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A SIMULTANEOUS DYNAMIC EQUATION MODEL FOR WAGES, EARNINGS AND PRICE INFLATION IN THE UNITED KINGDOM, 1949-1970.

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by Antoni Espasa[1]

I must make clear at the outset that I am not a specialist in the subject matter dealt with in this paper. My interest in these models arose whin I was looking for a small economic simultaneous system for which there were data of the order of about 80 observations so that I could estimate the model using spectral methods and compare the results with time domain methods. This will be my next task, meanwhile this paper describes the model I intend to use. For wage and price inflation the model contains 4 equations, one for wage rates, one for earnings, one for prices and one for unemployment.

In the paper the specification of each of these equations is first studied separately: a full information maximum likelihood estimation of the whole system is contained in the last section.

In this procedure I have used OLS in order to obtain a first approximation of the specification of the equations. I then allowed for a general autoregressive process in the errors in the equations and tested this against a more accurate dynamic specification of the equations. Finally I estimated the equations by simultaneous methods. I do not pretend that the paper contains full evidence that the specifications rejected by the OLS analysis will be rejected when more accurate methods of estimation are used. But it is obvious that all the trials using OLS would not have been possible had I always allowed for simultaneity and an auto-regressive process in the errors. It is clear that the research worker is constrained in the early stages of his investigation to the use of cruder methods of analysis in order to discriminate between different specifications for his model in order to make his task feasible.

1. Wage Equations

In order to specify a wage inflation equation I have followed an empirical approach in the sense that I have not worried too much about setting up a particular theory for the demand and supply of labour in order to construct a theoretical

As mentioned above I propose two equations for wage inflation, one for wage rates and one for earnings.

1.1 The Wage-Rate Equation

At the first stage in the investigation, the effect of earnings is ignored and unemployment, real wages and prices are used as explanatory variables.

1.1.1 Unemployment

Using as regressors current and one period lagged unemployment it was observed that their coefficients were similar in magnitude but with opposite sign (see for instance, E1.1).[2] The difference between them was therefore tried as a regressor and turned out to be at this stage a better candidate from the point of view of goodness of fit. It is interesting to note that this is not the case in the earnings equation, where current unemployment is the best candidate and the simultaneous presence of both current and lagged values reduces very much their significance.. This can be interpreted on the lines that unemployment is a short-run factor affecting the bargaining process in the settlement of wage rates, but it is the fact that it is decreasing or increasing that is important and not the level itself. On the other hand, in explaining earnings, what matters is the actual state of the economy and current unemployment enters in the equation reflecting this fact.

1.1.2 Real Wages

The variable used was the one period lag. The rationale for this, as has been explained by Sargan (12), may be that in wage bargaining there are long-term considerations by which workers try to increase money wages if some 'norm on wages' is decreasing. In the present formulation workers push for an increase if the previous real wages are falling. Note that it is not claimed here that real wages appear in the discussions of wage negotiations, but simply that their introduction in the equation takes account of some long-term motivations affecting the settlement.

It was noted that in estimating the linear trend of real wages for the period 1949(i) to 1970(iv) before 1955(i) and after 1965(i) real wages are under-trend. A slope dummy - variable for these under-trend periods was therefore tried, but it was not significant. Also, as an alternative to one lag real wages, the previous maximum real wage was used, but it did not yield a better fit.

point of view.

1.1.6 Vacancies

I tried vacancies as a substitute for unemployment and found that they did not give a better fit and thus I maintain unemployment in the equation. But again here it is interesting to note that the earnings equation behaves differently. In it I found that vacancies improves the fit over unemployment, and also the current level of unemployment is better than the one-term increase. The results can be seen by comparing equations (1), (2) and (3) in Table 4 or equations (4) and (5). In them, vacancies are significant and unemployment is not. From these results it can be seen that for explaining wage rates, unemployment is better than vacancies but for explaining earnings, the latter is better than the former. This is confirmed in other empirical studies, because those who claim that vacancies provide better results (see Department of Employment (3), and Bowers et.al. (2)) use earnings as the dependent variable and those who find that there is no reason to replace unemployment by vacancies (see Parkin ( ), and Summer ( )) use wage rates. This result seems quite sensible and shows that the definition of the dependent variable in this type of model is not an arbitrary choice of the empirical worker.

Here I also took note of the work of Bowers et.al. (2) and tried a dummy trend and a zero-one dummy for 1966 (iv) onwards, but none of them, taken jointly or separately, were significant, even when the zero-one dummy performed better than the other.

1.1.7 Hoarded Labour

Another approach in explaining a Phillips curve relationship for the recent past in the U.K. is due to Taylor ( ). He argues, as many others have done before, that the use of registered unemployment as a proxy for the excess supply of labour is not a good one. He proposes as a proxy the sum of registered unemployment (U_r) and hoarded labour (HL). He constructs the data for the latter series for sixteen industries and uses a weighted average of them in his regressions. Following his suggestion I have introduced hoarded labour in my wage equation. Since there is no _a priori_ reason for U_r and HL to have the same effect, I have tried both regressors separately and also their sum (US) as Taylor did. Table 1 contains my main results which can be summarised as follows :

effect of hoarded labour is justified by the fact that HL has a negative coefficient in the earnings equation.

Taylor ( ) in his article contained in ( ) also finds that US gives "disappointing results" in the equation for money wage rates, but in his equation (of the Lipsey-Parkin type) US has a negative sign.

In view of the above results and some others that are discussed later the use of hoarded labour in the wage equation was discarded. We see also the behaviour of hoarded labour in the earnings equation which is where Taylor ( ) and Godfrey and Taylor ( ) apply it.

1.1.8 Real Earnings

We have seen that neither vacancies nor hoarded labour provides a real improvement of the Phillips curve over wage rates. In this paper one specification is proposed which also contains earnings as one regressor. Unfortunately a direct quarterly series of earnings does not exist. The series used here is of weekly earnings per employee in employment constructed on data from the C.S.O. Appendix A contains details of this series. I have introduced real earnings lagged one period as the new regressor; it improves the fit considerably and makes the increase in prices not significant al all. That shows that an immediate price effect in a Phillips curve is better obtained through real wages and real earnings than by introducing it explicitly. Also it shows that in a Sargan equation for wage rates not only real wages but also real earnings must be present. It can be seen in Table 2 that the one lag in real earnings has a positive effect showing that workers try to pass to the negotiated wages the improvements obtained in earnings in the last period. Obviously they must do this in order to ensure the previous high income on a more stable basis. It can also be seen that the trend now has a negative coefficient which is not surprising in a world where wage rates are trying to catch up on earnings. This equation can explain a wage inflation situation even in periods with increasing unemployment provided that real earnings are increasing more rapidly than real wages. It is an argument in favour of this theory that without any constraint the regression gives the same coefficient but with different signs to real wages and real earnings. This result shows that a Phillips curve must include the long-run factors affecting the bargaining process in addition to other short-run factorssuch as the increase in unemployment.

The first part of Table 2-A also provides a comparison of equation (3) with current increase in earnings with others which instead include its lag or the one lag current increase in wages. None of these are significant if the dummy for trend is included (see equations (1), (2), (7) and (8)) and in any case they do not yield an improvement over specification 3 in Table 2.

Table 3 shows the effects of hoarded labour once we have introduced earnings in the equation and omit the price variable because if included, its t value is around 1. We can see that the effect of the hoarded labour persists as positive, but now there is no improvement at all in the corrected R^2. On the other hand, equation (1) in Table 3 seems to provide a better fit than equation (10) in Table 1.

1.1.9 Strikes

Different authors and in particular Godfrey (5) and Godfrey and Taylor (4) have introduced the number of strikes to explain wage inflation. I have experimented also with its inclusion. The variable that I have used, following the example of Godfrey ( ) based on previous results of Pencavel ( ), is the number of strikes beginning in each term for all industries except coal mining. This series is not directly available but it must be constructed by the research worker going through the data published in the Employment and Productivity Gazette. I include this series in Appendix D. As a matter of fact it will be more interesting to construct this series counting only those strikes due to wage disputes. Unfortunately, the Gazette does not publish enough information to construct such a series in quarterly terms.

The results of putting in strikes can be seen in the second parts of Tables 2 and 2-A. If we introduce the one lag of strikes, the fit improves and the new variable is significant (see equations (9) in both tables). The presence of this new regressor reduces the effect of real wages and earnings showing that their coefficiants were over estimated that collected part of the effects of the stoppages if these were omitted. On the other hand, strikes practically do not affect the unemployment coefficient.

If instead of the one lag we consider the current number of industrial stoppages, this does not affect other variables, does not improve the fit and is not at all, significant mainly in equation (10) of Table 2. If we introduce both the current and one lag number of strikes, equation (11) of Table 2 shows very little improvement over

If we put a dummy in for the intercept, we can see in equation (13) of Table 2 that it is not significant at all.

1.1.11 Forecasting with the Wage Equation

Another way of testing the equation is seeing its performance in forecasting. So I estimated the equation for the period 1951(i) - 1970(iii) and compared the forecast for 1970(iv) with the actual value:

	Equation (9), Table 2	Equation (9), Table 2-A
Actual value	.0368	.0368
Forecast value	.0262	.0309
Forecast error	.0106	.0059
χ^2_1	2.1815	.76078
5% confidence limit	3.841	3.841

So for both equations, the hypothesis of paramter stability is accepted.

1.1.12 Autoregressive Least Squares Estimation

So far I have not taken account in the estimation procedures employed of a possible autoregressive structure in the error process. In order to do that I estimated equations (9) in Tables 2 and 2-A subject to a general six order autoregressive error process using a constrained least squares program due to Dr. David Hendry. In both cases it was found that a third order autoregressive process was sufficient, and higher orders when α_1, α_2, and α_3 are non-zero were rejected. The details of the results are in equations one to six, Table 6. The main conclusions are: Taking account of the autoregressive errors the fit is improved, the residual sum of squares being reduced from 0.0036 to 0.0028. There is almost no effect on the coefficients of the included variables. Only α_1 has a t value lower than 2. Once we consider a more general hypothesis for the disturbances the difference between the equations is reduced significantly.

The appropriate χ^2_3 test for testing the hypothesis that all α's are zero takes the values 19.79 and 13.51, so in each case the hypothesis is rejected.

If we predict the 1970(iv) value with equations (2) and (4) in Table 6 we get the following:

and the results obtained are in E6.8 and E6.9. Applying similar tests as before E6.6 or E6.2 were selected. Now this preferred specification was estimated unconstrained (E6A.2). To do that we need first to omit the redundant variables, so E6A.2 contains 25 regressors. In the table only those with bigger coefficeents are stated because of the limitation of space. A L.R. test of E6.6 against E6A.2 takes the value $\chi^2_{(12)}$ = 13.89 so it seems as if the a.r. scheme is not rejected at 5% level. But this is only apparently because the degrees of freedom are inflated. In fact, in E6A.2, eleven of the new included logs are not significant, and ten of them (those omitted in the table) have very small coefficient. Therefore the real number of d.f. is just one or two and not twelve. I reestimated the equation omitting those regressors and the results are in E6A.3 and E6A.4. Now the $\chi^2_{(1)}$ test of E6.2 against E6A.3 takes the value 5.9285, so E6.2 is rejected in favour of E6A.3.

This last equation E6A.3 was estimated allowing up to a 3rd order a.r. process and in none of the cases the t values for the α's were significant and also the χ^2 tests for the reduction of the RSS, which only decreases to .0024 in the 3rd order case. We can conclude, that with the new specification for the wage equation, we have got rid of the auto-correlation in the errors, and if it was present before it was due to a misspecification of the dynamic aspects of the equation.

We saw before (E6A.1) that four logs in the dependent variable had a significant effect. But if we introduce now this regressor we can see, in E6A.5 and E6A.6, that it is no longer significant, as could be suspected from the previous analysis of the different auto-regressive schemes. Different logs of the increment in earnings have also no practical effect on the fit.

I have carried the discussion in this subsection using as sample period 1950(4) to 1970(3) based on the previous result that, in this case, the prices of imports are not significant. The observation corresponding to 1970(4) has been used to forecast.

1.1.13 Covariance Analysis of the dynamic equation for Wage Rates.

Once again it seems interesting to test if our equation has changed for the most recent part of the sample. Therefore E6A.3 was reestimated for the periods 1950(4) - 1970(4), 1950(4) - 1966(3) and 1966(4) - 1970(4) and a Chow test applied to them gives:

$$S_{oo} = 0.002715$$

$$S_o = 0.002393$$

$$F_{13.53} = \frac{(S_{oo} - S_o)/13}{S_o/53} \simeq 0.55$$

therefore the null hypotheses is not rejected. Table 6B presents the results and also contains the t tests for the difference of the coefficients between subsamples. An estimate for the standard error of the differences was constructed assuming that the estimates for the coefficients were uncorrelated between subsamples.

