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The Role of Tourism Education in the Promotion of Tourism. The Case of Greece in the Period 2005-2020 with Particular Reference to the Pandemic Era

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ABSTRACT

Nowadays, tourism appears to be one of the most developing sciences to research and study. Over the last decades, the industry of travel and tourism has evolved significantly, increasing its pace of common development year by year. For the Greek Economy, tourism is a central pillar of development and growth with significant contribution to Gross Domestic Product increase, employment, and investment. The rich cultural heritage, extensive coastline and natural environment are some of the basic advantages that make the country one of the most important tourist destinations worldwide. Considering the impact tourism has on our country, we understand the role that tourism education can play in the shaping of tourism consciousness and, consequently, in promoting social and economic development. Thus, it is necessary to study some elements in order to reach conclusions that will help to improve our tourism consciousness. In this paper, we will deal with tourism data (referring to the period 2005-2020 https://insete.gr/bi/inbound-tourism-total-country) using statistical process control, specifically time series control charts. We use Box-Jenkins methodology to find models of time series in Annual Changes of Income from 2005-2020, of Arrivals from 2010-2020 and the Average per capital expenses from 2005-2020. Specifically, we test models' sensitivity in detecting even small shifts in mean which may indicate financial instability. This analytical approach is widely applicable and therefore of theoretical and practical interest. Based on the results of this approach could propose the inclusion of introductory tourism education courses in all levels of education. The Greek tourism industry is thus expected to benefit from the financial and wider benefits of education.

Keywords: tourism education, external benefits of education, sustainability, SARIMA & ARIMA models, Shewhart's control charts, CUSUM control charts, ARIMA control chart.

INTRODUCTION

Quality plays a fundamental role in the increasingly competitive fields of industry, commerce, and business, occupying a central role in business and economic strategy topics.

According to Santos and Matschuck (2015), tourism represents an important source of income increase, investment, social inclusion, development in places that host it, and better quality of life.

For Feyerscgutte and Godoi (2008), tourism development in a locality or region is a process that may only succeed through information, knowledge and awareness that we must always adapt to improve our way of seeing and dealing with reality, and perceiving and protecting our natural, human, and cultural heritage; Appropriate methods, techniques and procedures, when combined with the proper training from young ages, may contribute meaningfully, by nurturing the necessary knowledge, skills, thought processes, and behaviours and building a "tourism culture" for both tourists and future "hosts" at a tourist destination.

The present paper aims to present an application of "statistical quality control", using the control charts on the data of Annual Changes of Income, Arrivals, and Average per capita expenses.

THEORETICAL REVIEW

Education and economic growth

The connection between education on the one hand, and the economy and economic growth on the other, which is interpreted based on the economics of education, has been noted internationally by a plethora of empirical studies. Among their conclusions are calculations of cost-effectiveness ratios, for example of different levels of education. This fact was usually reflected in educational policy at the national level, as well as that of supranational organizations that supported and/or funded the relevant national educational policies.

The initial "explosion" of the 1960s and the emphatic use of evaluations of the economic value of human capital through the return on educational investment was followed by the economic crisis of the 1970s; the crisis had an impact on the field of education economics, due to the poverty experienced by various countries and the resultant income disparities that manifested during the 1980s, in spite of the investments countries had made in certain educational programs.

This social situation gradually led to an expansion of research beyond just the economic returns offered by schools on education investments, branching into the social benefits, etc; as mentioned previously, in terms of education economics these benefits are linked with what are known as externalities or socially diffused benefits of education, such as promotion of equal opportunities, quality of life improvement, and social justice, to name a few. The relevant theories that developed tended to "capitalize" individual attributes related to education, with terminologies such as "social capital" (Coleman et al, 1966) and "cultural capital" (Bourdieu & Passeron, 1977).

In this context, education is no longer viewed as merely a means for economic growth, but also, for example, as an engine for poverty reduction, re-patriation of graduates (Brain gain), and contribution to sustainable development. Put otherwise, every issue, challenge, or problem a society may be facing can be largely solved through the appropriate education or training. To more accurately frame the issue, modern quandaries and challenges are due mostly to an "education loss" which is prevalent or persistent in individuals, groups, and/or societies and is

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partly due to the impact of the pandemic (Karatzia-Stavlioti, 2005· Alahiotis & Karatzia-Stavlioti, 2006· Alahiotis & Karatzia-Stavlioti, 2021, Lambropoulos et al, 2022).

The role of tourism education

Sustainable and viable tourism development requires planning and coordinated action at various levels: political, educational, and in the setting of tourism standards. Viewed in this frame, any efforts to develop tourism while concurrently preserving the natural and cultural environment for future generations- that is, sustainably, require effective utilization of previous experience and knowledge in the field, especially that on organizational learning and, consequently, effective knowledge management.

The methods and practices of organizational learning and knowledge management may contribute decisively both in terms of cultivating new ways of thinking and in developing transformative practices towards the transformation of tourism organizations. A primary objective is to facilitate innovative solutions or regulation mechanisms. Indeed, recent studies (Vathi, Stefani & Chainas, 2015·Britton, 2005) have shown that a basic parameter of organizational learning is organizational memory, which is intrinsically linked to knowledge management.

A fact worth noting is that the individuals involved in tourist activities are those who easily adapt, but it is the participation itself in transformative practices that transforms pre-existing notions; it is this form of participation that elicits changes in the individuals who participate in such practices, and not *vice versa*. Organizational learning is much more than the sum of the individual learning outcomes acquired by members of an organization. For this reason, it becomes necessary to invest in the dynamics of interaction between members of the same or different organizations and fully utilize it to create communication networks as well as facilitate the dissemination of technical know-how, experience, and viewpoints. This seems to be the optimal means of acquiring organizational learning, which is demonstrably the most appropriate type of learning for Tourism education and culture in general.

These organizations assume roles of ever-increasing importance to deal with modern challenges. For example, to combat organizational amnesia (Britton, 1998), they may utilize knowledge gained from good practices, such as alternative forms of tourism that respect local communities and the environment. Furthermore, they may also utilize acquired knowledge from examples of what to avoid and dysfunctionalities birthed by the ill-conceived tourism development of previous decades.

Additionally, organizational learning may also help provide effective answers to challenges the tourism industry faces (e.g. financial crisis, pandemic) to the benefit of tourism organizations and those involved; this may take place through viewing challenging unforeseeable conditions as opportunities to introduce innovative methods and practices (Lastres et al., 2020).

Tourism education may play a vital role in this direction, not only in the acquisition of professional skills (e.g. business administration, foreign languages, IT), but also in the development of appropriate, productive human capital (Athanassiou, 2004). According to the mainstream view (Athanassiou, 2004.Cooper et al., 1996), tourism is an inter-disciplinary field

of study, and appropriate tourism education is linked to the synthesis of disparate knowledge within a single perspective that relates to tourism advancement.

METHODOLOGY

Time Series

For many years, the time series models were considered to belong to the domain of theoretical statistics (Helfenstein, 1996). However, in 1976 Box and Jenkins provided a method for actually constructing time series models in practice. Their method, known as the "Box-Jenkins Approach", is an iterative approach for constructing linear time series models.

This method consists of four basic steps:
1. Identification of the preliminary specifications of the model
2. Estimation of the parameters of the model
3. Diagnostic checking of model adequacy and
4. Forecasting future realizations

in order to build an ARIMA model. When seasonal components are included in the model, then it is known as the SARIMA model.

According to Box et. al. (2008) and Cryer & Chan (2008), the generalized form of the SARIMA model can be written as:

$$\varphi_p(B)\Phi_P(B^s)(1-B)^d(1-B^s)^D X_t = \theta_q(B)\Theta_Q(B^s)e_t,$$

Where:

$$\varphi_p(B) = 1 - \varphi_1 B - \varphi_2 B^2 - \cdots - \varphi_p B^p$$
$$\Phi_P(B^s) = 1 - \Phi_1 B^s - \Phi_2 B^{2s} - \cdots - \Phi_P B^{Ps}$$
$$\theta_q(B) = 1 - \theta_1 B - \theta B^2 - \cdots - \theta_q B^q$$
$$\Theta_Q(B^s) = 1 - \Theta_1 B^s - \Theta_2 B^{2s} - \cdots - \Theta_Q B^{Qs}$$

Where:

B: Backward Shift Operator, D: Seasonal order of difference, d: non-seasonal order of difference e_t a "white noise" or a purely random process. e_t can be characterized as "random shocks", and is a sequence of uncorrelated random variables with a mean of zero and variance σ_e^2.

