Tourism Seasonal Research on Inbound Tourism

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Abstract

Seasonality is one of the significant features in tourism market. This study employs the X-13 ARIMA-SEATS method to tourism market in Taiwan. Tourists who had come to Taiwan from 1981 to 2016 mainly came from Asia, followed by the Americas and Europe. In Asian area, tourists from Mainland China account for the highest percentage, followed by Hong Kong and Japan, whose overall resources provide favourable conditions for industrial development. Rapid growth in the number of tourists coming to Taiwan gives rise to the issue of uniform distribution of tourists during the year, namely, tourism seasonality. The empirical results show that tourism seasonality of tourists coming to Taiwan is randomly changing. Analysis should be conducted concerning sustainable planning, environmental dynamic carrying capacity and sustainable development. The high tourism seasons are March, April, November and December. However, January, July and September every year are off-season in Taiwan's tourism market, with gradual decreasing number of tourists compared with those in high-season months. The contribution of this research is the analysis of data from high-season and off-season months, The local transport routes and environmental facilities can be planned for the high-season months, in order to develop diversified tourism marketing and strategies, improve the utilisation of space, and enhance business performance. During off-season months, Stay at Home Economic may be developed through Internet or platform marketing to provide distance-free remote services. For the overall environment, The analysis between off-season and high-season months not only helps to generate economic development, but can provide a sustainable planning direction, and link environmental dynamic carrying capacity and sustainable development.

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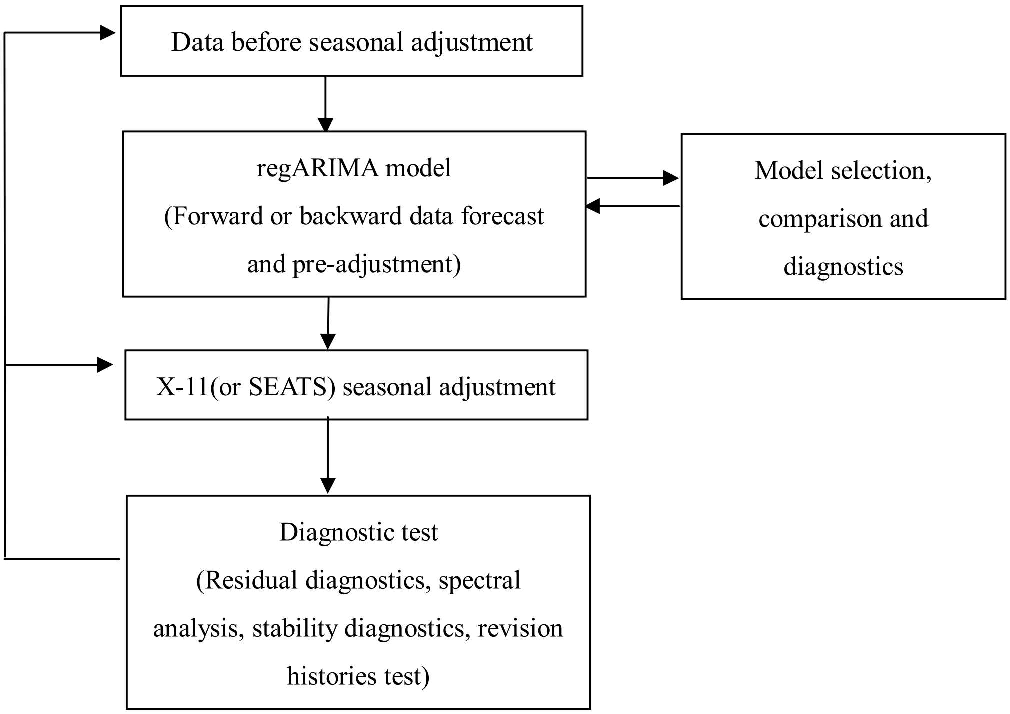

Figure 1 X-13 ARIMA seasonal adjustment process

Source: Findley, D.F., Brian C. Monsell, William R. Bell, Mark C. Otto and Bor-Chung Chen (1998), Yueh-Ying Huang (2013).

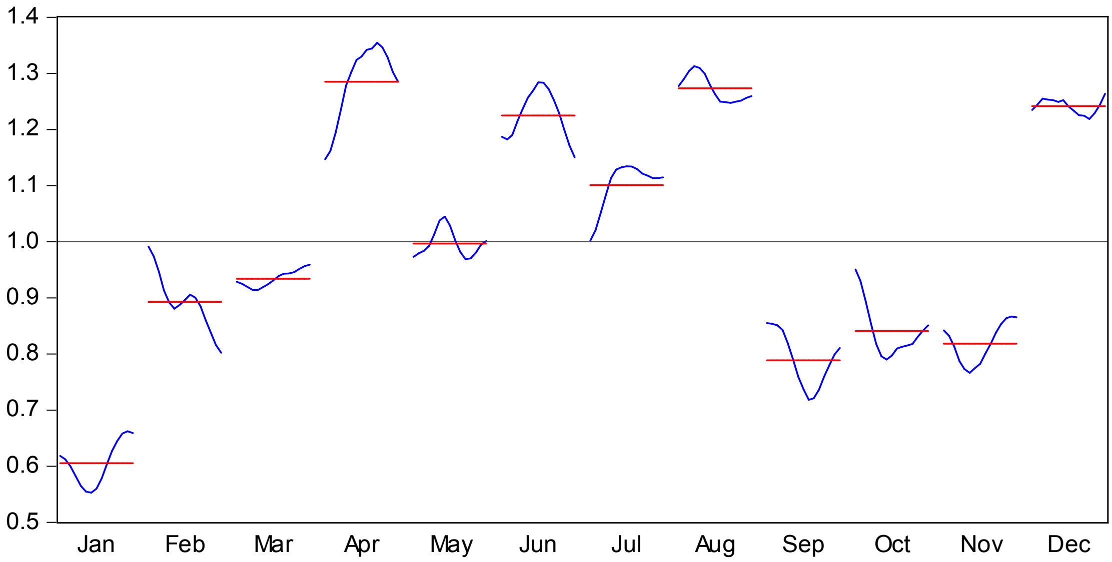

Figure 2 Seasonal Variations of Tourist Arrivals from Hong Kong during the Period from 2002 to 2016 - by month

