Smart Innovation, Systems and Technologies 171

Álvaro Rocha · António Abreu ·
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Preface

This book is composed by the papers written in English and accepted for presentation and discussion at the 2019 International Conference on Tourism, Technology & Systems (ICOTTS'19). This Conference had the support of the UAI (Universidad Abierta Interamericana) and AISTI (Iberian Association for Information Systems and Technologies). It took place at Buenos Aires, Argentina, December 5th–7th, 2019.

The 2019 International Conference on Tourism, Technology & Systems (ICOTTS'19) is an international forum for researchers and practitioners to present and discuss the most recent innovations, trends, results, experiences and concerns in the several perspectives of Tourism and/or Information Technologies and Systems.

The Program Committee of ICOTTS'19 was composed of a multidisciplinary group of 125 experts and those who are intimately concerned with Information Systems and Technologies. They had the responsibility for evaluating, in a 'double-blind review' process, the papers received for each of the main themes proposed for the Conference: Technology in Tourism and Tourist experience; Generations and Technology in Tourism; Digital Marketing applied to Tourism and Travel; Mobile Technologies applied to sustainable Tourism; Tourism research in providing innovative solutions to social problems; Tourism, Wellness and Hospitality; Information Technologies in Tourism; Digital transformation of Tourism Business; Traveling for health/medical and wellness; Information Technologies in Ecotourism and Agritourism; Information Technologies in Food Tourism; Information Technologies in Education and Educational Tourism; eTourism and Tourism 2.0; Big data and Management for Travel and Tourism; Geo-tagging and Tourist mobility; Health Tourism; Information Systems in Tourism and Hospitality; Smart Destinations; Resilience and Tourism; Dark Tourism; Military Tourism; Tourism Management; Tourism Planning; Strategic Planning in Tourism; Destination Marketing Planning; Destination Partnerships and Team-Building; Destination Governance and Leadership; Destination Product Development; Destination Markets; Accessible Tourism; Cultural Tourism; Destination Quality; Education and Tourism; Human Resources development in Tourism; Robotics in Tourism; Destination Marketing Systems; Computer

Reservations Systems; Global Distribution Systems; Electronic Information Distribution in Tourism and Hospitality; Organizational Models and Information Systems; Information Systems and Technologies.

ICOTTS'19 received about 100 contributions from 20 countries around the world. The papers accepted for presentation and discussion at the Conference are published by Springer (this book) and by AISTI, and will be submitted for indexing by ISI, EI-Compendex, SCOPUS and/or Google Scholar, among others.

We acknowledge all of those that contributed to the staging of ICOTTS'19 (authors, committees, workshop organizers and sponsors). We deeply appreciate their involvement and support that was crucial for the success of ICOTTS'19.

Buenos Aires, Argentina
December 2019

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Contents

Forecasting and estimation of medical tourism demand in India

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Abstract. The paper deals with India's Medical tourism analysis and forecasting, applying two time series forecasting models, for monthly data spreading over 2014 to 2017. Medical tourism worldwide and particularly in India is on rise. Figures of medical tourist arrivals in India for 2014, 2015 and 2016 denotes a significant growth. Several measures have been taken by the Government to attract medical tourists to the country. This study was undertaken to analyse the growth trends in medical tourism in India over a period of last four years and to forecast the medical tourist arrivals over the next couple of years using the ARIMA method for trend projection. The paper discusses these trends and the application of the model. The projections show a great potential for the country to earn valuable foreign exchange through medical tourism. India has a huge cost and expertise advantage which if leveraged through proper publicity can make it one of the leading medical tourist destinations in the days to come. It is suggested that the authorities should take efforts in this direction with aggressive publicity policies.

Keywords: India, Medical tourism, Inbound medical tourism, Forecast, ARIMA model.

1 Introduction

Please Medical tourism industry is one of the fastest growing service sectors of 21st century. The sector is growing exponentially and has emerged as a major force for the growth of service exports worldwide. Available high-quality healthcare services at affordable rate increased role of information and communication channels creating wider range of healthcare services from traditional to modern ones. India is one of the major players in these multi-billion industries. As per the Ministry of Tourism of India [1] "the Foreign Tourist Arrivals (FTA) in India on medical visa during 2016 and 2017 were estimated at 427015 and 495056 respectively, registering a positive growth of 15.9%."

