The Pattern of International Tourist Arrivals in Penang, Malaysia: 2002-2007

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Forecasting plays a vital role in tourism planning and tourism promotion strategies requiring an estimate of future tourism demand to fulfill national aspirations. This article investigates the applications of time series forecasting techniques namely exponential smoothing and univariate Autoregressive Integrated Moving Average (ARIMA) models to predict the number of arrivals from different countries to the state of Penang in Malaysia by air and sea, based on available data from January 2002 to December 2007. The month-wise seasonal factor has been determined and consequently the peak, moderate and lean months in terms of international tourist arrivals to Penang has been detected. Further, it is worthwhile to study the cluster of countries visiting Penang to identify the arrival pattern from different origins.

Key Words: Exponential smoothing models, Autoregressive Integrated Moving Average (ARIMA) models

Introduction

The primary objectives of developing and promoting tourism are to increase the Gross Domestic Product of the country and to earn foreign exchange. In order to achieve these objectives, all development and promotion plans should be deployed effectively and efficiently to the fullest extent possible provided accurate forecast is acquired. Tourism demand forecasting has been dealt with extensively by several authors, among others, Calantone, di Benedetto and Bojanic (1987); Martin and Witt (1987); Witt and Martin (1987); Witt and Witt (1991) and Turner, Kulendran, and Fernando (1997). Tideswell, Mules and Faulkner (2001) used an integrative approach for tourism forecasting that consisted of Holt's exponential smoothing. The integrative approach was applied specifically in their investigation into potential tourism for South Australia. In the area of business tourism, initial research was claimed to have started in the 1960s and continued intermittently through 2003 (Smith and Toms, 1967; Cleverdon, 1985; Morley and Sutikno, 1991; Witt and Witt, 1995; Kulendran and Wilson, 2000a; Kulendran and Wilson, 2000b; Kulendran and Witt, 2003). The error correction models (ECM), the ARIMA and the no-change models were the models used in Kulendran and Wilson (2000b) while Kulendran and Witt (2003) included additional models such as structural time-series model (STSM), the basic structural model (BSM), and a further ARIMA models. Kulendran and Witt (2003) found that the ECM produced better accuracy than the STSM but was a contradiction to Gonzalez and Moral (1995). Tourism is an exciting, vast and important area for investigation and development

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because it creates several spin-offs that create employment both in the service and manufacturing sectors. The spin-offs include, for example, increased revenue for industries such as transportation, restaurants, hotel and its related suppliers, entertainment, money exchange and medical.

With the advent of technology and the progressive wealth of many developing nations, we see the increase in tourism happening regionally and globally. This paper presents an analysis of tourist arrival data by air and sea into the state of Penang, Malaysia. The arrival data was furnished by the Penang Tourism Action Council, one of the state bodies responsible for the promotion of state tourism. The state of Penang has a moderate share of international tourist arrivals to Malaysia of about 3.5% on the average based on the national data. Penang is located in the north-west corner of Malaysia. A portion of the state land is located on the mainland of Peninsular Malaysia containing a few satellite towns, namely Seberang Prai, Seberang Jaya, Bukit Mertajam and Butterworth. The other half of the state is the island called Penang Island named after the Pinang tree or the areca nut tree. The state capital is called Georgetown located in the north east corner of the North-East district of the island. The state of Penang has an international airport capable of taking in jumbo jets, a sea port handling seagoing cargo, a bridge linking the island to the mainland allowing people of both sides to travel to their work destinations, several private hospitals which also promote cosmetic surgery, four and five star beach hotels serving local and western cuisine, and a private and public taxis plying the roads.

