Trend inflation, inflation targets and inflation expectations

Discussion of papers by Adam & Weber, Slobodyan & Wouters, and Blanco

Argia Sbordone

ECB Conference

Understanding Inflation: lessons from the past, lessons for the future?

Frankfurt, September 21-22, 2017

Papers Recap

- **Adam & Weber**
  - Heterogeneous firms with different trend productivity
    - The optimal trend inflation reflects firms' productivity ratio
    - US firm level data seen through the lens of the model help evaluate features of implied optimal trend inflation for the US economy
- **Blanco**
  - Menu cost model with idiosyncratic firms' shocks and ZLB
    - Idiosyncratic shocks and menu costs reduce the price dispersion cost associated with a higher inflation target
    - Probability of a binding ZLB raises the benefit of higher inflation target
- **Slobodyan & Wouters**
  - Survey expectations of inflation help identifying inflation shocks
    - Adaptive learning allows to exploit the information of inflation surveys more efficiently than a RE model, and give rise to a time-varying perceived inflation target

Discussion Points

- My comments will focus mainly on the papers presented by Klaus and Andres

- Related motivations for the papers
  - Disconnect between central banks inflation targets and theoretical results about “optimal” inflation
    - Develop models that can mitigate this disconnect and guide for the choice of the inflation target

- Main takeaways
  - Accounting for heterogeneity and non-linearities can overturn predictions of ‘standard’ models on optimal inflation
  - Importantly, estimates from micro data allow sharpening inference in aggregate models

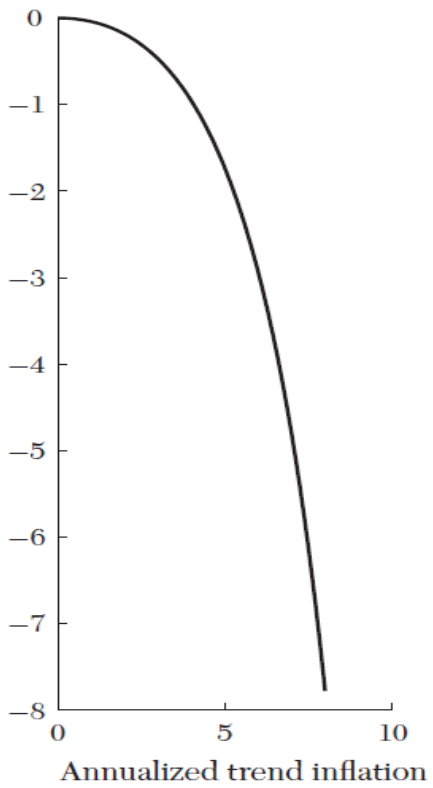
‘Standard’ Models with Nominal Rigidities

Rationale for zero inflation:

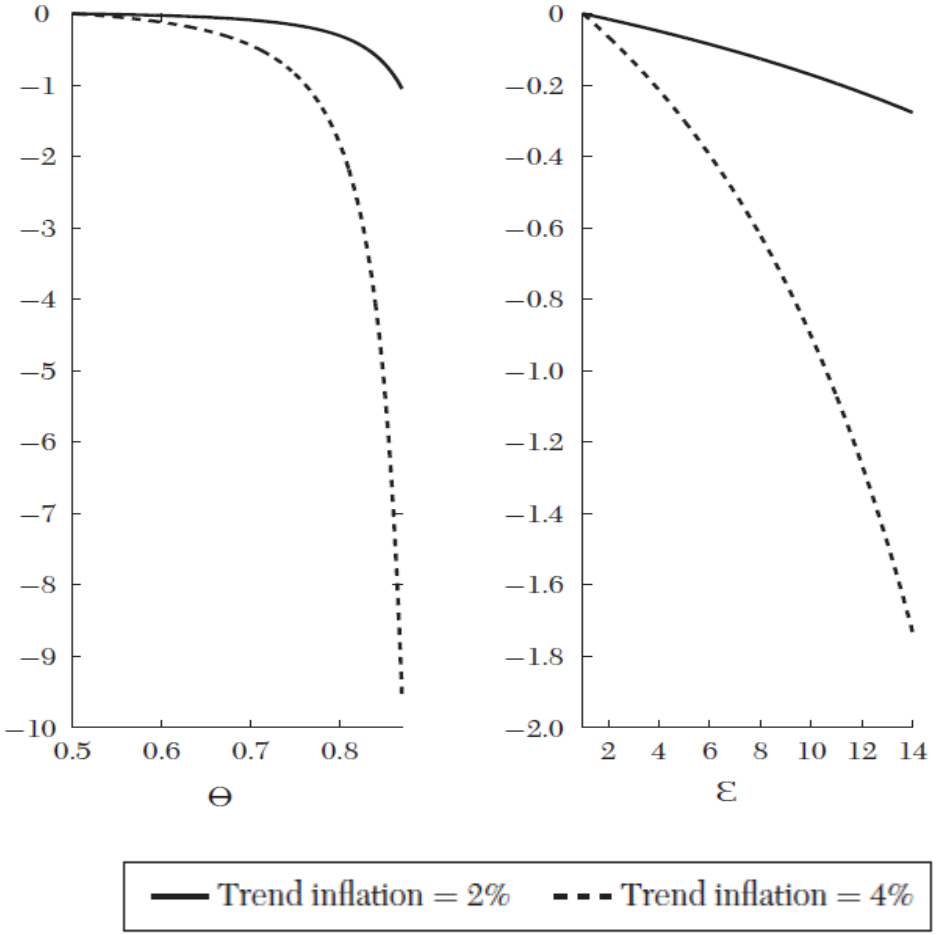
- With homogeneous firms productivity of price-adjusting firms is equal to that of non adjusting firms
- Economic efficiency requires prices to reflect relative productivities
  - price adjusting firms need to charge same price as non-adjusting firms
- Inflation creates price distortions, hence inefficient allocation
  - Price adjustment frictions tightly anchor the optimal steady state inflation rate at zero
- Comprehensive reference for the (mostly pre-GR) literature on the optimal rate of inflation: Schmitt-Grohe & Uribe (2010)