If there is no seasonal effect, then a SARIMA model reduces to an ARIMA model, and if the data is stationary, an ARIMA model reduces to an ARMA.

Control Charts

Statistical Quality Control (SQC) is a technique of analyzing the process, setting standards, comparing performances, verifying and studying deviations, to seek and implement solutions, and analyze the process again after the changes, seeking the best performance of machinery and/or persons (Montgomery, 1997).

According to Triola (1999), SQC is a preventive method in which the results are compared continuously through statistical data, identifying trends for significant changes, and eliminating or controlling these changes in order to reduce them further.

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In order to understand SQC, it is necessary to note that the quality of a product manufactured by a process is inevitably subject to variation. This variation can be described in terms of two causes: i. the special cause and ii. the common cause.

The first is a factor that generates variations that affect the process behavior in unpredictable ways, while the second is defined as a source of variation that affects all the individual values of a process (Russo et. al., 2012).

According to Woodall et. al. (2004), SQC is a collection of tools that are essential in quality improvement activities.

The usual control chart consists of three parallel lines:
CL: the central line that represents the mean value of the quality
UCL: the upper one that represents the upper limit of the control
LCL: the lower one that represents the lower limit of the control
Control charts are used to examine whether or not the process is under control, indicating that only random causes are acting on this process.

There are control charts by attributes and by variables. *Attribute Control Charts* are a set of control charts specifically designed for tracking defects. These types of defects are binary in nature (yes/no), where a part either does or does not have one or more defects.

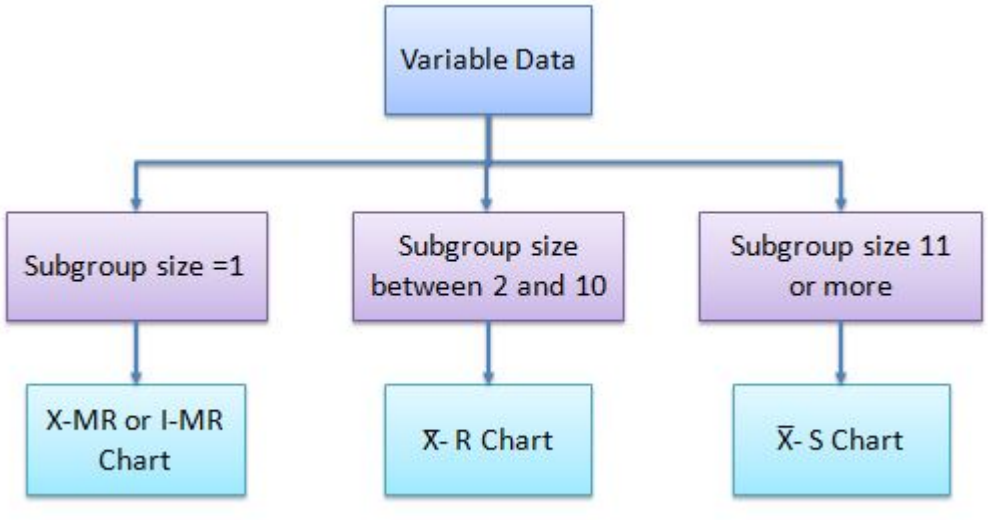
Variable Control Charts are used to evaluate variations in a process where the measurement is a variable.

Some of the methods that are suitable for constructing different control charts are: The Shewhart Chart (also known as I-MR Chart), the EWMA Chart (Exponentially Weighed Moving Averages) and CUSUM Chart (Cumulative Sum).

The *I-MR chart* is basically two separate charts: Individuals (I) chart and Moving Range (MR) chart. The combination of these two charts provides the complete picture of process behavior.

I-Chart: The Individuals chart displays the individual data points and monitors mean and shifts in the process when the data points are collected at regular time intervals. This chart will help to identify the common and assignable causes in the process, if any.

MR Chart: While the Individuals chart monitors the process mean, the Moving Range chart monitors the process variation when the data points are collected at regular time intervals. In other words, the moving range chart tracks the absolute difference of each measurement compared to its previous measurement.



The CUSUM chart is used to monitor the mean of a process based on samples taken from the process at given times (hours, shifts, days, weeks, months, etc.). The measurements of the samples at a given time constitute a subgroup. Rather than examining the mean of each subgroup independently, the CUSUM chart shows the accumulation of information of current and previous samples. For this reason, the CUSUM chart is generally preferable to the Shewhart chart for detecting small shifts in the mean of a process.

The EWMA chart was introduced by Roberts (Technometrics 1959) and was originally called a geometric moving average chart. The name was changed to reflect the fact that exponential smoothing serves as the basis of EWMA charts. Like a CUSUM chart, an EWMA chart is an alternative to a Shewhart individuals chart and provides quicker responses to shifts in the process mean then an individuals due to incorporating information from all previously collected data.

Identification of Process in Control

The process is in control if:

a. All points on the chart are within the control limits
b. The arrangement of points within the control limits is random

According to Montgomery (2009), there are various criteria that can be applied to a control chart for determining whether the process is out of control.

The basic criterion is one or more points outside the control limits. Additional criteria are sometimes used in order to increase the sensitivity of the control charts when there is a small change in the process, so as to provide a quick response to an assignable cause.

ARIMA Control Charts

A basic assumption in classical SPC techniques is that the observations from the processes under investigation are normally and independently distributed. When these assumptions are satisfied, conventional control charts may be applied. However, the independence assumption is often violated in practice. In both discrete and continuous production, process data often

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shows some autocorrelation, or serial dependence. Even a very low degree of autocorrelation results in the failure of classical SPC control charts, manifested by a large number of points outside the regulatory limits in the control diagram.

Autocorrelation is present in the data generated by most continuous and batch process operations, since the value of the parameter being monitored is dependent on the previous value of the parameter.

Continuous product manufacturing operations, such as the manufacture of food, chemicals, paper, and other wood products often exhibit serial correlation. This phenomenon might also be present in monthly series of survey quality data.

One of the ways to handle autocorrelated data is via the concept of stochastic modelling of time series using ARIMA models. The Box-Jenkins methodology represents a modern concept analysis of stationary and nonstationary time series based on probability theory.

ARIMA Control Charts are based on the principle of identifying a suitable time series model and using a control chart for residuals (deviations of the values actually measured from the values calculated using the model).

The use of residuals charts assumes that the correct time series model is fitted to the data, and the residuals will be independently and identically distributed random variables. Thus, any of the traditional SPC charts may be applied, as all the assumptions of traditional quality control will be verified.