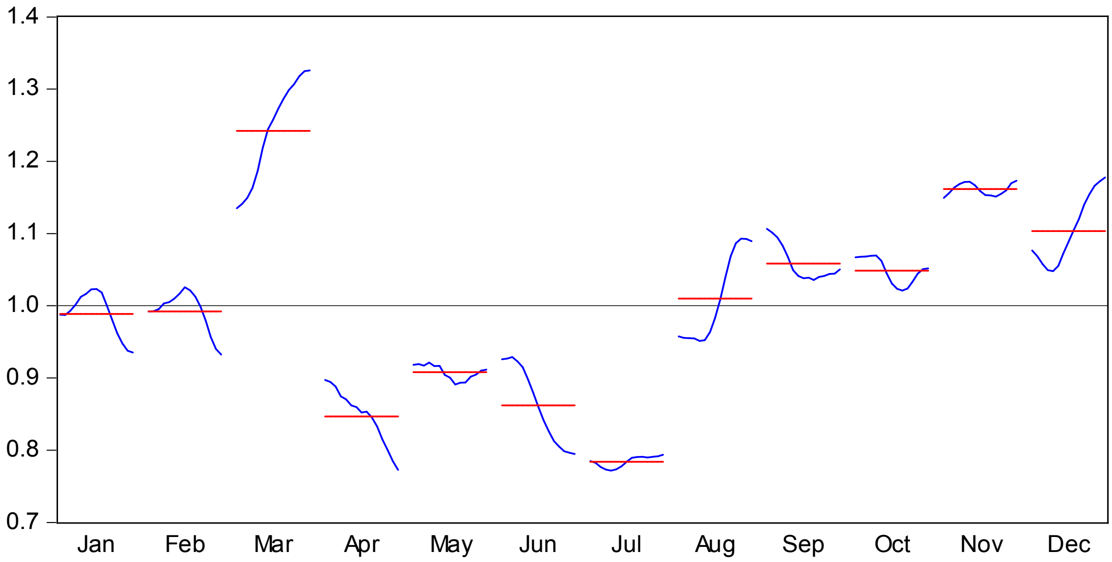

Figure 3 Seasonal Variations of Tourist Arrivals from Japan during the Period from 2002 to 2016

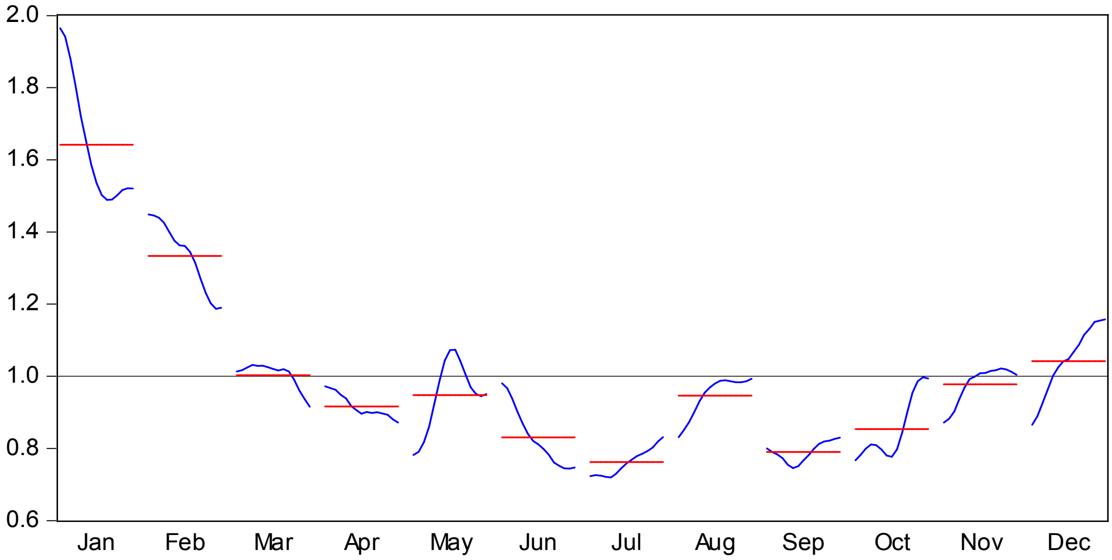

Figure 4 Seasonal Variations of Tourist Arrivals from Korea during the Period from 2002 to 2016

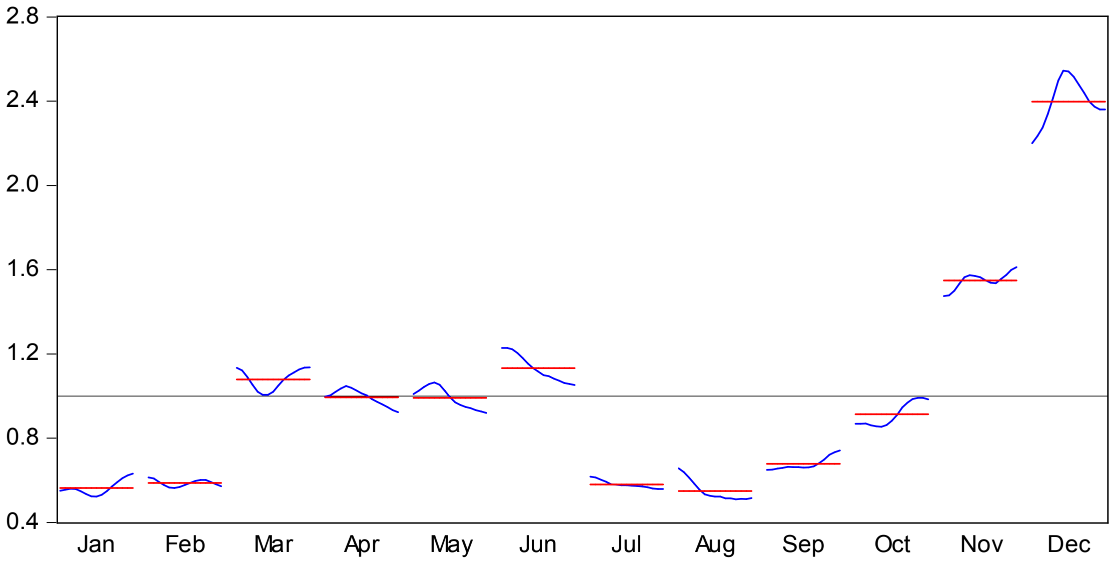

Figure 5 Seasonal Variations of Tourist Arrivals from Singapore during the Period from 2002 to 2016

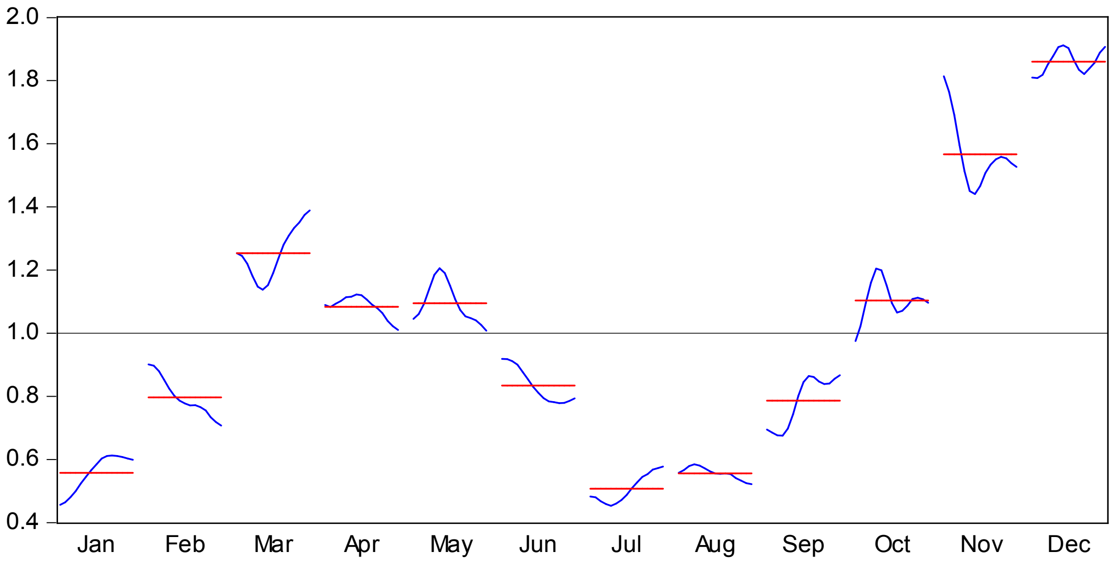

Figure 6 Seasonal Variations of Tourist Arrivals from Malaysia during the Period from 2002 to 2016