Badaruddin and Omar (2008) studied the competitiveness of 15 destinations in Malaysia using a questionnaire survey from October 2007 through April 2008. The many attributes surveyed were categorized under five themes, namely (1) tourist attractions, (2) facilities and services, (3) infrastructures, (4) costs and (5) hospitality. The state of Penang was one of the destinations studied. The destinations comprised capital cities of other states and also a resort highland. Initial results showed Penang ranked 6th in terms of overall satisfaction, 3rd in terms of tourists' willingness to revisit the destination, and 2nd alongside two other destinations in terms of tourists' willingness to recommend the destination to others. Tan (2008) wrote about her pilot project documenting Penang culture to promote a sustainable cultural tourism. The article described, with clear detail, the diverse settlers from different parts of the region that "included Europeans, Armenians, Malays, Achenese, Batak, Chinese, Chuliahs, Bengalese, Siamese, Burmese, Arabs, Parsees, Native Christians and Caffrees (Africans)." Penang was a confluence of trading for these people who brought along different types of food, worship practices; these people also built worship places of varied architecture. According to Tan (2008) this diverse cultural heritage could attract tourists. Likewise, Abdullah (2008) also researched into the cultural heritage of Penang, in particular with reference to: (1) the role played by cultural heritage assets in making a site livable for the community, (2) the extent of community knowledge of cultural assets in their immediate neighbourhood, and (3) the community's perception of heritage value of their own residency/workplace, trade and neighbourhood. More importantly, the area demarcated in the first phase of the research reinforced the work of Tan (2008) on the diverse cultural heritage of Penang, especially in the so-called inner city of Penang that was the initial settlement of the early settlers. While there is a relative abundance of descriptive studies of Penang, there appears to be little research using time-series modelling for international tourist arrivals to Penang. Therefore, this research makes an attempt to study the pattern of tourist arrivals in Penang from different parts of the world using appropriate forecasting models. Further, the seasonal variations of arrivals from January 2002 through December 2007 and clustering of tourists from different countries are explored.

Research Methodology

The original research design required the researchers to gather data on international tourist arrivals into Malaysia – nation-wise, state-wise and day-wise. Incidentally, the Malaysian Tourism Promotion Board, Ministry of Tourism, Malaysia, which is the national body of tourism development, does not have state-wise data in their database as their main interest is national revenue from tourism. This forced the researchers to contact state authorities to obtain state data and the state of Penang was the earliest to respond to our request. Data of international arrivals into Penang was obtained from the Penang Tourism Action Council. The Penang database consisted of yearly international tourist arrivals (2002 through 2007), monthly arrivals by air and sea, and arrivals from different countries to Penang. Apparently, the data is collected at the main entry points into Penang such as airport and seaport. The authenticity and the accuracy of this secondary data are therefore ensured for the purpose of statistical model building. However, the data excludes international visitors coming to Penang transiting through Kuala Lumpur (air) or arriving by domestic ferry from Butterworth. The data received is connected with the latest years from 2002 to 2007 complete with 72 months of information, which is sufficiently good enough for model building. The data was imported into SPSS software for the purpose of analysis.

Objectives of the Study

The major objectives of the current paper are to:

1. Identify the appropriate statistical model for international tourist arrivals in Penang. This has to be separately carried out for those who are travelling by air and sea.
2. Estimate the international tourist arrivals for Penang for the next three years month-wise.
3. Study the pattern of tourist arrivals in Penang using seasonal decomposition.
4. Cluster all the countries visiting Penang so as to identify maximum, moderate, average and below average arrivals.

Significant Findings

The international tourist arrivals from 2002 to 2007 via air and sea are provided in Table 1. The maximum tourists visited the state Penang of Malaysia during 2006, although 2007 was declared as Visit Malaysia Year by the government. It is interesting to note that on the average there was a 1:4 ratio of people arriving via sea and air respectively to Penang.

Table 1: Penang Data on International Tourist arrivals: Year-wise

Year	By Air	By Sea	Total Arrivals
2002	370,753	96,851	467,604
2003	337,686	91,128	428,814
2004	447,161	120,045	567,206
2005	378,247	122,873	501,120
2006	472,521	99,300	571,821
2007	444,851	95,885	540,736

Forecasting Models for International Tourist Arrivals in Penang

In addition to the yearly data given in Table 1, monthly data has also been collected from January 2002 to December 2007 (72 months) for forecasting purposes. Several time series models using SPSS have been applied to identify the best model for those who are coming by air, sea and for total respectively. Surprisingly, the exponential smoothing model fits well for all the three series of data and the model statistics and best estimates of the parameters are given in Table 2. A measure that compares the stationary part of the model to a simple mean model is called the Stationary R^2. This measure is preferable to ordinary R-squared when there is a trend or seasonal pattern. In our case the Stationary R^2 values are above 62% for all three models indicating the goodness of fit. The mean absolute percentage error (MAPE) score is least for total arrivals (10.382%) followed by air (13.2%) and it strengthens the validity of the model. However, it is necessary to test the goodness of the fit, and for which we set the null hypothesis:

H_0: The exponential smoothing model fits well for the data
against
H_1: The exponential smoothing model is not good.

