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# Construction of tourism cycle indicator: a signalling tool for tourism market dynamics

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The composite leading indicators approach has been popularised in general business and property forecasting extensively, but only rarely in a tourism framework. By utilising the National Bureau of Economic Research (NBER) approach in the construction of a tourism cycle indicator (TCI) for Maldives, a significant signalling attribute regarding international tourists arrivals (TA) to Maldives can be determined. This study spanned approximately two decades of data (2000-2017). Both logarithm forms of TCI and TA with seasonal adjustment are detrended by Hodrick-Prescott (HP) filter. Turning points are detected using Bry-Boschan (BB) dating algorithm. This study explored the possibility of a TCI to capture the information needed for policy planning, risk monitoring and community development. Empirical findings highlighted that the forecasting ability of TCI is vital in reducing crisis burden and should be considered by Maldivians policymakers and tourism industry players.

**keywords:** tourism forecasting, leading indicator approach, near-term forecasting, turning point chronology

## 1 Introduction

Tourism can play a crucial role in a country as an evolving and dynamic industry. This is due to the potential of the tourism industry in creating a potential multiplier effect

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in the realms of foreign exchange, the import and export of goods and services, employment opportunities, and other industries such as telecommunications, transportation, construction, and hospitality. Therefore, tourism should be enhanced to ensure the continuous growth of the economy in tourism-oriented countries. However, a high level of political risk can contribute to a significant decline in a country's tourism business (Saha and Yap, 2014). Tourism-enhancing policies may be beneficial to the general economy of many countries during periods of economic downturn. Thus, a tourism-led growth hypothesis suggests that the tourism industry could play a strategic role as a stimulus for economic recovery (Shahzad et al., 2017). By utilising the leading indicators approach, appropriate policies can be implemented accordingly during both economic boom and recession. Augustin and Liaw (2017) emphasised the importance of decision-making at the macro level as a mandatory role for tourist activities that are increasing around the globe. By embracing leading indicators, which are world indicators or national economic indicators, this concern can be brought to the attention of a nation's policymakers, investors, business players, and the community.

Currently, the most dynamic sector of the Maldives development structure pertains to tourism receipts. The economic profile of the Maldives has evolved to that of a middle-income country, spurred by the rapid growth of its tourism sector. Thus, the Maldives is regarded as one of the tourism-dependent countries; the total contribution of tourism to its GDP grew from 44.5 percent in 1995 to 79.4 percent in 2016, approximately USD 2,647.0 million (Travel and Council, 2017). The tourism industry registered considerable growth and contributed 78,500 jobs, which is 43.6 percent of the total employment in the Maldives. This proves that the economy is mostly based on tourism development strategies.

The Maldives islands are well-known as "strings of pearls scattered across the Indian Ocean" and have been honoured as a premium tourism destination (Scheyvens, 2011). However, this industry is constantly plagued by unexpected crises such as terrorism, tsunamis, and the outbreak of severe acute respiratory syndrome (SARS). The 2014 tsunami in Sri Lanka negatively affected the Maldives, located in the Indian Ocean. Raddatz (2007) emphasised that disaster shocks can have a severe impact on GDP. On the contrary, Skidmore and Toya (2002) argued that there is also a potential for growth rate after disaster events. The hypothetical perspective is that this growth is due to the accumulation of capital stock, human capital and technology capacity improvement. Apart from that, tourism demand is extremely vulnerable to the economic, social, and political changes in either the tourists' destination or origin countries (Kulendran and Wong, 2009). The expansion and recession of tourism leads to the issue of effective resources allocation. The Maldives consist of 1,190 coral islands where the amazing marine environment and beaches are the main tourist attractions. However, the Maldives is a small developing country with communities widely dispersed throughout the islands. It is unfortunate that the Maldives' development has been constrained by limited skilled human capital. This has hampered the growth of a tourism industry that could make a great contribution to the gross domestic product (GDP). This underlines the need to conduct research on an industry monitoring tool for the Maldives, which is seeing overwhelming demand as a global tourist destination. To pursue this goal, accurate

detection of turning points with parsimonious leading economic indicators is required for risk monitoring.

The principal objective of this study is to construct a tourism cycle indicator (TCI) that acts as a prior signalling tool for the Maldivian tourism industry by employing the traditional NBER indicator approach. Nonetheless, the significances of this paper are threefold. First and foremost, previous relevant tourism literature tended to concentrate on forecasting tourism demand rather than constructing a tourism cycle indicator to predict the cyclical movement with magnitude. The current study fills the literature gap by demonstrating the predictive ability of TCI on the fluctuation in numbers of international tourist arrivals. Secondly, this study is the first study that utilizes the NBER indicator approach for comparative analysis for both cycles in the tourism context. Thirdly, this constructed signalling tool can efficiently reduce the crisis burden and the possible detrimental effects on the nation.

