

Discussion of:

"Price Stickiness in Argentina: Evidence from
Two Hyper-inflations followed by Stable Prices"

by

Fernando Alvarez (Chicago)
Martin Gonzales-Rozada (UTDT)
Andy Neumeyer (UTDT), and
Martin Beraja (UTDT)

Brent Neiman (Chicago)
February 18, 2011

Overview of the Paper

- ▶ Derive and test comparative statics of general menu cost model at low and high inflation.
- ▶ Two types of predictions:
 1. Frequency of price changes
 - ▶ At low inflation: insensitive to inflation
 - ▶ At high inflation: elasticity of $2/3$ wrt inflation
 2. Relative price dispersion
 - ▶ At low inflation: insensitive to inflation
 - ▶ At high inflation: elasticity of $1/3$ wrt inflation
- ▶ Empirical Findings:
 - ▶ Striking support for frequency predictions
 - ▶ Pretty darn good on dispersion predictions

Overview of Discussion

- ▶ Intuition for Low Inflation Findings
- ▶ Review of Empirics
- ▶ Concerns and Suggestions
- ▶ What Are Authors After?

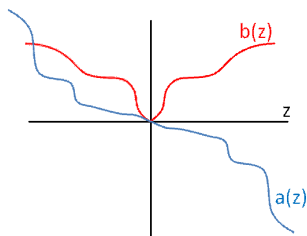
Model Setup

- ▶ Key definitions:
 - ▶ $F(x, z)$ is flow operating profit from relative price x and productivity $z \in [-Z, Z]$
 - ▶ $dz = a(z)dt + b(z)\sigma dW$, where W is a Brownian Motion
 - ▶ $p^*(z) = \arg \max_x F(x, z)$
- ▶ Proposition 1a: If $F()$, $a()$, and $b()$ are *symmetric*:

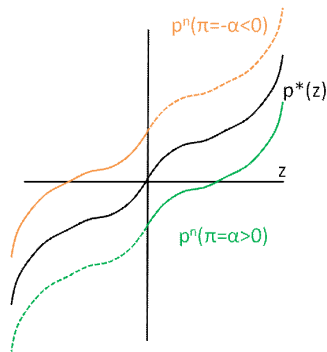
$$\frac{\partial}{\partial \pi} \lambda_a(0, \sigma^2) = 0,$$

where $\lambda_a(\pi, \sigma^2)$ is the frequency of price adjustment under constant inflation rate π .

Symmetric: Low Inflation Results



$$\Pr(\{z(t)\}|z(0)) = \Pr(\{-z(t)\}|-z(0))$$



• Flow loss from price too low by α for solid (dashed) green firms equals loss from price too high by α for solid (dashed) orange firms.

• Symmetric distribution/paths of z

• Symmetric price change incentive

(Symmetry in distribution/paths) + (equal flow incentives to adjust for π or $-\pi$)

→ frequency at π = frequency at $-\pi$ → Elasticity of frequency to π (at 0) is 0

How Restrictive Are These Assumptions?

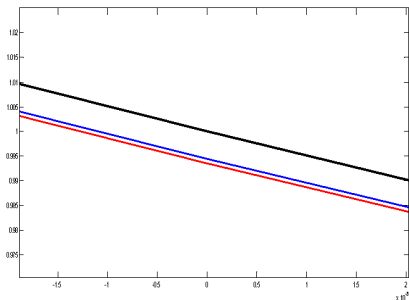
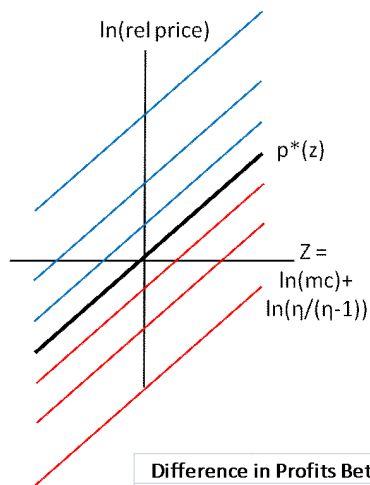
- ▶ Key is symmetry of period profit. Loosely speaking, a price 1% too low is approximately as bad as 1% too high
- ▶ Following authors, consider second order approximation of profit function around p^* :

$$F = F(p^*(z), z) + \frac{1}{2} F_{pp}(p^*(z), z) (p - p^*(z))^2 + o(p - p^*(z))^2,$$

because $F_p(p^*(z), z) = 0$ by definition.

- ▶ If fixed adjustment cost is small, quadratic approximation embodying this symmetry should hold relatively well

CES Case?