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Medical Tourism holds immense potential for India. The Indian systems of medicines, Ayurveda, Yoga, Panchakarma, Rejuvenation Therapy, etc., are among the most ancient systems of medical treatment in the world. India can provide medical and health care at international standards level but at low costs. India excels in the state-of-the-art medical facilities, reputed health care professionals, quality nursing facilities and traditional healthcare therapies.

India has emerged as a major Medical Tourism destination. The India's Ministry of Commerce informs that as per a FICCI-IMS Knowledge Paper titled 'Medical Value travel in India: Enhancing value in MVT', published in 2016, "India is amongst the top 6 MVT (Medical Value Travel) destinations of the world which include Thailand, Singapore, India, Malaysia, Taiwan and Mexico (India ranked third in the world in 2015). It is further informed that as per the above report, through adequate focus and effective execution, Indian Medical Value Travel, pegged at 3 billion USD in 2015, can be at 9 billion USD opportunity by 2020. This situation shows that medical tourism in India is passing through a process of dynamic change. The market has been growing rapidly and is playing an increasingly important role in international tourism trade and trade relations".

"When it comes to tourism, this developing nation (India) only welcomed 7.7 million international visitors, which can be attributed to the visa requirements for almost all nationalities travelling for tourism. Healthcare in India is mainly dominated by the private sector and most of the healthcare expenses are paid out-of-pocket, as insurance is not yet popular in this destination. Although there are public healthcare facilities owned, control and run by the government, its unreliability makes the private medical sector the main source of healthcare for as many as 7 out of 10 households. This makes the private sector bigger than the public one and thirsty for incremental business including medical tourism, which can take advantage of its not so strong currency and already achieved economies of scale."

The purpose of this research is to analyse past four years' data of medical tourism in India to forecast three years' data of likely medical tourist visitors to India. The present study will try to forecast the number of medical tourist arrivals from various country of nationality until 2020, as precisely as possible, based on available models as suited to the nature of data specific to individual country. Since the data on the number of medical tourist arrivals and their country of nationality is not readily available, this report will significantly help decision makers for long-term decision making for sustainability of medical tourism industry in India.

Medical Tourists visit India from 75 nations [17]. Among them are: Bangladesh, Afghanistan, Iraq, Maldives, Oman, Yemen, Uzbekistan, Ethiopia, Kenya, Sudan, Nigeria, United republic of Tanzania, Somalia, Saudi Arabia, Sri Lanka, Myanmar (Burma), Pakistan, Tajikistan, Mauritius, Uganda, Rwanda, Bahrain, Kuwait, Seychelles, Fiji, Turkmenistan, United kingdom, Zambia, United states, Zimbabwe, Cambodia (Kampuchea), Malawi, United Arab Emirates, Madagascar, Australia, Liberia, South Africa, Jordan, Ukraine, Tuvalu, Germany, Iran, Palestine, Burundi, France, Comoros, Angola, Eritrea, Lebanon, Netherlands, Sierra Leone, Congo, Qatar, Bulgaria, Norway, Niger, Singapore, Italy, Gambia, Botswana.

This paper is structured in four sections, after the introduction. In the second section, literature review was made, where it was written information about Medical tourism analysis and forecasting, India, Medical tourism, inbound medical tourism, Forecast and ARIMA model. In the third section, research methodology was made where it was written about the objective of the study, description of data collection and description of data analysis. The four part presents an analysis of the results that includes Tourist arrival and the descriptive analysis. The fifth part of the work includes conclusions, limitations and future research.

2 Literature Review

Béland and Zarzeczny [2] have drawn on the existing literature to discuss a comparative research agenda on medical tourism that stressed the multidimensional relationship between medical tourism and the institutional characteristics of national health care systems. While on one hand, it is claimed that such characteristics shape the demand for medical tourism in each country, on the other hand, the institutional characteristics of each countries health care system can shape the very nature of the influence of medical tourism on that nation.

Research from Alberta, Canada, suggested that the financial costs associated with treating complications from medical tourism for bariatric surgery are quite huge, and complication rates are sizably higher than similar surgeries conducted in Alberta (42.2–56.1% versus 12.3% locally) [3].

