Monetary Policy, Regime Shifts, and Inflation Uncertainty in Peru (1949 – 2006)

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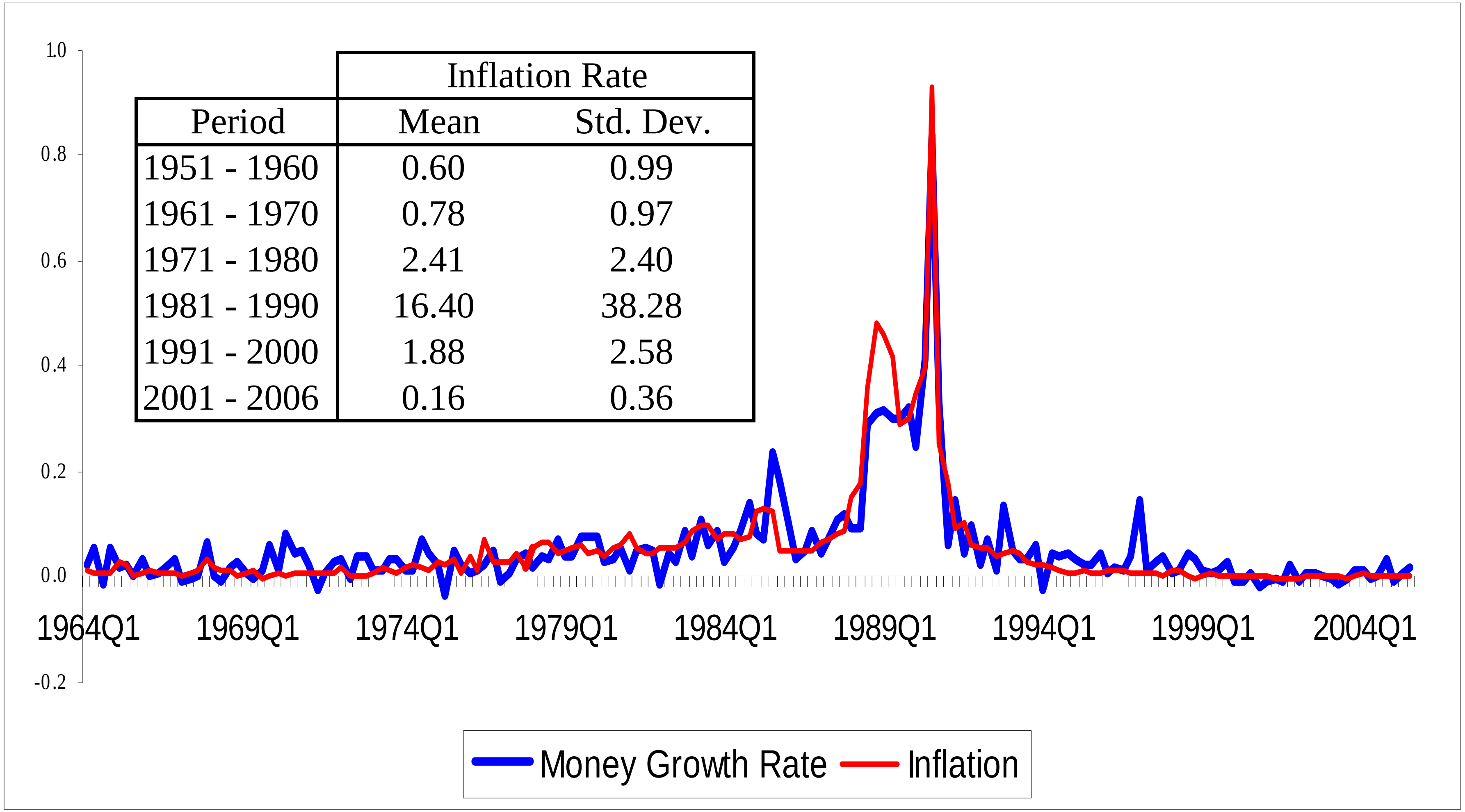
Motivation (1)



	Inflation Rate	
Period	Mean	Std. Dev.
1951 - 1960	0.60	0.99
1961 - 1970	0.78	0.97
1971 - 1980	2.41	2.40
1981 - 1990	16.40	38.28
1991 - 2000	1.88	2.58
2001 - 2006	0.16	0.36

Motivation (2)

- Empirical evidence of link among inflation and inflation uncertainty

- From a policy-oriented perspective, high inflation and high uncertainty are associated to higher stabilization costs
  - what about inflation persistence?

