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: $\log C - L + \log\left(\frac{M}{P}\right)$
- $C = \left(\int_0^1 C_i^{\frac{1-\rho}{\rho}} \, di\right)^{\frac{\rho}{\rho-1}}$
- 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:

$$
\begin{aligned}
P &= \mu M \\
C &= \frac{1}{\mu}
\end{aligned}
$$

- 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 γM
- ▶ 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 $PC = \gamma M$

$$
\begin{aligned}
P &= \mu M \\
C &= \frac{\gamma}{\mu}
\end{aligned}
$$

- ▶ 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 γM
- Firms are allowed to change their price with probability $1 - \lambda$, and if not must meet demand.
- If a firm can reset its price, $P_i^{flex} = \mu \gamma M$
- If not, $P_i^{fix} = \mu M$
- Equilibrium:

$$P = \left((1 - \lambda)\gamma^{1-\rho} + \lambda\right)^{\frac{1}{1-\rho}} \mu M$$

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 λ

- 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: $P_i^{flex} = \mu \gamma M$ with prob. $1 - \lambda$ and $P_i^{fix} = \mu M$ with prob. λ

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 γ (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
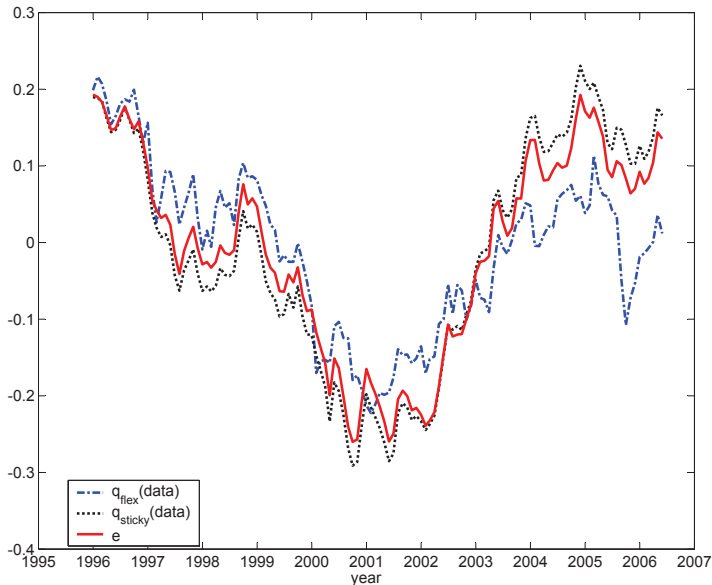
2. Comments on the quantitative part
Data

- ▶ 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.
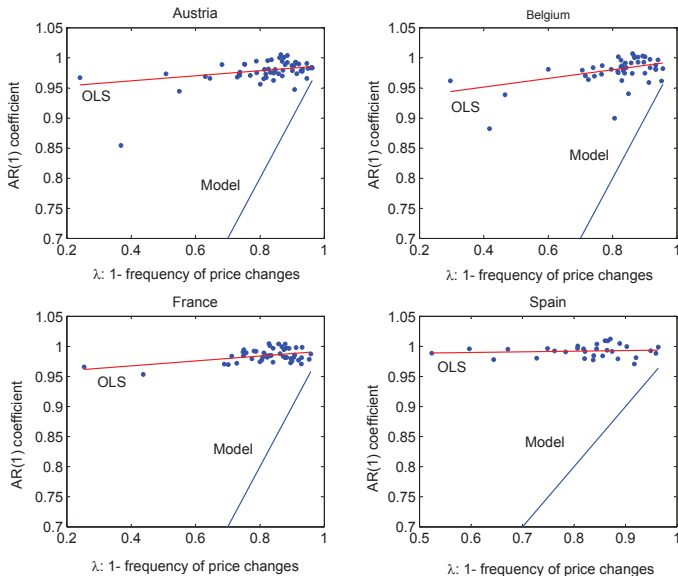
2. Comments on the quantitative part
Persistence and stickiness

- ▶ The simple model predicts that the RER persistence is exactly the λ 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
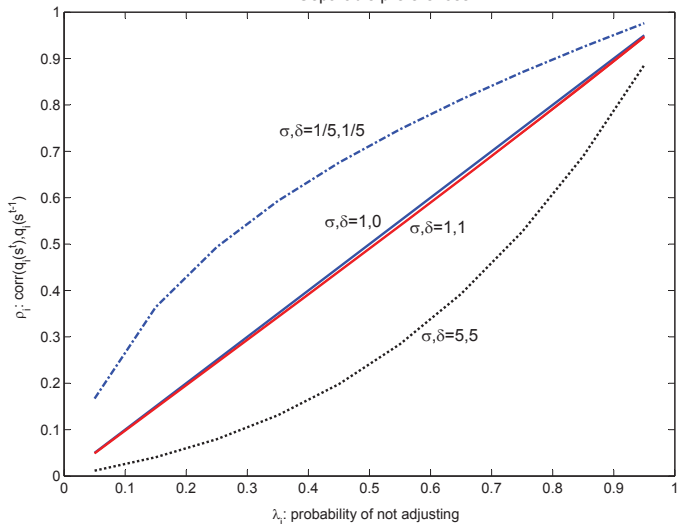
2. Comments on the quantitative part
Persistence and stickiness

- ▶ But playing around with preferences, Pat & Virgiliu can obtain a flatter relation between ρ and λ.

2. Comments on the quantitative part

Persistence and stickiness

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

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 λ "parameter"

- ▶ λ 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).
- ▶ λ is not a deep parameter, but is affected by (among other things)
  - ▶ Average inflation

	US	Austria	Spain	Belgium	France
years covered	95-97	96-03	93-01	89-01	94-03

2. Comments on the quantitative part

The λ "parameter"

- λ 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).
- λ is not a deep parameter, but is affected by (among other things)
    - 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.