Illustration of the Cost of Trend Inflation

- Reduces aggregate productivity



- Enhances sensitivity of the cost of price dispersion to Calvo parameter Θ and demand elasticity ε



Source: Ascari-Sbordone, JEL 2014

Exploring Heterogeneity

- **Adam & Weber**
  - Firms heterogeneity takes the form of systematic productivity changes → firms have different trend productivities
  - Price frictions modeled as in Calvo, with random price adjustments opportunities arriving possibly in conjunction with a productivity change
    - LBD data used to estimate inflation-relevant firm-level productivity trends
- **Blanco**
  - Firm heterogeneity takes the form of large idiosyncratic productivity shocks, which do not raise trend productivity
  - Price frictions modeled with a random menu cost model
    - CPI micro data set of the UK ONS used to estimate the distribution of price changes
    - Empirical evidence used to calibrate some of the model parameters (shock variances and pricing)

Adam & Weber paper - Related Earlier Literature

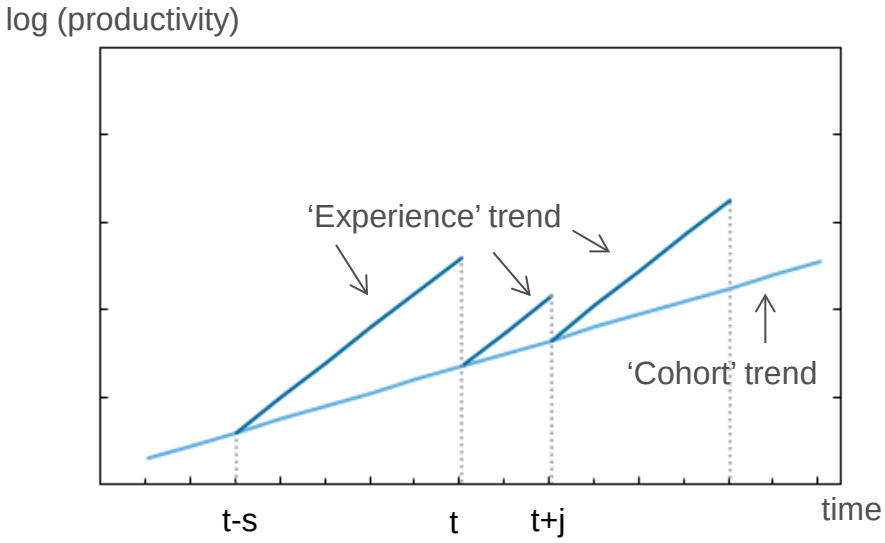
- Benigno, JIE 2004: monetary policy in a currency area:
  - Two-region economy with *same* degree of nominal rigidity
    - Optimal to target a weighted average of regional inflation rates (weights = economic size of regions)
  - Two-region economy with *different* degrees of price rigidity
    - Nearly optimal to target an inflation which gives higher weight to the inflation in the region with higher degree of nominal rigidity