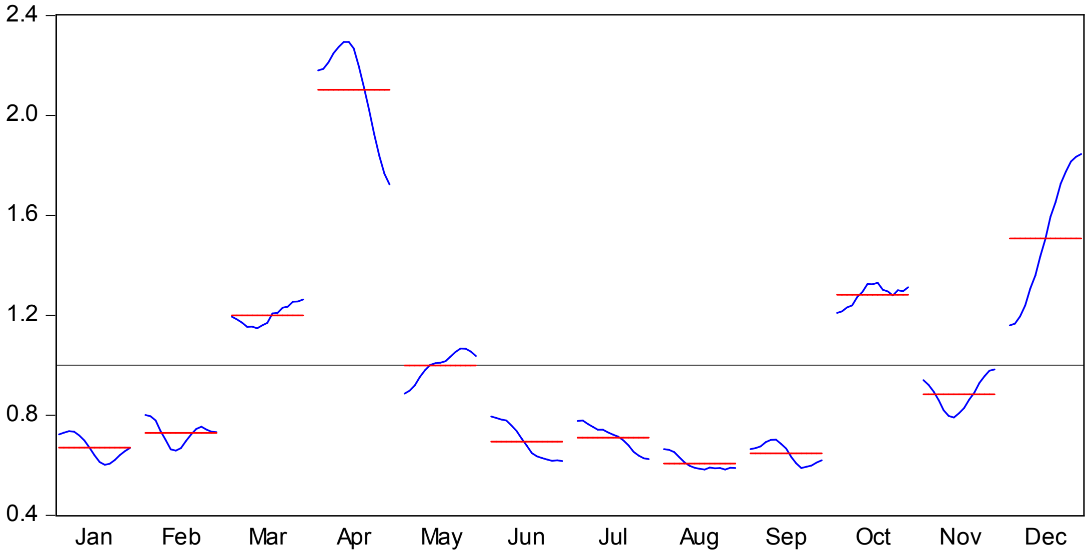

Figure 7 Seasonal Variations of Tourist Arrivals from Thailand during the Period from 2002 to 2016

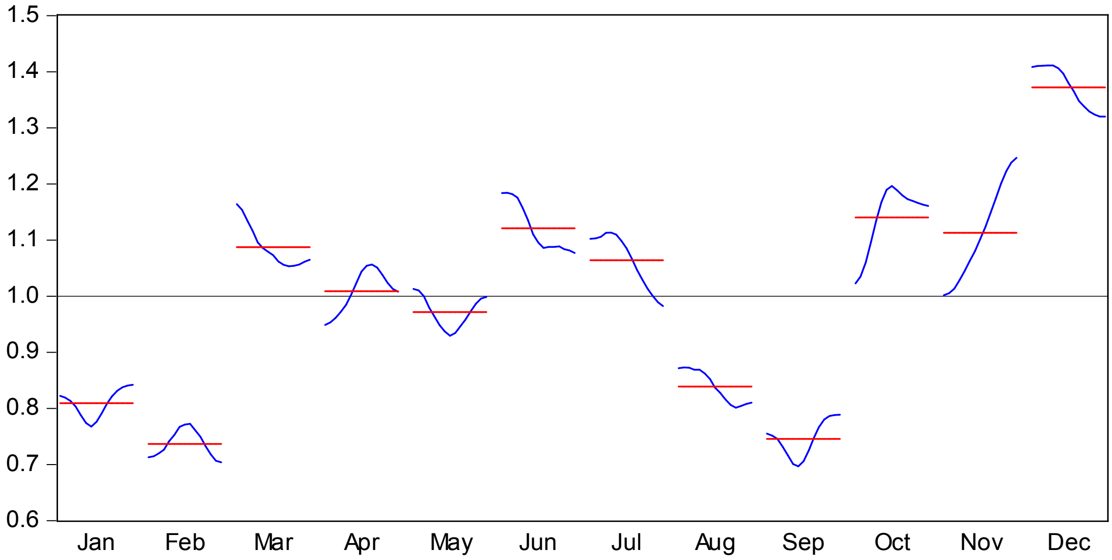

Figure 8 Seasonal Variations of Tourist Arrivals from America during the Period from 2002 to 2016

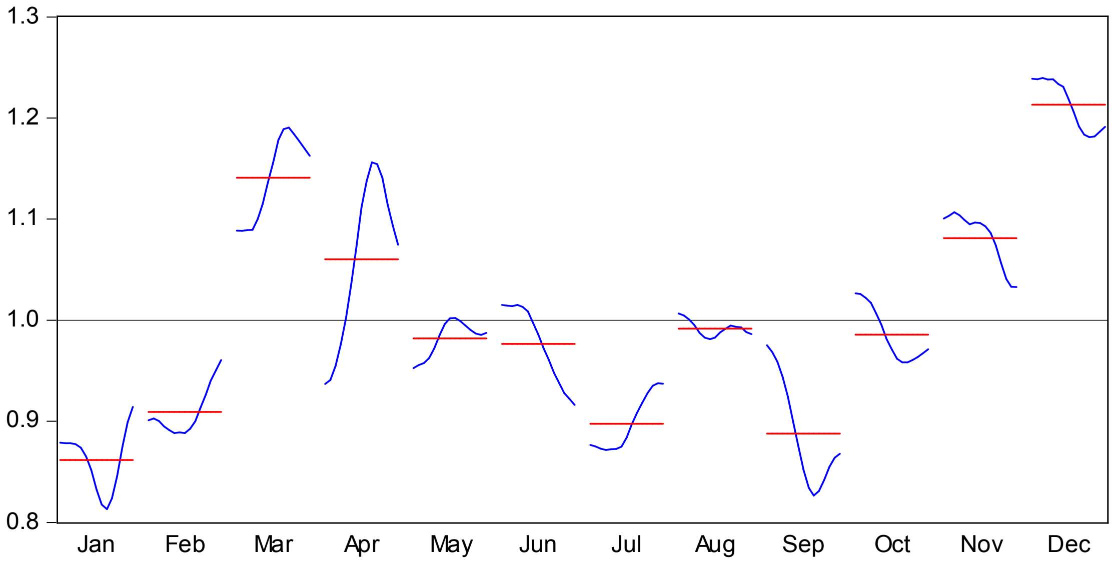

Figure 9 Seasonal Variations of Tourist Arrivals to Taiwan during the Period from 2002 to 2016