- This link might be subject to regime shifts in monetary policy

Objective

- Evaluate empirically the link between inflation and inflation uncertainty in a context of monetary policy regime shifts for the Peruvian economy

- As a by-product:
  - Assess inflation persistence

Related Literature

Univariate models

- Ball and Cecchetti (BPEA, 1990)
  - Unobserved components
- Kim and Nelson (MIT, 1999)
  - Unobserved components subject to regime switching

Learning models

- Marcet and Nicolini (RED, 2005)
  - Regime switching in money growth
- Sargent, Williams, and Zha (2006)
  - Regime switching in fiscal policy

Unobserved Components of Inflation

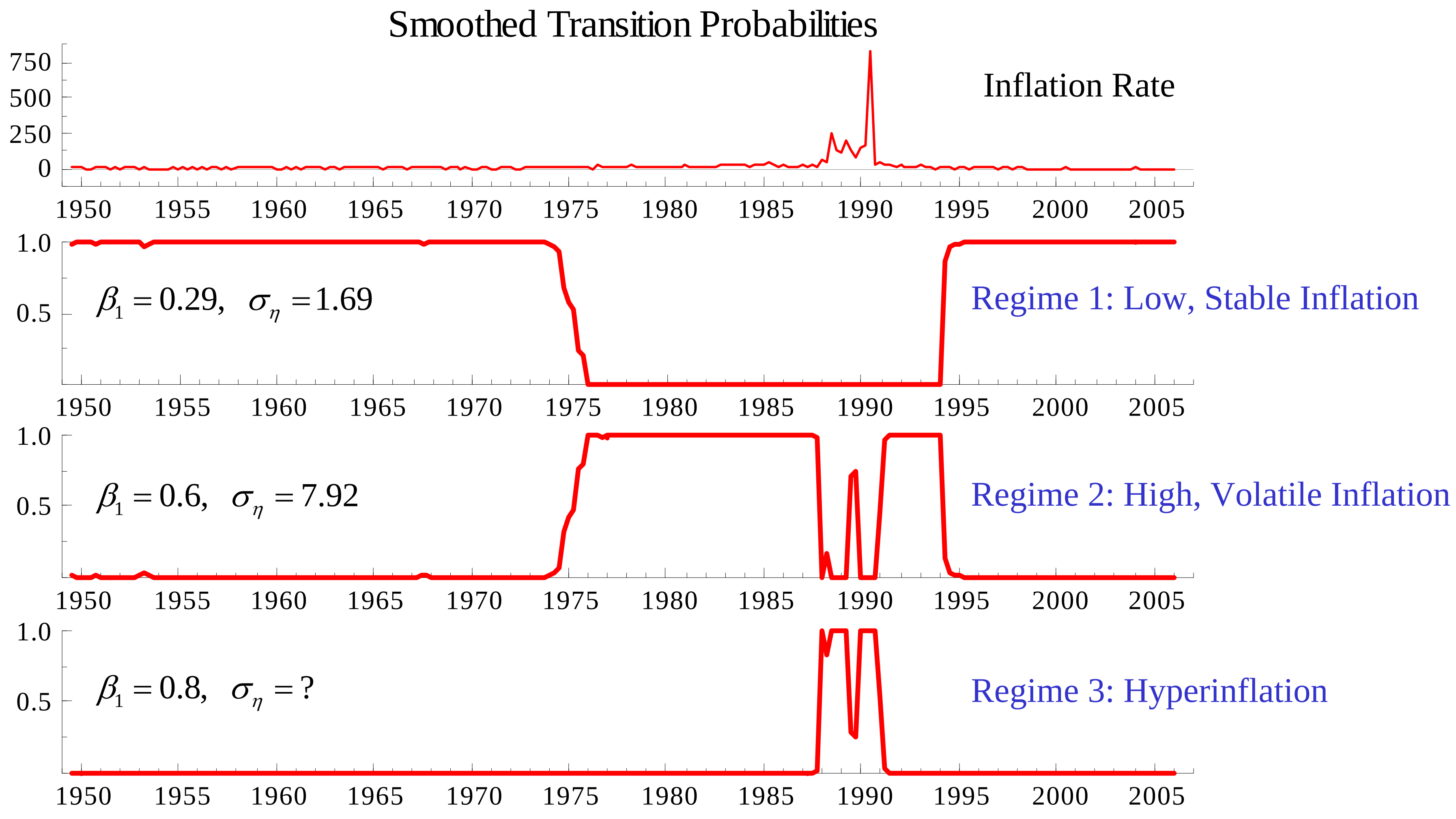
$$\pi_t = \pi_t^T + \eta_t$$ → Short-term uncertainty

