

Price Setting and Exchange Rate Pass-through: Theory and Evidence

Michael B. Devereux

James Yetman

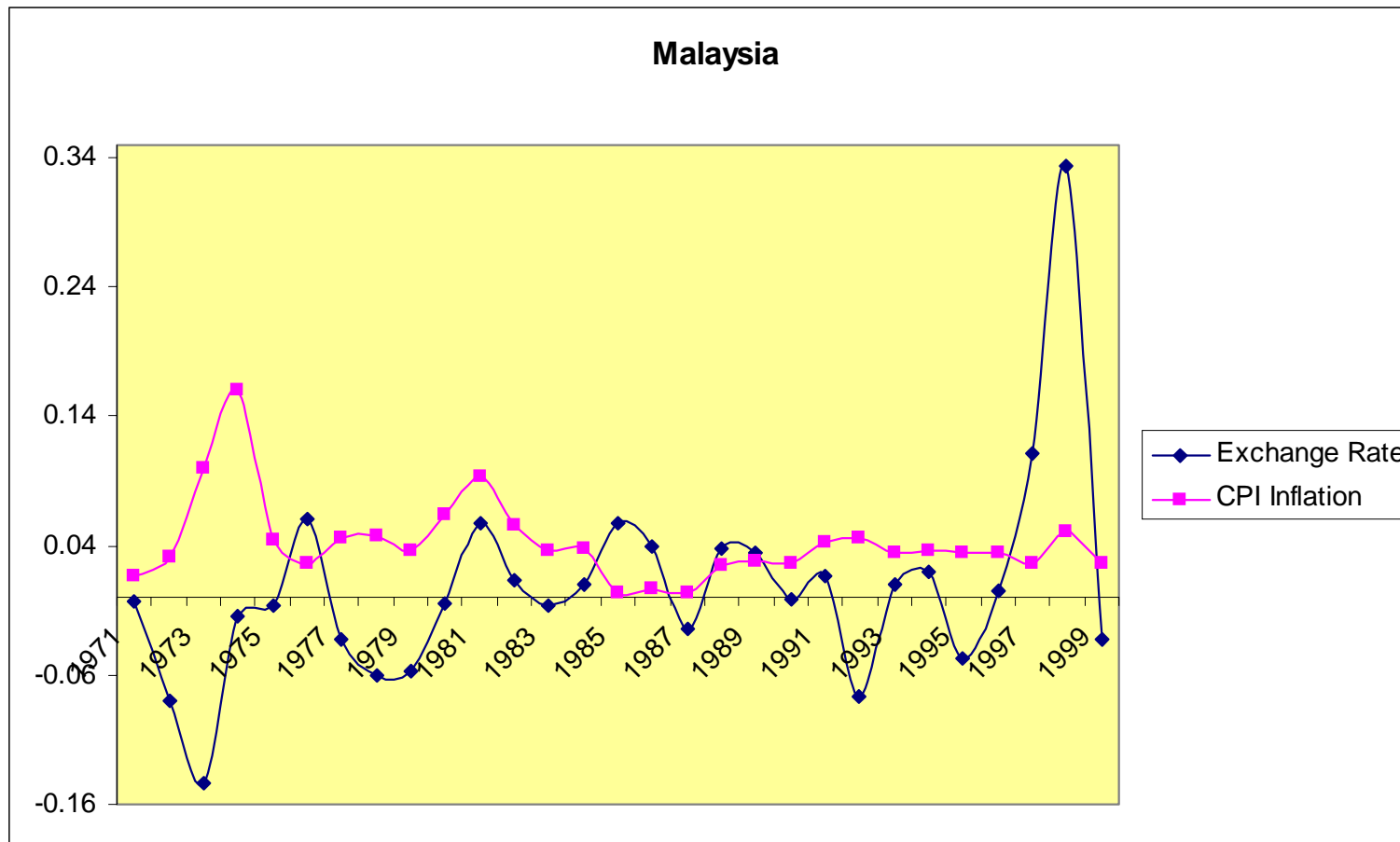
Exchange Rate Pass-through

- Renewed interest because pass-through seems quite low
 - Empirical evidence on prices
 - Low effect of devaluations
 - Ignore exchange rate for monetary policy