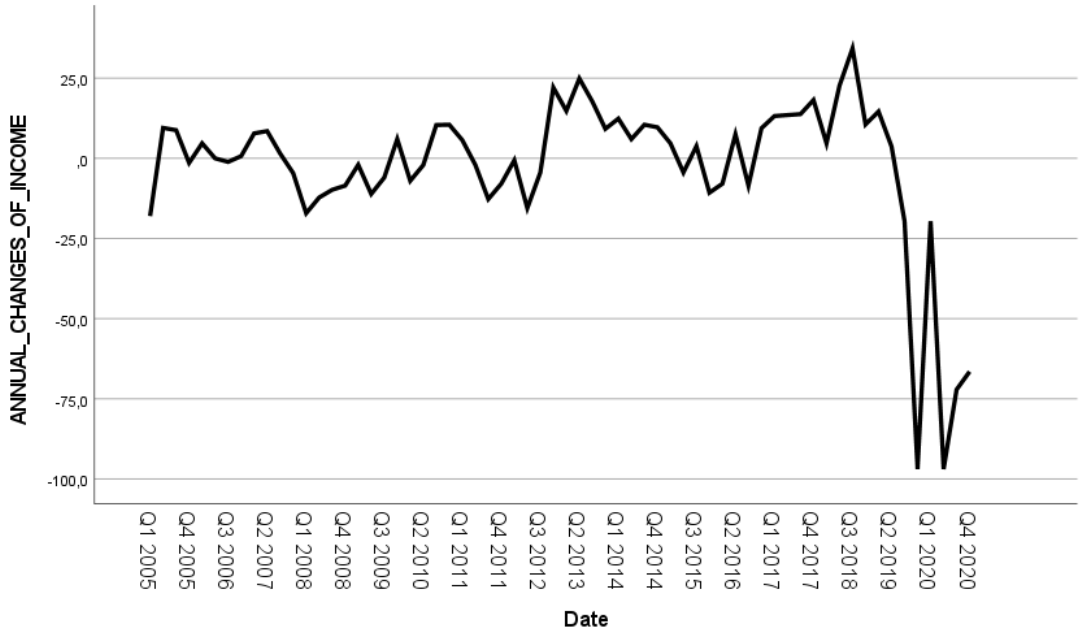
Any changes of the mean and/or the variance in the residuals process indicate that the mean and/or the variance of the process itself has been changed. Thus, plotting the residuals on a control chart provides a mechanism for detecting a process change.

RESULTS OF THE CASE STUDIES

As mentioned previously, the aim of this paper is to present an application of "statistical quality control", using control charts for data of Annual Changes of Income, Arrivals, and Average per capita expenses. The purpose of the study is to illustrate time series charts sensitivity in detecting shifts. We will utilize the fact that these control charts may be used in certain situations where the data are autocorrelated. The data used were obtained from the Institute of the Greek Tourism Confederation (INSETE) (https://insete.gr/bi/inbound-tourism-total-country). Data analysis was carried out using the Statistical packge SPSS (version 27).

Annual Changes of Income

Firstly, let us analyze a time series of the Annual Changes of Income for 2005-2020. The data is quarterly. The basic goal is to identify the best model. A particular model for a given time series is selected from the general class of ARIMA models. The decision may be supported by the rule of parsimony, i.e. to choose the simplest model. Firstly, we apply the Box-Jenkins methodology to the time series, as illustrated in the following Figure. An examination of the plot does not reveal the existence of a seasonal component. Moreover, as the following Figure demonstrates, there is a decrease in the annual changes of income in year 2020, coinciding with the outbreak of the “COVID-19” pandemic.



Following the Box-Jenkins methodology, we conclude that a SARIMA (1,1,0)x(0,1,0)$_4$ fits the data properly. From the estimation procedure we have: $\widehat{\varphi}_1 = -0.314$ *and* $p - value = 0.028$

This model fits the series better than the other models. The residual analysis does not reveal any model inadequacy. If we take into account now the data model SARIMA (1,1,0)x(0,1,0)$_4$, the estimation yields:

$$(1 + 0{,}314)(1 - B)(1 - B^4)x_t = e_t$$

The information we have obtained about the process from the statistical model may now be used to construct control charts.

The following Figures are the control charts for individual values, the EWMA chart and CUSUM chart applied to the SARIMA model's residuals.

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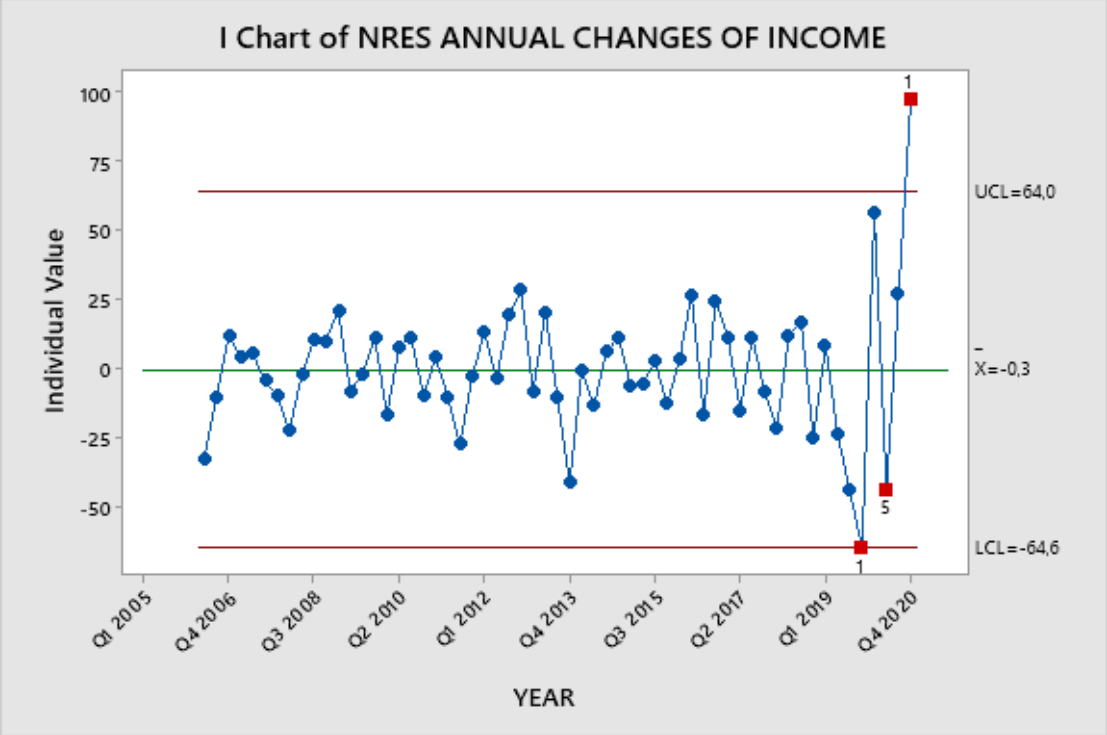