Difference in Profits Between Too High and Too Low (as share of max profits)			
	<u>Gap: 0.5 %</u>	<u>Gap: 1%</u>	<u>Gap: 2%</u>
Elast = 2	0.000%	0.000%	0.003%
Elast = 6	0.002%	0.014%	0.112%

Empirical Approach on Stickiness

- ▶ Paper deals carefully with censoring, substitutions, etc. – not so exciting for a discussion
- ▶ Basic intuition of baseline approach is to see what share of outlets containing the same good (e.g. milk) changed prices:
 - ▶ Create weighted average
 - ▶ Weighted/Unweighted medians
 - ▶ Pool everything
- ▶ Would be nice to see pdf of lambdas across goods in high and low regimes. Distribution matters (Nakamura/Steinsson 2010)

Empirical Approach on Stickiness

- ▶ Implicit assumption is that pricing behavior is on average the same across outlets
 - ▶ Standard in literature
 - ▶ So get multiple observations within each period
- ▶ But what if outlets are heterogeneous in price changing technology?
 - ▶ Midrigan (2011) documents how existence of cookies may change menu cost on milk.
 - ▶ Since quantity weights aren't used at this stage, small-volume outliers can matter

Empirical Approach on Stickiness

- ▶ Empirical approach will yield identical stickiness for A and B:

	Case A					Case B				
Outlet 1	1	1	1	1	1	1	0	1	0	1
Outlet 2	0	0	0	0	0	0	1	0	1	0

- ▶ Would be useful to corroborate that this sort of heterogeneity isn't playing big role.
- ▶ This matters because Outlet 1A might be changing prices because it's much cheaper to do so, and one of paper's goals is to capture "lost resources" cost of high inflation

Another Way to Look at the Data?

- ▶ Useful to trace out full curve of stickiness vs. inflation, but not essential that curve is continuous
- ▶ In addition to existing analysis, authors might estimate stickiness good-by-good in 2 regimes: High (1988-1992) and Low (1993-1997).
 - ▶ Estimate for each good X outlet combination (i.e. each price)
 - ▶ Probably best if spell-weighted
 - ▶ Bahard and Eden (2003)

Approach on Dispersion

- ▶ Conceptually a bit different from stickiness
 - ▶ Stickiness compares milk to juice
 - ▶ Dispersion separately compares milk among outlets
- ▶ Would also like to know what is happening between milk and juice (potentially in same outlet).
- ▶ Imagine p^* is the same, but C , and therefore λ , differs.

Approach on Dispersion

- ▶ This might result in price series like:

	High Inflation						
Milk (store 1)	2.25	2.25	3.25	3.25	4.25	4.25	...
Milk (store 2)	2.25	2.25	3.25	3.25	4.25	4.25	...
Juice (store 1)	2	2.5	3	3.5	4	4.5	...
Juice (store 2)	2	2.5	3	3.5	4	4.5	...

- ▶ Still have excess relative price volatility a la Woodford and Burstein/Hellwig, and will change with aggregate inflation if either or both λ s change with inflation.
- ▶ But empirical measure captures zero dispersion and zero change in dispersion.

What Are Authors After? Why Does Stickiness Matter in Very High Inflation Environment?

- ▶ Authors talk about excess relative price volatility and resources used up to change prices
 - ▶ Is technology for weekly price changes same (or similar) as annual price changes?
 - ▶ Empirical validity of model supports this, but I'm still skeptical
- ▶ I'd guess we care much more about other sources of costs when inflation is $>200\%$
 - ▶ Model abstracts from uncertainty (constant inflation) so no impact on, for example, savings/investment
 - ▶ Other costs like holding money, contracting, re-distribution based on lack of indexing, etc.

What Are Authors After? Why Does Stickiness Matter in Very High Inflation Environment?

- ▶ Substitutions and stock-outs could be very interesting
- ▶ Handled well in terms of robustness
- ▶ But might reveal interesting new costs of very high inflation (perhaps different paper), but
 - ▶ Why is inflation and substitution so tightly linked? What is relationship for stockouts?
 - ▶ Should I think of this in terms of Nakamura/Steinsson (2011) as a price change?
 - ▶ Changes in the innovation process?
 - ▶ Difficulty in estimating demand?

What Are Authors After? Why Does Stickiness Matter in Low Inflation Environment

- ▶ I think result is super-useful for thinking about optimal inflation rate in neo-Keynesian models
 - ▶ Coibion, Gorodnichenko, and Wieland (2010) and others
 - ▶ Cost of price dispersion rises with inflation, even at low levels
 - ▶ Idea is to trade off cost of excess relative price dispersion vs. reduced likelihood of hitting ZLB
- ▶ This paper has very nice proof showing this tradeoff doesn't exist near zero
- ▶ Further, "kink" or inflation-threshold typically estimated $>5\%$, and often much higher
- ▶ Most compelling defence for Blanchard et al. (2010)

Conclusion

- ▶ A very nice paper! Will be a clearer read after another iteration, but there are many exciting theoretical and empirics findings in there
- ▶ For me, the results near infinity are a little less new and exciting ...
- ▶ ... but results near zero are beautiful, clean, novel and important (both theory and empirics)