$$\pi_t^T = \pi_{t-1}^T + \varepsilon_t$$ → Long-term uncertainty

Dependent Variable	Coefficient on Average Inflation	R^2
Permanent Shock (σ_ε^2)	0.173 (7.617)	0.84
Transitory Shock (σ_η^2)	0.163 (2.003)	0.52

Numbers in parenthesis are t-statistics. Information for 1985-1995 is excluded.

Regime Switching in Inflation Rate



$$\pi_t = c(s_t) + \beta_1(s_t)\pi_{t-1} + \eta_t(s_t)$$

Markov Switching Heteroskedasticity

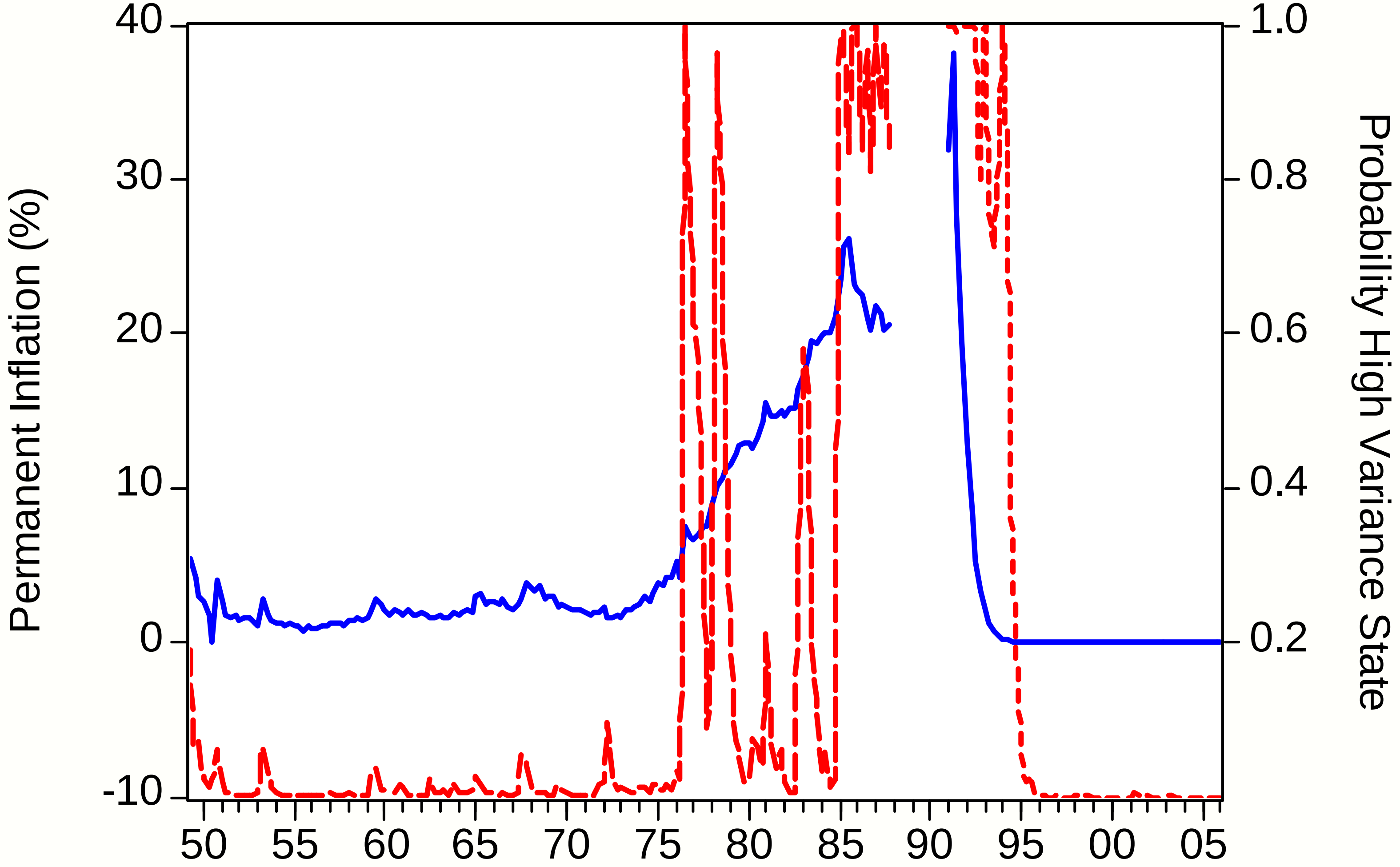
$$\pi_t = \pi_t^T + \mu_2 S_{1,t} + \mu_3 S_{2,t} + \mu_4 S_{1,t} S_{2,t} + \left(h_0 + h_1 S_{2,t}\right)\eta_t$$

