

University of Hradec Králové  
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# MASTER THESIS

2018

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**Analysis of Time Series Data Available in Official Statistics**

**Master's Thesis**

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Hradec Králové

April, 2018

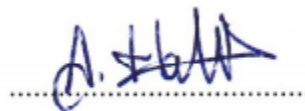
## **Declaration**

I declare I wrote the Master's thesis "Analysis of time series data available in official statistics" myself, using only the listed bibliography.

The research was done under the support and guidance of prof. RNDr. Hana Skalská, CSc.

In Hradec Králové, 24.4.2018

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## **Acknowledgements**

I would like to express my sincere gratitude to the supervisor of my thesis of prof. RNDr. Hana Skalská, CSc. for the continuous support to my master degree study, advice, guidance and motivation. Her guidance helped me in all the time of research and writing of this thesis. I could not have imagined having a better supervisor for my master study.

Besides my supervisor, I would like to thank the entire staff at Hradec Kralove University for their moral support, encouragement and immense knowledge.

At last, I would like to thank my family: my father, mother, sisters, my uncles and my friends and Pavla Váňová and her family for their great supports and motivations.

## **Annotation**

The name of this thesis is “Analysis of time series data available in official statistics”.

The goal of this thesis is to study possibilities how to use selected indicators available in public statistical data collected in time series. The first goal of this thesis has been aiming to the description of the tourism development in Turkey between the years 2012 and 2016. For this purpose, the attendance in four tourism locations in Turkey has been analyzed, examined and compared each other. The overall tourism development process of the country has been described as well. Data collection, various graphs, and presented analyses are the main outcomes achieved within this goal.

The second goal of this thesis has been aiming to comparison and examination the development process between the overall economies of the Czech Republic and Turkey within the years 2006 and 2016. For this purpose, GDP has been selected as an indicator measuring the overall development and is used as a descriptor of world development indicator economies. Results of the second goal are indicated with the use of analyses and visual presentation of data.

The objectives of this thesis were achieved by methods of quantitative data analysis. Necessary data used in analytical processes has been obtained from the country’s official organizations and websites, public statistics and reliable websites worldwide.

## **Anotace**

Cílem diplomové práce bylo studium možností, jak lze využít vybrané indikátory, dostupné ve veřejných statistických databázích a uspořádané v časových řadách, pro porovnání a další analýzu.

Diplomová práce se zabývá dvěma hlavními tématy. První část práce se zabývá analýzou a vývoje cestovního ruchu v Turecku v letech 2012 až 2016 a porovnáním mezi čtyřmi vybranými turistickými centry. Výsledky porovnání jsou popsány pomocí tabulek, grafů, statistických charakteristik, modelů trendu a sezónnosti.

Druhá část práce se zabývá popisem a porovnáním procesu rozvoje ekonomik dvou zemí, České republiky a Turecka v letech 2006 až 2016. Pro tento účel byl vybrán HDP jako celosvětově používaný ukazatel rozvoje hospodářství daných zemí. Celkový vývoj je hodnocen pomocí indexních čísel a regresního modelu.

Data pro analýzu byla získána z několika zdrojů, zejména z oficiálních databází jednotlivých zemí, veřejných resortních statistik a jiných dostupných oficiálních webových stránek. Hlavní zvolené metody výzkumu náleží do oblasti kvantitativních metod.

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## 1. Introduction

Analysis of time series (TS) data has quite an important place in the world today that is impossible to ignore. Data in TS are present in many corporate business fields for a description of business metrics, national economy or demographics indicators, monitoring industrial processes, and others. Particularly, TS analysis is a well-known and frequently demanded analysis in Business, Management and Economical areas (although it is not limited only within these areas), as it provides the possibility to evaluate the process and forecast the future.

Analysis of time series data is a way to evaluate, to examine the current and past data in order to conclude or project the forecast data about future.

Every day, people such as managers make decisions without the knowing what will happen after one week, one month, one year or basically, what can/will happen in the future. When people need to make some important decisions, such as managers, people would like to have some idea, some information about the future of their decision; if they do the investment or if they decide in one way how it will look like in the future? What it will bring them such as cost or benefits etc. Before deciding, managers would like to reduce this uncertainty also to make better forecasts about what will happen in the future. In order to learn the answers to these kinds of questions, they need to do some analysis.

There are many ways, many methods to forecast the future. Analysis of time series data is one of the most common and simple quantitative methods for these kinds of purposes.

