Research question: Is there empirical evidence of this so-called Monopolistic competition

Extension: Standard framework is augmented by considering costs

Empirical evidence? Does the nominal interest rate directly affect firms’ marginal costs and working capital through cash-in-advance

Basic Set up (of working capital through cash-in-advance

General equilibrium models; parameters estimated by Matching Impulse Response Functions: Christiano, Eichenbaum and Evans (2005, JPE); Hensel et al. (2008, JIMI)

A Brief Literature Review:

Empirical support for the cost channel:

- Using industry level data: Barth and Ramey (2001)
- Present value approach (VAR): Tillmann (2008, JEDC)
- Evidence against the cost channel:
  - No consensus has emerged on the empirical evidence of the cost channel!

Theoretical Considerations I

Basic Set up

- Monopolistic competition
- Flexible price equilibrium without the cost channel: Firms set prices as a fixed mark-up over nominal marginal cost
- Sticky prices ("Calvo pricing")

Monopolistic competition: Firms set prices as a fixed mark-up over nominal marginal cost

Flexible price equilibrium without the cost channel: Firms set prices as a fixed mark-up over nominal marginal cost

Sticky prices ("Calvo pricing")

Firms set prices infrequently due to costs of information gathering

Theoretical Considerations II

Introducing the Cost Channel

- Firms face liquidity constraints: Input factors have to be paid before revenues for the produced good have been received
- Firms have to borrow these outlays from the financial intermediary sector

At the end of the period firms repay loans with an interest \( i \) of the loan amount

With these liquidity constrains, firms marginal costs are given by

\[
\text{MC}(t) = \frac{S(t)}{l(t)} - \lambda(t) + \beta(t) + \gamma(t)
\]

where \( \lambda \) is the interest rate, \( \beta \) and \( \gamma \) are structural parameters

A Hybrid Phillips Curve

- Assuming a partial indexation scheme for those firms that do not re-optimize, aggregate inflation \( \pi \) can be related to average real marginal cost \( \text{R}^m \) according to

\[
\pi(t) = \beta(t) + \gamma(t) + \lambda(t) + \beta(t) + \lambda(t) + \xi(t) + \phi(t)
\]

where \( \lambda(t) = \lambda + \eta(t) + \phi(t) \)

With the cost channel, marginal costs are given by \( \text{MC}(t) = \beta(t) + \lambda(t) \)

With the cost channel, the interest rate set by monetary policy \( R^m \) (due to market imperfections, the likelihood of default,...) can deviate from the interest rate set by monetary policy \( R^m \)

Firms set prices as a fixed mark-up over nominal marginal cost

- Flexible price equilibrium without the cost channel: Firms set prices as a fixed mark-up over nominal marginal cost

- Sticky prices ("Calvo pricing")

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Theoretical Considerations II

Econometric Specification I

\[
\pi(t) = \gamma_1 \pi(t-1) + \gamma_2 \pi(t-2) + \gamma_3 \pi(t-3) + \lambda_1 + \lambda_2 \pi(t-1) = \omega(t)
\]

The latent variable \( E_{\omega} \) is replaced by the realization \( \omega(t) \), assuming the forecast error \( \hat{\omega}(t) = E_{\omega(t)} - \omega(t) \) to be orthogonal to past information; with \( \omega(t) = \gamma_1 \pi(t-1) + \ldots \)

- Fits well into the standard GMM framework
- Moment conditions are given by \( \xi(t) = (\pi(t), \omega(t)) \), where \( \hat{\xi}(t) = \omega(t) - E_{\omega(t)} \)

Advantages of the GMM approach

- Does not require a full specification of the model (as in the FIML case)
- The error term may be of a very general structure (autocorrelated and heteroskedastic)
- Can deal with non-linearities
- The instrument vector \( \xi(t) \) consists of variables dated \( t-1 \) or earlier
- Problems with the conventional (two-step) GMM estimator

Finite sample bias: Hansen et al. (1996, JBES), Stock and Wright (2000, Econometrica)

Bias increases with the inclusion of irrelevant instruments: Tauchen (1986, JBES)

In non-linear settings: Sensitivity to the exact statement of the moment conditions

- Not robust to weak instrument problems

- Highly relevant for estimating the NDCPC: Ma (2002, EU); Dufour et al. (2006, JEDC),

Hansen and Smith (2008, JAE), Kleibergen and Paap (2005, JBES)

- Distributions of estimated parameters may be far away from normality (leads to unreliable tests)

Stock et al (2002, JFES)

Econometric Specification II

- An alternative procedure: The continuous-updating GMM estimator (CUE)
  - Difference to the conventional two-step GMM estimator: The weighting matrix is estimated jointly with the parameter vector
  - Better finite sample properties
  - Not affected by problems of normalization, increasing bias with irrelevant instruments
  - Identification robust confidence intervals can be constructed from the CUE objective function (fully robust to problems of weak instruments)

The construction of \( S \)-sets - some details:

- Formulating the null hypothesis for the structural parameters:

- \( \hat{\alpha}_t = a_t \) and \( \hat{\lambda}_t = \lambda_t \)

- Joint confidence intervals for the parameter vector \( \hat{\alpha}, \hat{\xi}, \hat{\phi} \) can be obtained using Stock and Wright’s result that

- Joint CIs consist of all parameter values for which the test statistic do not reject

- CIs for the individual parameters are obtained using the projection method


Results

- Identification problems for \( \hat{\alpha}_t \) and \( \hat{\lambda}_t \)
- Mostly: perfect price rigidity cannot be rejected (e.g. for the standard hybrid NDCPC)

- For US: A pure forward-looking model with the cost channel is supported

For EU: a pure forward-looking model with the cost channel seems to be pure (with and without the cost channel)

Conclusion

- Evidence of weak identification (Hard to discriminate between forward- and backward-looking elements of inflation)
- For the US: A pure forward looking specification with the cost channel is most compatible with the data
- This model can explain inflation persistence without introducing a lagged inflation term

Rolf Scheufele, Halle Institute for Economic Research (IWH)

http://www.iwh-halle.de