Also, in order to see if just one or few regressors have a different effect between samples, I constructed slope dummies for the variables showing bigger changes. In all cases the t values for these variables were no significant and, in fact, very low indeed.

The same covariance analysis has been done with E6A.7. The F statistic takes the value 0.71, i.e. the null hypothesis is not rejected. Table 6C collects the estimates of the coefficients and their differences between samples. It can be observed that the values of the coefficients of ΔW_{-1} are significantly different at 5% level, but maybe it is not strange that some of the t values are significant in a regression with fourteen parameters. Nevertheless I have compared the performance of E6C.3 with E6A.7 (reestimated to include also 1970(4)) for the year 1970 and the fitted values for the endogenous variable were as follows:

we get the prices logged three periods, significant with coeffieient .16, so, not far from the implied .20 of E6A.4. But the fit is worse, and I am still keeping E6A.4 as a more interesting specification.

1.1.14 The Expectation Hypothesis

It is quite convincing, on theoretical grounds, the argument that in a Phillips curve or in any model trying to explain the increase in wages, a variable reflecting the expected rate of inflation must be included. When we pass to the empirical world, and try to estimate the model, we need 'a priori' idea on how the expectations are formed. Unfortunately, we do not have it, and in practice the research worker introduces an arbitrary assumption consisting in some sort of distributed logs on prices, or wages.

My approach has consisted in trying to find the dynamic aspects of the wage equation free from any 'a prior' conception. The only thing that remains to be done, is to check that the moving average version of the equation has positive weights. Combining E6A.3 and the equation for earnings treated in the next section, it can be seen that the weights are positive.

1.1.15 Extension of the sample period to 1972(1)

We can see from figure one, how remarkably difficult it would be to forecast the period 1971(1) to 1972(1), because the big peaks of 1970 have been followed by higher inflation rate for 1971(1), and 1971(4) and 1972(1) still have ones of the highest values of the sample. There is no doubt that 1971(1) - 72(1) form a particular set of observations that are very much affected by political factors whose prediction will not be necessarily good, this maybe the reason why an expirienced center as the London Graduate Shool of Business Studies has produced its last forecast of the U.K. Ecomony, taking the increment in wages as exogenous. Nevertheless,

	Observed Values	Estimated
1971(1)	.0398	.0330
(2)	.0203	.0246
(3)	.0250	.0211
(4)	.0331	.0297
1972(1)	.0333	.0222

From then we can see that the equation has been able to pick up quite high values for 1971(1) and 1971(4).

As I did before with other equations, a covariance analysis of E6A.10 has been done. The F test takes the value .53 and the corresponding value in the table is 1.88 (at 5% confidence level). The detail of the results are in table 6D. There it can be observed that the change in the first lag of the endogenous variable is not significant at 5% level as it was in table 6C.

I have tried a similar variable as T1SQ but starting in 1949(2), 1963(1) or 1966(4) and in all cases T1SQ was preferred to the others.

The equation E6A.10 has been estimated using 'constructed' variables as those denominated as real wages and real earnings in which the wages and earnings have been deflated by the consumer price index. On statistical grounds this is not very orthodox and we must test if a free fit support these constrained variables. The results are in table 6E, where E6E.1 is E6A.10 re-estimated using revised data for prices. Comparing E6E.1 and E6E.2 the $\bar{R}^2$ and σ are more favourable in the former equation and a $\chi^2(2)$ test reveals that the reduction in the RSS experimented in E6E.2 is not significant at all ($\chi^2(2) = .66$). Comparing the estimated parameters, the implied values for the free regressors from E6E.1 are very much the same than the values estimated by E6E.2, concluding that the restrictions on the 'constructed' regressors of E6E.1 are valid. If in E6E.2 we run the regression with W_t as dependent variable the estimates obtained are the same that those in E6E.2 except for W_{-1} for which we obtain .81(t=6.54), the RSS and σ are the same and the new R^2, for those worried with obtaining big

1.2 Earnings Equation

The specification of an equation to explain average weekly earnings per employee in employment is now considered. First, however, it must be notėd that this new variable contains a high seasonal component which explains in part at least,. why quarterly data produce better R^2 for earnings than for wage rates.

The dummies which appeared significant in the previous equation no longer are so. Also the increase in retail prices is not significant in the earnings equation, as can be seen in lines (1), (2) and (3) of Table 4. As was said above, vacancies perfom better than unemployment and the current level better than the first increment.

For this equation we have strong a priori reasons for including the current increase in wages as an explanatory variable. Its inclusion improves the fit considerably and makes the one lag real wages more significant, and if in order to avoid simultaneous equation bias, the equation is estimated by instrumental variables the current increase in wages still remains significant.

At this stage two alternative specifications reveal themselves as interesting. The first, which I prefer, is the equation containing a trend, real wages, and earnings and current increase in wages; the second is without trend and with the dependent variable lagged one period and increase in wages. In this equation we can see in E4.8, 9 and 10 that the lagged real earnings has a positive effect but this is so because the trend in the dependent variable is not peaked up by any other regressor, so once we include as explanatory variables one dummy trend as T or T_1 or some economic variable with some trend in it, at least from the sixties onwards as stoppages, the one lag in real earnings has a negative effect. But in this equation all variables except current increase in wages and one lag increase in earnings tend to be not significant at all (E4.19) and in a full information maximum likelihood only the lagged dependent variable is significant.[5/] So it seems to me that the evidence is in favour of the first specification.

By introducing the number of strikes in the equation, the fit improves, but an instrumental variable estimation for the number of strikes shows that its current level is not significant at the 5% level. It seems to me not very orthodox to include

From these results I arrived at the conclusion that for the equations I am working with hoarded labour does not lead to any improvement. Also from the results in the previous equation I would not use hoarded labour as an explanatory variable for earnings without constructing a simultaneous system that also explains its behaviour.

I must make clear that the dependent variable that I use for earnings differs from that used by Taylor in several respects. He uses bi-annual data from the Ministry of Labour Gazette and I use quarterly data based on C.S.O. series on national wages and salaries. And he explains the hourly increase in earnings corrected for overtime whereas I try to explain weekly increase in earnings.

1.2.1 Forecasting with the Earnings Equation

The equation (27) in Table 4 has been estimated for the period 1951(i) to 1970(iii) and used to forecast the 1970(iv) observation. The result was:

Actual value	0.0590
forecast value	0.0494
forecast error	0.0096
χ^2_1	0.99
5% confidence limit	3.841

The stability parameter hypothesis is not, therefore, rejected.

1.2.2 Autoregressive Least Squares Estimation

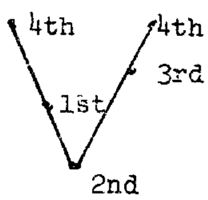
I have now estimated the equation assuming a general autoregressive error structure allowing in the estimation for a sixth order process. Assymptotic ^{2} test of the hypotheses that $\alpha_4 = 0$,{ $\alpha_4 = 0$ and $\alpha_5 = 0$ } and { $\alpha_4 = 0$, $\alpha_5 = 0$ and $\alpha_6 = 0$ } when α_1, α_2 and α_3 are not zero did not reject the hypotheses and so a 3rd order autoregressive process seemed sufficient. The results of this estimation are given in E7.2. It is clear that the autoregressive structure is important: it reduces the RSS from 0.0065 to 0.0045, it also has a great effect on the coefficients for real wages and earnings, which under the hypothesis of a white noise error structure are highly overestimated. The $\chi^2(3)$ test for the hypothesis that all α's are zero takes the value 28.98 and so is rejected.

least I have not been able to identify it, for the wage equation. Also note that in E7A.7 the trend for the overall period is no longer significant.

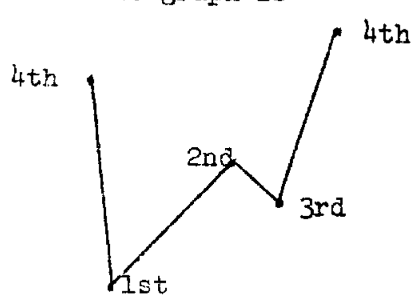
Looking at table 7-A we can see that more interesting than testing equation 5 or 1 against 7, is forming an equation which includes lags up to 4th order and testing it against equations 1,5 or 7. This has been done in equations 8 to 11 and in all cases the RSS was 0.0031. In them we have unnecessary regressors and we need to pick up those that most affect the fit. To do this I tried more than 200 combinations of lags and the variables ΔW_{-2}, RW_{-4}, RE_{-4}, ΔW_{-4}, ΔE_{-4}, RW_{-5}, RE_{-5}, SP_{-4} and SP_{-5} were the most likely candidates. After these trials I would be in favour of equation 1 and 2 of table 7-B. It must be said that if both RW_{-4} and RE_{-4} are used as regressors neither are significant. And comparing them with equations 5 or 7 in table 7-A the statistical evidence is in favour of the former. In these trials the level and first difference in unemployment and their lags were also used but none of them proved significant. Nevertheless it was observed that the unemployment level performs better than the first difference.

1.2.3 A Changing Pattern of the Seasonal Component

The fact that four lags on the dependent variable is significant suggests that there is perhaps a change in the seasonal behaviour of the increase in earnings. Simply looking at the plot of the series (Figure 2) we see that in the 1st part of the sample (nineteen fifties) the quarters graph is as follows



but during the sixties the graph is



explain 79% of the variation in ΔE. If we used desseasonalized data (i.e. the residuals from the regressions of each variable on the seven dummies C plus Q's) as in E7C.6 and E7C.7 we see that the regression explains 61% of the variation of the dependent variable and that the strike regressors are also significant.

This extended set of seasonal dummies was also tried in the equation for wage rates but here the improvement in the fit was neglegible. Therefore once again we see how different are the wages rates and earnings series.

1.2.4 The Price Effect

The fact that one of the variables four lags in real earnings or four lags in real wage rates is significant, but not both, suggests that they are perhaps acting for some price effect. To test this in E7B.5, I have omitted the RE_{-4} and have included the first, second, third and fourth lag of the price variable. The characteristics of the fit are pretty much the same as before, and on the price variables P_{-4} is significant with a negative effedt and P_{-3} is near significant with a positive coefficient. Running this regression with ΔP, $(\Delta P)_{-1}$, $(\Delta P)_{-2}$ and $(\Delta P)_{-3}$ the results are much the same and only $(\Delta P)_{-3}$ is significant with coefficient 0.17. Note that the current increase in prices is not significant at all; certainly this is not surprising here because the current increase in wages is one of the already included regressors. But this result perhaps suggests that when trying to explain earnings it is better to use current increase in wage rates than the current or first lags on prices. Certainly there are good a priori reasons for including the wage rates and since we have data on it, my suggestion would be not to omit it as so often empirical workers do.

Going back to E7B.5, the results there suggest that what happens to prices one year before (P_{-4}) is important - note that ΔW_{-4} does not make P_{-4} unsignificant - but it must be compared with some more recent prices. I have chosen P_{-3}

2. Price Equation

To explain the current increase in the index of retail prices I have used the prices of imports and wages or earnings, all deflated by the retail prices. I have included also two trends, one starting in 1949(T) and the other in 1959(T1). Table 8 shows that earnings are more interesting than wages, so I have chosen them.

In E8.1 we use deflated regressors, constraining P_{-1} to have a coefficient equal to the sum of the coefficients of price of imports and earnings, but with opposite sign. To see if that constraint is legitimate on statistical grounds I have run E8.1 free, i.e., using PM_{-1}, E_{-1} and P_{-1}. The results were that the constraint on the coefficients was satisfied and the likelihood ratio test for the reduction of RSS was not significant at 5% level ($X^2_{(1)} = 1.6039$). Therefore E8.1 can be accepted.

So far the series that I am using for earnings does not include the amount paid for the employers to the National Insurance, etc. Constructing a new series for earnings that includes the employers contribution (E*) it was observed that it yields a better fit and that with it the T1 trend was no longer significant (E8.5 6 and 7).

In that equation I have used also a productivity variable (GDP deflated by time or by the number of employees in employment) but this variable was never significant when running the regression with a trend. Without the trend the fit was worse. Therefore, confirming previous results of Sargan (   ), the productivity effect in prices seems will be captured by a negative trend.

