

### **Estimates of the Models Reported in Table 6 based on Post-December 1981 Data**

Table 6S below provides the output based on 3 regimes for the last half of the data for the models reported in Table 6 in the paper (which is also reported below). As with the full sample and 8 breaks we see that the standard results are recovered for the F-P, NK and hybrid models of the Phillips curve when we do not allow for the different means in the three regimes (see columns 1 to 3).

Once we account for the different mean rates of inflation across the inflation regimes (i.e. the fixed effects models) we see in columns 5 to 7 that we again reject all three models (F-P, NK and hybrid). The forward inflation term in the NK and hybrid modes are insignificant and the lagged term in the F-F model is significantly less than 1 by a wide margin. The only substantial difference is that the lag in inflation is significant in the fixed effects F-P model when it is estimated over the last half of the data sample. This might be explained by the inflation turbulence in the first half of the data.

In contrast, if we use only 5 breaks on all the data the models behave poorly in a statistical sense and we can again retrieve the standard results which might be explained by the data still containing some ‘residual’ non-stationarity when only 5 breaks are applied.

The question is: are the estimates derived from using all the data and 5 breaks different from the estimates using the second half of the data due to a change in the underlying economic structure of the US economy in December 1981 or due to too few breaks being included in the first half of the data and so the data remains non-stationary?

To throw some light on this question I attach a graph of the US inflation data. The thin horizontal lines are the 9 mean rates of inflation from all the data assuming 8 breaks (the last three regimes are the same). The three red lines are the mean rates of inflation when we assume only 5 breaks.

Assuming 5 or 8 breaks makes little difference to the first inflation regime. However, the data in regime two relative to its mean (the red line) looks as though it has a shifting mean in it (or a trend) and therefore it may not be valid to characterise this regime as having a constant mean. Similarly, ‘eyeballing’ the data in regime 3 looks as though the data again does not have a constant mean if we assume 5 breaks and better described when we assume 8 breaks.

All this suggest it may be valid to proceed, as we do in the paper, on the maintained assumption that the data has 8 breaks as indicated by the BIC. While we might agree that this evidence is not conclusive (as evidence hardly is) we would not agree that 5 breaks is a better characterisation of the data than 8 breaks even though 5 breaks is indicated by the supF test. This is particularly the case when we know from the Monte Carlo simulations in Section 3.3 in the paper that ignoring mean shifts in the inflation data introduces large biases into the estimates of the dynamic inflation terms in the Phillips curve and this bias falls disproportionately on the forward (i.e. New Keynesian) inflation term.

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**Table 6S: Panel Estimates of United States Phillips Curve (post December 1981)**

	All Inflation Regimes						
	Restricted Constant			Fixed Effects			
	F-P	NK	Hybrid	F-P	NK	Hybrid	
	1	2	3	5	6	7	8
$\Delta p_{t+1}^n$		0.9908 (10.6)	0.6183 (2.5)		0.3410 (0.9)	0.2510 (0.7)	
$\Delta p_{t-1}^n$	0.3411 (4.7)		0.2861 (2.3)	0.2201 (3.3)		0.2185 (4.2)	
$\Delta p_{t-2}^n$	0.0755 (5.2)						
$\Delta p_{t-3}^n$	0.2389 (3.2)						
$mu_t$	- 0.0166 (- 4.5)	- 0.0079 (- 0.6)	- 0.0106 (- 1.2)	- 0.0360 (- 2.3)	- 0.0300 (- 4.2)	- 0.0279 (- 4.1)	
Constant	0.0101 (5.0)	0.0039 (0.6)	0.0057 (1.6)	0.0224 (2.9)	0.0188 (5.0)	0.0169 (4.2)	
$\bar{R}^2$	0.361	0.077	0.364	0.450	0.433	0.473	
DW	2.129	2.744	2.970	2.010	2.165	2.452	
<i>Wald Tests – probability values</i>							
$\phi_f + \phi_b = 0$	[0.000]	[0.000]	[0.000]	[0.001]	[0.390]	[0.203]	
$\phi_f + \phi_b = 1$	[0.000]	[0.922]	[0.439]	[0.000]	[0.098]	[0.151]	
<i>F Tests – probability values</i>							
Significant Variables	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]

Notes: Models estimated with three regimes for the period December 1981 to June 2007.

