Macroeconomic Determinants of Tourism Demand in Malaysia: A Markov Switching Regression Approach

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Abstract

A wave of studies has always surrounded the nexus of tourism development and economic growth in a nation. An assessment is provided in this study to examine the Malaysian tourism market dynamics. A series of macroeconomic variables has been utilised to model tourism demand and examine causal linkages among tourism and economic growth. Spanning from 2000 till 2018 on a monthly basis, the Markov regime switching regression provides an overview of tourism market performance and potential influences during recession and expansion periods of the Malaysian tourism cycle. Notably, the results present a reference chronology of the crises happening over the past two decades, the Granger causality of the variables, and different behavioural changes of the variables as well for both recession and expansion periods. Significant relationships have been revealed in this study that suggest that overall international tourism can drive economic growth and vice versa.

Keywords: Markov switching regression, sustainable development goals, Granger causality, tourism-led growth hypothesis, R language

1. INTRODUCTION

The economic prosperity of a nation is always associated with its manufacturing and agricultural sectors as well as inflows of foreign direct investment (Tang & Tan, 2015). Many developing countries also rely on the service sector for sustainable economic growth. In 2018, the international tourism revenue reached US$1.7 trillion for the first time, a threefold increase over the last two decades, while the number of international tourist arrivals doubled to 1.4 billion. The United Nations World Tourism Organization (UNWTO) highlighted in 2019 that the international tourism industry has become the third-largest export earnings on a global scale, valued at a staggering US$1,586 billion as of 2017. The industry is ahead of automotive products and food in valuation while lagging behind chemicals and fuels. Today, tourism is a major source of foreign exchange earnings for most countries in the Asia Pacific region and one of the most dynamic economic sectors globally (Kadir & Karim, 2012; Soh et al., 2021a).

Malaysia is the home to 32 million citizens that has attracted tourists worldwide due to its unique diversity in culture. For 18 years since 2000, the number of international tourist arrivals to Malaysia has increased from 10.2 million to 25.8 million, with tourism receipts growing fivefold to RM84.1 billion in 2018 alone (Tourism Malaysia, 2021). The top three market sources for Malaysia's tourism accounted for 65.3% of total tourist arrivals, constituted of tourists from Singapore, Indonesia, and China. Disregarding the multiplier effect created on other industries such as accommodation, transportation and communication, the tourism sector itself occupies approximately 11.3% of total employment in Malaysia. The industry has also contributed 13.3% to the nation's GDP in 2018. These simply highlight the important role of the tourism sector to the Malaysian economy. Thus, it becomes inevitable that the tourism sector has to adopt and sustain best practices for continuous growth.

A sustainable tourism requires perpetual monitoring coupled with imperative, corrective or precautionary measures to ensure its survivability. A sustainable tourism sector also ensures

sustainable consumption and production patterns that align with the United Nation's 12th Sustainable Development Goal (SDG) (United Nations, 2022). This is measurable through the modelling of the tourism demand to identify the significant factors that can aid in policy-making and promotion of public procurement practices that can further enhance the tourism sector's sustainability. In this sense, the current study aims to examine the fundamental macroeconomic variables that can trigger tourism demand in Malaysia and contribute towards the SDG.

The UNWTO defined "sustainable tourism" as a tourism sector that can handle current and future impacts from economic, social, and environmental perspectives without neglecting the needs of tourists and stakeholders involved as a whole. Given the pertinent role of tourism in the Malaysian economy, this study explored the fundamental determinants of international tourist arrivals in Malaysia by employing the Markov switching regression that considered both contraction and recession periods in the Malaysian tourism cycle. Whilst placing the tourism sector at the root of its discussion, this study aims to contribute to emerging dialogues on sustainable development issues. This study also employed pairwise Granger causality to identify the temporal causal relationships among the selected variables, in view that the pioneering works on tourism demand study have always studied the direction of causality between tourism and economic growth (Soh et al., 2019a). Besides that, the tourism-led growth (TLG) hypothesis and vice versa remains a hot topic of discussion ever since its first publication in 2002, as there are always opposing opinions among researchers.