The variable that I am using for prices is the consumer's price index. The National Institute of Economic and Social Research has proposed to forecast this index as the following equation:

2.3 $$P_t = \underset{(.31)}{.06} \; \underset{(4.06)}{-.003T} \; \underset{(.70)}{-.002\,Q1} + \underset{(.003)}{.007Q2} + \underset{(.002)}{.008\,Q3} + \underset{(.07)}{.48}\,E^*_{-1}$$

$$+ \underset{(.07)}{.42}\,P_{t-1} + \underset{(.015)}{.08}\,PM_{-1} \qquad \begin{aligned} R &= .9983 \\ DW &= 2.12 \\ RSS &= .004839 \\ \sigma &= .007980 \end{aligned}$$

and we can see that the fit in (2.3) is better than (2.2) and also that the constraints imposed in the definition of the variables in E8.6 are satisfied by the results of (2.3) and the standard error of the estimation is lower for E8.6.

I have tried to use the indirect taxes as another regressor, but I have not been able to identify its effect with a sensible coefficient. In that respect it appears that it would be preferable to correct the endogenous variable for indirect taxes, as it has been done by the National Institute.

In the equation E8.6 or 7 I have used ΔW or ΔE as additional regressors but they were not significant and also other lags on real earnings, prices, or prices of imports. We will see in Section IV that the situation is different when we allowed for a simultaneous estimation.

that relation under an autoregressive process in the disturbances, that process in all the cases considered (from the first to the fifth order) was never significant. In fact, the values for α's were never greater than 0.1 and with very low t values (never greater than 0.7) and the X^2 tests were also very low indeed. This relation was also estimated with only one of the DN variables, the fit was worse and the DN variables as in E10.6 were not significant. This result and the fact that when we include both DN and DN_{-1} they have coefficients that are not statistically different in absolute value suggests that it is better to substitute both variables by one dummy with zero value in all the observations except for 1966(4); in the article this variable has been denominated by D664. The use of D664 implies that, at that particular quarter, the increment in unemployment was for some social and political reasons that cannot be included into the model, was unreasonably high, and we just add a positive factor to the mean for that observation.

I try to identify the effect of ΔW or ΔE in unemployment but without success. We will see that by simultaneous method of estimation, some wage effect is present in the equation for ΔU.

been used, but it is not significant at all in the price equation of the S.F. or of the U.R.F.

The forecasting performance of the model has been investigated by estimating it for the period 1950(4) - 1969(4) and using the results to predict 1970. It must be said that the values obtained for the parameters in this case do not idffer significantly from those presented in Table 11, but now the t value for ΔW in the unemployment equation is 1.08. From the figures showed in Table 12 can be seen that the prediction with the unrestricted reduced form is not satisfactory, and only the one period forecast past the $X^2_{(4)}$ test for stability. On the contrary, when we predict using the restricted model, the forecasts are much more accurate and the null hypothesis of post-sample stability is not rejected in the $X^2_{(4)}$ tests for individual quarters or in the $X^2_{(16)}$ test for the whole prediction period. The correlations of the forecasts errors of the different equations have also been reduced comparatively with those obtained from the U.R.F. All this is another argument in favour of the imposed zero restrictions.

The correlation between the observed and predicted values of the dependent variables over the sample period 1959(4)-69(4) is as follows:

	ΔW	ΔE	ΔP	ΔU
U.R.F.	0.831	0.950	0.881	0.926
Restricted Model	0.792	0.932	0.853	0.900

The correlation matrices of the residuals of the U.R.F. and R.R.F. corresponding to the system in Table 11 are:

U.R.F. correlation matrix of residuals:

ΔW	1.0			
ΔE	0.45	1.0		
ΔP	0.12	0.03	1.0	
ΔU	-0.08	0.08	0.17	1.0

CONCLUSIONS

We can derive some conclusions from this study. First, the dynamic elements in a model for wages and prices inflation plays an important role, and it can include lags up to the fifth order. Second, in explaining wage rates using a Sargan type equation, the inclusion of real earnings seems very fruitful and reflects the phenomenon that once the workers get a high income they try to insure it in the next collective negotiation of the wage rates. If that is so, it seems to me that the way to deal with it is to provide a workers participation in the management of the economy at the national and firm levels.

Third, the inclusion of earnings in the system has been revealed as more promising than the correction of unemployment as the hoarded labour hypothesis of J. Taylor. On the other hand, it is difficult to justify the omission of a simultaneous treatment of wages and earnings at least when we try to explain the latter.* Also it has been proved very wrong the implicit assumption in some applied works that to take a measure of the labour costs we choose between wages or earnings. It is not a matter of choise (both variables have a quite different behaviour) but a question to include both in the analysis. The experience obtained along this study points out that a rational distributed lag between wages and earnings

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* In fact a rational distributed lag on wage rates explains most of the variation in the level of earnings, and the regression $(1. -.25L -.22L^2 + .23L^5)E = (.7 - .26L^2 + .22L^3 - .14L^4 + .39L^5)W - .18L^4P + (.006L^1 + .012L^5)ST$ + trend and seasonals. has an $R^2 = .9997$

APPENDIX C

The data is quarterly from 1949(01) to 1970(04). All variables except real GDP are expressed in index numbers based on average 1948 = 100. All variables except dummies enter the equation in logs.

If X_t is a variable in the system,

$\Delta X = X_t - X_{t-1}$ and

$\Delta X_{-1} = X_{t-1} - X_{t-2}$.

W_t - official wage-rate index

E_t - weekly earnings per week per employee in employment (See Appendix A)

$TW_t = W_t - p_t$ - real wage rates

$RE_t = E_t - p_t$ - real weekly earnings

p_t - consumers' price deflator

PM_t - official import price index

Y_t - real GDP (see Appendix B)

U_t percentage unemployment

HL_t - percentage estimated of hoarded labour. I am indebted to Mr. Jim Taylor of Lancaster University for this series.

$US_t = U_t + HL_t$

SP_t - number of industrial stoppages in all industries except coal mining (See Appendix D)

V_t - number of total notified vacancies

<u>Dummy variables:</u>

T_t - trend 1949(02) = 1, ..., 1970(04) = 87

$T1_t$ - trend starting in 1959(01)

Q_{it} - seasonal dummy for the i-th quarter

$DUSU_t$ = 1 for 1956(02) to 1959(02)

= 0 otherwise

QiA = one for the i-th quarter during the period 1949(1) - 1958(4)
= Zero otherwise

QiB = one for the i-th quarter during the period 1959(1) - 1970(4)
= Zero otherwise.

Footnotes

1. I am very grateful to Professor Sargan for his advice and encouragement during the preparation of this paper; without which it would not have been possible. But I, of course, take full responsibility for any errors it contains. I gratefully acknowledge financial support from the Fundació Jaume Bofill and Fundaciõu Juan March.

2. The equations in the tables are mentioned in the paper as E x.y, where x stands for the number of the table and y the number of the equation. So E2.1 refers to table two, first equation.

3. I am also grateful to Mr. J. Taylor for providing me with his estimates for hoarded labour 1953(i) to 1970(iv) and for letting me know of his work when it was still unpublished.

4. In a recent work, by Godfrey and Taylor, they used hoarded labour and unemployment separately.

5. On the other hand, if we introduce also the linear trend T and real wages lagged one period in equation (19), Table 4, then ΔE_{-1} is significant on an OLS estimation and improves the fit with respect to equaticn (27) in the same table. But using a third order autoregressive process ΔE_{-1} is no longer significant and E4.27 performs better than E4.19. Also with this inclusion of T and RW_{-1} in equation (19) a FIML estimation makes ΔE_{-1} no longer significant.

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TABLE 1

Dependent Variable ΔW (See appendix C for description of the variables)

N.E.	SP	$\bar{R}^2$	DW	σ	C	T	Q1	DUSU	RW-1	ΔP	U	U-1	ΔU	HL	HL-1	ΔHL	US	US-1	ΔUS
1	5302-70	.216	1.43	.00815	.027 (1.26)	.0007 (3.67)	.004 (1.38)	.005 (1.84)	-.175 (3.18)	.23 (2.94)	-.023 (2.18)	.018 (1.79)							
2	"	.217	1.42	.00814	.006 (1.95)	.0007 (3.55)	.003 (1.19)	.005 (1.72)	-.176 (3.21)	.24 (3.12)			-.020 (1.99)						
3	"	.192	1.47	.00827	.026 (1.84)	.0006 (3.21)	.002 (.94)	+.005 (1.71)	-.156 (2.77)	.20 (2.57)				.0018 (.41)	-.006 (1.38)				
4	"	.192	1.46	.00827	.034 (191)	.0006 (3.32)	.003 (1.07)	.005 (1.77)	-.156 (2.78)	.20 (2.53)							.0003 (.06)	-.007 (1.13)	
5	"	.217	1.48	.00814	.02 (.82)	.0007 (3.45)	.003 (1.05)	.006 (1.95)	-.171 (3.06)	.23 (2.85)	-.024 (1.96)	.022 (1.91)		.005 (1.14)	-.007 (1.45)				
6	"	.178	1.43	.00834	.006 (1.73)	.0006 (3.22)	.002 (.87)	.003 (1.16)	-.165 (2.94)	.22 (2.80)						.0039 (.90)			
7	"	.172	1.43	.00837	.006 (1.70)	.0006 (3.20)	.002 (.90)	+.003 (1.13)	-.166 (2.94)	.22 (2.82)									.0036 (.62)
8	"	.228	1.48	.00809	.016 (.71)	.0007 (3.58)	.003 (1.08)	.005 (1.93)	-.175 (3.19)	.23 (2.99)	-.026 (2.45)	.024 (2.20)				.0066 (1.39)			
9	"	.229	1.49	.00808	.015 (1.02)	.0007 (3.54)	.003 (1.03)	.006 (1.97)	-.170 (3.08)	.23 (2.91)			-.023 (1.99)	.006 (1.24)	-.007 (1.73)				
10	"	.238	1.49	.00803	.007 (2.11)	.007 (3.62)	.003 (1.02)	.005 (1.91)	-.175 (3.22)	.23 (3.11)			-.026 (2.43)			.0073 (1.65)			

Q2 and Q3 omitted in order to have the table on one sheet

TABLE 2

Dependent Variable ΔW (See appendix C for the description of variables)

N.E.	SP	R^2	$\bar{R}^2$	DW	σ	RSS	C	T	Q1	Q2	Q3	DUSU	DUMY
1	49-70	.25	.21	1.48	.0088	.0061	.009 (2.94)	.0007 (3.66)	.006 (2.37)	-.003 (.84)	-.003 (1.13)	.002 (.90)	-.010 (2.43)
2	"	.38	.31	1.59	.0083	.0052	.008 (2.94)	.0008 (4.53)	.002 (1.08)	-.007 (2.09)	-.006 (2.18)	.005 (1.78)	-.008 (2.22)
3	"	.46	.39	1.77	.0077	.0046	.016 (5.17)	-.0009 (2.55)	-.001 (.51)	-.007 (2.24)	-.003 (1.31)	.007 (2.58)	-.016 (4.13)
4	"	.44	.37	1.76	.0079	.0048	.004 (1.19)	-.0005 (1.33)	-.0006 (.21)	-.008 (2.42)	-.005 (1.80)	.007 (2.35)	
5	"	.46	.39	1.76	.0077	.0046	.014 (4.48)	-.0006 (1.40)	-.001 (.50)	-.008 (2.42)	-.004 (1.58)	.007 (2.62)	-.015 (3.58)
6	"	.46	.39	1.79	.0077	.0046	.012 (2.22)	-.0008 (2.07)	-.001 (.47)	-.008 (2.31)	-.004 (1.44)	.007 (2.46)	-.012 (1.88)
7	"	.46	.39	1.76	.0077	.0046	.03 (1.65)	-.0008 (2.20)	-.0008 (.28)	-.007 (2.09)	-.004 (1.34)	.008 (2.61)	-.015 (3.87)
8	"	.43	.35	1.70	.0080	.0048	.006 (2.11)	.0007 (4.37)	-.0003 (.09)	-.005 (1.45)	-.005 (1.49)	.005 (1.85)	-.007 (1.57)
9	"	.54	.48	1.85	.0071	.0038	-.047 (2.81)	-.0009 (2.49)	.0016 (.51)	-.0098 (3.13)	-.0056 (2.19)	.009 (3.21)	-.018 (4.77)
10	"	.46	.38	1.77	.0078	.0045	.008 (.52)	-.001 (2.67)	-.002 (.67)	-.007 (2.20)	-.003 (1.31)	.008 (2.60)	-.015 (3.70)
11	"	.57	.51	1.88	.0070	.0036	-.034 (1.91)	-.0007 (2.18)	.004 (1.43)	-.010 (3.43)	-.006 (2.58)	.008 (3.08)	-.018 (4.77)
12	"	.56	.50	1.90	.0071		-.03 (1.07)	-.0007 (1.70)	.005 (.82)	-.013 (2.72)	-.008 (2.05)	.009 (3.19)	-.019 (5.00)
13	"	.55	.48	1.88	.0072		-.047 (2.79)	-.0006 (2.30)	.002 (.70)	-.01 (3.15)	-.006 (2.15)	.008 (3.07)	-.02 (5.11)

N.E.	RW-1	RE-1	ΔUr	Ur	Ur-1	ΔP	$\left(\frac{PM}{P}\right)_{-1}$	SP-1	ΔE-1	SP	DN	ME
1	-.18 (3.83)		.013 (1.49)									
2	-.21 (4.70)		-.018 (2.09)			.24 (3.60)						
3	-.32 (6.51)	.32 (5.07)	-.017 (2.09)									
4	-.23 (4.18)	.23 (3.80)	-.018 (2.15)				.045 (3.70)					
5	-.32 (6.09)	.27 (3.45)	-.018 (2.19)			.080 (1.01)						
6	-.30 (4.57)	.30 (4.29)	-.017 (2.11)				.016 (.83)					
7	-.33 (6.52)	.31 (4.87)		-.018 (2.22)	.015 (1.84)							
8	-.20 (4.56)		-.020 (2.30)			.19 (2.77)			.19 (2.79)			
9	-.24 (4.63)	.21 (3.07)	-.018 (2.38)					.016 (3.84)				
10	-.32 (6.02)	.32 (4.75)	-.017 (2.00)							.002 (.47)		
11	-.25 (4.82)	.20 (3.11)	-.021 (2.81)					.022 (4.45)		-.0098 (2.16)		
12	-.25 (4.72)	.20 (3.03)	-.032 (1.91)					.022 (1.75)		-.0098 (.52)		IV (ΔUr, SP)
13	-.23 (3.75)	.19 (2.83)	-.018 (2.36)					.016 (3.80)			.0007 (.19)	OLS

TABLE II-A

Dependent Variable ΔW (see Appendix C for the description of variables).