Under the null hypothesis, the Ljung-Box statistic has been used for all the three time series data (Hanke and Wichern, 2008). It is clear from Table 2 that the significance value p exceeded 0.05 for all the three cases and so there is no evidence to reject H_0. Hence, the exponential smoothing model is best suited for the data and the goodness of fit is therefore established through the Ljung-Box statistic.

Table 2: Model Statistics

	Model Fit statistics								Ljung-Box Q Statistic		
Model	Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	MaxAE	Normalized BIC	Statistics	DF	Sig.
By air-Model_1	.666	.411	5196.995	13.200	3268.843	225.032	24361.997	17.230	10.422	16	.844
By sea-Model_2	.629	.370	1865.715	16.825	1373.170	104.814	5773.832	15.182	11.965	16	.746
Total-Model_3	.647	.402	5592.673	10.382	3647.108	119.298	25822.036	17.377	16.913	16	.391

In one parameter exponential smoothing model, alpha (α) is the smoothing constant with $0 < \alpha < 1$ and the model is given by:

$$s_0 = x_0$$
$$s_t = \alpha x_t + (1-\alpha)s_{t-1} = s_{t-1} + \alpha(x_t - s_{t-1})$$

The smoothed statistic s_t is a simple weighted average of the latest observation x_t and the previous smoothed statistic s_{t-1}. This form of exponential smoothing is also known an ARIMA (0,1,1) model with no constant term. The two parameter exponential smoothing model includes delta (δ) for smoothing the mean absolute deviation and the error total. However, the estimated value of delta is close to zero for all three cases (Table 3) and hence it is not statistically significant and so one can restrict to exponential smoothing model with one parameter alpha stated above. For air visitors the alpha value is 0.5 and is found to be highly statistically significant ($t = 4.734$, $p < 0.001$). Similarly for sea and total visitors,

alpha values are found to be 0.3 and 0.4 respectively and are highly statistically significant at 1% level of significance.

Table 3: Exponential Smoothing Model Parameter

Model			Estimate	SE	t	Sig.
By air-Model_1	No Transformation	Alpha (Level)	.500	.106	4.734	.000
		Delta (Season)	1.65E-005	.221	7.45E-005	1.000
By sea-Model_2	No Transformation	Alpha (Level)	.300	.089	3.376	.001
		Delta (Season)	1.19E-005	.132	9.07E-005	1.000
Total-Model_3	No Transformation	Alpha (Level)	.400	.096	4.146	.000
		Delta (Season)	2.08E-005	.187	.000	1.000

The month wise international tourist visitors for Penang are displayed in Figure 1. It includes the best fitted exponential smoothing model, the 95% confidence limits with lower and upper confidence values and the projected values till December 2010. It is worthwhile to mention that the original tourist arrivals and the fitted values are closer to each other for all the three cases namely by air, sea and for total arrivals. The projected values for three years from January 2008 to December 2010 along with the lower and upper confidence values are provided in Appendix.