## 2 Literature Review

As a matter of planning and investment, prior awareness of the beginning or end of the turning points are essential for decision-making of the government and other tourism industry players. Turner et al. (1997) and Cho (2001) emphasised the importance of turning points in forecasting and utilising influential economic or national indicators for tourism demand, such as income of origin country, exchange rate, and relative price. Rosselló-Nadal (2001) proposed that time series models, such as autoregressive integrated moving average models (ARIMA) and naïve process, be used in turning-point prediction. Kulendran and Wong (2009) also accessed the foretelling performance of single-input leading-indicator model and no-change model. They also stressed that the leading indicator approach is assigned as a measurement without theory, but the clues are applicable to the selection of variables via economic theory. Following the research done by Kulendran and Wong (2011) and Tang and Kulendran (2011), the researchers further study the validity of the constructed composite leading indicator on Hong Kong tourism demand that outperformed the existing OECDCLI. Findings also revealed the significant causality between economic indicators and the tourism demand growth rate, such as real oil price, tourist real income, and share price index. Similar forecasting research by Kulendran and Witt (2003) utilised transfer function (TF) models, and Chang et al. (2014) investigated the suitable variables for producing a useful tool that provide insights for policy decision-makers. More recent studies such as that of Mendola and Volo (2017) stressed that composite indicators are effective tools to synthesize multidimensional phenomena in tourism. Up to recent study, Soh et al. (2019) also investigated the important role of the tourism cycle forecasting using a Markov-regime switching model. Given the importance of predicting the fluctuation of visitor arrivals, coupled with inadequacy of relevant research in the tourism context, it is evident that more comprehensive research with convincing results is needed.

Apart from the tourism context, leading indicators have been widely employed in the business, property and financial sector for forecasting purposes and proved to be of great

efficacy. The research carried out by Altissimo et al. (2000), Seip and McNown (2007), Heij et al. (2011), and Levanon et al. (2015) frequently focused on the business cycle indicator by employing the composite leading indicator approach. Furthermore, Tule et al. (2016) and Tang et al. (2017) implemented the Organisation of Economic Co-operation and Development (OECD) system and the OECD composite indicators in conducting their research on forecasting the unemployment and hotel occupancies rate. In principle, Abu Mansor et al. (2015) and Puah et al. (2016b) captured the information content behind the business cycle using an indicator-based forecasting tool that is popularised as a tool for economic risk monitoring. Furthermore, Arip et al. (2019) developed a financial forecasting tool with an indicator-based approach and proven that it is useful in policy response formulation. Concurrently, there has been a growing consensus on using the well-established National Bureau of Economic Research (NBER) approach, developed by Puah et al. (2016a) and Voon et al. (2016) for property market forecasting, followed by Chong et al. (2018) for oil price forecasting. Recent findings regarding the use of the well-established NBER indicator approach in near-term forecasting have produced convincing results, specifically in the business and property fields. Despite this, scant progress has been made in using the technique in the tourism context. Since the tourism industry serves as the primary engine for the nation's growth, the importance of forecasting the tourism market using the composite leading indicator approach is obvious.

## 3 Methodology

Burns and Mitchell (1946) pioneered and extended classical business cycle analysis to generate leading indicators based on the conceptual framework developed by the National Bureau of Economic Research (NBER). The traditional approach was further developed into a more advanced approach that was dedicated to the measurement of the expansion and contraction length or the fluctuation amplitude. In general, the business cycle indicates the co-movement of several kinds of economic activity in a cycle (Stock and Watson, 1989). The extension of this approach can provide potential insights for a country and act as an economic stabiliser. As set out in this framework, it can be further extended into the construction of a tourism composite indicator in the Maldives. These leading indicators thus become more useful in predicting the tourism cycle.

