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THE ROLE OF SUSTAINABLE COMPETITIVENESS INDICATOR IN MALAYSIAN TOURISM AND ECONOMIC GROWTH

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Abstract:

This paper proposes a sustainable competitiveness indicator for the state of tourism vulnerability in the Malaysian tourism market. Further investigation has also been done on the time-frequency and lead-lag relationship of the indicator with tourism development and economic growth. The resultant indicator is consisted of 12 variables, identified based on the pillars of sustainability and competitiveness to extract a common vulnerability component using a dynamic approximate factor model. The model's accuracy rate was at a promising 92% based on the variable importance assessment using random forest algorithms. Through the implementation of bivariate wavelet coherence analysis, the empirical results indicated that the constructed indicator has a positive leading role in Malaysian tourism development and economic growth. This indicator can be embedded within an early warning system to signify vulnerabilities in the Malaysian tourism market.

Key words: *Competitiveness, sustainable development, sustainable competitiveness, tourism growth, indicator*

1. Introduction

Malaysia is one of the developing countries that have successfully converted and utilized its natural resources to transform the nation's economy for a long-term sustainable growth according to World Bank (2013). A sustainable economy strengthens a nation's competitive position in the global marketplace and affects its international reputation. This is highly beneficial for the tourism industry, which itself is a fast-changing and competitive industry that requires constant innovation and evolution. According to Ritchie and Crouch

(2003), many existing tourism destinations are already heading towards the path to be sustainable competitiveness. However, the dimensions of sustainable competitiveness are complex and unlikely to remain constant over time. Many key factors may need to be considered simultaneously on both micro and macro scales with constant involvement of the stakeholders.

Malaysia's economic growth is dependent on exports and the growing tertiary sectors such as tourism. This has put the economy in a vulnerable position, susceptible to external shocks such as regional and global financial crises, societal crises, and health-related crises like the Coronavirus pandemic. According to the Department of Statistics Malaysia, the Gross Value Added of Tourism Industries (GVATI) is about 14.1% to the nation's GDP (2019: 15.9%). Realizing that the tourism is a fragile industry, the Malaysian government has developed policy schemes to ensure that the tourism sector remains competitive. This includes the development and innovation of value-added tourism products to increase the sector's attractiveness. Nevertheless, these products require the stakeholders including the government, the businesses, and the local community to sustain its attractiveness. In addition, these stakeholders also play a crucial role in providing feedback on the strengths and weaknesses of the products within the context of their tourism business to measure its competitiveness for better future planning and improvement.

Despite the overwhelming arrivals of tourists in some tourism destinations, a lack of proper planning and effective management may lead to an unstable and unsustainable tourism market performance. This diminishes the attractiveness of a nation's tourism destinations while benefiting the competitors. Therefore, this study intends to introduce a sustainable approach to destination competitiveness through the construction of a tourism sustainable competitiveness indicator (TSCI) to monitor the sector's vulnerability. This can serve as a reliable reference to better policy-making and implementation arisen from a more informed decision-making process.

2. Literature Review

The discussion on destination competitiveness is a notable one (Nadalipour et al., 2019) whereby several models have been developed by different researchers. Ritchie and Crouch (2003) developed a comprehensive model of destination competitiveness with five categories of elements, i.e., destination policy planning and development; destination management; core resources and attractiveness; supporting determinants and resources; and determinants of lessening and flourishing the competitiveness. Some models such as the ones developed by Dwyer and Kim (2003) and Ritchie and Crouch (2003) solely focus on the creation of competitiveness and the characteristics of destination.

The anchor to sustainable competitiveness is the theory of competitive advantage developed initially as a theory on economics by Porter (1990). This theory has been extended to the system of determinants, so-called "diamonds", which encompasses the factorial determinants; the demand; the upstream and downstream industries; the domestic competitiveness; and the government policy. Porter (1990) emphasized that the advanced factors (i.e., informatic infrastructure, high-skilled labour, and research institutes) are built on top of the primary factors (i.e., natural resources, climate, and geographical positions).