No Eq	M.E.	S.P.	R^2	$\bar{R}^2$	RSS	σ	D.W.	C	T	Q1	Q2	Q3	DUSU	DUMY	RW-1	RE-1	ΔE	ΔE-1	ΔW-1	ΔUr	Ur	Ur-1	$\left(\frac{PM}{P}\right)_{-1}$	SP-1	SP
1	OLS	49-70	.45	.38	.0046	.0078	1.74	.015 (3.82)	-.0009 (1.82)	-.002 (.61)	-.007 (1.91)	-.003 (1.23)	.007 (2.45)	-.015 (3.14)	-.32 (5.33)	.32 (3.36)		.018 (.19)		-.017 (2.09)					
2	"	"	.46	.39	.0045	.0077	1.84	.015 (4.40)	-.0009 (2.38)	-.001 (.46)	-.008 (2.33)	-.004 (1.41)	.007 (2.41)	-.013 (3.21)	-.31 (5.95)	.31 (4.59)			.10 (1.04)	-.017 (2.13)					
3	"	"	.58	.53	.0035	.0068	1.96	.008 (2.51)	-.001 (4.13)	.006 (1.92)	.001 (.33)	.003 (1.06)	.008 (3.25)	-.014 (4.29)	-.31 (6.96)	.37 (6.58)	.27 (4.77)			-.014 (1.96)					
4	TSLS (ΔE)	"	.58	.53	.0035	.0068	1.96	.008 (1.69)	-.001 (3.55)	.006 (1.33)	.001 (.23)	.003 (.74)	.008 (3.22)	-.015 (4.24)	-.31 (6.85)	.37 (6.08)	.28 (2.07)			-.014 (1.93)					
5	OLS	"	.58	.52	.0035	.0068	1.95	.008 (1.81)	-.001 (3.83)	.005 (1.92)	.001 (.37)	.003 (1.07)	.008 (3.23)	-.016 (2.78)	-.32 (5.55)	.37 (5.95)	.28 (4.65)			-.014 (1.93)			-.004 (.23)		
6	"	"	.58	.52	.0035	.0069	1.96	.010 (.60)	-.001 (3.83)	.006 (1.90)	.001 (.33)	.003 (1.03)	.008 (3.23)	-.015 (4.16)	-.31 (5.91)	.37 (6.39)	.28 (4.66)				.014 (1.90)	.014 (1.87)			
7	"	"	.43	.36	.0048	.0079	1.70	.010 (3.74)		.00009 (.03)	-.004 (1.25)	-.003 (.94)	.006 (2.10)	-.001 (2.55)	-.27 (4.97)	.15 (4.81)		.013 (1.90)		-.018 (2.11)					
8	"	"	.42	.35	.0048	.0080	1.78	.010 (3.62)		.003 (1.06)	-.007 (1.92)	-.004 (1.49)	.006 (2.12)	-.001 (2.57)	-.29 (5.43)	.16 (5.34)			.15 (1.54)	-.018 (2.08)					
9	"	"	.62	.56	.0033	.0066	1.98	-.032 (1.98)	-.001 (3.63)	.006 (2.26)	-.002 (.61)	.0003 (.13)	.009 (3.58)	-.017 (4.97)	-.26 (5.31)	.28 (4.29)	.22 (3.71)			-.015 (2.18)				.010 (2.52)	
10	"	"	.60	.54	.0034	.0068	1.84	.031 (2.08)	-.001 (4.29)	.007 (2.39)	.0025 (.72)	.004 (1.35)	.008 (3.08)	-.013 (3.83)	-.33 (7.17)	.41 (6.73)	.32 (5.05)			-.016 (2.16)					-.006 (1.58)
11	"	"	.68	.62	.0028	.0061	2.008	-.007 (.43)	-.001 (3.69)	-.011 (3.87)	-.001 (.43)	.0003 (.12)	.008 (3.55)	-.016 (4.94)	-.27 (5.95)	.30 (4.92)	.28 (4.80)			-.020 (2.95)				.018 (4.20)	-.015 (3.65)

TABLE 3

Dependent variables ΔW (See appendix C for description of the variables)

N.E.	SP	R^2	R^{-2}	DW	σ	C	T	Q1	Q2	Q3	DUSU	RW-1	RE-1	ΔU	ΔHL	ΔUS	ΔP	ΔE	SP-1
1	53-70	.47	.406	1.68	.00709	.019 (4.95)	-.001 (3.80)	-.003 (.94)	-.006 (1.81)	-.004 (1.40)	.008 (2.92)	-.37 (5.92)	.43 (5.71)	-.022 (2.46)					
2	"	.48	.408	1.70	.00708	.019 (4.92)	-.001 (3.59)	-.003 (.95)	-.007 (2.02)	-.004 (1.64)	.008 (2.99)	-.36 (5.76)	.41 (5.46)	-.025 (2.67)	.0042 (1.07)				
3	"	.48	.407	1.66	.00709	.018 (4.63)	-.001 (2.73)	-.003 (1.00)	-.007 (1.98)	-.004 (1.65)	.008 (2.97)	-.36 (5.76)	.39 (4.56)	-.022 (2.52)			.078 (1.01)		
4	"	.49	.409	1.67	.00708	.018 (4.59)	-.001 (2.52)	-.003 (1.03)	-.008 (2.20)	-.006 (1.90)	.008 (3.04)	-.35 (5.59)	.37 (4.32)	-.026 (2.75)	.0044 (1.12)		.08 (1.07)		
5	"	.58	.527	1.83	.00633	.013 (3.52)	-.002 (5.08)	.004 (1.32)	.0002 (.05)	.002 (.76)	.008 (3.66)	-.38 (6.90)	.48 (7.06)	-.020 (2.50)				.26 (4.10)	
6	"	.59	.520	1.83	.00637	.013 (3.43)	-.001 (4.05)	.004 (1.24)	-.0001 (.04)	.002 (.57)	.009 (3.64)	-.38 (6.74)	.47 (5.91)	-.020 (2.51)			.025 (.36)	.26 (3.93)	
7	"	.60	.530	1.82	.00631	.013 (3.50)	-.002 (4.86)	.004 (1.31)	-.0007 (.21)	.001 (.46)	.009 (3.74)	-.38 (6.73)	.47 (6.80)	-.023 (2.76)	.0042 (1.21)			.26 (4.12)	
8	"	.60	.524	1.82	.00635	.013 (3.39)	-.002 (3.83)	.004 (1.22)	-.001 (.31)	.0008 (.27)	.009 (3.73)	-.37 (6.57)	.45 (5.65)	-.023 (2.77)	.0043 (1.22)		.029 (.42)	.26 (3.93)	
9	"	.54	.478	1.84	.00665	.012 (3.02)	-.002 (4.73)	.004 (1.22)	.006 (2.15)	.005 (2.05)	.007 (2.90)	-.37 (6.29)	.47 (6.45)			.00004 (.01)		.27 (4.05)	
10	"	.53	.46	1.76	.00673	-.03 (1.68)	-.001 (3.36)	-.0001 (.03)	-.008 (2.31)	-.005 (1.73)	.009 (3.32)	-.32 (5.09)	.32 (3.97)	-.020 (2.33)					.013 (2.78)
11	"	.54	.46	1.76	.00677	-.03 (1.53)	-.001 (3.25)	-.0002 (.08)	-.008 (2.36)	-.005 (1.80)	.009 (3.33)	-.32 (5.03)	.32 (3.91)	-.022 (2.36)	.002 (.54)				.012 (2.59)

TABLE 4

Dependent Variable ΔE (See appendix C for description of the variables)

N.E.	SP	R^2	$\bar{R}^2$	DW	σ	C	T	Q1	Q2	Q3	DUSU	ΔP	Ur	V	ΔV	RE-1	RW-1	ΔW	ΔE-1	SP
1	49-70	.56	.51	2.04	.0127	.068 (2.30)	.002 (2.84)	-.024 (5.10)	-.028 (6.81)	-.024 (5.90)	-.005 (1.23)	.129 (1.05)	-.009 (1.38)			-.28 (2.71)				
2	"	.58	.53	2.08	.0125	-.17 (1.93)	.002 (2.96)	-.025 (5.42)	-.030 (7.22)	-.025 (6.23)	-.001 (.27)	.101 (.84)		.016 (2.25)		-.28 (2.83)				
3	"	.56	.51	2.02	.0127	.031 (5.76)	.002 (2.70)	-.030 (5.71)	-.036 (5.20)	-.027 (5.49)	-.004 (.92)	.146 (1.19)			.024 (1.39)	-.27 (2.64)				
4	"	.56	.51	2.16	.0128	.07 (2.43)	.0016 (2.59)	-.025 (5.08)	-.028 (6.77)	-.023 (5.80)	-.003 (.73)		-.0098 (1.47)			-.18 (1.70)	-.066 (.81)			
5.	"	.57	.53	2.12	.0126	-.18 (1.93)	.002 (2.86)	-.025 (5.23)	-.029 (7.18)	-.024 (6.14)	-.001 (.23)			.017 (2.25)		-.23 (2.18)	-.012 (.15)			
6	"	.64	.60	2.51	.0115	-.14 (1.94)	.002 (3.45)	-.026 (6.20)	-.028 (7.65)	-.023 (6.34)				.013 (2.23)		-.26 (3.3)		.50 (3.75)		
7	"	.65	.61	2.39	.0114	-.19 (2.36)	.002 (3.73)	-.025 (5.83)	-.028 (7.73)	-.023 (6.51)				.017 (2.63)		-.35 (3.57)	.11 (1.49)	.59 (4.05)		
8	"	.66	.63	2.32	.0111	-.12 (1.68)		-.026 (6.77)	-.036 (9185)	-.027 (7.39)				.012 (2.13)		.014 (1.96)		.69 (5.01)	-.43 (4.37)	
9	"	.66	.63	2.31	.0111	-.12 (1.67)		-.026 (6.76)	-.036 (9.80)	-.027 (7.38)				.012 (2.10)		.014 (1.96)		.65 (2.34)	-.42 (3.63)	
10	"	.55	.52	1.97	.0126	-.03 (1.13)		-.027 (6.06)	-.035 ([illegible].43)	-.0[illegible]7 (6.53)				.016 (2.54)		.017 (1.98)			-.25 (2.43)	
11	"	.69	.65	2,60	.0108	-.08 (2.85)	.0[illegible]2 (3.11)	-.030 (7.26)	-.029 (8.44)	-.022 (6.64)				.006 (.99)		-.29 (3.86)		.45 (3.57)		.018 (3.46)
12	"	.69	.65	2.61	.0108	-.03 (.95)	.002 (3.[illegible]4)	-.029 (7.06)	-.029 (8.41)	-.022 (6.71)			-.006 (1.10)			-.29 (3.90)		.45 (3.60)		.020 (4.05)
13	"	.68	.65	2.63	.0108	-.07	.002	-.029	-.029	-.023				.008		-.28		.46		.014
						(2.24)	(3.17)	(6.80)	(8.30)	(6.64)				(1.18)		(3.76)		(3.61)		(1.79

TABLE 4 (Cont.)