Figure 2: I-Chart for residuals of Annual Changes Income

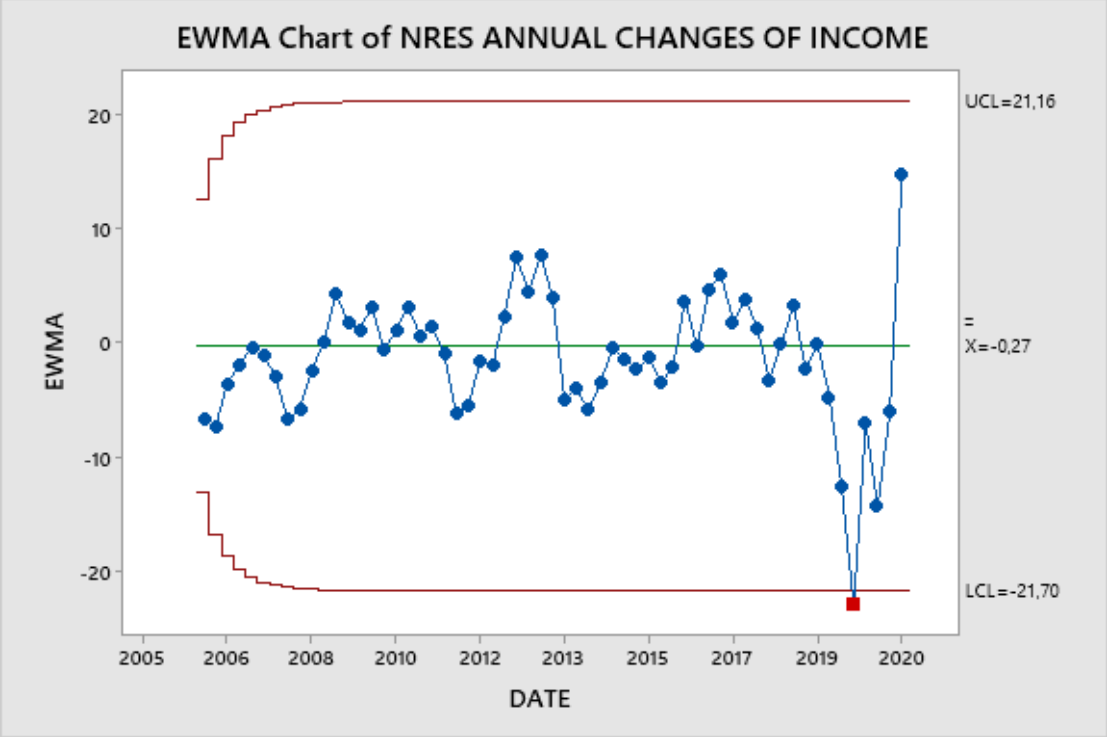


Figure 3: EWMA Chart for residuals of Annual Changes Income

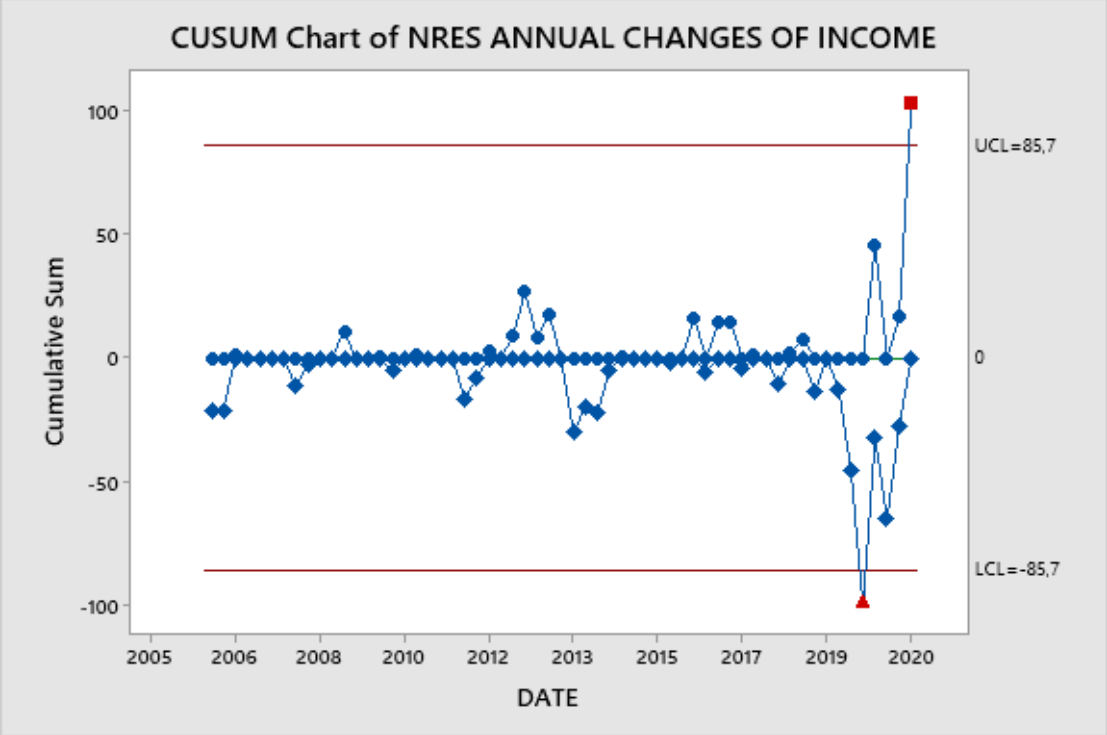


Figure 4: CUSUM Chart for residuals of Annual Changes Income

The above Figures clearly demonstrate that the process is out of control. These control charts detected a shift of mean and therefore high heteroscedasticity in Q4 2020, which corresponds to fluctuations in Annual Changes of Income.

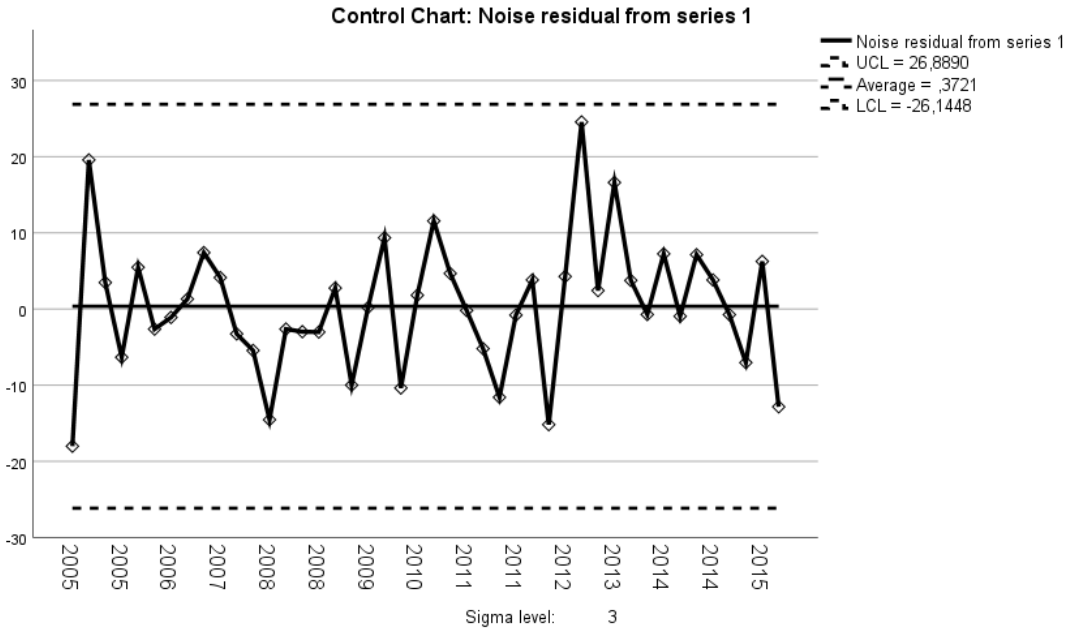
Now, we will split the above time series into two parts and study each part separately. The first will be from 2005-2015 (series 1) and the second from 2016-2019 (series 2).

The above procedure shall now be applied to each time series.

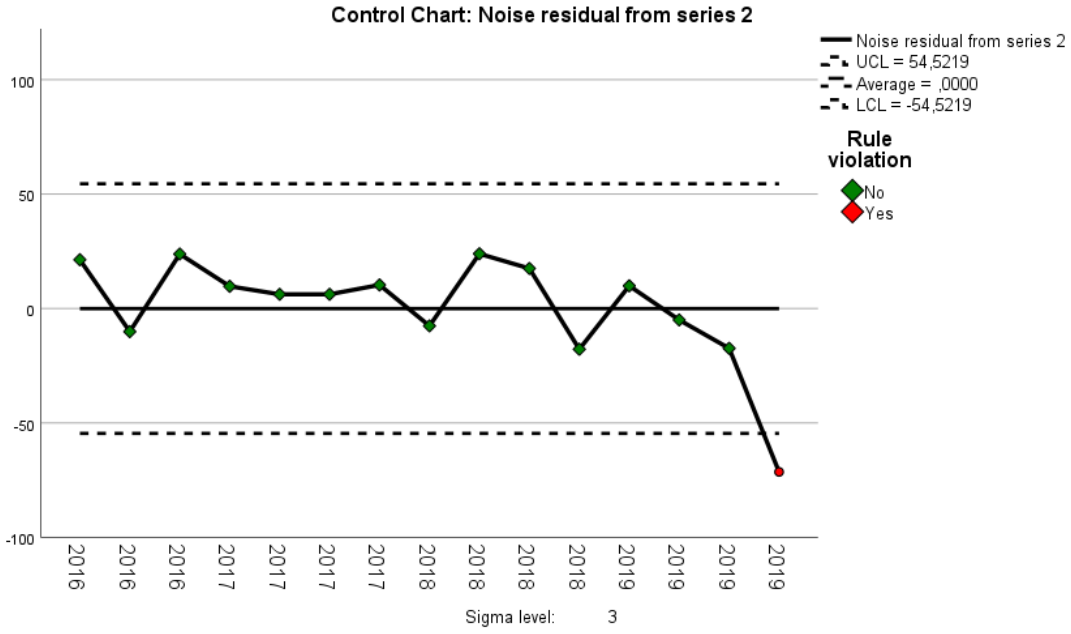
Applying the Box-Jenkins methodology to each series, we conclude that an AR(1) and ARIMA(0,1,0) fit the two data sets respectively.