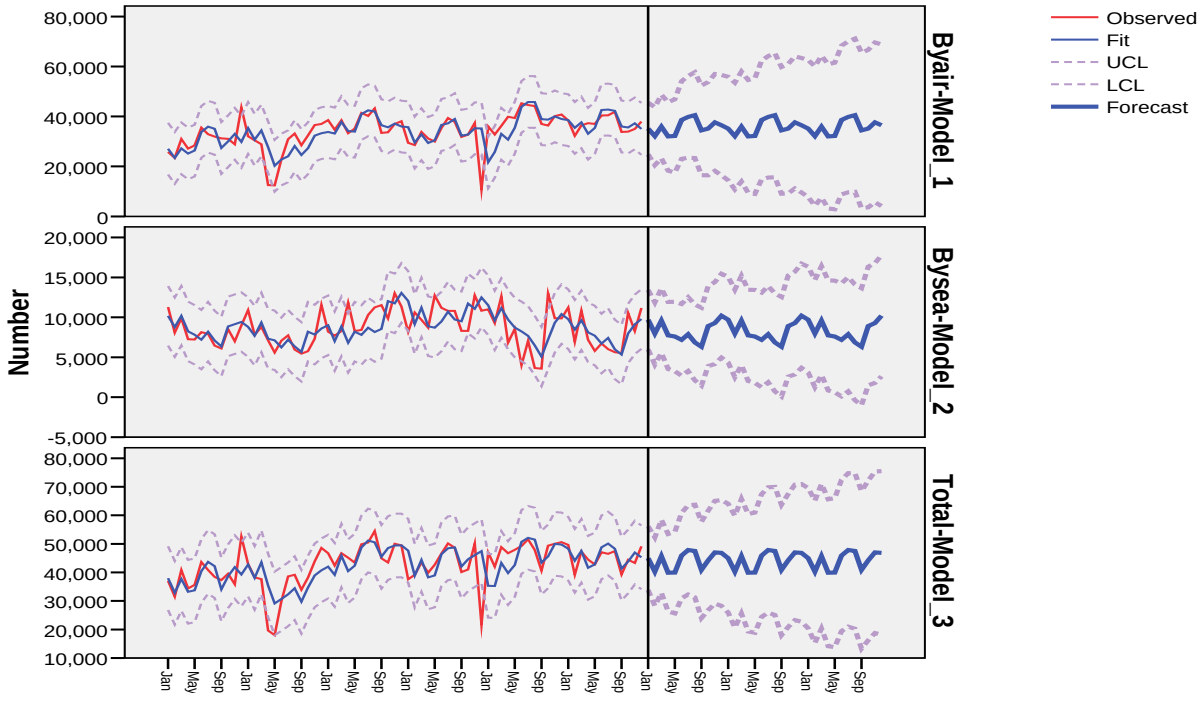


Figure 1

The exponential smoothing model fits well for the Penang international tourist arrival data and is clearly evinced from the Residual Autoregressive Correlation Function (ACF) and Residual Partial Autoregressive Correlation Function (PACF) graphs given in Figure 2. The variations between the observed and fitted values are well within ± 0.5 and are negligible. This result holds good for all the 3 cases namely for air, sea and total international tourist arrivals and the lag time is taken to be 12 months periodicity.