According to Payne and Mervar (2010), there are two dimensions of the nexus between economic growth and tourism. If the government policies implemented have been effective, i.e., when the government has allocated adequate investment in both physical and human resources, it results in a growth-led tourism (GLT). On the contrary, if the tourism sector has served as a growth engine for positive economic externalities, then it results in a tourism-led growth (TLG). Several studies have examined this economic theory (Gunduz & Hatemi-J,

2005; Kadir & Karim, 2012; Brida et al., 2016; Soh et al., 2019b; Lee, 2021; Odeleye et al., 2022). Moreover, Tang and Abosedra (2014) found a significant relationship among energy consumption, tourism, and economic growth of the countries studied. In this study, oil price has been included as a proxy for energy consumption while producer price index is a proxy for economic growth in Malaysia. Using fundamental determinants model, this study explored the prominent roles of economic growth, energy consumption, and financial indicators for the Malaysian tourism. There are other approaches such as ARDL bounds approach (Salleh et al., 2008; Kumar, 2014; Yap et al., 2020, Jong et al., 2022), VECM approach (Kadir & Karim, 2009; Lee et al., 2020), and input-output analysis (Mazumder et al., 2009; Latiff et al., 2020) in modelling tourism demand. Puah et al. (2019) and Jong et al. (2020) employed panel analysis with the application of the gravity model in modelling the Vietnam and Sabah tourism demand, respectively. This study, on the other hand, employed the Markov regime switching regression instead of a conventional single-state approach (Tang & Tan, 2015; Soh et al., 2019c).

2. METHODOLOGY FOR SWITCHING REGRESSION

Hamilton (1989; 1990) introduced the switching regression modelling approach to study the contraction and expansion periods of the economic cycle. The approach suggests that the lagged values of an optimal forecast of variables do not follow a linear pattern, but a nonlinear stationary process. Departure from linearity, in this sense, has been emphasized by Hamilton as crucial for many macroeconomics time series. In their study on economic crises and tourism competitiveness, Perles et al. (2015) stated that most studies consider two economic policy regimes, rarely three or more. The chosen number of regimes is commonly decided a priori, instead of depending on the data or the underlying economic theory. This study considered two regimes (r=2) to examine the Malaysian tourism demand.

The dependent variable in this study is the international tourist arrivals (LTA). The independent variables are visitor exports (LVE), world crude oil price (LBRENT), producer

price index (LPPI), and share price index (LSP). The monthly dataset was extracted from the CEIC database and spanned across 2000 until 2018. All variables are presented as logarithm differences. The possible fundamental variables for modelling Malaysian tourism demand were selected based on published literature. Table 1 depicts the results of correlation analysis.

Table 1: Correlation Analysis Result

	LTA	**LVE**	**LBRENT**	**LPPI**	**LSP**
LTA	1.000				
LVE	0.979	1.000			
LBRENT	0.762	0.717	1.000		
LPPI	0.944	0.901	0.868	1.000	
LSP	0.899	0.869	0.731	0.923	1.000

Another similar study that had employed this two-regime model was done by Soh et al. (2019c) to model and forecast the Fijian tourism demand to capture the expansion and contraction of the tourism cycles. In this study, the model used can be explained using Equation (1).

$$LTA = \alpha_{ri} + \beta_{1ri} LVE + \beta_{2ri} LBRENT + \beta_{3ri} LPPI + \beta_{4ri} LSP + \varepsilon \quad (1)$$

where the sub-index "*ri*" denotes an indicator for the corresponding regime. Terasvita et al. (2010) has also emphasised that the two-regime approach is suitable to represent the remarkable non-linearities in practice. After exemplifying the model-estimated coefficient, the transition probabilities of the regression were identified. The matrix π with transition probabilities shifts from state *k* to *j* following the matrix in Equation (2).