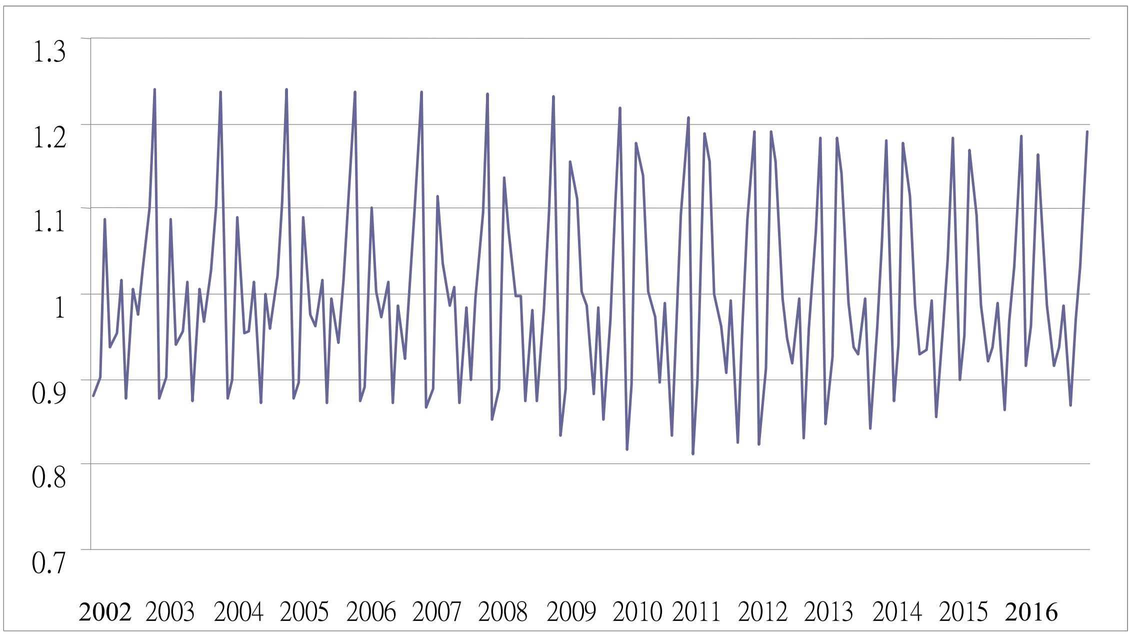

Figure 10 Seasonal Variations of Tourist Arrivals to Taiwan during the Period from 2002 to 2016

Table 1 Tourists coming to Taiwan from 1981 to 2016 (by origin tourism countries)

Unit: person %

Year	Asia	%	Americas	%	Europe	%	Oceania	%	Africa	%	Others	%	In total
1981	720,072	83.72	76,120	8.85	32,836	3.82	8,265	0.96	9,893	1.15	6,618	0.77	860,073
1986	824,447	86.86	76,906	8.10	17,337	1.83	6,745	0.71	2,709	0.29	17,767	1.87	949,198
1991	751,308	90.91	46,852	5.67	14,260	1.73	4,227	0.51	2,033	0.25	5,626	0.68	826,441
1996	812,984	89.88	53,252	5.89	21,186	2.34	5,775	0.64	1,053	0.12	8,284	0.92	904,489
2001	879,845	88.79	73,848	7.45	18,409	1.86	6,758	0.68	893	0.09	9,821	0.99	990,874
2002	922,784	89.71	77,834	7.57	18,960	1.84	7,711	0.75	893	0.09	453	0.04	1,028,635
2003	618,078	88.90	55,006	7.91	14,590	2.10	6,370	0.92	745	0.11	488	0.07	695,277
2004	902,797	87.50	91,167	8.84	24,299	2.36	12,500	1.21	793	0.08	157	0.02	1,031,713
2005	1,242,751	89.95	96,780	7.00	25,724	1.86	14,475	1.05	763	0.06	1,144	0.08	1,381,637
2006	1,358,781	89.97	107,000	7.09	29,496	1.95	14,076	0.93	727	0.05	127	0.01	1,510,207
2007	1,475,396	89.50	117,172	7.11	35,738	2.17	19,483	1.18	657	0.04	61	0.00	1,648,507
2008	1,574,236	88.68	127,495	7.18	48,098	2.71	24,535	1.38	809	0.05	56	0.00	1,775,229
2009	2,078,123	90.42	136,224	5.93	56,237	2.45	26,970	1.17	699	0.03	81	0.00	2,298,334
2010	3,014,703	92.87	146,687	4.52	53,687	1.65	30,083	0.93	781	0.02	64	0.00	3,246,005
2011	3,410,477	93.85	136,442	3.75	54,539	1.50	31,326	0.86	976	0.03	96	0.00	3,633,856
2012	4,432,417	94.76	145,520	3.11	61,545	1.32	36,830	0.79	952	0.02	66	0.00	4,677,330
2013	5,222,063	95.31	151,411	2.76	65,908	1.20	38,575	0.70	909	0.02	233	0.00	5,479,099
2014	6,886,203	95.75	180,818	2.51	80,020	1.11	43,757	0.61	1,131	0.02	166	0.00	7,192,095
2015	7,191,874	95.82	190,298	2.54	82,632	1.10	39,232	0.52	1137	0.02	284	0.00	7,505,457
2016	7,192,696	95.13	225,176	2.97	98,803	1.30	42,555	0.56	1178	0.02	345	0.00	7,560,753

Source: Organised from years of "Monthly Tourism Statistics", Tourism Bureau, MOTC.

Table 2 Tourists coming to Taiwan from 1981 to 2016 (Based on area)

Unit: Person

Year	Mainland China	Japan	Hong Kong	Malaysia	Singapore	Korea	America
1981	--	532,359	9,591	52,166	37,897	14,788	66,568
1986	--	585,143	122,075	39,613	25,623	10,661	68,878
1991	--	594,281	40,365	10,600	16,375	69,957	41,598
1996	--	605,673	87,890	16,504	21,117	58,283	45,568
2001	--	575,613	87,034	15,730	18,205	35,026	45,519
2002	--	497,928	113,093	12,681	18,330	6,842	48,678
2003	--	481,544	148,211	12,355	16,410	10,604	49,407
2004	--	527,074	177,983	12,728	16,511	12,145	58,838
2005	--	590,786	220,711	15,906	21,637	12,650	60,232
2006	--	587,170	237,402	21,090	29,053	11,593	62,464
2007	--	323,375	187,270	25,250	23,367	21,471	43,819
2008	--	460,231	259,887	40,504	42,733	47,481	73,229
2009	--	677,937	276,153	52,993	82,221	67,354	77,133
2010	--	721,351	274,222	59,295	98,383	77,254	86,239
2011	--	737,638	321,405	82,017	115,322	102,233	92,724
2012	63,790	674,506	426,890	95,538	121,286	124,216	97,854

2013	539,106	662,644	538,474	107,414	121,988	64,794	103,557
2014	1,228,086	701,561	560,082	209,930	157,046	99,241	111,093
2015	1,290,933	902,733	553,757	230,368	214,113	133,793	101,673
2016	2,019,757	1,037,067	612,826	262,935	243,034	158,205	106,843
1981	2,263,635	1,019,113	1,009,862	307,755	273,245	241,440	111,016
1986	3,393,346	1,195,340	1,174,567	339,110	278,919	390,768	131,714
1991	3,437,425	1,187,552	1,308,290	321,270	290,180	508,226	143,140
1996	2,845,547	1,379,233	1,397,233	339,710	292,240	693,224	166,044

Source: The same as Table 1.

