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

The views expressed here are my own and do not necessarily reflect those of the Federal Reserve Bank of New York or any other part of the Federal Reserve System
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
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
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 $\Theta$ and demand elasticity $\varepsilon$

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)
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

log (productivity)

't-s t
't t+j
'time

'Experience' trend

'Coahot' trend

log (relative prod.*)

't-s t
't t+j
'time

* each relative to 'experience'

log (1/price)

't-s t
't t+j
'time

Each relative to 'experience'
A&W - Model’s Implication for the US

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

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

where

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

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

- Compute, for each year, the aggregates relative trend productivity of all sectors, $\Phi_t$:

$$\Phi_t \equiv \sum_{z=1}^{65} \left( \psi_z \frac{\gamma_z}{\gamma_e} \right) \exp(\hat{\eta}_{zt}).$$
Baseline estimate of $\Phi_t$:

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
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 $\Pi_t^*$:

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

- 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

Annual Percentage Change

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 $\pi^*$ 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 $\pi^*$ (so support of the distribution of relative prices is unaffected)
  - Don‘t shrink at lower $\pi^*$

- Distribution of relative prices essentially symmetric at low inflation, rules out asymmetric effects
Blanco: Why $\pi^*$ 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 $\pi^* = 1\%$ vs $3\%$ → most of the decline in inflation explained by the selection effect, as a large set of firms hit the Ss band
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

- 4 Quarter % Change
- 10-Year PCE Inflation Rate
- 75th Percentile
- Median
- 25th Percentile

Source: Federal Reserve Bank of Philadelphia Survey of Professional Forecasts.
Note: Shading shows NBER recessions.

Long-Term Inflation Expectations, Euro Area

- Annual Percentage Change
- 5-Year HICP Inflation Rate
- 75th Percentile
- Median
- 25th Percentile

Source: European Central Bank Survey of Professional Forecasts.
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