As indicated in Board (2001), there are five distinct procedures involved in formulating the tourism cycle indicators (TCI). The steps are listed in the following section:

$$L(\lambda_{ij}, \gamma_{ij}) = \prod_{k-1}^{m} \frac{{\lambda_{ij}}^{\gamma_{ij}}}{\lceil \gamma_{ij}} {t_k}^{\gamma_{ij}-1} \exp(-\lambda_{ij} t_k) \tag{1}$$

1. Compute month-to-month changes ($y_{i,t}$) for respective component ($X_{i,t}$), where $i = 1, \ldots\ldots, n$. Simple arithmetic differences are computed as:

$$y_{i,t} = X_{i,t} - X_{i,t-1} \tag{2}$$

For all the alternative conditions, a formulation of symmetric percent change is utilized as:

$$y_{i,t}= 200*\frac{(X_{i,t}-X_{i,t-1})}{(X_{i,t}+X_{i,t-1})} \tag{3}$$

1. Adjustment of the month-to-month changes for each component series by multiplying each particular of them by the standardization factor of the component ($k_i$). Monthly contributions of each component series can be obtained via this step:

$$Z_{i,t} = (k_i) * (y_{i,t}) \tag{4}$$

2. Summation of the adjusted month-to-month changes by including all the component series for each month. The adjusted contribution can be achieved resulting from the summation step:

$$S_t = \sum_{i=1}^{n} Z_{i,t} \tag{5}$$

3. Application of the symmetric percent change formula to compute the index in preliminary levels. The initial value of the index for first month is denoted as $I_1 = 100$ and the subsequent month will be interpreted as:

$$I_2 = 100 * \frac{(200 + S_2)}{(200 - S_2)} \tag{6}$$

4. Thus, the preliminary index value for the following month will be:

$$I_3= 100*\frac{(200+S_2)}{(200-S_2)}*\frac{(200+S_3)}{(200-S_3)} \tag{7}$$

5. Rebase the preliminary index of TCI into the base year. The preliminary indexes computed in Step (5) are multiplied by 100, and followed by the division of the preliminary levels mean in the base year.

Anchored to Moore and Zarnowitz (1986), the TCI for the Maldives will be modelled using the growth cycle approach as the reference chronology of the tourism cycle, which is postulated to emulate the features of the business cycle. The procedure started with the seasonal adjustment through Census X-12-ARIMA to eliminate the seasonal factor. Then, to obtain the cyclical movement of the TCI, the Hodrick-Prescott (HP) filter is chosen to detrend the seasonally adjusted time-series. Hodrick and Prescott (1997) proposed that the HP filter is a two-sided linear filter that provides a smoother trend $s_t$ of $y_t$ by minimising the variance of $y_t$ around $s_t$. Therefore, the filter determines $s_t$ to minimise:

$$\sum_{t=1}^{T} (y_t-s_t)^2+\lambda \sum_{t=2}^{T-1} (s_{t+1}-2s_t-s_{t-1})^2 \tag{8}$$

In this aspect of the study, a similar routine of cycle extraction was then employed on the reference cycle presented by the TCI. Predictive ability could be visualised by standardising both cyclical processes, and the cycles were further subjected to turning point analysis via the Bry and Boschan (1971) technique. It is deployed to outline two economic phases, contractions and expansions, during the period of a cycle. Seasonal adjustment is needed for each indicator in the time series as an initial step for turning-point determination. This turning-point determination technique is a non-parametric approach and an easily implemented algorithm to identify the local maximum and minimum turning points in the series path. This technique outperforms the other turning-point dating algorithm due to the treatment of additional new observations and outliers. Hence, the role of predicting for comparative analysis relies on its predictive power with accurate signalling proportion.

## 4 Data Descriptions

An assortment of world indicators, macroeconomics, and financial market variables that possess the leading characteristics were selected for inclusion for the sake of TCI construction. In this study, the selection of component series is facilitated by the correlation analysis, as the convincing result was successfully proven by Abu Mansor et al. (2015). To ensure the ability of TCI to track the tourism cycle satisfactorily, series that have high correlation with the reference series are adopted in this study. This is due to their ability to portray the significant interrelationship with the reference series, and thus the ability to act as an early warning signal for the tourism market. After the screening and filtering process, the series with significant predictive behaviour are embraced as component series: political stability index (PSI) acts as the aggregate perceptions on the tendency of political instability, including terrorism and violence; foreign direct investment (FDI) indicates the capital inflow or outflow for the host country; visitor exports (VE) portrays the total inbound tourism expenditure and reservation services accessed by potential tourists (RMF, 2008); Europe Brent Spot Price FOB (BRENT) acts as a proxy for travel cost; effective federal funds rate (EFFR) reflects the market expectations and mirror the movements of appreciation or depreciation of rufiyaa (Authority, 2017); and the Shanghai Stock Exchange Composite Index (SHCOMP) is regarded as a proxy variable for financial performance of tourists since its major tourism markets from China encompassed approximately 30 percent of overall arrivals.

