American Journal of Tourism Management 2013, 2(2): 55-61
DOI: 10.5923/j.tourism.20130202.04

Forecasting Annual Patronage by Domestic and Foreign Tourists to Mole National Park, Ghana

Eric Adjei Lawer[1,*], SulemanNasiru[2], Conrad-J. Wuleka Kuuder[3]

[1]University for Development Studies, Dept. of Range & Wildlife Mgt., Nyankpala Campus, P. O. Box TL1882, Tamale, Ghana
[2]University for Development Studies, Dept. of Statistics, Navrongo Campus,P. O. Box 24, Navrongo, Ghana
[3]University for Development Studies, Dept. of Ecotourism & Environmental Mgt., Nyankpala Campus, P. O. Box TL1882, Tamale, Ghana

Abstract The ecotourism industry contributes significantly to the economic development of a country as well as conserving its biodiversity. The introduction and development of ecotourism gives an economic and educational growth opportunity to the indigenous people that would not otherwise be available. This study employed the double exponential smoothing model to model the annual number of domestic and foreign tourists who travel to Mole National Park. Forecast with the models revealed that the number of domestic tourists will continue to increase while that of the foreign tourists will decrease with time. This will have a negative impact on the industry and the country as a whole due to a possible decline in foreign exchange earnings. It is therefore recommended that management of the park and its stakeholders should work assiduously to develop and implement effective ecotourism packages that will help attract more tourists especially foreigners.

Keywords Ecotourism, Domestic Tourist, Foreign Tourist, Ghana, Forecast

1. Introduction

Tourism has expanded to such an extent that it is considered the largest business on earth[15][20]. The tourism industry plays a significant role in the economic development of a country. For instance, Ghana's tourism sector provided about 47,000 direct and 115,000 indirect jobs in 2004 compared to 19,000 direct and 46,000 indirect jobs in 1996[1]. Thus, tourism is a very appealing prospect, particularly in developing countries where economic development alternatives in rural areas are limited, biodiversity investments are inadequate and public funds to support are usually scarce. All forms of tourism can make substantial contributions to the economy of a country but ecotourism is particularly important in the context of sustainable development[17][8] and biodiversity conservation[11]. Ecotourism is the fastest growing sector of the tourism industry[7].[12] Proposed a more detailed definition of ecotourism as "travel to fragile, pristine and usually protected areas that strives to be low impact and (usually) small scale. It helps educate the traveler; provides funds for conservation; directly benefits the economic development and political empowerment of local communities; and fosters respect for different cultures and for human rights". The concept of protected areas began evolving in the 19th century largely as a response to population pressure and increased resource consumption. Protected areas are characterized by; defined borders, an identifiable entity or individual that manages and protects it and has established conservation objectives. For most countries, protected areas have become the last and most significant reserves of plant and animal diversity, water and other ecological services[9]. The first true national park was established in 1872[3][18] with the dedication of Yellowstone by United States law "as a public park or pleasuring ground for the benefit and enjoyment of the people"[10]. Ghana's wildlife laws which date back to 1901 were based on the 1900 London Convention. Though the country's first game reserves were constituted in 1909, no department was established with the sole mandate of wildlife protection. It was not until 1957 that three (3) new reserves namely Mole, Shai Hills and Owabi were proposed[6] which were later gazetted along with many others in subsequent years.

According to[21], world tourism grew by an estimated 7.4 percent in 2000. In Ghana however, tourist arrivals increased from 172,000 in 1991 to 429,000 in 2005[1]. The introduction and development of ecotourism gives an economic and educational growth opportunity to the indigenous people that would not otherwise be available. Considering the number of benefits derived from the ecotourism industry, it is imperative to expand the industry. However, the expansion of the industry one way or the other depends on the number of tourists who travel to the various tourist centers in the country.

A number of studies have been done on tourism.[16] in his studies argues that more travels are onlypossible when

* Corresponding author:
ladjei@uds.edu.gh (Eric Adjei Lawer)
Published online at http://journal.sapub.org/tourism

the increases in leisure time are accompanied by increase in income.[22]investigated the travel behavior of Chinese leisure travelers to Australia.[5],[19] and[23] are among the few studies which analyzed the contributing factors of Chinese outbound tourism. This study thus employs the double exponential smoothing model to forecast the annual arrivals of domestic and foreign tourists to Mole National Park in Ghana.