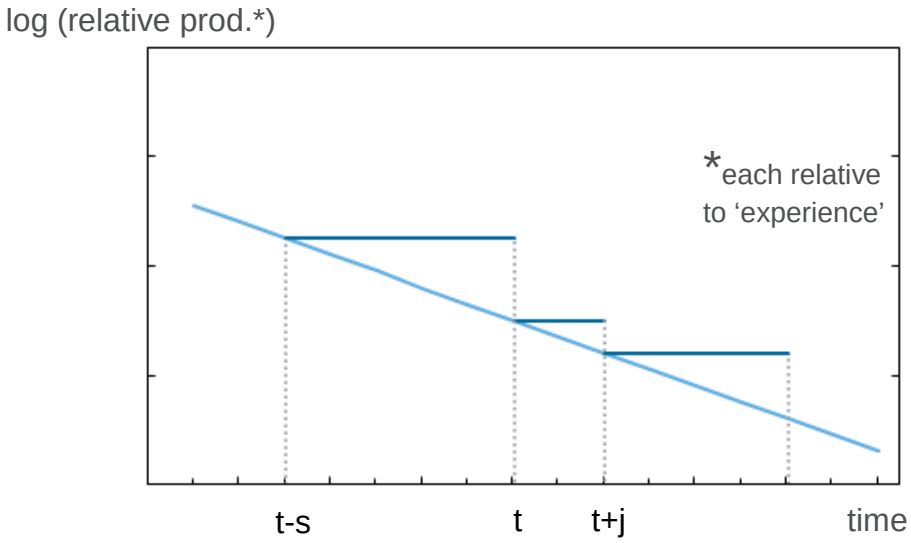
- Wolman, JMCB 2011: Two-sector sticky-price model with exogenous relative price trend, i.e. different trend productivity
  - Optimal inflation rate depends upon *interaction* between *relative price trend* and *differential price stickiness* across the two sectors
    - Optimal to require a smaller nominal price trend of goods whose nominal price trend is more costly (either because of price dispersion or because of fixed cost of adjustment)

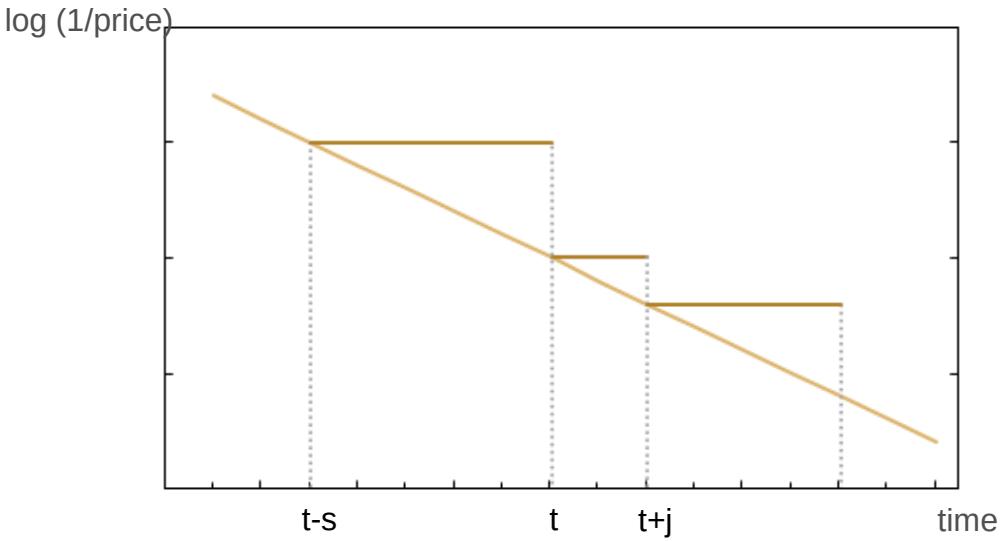
A&W – Optimal Trend Inflation

- Heterogeneity within a sector: same characteristics of the Wolman's model
  - Firms have different relative prices and different stickiness
- Essential insight as Wolman's → get the flex-price firms to be the ones whose price does the adjusting
  - But his conclusion doesn't apply in A&W because the stickier price sector is the *more* productive one
- The optimal inflation rate implements the efficient allocation
  - Is a function of the efficient productivity adjustment
- Optimal *steady state* inflation (limit of the optimal inflation when the productivity distribution converges to the stationary distribution) is equal to the ratio experience-to-cohort trend *g/q*

Productivity Trends and Relative Prices: my illustration







A&W - Model's Implication for the US

- From LBD data:
- Regress employment L_{jzt} to firm age s_{jzt} (time since last δ-shock) on all firms j of each sector z (z=1,…, 65) for each t (t=1986,.., 2013).