Barney (1991) pioneered the concept of sustainable competitive advantage to determine the important role of resources in creating values for the consumers. Krainjenbrink et al. (2010) affirmed that sustainability cannot be achieved solely from owning the resources. Nevertheless, the theoretical development of the multidimensional concept of competitiveness and sustainability has remained independent from each other thus far, especially in the tourism context. Thus, the intention of this paper is to fill the literature gap in understanding the interlocking relationship between competitiveness and sustainability.

Destination competitiveness and sustainable development

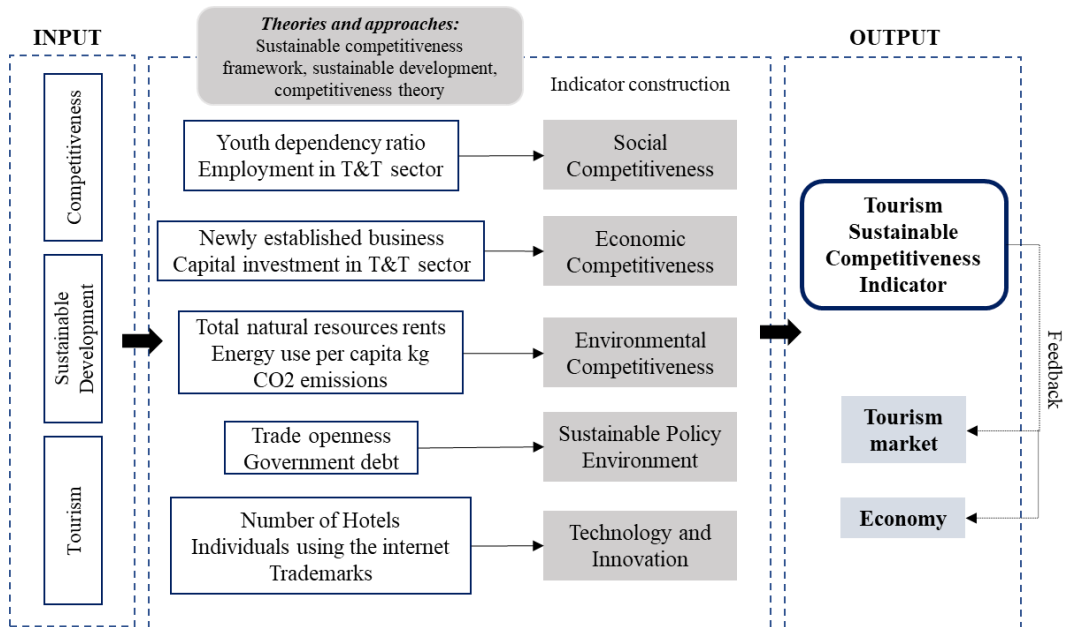
The constant evolution of the sustainable development concept simply means that there is no standard definition (Nadalipour et al., 2019) although all definitions eventually strive for sustainable long-term growth. Rather than merely fulfil short-term needs, a sustainable approach ensures that the local needs are constantly fulfilled despite a changing environment. Generally, sustainable development covers the economic development, the social progress, and the environmental responsibility. McKercher (1993) believes that sustainability should consider both economy and environment for a meaningful outcome.

Blanke et al. (2011) introduced the framework of Sustainable Competitiveness Index that has five pillars including human capital; market conditions; technology and innovation; policy environment and enabling conditions; and physical environment. Alongside the main five pillars are 17 sub-pillars and 133 indicators. However, within the context of destination competitiveness, the role of sustainability has largely been ignored albeit the useful insights present in previous studies (Cucculelli & Goffi, 2016). In this paper, the methodology proposed to construct the index differs from traditional index construction to increase the comprehensiveness and validity of the results.

3. Research Method

The selected indicators in this study adheres to the indicator selection criteria used by the United Nations Statistical Commission (Sachs et al., 2020). This means that the selected indicators are quantifiable to measure the sustainable competitiveness of the Malaysian tourism. Drawing inspiration from the works of Sachs et al. (2020), the indicators have been selected in such a manner to ensure that they are relevant to the concept of study; statistically adequate; always up-to-date and published on a reasonably prompt schedule; derived from reliable sources; and are constructed from data that are consistent and appropriate to the proposed framework. The challenge is in eliminating irrelevant features. Despite the usefulness of regularised regression methods such as principal component analysis or partial least squares regression on high dimensional data, the elimination of irrelevant features remains uncertain (Menze et al., 2009). Following the study done by Breiman (2001) and Gromping (2009) using random forests on the data treatment with high dimensional data, the default method to compute variable importance through Python's sklearn has been proposed in this study. The random forest classifier with its associated mechanism such as Gini importance of mean decrease in impurity (MDI) allows for an explicit feature elimination.