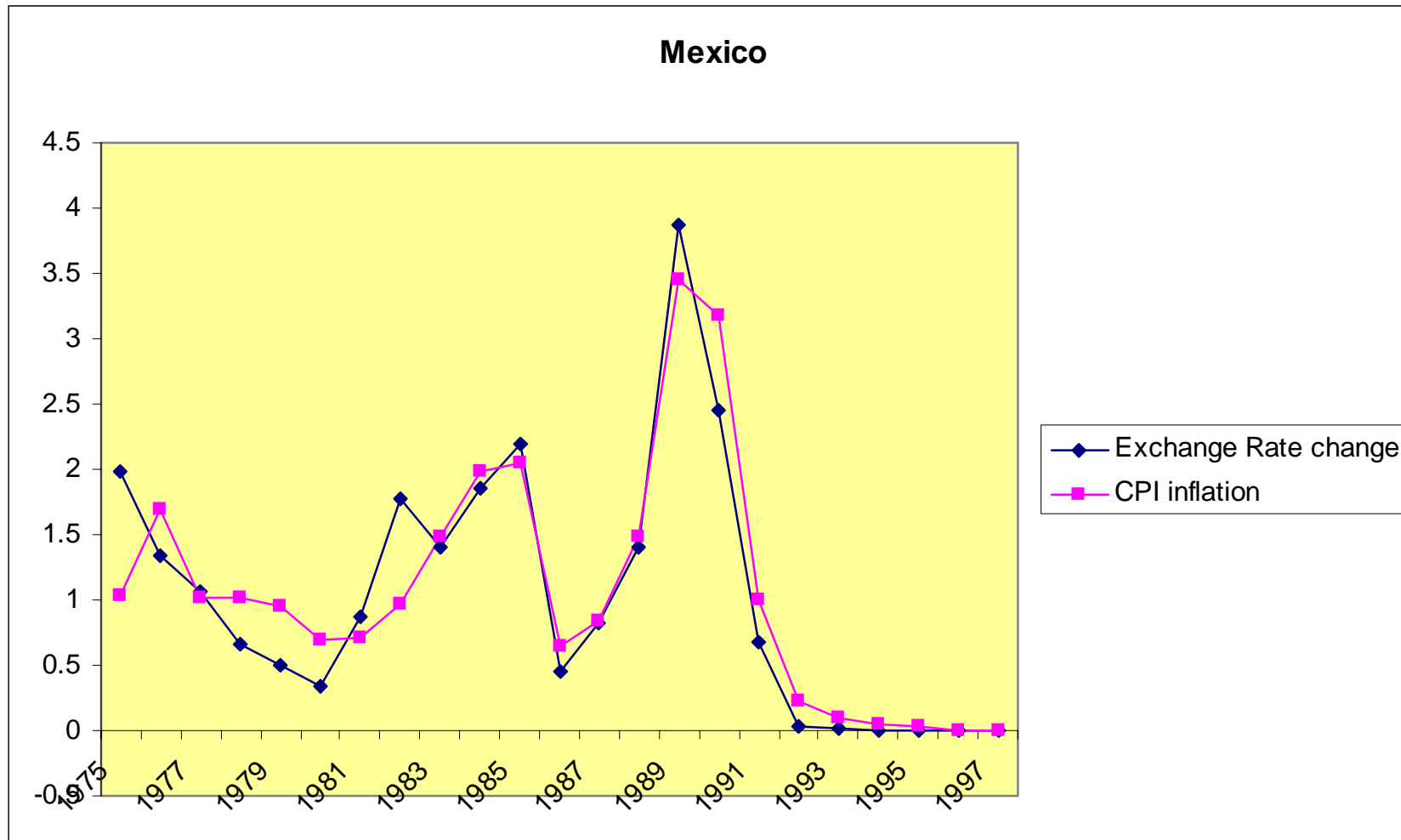
Is pass-through a macro or micro phenomenon?

