) dt + \sigma_X^i dZ_{4,t}
\]
Parameter estimates

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Estimate</th>
<th>t-stat</th>
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<tbody>
<tr>
<td>$\sigma_m$</td>
<td>0.162</td>
<td>26.04</td>
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<td>$\alpha_0$</td>
<td>0.037</td>
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<td>$\alpha_S$</td>
<td>-0.007</td>
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<td>$\alpha_y$</td>
<td>0.162</td>
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<td>$\theta_0$</td>
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<td>$\theta_S$</td>
<td>-0.445</td>
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<td>$\theta_y$</td>
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<td>$\bar{s}$</td>
<td>3.476</td>
<td>9.10</td>
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<td>$\kappa_S$</td>
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</tr>
<tr>
<td>$\sigma_S$</td>
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<td>$\rho_S$</td>
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<td>$\kappa_y$</td>
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<td>7.90</td>
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<tr>
<td>$\rho_y$</td>
<td>-0.169</td>
<td>-3.20</td>
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The negative oil price-MPR relation

- Recessions are preceded by spikes in oil prices (Hamilton)
  - May explain negative oil price-MPR relation
- However, secular bull market from 1980 to 2000 (partly due to lower risk premia) coincides with downward trend in real oil prices
  - Argues for positive oil price-MPR relation
The role of the second state variable

- $y$ “captures other macro effects not related to the oil price”
  - But which macro-factors exhibit so fast mean-reversion that shocks have a half-life of approx. one month?
- Ideally $y$ should capture the effect of known variables driving the time-series and cross-sectional variation in expected excess returns
  - By not doing so, perhaps the effect of oil is overstated?
- BTW: since $y$ is identified from the real rate, its very low persistence is surprising
Decomposition of the effect of oil shocks

- Analysis can be understood in terms of the Gordon growth formula
  \[ P^i = \frac{D^i}{\mu^i - g^i} \]
- CH use their model to quantify the effect an oil shock on each component
- For all industries, an oil shock causes a
  - decrease in \( D^i \),
  - decrease in \( \mu^i \),
  - larger (except for the oil industry) decrease in \( g^i \)
Robustness

- Suggestion: Analyze the robustness of results
  - Specification analysis
  - Model-independent analysis
- Regression:
  \[ R_t^i = \beta_0 + \beta_1 \Delta \log(P_t) + \epsilon_t \]
- Monthly data from 1984:01 to 2013:06

Response to 10 percent increase in oil price
Oil as a priced risk factor?

- Current model is conditional CAPM style
- What about oil as separate priced risk factor
- Chen, Roll, and Ross (1986) "Economic Forces and the Stock Market"

**TABLE 7** Pricing with Oil Price Changes

<table>
<thead>
<tr>
<th>Years</th>
<th>OG</th>
<th>MP</th>
<th>DEI</th>
<th>UI</th>
<th>UPR</th>
<th>UTS</th>
<th>Constant</th>
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<td></td>
<td>(.996)</td>
<td>(1.406)</td>
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<td>(1.921)</td>
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<td>(.251)</td>
<td>(.296)</td>
<td>(−2.737)</td>
<td>(−2.975)</td>
<td>(3.839)</td>
<td>(−3.154)</td>
<td>(−.243)</td>
</tr>
<tr>
<td></td>
<td>(.303)</td>
<td>(1.228)</td>
<td>(−.598)</td>
<td>(.156)</td>
<td>(1.465)</td>
<td>(−1.024)</td>
<td>(2.240)</td>
</tr>
</tbody>
</table>

**Note.** — CG = growth rate in real per capita consumption; OG = growth rate in oil prices; VWNY = return on the value-weighted NYSE index; EWNY = return on the equally weighted NYSE index; MP = monthly growth rate in industrial production; DEI = change in expected inflation; UI = unanticipated inflation; UPR = unanticipated change in the risk premium (Baa and under return – long-term government bond return); and UTS = unanticipated change in the term structure (long-term government bond return – Treasury-bill rate). *-statistics are in parentheses.