Taking the residuals from each model, we apply the I-Chart and come up with the following Figures:

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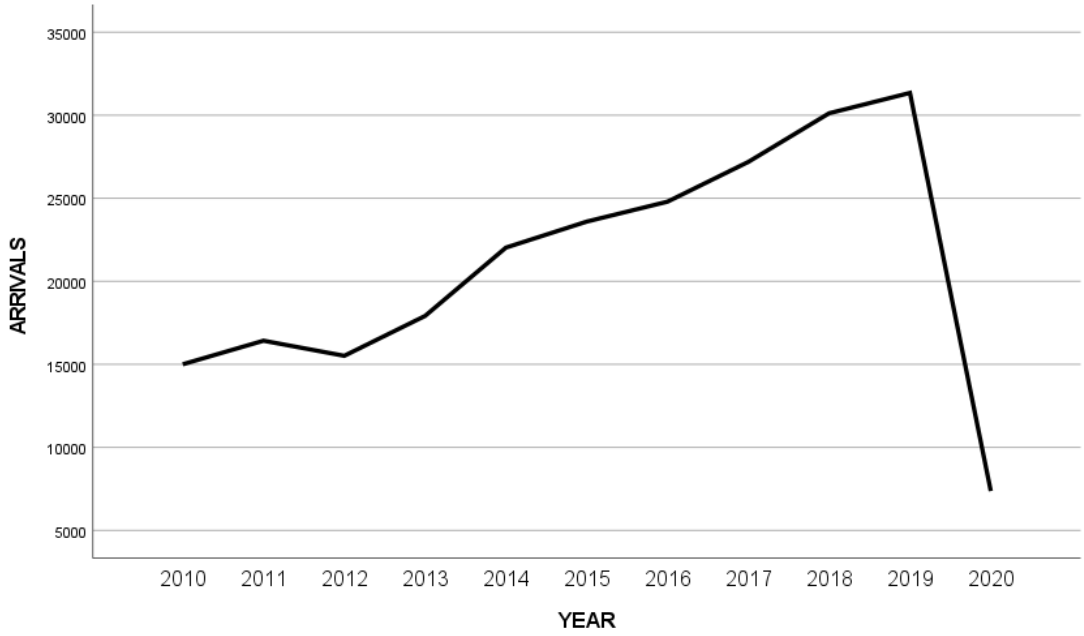
The above Figure clearly demonstrates that the process has been placed under control.



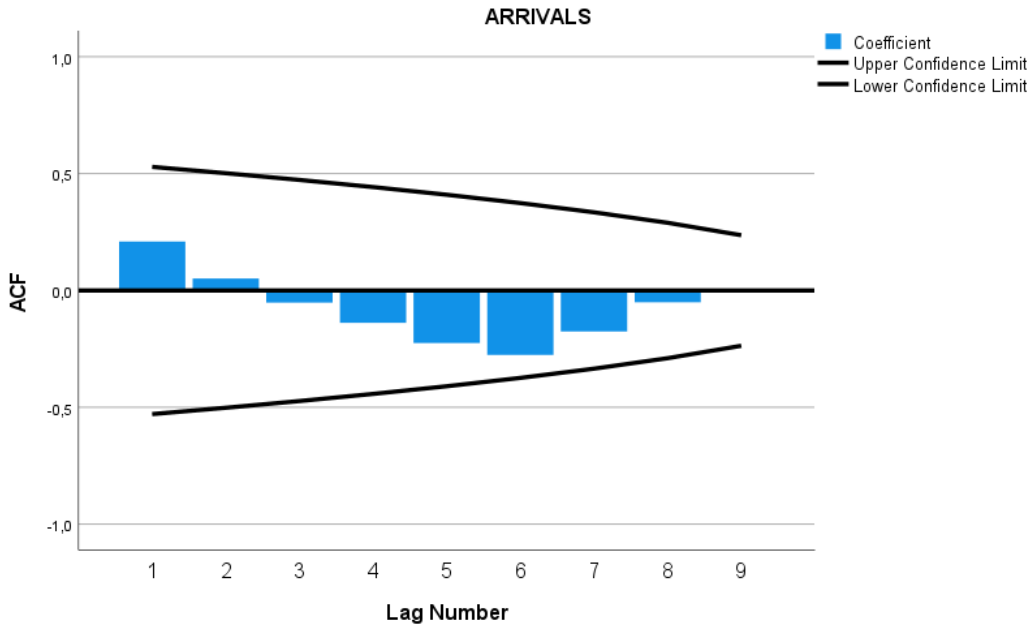
This control chart detected a shift of mean in Q4 2019. One possible explanation may be the outbreak of "COVID-19" in China and resultant fear-induced voluntary travel restrictions.

Tourist Arrivals

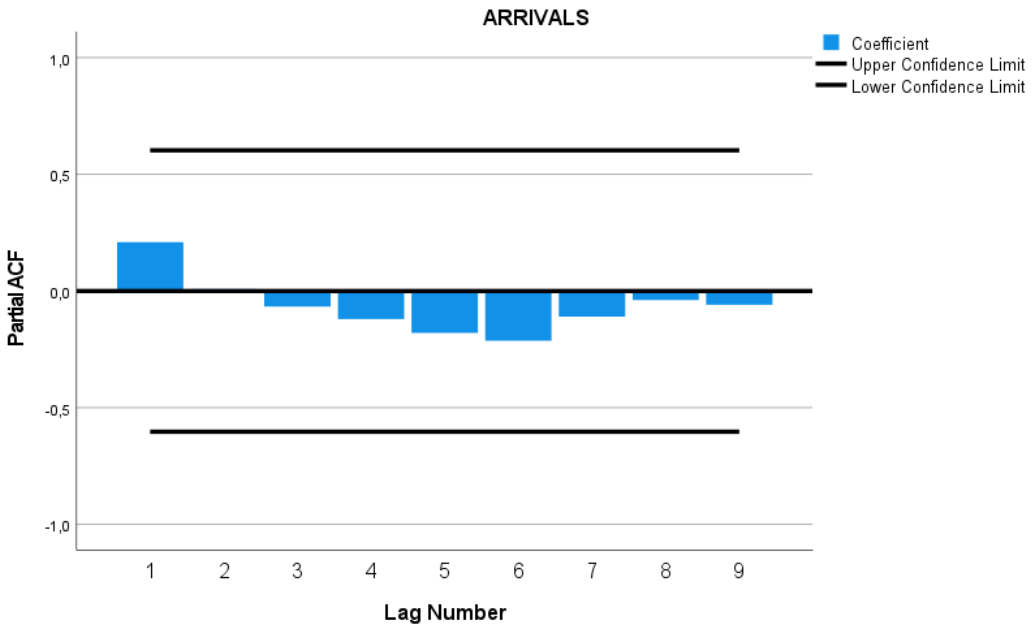
Let us now analyze a time series of Arrivals for 2010-2020. The data is annual. The time series is illustrated in the following Figure. According to the plot, there is an upward trend until 2019, with a decrease in Arrivals in 2020, coinciding with the outbreak of the "COVID-19" pandemic.



We apply again the Box-Jenkins methodology to the series. Plotting the ACF and PACF.



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It becomes evident that the model most suited to describe our data is ARIMA (0,0,0). An ARIMA (0,0,0) model with zero mean is white noise, so it means that the errors are uncorrelated across time. This carries no implications about the *size* of the errors, and is thus not an indication of good or bad fit.

This model it is made up of two parts:

1. A Constant
2. An error term

And has the following form:

$$x_t = c + e_t$$

From the estimation procedure we have: $\hat{c} = 21031.091$ with p-value<0,001.