- Micro approaches
 - Non-traded goods prices
 - Pricing to Market
 - Distribution sector (local content)
 - Substitution in consumption
 - Changes in trade shares
- Macro phenomenon
 - Slow price adjustment
 - Importance of monetary policy

Some very extreme evidence: Look first at
Malaysia – link between S and CPI quite weak



Mexico up to mid 1990's – very tight relationship



Aim of this paper

- To explore the case for slow price adjustment as being important to exchange rate pass-through
- Develop a theoretical model
 - Pass-through is limited by sticky prices
 - But sticky prices endogenous to monetary policy
 - With high inflation, prices are not sticky
- Empirical evidence
 - Positive but non-linear relationship between pass-through and inflation, mean depreciation
 - Negative relationship between pass-through and exchange rate volatility

Plan of talk

- Lay out the model
- Show determinants of exchange rate pass-through for given price adjustment
- Explore determinants of price adjustment
- Empirical evidence

Basic features of model

- Small economy
 - Domestic firms import and set local prices
- Combination of slow price adjustment and UIRP determine RER and inflation
- Endogenous choice of frequency of price adjustment
 - menu costs of price change

Importing Firm' Loss Function

$$L_t = F + E_t \sum_{j=0}^{\infty} (\beta\kappa)^j (\tilde{p}_t(i) - \hat{p}_{t+j}(i))^2 + \frac{(1-\kappa)}{\kappa} \sum_{j=1}^{\infty} (\beta\kappa)^j L_{t+j}$$

Desired price depends on the exchange rate (cost of importing)

$$\hat{p}_{t+j}(i) = \hat{\lambda} + s_t + p_t^* - \theta_t$$

$1 - \kappa$ Frequency of price adjustment

F Menu cost

Price setting

Newly set price

$$\tilde{p}_t(i) = (1 - \beta\kappa)(\hat{\lambda} + s_t + p_t^* + \theta_t) + \beta\kappa E_t \tilde{p}_{t+1}(i)$$

Import price index

$$p_t = (1 - \kappa)\tilde{p}_t + \kappa p_{t-1}$$

Gives the inflation equation

$$\pi_t = \eta(\hat{\lambda} + \theta_t + q_t) + \beta E_t \pi_{t+1}$$

Two other conditions:

UIRP

$$i_t = i_t^* + E_t s_{t+1} - s_t$$

Policy rule

$$i_t = -\phi + \delta\pi_t + v_t$$

Gives 'demand side'