Figure 1 shows the above-mentioned research framework, designed to quantify the sustainable competitiveness of the Malaysian tourism and its impact to the economy. Since Nadalipour et al. (2019) suggested that the inclusion of sustainability factors can gradually improve competitiveness, this research framework has incorporated the pillars of social competitiveness, economic competitiveness, environmental competitiveness, sustainable policy environment, and technology and innovation for the construction of Tourism Sustainable Competitiveness Indicator (TSCI).



Source: own elaboration.

Figure 1. Tourism Sustainable Competitiveness Framework

The accuracy of the forecast using the random forest prediction model with International Tourist Arrivals defined as the dependent variable was performed based on the calculation proposed by Hyndman (2014). The calculation of absolute error is done by finding the difference between actual and forecast value. The root mean square error, percentage of error and lastly, the percentage of accuracy was also calculated. After that, the approach of van Roye (2014) and Kuek et al. (2021) was referred to construct the indicator in a state space form using the dynamic approximate factor model (DAFM).

$$s_t = \Delta TSCI_t + e_t, \quad \text{where } e_t \sim iid N(0, c) \quad (1)$$

where s_t expresses a stationary independent variable of tourism-related data, financial and macroeconomic data, environmental data as well as technological readiness data in vector form, $\Delta TSCI_t$ denotes the single common latent factor while the factor loadings of each data series in the vector form of $n \times 1$ is represented by Δ , e_t symbolises the underlying components in the similar vector form.

Subsequently, the application of Soh et al. (2021) has been adopted to apply the wavelet approach in identifying the lead-lag relationship among the studied variables using

R language. A “biwavelet” package using pseudocode, written by Percival and Walden (2000), has been implemented to illustrate the wavelet coherence maps. Within the bivariate framework, the wavelet coherence between two selected time series is expressed as

$$W_{xy}(\tau, u) = W_x(\tau, u)W_y^*(\tau, u) \quad (2)$$

The arrow sign in coherence maps is illustrated in the form of a contour plot, which is used to identify the lead-lag relationship among the examined time series. The monthly data that spanned from 2000M01 through 2020M12 were obtained from reliable sources including the World Travel and Tourism Council (WTTC) for tourism-specific data; CEIC database for financial and macroeconomic data; Our World in Data (OWID) for environmental data; and International Telecommunication Union (ITU) for technological readiness data, as stated in Table 1.

Table 1. Data Source

Indicator	Source
Youth Dependency Ratio	CEIC
New Business (newly establishment registered)	CEIC
Number of Hotels Accommodations	CEIC
Trademarks	CEIC
Government Debt	CEIC
Trade Openness	CEIC
Total Natural Resources Rents (% of GDP)	CEIC
Individuals using the Internet (% of population)	ITU
Energy Use per Capita Kilograms	OWID
CO2 Emissions	OWID
Employment in T&T Sector	WTTC
Capital Investments in T&T Sector (% exports)	WTTC

4. Results and Discussions

In accordance with the Sustainable Competitiveness Index conceptual framework which has been theoretically tested on previous works and the criteria selection endorsed by the UN Statistical Commission, twelve variables were identified through the implementation of variable importance assessment using the random forest algorithm (Breiman, 2001). The prediction model developed had been subjected to dimension reduction, cross validation and model optimization. Table 2 demonstrates the ranked results of variable importance using random forest algorithm with the International Tourist Arrivals (TA) to Malaysia set as the dependent variable in the prediction model. International tourist arrivals serve as a crucial indicator within the tourism sector, offering insights into the influx of visitors to a destination and providing valuable data on Malaysia’s tourism performance. Furthermore, the quantity of international tourist arrivals directly impacts various economic sectors, including hospitality, transportation, and local enterprises, thereby influencing overall economic dynamics related to tourism. Hence, the choice of "international tourist

arrivals" as the dependent variable is warranted due to its pivotal role in assessing the success and vigor of the tourism industry. The values were calculated based on the sum of 100 to allow easier interpretation.