Despite the enactment of the Affordable Care Act (ACA) in 2010 in the USA healthcare system, about 9% of the population remains uninsured [4] and people who lacked insurance coverage but who faced a medical need might go to some other country to seek cheaper treatment. In fact, the higher cost of care in the US has been recognised as a major factor pushing US citizens to seek care at lower cost outside the USA, an option that is facilitated by healthcare globalization. At the same time, differences in regional health system institutions within the two countries can also affect the demand for medical tourism within their borders. For example, in states like Texas, where the elected officials have so far refused to expand Medicaid as part of the ACA [5] large number of people live without health care coverage than elsewhere, about 18% of the population as of March 2016 [6, 17], which may push them to look to Mexico for a cheaper health care. The extent of these concerns differs depending on the urgency of the issue and whether it falls within the purview of hospital and physician services covered by the universal system (versus, for instance, dental care where public coverage is more limited) [7].

Chun [8] referring the 13th Five-year Plan of China that as proposed the strategy of "healthy China", felt hat medical tourism the country was developing rapidly in that environment. The author concluded by saying that Medical tourism in China started late and was in its initial development stage. In addition, the medical literature was insufficient.

Investigating challenges faced by main stakeholders in medical tourism Thayarnsin and Douglas [9] have opined that due to the expansion of the global tourism industry, medical tourism destinations were competing in the international marketplace.

Some medical tourists even purchase medical complication insurance because of the concerns like complications during treatment [10]. Stephano [11] has listed the most common medical conditions treated in medical tourists from USA: Dentistry; Cosmetic surgery; Cardiac conditions; Invitro fertility; Weight loss; Dermatology; Liver, kidney transplants; Spine surgery.

The primary concern of Americans considering medical and surgical treatment in hospitals and clinics outside the United States is the quality of the care. The Joint Commission (formerly the Joint Commission on Accreditation of Hospitals) began to evaluate, inspect, and accredit hospitals outside the United States in 1998. Many overseas hospitals were staffed in part by physicians and other health professionals who were trained in US hospitals. One hospital in India has 200 US-trained board-certified surgeons [12].

Most of the studies have highlighted the reasons for the increase in medical tourism especially in the Western countries. As stated in the 1st chapter under the heading Medical Tourism in India, the Ministry of Tourism has stated that there is a big potential for the growth of Medical Tourism in the country in the backdrop of two important factors – low cost and expertise like Ayurveda. This then demands an analysis of the past trends of the number of medical tourist arrivals in the country to project the future estimates to gear-up well in time to meet the increased demand. No such studies have been found that have tried to mathematically project the likely number of medical tourism arrivals.

3 Research Methodology

A time series model explains a variable about its own past and a random disturbance term. Particular attention is paid to exploring the historic trends and patterns (such as seasonality) of the time series involved, and to predict the future of this series based on the trends and patterns identified in the model. Since time series models only require historical observations of a variable, it is less costly in data collection and model estimation.

Time series models have been widely used for tourism demand forecasting in the past four decades with the dominance of the integrated autoregressive moving-average models (ARIMA) proposed by Box and Jenkins [13]. Different versions of the ARIMA models have been applied in over two-thirds of the post-2000 studies that utilised the time series forecasting techniques. Depending on the frequency of the time series, either simple ARIMA or seasonal ARIMA models could be used with the latter gaining an increasing popularity over the last few years, as seasonality is such a dominant feature of the tourism industry that decision makers are very much interested in the seasonal variation in tourism demand. Regarding the forecasting performance of the ARIMA and SARIMA models, empirical studies present contradictory evidence.