$$\pi_t^T = \pi_{t-1}^T + \left(Q_0 + Q_1 S_{1,t}\right)\varepsilon_t$$

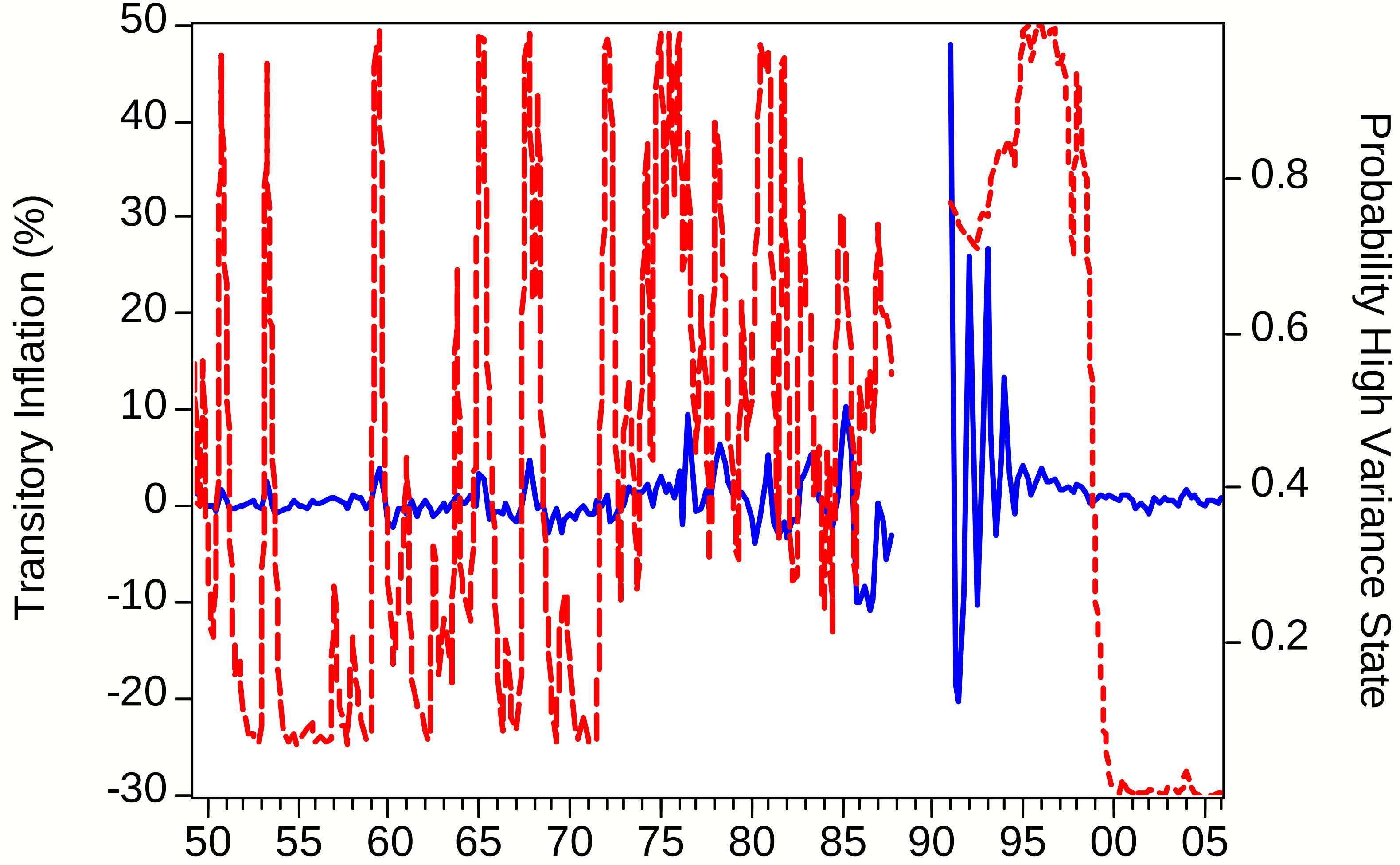
Permanent shock — Transitory shock

	$S_{1,t}$		$S_{2,t}$
Discrete State Variables		$= 0$	Low variance
		$= 1$	High variance

