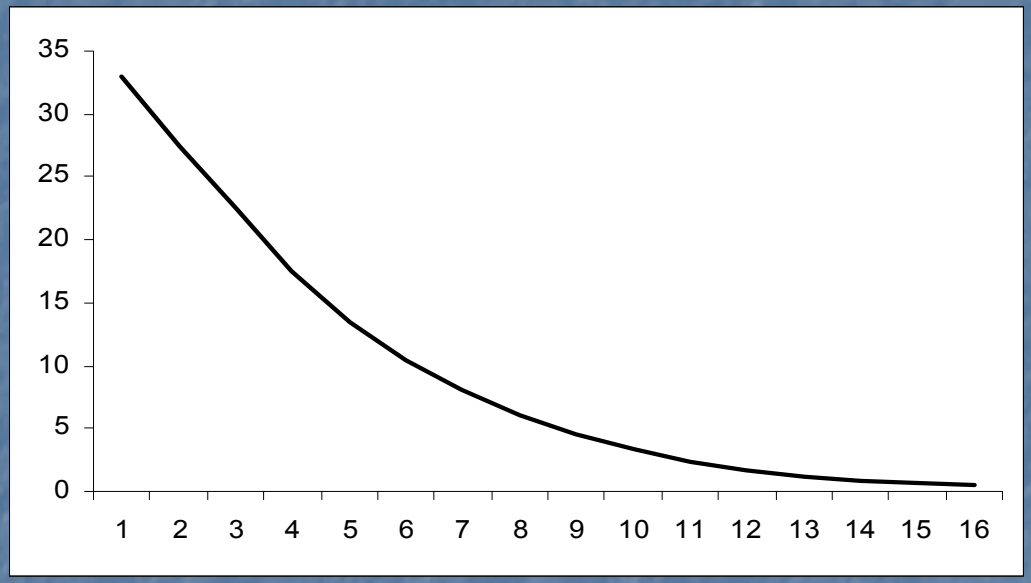
Inflation Dynamics in Pakistan: Evidence based on New Keynesian Phillips Curve

by

Wasim Shahid Malik
Ather Maqsood Ahmed
Ahsan ul Haq

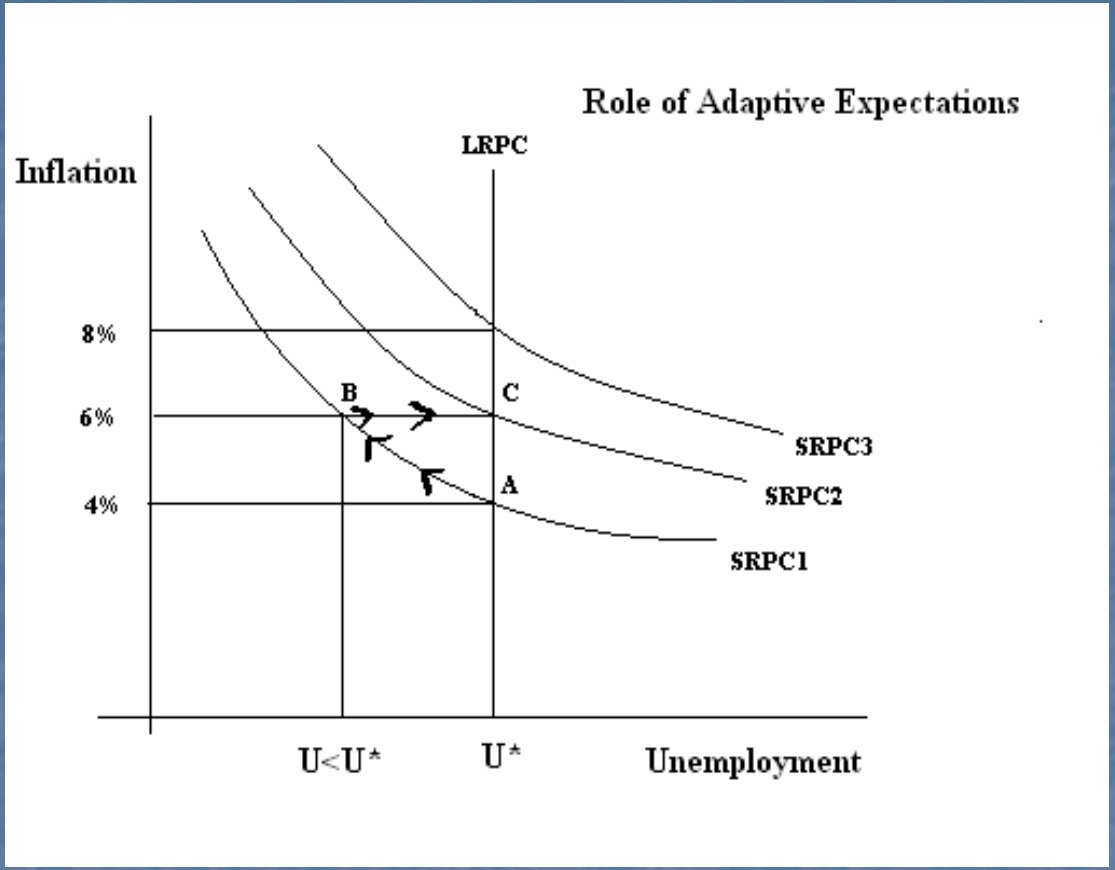
Background of the Issue

- Old Phillips Curve



$$\pi_t = f(u_t) \qquad \pi_t = \alpha_1 y_t$$

Long run Phillips Curve



$$\pi_t = \sum_{i=1}^{k} c_i \pi_{t-i} + y_t, \sum_{i=1}^{k} c_i = 1$$

Rational Expectations Revolution

- Expectations are rational
- Outcome
- Lucas supply curve (1972)