The information we have obtained about the process from the statistical model may now be used to construct control charts.

The following Figures are the control charts for individual values, the EWMA chart and CUSUM chart applied to the ARIMA model's residuals.

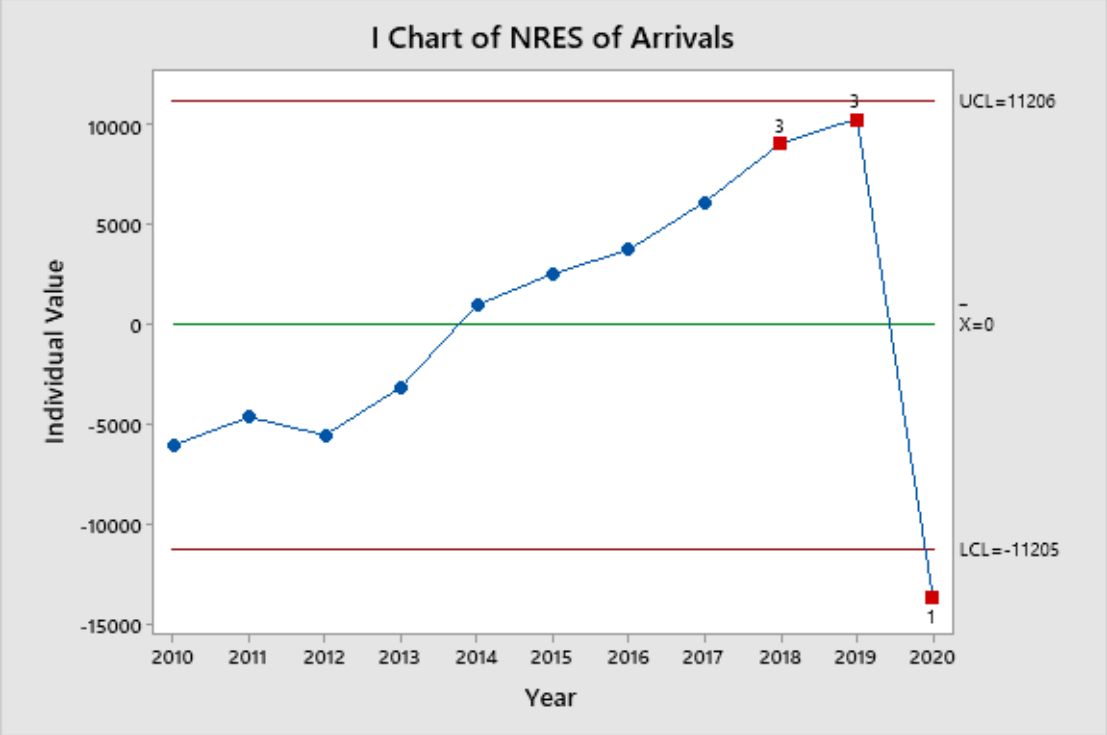


Figure 8: I-Chart for residuals of Arrivals

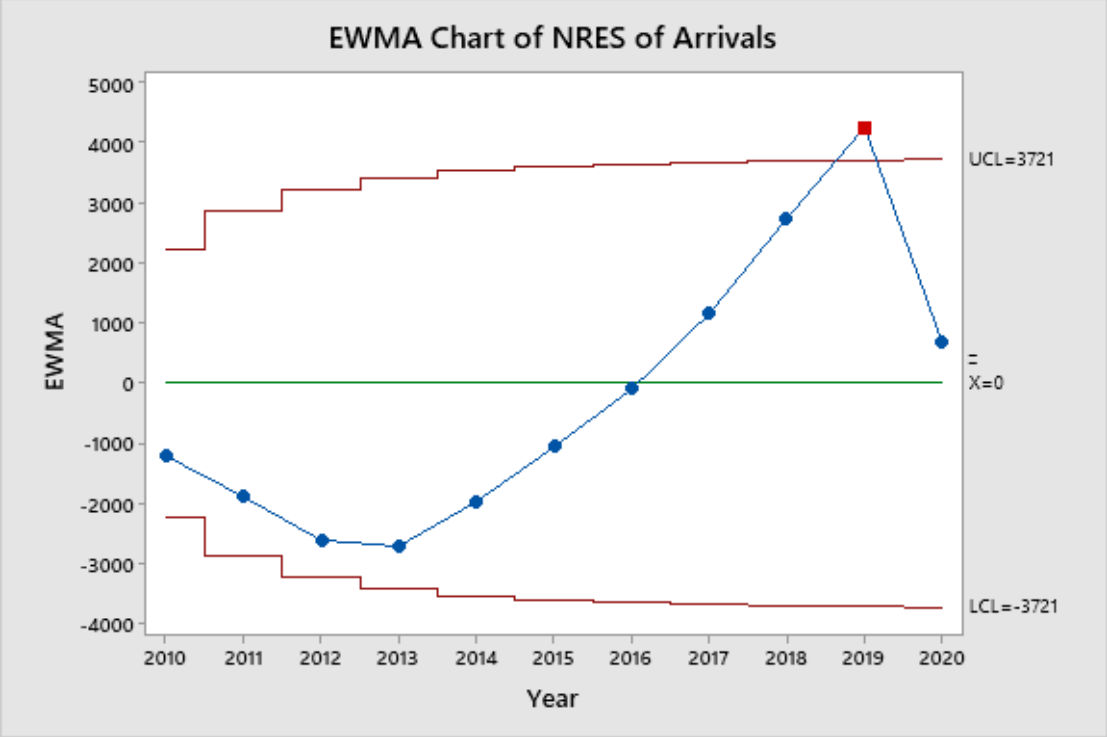


Figure 9: EMWA Chart for residuals of Arrivals

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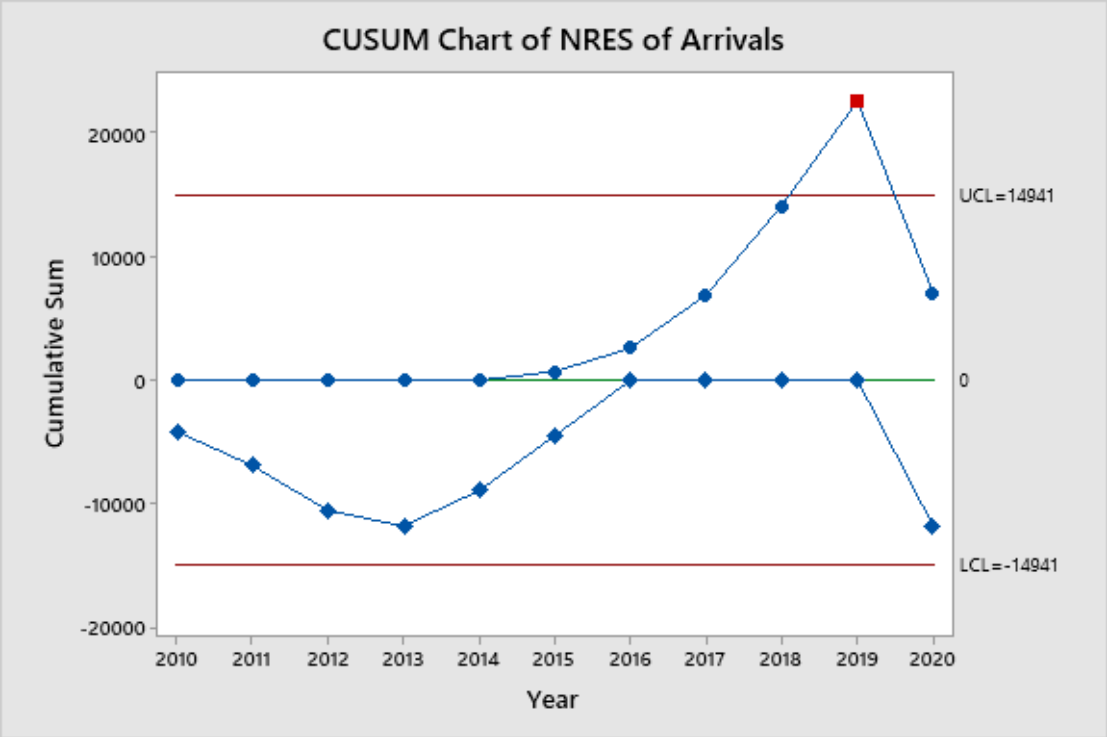
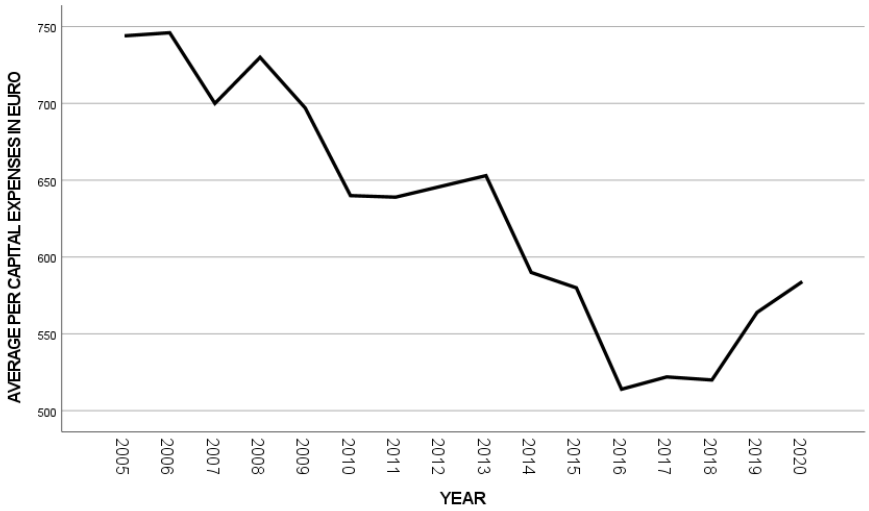