N.E.	SP	R^2	$\bar{R}^2$	DW	σ	C	T	Q1	Q2	Q3	V-1	T1	Ur	V	SP-1	RE-1	RW-1	ΔW	ΔE-1	SP
14	49-70	.72	.69	2.36	.0102	-.06 (2.58)		-.029 (7.96)	-.036 (10.74)	-.026 (7.78)				.005 (.89)		-.05 (2.76)		.62 (4.86)	-.40 (4.37)	.019 (3.79
15	"	.72	.69	2.36	.0103	-.03 (1.10)		-.029 (7.91)	-.036 (10.8)	-.026 (7.82)			-.003 (.67)			-.05 (3.02)		.62 (4.87)	-.39 (4.32)	.021 (4.33
16	"	.71	.69	2.35	.0102	-.05 (2.63)		-.029 (8.23)	-.036 (10.87)	-.025 (7.87)						-.06 (3.45)		.63 (4.97)	-.39 (4.29)	.021 (4.35
17	"	.67	.64	2.37	.0110	-.02 (.95)		-.025 (6.14)	-.036 (9.98)	-.026 (7.48)					.014 (2.39)	-.03 (1.74)		.59 (4.05)	-.42 (4.27)	
18	"	.68	.64	2.37	.0109	-.047 (1.68)		-.024 (6.17)	-.037 (10.16)	-.027 (7.68)				.009 (1.51)	.011 (1.84)	-.02 (1.03)		.59 (4.05)	-.43 (4.46)	
19	"	.68	.64	2.36	.0109	-.03 (.97)		-.024 (6.13)	-.036 (9.51)	-.027 (7.43)		.0002 (.81)		.008 (1.29)	.009 (1.35)	-.03 (1.29)		.58 (3.99)	-.42 (4.31)	
20	"	.64	.60	2.53	.0116	-.03 (.87)	.002 (2.97)	-.026 (2.97)	-.028 (7.53)	-.023 (6.23)		.0002 (.66)		.0117 (1.78)		-.26 (3.21)		.48 (3.51)		
21	"	.72	.69	2.15	.0102	-.007 (.27)	.001 (2.40)	-.02 (4.94)	-.026 (7.85)	-.023 (7.30)		.0002 (4.55)		.012 (2.08)		-.71 (6.01)	.66 (4.78)	.82 (5.85)		
22	"	.71	.68	2.17	.0104	.046 (7.02)	.0009 (1.79)	-.02 (5.19)	-.025 (7.44)	-.022 (6.86)		.002 (4.90)				-.68 (5.65)	.66 (4.66)	.84 (5.88)		
23	"	.76	.73	2.21	.0094	-.04 (1.93)	.001 (2.26)	-.024 (6.49)	-.027 (8.80)	-.022 (7.79)		.002 (4.17)				-.73 (6.62)	.65)5.05)	.81 (6.23)		.02 (4.20
24	(86) "	.72	.68	2.15	.0103	-.0006 (.02)	.0012 (2.24)	-.018 (4.26)	-.023 (6.47)	-.022 (6.96)	.010 (1.77)	.002 (4.84)				-.73 (5.98)	.69 (4.93)	.84 (5.94)		
25	"	.73	.70	2.20	.0101	-.04 (1.30)	.0014 (2.55)	-.016 (3.77)	-.025 (6.93)	-.023 7.40)	.009 (1.48)	.002 (4.48)			.012 (2.07)	-.79 (6.42)	.71 (5.13)	.76 (5.27)		
26	"	.74	.70	2.20	.0100	-.05 (1.52)	.0014 (2.70)	-.018 (4.29)	-.028 (8.28)	-.025 (7.72)		.002 (4.24)		.010 (1.82)	.012 (2.06)	-.77 (6.45)	.68 (5.02)	.74 (5.21)		
27	"	.73	.69	2.21	.0101	-.011 (.43)	.0011 (2.23)	-.018 (4.44)	-.027 (7.98)	-.023 (7.39)		.002 (4.51)			.013 (2.30)	-.75 (6.20)	.68 (4.94)	.75 (5.19)		

TABLE 5

Dependent Variables ΔE (See appendix C for definition of the variables)

N.E.	SP	R^2	$\bar{R}^2$	DW	σ	C	T	Q1	Q2	Q3	RE-1	RW-1	ΔW	V	Ur	HL	US	SP-1
1	53-70	.66	.61	2.31	.0108	-.07 (2.31)	.003 (3.91)	-.023 (4.85)	-.024 (6.50)	-.023 (6.27)	-.53 (3.95)	.32 (2.95)	.67 (3.79)	.017 (2.67)				
2	"	.68	.63	2.38	.0105	-.12 (3.16)	.003 (4.09)	-.020 (4.16)	-.027 (6.99)	-.024 (6.66)	-.61 (4.48)	.34 (3.25)	.56 (3.07)	.015 (2.34)				.016 (2.08)
3	"	.65	.61	2.41	.0108	.06 (2.87)	.003 (3.66)	-.023 (5.05)	-.022 (5.99)	-.021 (5.74)	-.48 (3.68)	.29 (2.73)	.65 (3.66)				-.012 (2.62)	
4	"	.67	.62	2.43	.0106	-.003 (.08)	.003 (3.77)	-.021 (4.43)	-.024 (6.27)	-.022 (6.02)	-.54 (4.05)	.30 (2.92)	.56 (3.02)				-.009 (1.87)	.013 (1.64)
5	"	.66	.61	2.39	.0108	.07 (2.65)	.003 (3.73)	-.022 (4.55)	-.022 (5.98)	-.021 (5.79)	-.50 (3.75)	.29 (2.77)	.65 (3.64)		-.010 (1.40)	-.007 (1.90)		
6	"	.67	.62	2.43	.0106	.015 (.31)	.003 (3.88)	-.020 (3.92)	-.025 (6.30)	-.023 (6.11)	-.57 (4.15)	.31 (2.99)	.55 (2.99)		-.009 (1.39)	-.005 (1.20)		.013 (1.70)

TABLE 6

Dependent Variables ΔW

N.E.	RSS	R^2	DW	ME	DUSU	ΔU	RW-1	RE-1	ΔE	SP-1	T	T1	C	Q1	Q2	Q3	α_1	α_2	α_3	α_4	α_5
1	.0036		1.89	OLS	.008 (2.97)	-.016 (2.02)	-.24 (4.41)	.21 (2.85)		.015 (3.43)	-.0009 (2.32)		-.04 (2.48)	-.01 (2.73)	-.007 (2.03)	-.002 (.65)					
2	.0028			CLS (RALS)	.007 (2.87)	-.014 (2.05)	-.24 (4.63)	.22 (3.74)		.014 (3.52)	-.0009 (3.06)		-.04 (2.43)	-.009 (2.49)	-.006 (1.55)	-.002 (.57)	.21 (1.76)	-.41 (3.90)	.27 (2.44)		
3	.0032			OLS	.009 (3.33)	-.014 (1.87)	-.26 (4.96)	.28 (3.86)	.22 (3.14)	.010 (2.27)	-.001 (3.25)		-.02 (1.39)	-.008 (2.28)	-.006 (1.89)	-.006 (2.05)					
4	.0027			CLS	.008 (3.16)	-.012 (1.91)	-.26 (4.51)	.29 (4.00)	.12 (2.18)	.011 (2.74)	-.001 (3.59)		-.03 (1.76)	-.007 (2.08)	-.005 (1.27)	-.003 (1.15)	.18 (1.47)	-.35 (3.22)	.30 (2.59)		
5	.0036	.50	1.75	OLS	.007 (2.49)	-.017 (2.18)	-.42 (4.03)	.26 (2.82)		.014 (3.21)		-.0007 (2.33)	-.05 (3.12)	-.01 (2.60)	-.007 (1.97)	-.002 (.67)					
6	.0028			CLS	.006 (2.22)	-.016 (2.34)	-.42 (4.95)	.26 (3.51)		.013 (3.24)		-.0008 (2.77)	-.05 (3.07)	-.009 (2.37)	-.006 (1.53)	-002 (.73)	.26 (2.16)	-.40 (3.66)	.28 (2.44)		
7.	.0033			CLS	.007 (2.59)	-.015 (2.09)	-.27 (4.28)	.24 (3.13)		.016 (3.96)	-.001 (2.66)		-.05 (3.11)	.005 (1.48)	.006 (1.57)	-.003 (1.03)				.23 (2.64)	
8*	.0033			CLS	.008 (2.63)	-.016 (2.18)	-.27 (4.22)	.23 (2.92)		.017 (3.94)	-.001 (2.37)		-.06 (3.20)	.003 (1.05)	.008 (2.22)	.010 (2.38)	.019 (.15)			.28 (2.54)	
9	.0033			CLS	.008 (2.52)	-.015 (2.01)	-.27 (3.90)	.24 (2.84)		.016 (3.83)	-.001 (2.41)		-.06 (3.09)	.003 (1.01)	.008 (2.14)	.009 (2.24)	.028 (.23)			.28 (2.52)	-.023 (.20)

* in equation eight the autoregressive process estimated was $U_t = (1-\alpha_1 L)(1-\alpha_4 L^4)U_t$ where L is the back operator.

TABLE 6A **

Dependent Variable ΔW. Method of estimation O.L.S.

N.E	SEE R^2	DW	N.R	SP	.70(4)	DUSU	ΔU	RW_{-1}	RE_{-1}	SP_{-1}	$(\Delta W)_{-1}$	$(\Delta W)_{-2}$	$(\Delta W)_{-3}$	$(\Delta W)_{-4}$	RW_{-3}	RE_{-3}	RW_{-5}	RE_{-5}	$(\Delta W)_{-4}$	SP_{-5}	T	T1	Q1	Q2	Q3	C	$(T1)^2$
1	.0032	1.91	16	50(4)-70(3)	.0284	.008	-.014	-.30	.29	.015				.27			.06	-.10	.001	-.006	-.0006		.004	.006	-.003	-.031	
	.56					2.49	1.78	3.07	2.92	3.35				2.34			.62	.95	.15	1.23	1.18		1.28	1.29	.86	1.17	
2	.0023	2.04	25	50(4)-70(3)	.0230	.007	-.028	-.33	.28	.015	.17	-.48	.31		-.43	.22						-.001	.005	.009	-.003	-.05	
	.68					2.11	2.92	2.61	2.79	2.90	1.20	3.65	2.26		2.83	2.14						2.48	1.12	1.50	.56	1.89	
3	.0026	1.65	14	50(4)-70(3)	.0228	.009	-.025	-.25	.23	.018		-.51	.21		-.43	.20						-.001	.006	.008	-.005	-.08	
	.63					3.72	3.18	2.49	2.66	4.59		4.87	2.19		3.52	2.29						3.36	2.10	2.07	1.67	4.93	
4	.0025	1.91	15	50(4)-70(2)	.0253	.008	-.025	-.29	.26	.016	.14	-.51	.24		-.36	.18						-.001	.006	.007	-.005	-.09	
	.66					3.29	3.25	2.82	2.94	4.02	1.40	4.83	2.50		3.05	2.09						3.50	2.07	1.67	1.89	4.66	
5	.0025	1.66	15	50(4)-70(3)	.0235	.009	-.025	-.24	.23	.018		-.48	.19	.09	-.39	.19						-.001	.006	.008	-.005	-.08	
	.65					3.47	3.25	2.42	2.62	4.65		4.38	1.93	1.04	3.43	2.20						3.35	2.18	2.00	1.73	5.01	
6	.0025	1.88	16	50(4)-70(3)	.0258	.008	-.025	-.28	.25	.017	.12	-.48	.22	.08	-.36	.18						-.001	.006	.007	-.005	-.08	
	.66					3.12	3.30	2.72	2.87	4.07	1.28	4.38	2.23	.87	3.00	2.03						3.52	2.13	1.83	1.92	4.73	
7	.0027	1.97	15	50(1)-70(3)	.0267	.008	-.028	-.31	.29	.015	.17	-.49	.28		-.41	.22						-.0017	.0016	-.012	-.007	-.07	
	.64					3.12	3.65	3.05	3.51	3.73	1.83	4.67	3.11		3.55	2.78						5.11	.57	3.84	2.50	4.47	
8*	.002860	1.96	15	50(1)-70(4)	.0273	.009	-.031	-.32	.30	.018	.21	-.46	.33		-.37	.17						-.0015	.0007	-.015	-.007	-.08	
	.65					3.46	4.01	3.11	3.67	4.44	2.23	4.36	3.68		3.18	2.19						4.73	.25	4.65	2.65	4.97	
9*	.003579	1.88	14	50(1)-70(4)	.0263		-.024	-.31	.29	.015	.29	-.40	.33		-.28	.14						-.0016	.0008	-.012	-.006	-.07	
	.59						2.99	2.88	3.28	3.51	2.98	3.52	3.46		2.29	1.65						4.43	.25	3.63	2.00	4.01	
10*	.002820	2.01	15	50(1)-70(4)	.0309		-.025	-.39	.36	.011	.22	-.45	.26		-.32	.20						-.0028	.0003	-.011	-.006	-.06	.00002
	.65						3.34	3.82	4.29	2.93	2.40	4.27	2.92		2.86	2.52						6.01	.01	3.63	2.32	3.76	3.70
11*	.003411	1.94	15	50(1)-72(1)	.0338		-.016	-.42	.35	.005	.26	-.40	.26		-.23	.18						-.0029	.002	-.005	-.003	-.04	.00003
	.65						2.15	3.92	4.00	1.47	2.75	3.76	2.71		2.07	2.22						5.90	.76	1.95	1.13	2.47	5.74
12*	.004739	1.93	15	50(1)-72(1)	.0323	.005	-.013	-.30	.23	.006	.41	-.27	.39		-.07	.02						-.0006	.004	-.005	-.0006	-.03	
	.52					1.73	1.49	2.40	2.28	1.43	3.84	2.19	3.63		.55	.23						1.63	1.23	1.61	.20	1.82	

* This equation has been estimated using revised data per earnings.

