

THE REAL EFFECTS OF PRICE VARIABILITY IN THE FEDERAL REPUBLIC OF GERMANY, 1953–1977 *

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Using a forty industry data set for the years 1953–1977 for the Federal Republic of Germany evidence is presented on the real effects of price variability. Measuring price variability as the expenditure share weighted sum of squared deviations about the rate of inflation, it is found that increased variability reduces real GDP, hours of work, and production employment, while increasing the unemployment rate. Further, it is found that unanticipated inflation has a positive influence on real variables for six different measures of unanticipated inflation. The six inflation series do not support the natural rate hypothesis in that the effect of the expected inflation rate is not always insignificant.

1. Introduction

In the growing literature on price variability a recent avenue of exploration is the relationship between real economic variables and the unevenness of inflation. In a recent empirical study of the U.S., evidence was presented by Blejer and Leiderman (1980) showing that increased variability in price changes reduced output and increased unemployment. Friedman (1977) anticipated these findings in his Nobel address, arguing that unemployment will increase with the noise in market signals. To the extent that prices are information transmitting signals, an increase in

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their unreliability as such makes them unreliable in the process of input allocation, and makes contracting more difficult and specialization more risky.

In this paper evidence is presented on the real effects of price variability in the Federal Republic of Germany. Included in the menu of real economic variables are gross domestic product, unemployment, hours of work, and production employment. The investigation is for the period 1953–1977. The data covers forty industries, although the classification is not exhaustive of gross domestic product. Hours of work and production employment are included as a result of two observations: First, there is a strong positive relationship between price variability and the rate of inflation [Buck and Gahlen (1982a)]. Second, there appears to be a positive correlation between labor force participation and inflation. Thus a positive relationship between price variability and unemployment might be measuring only the relationship between inflation and unemployment.

Evidence is presented which suggests that price variability affects the real economic variables adversely. Further, to the extent that anticipated inflation is not neutral in its effect on real variables, the natural rate hypothesis does not apply in Germany, although the expectations model used here has been criticized by Amihud (1982) and others.

2. The empirical model

In his seminal article on the output–inflation trade-off Lucas (1973) sketches the elements of the natural rate hypothesis as follows: First, nominal output is determined on the aggregate demand side of the economy. The course of West German economic history over the last three decades suggests that this is not unreasonable. Second, short run supply behavior is dominated by suppliers' lack of inflation on all prices. Thirdly, inferences on unobserved prices are made rationally. From these three assumptions it is inferred that unanticipated inflation should affect real output positively and that anticipated inflation should have no effect.

To test this hypothesis let the price of commodity i in year t be given by P_{it} and define the rate of inflation as

$$DP_t = \sum_{i=1}^{40} w_{it} DP_{it}, \quad (1)$$

where w_{it} is the set of Tornquist expenditure shares constructed from $(w_{it}^* + w_{it-1}^*)/2$ and $DX_t = \ln X_t - \ln X_{t-1}$. Also, define the variance of relative price changes as

$$\sigma_t^2 = \sum_i w_{it} (DP_{it} - DP_t)^2. \quad (2)$$

Because input and output adjustments to price variability may be quite slow, define $SVP1 = \sigma_t^2 + \sigma_{t-1}^2$ and $SVP2 = \sigma_t^2 + \sigma_{t-1}^2 + \sigma_{t-2}^2$ as additional independent variables.^{1,2}

Now estimate the parameters of the following model:

$$Y_t = \beta_0 + \beta_1 t + \beta_2 Y_{t-1} + \beta_3 V(P) + \beta_4 (EDP_t - DP_t) + \beta_5 (EDP) + U_t, \quad (3)$$

where Y_t is one of four real economic variables,³ $V(P)$ is one of the three measures of price variability, EDP_t is the expected rate of inflation and $EDP_t - DP_t$ is the unanticipated rate of inflation. The variable EDP_t was calculated two different ways, AR(1) and AR(2), from each of three different price series (the consumer price index, the wholesale price index, and the average rate of increase of prices in the forty industry sample)⁴ for a total of six inflation series.