2. Methodology

2.1. Study Area

The study was carried out in Mole National Park as shown in Figure 1. The park located in the Northern Region of Ghana covers an estimated land area of 4,912 Km^2. It is characterized by rich and diverse floral (eg. *Burkeaafricana,Parkiabiglobosa*and *Vitellariaparadoxa*) and faunal (eg.*Kobuskob, Loxodonta Africana,* and *Syncerus caffer*) species which makes it a tourist destination for both domestic and foreign visitors.The park also has various attractions that are of value for ecotourism. For instance, the Polzen waterfall which is a haven for water birds is a major attraction to visitors. That apart, the park has two scarps of touristic value in which are located the Konkori and Gbanwelle caves.

This study was conducted using secondary data on the number of domestic and foreign tourists who travel to the Mole National Park. Yearly data from 1988 to 2012 was obtained from the Mole National Park management.

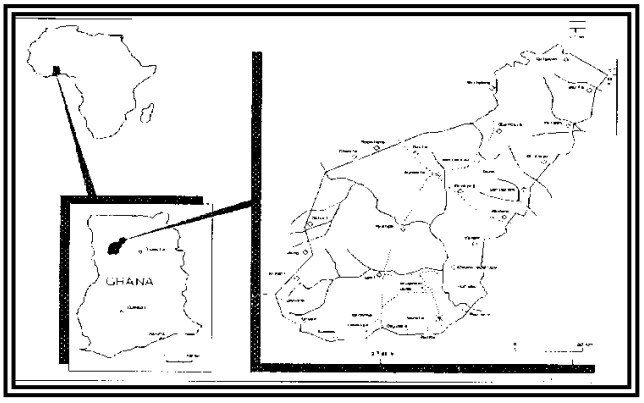

Figure 1. Map of Ghana showing Mole National Park

2.2. Double Exponential Smoothing Model

The Double exponential smoothing model was employed to model the number of domestic and foreign tourists who travel to the park. The use of this model is appropriate when the data has constant or non-constant trend but with seasonal pattern present[2]. The double exponential smoothing equations are given by;

$$L_t = \alpha Y_t + (1-\alpha)L_{t-1} \quad (1)$$

$$T_t = \gamma(L_t - L_{t-1}) + (1-\gamma)T_{t-1} \quad (2)$$

where L_t is the level at time t, α is the weight for the level, T_t is the trend at time t, γ is the weight for the trend, Y_t is the data values at time t. The one-step-ahead forecast at time t, is given by;

$$\hat{Y}_t = L_{t-1} + T_{t-1}$$

2.3. Ljung-Box Test

The Ljung-Box Q_m statistic was used to test for the presence of autocorrelation in the data and the residuals of the developed model[14]. The test statistic is given by;

$$Q_m = n(n+2)\sum_{k=1}^{m}(n-k)^{-1}r_k^2 \sim \chi^2_{m-r} \quad (3)$$

where

r_k^2 is the sample autocorrelation at lag k

n is the number of observations

m is the number of time lags included in the test.

When the p-values associated with the Q_m is large the autocorrelation is insignificant. The test was performed at 5% level of significance.

2.4. Testing for Trend

In order to investigate the existence of trend in the data, an F-test for trend and curvature of trend was performed using regression with autocorrelated errors[2]. The model is given by;

$$Y_t = \alpha + \beta t + \theta t^2 + \varepsilon_t \quad (4)$$

with $\varepsilon_t = \eta_1\varepsilon_{t-1} + \eta_2\varepsilon_{t-2} + \ldots + \eta_p\varepsilon_{t-p} + a_t$

The relevant null hypotheses of these tests are

$H_0: \beta = \theta = 0$ (No trend) and

$H_0: \theta = 0$ (No curvature in trend)

3. Results and Discussion

Table 1 presents the descriptive statistics of both domestic and foreign tourists who travel to Mole National Park in a year. The average number of domestic and foreign tourists was 2,959 and 4,276 respectively. The minimum number of domestic and foreign tourists was 617 and 970 respectively and the maximum number was 8,048 and 8,759 respectively. Comparing the coefficient of variation, the foreign tourists had the least value. This indicates that the data for the foreign tourists was more evenly distributed than that of the domestic tourists. The data for both groups were positively skewed indicating that there are large swings in the data sets. The values for the excess kurtosis were negative indicating that the distribution of the data for both domestic and foreign tourists was platykurtic in nature. This implied that the observations for each group are widely scattered around their average value.