$$\delta\pi_t + v_t = r_t^* + \phi + E_t q_{t+1} - q_t + E_t \pi_{t+1}$$

Full model

$$\pi_t = \eta(\hat{\lambda} + \theta_t + q_t) + \beta E_t \pi_{t+1}$$

$$\delta \pi_t + v_t = r_t^* + \phi + E_t q_{t+1} - q_t + E_t \pi_{t+1}$$

Use to examine determinants of exchange rate pass-through

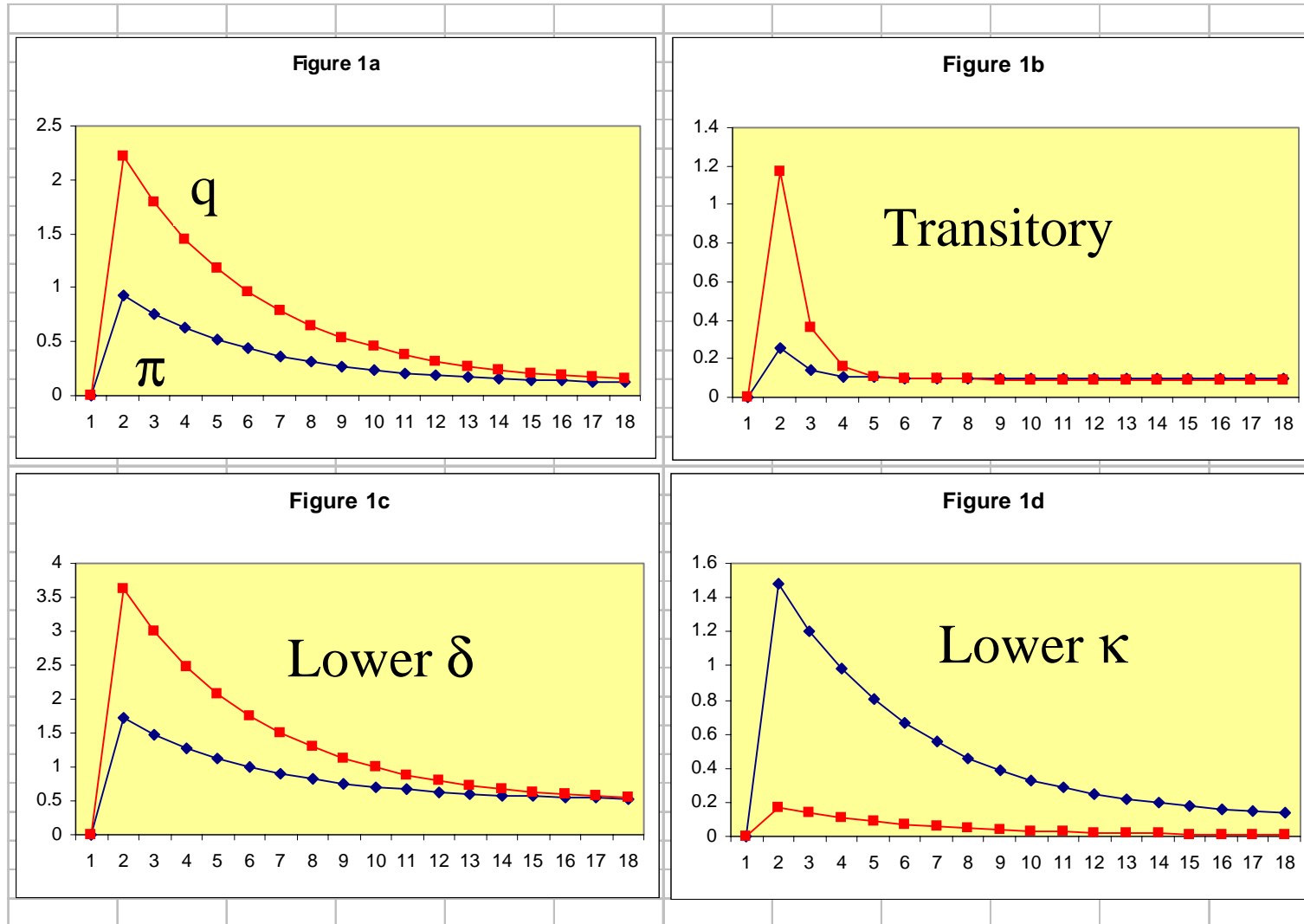
Solution

$$\pi_t = \frac{\phi}{(\delta - 1)} + a_1 r_t^* + a_2 v_t + a_3 \theta_t$$

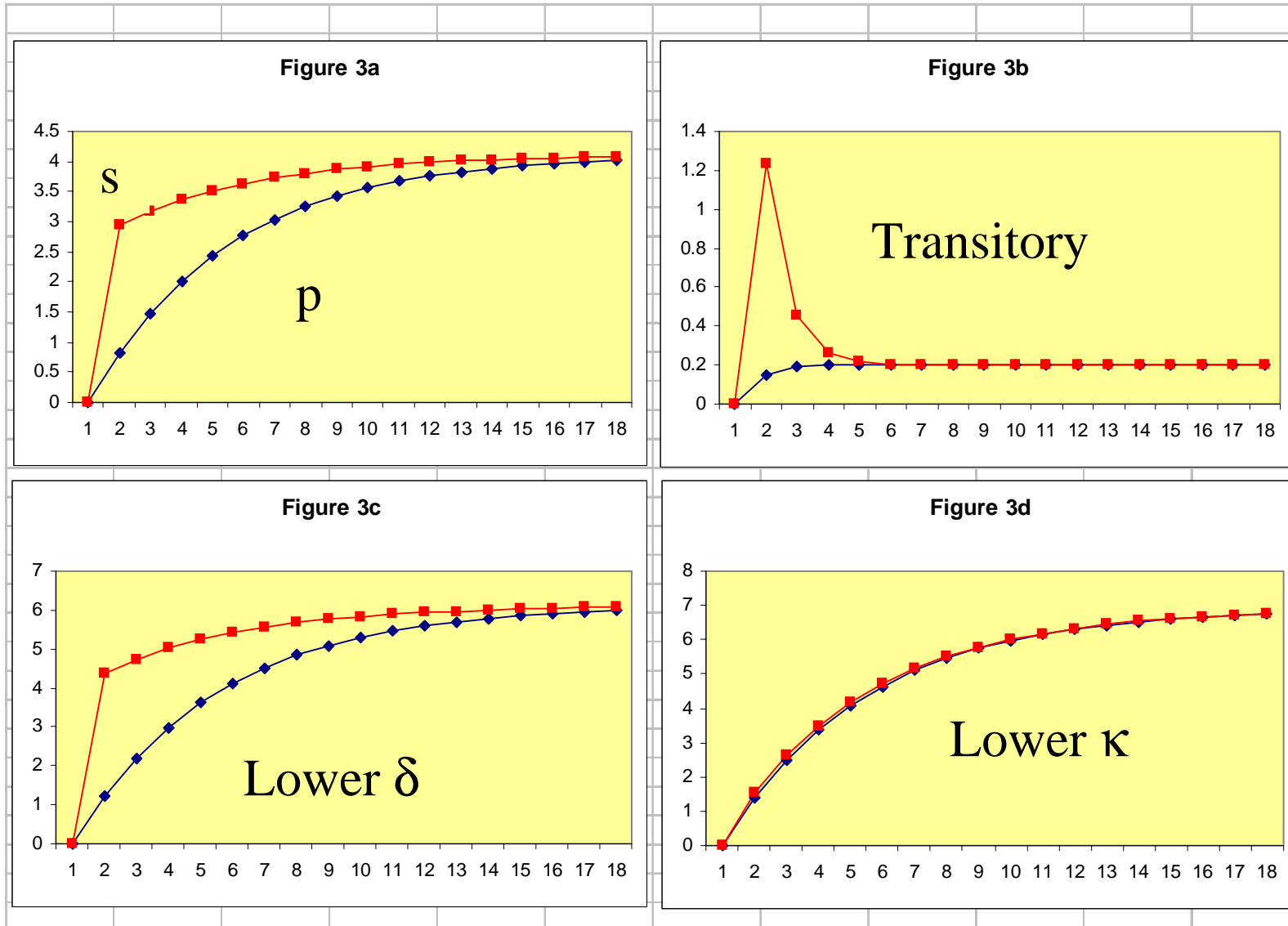
Monetary policy rule determines mean inflation, and response to shocks

$$q_t = \frac{\phi(1 - \beta)}{\eta(\delta - 1)} - \hat{\lambda} + b_1 r_t^* + b_2 v_t + b_3 \theta_t$$

Foreign interest rate shock



Pass-through implications



Pass-through

Table 2			
	Baseline	Transitory	Low Price Rigidity
t=1	0.28	0.12	0.89
t=2	0.47	0.41	0.95
t=5	0.76	0.98	0.99
t=10	0.81	1	1

But model so far is subject to 'Lucas Critique'

Mean inflation rate (rate of exchange depreciation) is affected by monetary policy

$$\frac{\phi}{(\delta - 1)}$$

Variance of exchange rate is affected by monetary policy

$$\sigma_{ds}^2 = \left[\left(\frac{(1+\eta)}{\delta\eta + 1} \right)^2 + \frac{1}{(\delta\eta + 1)^2} \right] \sigma_{\varepsilon}^2$$