As outlined in Table 2, new business was the topmost important contributor to the Malaysian tourism from the sustainable competitiveness perspective. Globalisation has resulted in interdependence among businesses and trade (Etemad et al., 2001). This encourages businesses to further develop new business, open new markets, adapt to the fast-changing technological progress, and seize the advantage of falling trade barriers. These have certainly increased the competitiveness of a nation albeit a persistent difficulty to improve business competitiveness due to global threats. This finding is consistent with Nepal et al. (2019) and Gani and Clemes (2021) who emphasized that a conducive business environment encourages more international business travellers visiting the destination and creating a positive impact to the tourism industry. To remain competitive, other aspects such as human capital and innovation capital must be taken into consideration. Contrary to the previous study conducted by Qinfen (2017), which focused on female labor participation as a significant factor for economic development, this paper proposes employment in the travel and tourism sector, irrespective of gender, to ensure the sustainable competitiveness of the tourism industry.

In fact, trademarks have been identified as the third most important variable. This is expected since a trademark solidifies the identity of a business and in many instances, leads to increased profit margin (Mokina, 2014). Therefore, the key to a flourishing tourism sector at the global arena is the existence of outstanding trademarks that attracts international tourist arrivals. However, instead of using trademarks which specific to intellectual property rights and brand protection, other studies (Gooroochurn & Sugiyarto, 2005; Azqueta-Gavaldón, 2017) considered international openness which pertains to broader aspects of global engagement and interaction. While trademark and international openness are distinct concepts, they do share a similarity in that they both play roles in facilitating and regulating international commerce. In essence, both trademarks and international openness contribute to the facilitation and regulation of international trade, supporting businesses in their efforts to engage with global markets and consumers.

Consistent with the findings of Wong (2017), the macro environment of the tourism destination can globally influence the travel behaviour of tourists. The forces of macro environment require in-time adjustment to ensure the nation remain its competitiveness. Government debt management, fiscal and monetary policies can reinforce each other through information sharing of the government's current liquidity needs. Horng et al. (2023) emphasized that information sharing have positive moderating effects on strengthening the changes in critical attributes during the process in obtaining competitive advantage. Khalid (2020) pointed out that, although the domestic debt crisis encourages international tourist arrivals, it impacts the quality of the services provided to the tourists. As such, debt management is crucial in ensuring that the country can remain competitive in a sustainable manner. Činčikaitė and Meidutė-Kavaliauskienė (2022) argued that economic, social, environment and urban governance are four components which are important to be considered for sustainable development. Similar to the previous study, this paper has also

included the government debt as one of the important indicator in ensuring the sustainable development of Malaysian economy.

On the other hand, the efforts poured into conserving the environment at the tourism destinations also plays a significant role in ensuring sustainable competitiveness (Ritchie & Crouch, 2003; Wong, 2017; Nadalipour et al., 2019). This is evident since the energy used per capital kilograms, total natural resource rents, and carbon dioxide emissions have ranked the fifth, seventh, and ninth most important variable, respectively. Environmental competitiveness is related to the management of natural resources (Kukushkina et al., 2022). It indicates the ability of the economic systems to efficiently allocate the resources in a sustainable and prudent way. This is also to ensure that the favorable ecosystem can be sustain for the future generations. As highlighted by SolAbility (2022), the essence of environmental competitiveness includes the components of natural capital and resource intensity.