$$\pi = \begin{bmatrix} p_{11} & p_{21} \\ p_{12} & p_{22} \end{bmatrix}, \; p_{kj} = \Pr\left(S_t = j \mid S_{t-1} = j\right) \tag{2}$$

A series of diagnostic checks are applied for the Markov-switching regression to determine the best-fit model that has the highest compatibility with Malaysian tourism forecasting. The diagnostic checking for residuals includes plot against fitted line and normality distribution plot. Furthermore, the pairwise Granger causality test was also conducted to identify the short-term forecasting relationships among the selected variables.

3. RESULTS AND DISCUSSION

The classical linear regression of the estimated model is presented in Table 2. This linear model showed that LBRENT has a negative association with LTA and is statistically significant at the 1% level. Meanwhile, both LPPI and LVE have positive relationships with LTA and are statistically significant at 99% confidence level. The adjusted R-squared proved that 97.9% of the variation in the dependent variables can be explained by the independent variables.

Table 2: Ordinary Least Square Estimation Result

DV: Tourist Arrivals			
Variable	**Coefficient**	**Standard Error**	***p*-value**
(Intercept)	10.702	0.266	0.000***
LBRENT	-0.042	0.013	0.002***
LPPI	0.801	0.083	0.000***
LVE	0.818	0.030	0.000***
LSP	-0.013	0.024	0.590
Adjusted R-square: 0.979		**α= 0.047**	

Table 3 shows the results of the Markov regime switching regression. Regime 1 denotes the crisis or recession period while regime 2 represents the growth or expansion period. There is a contradictory relationship between oil price and tourist arrivals in both regimes. During recession, the relationship is positive whereby the change in crude oil price is less elastic for tourist travelling behavior since the estimated coefficient is relatively smaller. Oil price acts as a proxy variable for transportation cost. The positive relationship could be because tourists from Singapore make up more than 50% of tourist inflow. In 2018 alone, there was around 10 million travelers from Singapore. Traveling to a neighboring country is a logical choice to reduce transportation cost, especially when fuel price declines. However, during a recession, a negative relationship between LBRENT and LTA is observed. This phenomenon has been explained by Perles et al. (2014) as a change in market share behaviors in times of contraction and recession in an economy.

Table 3: Markov Switching Regression Result

Regime 1: Recession			
Variable	**Coefficient**	**Standard Error**	***p*-value**
(Intercept)	16.094	0.116	0.000***
LBRENT	0.108	0.011	0.000***
LPPI	-0.760	0.030	0.000***
LVE	1.279	0.015	0.000***
LSP	0.201	0.019	0.000***
Adjusted R-square: 0.993		**α= 0.031**	

Table 3: Markov Switching Regression Result (continued)

Regime 2: Expansion			
Variable	**Coefficient**	**Standard Error**	***p*-value**
(Intercept)	8.613	0.045	0.000***
LBRENT	-0.147	0.004	0.000***
LPPI	1.359	0.015	0.000***
LVE	0.446	0.019	0.000***
LSP	0.008	0.012	0.491
Adjusted R-square: 0.994		**α= 0.019**	

According to the Bureau of Labor Statistics (BLS), producer price index (PPI) monitors the average changes over time in market selling prices. The index is a combination of products and services prices from the first commercial transaction (Jong et al., 2021). Our empirical findings showed that LPPI and LTA have a negative relationship during recession and a positive relationship during growth period. This shift in consumer spending is expected. During recession, PPI increases and consumers will spend less to conserve their purchasing power. When economy is good, international tourists become keener to purchase local products even when the cost and price of goods and services increase due to a proportional increase in purchasing power. LVE and LTA always have a positive association in both linear and nonlinear models. In this study, the relationship has been statistically significant at a 99% confidence interval. An increase or decline visitor exports is expected to cause the same effect on international tourist arrivals. However, a decrease in visitor exports during a recession can be viewed as an opportunity to relocate the funds for upgrading works to attract future tourists.