A result that emerges consistently from table 1, which reports to the average of coefficients, t -statistics, and Durbin's h from the six regressions corresponding to the expectations series, is that increased price variability affects the real economic variables adversely. Secondly, the output decisions of economic agents are persistently fooled by unantic-

¹ In addition to these definitions of price variability, declining weights were used on the current and lagged values of σ^2 without changing the results presented here [Buck and Gahlen (1982b)]. The use of predetermined equal or declining weights was made necessary by the annual observations and a desire to avoid mining the data.

² The data used in this study were computed from Kregel et al. (various years).

³ GDP is real gross domestic product. The output equations were also estimated using the real output of the forty included industries. This did not alter the results significantly.

⁴ The motivation was as follows: Firstly, price variability and the rate of inflation calculated from the same sample are highly correlated [Buck and Gahlen (1982a)]. Thus it was felt that some multicollinearity could be eliminated by using other inflation series. Secondly, in papers subsequent to the Lucas (1973) essay the common price information is presumed to come from readily available, published sources. The CPI and WPI are more readily available than the price index computed from the sample of forty industries.

Table 1
Price variability and the natural rate hypothesis. ^{a,b}

| Dependent variable | Intercept | Time | Logged dependent variable | <i>VAR</i> | <i>SVP1</i> | <i>SVP2</i> | Unanticipated inflation | Anticipated inflation | R^2 | Durbin's <i>h</i> |
|---------------------------|---------------------|------------------|---------------------------|---------------------|--------------------|--------------------|-------------------------|-----------------------|-------|-------------------|
| <i>GDP</i> | -5077.3 (-4.49) | 2.614 (4.51) | 0.4626 (4.24) | -2928.46 (-4.41) | | | 187.04 (3.86) | 144.74 (0.93) | 0.99 | -2.18 |
| <i>GDP</i> | -77164.9 (-6.53) | 3.688 (6.55) | 0.2483 (2.30) | | -1670.6 (-5.99) | | 153.75 (3.99) | 288.79 (1.68) | 0.99 | -4.25 |
| <i>GDP</i> | -10159.5 (-7.20) | 5.227 (7.21) | -0.0530 (-0.39) | | | -1287.6 (-6.79) | 123.93 (3.69) | 303.66 (1.88) | 0.99 | -1.26 |
| <i>UNEMP</i> ^c | -76.256 (-2.48) | 0.0382 (2.45) | 0.8764 (20.28) | 259.21 (3.67) | | | -8.99 (-1.51) | 30.44 (2.29) | 0.95 | 2.42 |
| <i>UNEMP</i> ^c | -68.98 (-2.15) | 0.0346 (2.11) | 0.8189 (15.93) | | 127.51 (3.84) | | -4.02 (-0.60) | 28.03 (2.37) | 0.95 | 2.26 |
| <i>UNEMP</i> ^c | -57.25 (-1.59) | 0.0287 (1.55) | 0.7606 (10.89) | | | 84.58 (3.34) | -2.135 (-0.15) | 35.13 (2.80) | 0.94 | 2.07 |