Table 2. Ranked of Variable Importance using Random Forest Algorithm

Feature	Importance (RF)	Importance (sum=100)
New Business	0.128	30.993
Individuals Using the Internet	0.067	16.223
Trademarks	0.061	14.770
Youth Dependency Ratio	0.054	13.075
Energy Use per Capita Kilograms	0.023	5.569
Number of Hotels Accommodations	0.017	4.116
Total Natural Resources Rents	0.015	3.632
Government Debt	0.014	3.390
CO2 Emissions	0.012	2.906
Employment in T&T Sector	0.011	2.663
Trade Openness	0.010	2.421
Capital Investments in T&T Sector	0.001	0.242

Wong (2017) emphasized the importance of infrastructure towards tourism development in Malaysia. From the findings of variable importance assessment, the number of hotel accommodation was the sixth most important variable while capital investment in travel and tourism sector ranked the twelfth. Tourism infrastructure is the key element of tourism development in a tourism destination. Since the tourism industry contributes more than 10% to the nation's GDP, it is clearly important that proper and adequate infrastructure is provided at tourism destinations. This finding is consistent with studies by Nonthapot (2017) and Jeje (2021), which emphasize the importance of capital investment in promoting the competitiveness of the tourism sector. Jeje (2021) emphasized on the significance of both domestic and foreign investment in creating appealing tourism destinations and ensuring high-quality tourism services. Capital investment includes infrastructure development, accommodation, restaurant or catering services, affordable and accessible transportation services, and tour guide operations. Besides, the capital investment can also seek to support tourism businesses to enhance the competitiveness of the Malaysian tourism sector.

Table 3. Accuracy Analysis Outcome

No.	Date	Forecast	Actual	Absolute Error	Error ²	%Error	%Accuracy
1	2000M01	786040	773727	12313	151609969	0.0159	98%
21	2001M09	596202	964665	368463	1.35765E+11	0.3819	62%
42	2003M06	753029	828498	75469	5695569961	0.0911	91%
80	2006M08	1384890	1516682	131792	17369131264	0.0869	91%
125	2010M05	2246084	2017648	228436	52183006096	0.1132	89%
185	2015M05	1893792	2101189	207397	43013515609	0.0987	90%
203	2016M11	2646810	2172470	474340	2.24998E+11	0.2183	78%
226	2018M10	1989842	2178153	188311	35461032721	0.0865	91%
242	2020M02	671084	1279068	607984	3.69645E+11	0.4753	52%
Accuracy rate							92%

Note: Only selected points are presented for the ease of interpretation.

Table 3 depicts the accuracy analysis outcome of the prediction model, which shows that the accuracy rate is a promising 92%. Given that simplicity is the way forward for overwhelming issues of existing indicators (Agyeiwaah et al., 2017), the empirical finding shows that real action and appropriate remedial measures can be taken to boost and recover the Malaysian tourism industry. As such, decision-makers can confidently rely on the insights provided by the prediction model to inform policy formulation, resource allocation, and intervention strategies geared towards enhancing the competitiveness and resilience of the tourism sector. By leveraging the predictive capabilities offered by the model, stakeholders can embark on a path of informed decision-making, thereby unlocking the full potential of Malaysia's tourism landscape and fostering long-term prosperity and success.

Figure 2 depicts a graphical illustration of the constructed TSCI using DAFM approach with emphasis on the importance of the pillar representing social, economic and environmental competitiveness, sustainable policy environment as well as technology and innovation. The World Tourism Organization (UNWTO) has previously identified five major types of tourism-related crises including societal crisis, environmental crisis, economic crisis, health-related crisis and technological crisis. Incorporating factors such as economic indicators, social indicators and environmental indicators, a systematic analysis of past crisis and their impacts on tourism sector in Malaysia has been proposed in this paper. While the previous study utilized the National Bureau of Economic Research (NBER) approach (Soh et al., 2020) for constructing tourism indicator, this paper suggests a more advanced method known as the Dynamic Approximate Factor Model (DAFM) approach for tourism indicator construction. Apart from international events such as oil price hikes and sub-prime mortgage crisis, the current paper has traced several impactful domestic events. In an orderly manner, the constructed TSCI has successfully traced eight major episodes of crises for the Malaysian tourism market, encompassing the 2001 Kidnapping Incident in Sabah; the Tsunami and Earthquake in 2004; the Global Financial Crisis in 2007; the H1N1 Flu Virus in 2009; the Loss of Malaysia Airlines in 2014; the Grenade Attack in 2016 at Puchong; the Covid-19 Pandemic outbreak in 2019; and the Malaysia Movement Control Order in 2020. All the above-mentioned crises have created impactful consequences on the Malaysian tourism cycle with significant drop in international tourist arrivals. In conclusion, the constructed TSCI has validated its role in crises determination and possesses leading characteristics in forecasting the Malaysian tourism cycle. The selected 12 key variables are

also crucial in policy implementation and remedial measure planning, especially for crisis recovery.