Table 3 Estimated Results of X-13ARIMA Model for Tourism Seasonality of Tourists Coming to Taiwan

Variable	Hong Kong		Japan		Korea		Singapore		Malaysia		Thailand		United		All	
	coefficient	t value	coefficient	t value	coefficient	t value	coefficient	t value	coefficient	t value	coefficient	t value	coefficient	t value	coefficient	t value
AR(1)					-0.45								0.18	3.54*		
MA(1)	0.79		0.65		0.47		0.67	10.92*	0.76	15.88*	0.70	14.72*	0.74	15.06*	0.35	3.37*
SAR(1)	0.99		-0.19		-0.55											
SMA(1)			0.62		-0.26		0.70	12.01*	0.58		0.75	14.12*	0.61	9.63*	0.65	15.02*
SMA(2)					0.50				0.55							
Outliers																
2002.Dec									0.64	5.91*						
2002.Sep					-0.68	-4.42*										
2002.Feb																
2002.Mar													0.35	4.15*		
2003.Apr	-1.10	-6.83*	-1.34	-13.26*	-1.75	-10.96*	-2.66	-20.00*	-2.59	-14.55*	-1.88	-8.72*	-0.66	-6.12*	-1.19	-14.1*
2003.Aug													0.45	5.11*	0.43	5.90*
2003.Sep									0.55	4.25*						
2003.Jun			-0.82	-7.58*									1.26	4.90*	-0.47	-5.52*
2003.Jul	2.87	17.77*	1.74	17.84*	1.72	11.55*	1.88	15.71*	1.18	8.49*	1.74	9.94*	-0.67	-8.68*	1.18	11.94*
2003.May	1.50	5.69*	-2.34	-22.02*	-1.12	-6.67*	-3.55	-26.88*	-4.17	-31.50*	-1.21	-5.15*	-1.99	-19.63*	1.26	4.90*
2003.Nov					0.59	4.34*										
2004.Mar							-0.57	-4.91*								
2004.Jan			-0.41	-4.52*												
2009.Apr															0.30	4.51*
2009.Feb					-0.69	-5.13*			-0.62	-5.37*						
2009.Jun									-0.55	-4.80*					-0.25	-4.73*
2012. Oct	-1.47	-10.76*														
2012.Dec	0.50	4.84*														
Ljung-Box Q	25.85		24.13		30.26		12.35		29.38		15.28		18.49		21.81	
	0.52		0.57		0.42		0.36		0.86		0.65		0.45		0.43	

Q2	0.57	0.61	0.42	0.34	0.59	0.64	0.46	0.47

Note:* The table content is below the 5% significant level, and the coefficient of zero is abandoned as null hypothesis.

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Abstract

Seasonality is one of the significant features in tourism market. This study employs the X-13 ARIMA-SEATS method to tourism market in Taiwan. Tourists who had come to Taiwan from 1981 to 2016 mainly came from Asia, followed by the Americas and Europe. In Asian area, tourists from Mainland China account for the highest percentage, followed by Hong Kong and Japan, whose overall resources provide favourable conditions for industrial development. Rapid growth in the number of tourists coming to Taiwan gives rise to the issue of uniform distribution of tourists during the year, namely, tourism seasonality. The empirical results show that tourism seasonality of tourists coming to Taiwan is randomly changing. Analysis should be conducted concerning sustainable planning, environmental dynamic carrying capacity and sustainable development. The high tourism seasons are March, April, November and December. However, January, July and September every year are off-season in Taiwan's tourism market, with gradual decreasing number of tourists compared with those in high-season months. The contribution of this research is the analysis of data from high-season and off-season months, The local transport routes and environmental facilities can be planned for the high-season months, in order to develop diversified tourism marketing and strategies, improve the utilisation of space, and enhance business performance. During off-season months, Stay at Home Economic may be developed through Internet or platform marketing to provide distance-free remote services. For the overall environment, The analysis between off-season and high-season months not only helps to generate economic development, but can provide a sustainable planning direction, and link environmental dynamic carrying capacity and sustainable development.

Keywords: tourism seasonality, X-13 ARIMA-SEATS, inbound tourism, tourism industry, seasonal patterns

I. Introduction

Tourism has an impact on related industry in which the country earns foreign exchange and pursues economic multiplication. Rapid growth in the number of tourists coming to Taiwan gives rise to the issue of uniform distribution of tourists during the year, namely, tourism seasonality. From the perspective of global regional tourism, it is predicted by United Nations World Tourism Organization (UNWTOW) that tourists around the globe will reach 1.6 billion in 2020, with tourists from European region (720 million), followed by Asian area (400 million), American region (280 million), Africa, Middle east and south Asia. Also, a large part of Asia will witness a huge growth, exceeding America and becoming the second largest regional tourism market in the world. The four distinctive features of international tourism are popularisation and expansion of mass tourism, enhanced ability to resist risks in the world tourism market, growth rate of tourism revenue much higher than the growth rate of population and shift of the world tourism market. According to evaluation of The World Travel & Tourism Council (WTTC) concerning global tourism, Taiwan's tourism industry continues to grow in recent years, and its overall tourism economy still has much room for development. In recent years, Asia and the Pacific region witness rapid development of tourism, with a market share of 23.5%, exceeding 16.2% of the American region, replacing the status of the American tourist market and becoming the world's second largest tourist region.

In the global economic downturn of deflation in 2001, Taiwan faced the impact of negative economic growth, with sharply declining export market and soaring number of unemployed people. In order to effectively boost economic development, governments attached great importance to expand domestic demand market. Executive Yuan proposed in 2002 a "Doubling Tourist Arrivals" in a bid to increase the number of visitors to Taiwan from 2.6 million to 5 million; and increase the number of visitors to Taiwan for tourism from 1 million to 2 million. In 2003, SARS led to a substantial reduction in the number of tourists coming to Taiwan. In 2004, the number of tourists coming to Taiwan increased to 2.9 million and exceeded 3 million in 2005. On July 18, 2008, Taiwan lifted a restriction on tourists coming to Taiwan from Mainland China. In 2009, the number of tourists coming to Taiwan surpassed 4 million and increased rapidly to 10.696 million in 2016, 2.67 times that of 2009.