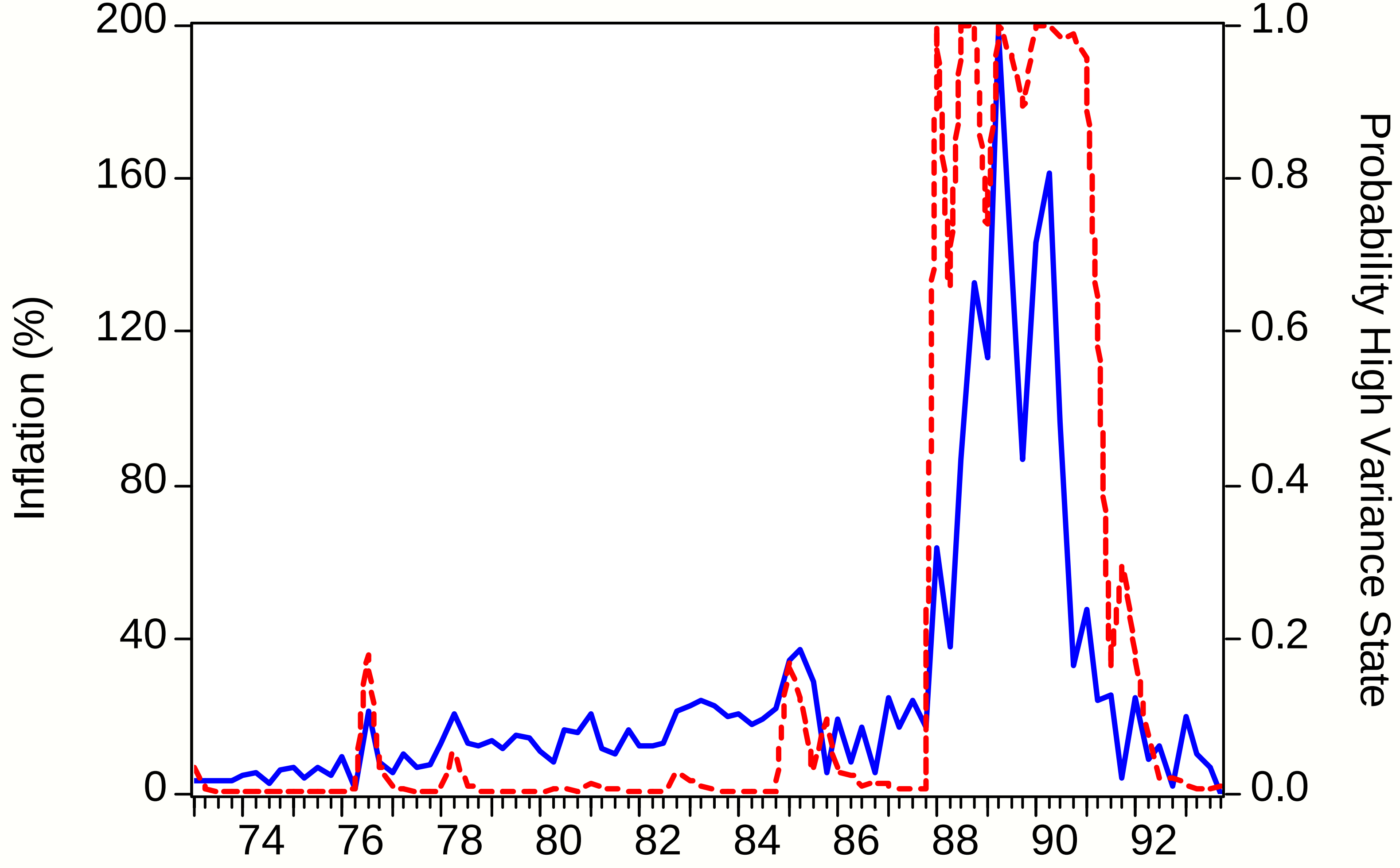
Permanent Shocks



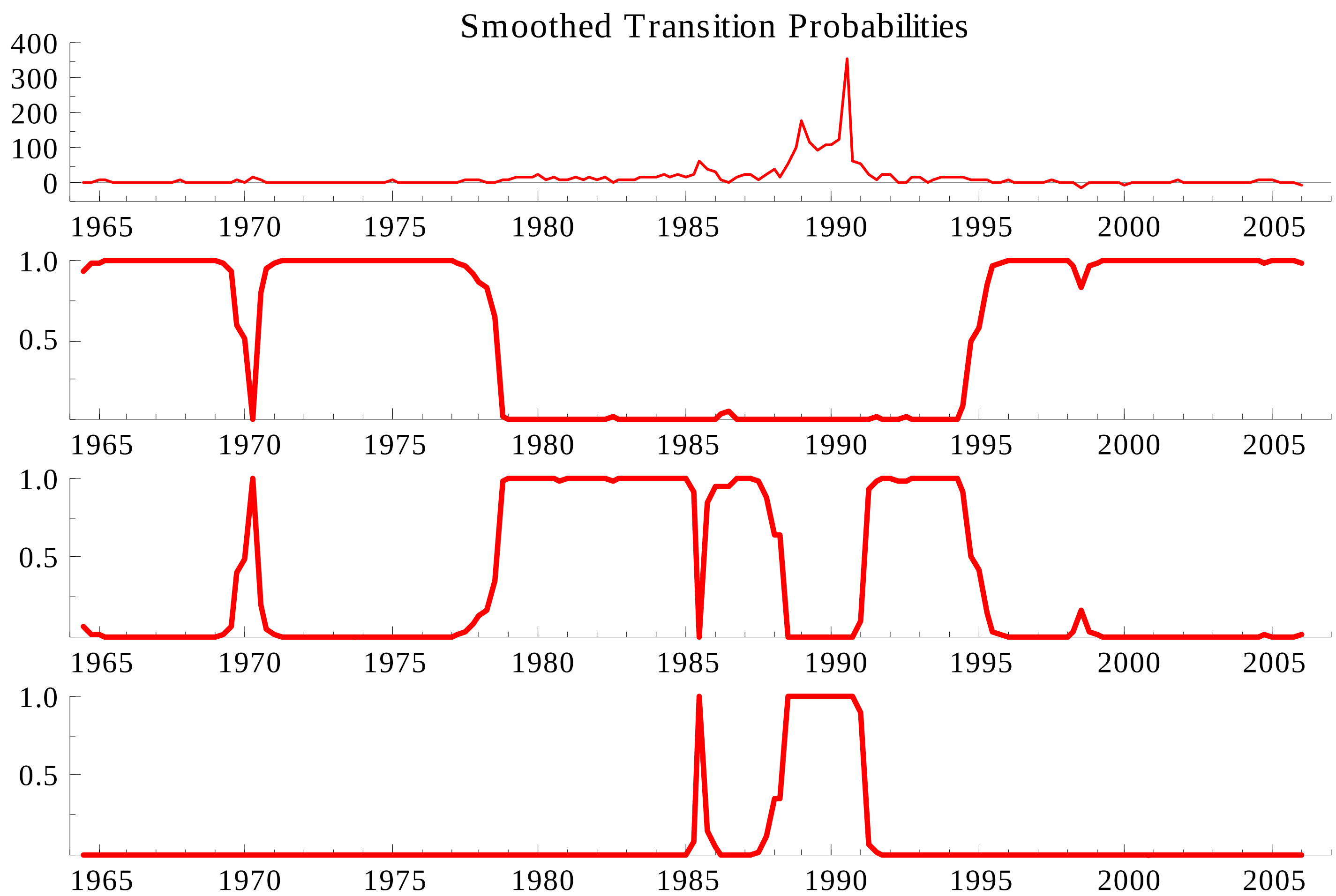
Transitory Shocks



Hyperinflation: Permanent Shocks

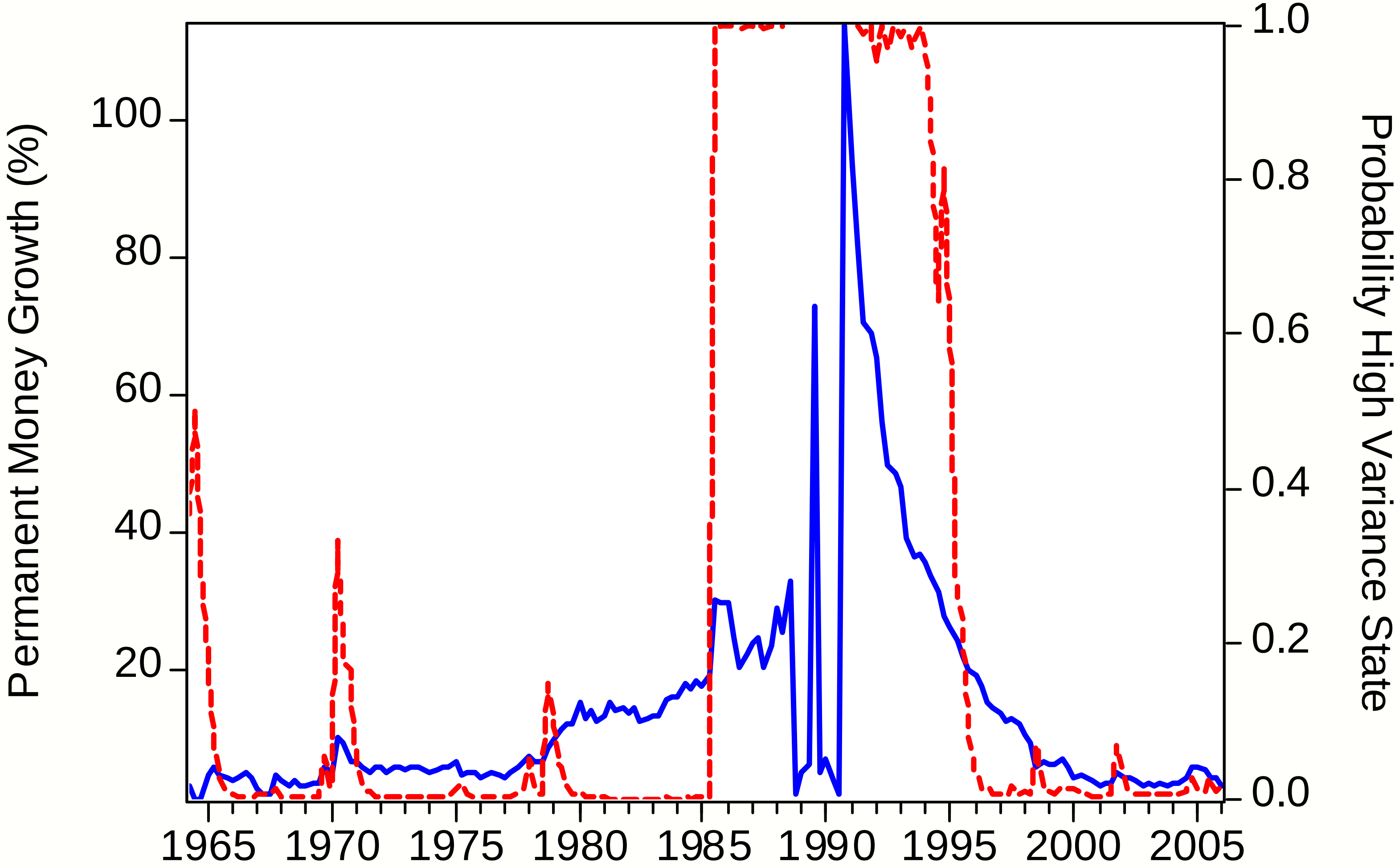


Regime Shifts in Monetary Policy



$$m_t = c(s_t) + \beta_1(s_t)\, m_{t-1} + u_t(s_t)$$

Permanent Shocks in Money Growth



What about inflation persistence?

- Short-run and long-run uncertainty has changed: inflation persistence varies across regimes