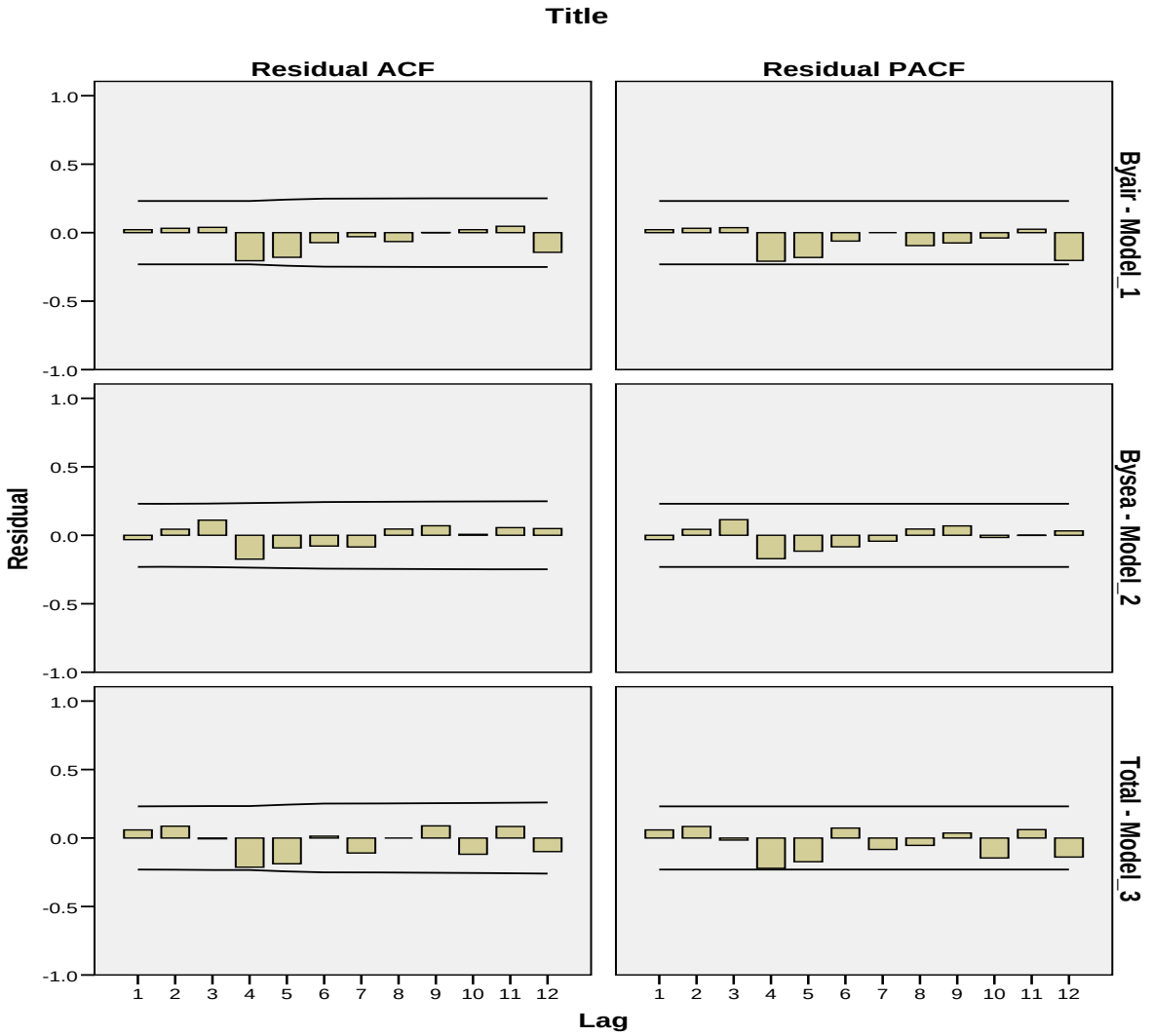
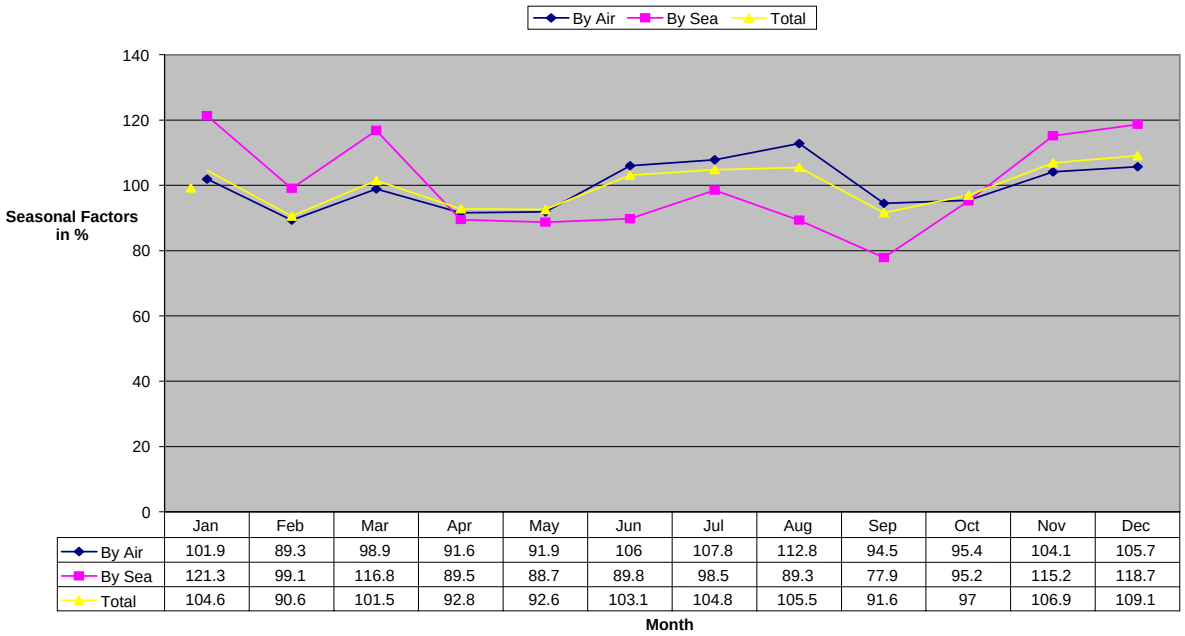