**Table 6: Panel Estimates of United States Phillips Curve**

	All Inflation Regimes								Stationary Inflation Regimes			
	Restricted Constant				Fixed Effects				Fixed Effects			
	F-P	NK	Hybrid	Markup Only	F-P	NK	Hybrid	Markup Only	F-P	NK	Hybrid	Markup Only
	1	2	3	4	5	6	7	8	9	10	11	12
$\Delta p_{t+1}^n$		0.9835 (55.5)	0.6888 (6.1)			0.0636 (0.2)	0.3819 (1.3)			0.2392 (0.8)	0.4186 (1.3)	
$\Delta p_{t-1}^n$	0.4642 (5.0)		0.2754 (2.5)		0.1263 (1.2)		0.1748 (1.6)		0.0573 (0.5)		0.0845 (0.9)	
$\Delta p_{t-2}^n$	0.1477 (2.3)											
$\Delta p_{t-3}^n$	0.2805 (4.1)											
$mu_t$	- 0.0409 (- 2.3)	- 0.0064 (- 1.0)	- 0.0153 (- 2.1)	- 0.2106 (- 9.7)	- 0.0527 (- 2.1)	- 0.0571 (- 2.1)	- 0.0411 (- 1.6)	- 0.0581 (- 2.7)	- 0.0441 (- 2.1)	- 0.0438 (- 2.3)	- 0.0365 (- 1.8)	- 0.0469 (- 2.3)
Constant	0.0205 (2.3)	0.0032 (1.0)	0.0076 (2.1)	0.1094 (10.5)	0.0330 (2.7)	0.0356 (2.6)	0.0236 (1.7)	0.0367 (3.5)	0.0288 (2.8)	0.0272 (3.1)	0.0215 (2.1)	0.0306 (3.2)
$\bar{R}^2$	0.786	0.711	0.785	0.340	0.838	0.827	0.816	0.835	0.810	0.795	0.774	0.810
AR(1)	[0.031]	[0.000]	[0.000]	[0.000]	[0.844]	[0.575]	[0.000]	[0.195]	[0.429]	[0.012]	[0.000]	[0.708]
AR(2)	[0.144]	[0.020]	[0.455]	[0.000]	[0.020]	[0.033]	[0.119]	[0.024]	[0.065]	[0.090]	[0.152]	[0.068]
AR(3)	[0.088]	[0.668]	[0.668]	[0.000]	[0.760]	[0.821]	[0.728]	[0.626]	[0.546]	[0.227]	[0.245]	[0.555]
AR(4)	[0.068]	[0.197]	[0.151]	[0.000]	[0.551]	[0.542]	[0.285]	[0.729]	[0.399]	[0.305]	[0.292]	[0.403]
DW	2.121	2.769	3.027	0.485	2.048	1.886	2.665	1.82	2.051	2.378	2.747	1.94
<i>Wald Tests – probability values</i>												
Parameter Constancy	[0.000]	[0.209]	[0.383]	[0.000]	[0.134]	[0.336]	[0.128]	[0.413]	[0.253]	[0.669]	[0.393]	[0.261]
$\phi_f + \phi_b = 0$	[0.000]	[0.000]	[0.000]		[0.600]	[0.836]	[0.089]		[0.623]	[0.449]	[0.159]	
$\phi_f + \phi_b = 1$	[0.001]	[0.354]	[0.018]		[0.000]	[0.003]	[0.175]		[0.000]	[0.017]	[0.164]	
<i>F Tests – probability values</i>												
Significant Variables	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Fixed Effects					[0.000]	[0.376]	[0.977]	[0.000]	[0.000]	[0.600]	[0.946]	[0.000]

