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EFFECTS OF ALTERNATIVE SEASONAL ADJUSTMENT PROCEDURES ON MONETARY POLICY — COMMENT*

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While Maravall's (1980) excellent paper concerns the conditions under which policy decisions will differ, depending on the method of seasonal adjustment, differences in the information contained in the series r_t^0 (the monthly SA *M1* series) and r_t^a (the daily SA *M1* series) should also be considered.[1] This comment reports observed differences in both the sum of squares and the significance of specific coefficients in four transfer functions[2] of the form

$$Y_t = \left[\sum_{i=1}^{k} (\omega_i(B)/\gamma_i(B))X_{it} \right] + (\theta(B)/\phi(B))a_t,$$

between the commercial paper interest rate (RCP) and r_t^0, r_t^a, δ_t and both δ_t, r_t^a, respectively, reported in table 1 as model 1-4, and addresses this subject. Such results, although not definitive, illustrate Granger's[3] proposal to rank methods of seasonal adjustment for one criterion, and suggest that, in the sense of minimizing the sum of squares, r_t^0 is significantly superior to r_t^a.

The functional form of the noise model for all four transfer functions was found to be the same. Since the sum of squares of model 1 (8.1004), which uses r_t^0 as the independent variable, is 9% less than the sum of squares of model 2 (8.8607), which uses r_t^a as the independent variable, it is evident that

*Computer time for this study was supplied by the Computer Center of the University of Illinois at Chicago Circle.

[1]The notation used is from Maravall.

[2]For a discussion of transfer function model building and estimation, see Box and Jenkins (1976, chs. 10-11). $\omega(B)/\gamma(B)$ and $\theta(B)/\phi(B)$ are ratios of polynomials in the lag operator B for the input and noise model, respectively. The usual assumptions regarding permissible ranges of parameters are assumed.

[3]When shown by discussants that his proposed list of criteria for SA were 'impossible to achieve in practice', Granger (1978) concluded that possibly the 'best that we can hope to do is to rank alternative methods'. In the same spirit the example presented in this note outlines some of the loss of predictive power associated with one of the two seasonal adjustment methods. Since only one dependent variable was tried, results are preliminary. Because differences were found in this case it suggests that the performance of alternative seasonally adjusted series in an econometric model might be one of the possibly multiple criteria used for the selection of the method of SA.

Table 1

Transfer functions 1971/3–1977/12.[a]

Model 1

$$(1-B)RCP=(1.5878+5.1711B+2.5937B^3+2.8654B^{11})(r_t^0-0.063092)$$

1.14 −3.52 −1.88 −2.04

$$+(1+0.36501B-0.32779B^6-0.27780B^7-0.26271B^{14})(1+0.50195B^{12})a_t$$

−3.17 2.55 2.22 2.18 −4.01

$RSS=8.1004$ $MSL(24)=16.0$ $MSR(24)=34.7$ $MQ(24)=16.5$
$RMS=0.13065$ $DF=62$

Model 2

$$(1-B)RCP=(1.1205+5.2320B+2.3348B^3+2.6669B^{11})(r_t^a-0.065692)$$

0.72 −3.16 −1.51 −1.67

$$+(1+0.42332B-0.30423B^6-0.25721B^7-0.23749B^{14})(1+0.53233B^{12})a_t$$

−3.77 2.34 2.01 2.01 −4.40

$RSS=8.8607$ $MSL(24)=23.9$ $MSR(24)=23.9$ $MQ(24)=16.1$
$RMS=0.14291$ $DF=62$

Model 3

$$(1-B)RCP=(11.986+11.858B^1+9.8078B^2)(\delta_t-0.0005423)$$

2.38 −2.45 −1.89

$$+(1+0.43842B-0.191614B^6-0.13919B^7-0.48931B^{14})(1+0.42028B^{12})a_t$$

−5.03 1.843 1.26 4.87 −3.62

$RSS=11.061$ $MSL(24)=15.5$ $MSR(24)=28.8$ $MQ(24)=14.7$
$RMS=0.15362$ $DF=72$

Model 4

$$(1-B)RCP=(10.957+14.146B^2)(\delta_t-0.0005423)+(1.3058+5.9211B+2.5299B^3)(r_t^a-0.065692)$$

2.88 −3.31 0.96 −4.78 −1.98

$$+(1+0.63801B-0.45450B^6-0.31819B^{14})(1+0.49636B^{12})a_t$$

−7.82 4.87 3.23 −4.22

$RSS=8.1485$ $MSL(24)=24.0$ $MSR(24)=39.3$ $MQ(24)=13.8$
$RMS=0.11641$ $DF=70$
$MSL(24)=29.4$ $MSR(24)=19.7$

[a] r_t^0 = rate of growth of *M1* SA via monthly method, r_t^a = rate of growth of *M1* SA via daily method $\delta_t=r_t^0-r_t^a$. For further discussion of data, see Maravall. CPI = the commercial paper interest rate obtained from NBER data bank, RMS = residual mean square, DF = degrees of freedom, RSS = residual sum of squares, $MSL(k)$ = the Haugh (1976) small sample S-statistic calculated between the residual and the 0th to kth lag of the prewhitened input, $MSR(k)$ = the small sample S-statistic calculated between the prewhitened input and the 0th to kth lag of the residual (to check for feedback), $MQ(k)$ = the Ljung and Box (1976) modified Q statistic for the first k the autocorrelations of the residual. All models have been estimated using methods suggested in Box and Jenkins (1976). Diagnostic checking prewhitening models for inputs are:

$$r_t^0=0.063092+(1+0.93165B)(1+0.21227B^6)(1-0.31012B^{13})u_t,$$

15.45 −23.45 −1.83 2.70

$RSS=0.03762$ $RMS=0.0004823$
$MQ(24)=16.71$ $DF=78$

$$r_t^a=0.065692+(1+0.93879B)(1+0.31215B^6)u_t,$$

12.33 −25.45 −2.75

$RSS=0.03175$ $RMS=0.0004019$
$MQ(24)=17.23$ $DF=79$

$$\delta_t=(1+0.88B)(1+0.27B)^{-1}(1+0.27B^6-0.47B^{12})^{-1}u_t,$$

where the model for δ_2 is identical with the one proposed by Maravall and u_t and a_t are the error terms of the ARIMA and transfer function models, respectively.

in cases where RCP is the dependent variable, r_t^0 contains more information.[4] Model 3, where the coefficients of δ_t were found to be highly significant, and model 4, where there are two inputs (r_t^a and δ_t) and the coefficients for δ_t are again significant, provide further evidence of a significant difference in the information content of r_t^0 and r_t^a.[5] These preliminary findings suggest that it might be profitable to investigate other dependent variables to see if r_t^0 continues to outperform r_t^a.[6]

One of the surprising points of Maravall's (1980) paper is that 'in some region, improvements in forecasting accuracy increase the probability of disagreement'. This arises because the function that relates the sum $P_{\rm I}+P_{\rm II}+P_{\rm III}$ to σ_e tends to a minimum as σ_e approaches zero and as σ_e approaches

[4]In Stokes and Neuburger (1979) it was argued that *M2* was the proper monetary variable in an equation for the commercial paper interest rate. Various functional forms were used to test for a number of monetary effects. In contrast the present example is meant only to highlight the difference between the predictive power of the two SA *M1* series, not to argue that *M1* is the appropriate independent variable in the interest equation.

[5]All models passed the Haugh (1976) modified *S*-statistic test for the adequacy of the functional form of the input model and the Ljung–Box (1976) modified *Q*-statistic test for the appropriateness of the noise model. Model 4, which was estimated at the suggestion of the referee of a prior draft, contains an apparently significant spike in the cross-correlation between the residual and r_t^a at the 11th period. However, when an input parameter at the 11th period is entered into the model, possibly due to multicollinearity between the parameters, neither it or some other, formerly significant parameters, are significant. Although model 4 contains some multicollinearity in the covariance matrix of parameters, this does not appear to unduly influence the apparent significance of the coefficients for the δ_t term because in a model containing a simplified specification of the input model for r_t^a, the coefficients of δ_t remain significant. A referee has noted the fact that the *RSS* of model 4 is greater than the *RSS* of model 1, although model 1 is a special case of model 4. This apparent paradox is resolved if we note that although it is possible to compare the *RSS* of model 1 and model 2, which both have the same degrees of freedom (62), it is *not* possible to compare the *RSS* of model 1 and model 4 directly since the degrees of freedom of the latter was 70. The correct procedure is to compare the residual mean squares. Using this criterion the residual mean square for models 1 and 2 are 0.13065 and 0.14291, respectively, while for the more general model 4 the residual mean square falls (as it should) to 0.11641, or a 10.899% decrease due to the additional information left out of the previous best equation (model 1).

[6]A referee of the present note suggested that two additional transfer functions might prove of interest. In one the dependent variables would be *RCP* adjusted by X-11 and would presumably use the present independent variables, in the other the dependent variable would be unadjusted *RCP* while the independent variable would be unadjusted *M1*. In the view of the referee there might possibly be a small bias in the present transfer functions due to the fact that the seasonal factor in *RCP* might be related to the seasonal factor in *M1* which would imply that there would be a 'specification bias' if unadjusted *RCP* was used. In my view if the first suggestion were followed there might be a bias depending on whether the seasonal adjustment procedure used to form *RCP* was the 'daily' or 'monthly' method. In the reported transfer functions the same functional form of the noise model was used for all models (except the last where one 7th order term was removed). As a consequence in the present formulation all independent variables are attempting to explain the same information. Since there is no evidence of a seasonal remaining in the residual, the presumption is that the noise model was able to take out the seasonal. The estimated noise model coefficients are remarkably similar, as would be expected if this were the case. The second suggestion has already been reported by Stokes and Neuburger (1979) for the *RCP* and *M2* and real *M2*. If results were reported here for unadjusted *M1* it would not help us distinguish between the predictive powers of daily or monthly SA methods and would take this note far beyond its more modest objective.

infinity. However, it would be incorrect to infer from this that the policy-maker is different between two points with the same probability of disagreement but with different values for σ_e.[7] If the policy-maker had a choice of two situations where the probability of disagreement was the same, a rational choice would be to select the one with the lower σ_e, since any loss function for a type I or a type II error would show a smaller expected value.

[7]Maravall (1980) does not make this incorrect inference.

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