Figure 2

Seasonal Fluctuations Month Wise for International Tourist Arrivals in Penang

The seasonal fluctuations using the ratio to moving average method through multiplicative decomposition of the Time series model have been calculated for each month by fixing the years from 2002 to 2007, and are displayed in Figure 3. As far as the tourists who are coming by air to Penang, the peak months in terms of more tourists are June, July, August and December irrespective of year. In fact, the maximum tourist arrivals occur during August and it is 12.8% more than the base value of 100%. Lean tourist arrivals occur during February and is 10.7% less compared to the base value. Interestingly, the international tourist arrivals are less during February to May by air and there are no major events taking place during this season in Penang. On the other hand, the maximum arrivals by sea occur during January and it is more to the extent of 21.3%. In fact, peak arrivals for Penang occur during November to January every year by sea. With regards to lean periods, the minimum arrivals occur during September (22.1% less) followed by May (11.3% less).



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
By Air	101.9	89.3	98.9	91.6	91.9	106	107.8	112.8	94.5	95.4	104.1	105.7
By Sea	121.3	99.1	116.8	89.5	88.7	89.8	98.5	89.3	77.9	95.2	115.2	118.7
Total	104.6	90.6	101.5	92.8	92.6	103.1	104.8	105.5	91.6	97	106.9	109.1

Figure 3: Seasonal Factor (in %) of International Tourist Arrivals in Penang, Malaysia

Cluster Analysis for Grouping the Visiting Countries to Penang

The authentic data on international tourist arrivals to Penang by air and sea according to 31 different origins are given in Table 4 from 2002 to 2007. It is obvious from Table 4 that Indonesia forms a major contribution in terms maximum tourist arrivals by air and sea followed by Singapore. However, it is difficult to identify from the raw data countries which are visiting Penang on a moderate and below average basis. For this purpose, the K-means non-hierarchical cluster analysis has been applied and the results are provided in Table 5.

Table 4: Tourist arrivals from different countries to Penang

Year	**2002**		**2003**		**2004**		**2005**		**2006**		**2007**	
Country	**Air**	**Sea**	**Air**	**Sea**	**Air**	**Sea**	**Air**	**Sea**	**Air**	**Sea**	**Air**	**Sea**
Singapore	63925	1232	42830	2297	51474	13446	50389	16985	59920	16727	55465	16967
Australia	11088	2342	6531	275	10852	2753	11391	9275	12831	11820	12105	6577
New Zealand	1260	214	1035	54	2542	656	1471	755	2149	713	1615	437
Canada	2754	425	2188	313	3001	493	2610	441	3650	607	3770	439
United Kingdom	14086	2509	11845	2327	24736	3304	21038	3372	17149	2953	16684	4207
Hong Kong (British)	9549	13	10509	6	11934	292	6159	547	8620	607	5400	624
Hong Kong (C.I.)	248	5	0	1	0	2	148	2	961	12	1093	62
Sri Lanka	315	4	223	1	352	158	421	196	363	277	142	199
Bangladesh	686	5	1792	3	1878	17	533	39	940	37	1257	13
India	4846	43	3032	78	5118	9616	6497	18994	5632	12203	6582	10400
Brunei Darussalam	131	6	462	9	719	88	136	43	257	87	415	103
Others Common-wealth Countries	1779	235	2814	178	4123	812	3885	1262	3886	706	3450	807
United	15837	1230	11046	377	15935	872	15794	1773	20459	2706	20577	1919

States												
China	6145	77	5816	172	10266	2281	9332	3516	12806	3961	16085	4377
Russia	418	25	407	12	386	18	539	46	600	61	738	39
America Latin	294	63	237	47	300	227	441	332	573	242	480	169
Arabia Countries	2144	47	755	30	3387	510	2609	626	3163	493	1019	404
Germany	4575	1975	3317	2191	4116	5330	4560	491	6248	1544	6261	1847
France	1425	681	1137	745	1328	360	1362	400	2018	602	1955	729
Norway, Sweden, Denmark	2014	1056	1533	495	2195	373	1785	443	2854	490	2573	62
Belgium, Luxemburg, Netherland	1754	761	944	753	1447	460	1337	365	2004	367	1503	472
Others West Europe Countries	2258	550	1549	391	1883	569	1893	304	2847	458	1709	2006
East Europe	143	98	180	72	361	213	323	72	625	79	580	140
Philippians	2515	219	2384	151	3190	1985	3304	2141	3713	3425	3919	2747
Thailand	5825	313	4798	303	10213	2234	11561	1459	16202	1345	17466	1382
Taiwan	22815	25	31533	5	41551	297	24471	1040	35083	1270	32815	766
Indonesia	158143	81818	163302	79496	193086	69615	157754	53495	201209	31996	187731	31061
Pakistan	276	7	449	5	826	120	570	261	542	238	868	179
Japan	27540	585	18364	173	21727	2236	17750	1893	25516	2230	25685	5448
South Korea	2862	112	1917	45	12913	338	13162	1484	15640	532	8848	687
Others	3103	176	4757	123	5322	370	5022	821	4061	512	6061	616
Total	370753	96851	337686	91128	447161	120045	378247	122873	472521	99300	444851	95885

