REGIONAL PHILLIPS CURVES UNDER CONSISTENT EXPECTATIONS*

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Introduction

In a recent paper, Michael Sumner and Robert Ward [10] argue that the Phillips curve is alive, well, downward sloping, and nonlinear. Their conclusions are supported by results obtained by Bean *et al.* [1], Newell and Symons [7], Davis and Minford [4], and others. At the same time, interest has grown in regional aspects of the relationship between wages and unemployment. Blackaby and Manning [3] estimate regional Phillips curves for the U.K. and revive the idea that "a selective reflationary policy concentrated in some of the depressed regions would be less inflationary than an economy-wide stimulus." Johnes and Hyclak [6] reach similar conclusions based on an analysis of regional wage inflation in Britain, Italy, and West Germany.

Few of the above studies assume consistent (rational) expectations, however. In the present note, linear and nonlinear Phillips curves are estimated for all regions of Great Britain under the assumptions of consistent expectations and perfect foresight. A result emerges that is both interesting and important; the linear estimates of the Phillips curves are vertical, but the nonlinear estimates are downward sloping. Such a result is likely to be observed only if the the true Phillips curve approximates an L shape.

The Model

The results reported below refer to linear and log-log versions of the estimating equation.[1]

(1) $\dot{w} = a + bU + c\dot{p}^e + dM_{-1}$

where

$\dot{w}$ = the annual rate of change of the average hourly earnings of full-time men,

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[1]The log-log specification realistically excludes the possibility of negative inflation.

U = the unemployment rate,

$\dot{p}^e$ = the expected annual rate of price inflation and

M = a measure of union militancy.

The inclusion of this last variable follows the early work of Taylor [11] and the more recent contribution of Newell and Symons [8]. Militancy is measured as working days lost through industrial stoppage per thousand employees per year. All variables are region-specific with the exception of price expectations which are assumed to be determined nationally.

The modelling of the price expectations variable is crucial. Two sets of results are presented here. First, the consistent expectations (CE) version of the estimating equation uses forecasts of price inflation generated by an equation where inflation depends on current and lagged values of the cyclically adjusted PSBR.[2] The data for the explanatory variables used here were obtained from Biswas, Johns, and Savage [2]. Second, in an attempt to eradicate any model bias, a perfect foresight (PF) version of equation (1) also is estimated, where expectations of current price inflation are constrained to be accurate.

New classical models that embody consistent expectations typically yield vertical Phillips curves, with $c \sim 1$ and $b \sim 0$. This follows the intuition that variations in the unemployment rate due to money illusion cannot be achieved systematically by the authorities, as systematic control of policy variables will be perceived and its inflationary effects consistently anticipated by the public (Sargent and Wallace [9]). More recent work emphasizes the bargaining interpretation of the Phillips curve (Newell and Symons [8]). Here, unions whose preferences are defined across wages and employment bargain in an imperfectly competitive labor market. When unemployment is relatively high, unions are likely to pursue relatively moderate wage demands. The long-run equilibria in such a model define a downward sloping Phillips curve. Such theories are appealing because they accord with casual observation and because they explain the observed potency of government policy.

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[2]Estimated price inflation is thus given by the GLS equation:

$$\dot{p}^e = 25.14 + 0.53X + 1.95X_{-1}$$
$$\qquad (9.88) \quad (0.77) \quad (2.78)$$

$\rho = -0.1 \quad R^2 = 0.75$

where X denotes the adjusted PSBR:GDP ratio. Various alternative specifications were tested, several of which included terms in the money supply; these were not successful, however.

The Results

Tables 1 and 2 show the equations estimated by applying the seemingly unrelated regression (SUR) technique to data for 1973 through 1985. As can be seen, the CE and PF results are qualitatively similar. In all equations, union militancy appears to have a significantly positive effect on wage inflation; this is in accordance with the bargaining view of the Phillips relationship.

Of particular interest is the behavior of the coefficients on price inflation expectations and on the unemployment rate. As observed earlier, new classical models imply that $c \sim 1$ and $b \sim 0$. Bargaining theories of the Phillips curve yield more traditional results, though, such that $c < 1$ and $b < 0$. The clear implication of Tables 1 and 2 is that although linear models of the Phillips curve support the new classical hypothesis in most regions, the nonlinear specification yields a downward sloping Phillips curve. Because a linear vertical Phillips curve could be interpreted as a special case of the nonlinear system (that is, where $b = 0$), the log-log model represents the more general specification. The results are consistent with a set of regional Phillips curves that (while steep at high levels of inflation) suddenly become much flatter when inflation is low.

The above observations strongly support the central finding of Sumner and Ward [10]. An important corollary is that the policy impotency results obtained in early new classical studies result from misspecification. A trade-off between wage inflation and unemployment exists, at least at low levels of inflation, and can be exploited by policy makers.

Conclusion

Theory suggests that consistent expectations are far from being incompatible with a downward sloping Phillips curve when competition in the labor market is imperfect. The empirical work reported above confirms this. Estimates have been produced of the Phillips curves of the ten standard regions of Great Britain under the assumptions of consistent expectations and perfect foresight. Although linear specifications support the new classical view of policy impotency, a more general log-log model results in a strong and statistically significant trade-off between inflation and unemployment.