$$\ln(L_{jzt}) = d_{zt} + \eta_z \cdot s_{jzt} + \epsilon_{jzt},$$

where

$$\eta_z = (\theta - 1)\ln(g_z/q_z).$$

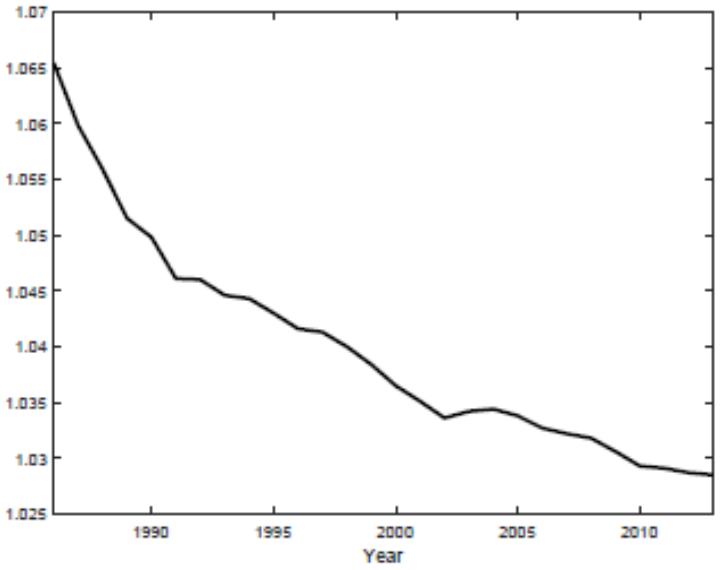
- Recover the relative productivity trends from estimated $\widehat{\eta}_z$ for each sector z (given an elasticity of demand θ)

- Compute, for each year, the aggregates relative trend productivity of all sectors, Φ_t :

$$\Phi_t \equiv \sum_{z=1}^{65} \left(\psi_z \frac{\gamma_z^e}{\gamma^e}\right) \exp(\widehat{\eta}_{zt})$$

A&W - Results

- Baseline estimate of Φ_t:



- Implications
  - Mature firms' productivity always grew faster than startups'
  - This gap has been closing in recent years

- Has young firms' productivity accelerated or has mature firms' productivity decelerated?
  - Raises an interesting question debated in recent literature on the sources of productivity slowdown

Productivity Slowdown and Firm Dynamism

- Recent literature links slowdown in aggregate productivity growth to decline in business dynamism
  - Aggregate productivity slowdown dates from circa 2004 (e.g. Fernald)
  - Startup rates and other measures of young firm activity have declined since the 1980s, with accelerated slowdowns in high-growth young firm activity since 2000

- Decker et al.(2017) combine industry and employment data of the Census Bureau's LBD with revenue data from tax records
  - Decompose aggregate productivity into un-weighted average of within-firm productivity of continuing firm, allocative efficiency among continuing firms and net entry
    - Find decline around the early 2000s due primarily to decline in allocative efficiency among existing firms

Decker et al.: Decomposition of annual change in productivity

- *Within firm contribution* (left block): surviving firms see negative productivity growth on average, roughly constant over time
- *Allocative efficiency* (central block): positive contribution, sharp decline in early 2000s
- *New firms contribution* (right block): small contribution, also declined in early 2000s

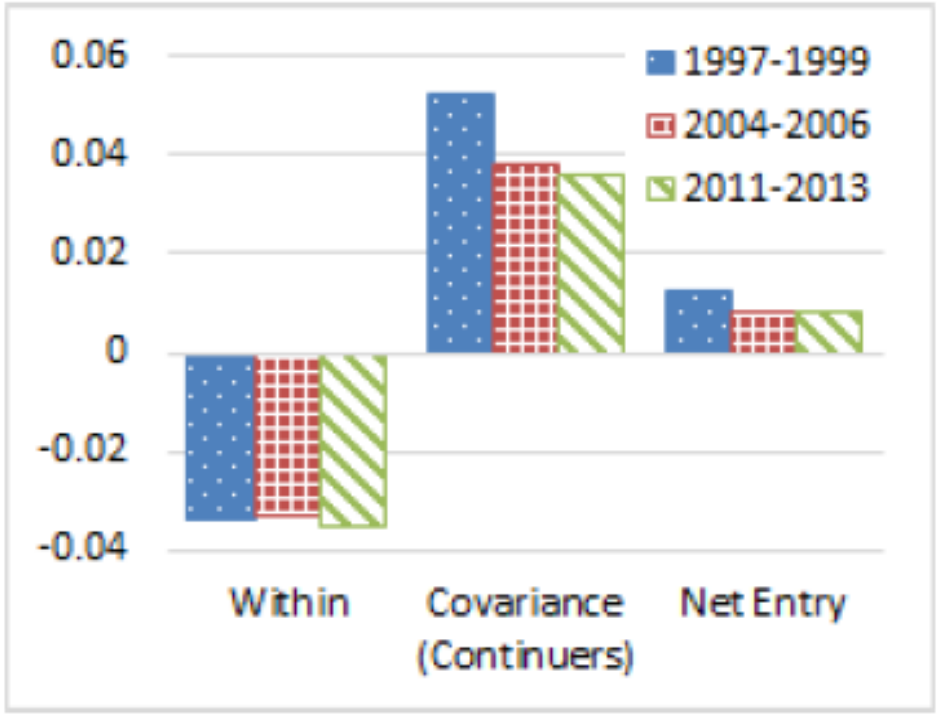


Figure 1: Dynamic Olley Pakes Decomposition
Author calculations from RE-LBD

Source: Decker et al. 2017

A&W – Optimal Trend Inflation for the US?