Higher these are, the costlier for the firm to keep price fixed

Allow for endogenous choice of κ

Figure 5

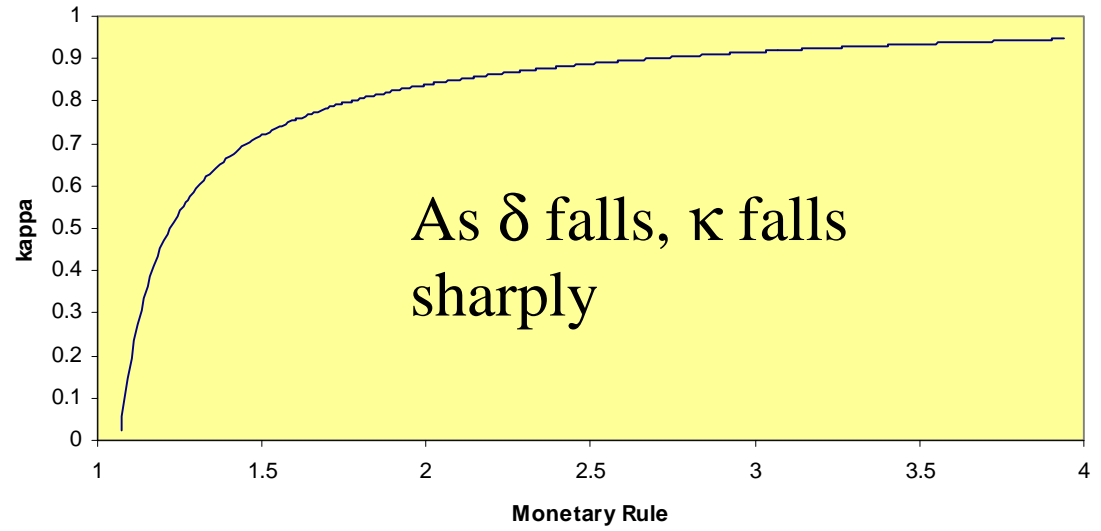


Figure 6

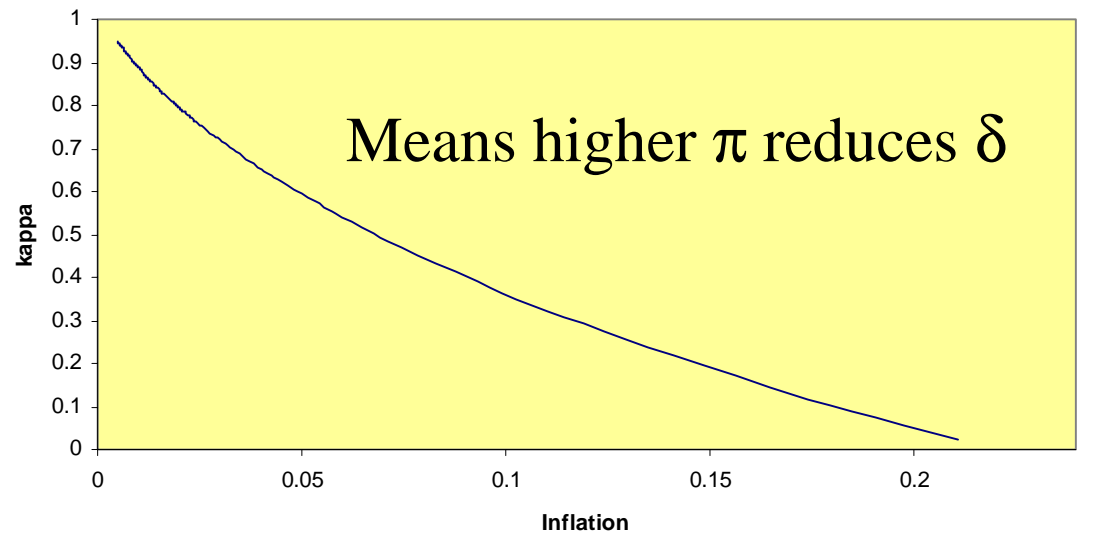
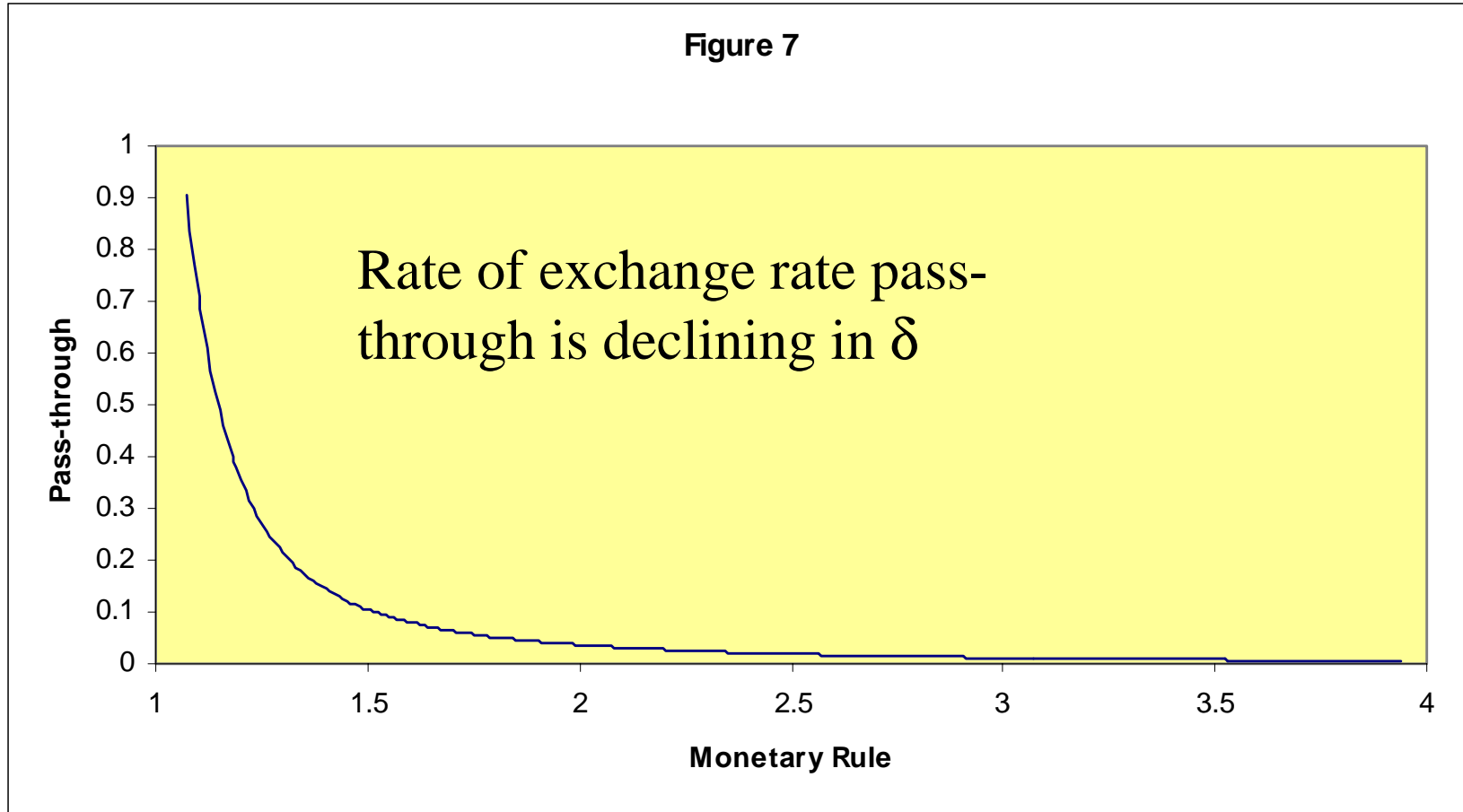