The ARIMA model (*p,d,q*), in which p corresponds to the order of the Autoregressive process (AR), d is the number of differences or integrations, and q corresponds to

the order of the Moving Averages process (MA), is represented by the following expression [14-15]:

$$\left(1-\phi_1 B-\ldots-\phi_p B^p\right)\left(1-B\right)^d Y_t=\left(1-\theta_1 B-\ldots-\theta_q B^q\right)e_t \tag{1}$$

or also, in a more summarised form, by:

$$\phi_p\left(B\right)\nabla^d Y_t=\theta_q\left(B\right)e_t \tag{2}$$

ARIMA models are normally used with quarterly, monthly or even weekly, daily or hourly data, or, in other words, in a context of short-term forecasting. For such purposes, ARIMA models are used to capture seasonal behaviour, in a manner that is identical to the treatment of the regular (or non-seasonal) component of the series. In such applications, it is not customary to work with just one ARIMA model (*p,d,q*), but with the product of the models: ARIMA (*p,d,q*) (*P,D,Q*) in which the first part corresponds to the regular part and the second to the seasonal part, corresponding to the following expression [14-15]:

$$\phi_p\left(B\right)\Phi_P\left(B^S\right)\left(1-B\right)^d\left(1-B^S\right)^D Y_t=\theta_q\left(B\right)\Theta_Q\left(B^S\right)e_t \tag{3}$$

The forecasts made with the ARIMA model, based on historical data, are given by the forecasting function:

$$Y_t^*\left(m\right)=\mathrm{E}\left\{Y_{t+m}/Y_t,Y_{t-1},Y_{t-2},\ldots\right\} \tag{4}$$

ARIMA model building method is an empirically driven methodology of systematically identifying, estimating, diagnosing and forecasting time series [16].

Following objectives were set for this study:

a) To review the medical tourism in India;
b) To analyse past four years data of medical tourists in India;
c) To forecast three years data of likely medical tourist visitors to India.

The study was carried based on secondary data. The main objective was to analyse last four years data pertaining to visits by medical tourism to India and to project the next three years data based on the historical data.

Following methodology was designed:

a. Collect the last four years data of medical tourists visiting in India;
b. Carry a monthly split of the annual data based on total monthly tourist visits;
c. Apply the ARIMA method to analyse the historical data for the past 48 months, (or four years – 2014-2017);
d. Forecast the data for the next 36 months (or three years 2018 and 2020).

ARIMA (*p,d,q*) modelling includes 4 main step: determine (d); determine (p) and (q);

estimate ARIMA (*p,d,q*); forecast ARIMA (*p,d,q*).

Since ARIMA is not the only technique of time series modelling, the data forecasting was also done using the least squares method through MS Excel. Both the results were compared to get a better insight of the projections.

4 Results and Discussion

The monthly data of foreign tourist arrivals was taken from the Tourism Statistics Report (2017) published by the Ministry of Tourism of India, Table 1.

Table 1. Monthly total tourist arrivals in India (2014-2017 real).

Month	2014	2015	2016	2017
January	731 021	790 854	844 533	983 413
February	649 203	761 007	848 782	956 337
March	628 148	729 154	809 107	904 888
April	535 823	541 551	592 004	740 275
May	499 320	509 869	527 466	630 438
June	545 725	512 341	546 972	669 989
July	645 420	628 323	733 834	788 377
August	569 538	599 478	652 111	724 067
September	506 300	542 600	608 177	722 567
October	621 124	683 286	741 770	875 838
November	669 602	815 947	878 280	1 004 826
December	813 633	912 723	1 021 375	1 176 233
Total	**7 414 857**	**8 027 133**	**8 804 411**	**10 177 248**

Source: Author's own elaboration based on Tourism Statistics Report (2017).

In the following Table 2, is possible to see the Medical Tourists Arrivals (MTA).

Table 2. Monthly medical tourism arrivals.

Month	2014	2015	2016	2017
January	18 170	23 046	40 960	47 837
February	16 136	22 176	41 166	46 519
March	15 613	21 248	39 242	44 017
April	13 318	15 781	28 712	36 009
May	12 411	14 858	25 582	30 667
June	13 564	14 930	26 528	32 591
July	16 042	18 310	35 591	38 349
August	14 156	17 469	31 627	35 221
September	12 584	15 812	29 497	35 148
October	15 438	19 912	35 976	42 604
November	16 643	23 777	42 597	48 878
December	20 223	26 598	49 537	57 216
Total	**184 298**	**233 917**	**427 015**	**495 056**

Source: Author's own elaboration based on Tourism Statistics Report (2017).

Thus, there were 48 (12 months x 4 years) and on those ARIMA method was applied to analyses past data and get the projections for next three years (36 months). The ARIMA statistics are given in the Table 3.