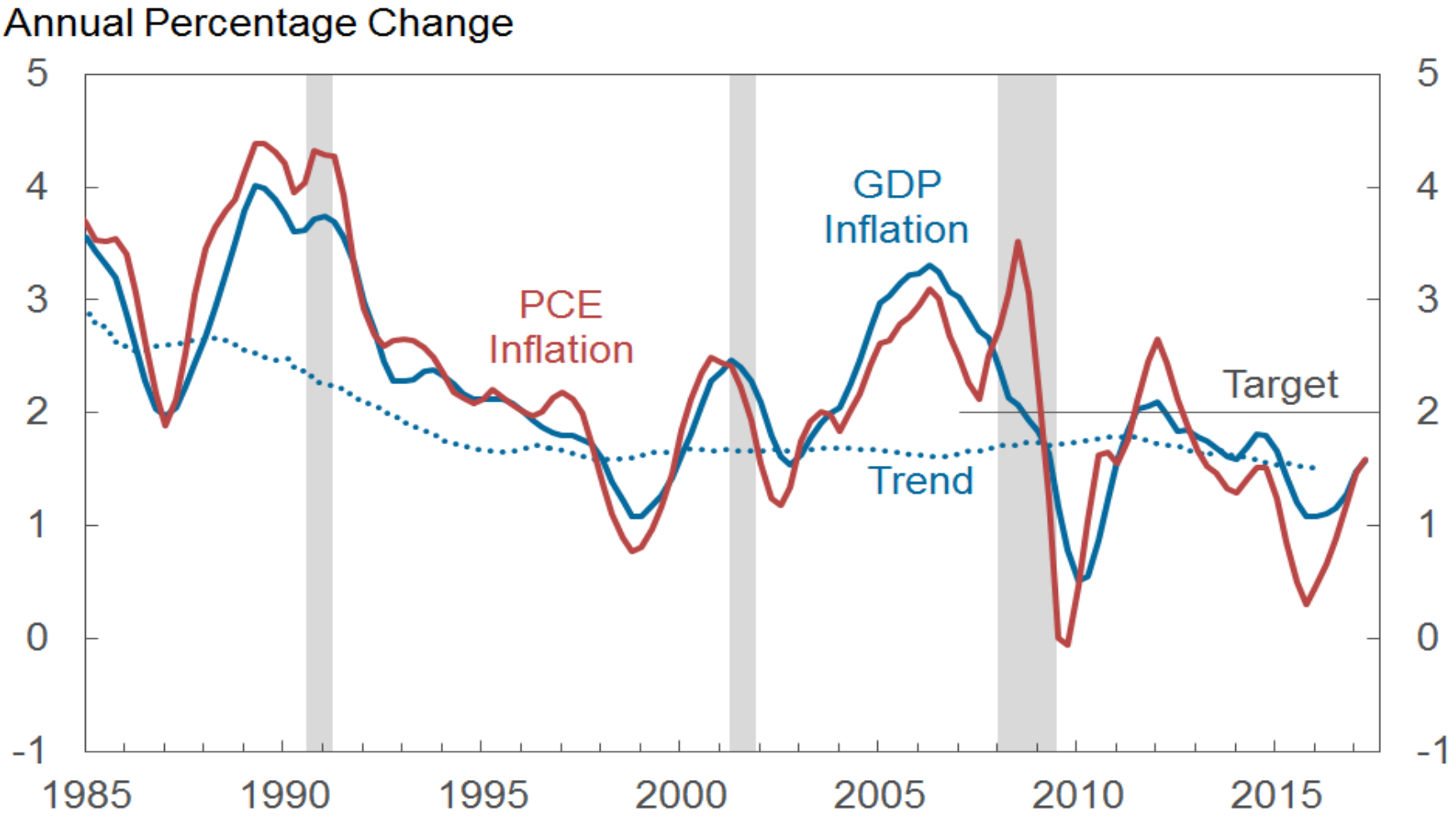
- Implied optimal inflation target Π_t*:

$$\Pi_t^\star - 1 = \frac{1}{\theta - 1}(\Phi_t - 1) + O(2)$$

  - Positive but declining over the whole period
  - In 2013 about half of its level in 1986

- The model rationalizes an optimal positive trend inflation
  - And it does so without invoking the ZLB constraint
  - It also offers a reason for why trend inflation should have declined since mid- ’80s
    - Something on which data may speak
    - Estimates do indicate a decline in inflation trend similar to that emerging from the paper’s calculations

U.S. Inflation: Actual, Target and Trend



Source: Own calculations (trend); Bureau of Economic Analysis.