Table 1. Descriptive statistics of Domestic and Foreign tourists' travelers

Variable	Mean	CV (%)	Min	Max	Skewness	Ex. Kurtosis
Domestic	2959	85.33	617	8048	0.82	-0.73
Foreign	4276	62.15	970	8759	0.42	-1.39

Figure 2 displays the time series plot for both domestic and foreign tourists. A visual analysis revealed that there was an increasing trend with an unstable mean in the data, as the

mean keeps increasing and decreasing at certain points.

3.1. Exponential Smoothing Model for Domestic Tourists

In order to fit the double exponential smoothing model to the domestic tourists' data, the existence of trend in the data was first investigated. A look at the correlation between successive values of the data revealed that the autocorrelation declined towards zero slowly, an indication of the presence of trend and non-stationarity in the data.The *p*-values for the Ljung-Box statistics were all less than0.05 indicating that the autocorrelation coefficients were significantly different from zero as shown in Table 2. This is an additional evidence of the presence of trend in the data. The existence of trend and curvature of trend in the data were further investigated. The results as shown in Tables 3 and 4 revealed that the trend (linear) was not significant but curvature of trend was significant. This justifies the use of the double exponential smoothing model as appropriate for the analysis. Using Minitab optimal ARIMA approach, the estimated smoothing parameters were $\alpha = 0.334721$ for the level and $\gamma = 0.409795$ for the trend. The estimated Mean Absolute Percent Error (MAPE), Mean Absolute Deviation (MAD) and Mean Squared Deviation (MSD) were 17, 505 and 596397 respectively.