An interesting observation is the relationship between international tourist arrivals (LTA) and share price index (LSP) when comparing the linear model with Markov switching regression model. In the linear Ordinary Least Square (OLS) model, LSP has a negative relationship with LTA, which means that international tourists do not travel to Malaysia when the nation's share price index is positive and vice versa. However, in the Markov switching regression model, the relationship is only statistically significant for the recession period. This shows that the local share price index has little influence on international tourist arrivals. Therefore, the impact of local market share index can be said to have negligible impact on travelling decisions. Both regimes have an adjusted R-square of more than 99%. This proves that the model can explain the Malaysian tourism cycle and validate the roles of the determinants in enhancing Malaysian tourism's prosperity.

Table 4: Transition Probability Matrix Result

	Regime 1	**Regime 2**	**Duration**	$P = \begin{bmatrix} 0.967 & 0.059 \\ 0.033 & 0.941 \end{bmatrix}$
Regime 1	0.967	0.059	30.3	
Regime 2	0.033	0.941	16.9	

The transition probability matrix shown in Table 4 reveals that regime 1 has the highest probability of staying on its own at 0.967. This is followed by the probability of regime 2 to stay on its own at a probability of 0.941. The probability of shifting to another regime is only 0.033 for regime 1 and 0.059 for regime 2. The expected duration for the period is calculated using the formula $1/(1-P_{00})$. For regime 1 to shift to regime 2, the expected duration is 30.3 months. For the reverse flow, the expected duration is only 16.9 months. This means that the Malaysian tourism sector only takes 17 months to slip into a recession, but almost twice the time to recover. As such, it is important that a good monitoring practice is in place to track the dynamic changes in the Malaysian tourism cycle to ensure sustainable tourism growth.

Figure 1 portrays the graphical illustration of the filtered and smoothed probabilities. Spanning from 2000 to 2018, there are five cycles detected with obvious peak and trough for the Malaysian tourism (Soh et al., 2020). Chronologically, Malaysia experienced four major happenings, namely the 2000s Energy Crisis; 2008-2010 Subprime Mortgage Crisis and Constitutional Crisis; 2012-2014 Eurozone Crisis; and 2016-2017 Political Turmoil. The most significant energy crisis related to the Malaysian tourism is the oil price crisis. From 2003 to 2014, the world crude oil demand had increased 3.4%. The high oil price volatility starting in 2000 had been suggested as one of the causes of the 2008 global financial crisis. From the consumer's perspective, the surge in transportation cost may discourage travelling desire. The European Sovereign Debt Crisis, on the other hand, has affected the Malaysian economy via two major channels - financial flows and trade. This has caused fluctuations in the Malaysian market (Soh et al., 2021b) that further impacted the tourism sector.