Note: Shading shows NBER recessions.

A&W – Final considerations

- By extending the NK model to heterogeneous firms the model brings to the fore the problem of inefficient resource allocation caused by trends in relative prices

- The model offers a framework to bring more evidence to bear on the issue of aggregate inflation from disaggregated data

- For example, granting that over time firms become more productive (and indeed it may take some time for young firms to become at all productive)

    - This may be due to producing the same good more efficiently
    - Or to the introduction of new goods which have higher value relative to the resources used to produce them

- Ideally one would measure trends in productivity of old vs new goods

Exploring Heterogeneity: Blanco's paper

- Blanco addresses the issue of optimal trend inflation in terms of optimal target in a DSGE model with firm heterogeneity

- Main features
  - Price frictions modeled with menu costs
    - Generally imply less price dispersion than Calvo pricing as firms adjust prices when they get out of line
    - Random menu costs make the model closer to Calvo
  - Firms subject to idiosyncratic shocks
  - *ZLB* is accounted for in the policy rule

- Model calibration relies on several other studies, but on own estimation of pricing and idiosyncratic shocks parameters
- Dynamics illustrated primarily with responses to risk shocks, comparing Calvo with menu cost models

Blanco's paper - Overview

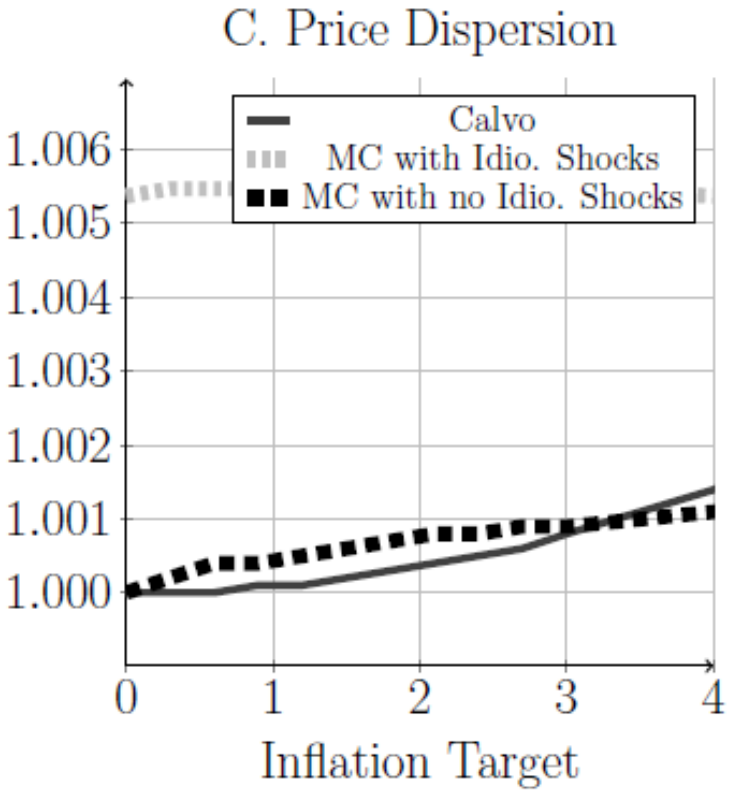
- Paper very rich and complex – provides many clever analytical advances
  - Brings together the literature on menu costs with the one on monetary models with ZLB constraints
    - Argues that *costs* of higher inflation target not too high
    - Argues for larger benefits of higher inflation target under potentially binding ZLB constraint

- Calibration is a bit of a mix
  - Menu cost and idiosyncratic shock parameters are estimated matching model steady state moments with data, but UK data
    - idiosyncratic shocks need to be large in order to match the price change distribution
  - ZLB frequency: parametrization based on international evidence on frequency of hitting the ZLB at about 2% inflation target
    - Some limits to this

Blanco - Why π* Should be Higher

Intuition

- The cost of a higher steady state inflation is not as high in the menu cost model as it is in the Calvo model