Table 3. Summary statistics on ARIMA modelling of the MTA series.

Variable	n	Min.	Max.	Mean	SD
MTA	48	12 411	57 216	27 922.63	12 291.42

Note: Min.-Minimum; Max.-Maximum; SD-Standard Deviation.

The minimum MTA of 12 411 corresponds to the month of May 2014 whereas the maximum MTA of 57 216 corresponds to the month of December 2017. The standard deviation is 12 291.418 and is around 50% of the mean of 27 922.63.

For determining *p* and *q* the function of correlogram was used providing visualization of the pattern of ACF and PACF (Fig. 1).

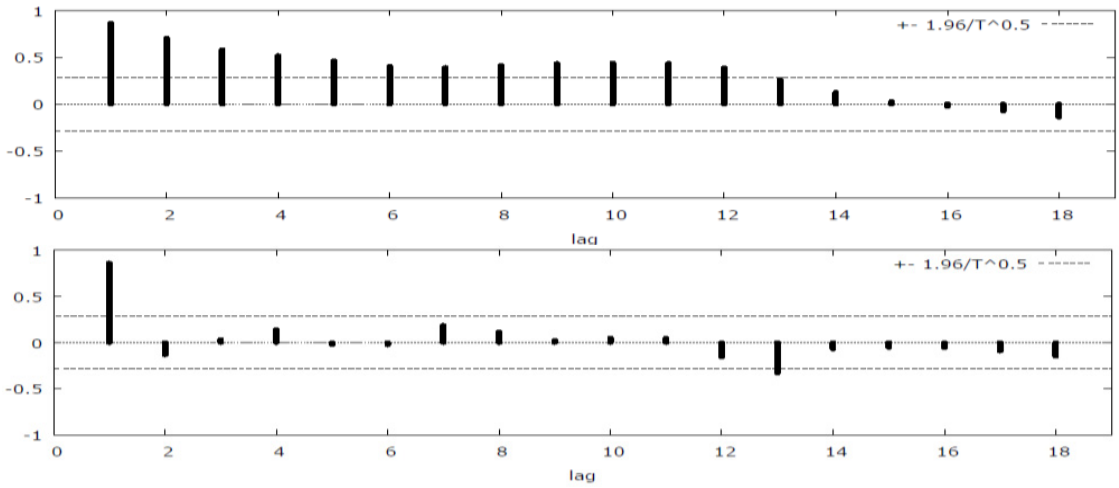

Fig. 1. ACF and PACF plots for ARIMA (MTA).

These two functions are decreasing. Both having an escalating pattern which is pointed out that p and q equals to 1 in ARIMA (*p,d,q*). The determined model is ARIMA (1,0,1) in non-seasonal criteria. In seasonal criteria ARIMA (*P,D,Q*) conclusively after evaluating Figure 2, P=0; D=1; Q=1 and makes it an adequate addition model. The final model is ARIMA (1,0,1) (0,1,1).

The forecast for the next 36 months (years 2018-2020) is presented in Table 4.

Table 4. The ARIMA model forecast for 2015-2017 and next 36 months.

Month	2015	2016	2017	2018	2019	2020
January	25 581	33 016	54 793	61 456	68 212	77 937
February	22 218	39 465	45 320	59 038	66 800	76 532
March	22 576	38 404	45 445	56 492	64 922	74 659
April	19 164	32 970	37 577	48 981	57 853	67 593
May	16 157	26 805	34 624	45 799	54 965	64 707
June	17 546	26 736	32 624	46 568	55 929	65 673
July	19 395	30 668	39 471	51 757	61 248	70 993
August	18 579	33 870	37 220	49 089	58 666	68 412
September	17 631	29 129	34 806	47 690	57 324	67 070
October	20 691	33 151	41 154	53 054	62 726	72 471
November	23 528	38 400	47 391	57 734	67 431	77 177
December	28 988	44 540	53 528	63 344	73 057	82 803
Total	**252 054**	**407 155**	**50 3953**	**641 002**	**749 134**	**866 027**

Thus for 2018 the MTA arrival is projected at 641 002 whereas for the year 2019 the same is projected at 749 134 (as per ARIMA method) and 2020 is 866 027. The visual for forecast is given in the Fig. 2.