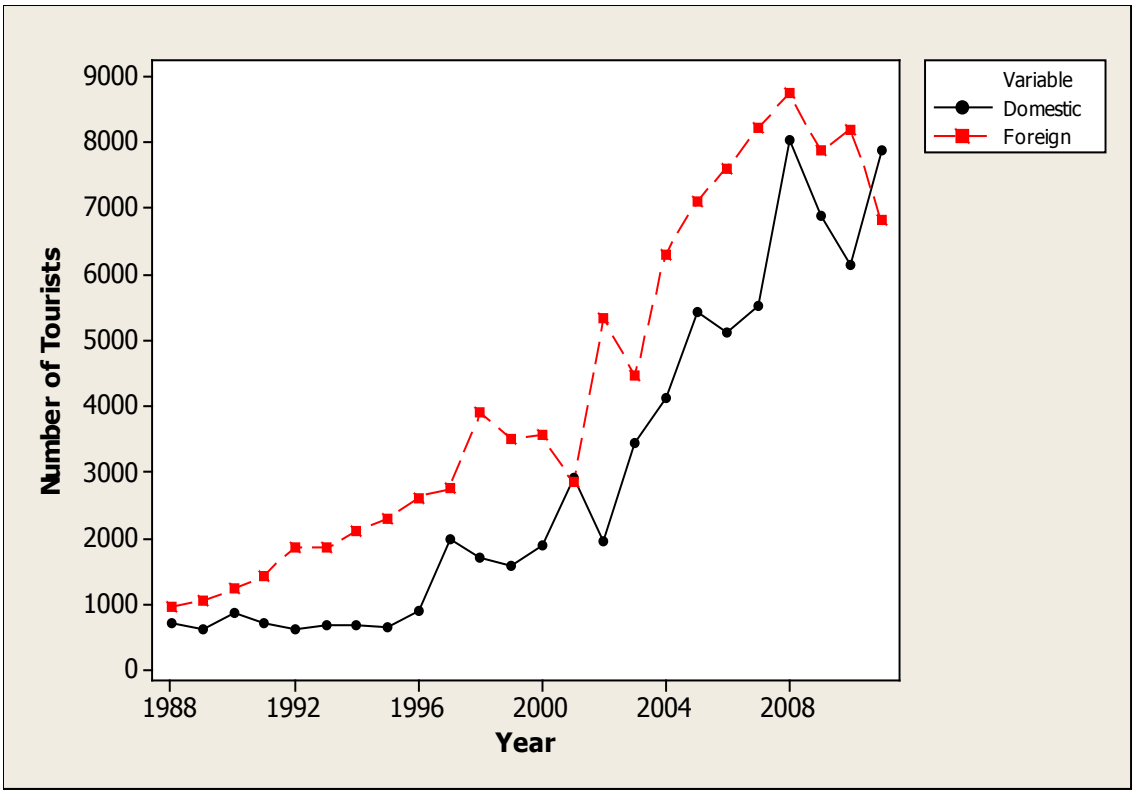

Figure 2. Time series plot of Domestic and Foreign tourist travelers

Table 2. Autocorrelation Function (ACF) of the Domestic Tourist data

Lag	ACF	Q-stat	*p*-value	Lag	ACF	Q-stat	*p*-value
1	0.8336	18.8537	0.0000	11	-0.2133	64.0191	0.0000
2	0.7462	34.6464	0.0000	12	-0.2774	68.0203	0.0000
3	0.6561	47.4390	0.0000	13	-0.3199	73.8250	0.0000
4	0.4727	54.4097	0.0000	14	-0.3397	81.0268	0.0000
5	0.3395	58.1958	0.0000	15	-0.3948	91.8311	0.0000
6	0.2225	59.9116	0.0000	16	-0.3969	104.121	0.0000
7	0.1040	60.3088	0.0000	17	-0.3755	116.688	0.0000
8	-0.0072	60.3108	0.0000	18	-0.3346	128.330	0.0000
9	-0.1203	60.9134	0.0000	19	-0.3042	139.882	0.0000
10	-0.1438	61.8348	0.0000	20	-0.2623	150.617	0.0000

Table 3. Test for linear Trend in Domestic Tourist data

Source	DF	Mean Square	*F*-value	*Pr*> *F*
Numerator	1	611875	1.48	0.2366
Denominator	21	412279		

Table 4. Test for curvature in Trend in Domestic Tourist data

Source	DF	Mean Square	*F*-value	*Pr*> *F*
Numerator	1	13526646	32.81	0.0001
Denominator	21	412279		

The double exponential smoothing equations for the domestic tourist travelers are therefore given by;

$$L_t = 0.334721\,Y_t + 0.665279\,(L_{t-1} + T_{t-1})$$

$$T_t = 0.409795\,(L_t - L_{t-1}) + 0.590205\,T_{t-1}$$

Diagnostic checks on the residuals of the model revealed that the model is free from serial correlation as the p-values for the Ljung-Box statistics were greater than 0.05 as shown in Table 5. A ten-year forecast using the model revealed that the number of domestic tourists who annually patronize the Mole National Park will continue to increase as shown in Figure 3. This is good news to the tourism industry as more funds will accrue from domestic tourists to expand the industry.

3.2. Exponential Smoothing Model for Foreign Tourists

The existence of trend in the foreign tourists' data was investigated. The ACF revealed that the autocorrelation declined towards zero slowly, which is indicative of trend and non-stationarity in the data. The p-values for the Ljung-Box statistics were all less than 0.05 indicating that the autocorrelation coefficients were significantly different from zero and this further affirms the presence of trend in the data as shown in Table 6. Another test was carried out to further investigate the presence and curvature of trend. As shown in Table 7 and Table 8, the trend (linear) was significant but curvature of trend was not. Thus the choice of the double exponential smoothing model for the foreign tourists was appropriate. Using Minitab optimal ARIMA approach, the estimated smoothing parameters were $\alpha = 0.41706$ for the level and $\gamma = 1.44252$ for the trend. However, $\gamma = 1.44252$ is outside the suggested range for exponential smoothing which seems to exemplify[4] argument that in practice it is possible for the smoothing constants to fall outside the suggested range.