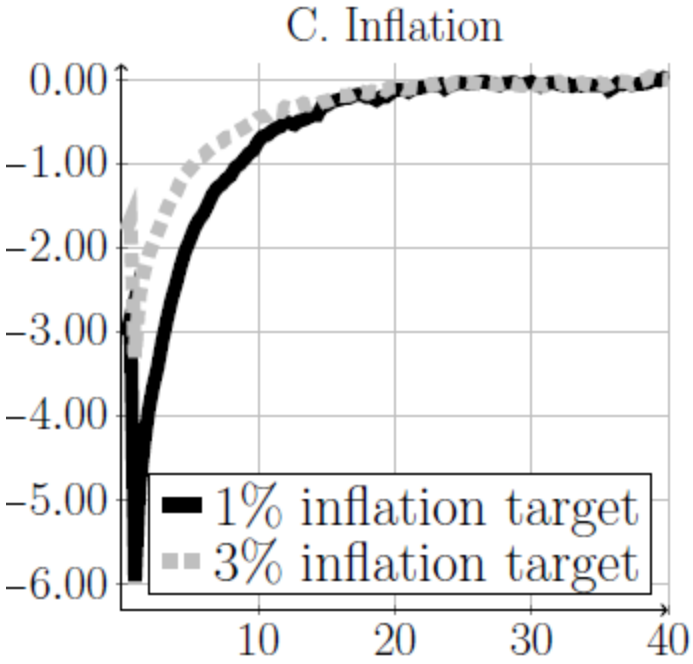


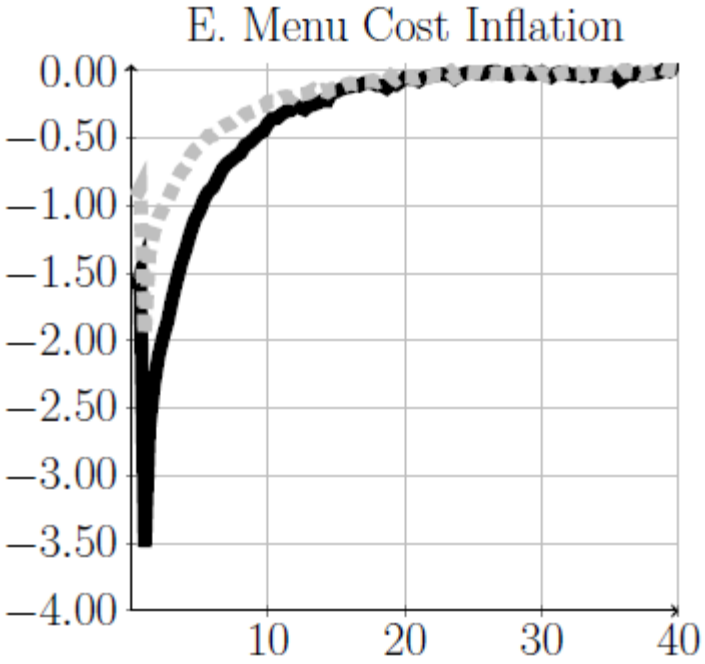
- In the MC model with large idiosyncratic shocks, at low levels of inflation, price dispersion (which is costly in all models) has the lowest elasticity to inflation (see fig.)
- shocks are large, and the Ss bands are relatively insensitive to π* (so support of the distribution of relative prices is unaffected)
  - Don‘t shrink at lower π*
- Distribution of relative prices essentially symmetric at low inflation, rules out asymmetric effects

Blanco: Why π^* Should be Higher

Intuition

- The benefit of a higher steady state inflation comes from ZLB
- Conditional (to low interest rate) response to risk premium shock at π^* =1% vs 3% → most of the decline in inflation explained by the selection effect, as a large set of firms hit the Ss band





Should Current Inflation Targets be Raised?

- Both papers offer some argument for targeting a positive rate of inflation
  - The structural framework of the first paper can resolve the apparent disconnect between central banks practice and monetary theory
    - The paper abstracts from the form of a monetary rule - its conclusion is in this respect more general
  - Comparing costs and benefits of a higher target the second paper brings more direct weight to this question
    - It illustrates that the way one models price stickiness matters for assessing the costs, with menu costs with idiosyncratic shocks framework generating in general lowest costs
    - And illustrates the benefits of having a higher inflation targets in terms of reducing the incidence of ZLB episodes
  - ➢ However, specific conclusions on this benefit depend very much on the assumed frequency and severity of the ZLB episodes

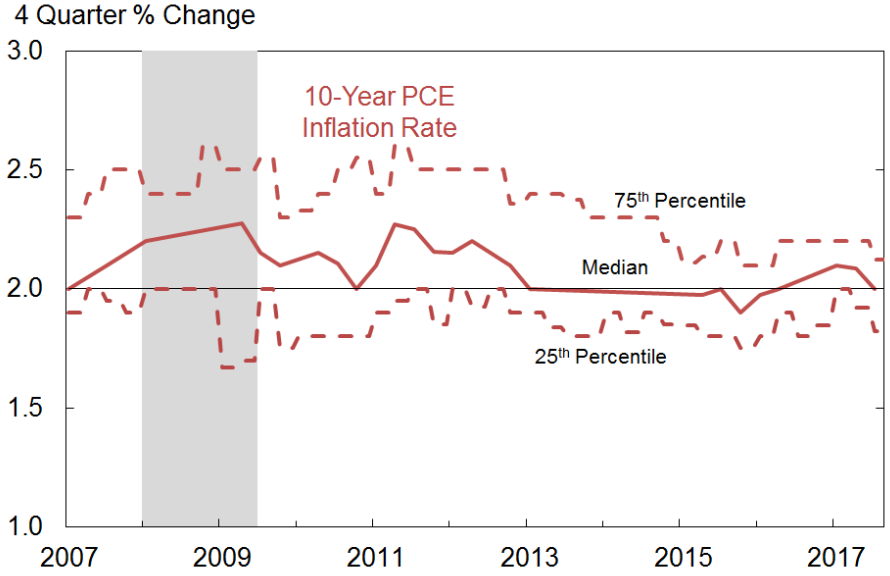
But, how frequent and severe are ZLB episodes?