Figure 10: CUSUM Chart for residuals of Arrivals

Once again, it is evident that the process is out of control: There is a documented point beyond the limits, while in the I Chart and EWMA Chart there is a sequence of 6 increasing points. There is a noticeable upward trend in arrivals, peaking in 2019. Indeed, this was the best year on record for Greek tourism.

Average per capita expenses

We will now analyze a time series of the Average per capita expenses in euro for 2005-2020. The data is annual. The time series is illustrated in the following Figure. According to the plot, there is a downward trend that bottoms out in 2016, and then begins to trend slightly upward.



Before applying the Box-Jenkins methodology to the series, we first need to adjust a linear model to describe the trend.

Linear

Model Summary

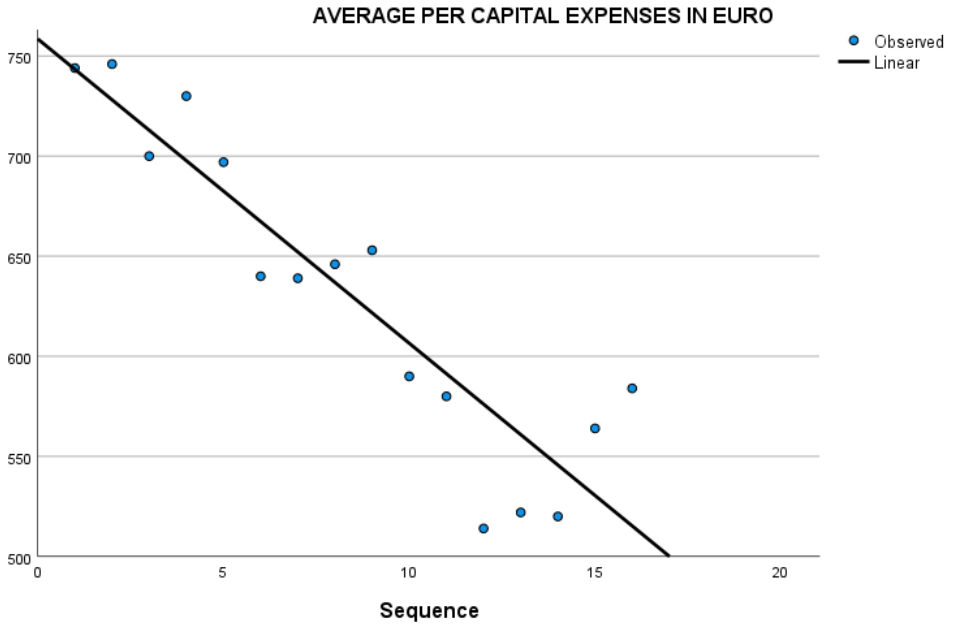
R	R Square	Adjusted R Square	Std. Error of the Estimate
,912	,831	,819	33,798

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	78599,207	1	78599,207	68,808	<,001
Residual	15992,231	14	1142,302		
Total	94591,438	15			

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
Case Sequence	-15,204	1,833	-,912	-8,295	<,001
(Constant)	758,550	17,724		42,798	<,001



The estimated equation for the trend is given by:

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$$\hat{y}_t = 758{,}550 - 15{,}204t$$

For 2005, the expected value of the trend is equal to 758,550. More specifically, the value of the Average per capita expenses trend for 2005 is equal to 758,550. It is also noted that the trend of the Average per capita expenses presents an annual decrease of 15,204.

Forecasts for how the model will trend over the next two years are given in the following table:

Forecasts	**95% CI**		**Period**
500,07500	418,22292	581,92708	2021
484,87059	401,33644	568,40473	2022

Following the Box-Jenkins methodology we conclude that an ARIMA (0,1,0) fits the data properly. From the estimation procedure we have: $\hat{\varphi}_1 = -0.314 \; and \; p - value = 0.028$

This model is better suited to the series than the other models. The residual analysis does not reveal any model inadequacy. Taking into account the data model ARIMA (0,1,0), the estimation yields:

$$(1 - B)x_t = -10{,}667 + e_t$$

Forecasts of the model for the two next years are given in the following table:

Forecast

Forecast

Model		2021	2022
AVERAGE PER CAPITA EXPENSES	Forecast	573	563
	UCL	647	667
	LCL	500	458

Finally, the forecasts of the model are excellent because the fitted curve does not overcome the confidence limits. The forecasts are observably within the lower and upper limits.

The information we have obtained about the process from the statistical model may now be used to construct control charts.

The following Figures are the control charts for individual values, the EWMA chart and CUSUM chart applied to the ARIMA model's residuals.