The non-hierarchical K-means cluster analysis attempts to identify relatively homogeneous groups of countries based on the international tourist arrivals to Penang month-wise from 2002 to 2007, using an algorithm that can handle large numbers of multivariate data points. However, the algorithm requires specifying the number of clusters and accordingly many trial runs were made. The best suitable model requires four clusters and is listed in Table 5. Understandably, Indonesia forms a separate cluster and the number of tourists visiting Penang by air and sea is very high from that country. The neighbouring country for Malaysia namely Singapore forms a second cluster in terms of moderate tourist arrivals by air, sea and total. It is surprising to see that India joins Singapore in the same cluster in terms of visitors by sea. The average number of international tourist arrivals forms the third cluster in which four countries are involved (Taiwan, Japan, US and UK) by air and one country is involved by sea (Australia). It is highly imperative at this juncture to concentrate on why this pattern existed in the past and how to improve upon this in future. The appropriate strategies to improve tourism on the whole may be evolved in order to improve the tourism revenue for the country.

Table 5: Clustering of countries visiting Penang

Arrivals	By Air	By Sea	Total
Very High	Indonesia	Indonesia	Indonesia
Moderate	Singapore	Singapore, India	Singapore
Average	Taiwan, Japan, US, UK,	Australia	Taiwan, Japan, Australia, UK, India, Us, China, Thailand,
Low	Remaining 25 Countries	Remaining 27 Countries	Remaining 21 Countries

Conclusions

The data on the international tourist arrivals from different countries to the state of Penang, Malaysia has been considered for study from January 2002 to December 2007 (72 months). It is interesting to observe from the data that on average there is a 1:4 tourist ratio that came via sea and air respectively to Penang. The 20% of arrivals via sea could have seen visitors coming from Medan and Banda Acheh (both of Sumatra) and short cruises from Singapore, Port Klang (the state of Selangor) or Phuket and Krabi (both of Thailand). The exponential smoothing model (ARIMA (0,1,1) with no constant terms fits well for the monthly time series international tourist arrivals for both by air and sea visiting Penang. Using these best fits with lower and upper 95% confidence limits, the projected values for the next three years from January 2008 to December 2010 were computed. As far as the international tourists who came by air to Penang, the peak months are June, July, August and December irrespective of the years. June, July and August could have seen visitors coming from countries in the northern hemisphere while December could see visitors coming from the southern hemisphere. Hotels in the state of Penang usually see relatively higher occupancy rates in June because of visitors from the Middle East. Apparently visitors leave their countries to spend time away from cold winters or hot summers. The state of Penang has colourful and interesting cultural festivals interspersed with national sports events throughout the year. This information is easily available on websites relating to Penang tourism. These festivals and sports events represent attractions to international tourists. However the lean months of international tourist arrivals occuring from February through May could be explained by a lack of push factors from visitors of foreign countries. On the other hand, the peak arrivals by sea occur during January which experienced arrivals in excess of 21.3% compared to other months. In fact, peak arrivals for Penang occur during November to January every year by sea. This can be attributed to the short cruises from nearby foreign seaports or sea towns mentioned earlier. With regards to the lean period, the minimum arrivals occur during September (22.1% less) followed by May (11.3% less). Indonesia forms a separate cluster and the number of tourists visiting Penang by air and sea is very high from that country. Although it is quite understandable that neighbouring Singapore forms the second cluster in terms of moderate tourist arrivals by air and sea, it is surprising to see that India joins with Singapore in the same cluster in terms of more visitors by sea. The average number of international tourist arrivals forming the third cluster in this study come from four countries consisting of Taiwan, Japan, US, UK (predominantly by air) and Australia (predominantly by sea). Although some tourists from the remaining parts of the world visit Penang, this number seems to be very low and they form the last cluster consisting of more than 21 countries. Based on these findings, it would be helpful for tourism strategists to come up with some appropriate measures for each cluster to increase tourism revenue for the state of Penang.

