Discussion of “The Puzzling Behavior of Sectoral Real Exchange Rates”
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Three facts and an explanation

- Real exchange rates are volatile.
- Real exchange rates are persistent.
- Real exchange rates closely track nominal exchange rates.
- Nominal rigidities is a common explanation.
Three facts and an explanation

“I mentioned recently that the correlation between nominal and real exchange rates is one key piece of evidence that we live in a Keynes-Friedman world of sticky prices, not the classical, perfect flexibility world of real business cycle theorists”. Paul Krugman, February 5, 2011, NY Times Blog
Pat and Virgiliu show:

- That the nominal rigidities story is indeed theoretically promising: stickier-priced goods tend to have more persistent real exchange rates.
- But the story does not work quantitively: data on sectoral real exchange rate show that the degree of price rigidity does not matter much for the three properties of RER.
My discussion

- First I try to get some intuition in a static closed economy model.
- Second, I comment on the quantitative part.
1. Insights from a static closed economy model

- The RER is the ratio of the aggregate prices in the home and foreign countries
- Let me look at the relationship between price stickiness and relative price movements in a closed economy
1. Insights from a static closed economy model

- Preferences: $\log C - L + \log \left( \frac{M}{P} \right)$

- $C = \left( \int_{0}^{1} C_i \frac{1-\rho}{\rho^i} \, di \right)^{\frac{\rho}{\rho-1}}$

- Monopolistic firm $i$: $Y_i = \ell_i$

- Money supply $M$

- One period
1. Insights from a static closed economy model

Flex price allocations

- From Hh FOC: \( PC = W \) and \( PC = M^d \), which gives in equilibrium \( (M = M^d) \): \( W = M \)
- Pricing: \( P_i = \mu W \), with \( \mu = \frac{\rho}{\rho - 1} \)
- Equilibrium:
  \[
  P = \mu M \\
  C = \frac{1}{\mu}
  \]
- Money is neutral, Imperfect competition reduces output.
1. Insights from a static closed economy model

Fix price allocations

- Assume that firms set their prices in the morning.
- In the afternoon, before any production or trade, money supply unexpectedly changes, from $M$ to $\gamma M$
- Firms are not allowed to change their price, and must meet demand.
- From Hh FOC, we still have: $PC = W$ and $PC = M^d$, which gives in equilibrium ($\gamma M = M^d$): $W = \gamma M$
- $P = \mu M$ is fixed
- Equilibrium output is given by $PC = \gamma M$

\[
P = \mu M \\
C = \frac{\gamma}{\mu}
\]

- Money is non-neutral, monetary expansion ($\gamma > 1$) is expansionary.
1. Insights from a static closed economy model

Sticky price allocations

- Assume that firms set their prices in the morning.
- In the afternoon, before any production or trade, money supply unexpectedly changes, from $M$ to $\gamma M$.
- Firms are allowed to change their price with probability $1 - \lambda$, and if not must meet demand.
- If a firm can reset its price, $P_i^{\text{flex}} = \mu \gamma M$.
- If not, $P_i^{\text{fix}} = \mu M$.
- Equilibrium:

$$P = ((1 - \lambda) \gamma^{1-\rho} + \lambda)^{1-\rho} \mu M$$
1. Insights from a static closed economy model

Sticky price allocations

- I can compute the “persistence” of relative prices as the correlation between the relative price in the morning and the relative price in the afternoon, which is (obviously) increasing with $\lambda$

- I can also compute the dispersion of relative price in the afternoon (cross-section) or the dispersion of price growth rates between morning and afternoon (time series)

- Let me do the time series:

  - Morning: $P_i = \mu M$
  
  - Afternoon: $P_i^{\text{flex}} = \mu \gamma M$ with prob. $1 - \lambda$ and $P_i^{\text{fix}} = \mu M$ with prob. $\lambda$
1. Insights from a static closed economy model

Sticky price allocations

- Variance of growth factors:

\[ \lambda(1 - \lambda)(\gamma - 1)^2 \]

- Comments:
  - start from flex price ($\lambda = 0$): increasing stickiness increases the variance of relative prices growth,
  - The variance is increasing in $\gamma$ (analogy with dynamic model with accumulated shocks,
  - note that for $\lambda > 1/2$, the first effect is reversed (because only one period)

- Insights:
  - “persistence” and dispersion of relative prices are magnified by sticky prices with monetary shocks
  - Pat & Virgiliu show that these results go through for real exchange rates in a two-country dynamic model
2. Comments on the quantitative part

Data

- Impressive work on data
- For CPIs:
  - 18 product categories, 1981-1995, Eurostat
  - 66 product categories, 1996-2006, BLS
- Data on frequency of price adjustments:
  - Bils /Klenow for the US
  - Price data for Austria, Belgium, France, Spain
- Some work to much those different sources of information.
2. Comments on the quantitative part

Striking result of the small quantitative importance of price stickiness

Figure 6A: Sectoral real exchange rates: most and least sticky sectors. Belgium.
2. Comments on the quantitative part

Persistence and stickiness

- The simple model predicts that the RER persistence is exactly the $\lambda$ parameter.
- This is clearly rejected by the data.
2. Comments on the quantitative part

Persistence and stickiness

Figure 4: Stickiness vs. Real Exchange Rate Persistence: 1996-2006
2. Comments on the quantitative part

Persistence and stickiness

- But playing around with preferences, Pat & Virgiliu can obtain a flatter relation between $\rho$ and $\lambda$. 
2. Comments on the quantitative part

Persistence and stickiness

Figure 2: Persistence of relative prices and frequency of price changes: Separable preferences

\[ \rho_i = \text{corr}(q_i(s_t), q_i(s_{t-1})) \]

\[ \lambda_i : \text{probability of not adjusting} \]

\[ \sigma, \delta = 1/5, 1/5 \]

\[ \sigma, \delta = 1, 0 \]

\[ \sigma, \delta = 1, 1 \]

\[ \sigma, \delta = 5, 5 \]
2. Comments on the quantitative part

Persistence and stickiness

- Can we go further and get a flat relationship with a different utility specification?
- Perhaps?
2. Comments on the quantitative part

The $\lambda$ "parameter"

- $\lambda$ is the probability of not adjusting.
- In the model, it is a parameter.
- But in the data, it is most likely an outcome (unless the Calvo model is literally true).
- $\lambda$ is not a deep parameter, but is affected by (among other things)
  - Average inflation

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  - Average inflation
  - Contractual environment
  - Commercial regulation (for example on sales)
  - Dynamic competitive behaviors
- High lambdas could correspond to little nominal rigidities + stable environment.
- This would mess-up the analysis.