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### Notes to Table 6

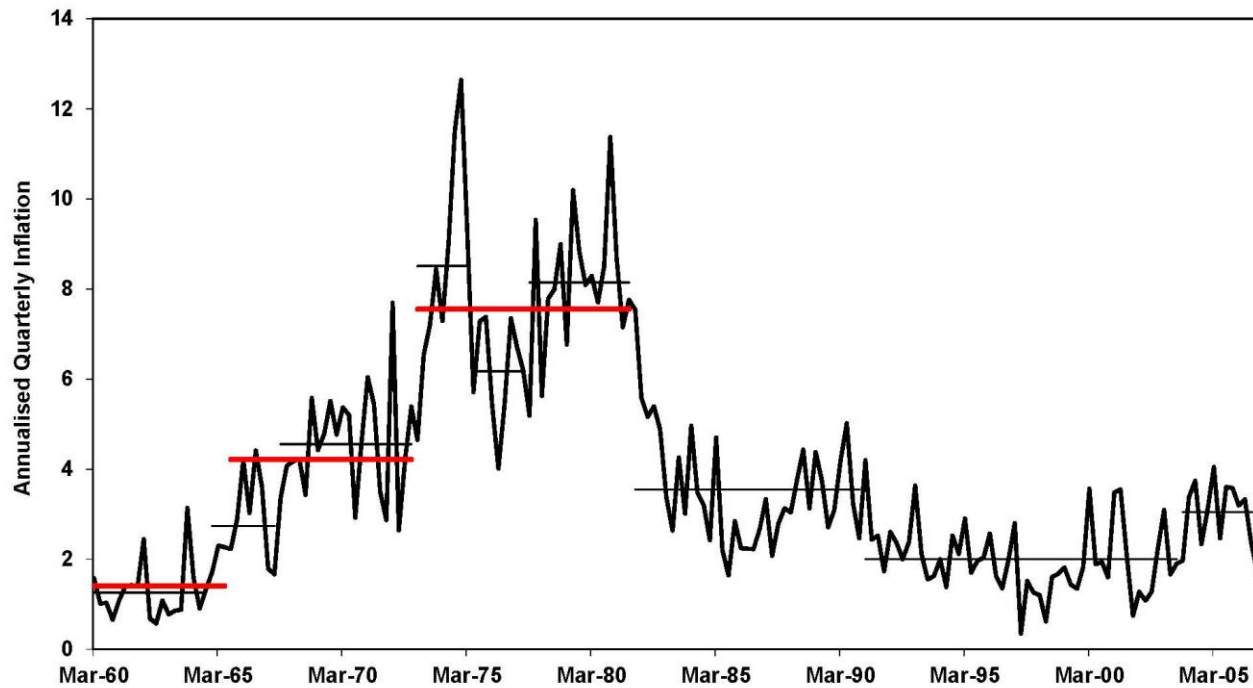
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Reported as ( ) and [ ] are  $t$ -statistics and probability values respectively. The dependent variable is,  $\Delta p_t^n$  and the forcing variable is the markup,  $mu_t$ . The panels for ‘all the inflation regimes’ consist of 9 cross-sections with 190 observations in total and 160, 150 and 150 usable observations in the F-P, NK and hybrid models respectively. The ‘stationary inflation regimes’ include regimes 1, 2, 3, 6, 7, 8 and 9 with 151 observations. See the Data Appendix and Section 2 for details concerning the data and the estimation of the inflation regimes. Lag length chosen by lag exclusion F-tests in all models except the restricted constant markup only model in column 4 where further dynamics do not improve the system diagnostics. Instruments are three lags of the independent variables in all models. Inference is not affected by the inclusion of fewer or more lags of the instruments. In columns 1 to 4 the constant (or fixed effect) in each panel is restricted to be the same such that  $\phi^1 = \phi^2 = \dots = \phi^9$ . In the fixed effects models in columns 5 to 12 the reported constant is the weighted average of the fixed effects. The models are estimated using White period robust coefficient covariance that allows for arbitrary heteroskedasticity and serial correlation within cross-sections and no serial correlation across cross-sections. AR(1) to AR(4) are the Arellano-Bond tests of first to fourth order serial correlation in the residuals. ‘Parameter Constancy’ tests the estimated parameters for  $\Delta p_t^n$  and  $mu_t$  are the same across inflation regimes. ‘Significant Variables’ tests  $\phi_f = \phi_b = \phi_z = \phi^n = 0$ . ‘Fixed Effects’ tests the fixed effects are zero such that  $\phi^n = 0$ . Models estimated with 2SLS using Stata/SE 8.2 and Eviews 5.1.

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### United States Quarterly Inflation - 5 & 8 Breaks in Mean

March 1960 to June 2007



The thin horizontal lines are the mean rates of inflation for all 9 inflation regimes based on 8 breaks. The last three regimes after December 1981 are the same if we assume 5 or 8 breaks in the data. The red horizontal lines are the means of the first three inflation regimes assuming 5 breaks in the inflation data.