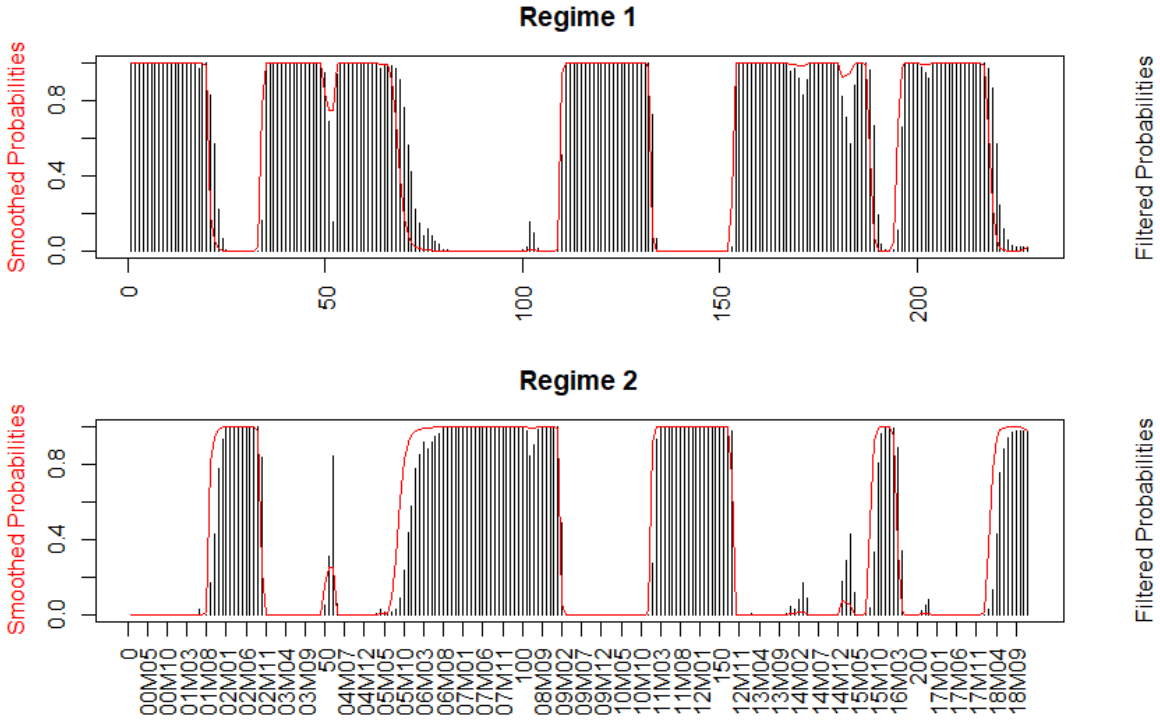

Figure 1: Graphic Visualization of Filtered and Smoothed Probabilities

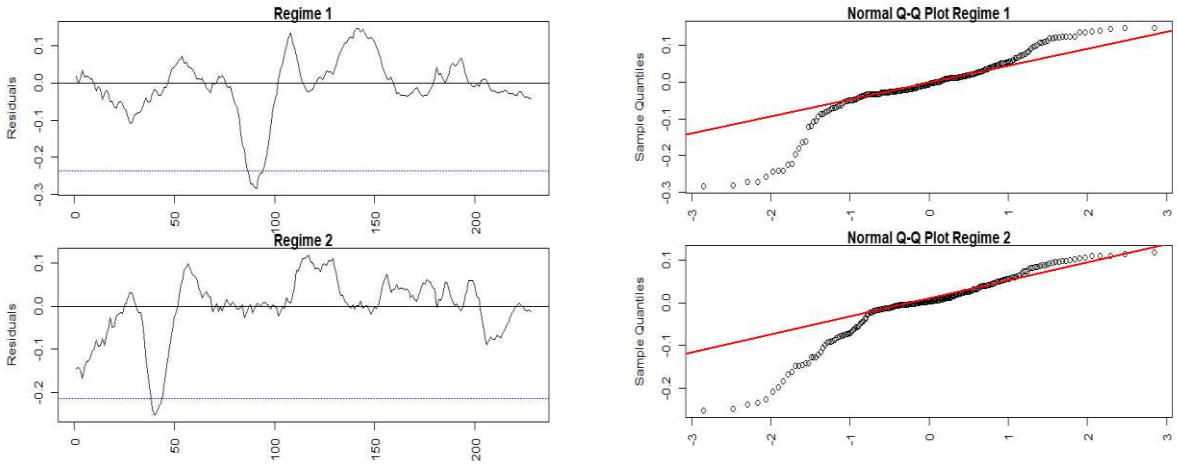

Figure 2: Residuals Diagnostic Checking Results and Normal Q-Q Plot

Figure 2 shows the diagnostic checking results for the estimated model in the form of a residual test and a Q-Q plot for both regimes. Both residual plots depict a null residual plot, showing a random scatter from -0.2 to 0.1 that is indicative of an adequately described statistical model. The Normal Q-Q residual plots showed that both distributions have a heavier left tail when compared to a standardized normal distribution. Both right tails have also deviated slightly from the standardized normal distribution. In both cases, the distributions are not normal, which proves the suitability of the Markov switching model to be used instead of a linear regression that demands for a normal distribution.