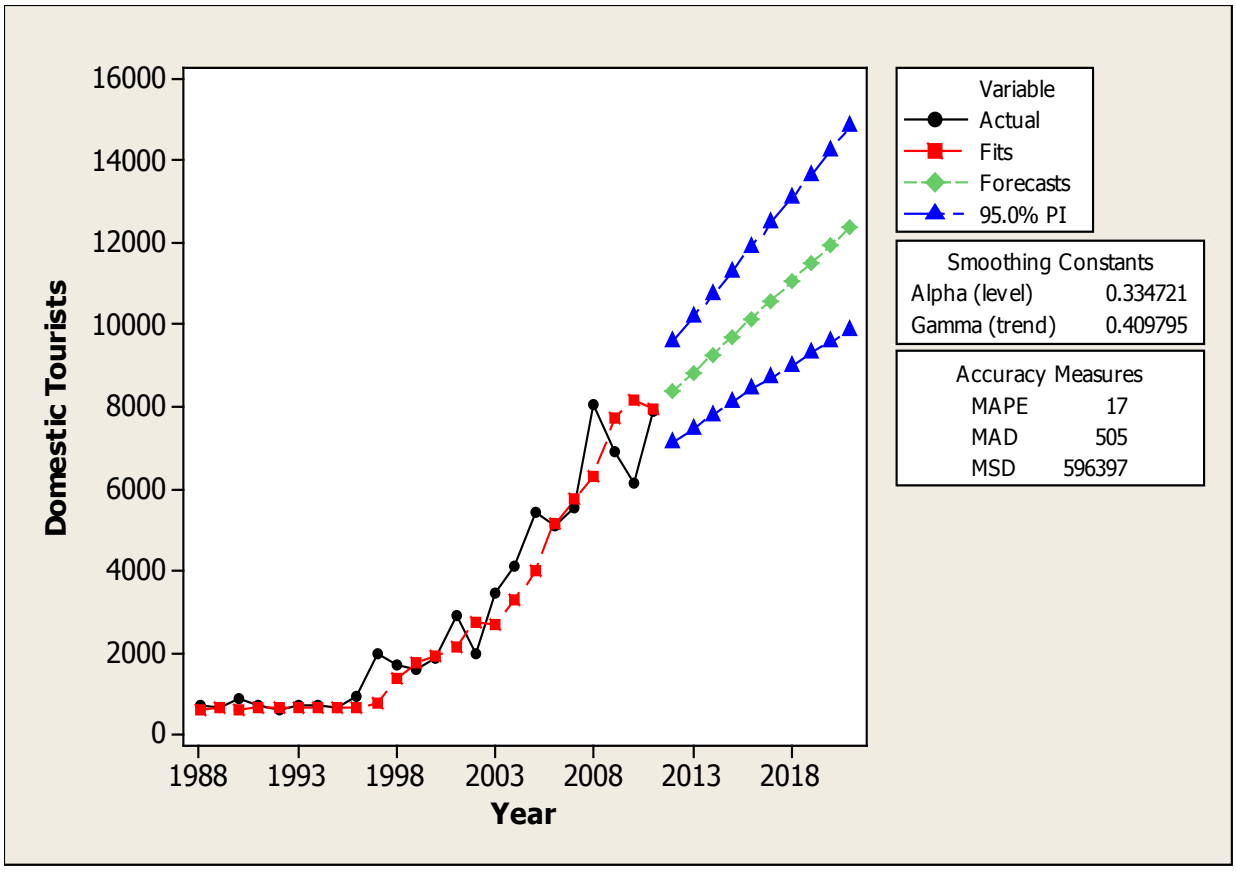

Figure 3. Ten Years forecast of number of Domestic Tourists

Table 5. ACF of residuals of the model for Domestic Tourists

Lag	ACF	Q-stat	*p*-value	Lag	ACF	Q-stat	*p*-value
1	0.0479	0.0621	0.8030	11	0.1532	11.7632	0.3820
2	-0.2769	2.2364	0.3270	12	-0.1228	12.5475	0.4030
3	0.1152	2.6306	0.4520	13	-0.2069	14.9750	0.3090
4	0.0850	2.8559	0.5820	14	-0.0367	15.0592	0.3740
5	-0.2622	5.1146	0.4020	15	0.0302	15.1226	0.4430
6	0.2906	8.0430	0.2350	16	-0.0110	15.1320	0.5150
7	0.1391	8.7531	0.2710	17	0.0134	15.1481	0.5850
8	0.1664	9.8331	0.2770	18	0.0603	15.5268	0.6260
9	-0.1383	10.6284	0.3020	19	-0.0039	15.5286	0.6880
10	0.0137	10.6367	0.3870	20	-0.0093	15.5420	0.7450