Limitations of the Study

The forecasting estimates of international tourist arrivals to Penang are obtained based on actual visitors only and the time series model does not include economic and non-economic factors such as the cost of living in Penang, occupancy rate of tourists, inflation rate, important events and functions that are taking place in Penang, cultural heritage, sightseeing places, etc. However, there is not much variation in the international tourist arrivals into Penang across the months for the years 2002-2007 and therefore the researcher could correctly identify the best forecasting model based on arrivals alone. Since the database includes all tourists from different countries visiting Penang, it is possible to carry out tourism forecasting for each country as well but it is beyond the scope of the objectives of the current study.

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Appendix

Forecasting for International Tourist Arrivals in Penang using ARIMA (0,1,1)

	By Air			By Sea			Total		
	Predicted values	95% Confidence Limits		Predicted values	95% Confidence Limits		Predicted values	95% Confidence Limits	
Month		Lower	Upper		Lower	Upper		Lower	Upper
Jan-08	35161	24796	45526	9712	5991	13433	45002	33848	56156
Feb-08	32158	20569	43746	7983	4098	11868	40269	28256	52283
Mar-08	35933	23238	48627	9596	5554	13638	45658	32842	58474
Apr-08	32020	18308	45732	7733	3540	11926	39882	26312	53452
May-08	32188	17529	46846	7604	3265	11944	39921	25636	54206
Jun-08	38596	23048	54144	7178	2698	11659	45903	30937	60869
Jul-08	39859	23470	56247	7886	3269	12503	47873	32257	63490
Aug-08	40507	23318	57696	6867	2117	11618	47503	31262	63745
Sep-08	34419	16466	52372	6327	1447	11207	40875	24031	57718
Oct-08	35140	16454	53826	8908	3902	13914	44177	26753	61602
Nov-08	37631	18239	57022	9283	4154	14412	47043	29056	65029
Dec-08	36505	16433	56578	10200	4951	15449	46834	28302	65367
Jan-09	35161	14430	55891	9712	4346	15078	45002	25940	64064
Feb-09	32158	10789	53526	7983	2502	13464	40269	20692	59846
Mar-09	35933	13945	57921	9596	4003	15190	45658	25579	65737
Apr-09	32020	9429	54611	7733	2029	13437	39882	19313	60451
May-09	32188	9010	55365	7604	1793	13416	39921	18874	60968
Jun-09	38596	14846	62346	7178	1260	13096	45903	24388	67418
Jul-09	39859	15550	64167	7886	1864	13908	47873	25900	69846
Aug-09	40507	15652	65362	6867	743	12992	47503	25082	69925
Sep-09	34419	9029	59808	6327	101	12553	40875	18013	63736
Oct-09	35140	9227	61053	8908	2583	15233	44177	20884	67470
Nov-09	37631	11204	64057	9283	2860	15706	47043	23326	70759
Dec-09	36505	9576	63435	10200	3681	16719	46834	22702	70967
Jan-10	35161	7737	62585	9712	3098	16326	45002	20460	69543
Feb-10	32158	4248	60067	7983	1275	14690	40269	15326	65213
Mar-10	35933	7546	64319	9596	2797	16396	45658	20318	70998
Apr-10	32020	3164	60876	7733	843	14624	39882	14153	65612
May-10	32188	2870	61505	7604	624	14585	39921	13807	66035
Jun-10	38596	8824	68368	7178	109	14247	45903	19411	72395
Jul-10	39859	9639	70078	7886	729	15043	47873	21008	74739
Aug-10	40507	9846	71168	6867	-376	14111	47503	20270	74737
Sep-10	34419	3323	65515	6327	-1002	13656	40875	13278	68471
Oct-10	35140	3615	66665	8908	1495	16321	44177	16222	72132

Nov-10	37631	5683	69579	9283	1786	16780	47043	18734	75351
Dec-10	36505	4140	68871	10200	2621	17780	46834	18176	75493

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