**Evaluation and resilience of ecotourism in the Annapurna Conservation Area, Nepal**

NABIN BARAL

**APPENDIX 1**

**A summary of statistical processes to forecast the number of visitors in a hypothetical scenario of no insurgency**

In this study, a time series contains annual data of visitor numbers for 23 years. During the exploratory data analysis, a trend in the mean and two structural breaks in the dataset were found. These issues should be addressed while modelling this dataset.

Here, a trend is a slow, gradual change in the mean over the whole interval under investigation. While modelling a time series, the data should be detrended at first if there are any trends, which is simply a statistical operation of removing the trend from the series. A major reason for detrending is to remove a feature that is thought to distort or obscure the relationships of interest. There are several ways of detrending the series. One simple way is to add a linear trend term to a regression model, which is essentially the same thing as using a ‘detrended’ series. Basically, the trend would be partialled out by adding the term.

Structural breaks in the dataset as well as substantive reasoning called for two dummies representing the three major time periods in the study area. Based on the intensity of the insurgency, the whole data series is divided into three periods. A base category was the ‘after the insurgency’ period.

To model the yearly number of visitors, the following regression equation was estimated at first:

*Yt = b0 + b1 Yt-1 + b2 t + b3 D1t + b4 D2t + ut*  (1)

where, *Yt* = the number of visitors at time *t* (*t* -> …1989, …, 2010, …); *t* = year; *D1t* = a dummy representing before the insurgency period; and *D2t* = a dummy representing during the insurgency period.

Once the model is built, it is critical to test whether the model is misspecified. For misspecification testing, an auxiliary regression model was built by taking the residuals (*ut*) from the equation (1) as a response variable and all the explanatory variables used in equation (1) as well as three additional predictors: squared of the trend component (*t2*), squared of the first lag (*Yt-12*) and the second lag (*Yt-2*). These terms were included to detect potential departure from trend heterogeneity, linearity and Markov (1), respectively. The following auxiliary regression equation was estimated:

*ut = δ0 + δ1 t + δ2 t2 + δ3 Yt-1 + δ4 Yt-12 + δ5 Yt-2 + δ6 D1t + δ7 D2t + vt* (2)

The regression coefficients from equation (2) were used to test major assumptions of the regression model: linearity, heterogeneity and dependence. Another critical assumption of normality was tested by using residuals (*ut* from equation 1) with the Kolmogorov-Smirnov test (see Table S1 for a summary of the results).

**Table S1** A summary of results for the misspecification tests.

|  |  |  |  |
| --- | --- | --- | --- |
| *Assumptions* | *Hypothesis* | *Test statistics* | *p value* |
| Linearity | H0: δ4 = 0 | t = -0.967 | 0.353 |
| Heterogeneity | H0: δ2 = 0 | t = 1.109 | 0.289 |
| Dependence | H0: δ5 = 0 | t = 1.276 | 0.226 |
| Normality | H0: Normally distributed | Kolmogorov-Smirnov D = 0.128 | 0.830 |

Once it was found that the model was statistically adequate, the results of regression equation (1) were summarized (Table S2). The following coefficients were used to forecast the number of visitors for an alternative scenario of ‘no insurgency’.

**Table S2** A summary of the regression model displaying beta coefficients, t-statistics and significance levels. The mode fit statistics are F4,17 = 62.54, *p* < 0.01, R2 = 0.93 and adjusted R2 = 0.92.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *Predictors* | *β estimate* | *Standard error* | *t value* | *p value* |
| First lag of visitor numbers (Yt-1) | 0.344 | 0.105 | 3.269 | **0.005** |
| Year (trend = t) | 1964.688 | 468.696 | 4.192 | **0.001** |
| Before the insurgency (Dummy1 = D1t) | 7519.492 | 5908.482 | 1.273 | 0.220 |
| During the insurgency (Dummy2 = D2t) | –21026.16 | 3360.921 | –6.256 | **0.001** |
| Intercept | 11422.934 | 7285.882 | 1.568 | 0.135 |