Table 6. ACF of the Foreign Tourist data

Lag	ACF	Q-stat	*p*-value	Lag	ACF	Q-stat	*p*-value
1	0.8935	21.6606	0.0000	11	-0.1937	69.6459	0.0000
2	0.7935	39.5208	0.0000	12	-0.2457	72.7842	0.0000
3	0.6523	52.1650	0.0000	13	-0.3096	78.2222	0.0000
4	0.5055	60.1360	0.0000	14	-0.3893	87.6803	0.0000
5	0.3551	64.2782	0.0000	15	-0.4034	98.9615	0.0000
6	0.2316	66.1378	0.0000	16	-0.4333	113.6042	0.0000
7	0.0961	66.4766	0.0000	17	-0.4230	129.5532	0.0000
8	0.0035	66.4771	0.0000	18	-0.3901	145.3796	0.0000
9	-0.0808	66.7489	0.0000	19	-0.3437	160.1206	0.0000
10	-0.1568	67.8448	0.0000	20	-0.2810	172.4358	0.0000

Table 7. Test for linear Trend in Foreign Tourist data

Source	DF	Mean Square	*F*-value	*Pr*> *F*
Numerator	1	3240060	4.61	0.0437
Denominator	21	703203		

The estimated MAPE, MAD and MSD were 12, 510 and 598633 respectively. The double exponential smoothing equations for the foreign tourists are therefore given by;

$$L_t = 0.41706Y_t + 0.58294\,(L_{t-1} + T_{t-1})$$

$$T_t = 1.44252\,(L_t - L_{t-1}) - 0.44252\,T_{t-1}$$

Diagnostic checks on the residuals of the model revealed that the model is free from serial correlation as the *p*-values for the Ljung-Box statistics were greater than 0.05 as shown in Table 9. A ten-year forecast using the model showed there will be a decrease in the number of foreign tourists who visit Mole National Park annually as shown in Figure 4. This finding however is contrary to that of[13] who in a study of the same park suggested that foreign rather than domestic tourism had a brighter future. Thus, the number of foreign tourists will not show any significant increments unless corrective measures are put in place. This would have a negative impact on both the tourism industry and the country as a whole. Thus, the country would be losing an appreciable amount of foreign exchange brought into the country by foreign travelers.

Table 8. Test for curvature in Trend in Foreign Tourist data

Source	DF	Mean Square	*F*-value	*Pr*> *F*
Numerator	1	1565340	2.23	0.1506
Denominator	21	703203		

4. Conclusions

This study employed the double exponential smoothing model to model the number of domestic and foreign tourists who patronize Mole National Park all-year round. Diagnostic tests revealed that the models developed were adequate for forecasting the number of domestic and foreign tourists who travel to the Mole National Park. The forecast for the number of domestic tourists revealed that arrivals would continue to increase annually. This is good to the

tourism industry as more funds will be accrued to develop the park. However, the forecast for foreign arrivals revealed that their visits to the park will continue to decrease with time. This will likely have a negative impact on the tourism industry and the country as a whole. The country would lose the foreign exchange these foreign tourists bring into the country. It is therefore recommended that management of Mole National Park and its stakeholders should work assiduously to develop and implement effective ecotourism packages that will help attract more tourists especially foreigners. This may be more efficiently achieved by instituting visitor-management programs which are essential components for managing tourism in protected areas.