$$y_t = \bar{y} + b(\pi_t - \pi_t^e)$$

- New classical economics--- micro foundations

Staggered Price Adjustment Model

- New classical were lacking market imperfections
- Keynesians ----- market foundations, RE
- Fischer (1977)------ Overlapping Wage Contract
- Taylor (1979), same with prices
- Calvo (1983) adding probability

New Keynesian Economics

- Basis for the supply side of the new Keynesian economics (Fischer, Taylor, Calvo)
- Demand side, McCallum and Nelson (1999)
- Outcome
  - New IS curve
  - New Phillips Curve

New Keynesian Phillips Curve

(Gali and Gertler (1999))

- Calvo (1983) model,
- Firm faces 1-δ probability of price adjustment, δ of not changing

$$p_t = \delta p_{t-1} + (1-\delta)\, p_t^*$$

$$p_t^* = (1-\beta\delta)\sum_{q=1}^{\infty} (\beta\delta)^q\, E_t[mc_{t+q}]$$

New Keynesian Phillips Curve

(Gali and Gertler (1999))

- Linear approximation around steady state

$$\pi_t = \Phi mc_t + \beta E_t[\pi_{t+1}],$$

$$\Phi = \frac{(1-\delta)(1-\beta\delta)}{\delta}$$

- New Keynesian Phillips Curve

$$\pi_t = \Theta y_t + \beta E_t[\pi_{t+1}],$$

$$\Theta = \Phi r$$

Policy Implications of NKPC

$$\pi_t = \sum_{i=1}^{k} c_i \pi_{t-i} + y_t$$

$$\pi_t = \Theta y_t + \beta E_t[\pi_{t+1}]$$

- In old PC, deflation is costly and a lengthy process
- In NKPC, monetary authority can costlessly and immediately deflate

Hybrid Phillips Curve

(Gali and Gertler (1999))

- Furher and Moore (1995)

$$p_t = \delta p_{t-1} + (1-\delta)\,\overline{p}_t^*$$

$$\overline{p}_t^* = (1-\lambda)\,p_t^f + \lambda p_t^b$$

$$\pi_t = \Phi mc_t + \rho^f E_t[\pi_{t+1}] + \rho^b \pi_{t-1}$$

Estimation Issues

- **Issue 1**

$$\pi_t = \Theta y_t + \beta E_t[\pi_{t+1}]$$

- Lag this equation one period and assume β=1,

$$\pi_t = -\Theta y_t + \pi_{t-1}$$

$$\pi_t = cy_t + \pi_{t-1}$$

$$\pi_t = 0.192 y_{t-1} + \pi_{t-1}$$

(0.16)

Estimation Issues

- **Issue 2**
- Production function
- Labor income share is the real unit labor cost
- **Issue 3**

$$\pi_t = \Phi mc_t + \beta E_t[\pi_{t+1}]$$

$$E_t[(\pi_t - \Phi mc_t - \beta \pi_{t+1})Z_t] = 0$$

- **Orthogonality condition provides basis for GMM estimation**

Empirical Results

Reduced Form NKPC

$$\pi_t = 0.05mc_t + 0.62E_t [\pi_{t+1}]$$

(0.02) (0.16)

Problem with estimating NKPC using ad hoc output gap

$$\pi_t = -0.15y_t + 0.93E_t [\pi_{t+1}]$$

(0.09) (0.04)

Empirical Results

- Structural Estimates

  Non-Linear GMM

	δ (Degree of price stickiness)	β (Discount factor)
OC-I	0.90 (0.01)	0.59 (0.17)
OC-II	0.91 (0.01)	0.62 (0.16)

Empirical Results

- Hybrid Model
- Reduced form evidence

$$\pi_t = 0.04mc_t + 0.61\, E_t[\pi_{t+1}] + 0.02\pi_{t-1}$$

(0.02) (0.16) (0.11)

Empirical Results

- Structural Estimates of the Hybrid Model
- Non-Linear GMM

	δ (Degree of price stickiness)	β (Discount factor)	ρ (Degree of backwardness in price setting)
OC-I	0.91 (0.10)	0.62 (0.02)	0.02 (0.16)
OC-II	0.90 (0.01)	0.68 (0.10)	0.08 (0.14)

Conclusion

- Pakistani data supports NKPC
- We could not find support for Furher and Moore (1995) one-half rule on the basis of Pakistani data
- Degree of backwardness in price setting is very low
- NKPC should not be estimated using output gap

Policy Implications

- Monetary authorities should consider Forward looking behavior of inflation while setting monetary policy instrument, especially at the time of monetary contraction

Future Research

- Why is the degree of backwardness in price setting is so low in Pakistan?
- Why is the relationship not proportional between output gap and real marginal cost

Thanks for your patience