Are Sticky Prices Costly? Evidence From the Stock Market

Gorodnichenko and Weber

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Contribution

- Average price rigidity at the firm level from confidential BLS PPI data.
  - Significant heterogeneity in price rigidity within and across industries.

- Empirical analysis linking stock returns, price rigidities, and policy shocks.
  - Indirect measure of the cost of price rigidities using stock market information.

- NK theoretical motivation - intuition:
  - Stock returns of more sticky-price firms are more sensitive to policy shocks.
  - Why? Firms with higher price-setting costs tolerate larger fluctuations in profits.
Contribution

- Identification of returns from a narrow time window.
- Regression:

  \[ R_{it}^2 = b_0 + b_1 \times v_t^2 + b_2 \times v_t^2 \times \lambda_i + b_3 \times \lambda_i + \text{controls}_{i,t} + \text{error}_{i,t}. \]

  \[ b_1 > 0 \]
  \[ b_2 < 0 \]
  \[ b_3 \approx 0 \]

- Diverse set of robustness tests.
Intuition

- **NK model:**

\[
\begin{align*}
\exp(-i_t) &= \mathbb{E}_t[M_{t,t+1}] = \mathbb{E}_t[\exp(\log \beta - \gamma \Delta x_{t+1} - \pi_{t+1})], \\
\pi_t &= \kappa x_t + \beta \mathbb{E}_t[\pi_{t+1}], \\
i_t &= \bar{i} + \iota \pi_t + v_t
\end{align*}
\]

\[
\begin{align*}
x_t &= \bar{x} - \frac{1}{\iota \pi \kappa + \gamma} v_t, \\
r_t &= -\log \beta + \frac{\gamma}{\iota \pi \kappa + \gamma} v_t.
\end{align*}
\]

- **Stocks:**

\[
\begin{align*}
S_t &= \mathbb{E}_t \left[ \sum_{n=1}^{\infty} M_{t,t+n} D_{t+n} \right] = \sum_{n=1}^{\infty} \frac{\mathbb{E}_t[D_{t+n}]}{(1 + r_{n,t} + \varphi_{n,t})^n}, \\
1 + R_{t,t+\Delta t} &= \frac{S_{t+\Delta t}}{S_t}.
\end{align*}
\]
Real Profits and Markups

Effect of policy shocks and price rigidity on profits depend on opposite output and markup effects.

- Real profits:

\[ D_{i,t} = \frac{P_{i,t}}{P_t} Y_{i,t} - W_t N_{i,t} = \frac{P_{i,t}}{P_t} Y_{i,t} \left( 1 - \frac{1}{\mu_{i,t}} \right). \]

- Output and markup gaps:

\[ \frac{Y_t}{Y^f} = X_t, \quad \frac{\mu_t}{\mu^f} = X_t^{-(\omega+\gamma)}. \]

- Two sectors, High and Low price rigidity:

\[ \frac{P_{H,t} Y_{H,t}}{P_{L,t} Y_{L,t}} \propto \left( \frac{P_{H,t}}{P_{L,t}} \right)^{-1} \frac{\mu_{H,t}}{\mu_{L,t}} \propto \left( \frac{P_{H,t}}{P_{L,t}} \right)^{\theta-1}. \]

If output > markup effects \( \Rightarrow E_t[R_{H,t+1}] > E_t[R_{L,t+1}] \).
Risk Premia

Policy shocks can generate time varying risk premia in expected stock returns.

\[
S_t = \mathbb{E}_t \left[ \sum_{n=1}^{\infty} M_{t,t+n} D_{t+n} \right] = \sum_{n=1}^{\infty} \frac{\mathbb{E}_t[D_{t+n}]}{(1 + r_{n,t} + \varphi_{n,t})^n}.
\]

\[
\varphi_{1,t} = -\text{cov}_t(M_{t,t+1}, D_{t+1})
= -\text{cov}_t(M_{t,t+1}, Y_{t+1}) + \text{cov}_t \left( M_{t,t+1}, \frac{Y_{t+1}}{\mu_{t+1}} \right).
\]
Additional Comments

- Data: control for labor share and/or price cost margin interacted with $\lambda_i \times v_t^2$.

- Model: Add regressions for simulated profits.

- Difference between expansionary and contractionary shocks?
  - Asymmetric downward/upward price rigidity.

- Are the results sensitive to the policy regime ($\nu_\pi$)?

- Are policy shocks a systematic source of risk?
  - $(R_{it} - \beta_{i,F} R_{F,t})^2$
  - Firm vs. portfolio regressions
  - Time varying loadings $\beta_i,t$

- Alternative return (implied) volatility: option straddles.
Conclusion

- Nice and clever contribution to understand the nature/cost of price rigidities from financial data.
- Very careful and convincing empirical analysis.
- Some doubts about the theoretical link. It is difficult to map the results to obtain an actual cost.
- Future work:
  - Lucca and Moench (2013) FOMC pre-announcement effect and price rigidities?
  - Other shocks?
  - Time-series predictability of stock returns.