Seasonality is prevalent in various industries, regardless of agriculture, industry or service, and is likely to occur due to factors such as industrial production characteristics, consumer decisions, natural and institutional factors. Hylleberg (1992) believed that seasonality was a year-to-year fluctuation and was produced systematically but not regularly. Climate change, calendar effects, timing of decisions, and decisions made by producers and consumers in economic system would affect seasonality. These decisions were be affected by resource endowments, expectations, preferences and available production technologies in the economic environment. Bulter (1994) defined tourism seasonality as a phenomenon of temporal imbalance during travel, which was mirrored by number of tourists, tourist spending, traffic flow, number of employment, and number of tourists to tourist attractions. The phenomenon of high seasons and off seasons caused by tourism seasonality affected the revenue and profit, employment and utilisation of facilities of tourism industry. Seasonality has long been considered one of the biggest features of tourism (Butler 2001), which has been disrupting the operation and development of the tourism industry. In this paper, the X-13 ARIMA-SEATS method is adopted to explore the tourism seasonality of tourists visiting Taiwan and to analyse the off and high seasons of tourists coming to

Taiwan from different countries and regions so as to provide relevant reference for formulation of relevant policies.

II. Literature Review

Seasonality is one of the significant features in tourism market. As a temporary imbalance phenomenon, seasonality arises from fluctuations in the time series occurs during special periods of the year. and repeats in similar or periodic cycle every year. (Moore, 1989). BarOn (1975) was the first scholar abroad who put forward comprehensive research on tourism seasonality (Koenig-Lewis and Bischoff, 2005), and analysed the seasonal patterns of 16 inbound tourism countries through static measurement methods of seasonal range, seasonality ratio and peak seasonal factors.

Yacoumis (1980) adopted three methods of index of seasonal variation, seasonality ratio and coefficient of seasonal variation to the tourism seasonality of Sri Lanka from 1967 to 1979. He also explored the tourism seasonality from, regions and department levels. As a result, this empirical analysis believed that coefficient of seasonal variation was a better method for tourism seasonality measurement.

Sutcliffe and Sinclair (1980) separated seasonal variations into pure change and pattern change and adopted the Lorenz curve and the Gini coefficient. Standard deviation and the extension of information theory by Tate (1967) can be used to measure the tourism seasonality in Spain from 1952 to 1975, taking the seasonality analysis to the next level. Drakatos (1987) explored the patterns of tourism seasonality of Greek from 1980 to 1985 by means of seasonal concentration index and moving average method, and compared the differences with those of neighbouring countries.

Using regression analysis to the seasonal variation of tourism industry in Canada during 1986-1997, Wilton and Wirjanto (1998) selected 113 national tourism indicators and analysed the seasonal variation from five aspects of tourism demand, foreign tourism demand, domestic tourism demand, tourism product supply and number of employment created by tourism. It turned out that except the number of employment created by tourism, there was clear seasonality among tourism demand, foreign tourism demand, and domestic tourism demand and tourism product supply in Canada, all of which occurred in the third quarter of every year.

Sorensen (1999) adopted a total of 324 nights of hotel accommodation data from Denmark during 1970-1996 and divided into 15 counties and cities, and 12 inbound tourism countries to verify the randomness of seasonality. When constructing traditional models, the author held that seasonal variations were deterministic or constant, and argued that seasonality was stochastic rather than stationary according to the definition of seasonality of Hylleberg (1986). Hence, in terms of the seasonality randomness of hotel accommodation verified by a seasonal unit root, it was found that regardless of the hotel accommodation series of counties and cities or inbound tourism countries, varying and changing seasonal patterns are fairly common, that is, seasonality of hotel accommodation was random rather than stationary.

Tourism seasonality was the temporal imbalance of distribution of time, which was mirrored by number of tourists, traffic flow, tourist spending, number of tourists to tourist attractions and number of employment. (Bulter, 1994). Lundtorp (2001) the tourism seasonality of Denmark from 1989 to 1998, using the number of hotel rooms as a substitute variable for tourists, and using the Gini coefficient and seasonal index to measure the tourism seasonality in 15 counties and cities in Denmark. The result showed tourism seasonality in Denmark was fairly stable and both measures were suitable for showing the concentration and proliferation of seasons.

To the tourist numbers from Japan to China with data from 1986 to 2000 and to explore seasonal patterns of China's inbound tourism market using the ARIMA method (Lim and Pan, 2005) was used. From January 1992 to December 2004, Koc and Altinay (2007) explored the seasonality of the Turkish inbound tourism market from the perspective of market segmentation. Using TRAMO/SEATS and X-12 ARIMA were employed to the inbound tourism seasonality of Turkey. The study found that the seasonal pattern of inbound tourism in Turkey was not stationary, that is, seasonal randomness was obvious.

Gini coefficient was adopted to study seasonal concentration of accommodation demands in the Costa del Sol from 1989 to 1994. Fernández-Morales and Mayorga-Toledano (2008) separated the Gini coefficient into different inbound tourism countries in order to understand the contribution of different countries to seasonal concentration and the marginal effect of accommodation variations. This study separated the Gini coefficient, which helped to grasp the main sources of seasonal concentration, and was of substantial benefits to industry and government agencies in formulating relevant strategies. In a review concerning prediction and establishing a model of tourism demand, by Haiyan & Gang (2008) it suggested that one distinct feature of tourist demand was seasonal variations. Seasonal fluctuations were quite complex for the tourism industry and were often presented in time series of random components; if seasonality was considered a deterministic item and was introduced into the time series model, there would be a clear seasonal variation. Cuccia and Rizzo (2011) used the X-12 ARIMA method to the seasonality of cultural and tourism destination of Sicily.

It can be seen from the above literature, tourism seasonality has been widely discussed in multiple countries around the world. However, rare studies concerning this aspect are seen in Taiwan. In terms of research methods, from the early static narrative statistics to the recent dynamic time series methods, various discussions concerning tourism seasonality put forward different thoughts. This paper uses the X-13 ARIMA method to explore the tourism seasonality of tourist arrivals to Taiwan and hope to reach certain findings for reference of development of tourism in Taiwan.

III. Research Method

1. Data source

Monthly Tourism Statistics published by Tourism Bureau (MOTC) covers numbers of tourists coming to Taiwan, number of Taiwanese going abroad, occupancy rate of tourism hotels in Taiwan, and number of tourists at the major tourist and leisure spots in Taiwan. This study uses statistical data on the number of tourists coming to Taiwan in the monthly report for empirical analysis. Information are selected from January 2002 to December 2016 to tourists from Hong Kong, Japan, South Korea, Singapore, Malaysia, Thailand, America and other countries and regions.

2. X-13 ARIMA-SEATS

In January 2013, the Census Bureau officially released the new seasonal adjustment mode (X-13 ARIMA-SEATS), integrating the latest X-12-ARIMA version with the SEATS program. The newly method enables users to select SEATS or X-11 seasonal adjustment method independently on the same page and evaluate season adjustment quality and stability with diagnostic analysis tools; also, parameters and model selection function of ARIMA error regression model are increased to effectively handle a number of time series of data. This built-in regression function allowed the trading day effect and holiday effect to be presented with appropriate explanatory variables and the ARIMA nature of the residuals to be retained (Shu-Min Liu, 2007).