Concurrently, appropriate selection of reference series is consistent with the common practice in tourism forecasting literature. Andraz and Rodrigues (2016) utilised international tourist arrivals (TA) to monitor the tourism flow in their study. Steyn and Jansen van Vuuren (2016) also emphasised that TA is potentially established as a valuable contributor to the gross domestic product and foreign currency reserves of the nation. Thus, TA is in fact a good proxy for receipts, which validates the extrapolation of the Maldives tourism demand. To acquire series with higher frequency, the interpolation technique proposed by Chow et al. (1971) is employed for higher accuracy.

This study draws upon almost two decades of data, from January 2000 through to

December 2017, to forecast the tourism market dynamics in the Maldives. The data were attained from various sources such as the World Travel and Tourism Council (WTTC), U.S. Energy Information Administration (EIA), and CEIC Database.

## 5 Empirical Results and Discussion

The graphical illustration of the comparative analysis between the cyclical process of TCI and TA is portrayed in Figure 1. TCI demonstrates the combination of alternative component series to trace the movement of TA, as TCI has consistently been linked with the signalling effect on TA. From visual inspection, the major transitions of TCI from one turning point to another also signalled the approaching shift of TA. Another significant aspect of the empirical evidence is that the constructed TCI can trace the general movement of the tourism market in the Maldives precisely, in a well-timed manner. Moreover, the shaded area visualised the critical episodes for the economy; it is clearly shown that turning points of TCI constantly move a few months earlier than the turning points of TA.

Specifically, the well-dated turning points correctly predicted the actual scenario of the Maldives economy between 2000 and 2017. As a luxury tourism destination, world crises and the political instability of the host country do influence the travelling behaviour and decision-making of potential tourists. Jovicic (2014) also emphasized the importance of globe support from broad political to ensure the sustainable tourism development. The slump revealed that there exist events leading to the spill-over effect on international tourism arrivals in the Maldives. The recurrent of oil price hikes led to inflation in production and transportation costs, which most affected the tourism sector when the oil price escalated to an average of USD $70 per barrel during 2006.

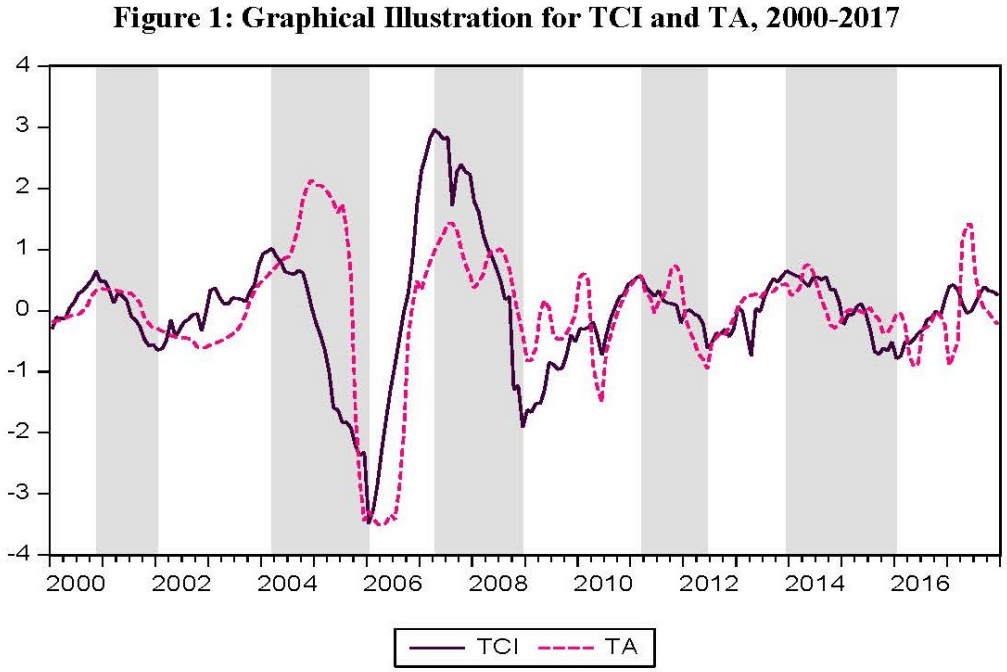


Figure 1: Graphical Illustration for TCI and TA, 2000-2017

During the year 2008, the sub-prime mortgage crisis in the United States illustrated a symbolic effect on Maldives tourism, as it led to sudden withdrawal of foreign direct investment capital. The demand for commodities also declined as the purchasing power of consumers lessened. During the economic crisis, the income effect drastically affected tourism demand. When the purchasing power is lower, the willingness to spend on a luxury tourism destination is also correspondingly lower. The evidence discussed thus supports the idea that the Maldivian tourism sector did undergo a recession during that crisis period.