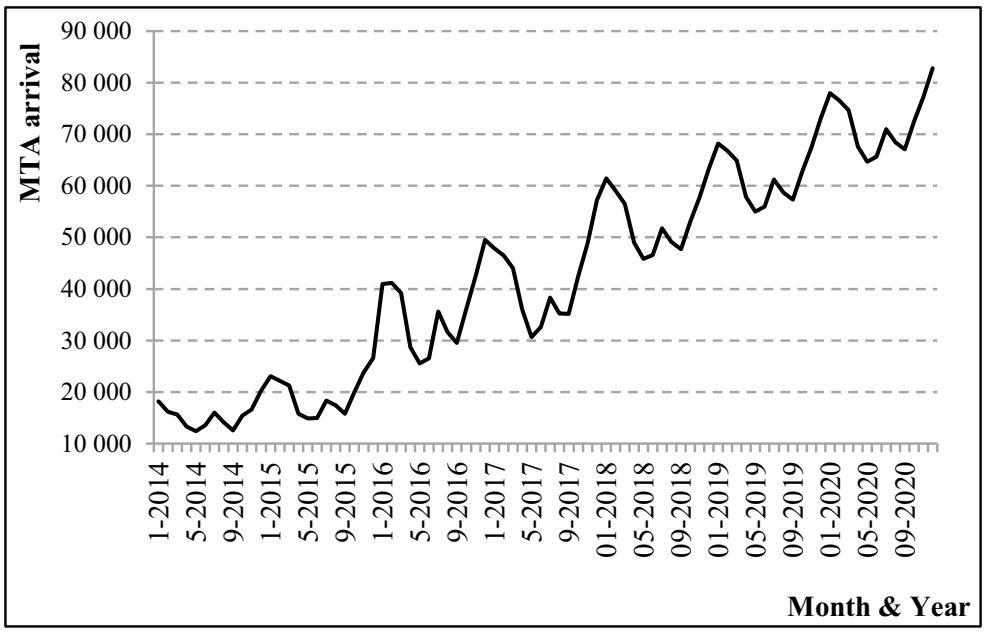

Fig. 2. MTA in India using ARIMA model.

The annual forecasting if done based on annual data using the least squares method is as under.

Table 5. The Least Squares method forecast.

Year	MTA
2014 (A)	184 298
2015 (A)	233 917
2016 (A)	427 015
2017 (A)	495 056
2018 (F)	683 765
2019 (F)	834 318
2020 (F)	984 872

Note: A=Actual and F=Forecast.

Thus for 2018 the MTA arrival is forecasted at 683 765 whereas for the year 2019 the same is forecasted at 834 318 and 2020 is forecasted 984 872. Visual representation of the method is given in Fig. 3.