Table 9. ACF of residuals of the model for Foreign Tourists

Lag	ACF	Q-stat	*p*-value	Lag	ACF	Q-stat	*p*-value
1	-0.1460	0.5787	0.4470	11	-0.0716	9.2370	0.6000
2	0.1682	1.3810	0.5010	12	0.0507	9.3705	0.6710
3	-0.1953	2.5149	0.4730	13	-0.0642	9.6040	0.7260
4	-0.0103	2.5183	0.6410	14	0.0106	9.6110	0.7900
5	-0.1903	3.7072	0.5920	15	-0.0327	9.6849	0.8390
6	0.1811	4.8446	0.5640	16	0.0056	9.6873	0.8820
7	-0.1969	6.2675	0.5090	17	-0.0349	9.7958	0.9120
8	0.1224	6.8520	0.5530	18	-0.0074	9.8015	0.9380
9	-0.1739	8.1102	0.5230	19	-0.0265	9.8892	0.9560
10	0.1405	8.9907	0.5330	20	-0.0083	9.8999	0.9700

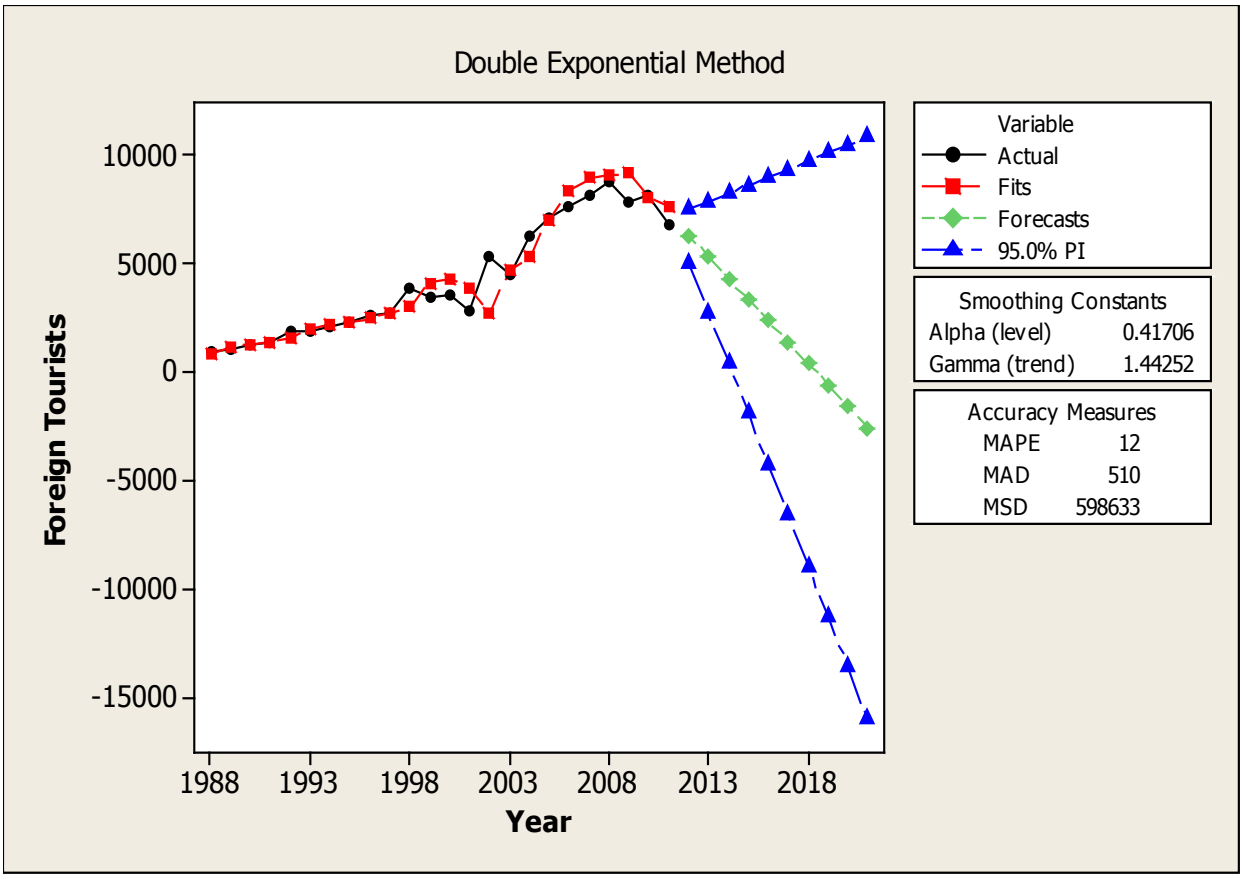

Figure 4. Ten Years forecast of number of Foreign Tourists

REFERENCES

[1] Bank of Ghana (2007). The tourism industry and the Ghanaian economy. Prepared by the research department. http://www.bog.gov.gh/privatecontent/Research/Research%20Papers/tourism.pdf