** The figures in the second line of each equation correspond to the t values of the respective coefficients.

TABLE 6B

(0)	(1)	(2)	(3)	(4)	(5)	(6)	
	Estimates of the coefficients				Estimates of the Variance of the coefficients		t Values for (4)
Exogenous Variables	1950(4) - 1970(4)	1950(4) - 1966(3)	1966(4) - 1970(4)	(2) - (3)	1950(4) - 1966(3)	1966(4) - 1970(4)	
C	-.077(4.84)	-.0067(2.96)	.14(0.98)	.1333	.000508	.02167	0.895
T1	-.0014(3.39)	-.0009(1.48)	-.004(1.50)	.0031	.0000004	.0000090	1.01
Q1	.001(0.35)	.0015(0.41)	-.0085(0.94)	.007	.000014	.000081	0.72
Q2	-.012(3.95)	-.0085(2.03)	-.0158(1.51)	.0073	.000018	.000110	0.64
Q3	-.0065(2.37)	-.0038(1.13)	-.0165(1.41)	.0127	.000011	.000138	1.04
DUSU	.0096(3.89)	.0086(2.76)		.0086	.0000198		
ΔU	-.028(3.65)	-.0175(1.68)	-.029(0.65)	.0115	.0001086	.001985	0.25
RW-1	-.27(2.75)	-.227(1.62)	-.43(1.53)	.20746	.01971	.08059	0.66
RE-1	.27(3.09)	.20(1.65)	.58(2.49)	.38	.01416	.05455	1.44
SP-1	.018(4.53)	.017(3.04)	.028(1.59)	.011	.0000326	.0003223	0.59
ΔW-2	-.49(4.59)	-.52(4.02)	-.21(0.36)	.31	.01666	.3533	0.51
ΔW-3	.26(2.75)	.17(1.54)	.27(0.59)	.10	.01321	.2048	0.21
RW-3	-.40(3.37)	-.29(1.97)	-.30(0.58)	.01	.0225	.2580	0.019
RE-3	.18(2.01)	.12(1.15)	.15(0.21)	.03	.01122	.4707	0.06
R^2	.6523	.5778	.9598				
$\bar{R}^2$	.5849	.4681	.8393				
DW	1.64	1.62	2.70				
RSS	.002715	.002309	.000084				
σ	.006366	.006795	.004581				
N.Ob	81	64	17				

TABLE 6C

(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Exogenous Variables	ESTIMATES of the Coefficients			(2)-(3)	Estimates of the Variance		t values for (4)
	1950(1)-70(4)	50(1)-66(3)	66(4)-70(4)		50(1)-66(3)	66(4)-70(4)	
C	-.06(3.64)	-.05(2.08)	-.18(1.46)	.13	.00049	.01463	1.057
D1	-.0017(4.96)	-.0018(3.61)	-.0038(1.53)	.0020			
Q1	.0006(0.19)	.0005(0.13)	-.014(1.73)	.0145	.00001	.00006	5.48
Q2	-.01(3.50)	-.008(2.05)	-.020(2.28)	.012	.00002	.00008	3.80
Q3	-.006(2.07)	-.004(1.33)	-.024(2.29)	.020	.00001	.00011	1.83
ΔU	-.024(3.09)	-.018(1.84)	-.045(1.20)	.027	.00010	.00139	.70
RW_{-1}	-.35(3.23)	-.35(2.46)	.06(0.15)	-.41	.02056	.1313	1.05
RE_{-1}	.32(3.65)	.31(2.73)	.54(2.84)	-.23	.01261	.03644	1.039
SP_{-1}	.012(2.91)	.009(1.62)	.016(0.99)	-.007	.00003	.00026	.41
DW_{-2}	-.41(3.75)	-.45(3.40)	-.48(0.96)	.03	.01734	.25700	.057
W_{-3}	.32(3.44)	.27(2.38)	.01(0.03)	.26	.01279	.1562	.63
RW_{-3}	-.31(2.59)	-.27(1.86)	-.54(1.25)	.27	.02048	.1901	.588
RE_{-3}	.17(2.06)	.16(1.71)	.25(0.44)	-.09	.00918	.3136	.16
W_{-1}	.27(2.86)	.26(2.31)	-.70(1.75)	.96	.01270	.1595	2.31
R^2	.61	.53	.98				
$\bar{R}^2$	.53	.42	.89				
DW	1.91	1.96					
RSS	.003204	.002711	.000042				
	.006765	.007152	.0037				
N.E.	1	2	3				

TABLE 6D

Dependent Variable ΔW

(0) Exogenous Variables	(1)* ESTIMATES of the Coefficients 1950(4)-70(4)	(2) 50(4)-66(3)	(3) 66(4)-70(4)	(4) (2)-(3)	(5) ESTIMATES of the Variance of the Coefficient 50(4)-66(3)	(6) 66(4)-70(4)	(7) t Value for (4)
C	-.05(3.30)	-.06(2.75)	-.32(0.92)	.26	.00049	.1192	.75
T1	-.0026(5.91	-.0030(4.24)	.0004(.04)	-.0034	$.5 \times 10^{-6}$	$.9 \times 10^{-4}$	.54
$(T1)^2$	.000015(3. 09)	.00003(2.34)	-.00007(.45)	.00010	$.21 \times 10^{-9}$	$.2 \times 10^{-7}$	.70
Q1	.0004(0.15)	.0005(0.15)	-.018(1.29)	.0185	.000013	.000200	1.27
Q2	-.010(3.32)	-.010(2.45)	-.016(1.08)	.006	.000016	.000200	.41
Q3	-.006(2.25)	-.006(1.71)	-.024(1.90)	.018	.000011	.000150	1.42
ΔU	-.023(3.19)	-.020(2.12)	-.020(.28)	0.0	.00009	.0050	0.0
RW_{-1}	-.38(3.76)	-.35(2.55)	-.13(.22)	-.22	.01886	.35130	.36
RE_{-1}	.34(4.15)	.32(2.95)	.72(1.59)	-.40	.01152	.2074	.85
SP_{-1}	.010(2.48)	.012(2.26)	.02(0.97)	-.008	.00003	.00043	.37
ΔW_{-1}	.21(2.35)	.21(1.93)	-.64(1.33)	.85	.01213	.23450	1.71
ΔW_{-2}	-.45(4.25)	-.49(3.81)	-.38(.59)	-.11	.01630	.41090	.17
ΔW_{-3}	.25(2.82)	.23(2.12)	-.03(.06)	.26	.01203	.23040	.53
RW_{-3}	-.32(2.87)	-.31(2.25)	-.36(.55)	.05	.01914	.42570	.07
RE_{-3}	.20(2.60)	.19(2.11)	.17(.26)	.02	.00857	.4602	.03
R^2	.6524	.5747	.9819				
$\bar{R}^2$	.5819	.4602	.8551				
DW	2.0024	2.0245	2.68				
RSS	.002839	.002456	.000038				
σ	.006414	.006872	.004351				
N.O.	84	67	17				

* The minor differences between this equation and E6A.10 are due to the fact that E6A.10 has been estimated using revised data for earnings.

Table 6E

Dependent Variable AW. Sample period 1950(4)-1970(4)

N.E.	1	2		
N.R	15	17		Implied values
R^2	.6628	.6688		from regression 1
R^2	.5913	.5860		
D.W.	1.95		1.98	
RSS	.002633	.002586		
σ	.006313	.006357		
C	-.06(3.58)		-.005(.03)	
T1	-.0026(4.88)		-.0026(4.67)	
$(T1)^2$	.0002(3.53)		.0002(2.80)	
Q1	-.0004(.12)		.0003(.09)	
Q2	-.009(2.99)		-.008(2.63)	
Q3	-.005(1.94)		-. 005(1.92)	
RW_{-1}	-.43(3.92)	U	-.021(2.78)	-.02
RE_{-1}	.36(3.96)	U_{-1}	.017(2.29)	.02
ΔU	-.02(2.79)	SP_{-1}	.011(2.69)	.011
SP_{-1}	.011(2.76)	W_{-1}	-.19(1.51)	-.19
ΔW_{-1}	.24(2.49)	W_{-2}	-.67(4.70)	-.69
ΔW_{-2}	-.45(4.19)	W_{-3}	.44(3.10)	.44
ΔW_{-3}	.25(2.66)	W_{-4}	-.24(2.56)	-.25
RW_{-3}	-.26(2.11)	E_{-1}	.34(3.61)	.36
RE_{-3}	.17(1.93)	E_{-3}	.18(2.01)	.17
		P_{-1}	.05(.66)	.07
		P_{-3}	.09(1.24)	.09
Within simple prediction				
70(1) .0349	.0347		.0345	
(2) .0226	.0207		.0209	
(3) .0248	.0250		.0248	
(4) .0368	.0308		.0299	

TABLE 7

Dependent Variable ΔE (See Appendix C, for description of the variables).
Sample Period 1950 (4)-1970(3).

N.E	RSS	R^2	NR	ME	C	Q1	Q2	Q3	T	T1	RE-1	RW-1	ΔW	SP-1	α_1	α_2	α_3	α_4	α_5	1970(4) ** .0590
1.	.0065	.72	10	OLS	-.03 (1.34)	-.01 (2.33)	-.007 (1.51)	.017 (4.00)	.0004 (.73)	.0026 (4.94)	-.82 (6.27)	.84 (5.31)	.63 (4.15)	.0186 (3.06)						.0494
2.	.0045		13	CLS (RALS)	-.04 (3.13)	.005 (.54)	.009 (1.96)	.033 (3.71)	-.0005 (1.59)	.001 (3.45)	-.22 (2.60)	.31 (3.33)	.62 (6.14)	.012 (3.89)	-.57 (5.12)	-.32 (2.66)	-.52 (5.15)			.0610
3.	.0054		11	CLS RALS	.003 (0.12)	.022 (3.85)	-.003 (0.54)	-.0016 (0.27)	.0002 (.27)	.0018 (3.03)	-.47 (3.72)	.48 (3.48)	.70 (4.92)	.006 (1.17)				.51 (5.01)		.0599
4*	.0053		12	CLS RALS	-.014 (0.58)	.0003 (.04)	.026 (4.80)	-.003 (.39)	-.003 (.46)	.0014 (2.41)	-.28 (1.82)	.30 (1.92)	.56 (4.08)	.009 (1.75)	-.27 (1.64)			.47 (3.15)		.0614
5	.0051		13	CLS RALS	-.008 (.33)	.001 (0.17)	.026 (5.49)	-.004 (0.51)	-.00005 (.09)	.0013 (2.14)	-.31 (1.58)	.34 (1.69)	.67 (4.80)	.007 (1.13)	-.26 (1.49)			.43 (3.21)	-.006 (.03)	.0615

* In E7.4 the autoregressive process estimated was: $U_t = (1 - \alpha_1 L)(1 - \alpha_4 L^4)\, U_t + e_t$, where L is the back operator and e_t is white noise.

