

Supplementary Material for

Effect of a state hospital formulary on medicines utilisation in Australia

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Supplementary File S1.

Additional Analysis Using Seasonal ARIMA Model

Autocorrelation testing of PBS claims for PPIs, suggested the presence of seasonality in the data, with pantoprazole having significant ($p < 0.05$ on Cumby-Huizinga testing) autocorrelation at lags 1, 6 and 12 and omeprazole at lags 1, 3 and 6 lags. Further analysis using a seasonal autoregressive integrated moving average (SARIMA) model was performed for the pantoprazole and omeprazole data.

Data was restricted to post January 2001 for pantoprazole, after the initial introduction to market period. Omeprazole data was restricted to post August 2002, corresponding to the availability of esomeprazole on the market. Stationarity at first difference was confirmed through visual inspection of the data and Dickey-Fuller testing ($p < 0.05$) for both. Model selection was performed utilising Box-Jenkin's methodology. Inspection of the autocorrelation and partial autocorrelation plots suggested a 1st lag moving average model with autoregressive seasonality for both data sets. The model was refined using Box-Jenkins methodology based on negative log-likelihood, AIC, BIC and residual plotting for autocorrelation. Addition of treatment lags to LAM listing (up to 3-month lag tested) did not improve the models. Regression with LAM listing as exogenous indicator variable was performed in both models.

For pantoprazole, a final SARIMA (0,1,3) (1,0,0)₁₂ model was selected. LAM listing was associated with a significant effect on PBS claims of 5.3 DDD per 1000 persons/month (95% CI 0.70-9.90; p=0.024). LAM listing did not have a significant effect on non-Queensland PBS claims using the same SARIMA model (0.44 DDD persons/month; 95% CI -1.78-2.65; p=0.7). 21

For omeprazole, a final SARIMA (0,1,2) (1,0,1)₁₂ model was selected. For omeprazole, LAM listing was associated with a significant effect on PBS claims of 2.04 DDD per 1000 persons/month (95% CI 0.06-4.02; p=0.043). LAM listing was associated with a statistically significant reciprocal effect in non-Queensland PBS data (-2.07 DDD per 1000 persons/month; 95% CI -4.60 - -1.27; p=0.04). This association is consistent with visual inspection of the data (figure 7) and although is mechanistically questionable, may reflect unaccounted exogenous factors. Controlling for this underlying trend in non-Queensland states results in a LAM effect of 4.11 DDD per 1000 persons/month (95% CI 1.31-6.91).

Discussion of Seasonal ARIMA Model Results

While autocorrelation trends were partially accounted for by the inclusion of one lag in ITS analyses, factors such as higher order autocorrelation and seasonality are not well accounted for in the estimates. Seasonality is commonly found in PBS claims data related to effects of the PBS safety net and periodic PBS claiming processes from large pharmacy service providers. Hence, a segmented regression using an ARIMA model (see Nelson, 1998 for an introductory explanation) was performed for PPIs to account for these seasonal effects. The estimates, in the order of 4-5 DDD per 1000 persons per month (relative to non-listing), were higher, but comparable, to those obtained from controlled ITS — positive 1-2 DDD per 1000 persons per month when listed and negative 1-2.5 DDD per 1000 persons per month when de-listed.