[2] Bowerman, B. L., and O'Connell, R. T., (1993). Forecasting and Time Series: An Applied Approach, Third edition. Duxbury Press.

[3] Brockman, C.F. (1959). Recreational use of wildlife. McGraw-Hill Book Company, New York,p 256.

[4] Brown, R. G., (1962). Smoothing, Forecasting and Prediction of Discrete Time Series. Prentice-Hall, New York.

[5] Chai, P. P., (1996). China's economy and tourism to Australia. Paper presented at the International Conference on China and the Asia Pacific Economy, Brisbane, Australia, BTR Conference paper, 96.9, July 14-16.

[6] Cansdale, G. S., (1964). The establishment of zoological gardens and wildlife conservation. Report to the Government of Ghana. FAO Report No. 1800. Rome, Italy.

[7] Cater, E., (1994). Ecotourism in the Third World - problems and prospects for sustainability. In: Cater, E. and Lowman, G. (eds). Ecotourism: a sustainable option?John Wiley and Sons Ltd, Chichester, U.K., pp. 69-86.

[8] Dieke, P. U.C., (2004). "Tourism in Africa's Economic Development: Policy Implication," Management Decision, 41 (3):287-295.

[9] Drumm, A., and Moore, A., (2002). Ecotourism development, A manual for conservation planners and managers. Volume 1: An introduction to ecotourism planning. The Nature Conservancy, Arlington, Virginia, USA.

[10] Eagles, P. F.J., McCool, S. F., and Haynes, C. D.A., (2002). Sustainable Tourism in Protected Areas: Guidelines for Planning and Management. IUCN Gland, Switzerland and Cambridge, UK. 183pp.

[11] Gianecchini, J., (1993). Eco-tourism: New partners, new relationships. Conservation Biology. 7:429-43

[12] Honey, M. (1999). Ecotourism and Sustainable Development: Who Owns Paradise? Island Press, Washington, DC, USA.

[13] Kuuder, C. W., (2012). Tourism potentials of Mole National Park in Northern Ghana. African Journal of Hospitality, Tourism and Leisure Vol. 2 (1)

[14] Ljung, G. M., and Box, G. E. P., (1978). On A Measure of Lack of Fit in Time Series Models. Biometrika, 65: 297-303.

[15] Miller, M. L., (1993). "The Rise of Coastal and Marine Tourism,"Ocean and Coastal Management.20:3:181-199.

[16] Ryan, C. (2003). Recreational Tourism: Demand and Impacts. Channel View Publications, Clevedon.

[17] Sinclair, M.T., (1998). Tourism and Economic Development: A Survey, Journal of Development Studies, 34 (5): 1-51.

[18] Turner, F. (1975). Tourism Development in National Parks. New York: Longman Group Ltd. p 86

[19] Wang, Y., and Sheldon, P. J., (1995). The sleeping dragon awakes: the outbound Chinese travel market. Journal of Travel and Tourism Marketing,4 (4): 41-54.

[20] Wells, M. P., (1997). Economic perspectives on nature tourism, conservation and development. Pollution and Environmental Economics Division, Environmental Economics Series, World Bank, Washington, DC, USA.

[21] World Tourism Organization (2001). Sustainable Development of Tourism: A Compilation of Good Practices. World Tourism Organization, Madrid, Spain.

[22] Yu, X., and Weiler, B., (2001). Mainland Chinese pleasure travelers to Australia: a leisure behavior analysis. Tourism, Culture and Communication,3 (2): 81-91.

[23] Zhang, H. Q., and Heung, V. C. S. (2001). The emergence of the mainland Chinese outbound travel market and its implications for tourism marketing. Journal of Vacation Marketing,8 (1): 7-12.