Figure 7



Implications

- Pass-through higher in high inflation countries
- Non-linear relationship
 - Effect should be smaller, higher is inflation
- Pass-through should be higher with higher exchange rate volatility

Test using following regression

$$\Delta P_{tj} = \beta_{0j} + \beta_{1j} \Delta S_{t-1j} + \beta_{2j} \Delta P_t^*$$

107 countries, annual data

Estimates of pass-through

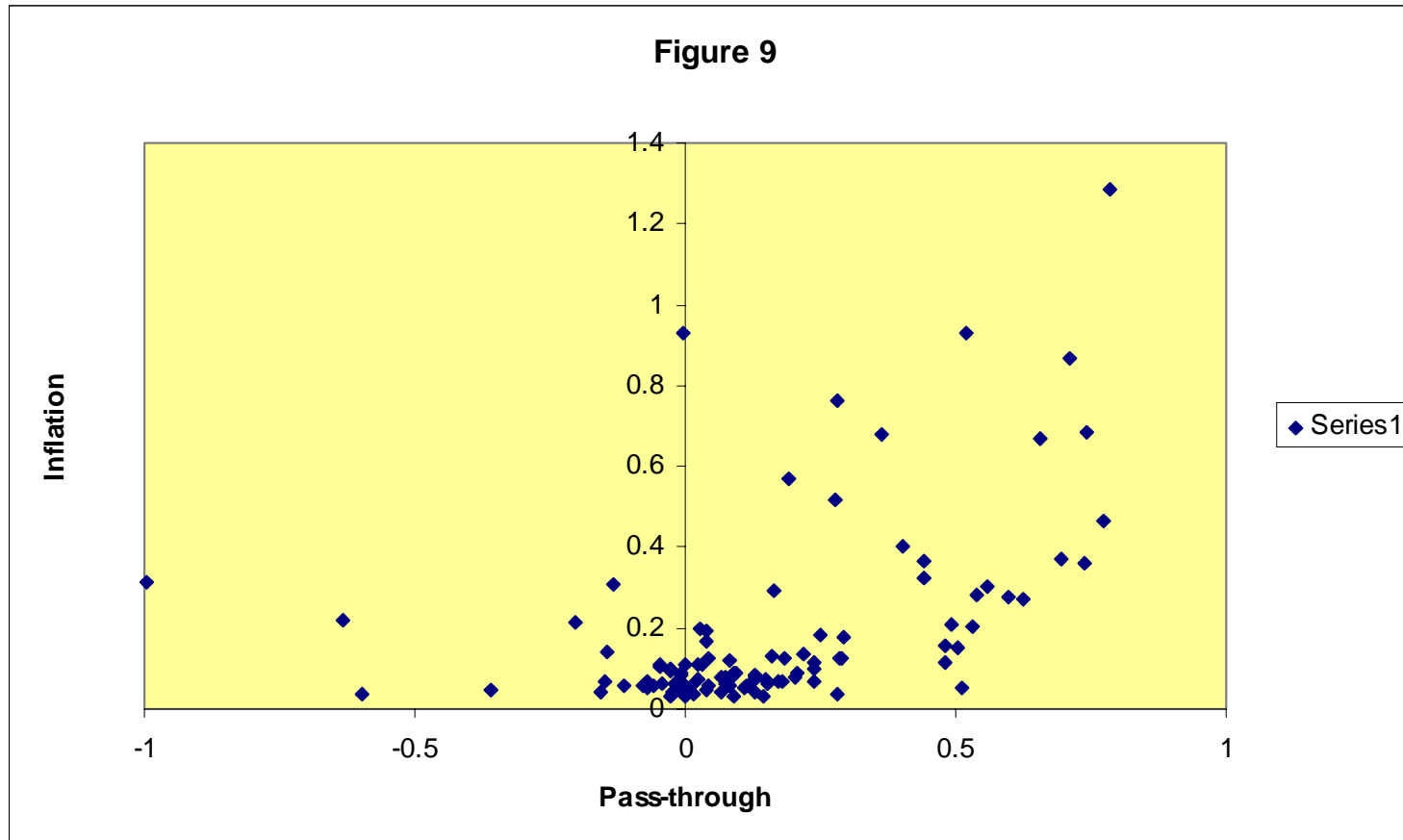


Table 3 Dependent variable: Estimated Pass-through Coefficient						
C	0.17** (2.8)	0.34** (6.9)	0.22** (3.8)	0.19** (3.0)	0.12 (1.9)	
Inflat	1.6** (3.6)		1.7** (3.9)	1.7** (4.0)	1.7** (4.1)	2.16** (6.6)
Inflat sq.	-1.1* (-2.42)		-1.14** (-2.7)	-1.2** (-2.7)	-1.2** (-2.7)	-1.44** (-4)
Ex Rate Depr		1.0 (1.93)			0.97* (2.1)	1.34** (3.1)
Ex. Rate Dep Sq		-2.1** (-2.8)			-2.0* (-2.9)	-2.46** (-3.9)
St.Dev. Inflat			-.37** (-3.3)	-.59** (-3.0)	-.47* (-2.4)	-0.5* (-2.56)
St. Dev Ex Rate				0.27 (0.21)	0.34 (1.6)	0.46* (2.3)
R ²	0.16	0.09	0.24	0.26	0.33	0.3

Conclusions

- Strong evidence that pass-through affected by macroeconomic experience
- May have big implications for design of monetary policy