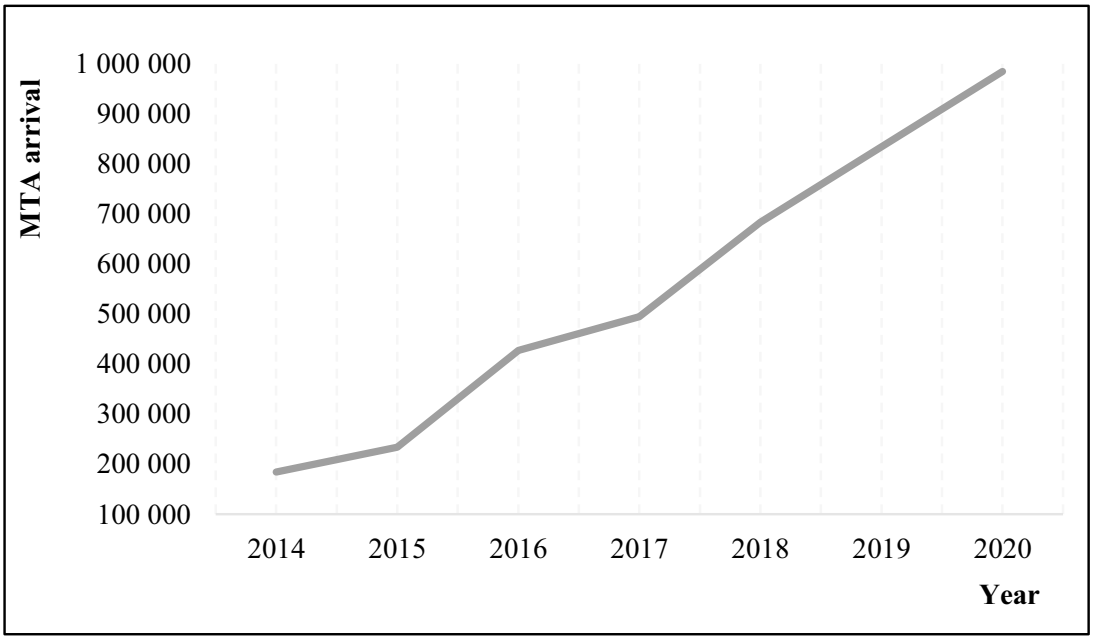

Fig. 3. MTA in India using least square.

Table 6 shows a comparison of the three-year forecasts as per the two methods of forecasting, namely, ARIMA and least squares.

Table 6. Comparison of forecasts of MTA as per two different methods.

Method	2018	2019	2020	MAPE*
ARIMA	641 002	749 134	866 027	7.2%
Least Squares	683 765	834 318	984 872	28.2%
Average	662 384	791 726	925 450	

Note: *The Average MAPE of 2014-2017.

Least squares model shows more positive and bigger values than ARIMA model. The main indicator influencing the decision on which model should be kept is MAPE. According to result on both models, the MAPE for ARIMA model equals 7.2% and for least Square Model, its meaning is higher and equals 28.2%. In case of ARIMA model, it has better performance and accuracy, because the MAPE ≤ 10% meaning high accuracy forecasting for all years ($MAPE_{2015}$=7.97%; $MAPE_{2016}$=8.37% and $MAPE_{2017}$=5.10%). In case of least Squares Model, the average of MAPE is between 20% and 50% meaning reasonable forecasting. The lower meaning of MAPE is better, as it shows better forecast.

5 Conclusions

The model as per ARIMA that emerged based on past 48 months' data was as under:

- The forecast for Medical Tourist Arrivals in India for the years 2018-2020 are quite encouraging. The ARIMA method may be considered as more accurate as it involved a monthly projection for 36 months. The annual summations for 2018-2020 are a total of 12 monthly summations of the forecasts.
- A major upswing was noted in the year 2016 when the number of MTA shot up from 233 918 in 2015 to 427 014 in the year 2016. This was a rise of 83% over the last year. This is one swing that has led to a spurt in the projections for the years to come.
- Whenever more than one set of forecasts is available the standard practice is to take an average figure of the forecast, which in this case has given as next projections: it is expected to be 662 384 tourist average in 2018; it is expected to have 791 726 tourist in average out of two methods (AIRMA and Least Squares) in 2019; and 925 450 tourists in average in 2020.

Given the highly encouraging projections for the next three years, Government should take all measures possible to make it a reality. These numbers can be taken as targets and efforts can be stepped up in achieving these.

Government and the Ministry of Tourism should use effectively publicity campaign to highlight "Advantage India" for medical treatment in the form of low cost and expertise. It should try and capitalize on its legacy method of Ayurveda which has no side effects. Lessons can be taken from the success story of brand "Patanjali" products that are based on Ayurveda and have gained immense popularity not only in India but even abroad.

The Government should try and come out with a scheme for medical insurance for foreign nationals including non-resident Indians (NRI). In India, the health insurance business has gained immense foothold in recent years and it can attract even foreigners. The Government should try and tie-up with Foreign Governments with blanket insurance for a fixed number of medical tourists based on past historical data. It suggested for the Government to take into consideration existing statistics to provide a better medical tourism service (insurance, travel and hospital care). By Looking through statistics, it is easy to see which translators should be available in hospitals as well.

The study has projected data for the future three years. Projections are subject to limitations and are affected by a range of factors. However, the researcher in this case

has attempted to use a sophisticated model to minimize errors due to assumptions like homoscedasticity by using the ARIMA model. Other methods of projections can also be used to arrive at a greater number of projections. In fact, the ARIMA model itself has different methods and those can be used.

Acknowledgment

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