This paper investigates methodological issues in forecasting tourism demand. We demonstrate that the employment of extended Box-Cox autoregressive tests for functional form and ridge regression to control for substantial and changing patterns of collinearity among the explanatory variables substantially increases forecast precision relative to extensively used OLS techniques.

I. Introduction

In many regions, tourism is an important component of the economic base. The tourist industry, however, tends to be a volatile industry. For example, Ghali (8) has shown that the rapid growth of income in Hawaii over the period 1953-1970, which resulted from tourism expansion, was accompanied by an increase in instability in Hawaii's economy. Hence accurate forecasts of tourism flows become particularly important for planning purposes.1

In this paper, we investigate a number of methodological problems often encountered in time series forecasts of tourism demand. We demonstrate that the precision of forecasts from simple economic models can be substantially increased over ordinary least squares (OLS) forecasts extensively employed in the past with the use of some new econometric tools which resolve the issue of functional form and which correct for the effects of substantial and changing patterns of multicollinearity. The relative efficiency of several forecast methodologies—specifically, OLS, generalized least squares (GLS), and ridge regression—are compared with alternative forecasts of U.S. visitor travel to Hawaii.

II. Model Specification

We assume that U.S. visitor demand for travel to Hawaii is described by equation (1):
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\[ VPC = f(RF, RPCY, VPC_{-1}) \]  \hspace{1cm} (1)

where:

- \( VPC \) = number of U.S. visitors to Hawaii as a proportion of the U.S. population
- \( RF \) = real airfare to Honolulu in constant 1972 dollars
- \( RPCY \) = U.S. real per capita income in constant 1972 dollars

The model is Spartan. The arguments were chosen in line with past studies of tourism demand and economic theory.\(^2\) The simplicity of the model is a virtue in forecasting as long as the predictive power of the model remains high. Substantial cost savings can be realized by not having to collect hard-to-obtain data required by more complex models.

Unfortunately, theory offers no suggestion regarding the appropriate functional form of the visitor demand equation. Previous authors have typically left the issue of appropriate functional form unresolved. Bechdolt (3), for example, estimated cross sectional demand functions for travel to Hawaii employing both linear and double log functional forms. No discussion of the relative merits of either specification or of the more general issue of the empirically appropriate functional form was included. Cline (4) assumed a linear specification in forecasting U.S. travel to the Pacific, while Mathematica (15) assumed a double log specification in estimating time series demand functions for U.S. travel to Hawaii. Gaudry and Wills (7), however, have shown that parameter estimates obtained from arbitrarily selected functional forms may produce unreliable forecasts.

The issue of appropriate functional form may be resolved empirically with an extended Box-Cox test. Consider the following specification of equation (1):

\[
\frac{VPC^\lambda - 1}{\lambda} = a_0 + a_1 \frac{RF^\lambda - 1}{\lambda} + a_2 \frac{RPCY^\lambda - 1}{\lambda} + a_3 \frac{VPC_{-1}^\lambda - 1}{\lambda} \]  \hspace{1cm} (2)

The extended Box-Cox test (21) allows the researcher to determine the empirically appropriate value of \( \lambda \). If \( \lambda = 1 \), the appropriate specification is linear. When \( \lambda = 0 \), the appropriate specification is double log. The limit as \( \lambda \rightarrow 0 \) is a double log specification so that the transformation is continuous around \( \lambda = 0 \).

\(^2\) For a summary of these previous studies, along with assessments of their forecasting ability, see Archer (1).

\(^3\) The only "price" variable in our model is the airfare to Hawaii. Ideally, an index of overall vacation costs should be used in lieu of airfares alone, since the latter comprise only one-third of the average trip cost to Hawaii. Unfortunately, data to construct such an index is unavailable. This is typical of nearly all tourist destinations. Only recently, the U.S. Travel Data Center began constructing an annual vacation cost index for U.S. travel. In our study, we did investigate alternative specifications that included airfares from either New York or San Francisco to London and the Bahamas in order to capture the potential influence of competing destinations. They did not improve forecast precision and were dropped from the specification.