| | | | | | | | | |
|--------------|-------------------|-------------------|------------------|---------------------|-------------------|---------------------|------|-------|
| <i>PEMP</i> | 15265.1 (1.09) | -7.143 (-0.99) | 0.8593 (9.95) | -39882.5 (-1.49) | 3026.29 (1.45) | -13514.6 (-1.63) | 0.82 | 0.28 |
| <i>PEMP</i> | 14521.6 (1.01) | -6.54 (-0.87) | 0.7801 (7.75) | -29221.0 (-2.23) | 2274.59 (1.22) | -11027.6 (-1.41) | 0.80 | 0.63 |
| <i>PEMP</i> | 11919.6 (0.79) | -4.97 (-0.62) | 0.7050 (5.65) | -22786.0 (-2.27) | 1557.9 (1.07) | -12014.5 (-1.68) | 0.78 | 0.85 |
| <i>HOURS</i> | 54839.0 (1.84) | -26.23 (-1.71) | 0.7544 (7.02) | -105915 (-1.70) | 5688.7 (1.37) | -32388.0 (-2.02) | 0.78 | -0.10 |
| <i>HOURS</i> | 79549.0 (2.08) | -37.98 (-1.99) | 0.6298 (4.38) | -73521 (-2.21) | 4929.5 (1.15) | -24066.0 (-1.55) | 0.77 | 0.77 |
| <i>HOURS</i> | 86644.0 (1.70) | -41.26 (-1.65) | 0.5783 (3.05) | -50665.0 (-1.53) | 4710.3 (0.96) | -27383.0 (-1.70) | 0.76 | 1.00 |

^a The model parameters were estimated by a Cochrane-Orcutt least squares procedure, adjusted for the presence of a lagged dependent variable (Dhrymes (1981)).

^b The expected rate of inflation is the set of fitted values from AR(1) and AR(2) models fitted to CPI, WPI and a forty industry sample of prices for the period 1950-1977. Unanticipated inflation is the set of residuals.

^c Rather than Durbin's *h* we have reported the Durbin-Watson statistic for the unemployment rate equations.

ipated inflation. The pattern of results for anticipated inflation is not as easily characterized. In the real output equations, when it is significant, anticipated inflation has a positive effect. Anticipated inflation adversely affects employment, whether measured by hours of work, production employment, or the unemployment rate. It is difficult to explain the reversal of effects between output and the other variables.⁵ A partial explanation may be that technological change has allowed West German industry to increase output while substituting away from labor which was becoming more expensive over the entire period.

Also, the parameter estimates of table 1 show that the speed of adjustment of hours of work always exceeds that of employment. This result is consistent with the findings of Nadiri and Rosen (1969).

3. Conclusions

The results of this study of the Federal Republic of Germany are generally in accord with the findings of Blejer and Leiderman (1980) in their study of the real effects of price variability. In addition to output and unemployment, the effect of price variability on hours of work and production employment was also studied. The consistent finding is that price variability adversely affects real output and employment.

Using three different price series, evidence concerning the natural rate hypothesis reveals that in Germany unanticipated inflation increased employment, hours of work, and real GDP. However, the anticipated inflation effect was not as predicted by the natural rate hypothesis. Anticipated inflation appears to increase output but decrease employment. Future research should investigate this outcome, as it is contrary to the U.S. evidence.

References

- Amihud, Y., 1982, Unanticipated inflation and economic activity, *Economics Letters* 9, no. 4, 327-335.
- Blejer, M.J. and L. Leiderman, 1980, On the real effects of inflation and relative price variability: Some empirical evidence, *Review of Economics and Statistics* 62, no. 4.

⁵ A complete set of tables which include the AR(1) and AR(2) constructions for anticipated and unanticipated inflation is available from the authors.

- Buck, A.J. and B. Gahlen, 1982a, Relative price variability and inflation, Mimeo.
- Buck, A.J. and B. Gahlen, 1982b, Der Einfluss der Variabilität relativer Preisänderungen auf die Stagflation, Mimeo.
- Dhrymes, P.J., 1981, Distributed lags (North-Holland, Amsterdam).
- Krengel, R. et al., various years, Produktionsvolumen und -potential, Produktionsfaktoren der Industrie im Gebiet der BRD, Statisches Jahrbuch der BRD (Deutsches Institut für Wirtschaftsforschung, Berlin).
- Friedman, M., 1977, Nobel lecture: Inflation and unemployment, *Journal of Political Economy* 85, no. 2.
- Lucas, R.E., 1973, Some international evidence on output–inflation tradeoffs, *American Economic Review* 63, no. 3.
- Nadiri, I. and S. Rosen, 1969, Interrelated factor demand functions, *American Economic Review* 59.