- Dordal-i-Carrera et al (2016) address this issue
  - Observe that actual ZLB episodes are infrequent and long-lived
    - Typically parametrized risk shocks are unable to generate in the models ZLB episodes with these characteristics
  - Model risk shocks with regime switching which allow to reduce the sensitivity of the optimal inflation target to the average duration of ZLB
    - Obtain estimates of optimal target in the 1.5% - 4% range
    - Observe: uncertainty of these estimates primarily due to lack of sufficient historical experience on ZLB

- More substantially: the frequency and even more the severity of the ZLB episodes depend on the response of monetary policy
  - Assuming that monetary policy at the ZLB is conducted with the same Taylor type policy rule
    - Would tend to emphasize the severity of the ZLB (see Kiley-Roberts, 2017)
    - And it is also counterfactual (see recent experience of unconventional policies implemented by many central banks)
    - Stability of expectations also speaks against expectations of future recurrent episodes keeping inflation below target

Inflation Expectations: US and Euro Area

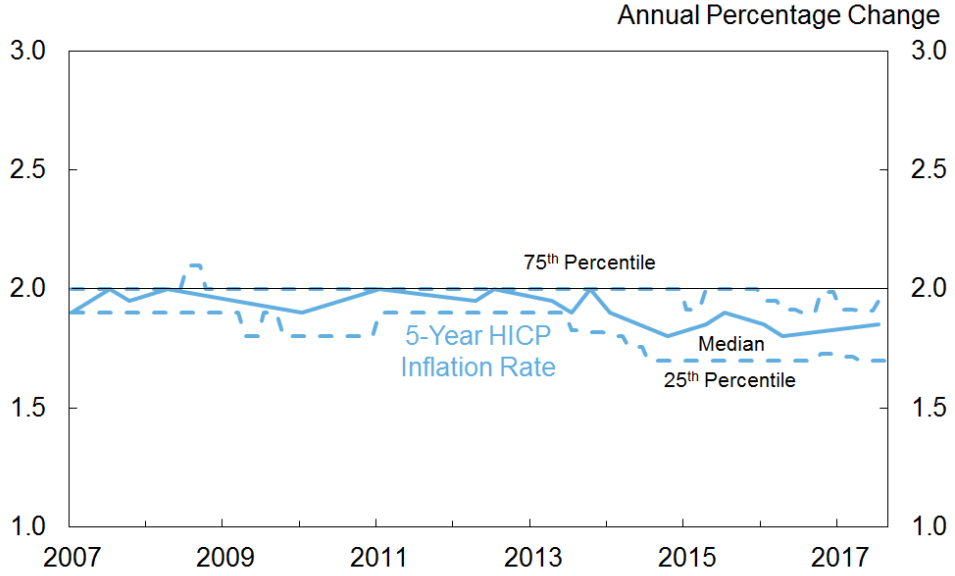
Long-Term Inflation Expectations, United States



Source: Federal Reserve Bank of Philadelphia
Survey of Professional Forecasters.

Note: Shading shows NBER recessions.

Long-Term Inflation Expectations, Euro Area



Source: European Central Bank
Survey of Professional Forecasters.

Are We Asking the Right Question?

- Rather than try to pin down the probability of hitting the ZLB, shouldn't one consider alternative policies to respond to the kind of negative shocks that trigger the ZLB?
  - Policy typically modeled in DSGE models as some form of a Taylor rule
  - Eggertsson-Woodford 2003, and following literature has shown that these rules are poor form of policy when ZLB binds, as they are a commitment to a purely forward-looking policy
    - They take into account at each point in time only the evolution of the economy from that point on
    - Hence fail to generate appropriate expectations of how policy will be conducted when the ZLB is no longer binding that could mitigate the effect of the constraint
  - The commitment to future policy can generate expectations of higher inflation in the future (what a higher target is meant to do)
  - Such a commitment could be achieved with policy rules in the form of price-level targeting rules, without adjusting the target inflation