Table 5 depicts the result of pairwise Granger causality test, which depicts the short-term relationship between two variables, giving some indication on "whether X_1 forecasts X_2". In this case, the null hypothesis states that X_1 does not Granger-cause X_2. This is tested at the 1%, 5% and 10% significance levels. The results indicated that LTA does not Granger-cause LBRENT, but it Granger-causes LPPI at the 10% significance level as well as LVE and LSP at the 1% significance level. LBRENT only Granger-cause LVE at 5% significance level. LPPI Granger-causes LBRENT at the 10% significance level and LVE at the 1% significance level. LVE Granger-causes LSP at the 1% significance level. Lastly, LSP Granger-causes

LBRENT at the 10% significance level and LVE at the 5% significance level. The short-term relationships identified showed that a bi-directional Granger-causality relationship exists between LVE and LSP, albeit at different significant level. A worthy observation is that LTA provides statistically significant information about future vales of both LVE and LSP at 1% significance level, showing a close-knitted relationship among the Malaysian share price index, visitor exports and international tourist arrivals on top of the bi-directional relationship between LVE and LSP. In addition, visitor exports (LVE) is Granger-caused by all other variables, which is a strong indication of both tourism-led growth and growth-led tourism in the Malaysian context.

Table 5: Pairwise Granger Causality Test Results

Dependent Variable	***F*-statistics**				
	LTA	**LBRENT**	**LPPI**	**LVE**	**LSP**
LTA	-	1.488 [0.195]	1.518 [0.185]	0.217 [0.955]	0.794 [0.555]
LBRENT	1.094 [0.365]	-	1.928 [0.091]*	1.350 [0.245]	2.208 [0.055]*
LPPI	2.135 [0.063]*	0.256 [0.937]	-	1.106 [0.358]	1.407 [0.223]
LVE	17.725 [0.000]***	2.543 [0.029]**	4.020 [0.002]***	-	2.577 [0.028]**
LSP	4.659 [0.000]***	0.389 [0.856]	1.673 [0.142]	3.423 [0.005]***	-

Notes. Significant codes: 0.01 “***”, 0.05 “**”, and 0.10 “*”.

CONCLUSION

This study has put forth an alternative approach to examine Malaysian tourism demand using the Markov regime switching model to further establish the role of fundamental variables in achieving sustainable tourism development during two economic phases – the recession and growth period. The results are expected to provide insights and some guidelines for policymakers, tourism stakeholders or the community for future risk monitoring and planning. The tourism sector alone has contributed more than 10% of employment opportunities in Malaysia. By addressing these issues, the tourism industry can further develop to achieve the 12th UNSDG on sustainable consumption and production. This has been the reason that production price index has been included as one of the variables, and the statistical analysis has proven that the PPI exhibits behavioral changes within the economy cycle through time. This study suggests that production and consumption require closer monitoring and dynamic adjustments, rather than following a fixed-price regime.

In relation to the causal relationships among variables, this study suggests policy measures that are able to neutralize negative impact on tourism in times of hostile economic situation. The tracking of crude oil price is an important feature that has to be included in the decision-making process since it is closely related to foreign direct investment, stability of the local market share, and price competitiveness of a market. However, the findings from this study cannot be applied to isolated extreme cases of wars or disasters. Thus, a broader spectrum of models has to be used to cover the occurrence of such extremity to study its significance and relevance to the tourism sector for national development.

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