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Table 1
Coefficient Estimates - The Linear Model

Region		a	b	c	d	R²	D-W
North	CE	13.35	-0.60	0.46	0.0013	0.49	1.98
		(2.67)	(3.50)	(1.48)	(6.89)		
	PF	4.40	-0.22	0.91	0.0009	0.75	2.64
		(1.43)	(1.79)	(5.01)	(5.14)		
Yorks & Humberside	CE	9.25	-0.50	0.65	0.0008	0.51	2.02
		(2.09)	(2.93)	(2.18)	(7.89)		
	PF	3.67	-0.19	0.95	0.0004	0.76	2.69
		(1.38)	(1.59)	(5.51)	(3.85)		
East Midlands	CE	5.83	-0.36	0.75	0.0018	0.55	2.04
		(1.29)	(1.58)	(2.56)	(6.55)		
	PF	2.24	-0.16	0.97	0.0011	0.81	2.59
		(0.88)	(1.04)	(6.31)	(5.27)		
East Anglia	CE	-11.66	0.82	1.38	0.0223	0.54	2.36
		(2.39)	(2.81)	(4.71)	(10.65)		
	PF	0.46	0.07	0.96	0.0097	0.71	3.01
		(0.16)	(0.39)	(5.19)	(13.42)		
South East	CE	3.66	-0.14	0.81	0.0025	0.64	2.05
		(1.02)	(0.67)	(3.39)	(10.80)		
	PF	1.96	0.05	0.94	0.0012	0.80	2.83
		(0.90)	(0.35)	(6.29)	(7.30)		
South West	CE	0.27	0.03	0.97	0.0052	0.67	2.07
		(0.07)	(0.15)	(4.08)	(10.79)		
	PF	0.67	0.09	0.97	0.0026	0.79	3.02
		(0.26)	(0.58)	(6.16)	(5.64)		

Table 1 (continued)

Region		a	b	c	d	R^2	D-W
West Midlands	CE	2.32 (0.91)	-0.02 (0.24)	0.71 (4.19)	0.0027 (14.47)	0.74	2.06
	PF	3.86 (2.40)	-0.07 (1.19)	0.70 (6.42)	0.0015 (8.78)	0.84	2.92
North West	CE	3.89 (0.88)	-0.11 (0.64)	0.81 (2.84)	0.0016 (5.24)	0.54	2.17
	PF	1.59 (0.60)	0.01 (0.12)	0.97 (5.58)	0.0007 (4.70)	0.74	2.92
Wales	CE	8.96 (1.74)	-0.43 (2.16)	0.64 (1.98)	0.0011 (4.31)	0.44	2.12
	PF	1.29 (0.42)	-0.05 (0.35)	1.00 (5.32)	0.0008 (3.13)	0.72	3.03
Scotland	CE	3.02 (0.60)	-0.12 (0.56)	0.84 (2.83)	0.0026 (6.67)	0.59	1.96
	PF	1.19 (0.40)	-0.01 (0.99)	1.02 (5.74)	0.0013 (4.37)	0.77	2.56

Note: t-statistics are in parentheses

Table 2
Elasticity Estimates - The Nonlinear Model

Region		a	b	c	d	R²	D-W
North	CE	1.49	-0.47	0.35	0.19	0.62	1.62
		(1.96)	(3.22)	(1.62)	(9.30)		
	PF	1.09	-0.40	0.51	0.17	0.74	2.07
		(2.19)	(4.11)	(3.37)	(13.96)		
Yorks & Humberside	CE	1.54	-0.36	0.41	0.11	0.61	1.78
		(2.48)	(3.19)	(2.04)	(7.19)		
	PF	1.23	-0.30	0.55	0.09	0.74	2.31
		(2.99)	(3.93)	(3.95)	(8.00)		
East Midlands	CE	0.96	-0.22	0.58	0.09	0.64	1.50
		(1.68)	(2.24)	(3.07)	(4.96)		
	PF	0.81	-0.20	0.68	0.07	0.75	1.98
		(2.34)	(3.11)	(5.64)	(6.06)		
East Anglia	CE	-0.60	0.04	0.73	0.27	0.59	2.06
		(0.77)	(0.29)	(3.45)	(6.04)		
	PF	-0.01	-0.06	0.68	0.21	0.70	2.85
		(0.02)	(0.52)	(4.45)	(7.92)		
South East	CE	0.30	-0.10	0.62	0.16	0.69	1.87
		(0.61)	(1.17)	(4.00)	(6.87)		
	PF	0.71	-0.13	0.60	0.11	0.75	2.41
		(1.96)	(2.10)	(4.89)	(5.86)		
South West	CE	-0.09	-0.03	0.75	0.17	0.67	2.04
		(0.14)	(0.23)	(4.21)	(4.43)		
	PF	0.46	-0.10	0.72	0.10	0.74	2.81
		(0.97)	(1.02)	(5.25)		(3.57)	

Table 2 (continued)

Region		a	b	c	d	R^2	D-W
West Midlands	CE	0.16	-0.07	0.49	0.20	0.74	1.64
		(0.37)	(1.20)	(3.90)	(7.65)		
	PF	0.53	-0.10	0.50	0.15	0.80	2.27
		(1.63)	(2.16)	(5.07)	(7.91)		
North West	CE	0.32	-0.12	0.57	0.17	0.62	2.02
		(0.50)	(1.04)	(3.11)	(5.42)		
	PF	0.62	-0.15	0.60	0.13	0.72	2.72
		(1.39)	(1.74)	(4.35)	(5.73)		
Wales	CE	0.83	-0.28	0.50	0.16	0.51	2.04
		(1.07)	(1.94)	(2.25)	(4.86)		
	PF	0.70	-0.26	0.60	0.14	0.66	2.65
		(1.36)	(2.64)	(3.77)	(6.31)		
Scotland	CE	1.20	-0.31	0.44	0.15	0.60	1.49
		(1.62)	(2.23)	(2.18)	(5.62)		
	PF	1.05	-0.27	0.55	0.12	0.71	1.93
		(2.02)	(2.61)	(3.73)	(5.92)		