In the whole X-13 ARIMA seasonal adjustment process, there are three main parts: 1. REGARIMA model, 2.X-11 seasonal adjustment model, 3. Diagnostic test (see Figure 1). These three parts will be elaborated as follows:

(1) RegARIMA model

The RegARIMA model combines regression with the time series ARIMA to be used to identify and quantify the factors that affect the estimation of seasonal factors. The main purpose of the regression method is to detect and modify the trading day effect, holiday effect and outliers, and to eliminate the influencing factors in advance through the establishment of the regression equation. ARIMA mainly constructs the forecasting model, and forwards or backwards forecasting the series data to supplement the numerical values at both ends of the series.

The RegARIMA model can be expressed as follows (UK national statistics, 2007):

where $\log\left[\frac{Y_t}{D_t}\right] = \beta' X_t + Z_t$ (1)

$\log\left[\frac{Y_t}{D_t}\right]$ in Eq. (1) is the logarithmic conversion of the original data Y_t: Z_t is an ARIMA process and X_t is a regression coefficient, such as the trading day, holiday or calendar effect and outlier, and β is a coefficient to be estimated: D_t refers to the leap-year adjustments or other known external effects.

(2) X-13 seasonal adjustment model

Seasonal adjustment SEATS (Signal Extraction in ARIMA Time Series) adopts the ARIMA model to separate trends, cycles, seasons, and irregularities in time series. Common time series separation forms include addition model (if the seasonal scale remains the same, it will not change with the original sequence level), multiplication model (if the seasonal scale and the original sequence level are is proportionally changed), and its time series data can be separated into the following elements: trend and cycle Ct, seasonality St, irregular It.

Addition model: $Y_t = C_t + S_t + I_t$ Multiplication model: $Y_t = C_t * S_t * I_t$

The seasonal adjustment process is briefly described in the following (UK national statistics, 2007). Assuming that the three elements in the sequence are of multiplicative relations($Y_t = C_t * S_t * I_t$), we first use the trend moving average method to obtain the initial replacement and the trend circulation C_t', and then eliminate the trend C_t with the original series data Y_t ($SI_t = S_t * I_t = Y_t / C_t'$).Then, the outlier is identified in the series SI_t, and the seasonal moving average method is applied to the series SI_t to obtain the preliminary seasonal element $\widehat{S}_t$. Later, the original series Y_t is divided by the seasonal element $\widehat{S}_t$ to obtain the initial seasonal adjustment series $\widehat{SA}_t'$. In the end, the above equation is repeated to use Henderson's moving average method to calculate the trend cycle of the series $\widehat{SA}_t'$.

(3) Diagnostic test

As seasonality and trading days have their periodicity, we first use spectral analysis to whether the above adjustments are still effective after seasonal adjustment. X-13ARIMA-SEATS software will automatically generate season-adjusted difference series (first-differenced, transformed seasonally adjusted series).

Stability diagnostics: X-13 ARIMA contains two types of stability diagnostics of sliding span and revision histories (Findley et al., 1998). Sliding sample analysis mainly divides all the data into overlapping sub-samples, is used to calculate the seasonal factors of different sub-sample and compare the differences between the maximum value and the minimum value of the seasonal factor or month-to-month changes of the same month to verify the stability of seasonal adjustment. Revision history test is mainly based on the seasonal adjustment and could not distort the trend cycle nature of the original series. Therefore, in the adjustment process of repeated tests, each adjustment should not vary greatly from the above adjustment. Revision history test provides a percentage between the final adjustment and concurrent adjustment (Liu, 2007).and the overall index of the acceptability for seasonal adjustment. Overall indicators Q and Q2. and seasonally adjusted quality control statistics and Individual indicators M1-M11.

IV. Results Analysis

1. Overview of number of tourists coming to Taiwan "Geopolitics" plays a vital role in the development of international tourism. From the origin tourism countries of tourists coming to Taiwan over the years, the impact of geopolitics on the development of Taiwan's tourism can be seen. In Table 1, it shows the changes in visitor arrivals to Taiwan from 1981 to 2016. In 1981, there were a total of 860,000 tourists coming to Taiwan, and over one million tourists in 1988. Thereafter, number of tourists coming to Taiwan was maintained at one million. With the implementation of "Doubling Tourist Arrivals", the number of tourists visiting Taiwan increased gradually, with 1.381 million tourists in 2005, 2.98 million in 2009 and 7.56 million in 2016. From the living area of tourists, it can be found that 95% of tourists came from Asia in 2016, 2.97% from the Americas and only an average of 1.30% from Europe. This showed the importance of regional tourism for Taiwan's tourism development. Tourists from Asia reached 720,000 in 1981, 1.242 million in 2015 and soared to 7.193 million in 2016. In 1981, numbers of tourists from the Americas and Europe were 76,000 and 32,000, which increased to 225,000 and 98,000 in 2016.

Table 2 shows the major origin tourism countries of tourists coming to Taiwan from 1981 to 2016. It can be seen that tourists from Mainland China have become the main source of tourists in inbound tourism market of Taiwan. Tourists from Mainland China recorded 63,000 in 2008, significantly increased to 1.228 million in 2010, and reached 3.437 million in 2015 and 2.845 million in 2016. Previously, Japan was the leading outbound tourism country for Taiwan. With the arrival of tourists from Mainland China, Japan is currently the third largest source of tourists to Taiwan. Tourists from Japan reached 532,000 in 1981, increased to 734,000 in 1989, and gradually declined until 2007. The number of tourists from Japan is 737,000 in 2007. and substantially increased to 1.399 million in 2016. Hong Kong has witnessed a rapid increase in the number of tourists visiting Taiwan in the past 10 years and has become the second largest source of inbound tourism in Taiwan. Tourists from Hong Kong recorded only 9,000 in 1987, raised to 220,000 in 2001, 426,000 in 2008 and 1.397 million in 2016. Malaysia, Singapore and South Korea, like Hong Kong, are also seeing fast-growing numbers of tourists coming to Taiwan in the past 10 years. In 2002, the numbers of tourist arrivals to Taiwan in these three areas were respectively 21,000, 29,000 and 11,000 and increased to 339,000, 292,000 and 693,000 in 2016. Tourists from America to Taiwan reached 66,000 in 1981, exceeded 100,000 in 2009 and recorded 166,000 in 2015.