- Ratio between long-run vs. short-run uncertainty contains information on central bank credibility

Signal to Noise Ratio:

$$\frac{\sigma_{\varepsilon}^{2}}{\sigma_{\eta}^{2}} = S = \frac{-1}{corr\left(\Delta\pi_{t}, \Delta\pi_{t-1}\right)} - 2$$

What about inflation persistence?

- Agent has to forecast inflation based on the unobserved component model

$$\hat{E}_t \pi_{t+1} = \hat{E}_{t-1}\pi_t + K\left(\pi_t - \hat{E}_{t-1}\pi_t\right), \quad 0 < K < 1$$

$$= K\left[\pi_t + (1-K)\pi_{t-1} + (1-K)^2 \pi_{t-2} + \ldots\right]$$

- Positive link between Signal to Noise Ratio (S) and Kalman Gain (K)

$$K = \frac{-S + \sqrt{S^2 + 4S}}{2}$$

What about inflation persistence?

- Larger S, larger K, more weight to recent inflation, hence , larger persistence

Signal to Noise Ratio and Kalman Gain Across Regimes*

	Regime 1 (low-volatility)	Regime 2 (high-volatility)
ρ	0.295	0.604
S	0.262	0.584
K	0.398	0.526

Conclusions (1)

- High inflation relates to high (short- and long-run) uncertainty
- Both permanent and transitory components of inflation have been subject to regime switching
- Regime switching in monetary policy has induced shifts in inflation dynamics

Conclusions (2)

- Inflation-intolerant policies reduce volatility of both permanent and transitory shocks

- Reduction in persistence (and in stabilization costs) might be due to fall in long-run/short-run uncertainty