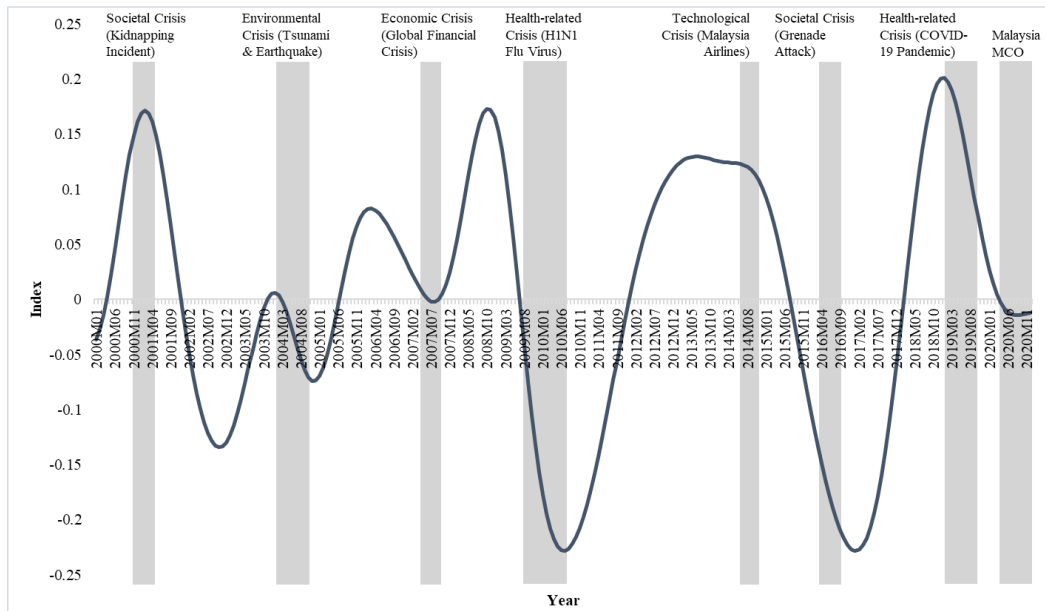


Figure 2. Graphical Illustration of Crises

Figure 3 illustrates the wavelet coherence maps for international tourist arrivals (TA-TSCI) and real gross domestic product (RGDP-TSCI) via a contour plot in a bivariate framework. Referring to the work of Kumar et al. (2019), the empirical findings here revealed that TA-TSCI has in-phase positive relationships since the arrows are pointing rightwards (\rightarrow) from 0 to 16 months. In terms of lead-lag analysis, the arrows pointing downwards-right (\searrow) indicate that the constructed TSCI plays a leading role in tourist arrivals in Malaysia. This implies that the TSCI has a positive and significant coherence with tourist arrivals in the short to medium term. Meanwhile, an interesting in-phase positive relationship has been observed from the wavelet coherence of RGDP-TSCI. Ranging from short to medium term, most of the arrows are pointing upwards-right (\nearrow), this means that RGDP leads TSCI. This implies that sustained economic growth has encouraged development in the Malaysian tourism – a validation of the growth-led tourism hypothesis. This finding is consistent with that of previous studies done by Hakan et al. (2015). Meanwhile, the constructed TSCI also plays a leading role in stimulating the economic growth in the medium and long term. This validates the tourism-led growth hypothesis and is similar to the outcome of Lee (2021). Thus far, the bidirectional causality between tourism and economic growth has been captured in Malaysia. In short, the analysis findings showed that the constructed TSCI has a positive leading role in both tourism development and economic growth of Malaysia.