2. Analysis of tourism seasonality

The X-13 ARIMA in Eviews software is adopted to estimate the seasonal factors of tourist arrivals and the result shows that the numbers of tourists of all countries in Table 3 are logarithmically transformed. The ARIMA model is applied and divided Hong Kong: ARIMA$(0,1,1)(0,1,1)_{12}$; Japan: ARIMA$(0,1,1)(1,1,1)_{12}$; Korea: ARIMA$(1,1,0)(1,1,2)_{12}$; Singapore: ARIMA$(0,1,1)(0,1,1)_{12}$; Malaysia $(0,1,1)(0,1,1)_{12}$; Thailand $(0,1,1)(0,1,1)_{12}$; America $(0,1,1)(0,1,1)_{12}$; overall visits to Taiwan:$(0,1,1)(0,1,1)_{12}$. Through the Ljung-Box Q statistic test, residual values of eight ARIMA models meet the white noise requirements. In terms of X-12 ARIMA model outliers, it is estimated through systematic detection that tourists from all over the world are affected by unexpected events both at home and abroad, such as the 2003 SARS incident and the global financial crisis in 2008, causing temporary impact. For the overall indicators of Q and Q2 values, the Q and Q2 values of eight X-13ARIMA models are all less than 1, which are acceptable. The seasonal factors estimated by the X-13ARIMA models of various countries coming to Taiwan are described as follows:

1. Tourism seasonality of Hong Kong

In Figure 2,it shows the seasonal variations of tourist from Hong Kong during the period from 2002 to 2016. As can be seen from Figure 2, April, June, July, August and December are the months with more tourists, with the proportion of tourists respectively taking up 9.41%, 9.81%, 9.46%, 10.82% and 10.97% ,of the total. Among them, April is the average number of tourists at a certain standard. These months are the peak seasons. January witnesses the least tourist volume, with the average proportion of tourists being only 5.28% during the whole year.

2. Tourism seasonality of Japan

In Figure 3, it shows the seasonal variations of tourist from Japan during the period from 2002 to 2016. The red line in Figure 3 shows that the average seasonal factor is 1. When the blue line is larger than 1, it means that such months are the high season; and such months are the low-season if the blue line is smaller than 1. March, August and December are the high seasons every year, with the proportion of tourists respectively being 10.61%, 8.81% and 9.77%. Fluctuations are seen in September, October and November. Although there is slight rebound in recent years, it still moves up and down the average, with no significant change. The off season months are April, May, June and July, of which July welcomes the least number of tourists, accounting for only 6.51%. The seasonal variation period are from December to January (from high season to off season) and from July to August (from off season to high season).

3. Tourism seasonality of Korea

In Figure 4 ,it shows the seasonal variations of tourist from Korea during the period from 2002 to 2016. The seasons with more tourists are January, February and December. However, as can be seen from Figure 4, both January and February show a year-on-year decline. Only December witnesses steady growth, with a proportion of 10.7%. On the contrary, although the off season are from July to November, these months have seen an upward trend in recent years. This shows that the willingness and number of tourists to visit Taiwan has changed. Taking October as an example, the number of tourists climbed from 705 in 2002 to 228,969 in 2016. During these 15 years, the proportion of tourists from Korea grew by 99.7%, and the average number of tourists in the year was above 5%.

4. Tourism seasonality of Singapore

In Figure 5, it shows the seasonal variations of tourist from Singapore during the period from 2002 to 2016. As can be seen from Figure 5, from March to June are the high season months, but number of tourists in April, May and June are still flat or even declining year by year, which entails review of tourism policies or other factors. Normally, November and December welcome the largest number of tourists, with a proportion of 13.62% and 21.15%. Periods from January to February and from July to October are low season months, both with an annual average ratio of number of tourists less than 5%.

5. Tourism seasonality of Malaysia

In Figure 6,it shows the seasonal variations of tourist from Malaysia during the period from 2002 to 2016. Period from March to May and from October to December are high season months. Among them, the number of tourists in November and December account for the highest proportion of 13.41% and 16.54%. Period from January to July are low season months, with the numbers of tourists accounting for 4.76% and 4.58%.

6. Tourism seasonality of Thailand

In Figure 7,it shows the seasonal variations of tourist from Thailand during the period from 2002 to 2016. As can be seen from Figure 7, there are significant differences in the number of tourists from Thailand to Taiwan, of which April and December are the high season months, accounting for 13.01% and 17.28%. However, periods from January to February and from June to September only see about 5% of number of tourists, showing a fluctuating or declining trend. In this aspect, we can refer to the tourism habits of Thailand.

7. Tourism seasonality of America

In Figure 8, it shows the seasonal variations of tourist from America during the period from 2002 to 2016. March, April, June, July, October November and December are the high season months, among which December welcomes the largest number of tourists with a proportion of 11.78% of the total number of tourists in the year. But only the number of tourists in November continues to grow, with a proportion of 10.03% during the whole year. Other months witness slight decreases. February and September are off season months, with the proportions of 5.93% and 6.39% in the whole year.

8. Tourism seasonality of overall tourism

Overall, the high season months for inbound tourism in Taiwan are from March to April and from November to December, with an annual tourist arrivals of 9.29%, 8.79%, 9.31% and 10.64%. The off season months are January and September, with the proportion of numbers of tourists of 6.90% and 7.46% in the whole year. A large number of countries are in line with the overall trend of inbound tourism in Taiwan. But few tourists from Hong Kong and Korea come to Taiwan during the high season months. Tourists from other countries such as Japan, Malaysia, Singapore, Thailand and America come to Taiwan during the high season months. In terms of off season months, off season months of Japan and Korea are relatively different from those of Taiwan, while other countries, such as: Hong Kong, Malaysia, Singapore, Thailand and America are basically the same with those of Taiwan.

In addition, as can be seen from the variations of seasonal factors of tourists visiting Taiwan in Figure 10, seasonal patterns of tourists visiting Taiwan have changed from the previous unimodal peaks to a bimodal one after 2009, with a decreasing gap between the high and off season months. This shows that the distribution of tourists in each month of the year is becoming more and more uniform, which is favourable for the development of tourism-related industries in Taiwan.

V. Conclusion

As a global industry, tourism industry has been playing a significant role in creating economic benefits and employment for a country. Development of Taiwan's tourism started from 1956. In recent years, inbound tourism market has been greatly driven by the implementation of the "Doubling Tourist Arrivals" and the "Tourism Outstanding Pilot Scheme". With the substantial increase in the number of tourists, how to strike a balance between quality and quantity becomes an important issue that cannot be ignored in the tourism development of Taiwan. This paper adopts the X-13 ARIMA-SEATS method to measure the tourism seasonality of tourists visiting Taiwan. The empirical results show that as to seasonality analysis, the high seasons for tourists visiting Taiwan are March and April, and November and December every year, with gradual narrowing gap between the high and off seasons. Except for Hong Kong and Korea, all other countries are in line with the overall tourism trend, while the off-seasons are January and September each year. Seven main origin tourism counties have different high seasons, resulting in the uniform overall distribution of tourists to Taiwan, which is conducive to the overall development of Taiwan's tourism industry. However, in off season months of January, July and September each year, there are fewer tourist arrivals in Taiwan's inbound tourism market. The contribution of this research is the analysis of data from high-season and off season months, In consideration of the regional tourism economy, the local transport routes and environmental facilities can be planned for high season months, to develop diversified tourism marketing and strategies, improve the utilisation of space, and enhance business performance. During off season months, Stay at Home Economic may be developed through Internet or platform marketing to provide distance-free remote services. For the overall environment, off-season and high-season analysis not only helps to generate economic development, but can provide a sustainable planning direction, and link environmental dynamic carrying capacity and sustainable development.