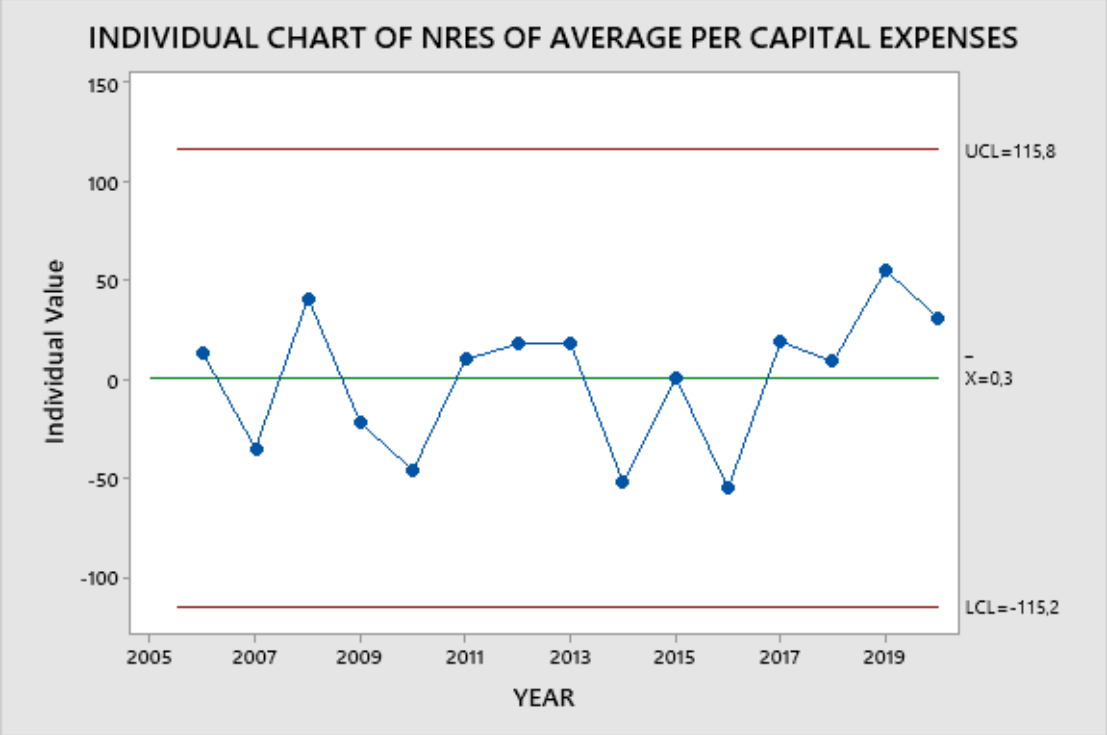


Figure 12: I-Chart for residuals of Average per capita expenses

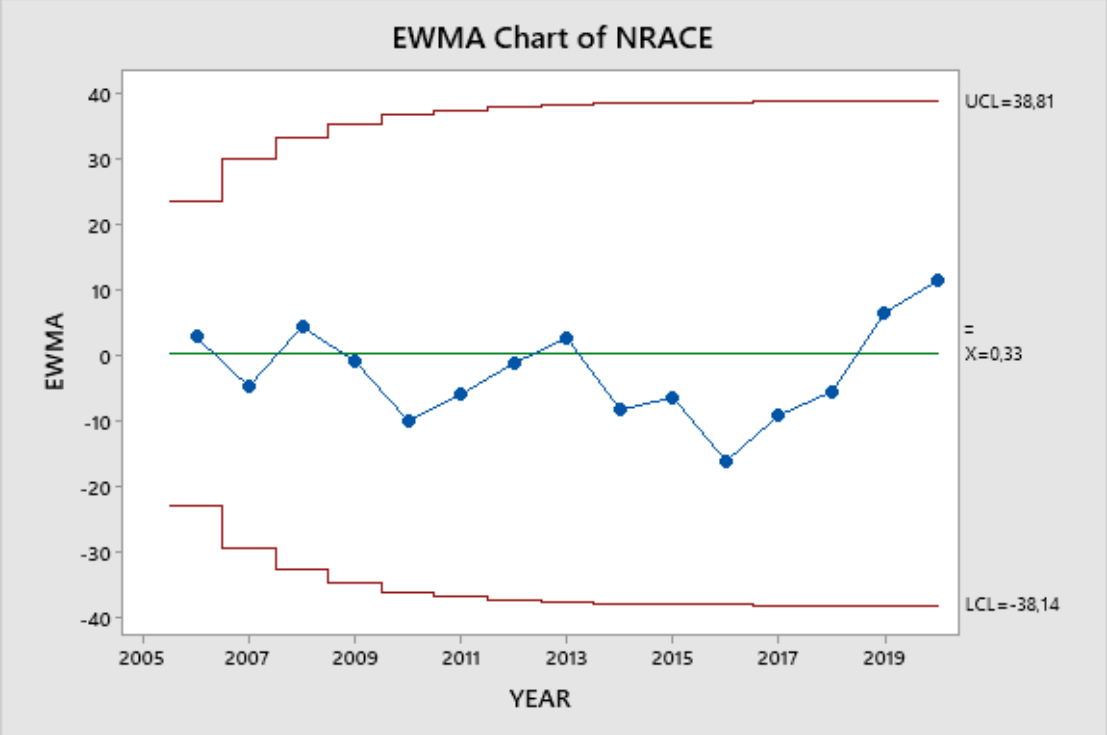


Figure 13: EWMA Chart for residuals of Average per capita expenses

URL: http://dx.doi.org/10.14738/abr.1012.13525

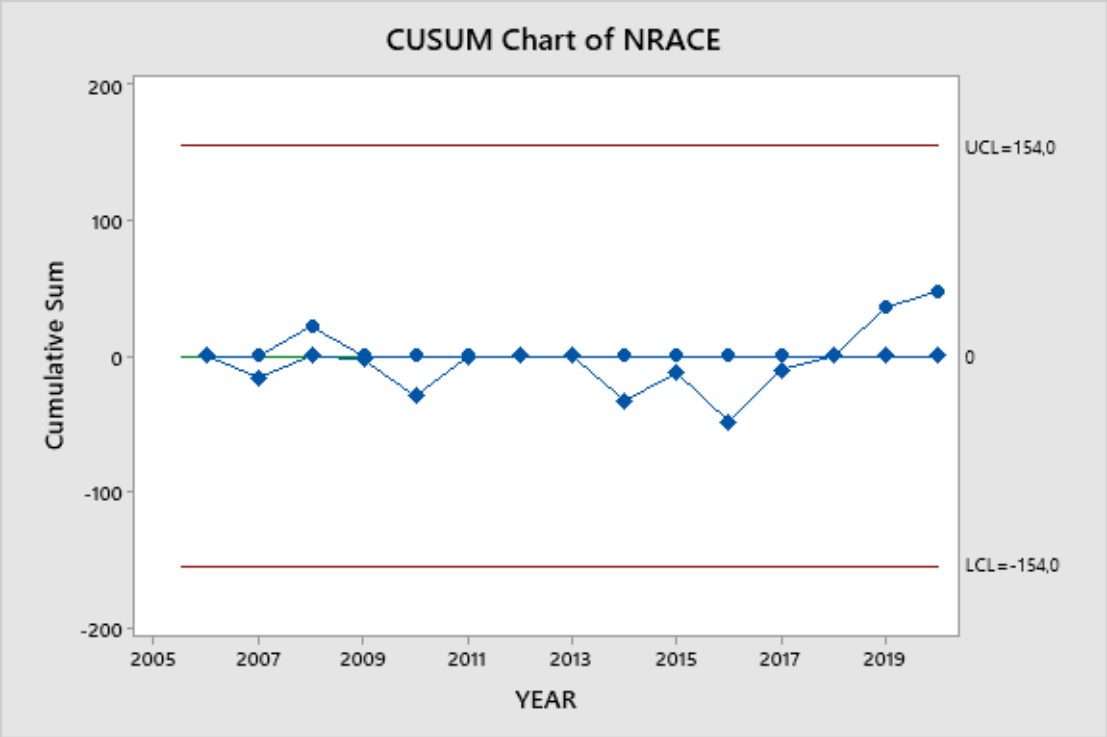


Figure 14: CUSUM Chart for residuals of Average per capita expenses

We can determine that the process may be considered statistically stable (no point is beyond the control limits), and thus the limits may be used to verify process statistical stability in the next period.

DISCUSSION AND CONCLUSIONS

This paper deals with regulation charts applied to tourism data which can be related to Tourism education. This kind of data is very sensitive to mean shifting, and strong autocorrelation appears frequently. It is also important to note that the proposed procedure can also be applied with a more general autoregressive integrated moving average model.

The pandemic has clearly affected tourism, a finding that yields interesting issues for the further development of tourism education.

The control charts detected a shift of mean and therefore high heteroscedasticity in Q4 2020, which corresponds to fluctuations of Annual Changes of Income. Moreover, there was a decrease in Arrivals in 2020. These may be explained by the pandemic and the related measures that peaked in 2020.

According to INSETE, a downward trend was observed in Average per capita expenses. This was primarily due to the internationally observable trend of decreasing Average Durations of stay, i.e. more but shorter trips. The development of Athens as a city break destination, especially after 2014, further strengthened this trend.

Moreover, the decrease in average per capita expenses is due to the change in the market mix of inbound tourism in Greece, with a decrease in the share of traditional “better off” markets

and an increase in new markets from the Balkans and Eastern European countries. The above analysis may be utilized by tourism organizations and relevant learning institutions towards the sustainable development of tourism education and Tourism in general.

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