Introduction to the Special Focus:

Tourism forecasting—New trends and issues¹

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Tourism forecasting is one of the longest-standing areas in tourism economics research, with over half a century of history already. The development of tourism forecasting research responds and contributes to the industry practice.

Accurate demand forecasts are the foundation of tourism related business decisions on pricing and operation strategies, and for governments on infrastructure investment and tourism policy making. In recent years, tourism forecasting has received more attention from industry practitioners. First, echoing the increasing numbers of international and domestic tourists, the tourism industry has continuously grown and become more dynamic. As a result, industry practitioners have hoped to understand the market and predict future trends more accurately and comprehensively. Second, in recent years, decision-makers have realised the increasing importance of quantitative evidence, and have become more likely to rely on or refer to it for their strategy and policy formulations. Finally, the development of big data based on Internet technology has made it possible for the industry to obtain more accurate forecasts. Data on online tourist behaviour can be traced and retrieved. With greater understanding of it, the industry can then use it to forecast future trends.

In line with industry needs, tourism forecasting has also received increasing interest from scholars. According to Li, Song and Witt (2005), there were over 420 studies on this topic published from 1960 to 2000. Song and Li (2008) later identified 119 studies on tourism demand modelling and forecasting published between 2000 and 2007. More recently Wu, Song and Shen (2017) reviewed 171 studies on tourism and hotel forecasting published between 2007 and 2015, and summarised some of the emerging

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topics and methods. Some traditional techniques have continued to attract researchers' attention due to their satisfactory forecasting performance. These have included autoregressive integrated moving average (ARIMA), exponential smooth and autoregressive distributed lagged (ADL) models and forecast combination techniques. At the same time, new trends, challenges and innovative methods have emerged in this area. A timely discussion of these issues is necessary and useful in guiding further development in this field, and has prompted this special issue edition. Eight studies are included in it, with diversified methods and perspectives for tourism forecasting. Together, they have shaped some future research directions for the field. A short summary of them appears below.

A study by Saayman and de Klerk introduces multivariate singular spectrum analysis (SSA) to forecast tourist arrivals in South Africa from five continents. SSA is a nonparametric forecasting technique that assumes a time series consisting of signal and noise components. Unlike traditional time series models that forecast both the signal and the noise, an SSA filters the noise and forecasts the signal alone. The advantage of this technique is that it has no assumptions for data-generating processes. Although there have been studies using the univariate SSA for tourism forecasting, this study by Saayman is the first to apply multivariate SSA to this field. The empirical evidence suggests that the proposed method outperforms the traditional univariate counterpart in generating more accurate tourism demand forecasts.

A study by Smeral identifies asymmetric tourist behaviour and shows that forecasting accuracy is improved when this asymmetric effect is factored into the modelling process. Unlike traditional demand models, Smeral bifurcates economic development into two stages: fast growth periods and slow growth periods. The two stages are treated separately in a tourism demand model. From this the author concludes that income elasticities vary over the two stages, whereas price elasticities do not change significantly. When taking account of the asymmetric effect in the modelling process, forecasting performance is improved. This finding encourages future research to take the nonlinear characteristics of tourism demand into account in tourism forecasting practices.

Three studies in this special issue apply big data to examine tourism forecasting performance. One is by Gunter, Önder and Gindl, in which two online data sources are adopted: Google Trends data and the 'LIKES' of Facebook posts of destination management organisations (DMOs). This study examines for the first time the predictive power of Facebook 'LIKES' for DMOs. Methodologically, both the ADL model and the mixed-data sampling (MIDAS) model are applied respectively, and three-time series models (naive, error-trend-seasonal and ARIMA) are used as benchmarks. Tourist arrivals in four Austrian cities are used for the empirical study, which has mixed results: benchmark models perform well for two cities; the ADL

model with two online data sources performs best for one city; and the MIDAS model with two online data sources performs best for one city. These results are not surprising in the forecasting field because it is common knowledge that the best performing model varies over different situations. This study partially supports the adoption of multiple sources of online data in forecasting practices.

Unlike most tourism forecasting studies that are based on a destination or source country/region's aggregate data, the study of Volchek, Liu, Song and Buhalis forecasts the number of visits to five museums in London using Google trend search data. The findings confirm that Google trend search data can improve forecasting power. When compared with the seasonal autoregressive moving average model augmented by Google trend search data (i.e. SARMAX), combined with the mixed-data sampling (MIDAS) technique (i.e. SARMAX-MIDAS), and artificial neural network (ANN) models, the ANN model was found to perform best. Unexpectedly, SARMAX-MIDAS could not outperform SARMAX. Applications of mixed frequency modelling techniques in tourism forecasting are still rare and further examination is encouraged.