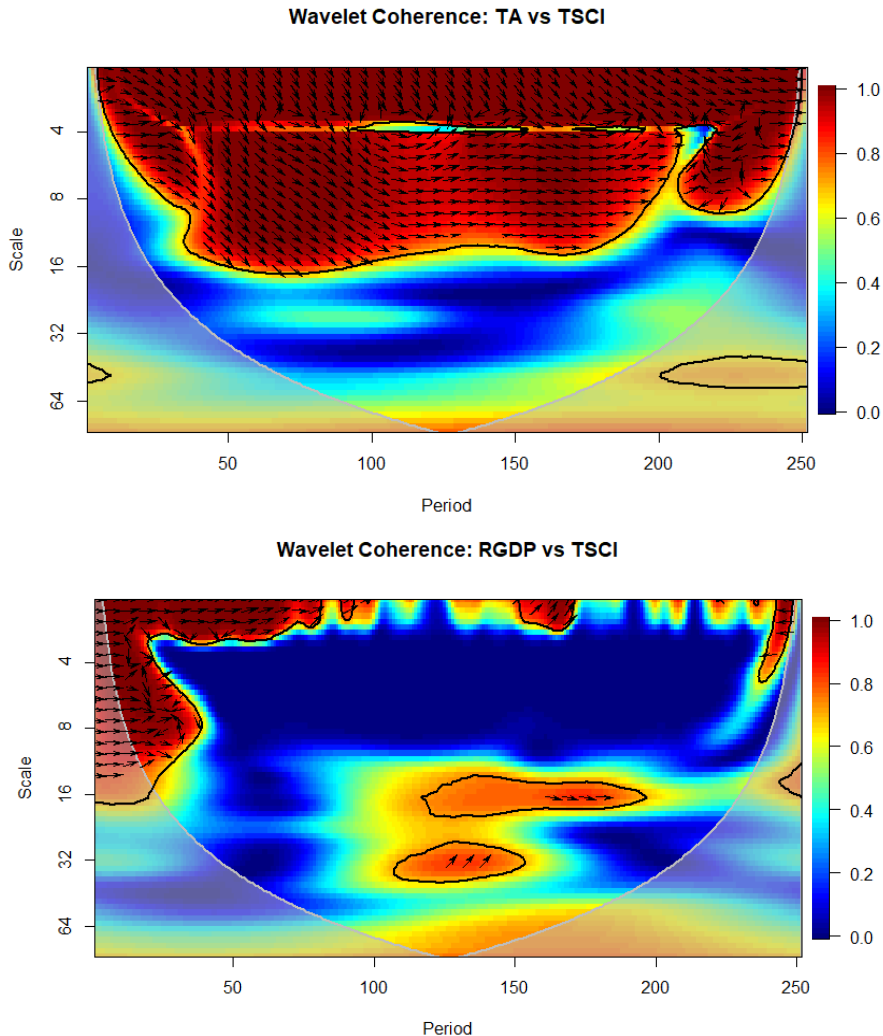


Figure 3. Wavelet Coherence

5. Conclusion and Implications

The empirical findings of this study highlighted the importance of sustainable competitiveness within the tourism context. The selected 12 leading indicators have contributed towards defining the tourism vulnerability of Malaysia. These indicators should be the key focus in policymaking decisions and management of tourism vulnerabilities. The constructed TSCI based on the DAFM approach has provided insightful information on the common crises that fluctuated the Malaysian tourism market. The information from these indicators are useful for actionable steps that can be taken by tourism operators, tourism authorities and policymakers. Furthermore, findings from the wavelet coherence analysis also revealed that the constructed TSCI can be used for short- and medium-term forecasting for effective policy-making and risk management.

In order to nurture a sustainable and competitive environment, caution should be exercised when adopting metrics for effective tracking and measurement. In this sense, the indicators proposed in this study are in fact, easy to understand and are measurable. This encourages the planning and effective operationalization of realistic policies that can further enhance the sustainable competitiveness of the Malaysian tourism industry.

Finally, the study on early warning mechanism remains feasible. Further studies can be conducted for other countries to construct the leading indicators using similar approach. Besides that, a more advanced and dynamic model-based approach can be employed to ensure higher sensitivity and more accurate tourism modelling in the context of sustainable competitiveness.

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