** (This column collects the forecast value for 1970(4).
The true value was .0590

TABLE 7A *

NE	NR	RSS R^2	T	ΔW_1	RW_{-1}	RE_{-1}	SP_{-1}	E1	ΔE_{-1}	ΔW_{-1}	RW_{-2}	RE_{-2}	SP_{-2}	ΔE_{-2} **
1	22	.0037 .84	-.002 (2.45)	.56 (3.71)	.79 (4.75)	-.71 (4.17)	.018 (2.78)	.003 (4.13)	-.13 (.80)		-.19 (.85)	.30 (1.28)	.001 (.19)	-.27 (1.62)
2	19	.0039 .83	-.001 (1.98)	.53 (3.63)	.87 (6.28)	-.79 (6.91)	.017 (3.05)	.003 (3.99)						.13 (1.28)
3	18	.0041 .82	-.001 (1.66)	.64 (4.66)	.80 (5.84)	-.77 (6.60)	.015 (2.60)	.003 (4.53)						.04 (.40)
4	22	.0037 .84	-.002 (2.45)	.56 (3.71)	.93 (5.80)	-.84 (6.86)	.018 (2.78)	.003 (4.13)		-.13 (.80)	-.06 (.35)	.17 (1.42)	.001 (.19)	
5	16	.0040 .83	-.002 (2.18)	.61 (4.57)	.81 (6.12)	-.78 (7.00)	.016 (2.92)	.003 (5.84)				.15 (1.69)		-.08 (.75)
6	16	.0038 (.84)	-.002 (2.50)	.54 (4.07)	.85 (6.57)	-.80 (7.40)	.017 (3.27)	.003 (6.37)				.12 (1.92)		
7	15	.0040 .83	-.00008 (.13)	.74 (5.61)	.83 (5.44)	-.79 (5.97)	.011 (2.15)	.003 (4.78)						
8	26	.0031 .87	-.0009 (1.06)	.61 (4.13)	.80 (4.56)	-.75 (4.30)	.014 (2.24)	.003 (4.32)	.013 (.08)		-.24 (1.06)	.30 (1.30)	-.002 (.23)	-.18 (1.08)
9	26	.0031 .87	-.0009 (1.06)	.61 (4.13)	.79 (4.15)	-.73 (4.83)	.014 (2.24)	.003 (4.32)		.013 (.08)	-.04 (.28)	.11 (.92)	-.002 (.23)	
10	26	.0031	-.0009 (1.06)	.61 (4.13)	.79 (4.15)	-.73 (4.83)	.014 (2.24)	.003 (4.32)	.013 (.08)		-.24 (1.06)	.30 (1.29)	-.002 (.23)	-.18 (1.08)
11	26	-.0031	-.0009 (1.06)	.61 (4.13)	.79 (4.15)	-.73 (4.83)	.014 (2.24)	.003 (4.32)		.013 (.08)	-.04 (.28)	.11 (.92)	-.002 (.23)	

* C, Q1, Q2 and Q3 omitted in order to have the table on two sheets.
** Additional columns are on the following page.

TABLE 7A

ΔW_{-2}	RW_{-3}	RE_{-3}	SP_{-3}	ΔE_{-3}	ΔW_{-3}	RW_{-4}	RE_{-4}	SP_{-4}	ΔE_{-4}	ΔW_{-4}	RW_{-5}	RE_{-5}	SP_{-5}	1970(4) .0590
	.14 (.66)	−.24 (1.05)	−.010 (1.38)	−.08 (.49)		.036 (.24)	.19 (1.25)	.015 (2.20)						.0487
−.34 (1.98)	−.11 (0.62)	.04 (.22)	−.010 (1.61)	−.001 (.008)		.02 (.14)	.23 (1.63)	.015 (2.30)						.0483
	.03 (.34)	−.06 (0.34)	−.011 (1.73)	−.08 (.59)		.09 (.59)	.18 (1.25)	.016 (2.48)						.0505
−.27 (1.62)	−.05 (.27)	−.05 (.44)	−.010 (1.38)		−.08 (.49)	−.04 (.25)	.27 (2.16)	.015 (2.20)						.0487
		−.13 (1.68)	−.013 (2.41)				.27 (4.33)	.015 (2.66)						.0501
−.26 (2.23)		.09 (1.44)	−.010 (1.75)				.24 (3.93)	.015 (2.68)						.0503
									.34 (3.50)	−.28 (1.97)	.23 (1.67)	−.13 (1.07)	.015 (2.82)	.0570
	.19 (.86)	−.30 (1.26)	−.009 (1.28)	.056 (.35)		−.18 (.88)	.39 (1.74)	.010 (1.35)	−.05 (.31)		+.38 (2.70)	−.38 (2.64)	.009 (1.43)	.0523
−.18 (1.07)	−.04 (.26)	−.06 (.52)	−.009 (1.28)		.057 (.35)	−.08 (.48)	.28 (2.39)	.010 (1.35)		−.05 (.31)	.33 (2.08)	−.33 (2.67)	.009 (1.43)	.0523
	.19 (.86)	.30 (1.25)	−.009 (1.28)	.056 (.35)			.20 (2.20)	.010 (1.35)	.14 (.87)	−.18 (.88)	.19 (1.10)	−.19 (1.14)	.009 (1.43)	.0523
−.18 (1.07)	−.04 (.27)	−.06 (. 53)	−.009 (1.28)		.057 (.35)		.20 (2.20)	.010 (1.35)	.08 (.48)	−.13 (.67)	.25 (1.29)	−.25 (1.34)	.009 (1.43)	.0523

TABLE 7.8 *

Dependent variable ΔE. Sample period 1950(4) - 70(3). Method of estimation OLS.

[illegible]	RSS $\bar{R}^2$	T	ΔW	RW_{-1}	RE_{-1}	SP_{-1}	T1	$ΔW_{-2}$	RW_{-4}	RE_{-4}	$ΔE_{-4}$	$ΔW_{-4}$	SP_{-5}	RW_{-5}	RE_{-5}	DLP_{-3}	P_{-1}	P_{-2}	P_{-3}	P_{-4}	C	Q1	Q2	Q3
1	.0035	-.001	.59	.86	-.79	.015	.003	-.28		.14	.27	-.40	.012								-.06	.013	.007	-.003
	.85	1.69	4.57	6.18	6.72	2.95	6.05	2.64		2.07	2.89	3.64	2.24								2.11	4.00	1.94	1.04
2	.0035	-.001	.62	.83	-.78	.013	.003	-.22	.15		.35	-.44	.013								-.06	.014	.010	-.002
	.85	1.56	4.75	6.02	6.70	2.64	6.20	2.01	2.22		4.52	4.08	2.60								2.04	4.68	2.62	.74
3	.0035	-.001	.60	.83	-.77	.014	.003	-.24	.16		.37	-.47	+.012	-.06	.04						-.06	.014	.009	-.002
	.82	1.44	4.45	5.68	6.07	2.62	4.87	1.96	2.04		3.97	3.12	2.35	.36	.33						1.98	4.00	2.08	.78
4	.0035	-.0003	.56	.83	-.73	.015	.0025	-.33			.34	-.45	.012			.148					-.06	.013	.007	-.004
	.85	.57	4.35	5.96	6.27	3.02	5.76	3.11			4.26	4.19	2.32			2.17					2.37	4.26	1.81	1.45
5	.0034	-.0005	.56	.88	-.73	.014	.003	-.39			.33	-.45	.012				.09	-.05	.12	-.17	-.03	.014	.007	-.004
	.85	.53	4.10	5.89	5.77	2.64	5.58	2.62			3.91	3.67	2.27				.85	.57	1.53	2.15	.12	4.21	1.80	1.46
6	.0035	.0001	.58	.83	-.75	.014	.002	-.32			.33	-.44	.012						.13	-.16	.10	-.006	-.017	-.013
	.85	.16	4.35	5.99	6.21	2.90	5.69	2.90			4.13	3.75	2.30						1.84	2.31	.52	1.54	4.72	4.24

* Equations one to five in this table have been estimated using the RALS program and the seasonal dummies Q1, Q2, Q3 do not correspond exactly to the 1st, 2nd and 3rd quarter as is the case of equation six that has been estimated by TSP (See note of appendix C).

* The figures in the second line of each equation correspond to the t values of the respective coefficiants.

TABLE 7 C **

Dependent variable ΔE. Sample period 1950(4) - 1970(3)

NE	DW	RSS R^2	C	T	T1	Q1A	Q2A	Q3A	Q1B	Q2B	Q3B	ΔW	RW_{-1}	RE_{-1}	SP_{-1}	ΔW_{-2}	RE_{-4}	ΔE_{-4}	ΔW_{-4}	SP_{-5}	$(P_{-1}-P_{-4})$	$(P-P_{-4})$	$(\Delta P)_{-3}$
1	2.27	.00345 .85	.0001 .01	-.00007 .15	.0016 3.98	-.015 3.72	-.041 11.5	-.019 5.63	-.030 7.95	-.018 5.87	-.025 7.99	.56 4.81	.50 3.85	-.45 3.83	.013 2.66								
2	2.07	.00252 .89	-.038 1.49	-.0009 1.56	.002 5.66	-.006 1.34	-.030 5.57	-.014 3.84	-.021 4.46	-.019 5.32	-.021 5.67	.53 4.53	.72 5.49	-.63 5.35	.015 3.30	-.28 2.90	.09 1.52	.09 .99	-.30 2.79	.011 2.30			
3	2.09	.00264 .89	-.050 2.06		.002 5.53	-.005 1.17	-.032 6.30	-.016 4.95	-.020 4.52	-.020 5.66	-.022 6.40	.56 4.97	.67 5.26	-.64 5.67	.015 3.27	-.26 2.79		.15 1.82	-.33 3.15	.012 2.57			
4	2.25	.0050 .70	.007 .30		.0016 4.19							.64 4.36	.48 4.08	-.57 5.39	.005 1.05	-.22 1.84	.15 2.63	.48 5.22	-.45 3.71	.001 .25			
4a	2.42	.0051 .78	.013 .55		.0018 4.61							.60 4.01	.55 4.52	-.48 4.85	.003 .48	-.38 3.01		.57 7.70	-.52 4.29	.002 .41	.14 2.08		
5	1.78	.0067 .71	.036 16.68			-.020 5.10	-.044 10.95	-.017 4.12	-.037 10.71	-.015 4.40	-.024 7.00												
*6	2.04	.0026 .61			.002 5.74							.57 5.27	.67 5.88	-.66 5.88	.014 3.33	-.24 2.72	.03 .74	.14 1.62	-.33 3.32	.011 2.50			
*7	2.09	.0026 .61			.002 5.82							.56 5.23	.67 5.54	-.64 5.97	.015 3.45	-.26 2.94		.15 1.92	-.33 3.32	.011 2.70			
8	2.06	.00255 .89	-.038 1.49		.002 5.72	-.004 .97	-.03 5.91	-.017 5.06	-.02 4.32	-.019 5.34	-.02 5.62	.57 5.07	.71 5.49	-.65 5.85	.013 2.69	-.31 3.17		.13 1.58	-.36 3.39	.011 2.35	.08 1.47		
9	2.06	.00260 .89	-.047 1.88		.002 5.52	-.006 1.28	-.03 5.99	-.015 4.43	-.02 4.43	-.019 5.57	-.02 5.77	.55 4.82	.67 5.24	-.63 5.63	.015 3.23	-.27 2.93		.15 1.76	-.34 3.21	.011 2.33			.06 .99

* The estimation has been run with deseasonalised data; see text.