Wen, Liu and Song propose a novel hybrid model that considers both linearity and nonlinearity in a tourism demand modelling process. Instead of adopting online search data directly, this study treats an online search index as an exogenous variable using principal component analysis. Two stages of modelling are designed with the first stage capturing linearity using the ARIMAX model, and the second stage capturing nonlinearity using an ANN technique. The residuals and one-step-ahead predictions from the first stage, search index and autoregressive items are set as inputs in the second. The findings show that the proposed hybrid model outperforms both the linear and nonlinear models. Thus, this study provides a new perspective for the construction of novel hybrid models when combining the advantages of different forecasting techniques.

Instead of combining two models, judgmental forecasting produces tourism forecasts by combining qualitative information, (i.e. experts' judgmental adjustments), and quantitative methods. The evidence suggests that the value of judgmental forecasting is its improved accuracy. In this study, Lin explores the relationship between the characteristics of a judgmental forecasting task, judgmental sources and forecasting performance. We learn that when quantitative models perform well, human interventions are unnecessary, and expert adjustments are more suited to situations in which there is a high level of variability in the tourism demand series. This study also finds that for improving forecasting accuracy, adjustments from industry practitioners are more valuable than input from academic researchers. Suggestions are provided for the application of judgmental forecasting in practice.

This special issue also includes two comprehensive literature reviews. Both discuss

tourism forecasting research developments with different emphases and perspectives.

Jiao and Chen review 72 studies published from 2008 to 2017 with the emphasis on methodological developments. Some important trends are observed. One is the combination forecasting technique that aims to produce a forecast by combining several forecasts derived from different single models. Empirical studies have shown that combined forecasting performance is superior to single models. Thus, a future research direction may be to explore new weighting schemes. Mixed frequency modelling techniques, which accommodate both low-frequency (e.g. tourism demand and macroeconomic variables) and high-frequency (e.g. online big data) variables are another new trend, confirmed by two studies (Gunter, et al.; Volchek, et al.) in this special issue. This review also calls attention to spatiotemporal regressions for tourism forecasting. Finally, both artificial intelligence models and hybrid models are growing in the tourism forecasting literature, as reflected in the study of Long et al. in this special issue.

The other review included in this special issue is by Liu, Liu and Wang. It applies the quantitative bibliometric visualisation technique to trace the evolution of tourism forecasting research and identify hot research topics and trends. This study is the first to apply the bibliometric technique to tourism forecasting reviews. The advantage of this technique is its ability to easily handle a large volume of articles and examine their characteristics, including keywords, authors and their cooperation networks and citations. This review has the widest coverage of the tourism forecasting literature, with 543 articles published over nearly half a century (1972-2018). The results provide new perspectives to understanding long-term research developments in the field. Four phases are identified, with the most recent phase (2008-2018) experiencing the fastest growth in terms of the number of publications. This review reveals the continuously increasing interest in tourism forecasting research. Key contributors, in terms of the nations, institutions and individuals are recognised. Moreover, the analysis, based on keywords, identifies the hot research topics and trends in the field, including machine learning, big data and search engine data-based research methods.

In summary, the articles included in this special issue contribute to the tourism forecasting field from different perspectives. They adopt innovative, state-of-the-art forecasting techniques, apply online tourist behaviour data, take account of asymmetric tourist behaviours, move from destination-level demand forecasting to attraction site visit forecasting, integrate judgmental forecasting with statistical forecasting, and conduct thorough reviews on research developments. We hope this special issue will inspire further research endeavours in this exciting field. Given the increasingly dynamic and even turbulent global tourism industry, tourism forecasters are facing greater challenges. However, they also have more opportunities for methodological

innovation and research development. We believe these will not only benefit the effective decision making of businesses and governments, but also foster long-term societal development.

References

- Li G, Song H and Witt SF (2005) Recent developments in econometric modeling and forecasting. *Journal of Travel Research* 44(1): 82–99.
- Song H and Li G (2008) Tourism demand modelling and forecasting—A review of recent research. *Tourism Management* 29(2): 203–220.
- Wu DC, Song H and Shen S (2017) New developments in tourism and hotel demand modeling and forecasting. *International Journal of Contemporary Hospitality Management* 29(1): 507–529.

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