Nevertheless, the instability of Maldivian politics from 2012 up to recent years has triggered fear and worry in the potential tourist market that has been a main source of national income. Specifically, the Maldivian political turmoil during 2011 and 2012 mainly arose due to the increase of commodity prices and poor economic conditions, thus causing a decline in tourist arrivals. The foreign currency earning was negatively affected after the dramatic presidential crisis in the Maldives. Travellers expect an atmosphere of total relaxation in the Maldives, but the country's atmosphere of political instability made them feel uneasy and anxious about entering the country, let alone travelling within it. Restoration of political stability is vital to promote tourism growth in the Maldives.

| **Cycle Condition** | **TCI** | **TA** | **Amount of Early Signals** | **Important Events** |
|---|---|---|---|---|
| **Peak** | 2000M11 | 2000M12 | 1 month | Maldives Election Crisis<br>U.S. Technology Bubble |
| **Trough** | 2002M01 | 2002M11 | 10 months | |
| **Peak** | 2004M03 | 2004M12 | 9 months | Recurrent of Oil Price Hikes<br>Tsunami |
| **Trough** | 2006M01 | 2006M04 | 3 months | |
| **Peak** | 2007M04 | 2007M07 | 3 months | Sub-prime Mortgage Crisis |
| **Trough** | 2008M12 | 2009M01 | 1 month | |
| **Peak** | 2011M03 | 2011M11 | 8 months | Constitutional Crisis |
| **Trough** | 2012M06 | 2012M06 | Coincident | |
| **Peak** | 2013M12 | 2014M05 | 5 months | Government Crack-down |
| **Trough** | 2016M01 | 2016M05 | 4 months | |
| **Average** | | | **4.4 months** | |

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|---|---|---|---|---|
| **Peak** | 2000M11 | 2000M12 | 1 month | • Maldives Election Crisis |
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| **Trough** | 2006M01 | 2006M04 | 3 months | • Tsunami |
| **Peak** | 2007M04 | 2007M07 | 3 months | • Sub-prime Mortgage Crisis |
| **Trough** | 2008M12 | 2009M01 | 1 month | |
| **Peak** | 2011M03 | 2011M11 | 8 months | • Constitutional Crisis |
| **Trough** | 2012M06 | 2012M06 | Coincident | |
| **Peak** | 2013M12 | 2014M05 | 5 months | • Government Crackdown |
| **Trough** | 2016M01 | 2016M05 | 4 months | |
| | **Average** | | **4.4 months** | |

Figure 2: Summary of Turning Points Analysis for TCI versus TA

In this context, the traced peaks and troughs from the turning-point analysis with the Bry and Boschan (BB) algorithm, portrayed in Table 1, are moderately consistent with the referenced chronological events of the Maldives tourism profile. The clusters of peaks and troughs formed by the series are computed to obtain the average amount of signalling. A prominent lead time of 4.4 months on average with 10 eventful turning points were dated successfully by TCI. The remarkable lead times, coupled with the precise turning-points detection, contributed to an efficacious TCI as it is not only limited to precedent episodes, but also to the attentive application for an imminent crisis. Ooi et al. (2013) argued that the tourism demand might rarely affected by tourism crises event but rather gained positive impacts after recovery.

## 6 Empirical Results and Discussion

To date, scant evidence has been found that link leading indicators and the tourism industry. Thus, a TCI with a noteworthy leading characteristic is constructed to speculate on the dynamic tourism market in the Maldives. The constructed TCI can be beneficial for the community, policy-makers, Maldivian government, investors, and business players from the public and private sector to account for a broader viewpoint of the tourism industry. This pragmatic tool also enables them to prepare multiple precautionary steps to reduce the burden of crisis and the detrimental impacts. Although this application of the NBER indicator approach in the tourism context is appealing, further exploration is recommended to construct TCIs for other countries. It could be both meaningful and interesting for a dynamic tourism market with an indicator-based framework. Furthermore, the empirical outcomes can be effectively utilised for tourism-enhancing policies in the Maldives. The common crisis activators for this study stem mainly from political

instability, which is stressful to tourism planning and development. As suggested, a possible solution through the practice of crisis management may aid in preparing the Maldives against an ambiguous future and unexpected instability. Investors, as well as tourists, are interested in good governance as this may trigger return on their investments. Additionally, sustained continual growth in tourists should be supported via economic growth and favourable political environment (Tolkach et al., 2016). With proper monitoring, better prospects of good governance and increased foreign earnings could offer resilient economic growth for the country.

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