** The figures in the second line of each equation correspond to the t values of the respective coefficients.

TABLE 7 C * **(Continuation)

Dependent variable ΔE. Sample period 1950(4) - 1970(3)

NE	DW	RSS R^2	C	T	T1	Q1A	Q2A	Q3A	Q1B	Q2B	Q3B	ΔW	RW_{-1}	RE_{-1}	SP_{-1}	$ΔW_{-2}$	RE_{-4}	$ΔE_{-4}$	$ΔW_{-4}$	SP_{-5}	$(P_{-1}-P_{-4})$	$(P-P_{-4})$	$(ΔP)_{-3}$
10	2.00	.00245	-.036		.002	-.007	-.03	-.017	-.02	-.019	-.02	.52	.69	-.63	.012	-.35		.11	-.35	.011		.10	
		.90	1.48		5.65	1.54	6.73	5.22	4.90	5.79	6.57	4.63	5.51	5.81	2.73	3.57		1.30	3.38	2.40		2.24	
11	1.97	.00251	-.033		.002	-.009	-.038	-.018	-.026	-.022	-.025	.51	.69	-.64	.012	-.37			-.30	.010		.11	
		.89	1.34		5.69	2.47	12.29	6.08	7.70	7.17	8.87	4.52	5.52	5.82	2.76	3.78			3.10	2.34		2.60	
12	2.03	.00265	-.034		.002	-.007	-.036	-.019	-.024	-.021	-.023	.57	.72	-.66	.013	-.33			-.30	.010	.09		
		.89	1.31		5.79	1.83	9.98	5.98	6.72	6.62	7.31	4.97	5.51	5.88	2.73	3.33			2.99	2.26	1.72		
13	2.03	.00272	.007		.002	-.013	-.038	-.017	-.028	-.019	-.023	.45	.56	-.52	.012	-.38			-.21			.12	
		.88	0.41		5.12	3.49	11.98	5.63	8.54	6.59	8.28	3.95	4.83	5.17	2.62	3.76			2.30			2.75	
14	2.05	.002867	.007		.002	-.010	-.036	-.018	-.026	-.018	-.021	.51	.60	-.55	.012	-.34			-.22		.11		
		.88	0.38		5.27	2.63	9.63	5.56	7.29	6.06	6.75	4.45	4.87	5.27	2.55	3.36			2.27		2.00		
15	2.12	.002832	-.006		.002	-.009	-.031	-.014	-.023	-.016	-.019	.48	.54	-.50	.014	-.28		.15	-.25				.09
		.88	0.31		4.94	2.18	5.80	3.98	4.92	4.87	5.19	4.19	4.53	4.96	3.09	2.92		1.70	2.48				1.42
16	2.06	.00267	.005		.0018	-.010	-.034	-.016	-.024	-.017	-.021	.45	.55	-.50	.012	-.37		.11	-.26			.11	
		.89	.28		5.05	2.46	6.64	4.84	5.52	5.08	6.01	3.97	4.80	5.12	2.56	3.57		1.22	2.60			2.45	
17	2.11	.002778	.005		.0019	-.007	-.030	-.016	-.022	-.016	-.019	.51	.58	-.53	.012	-.33		.13	-.28		.10		
		.88	.24		5.17	1.73	5.73	4.70	4.79	4.62	5.03	4.47	4.81	5.20	2.47	3.22		1.50	2.69		1.81		

* The estimation has been run with deseasonalised data; see text.

** The figures in the second line of each equation correspond to the t values of the respective coefficients.

Table 8*

Dependent variable ΔP. See Appendix C for description of the symbols

Method of estimation OLS

N.E.	S.P.	RSS σ	DW	R^2 $\bar{R}^2$	$PM_{-1}-P_{-1}$	$E_{-1}-P_{-1}$	$E^*_{-1}-P_{-1}$	$W_{-1}-P_{-1}$	T	T1
1	49(2)-70(4)	.0056 .0084	2.11	.60 .57	.073 (5.94)	.44 (7.49)			-.0027 (6.77)	
2	"	.0053 .0082	2.27	.63 .60	.069 (5.76)	.43 (7.63)			-.0028 (7.29)	.0003 (2.37)
3	"	.0094 .0108	2.11	.34 .29	.059 (3.49)			.08 (1.31)	-.0001 (.06)	
4	"	.0065 .0091	2.11	.54 .50	.089 (5.91)			.46 (5.63)	-.002 (5.63)	.0015 (5.89)
5	"	.005086 .007913	2.20	.64 .61	.076 (6.52)		.49 (8.42)		-.003 (7.74)	
6	50(1)-70(4)	.004846 .007933	2.13	.63 .60	.080 (5.79)		.50 (8.36)		-.003 (7.52)	
7	"	.004668 .007837	2.17	.65 .61	.077 (5.60)	-.48 (1.70)	.99 (3.35)		-.004 (7.66)	

* All equations have been estimated using a constant term and three seasonal dummies, but their coefficients have been omitted to save space.

Table 10

Depend Variable U_r

.E.	S.P.	M.E.	R^2 / $\bar{R}^2$	D.W.	RSS / σ	C	T	Q1	Q2	Q3	U_{r-1}	U_{r-2}	GDP	GDP_{-1}	DN	DN_{-1}	α_1
	49(3)-70(3)	OLS	.889 .881	1.36	.8181 .102	20.2 (2.55)	.02 (2.61)	.12 (2.52)	-.28 (7.70)	-.14 (4.27)	.73 (9.06)			-2.40 (2.47)			
	"	"	.916 .910	1.36	.6174 .089	33.9 (5.89)	.03 (5.97)	-.18 (3.87)	-.29 (9.52)	-.28 (8.38)	.66 (11.19)		-4.06 (5.78)				
	"	IV	.916 .910	1.36	.6181 .089	35.5 (3.04)	.03 (3.09)	-.19 (2.38)	-.29 (8.86)	-.28 (6.05)	.65 (7.32)		-4.25 (2.99)				
*	"	OLS	.935	2.10	.4761 .079		.03 (3.48)				.996 (9.69)	-.40 (4.64)	-3.73 (5.61)	-.51 (.63)			
*	"	CLS			.5473 .084		.03 (5.41)				.62 (6.69)		-3.66 (5.16)				.37 (2.48)
*	"	OLS	.919	1.32	.5970 .088		.03 (5.67)				.65 (10.94)		-3.92 (5.61)		.06 (1.62)		
*	"	OLS	.945	1.95	.4034 .074		.03 (4.96)				.992 (10.22)	-.35 (4.36)	-3.73 (5.96)	-.16 (.21)	.29 (3.65)	-.27 (3.33)	
*	"	CLS	.5118				.03 (4.90)				.55 (4.32)		-3.31 (4.82)		.14 (2.16)		.50 (2.86)

The equation has been estimated with the C, Q1, Q2 and Q3 dummies, but their values are missing in the table.

Table 11*

Full Information maximum likelihood estimation

Ω2 1956(4)-70(4)

Dependent Variable	ΔW	ΔE	ΔP	ΔU	$ΔW_{-1}$	$ΔW_{-2}$	$ΔW_{-3}$	$ΔW_{-4}$	RW^*_{-1}	RW_{-1}	RE_{-1}	RW_{-3}	RE_{-3}
ΔW				-.031 (3.40	.21 (2.70)	-.45 (4.95)	.20 (2.72)			-.39 (4.16)	.36 (4.53)	-.26 (2.60)	.14 (1.97)
ΔE	.53 (3.33)					-.39 (4.35)		-.33 (3.65)		.67 (6.14)	-.61 (6.85)		
ΔP		.31 (2.41)							.20 (2.70)		-.48 (1.70)		.21 (3.36)
ΔU	-1.47 (2.28)												

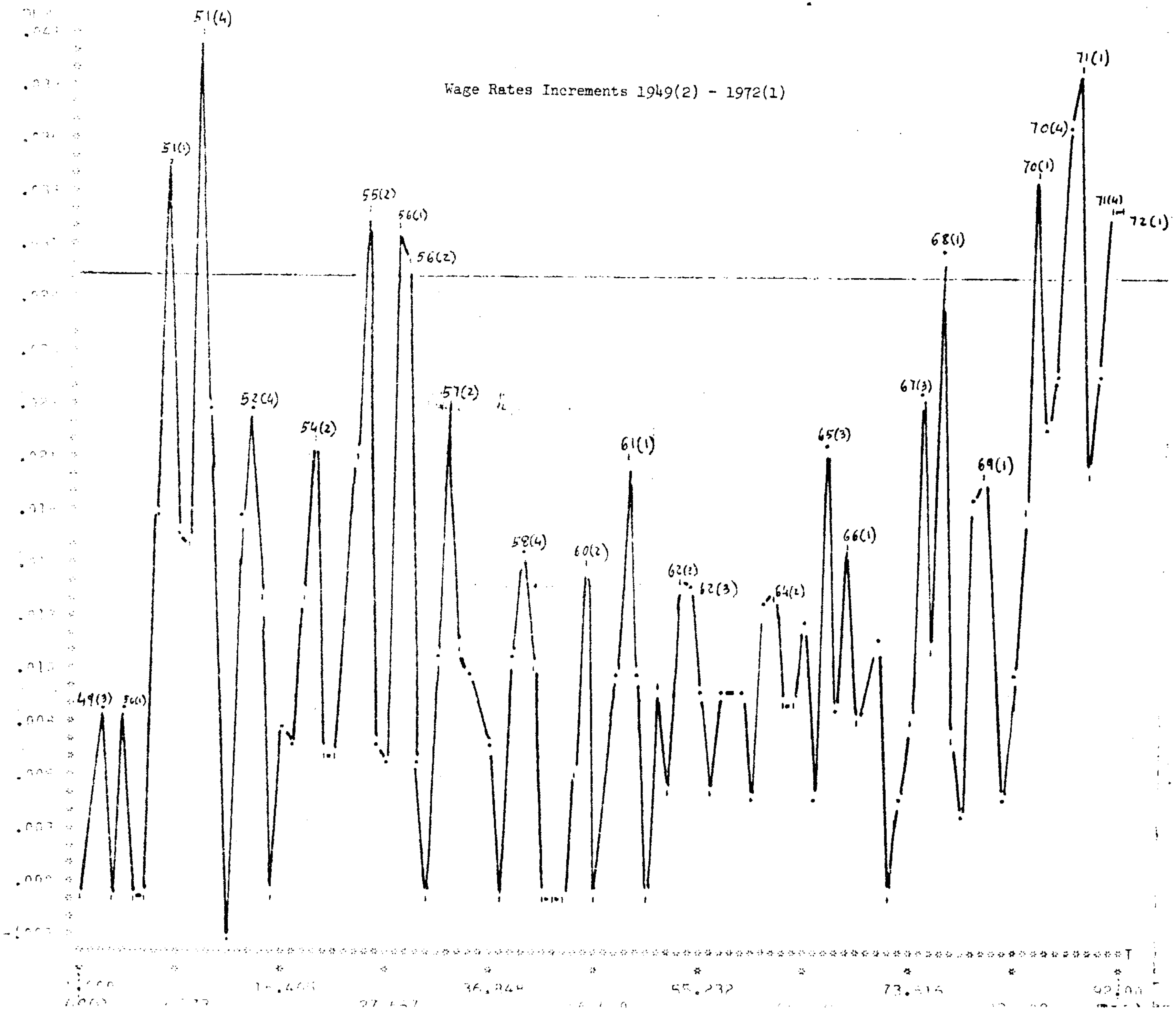
Dependent Variable	U_{-2}	$(P_{-1}-P_{-4})$	$(PM_{-1}-P_{-1})$	ODP	ST_{-1}	ST_{-5}	T	T1	$(T1)^2$	Q1B	Q2B	Q3B
ΔW					.012 (3.51)			-.0027 (5.02)	.00039 (4.75)			
ΔE		.14 (2.59)			.019 (2.16)	.009 (2.56)		.032 (6.43)		-.016 (5.33)	.015 (4.17)	-.004 (0.75)
ΔP		-.20 (3.57)	.08 (4.77)				-.004 (5.73)			-.007 (1.62)	-.016 (3.21)	.005 (1.20)
ΔU	-.54 (7.02)			-4.02 (5.06)			.03 (3.54)			-.08 ([illegible])	-.007 ([illegible])	.066 (2.45)

* t values in this table are not corrected for the degrees of freedom.

Table 12

Forecasting results with the simultaneous model estimated for the sample period 50(4)-69(4).

	1970(1)				1970(2)				1970(3)				1970(4)			
	ΔW	ΔE	ΔP	ΔU	ΔW	ΔE	ΔP	ΔU	ΔW	ΔE	ΔP	ΔU	ΔW	ΔE	ΔP	ΔU
Observed values	.0349	.0033	.0054	.0849	.0226	.0436	.0188	-.0756	.0249	.0275	.0282	.0398	.0368	.0563	.0092	.0058
Forecast with URF	.0257	.0020	.0119	.0663	.0150	.0279	.0245	-.2109	.0136	.0030	.0327	-.0126	.0171	.0293	.0119	-.0206
$X^2_{(4)}$ $X^2_{(16)}$ = 77.07	6.266				16.058				23.470				31.280			
Forecast with the restricted model	.0334	.0096	.0110	.1615	.0206	.0335	.0203	-.1285	.0226	.0112	.0285	.0586	.0274	.0408	.0154	.0935
$X^2_{(4)}$ $X^2_{(16)}$ = 22.679	3.244				3.302				7.088				9.044			


Wage Rates Increments 1949(2) - 1972(1)
49(3)
50(1)
51(1)
51(4)
52(4)
54(2)
55(2)
56(1)
56(2)
57(2)
58(4)
60(2)
61(1)
62(2)
62(3)
64(2)
65(3)
66(1)
67(3)
68(1)
69(1)
70(1)
70(4)
71(1)
71(4)
72(1)

Δ in wages and salaries per employee in employment in UK (Weekly) 1949(2) - 1970(4)