In an analysis of time series data, the key about the future forecast it is hidden in the past and current data. These data may lead to people, as managers to learn and have a forecast about the future. To generate a forecast, time series data analysis used only the past and current data.

In order words, time series models use historical data to predict the future. According to the time series models what can happen in the future is a function of what has happened in the past. The purpose of this thesis is to get an overview of publicly available data collected in TS for selected fields. It will study and explain briefly some possibilities of analysis of time series data and present an importance of using this analysis in economic and management area. Therefore, the study will be focused on the specific points mentioned above and also this study will stress attention to specific data collected in time series:

- Development of tourism in Turkey.
- Development of GDP and its comparison between Turkey and the Czech Republic.

This thesis has two parts; the first part gets an overview of theoretical knowledge and includes the general information about analysis of time series data and about the history and general information of Turkish and Czech Official Institutes. This part has its background in the searching and studying of cited references.

The second part is practical and describes data used for the analysis, available analytical methods, and tools, and evaluate the results. Results of evaluation part to evaluate the development of tourism in Turkey, also to compare the GDP between Turkey and the Czech Republic. For these purposes, the necessary data has been collected from the reliable sources. Microsoft Office software was used in this thesis in order to compare and evaluate the data.

## 2. Objectives and Methodology

### 2.1 Objective

The main objectives of the thesis are:

- To specify expected properties of data collected in time series.
- Explain the benefits of analysis of time series data and advantages of using this method management and economic areas.
- To describe and explain the main purposes for which managers are using this method in the business area?
- Some possible purposes will be studied in this thesis.

This thesis will be focused on importance and effectiveness of time series data and to do prediction by using time series data.

Also, in this thesis will be mentioned about the Czech Republic and Turkey official statistical institutes.

Based on the objectives, this thesis will answer the following research questions (RQ):

**RQ1:** What is the time series data analysis and for which purposes can be used?

In order to use effectively the time series data analysis, the managers should be aware of what it means the time series data analysis and what the best way to use effectively is.

**RQ2:** How is the development of Statistic in Turkey and the Czech Republic?

To understand and answer the next question it has an important role to answer this question. Because it was already mentioned, time series models use historical data.

Also, it is important to have some knowledge about statistical history because of its common uses areas in the world today.

**RQ3:** What is development process of the tourism in Turkey between the years 2012 and 2016?

This thesis attempts examine and evaluate the development of tourism within the county boundaries in Turkey.

**RQ4:** What is the development process of GDP in Turkey and the Czech Republic between the years 2006 and 2016?

To examine the development of GDP for both countries, in this thesis will be used time series data from both countries official statistical offices and reliable resources all over the world.

## **2.2 Methods**

This thesis attempts to explain the time series data analysis and examine the development of tourism in Turkey over the observed period 2012-2016 and compare the GDP between Turkey and the Czech Republic between the years 2006 and 2016. There are two methods that will be used to achieve the objectives of this thesis and so that it will be able to have answers to research questions. The first method will be used in this thesis is a study to the analysis of time series data and explain the benefits and for which purposes can be used. Also, collecting the information and data relevant to subjects.

The second method that will support the study to achieve set objectives is to evaluate and examine the data which has been collected through quantitative methods.

In this thesis to evaluate and examine the data which is collecting from reliable sources, will be used quantitative analysis methods, for these purposes these data will be examining and evaluating through Microsoft Excel.

At last, in order to make it simple and better explanation of data sets, in this thesis study used data visualization techniques. Also, it is important that in terms of see the fluctuations and movement of data.

### **3. Literature Review**

#### **3.1 Data**

Data is the set of values that commonly used in two different types which are qualitative and quantitative variables (Wikipedia, 2017). Examples of qualitative data can be a reporter's handwritten about some incident or it can be his or her interviews with someone etc. These kinds of pieces of data are individual pieces of information. Examples of quantitative data can be statistical variables about the development of country's GDP, a company's stock prices, crime rates in a city, number of export or import for a country etc. Commonly data is used in the scientific research area. Because collected data can help for future decisions or ideas. Data collected by organizations and institutes, especially by business organizations (sales data, stock prices, income, expenditure etc.) and government (crime rates, GDP, employment rates, tourism numbers etc.) also some non-governmental organizations collect data too (an example of this type is censused by non-profit organizations).

Firstly, data is measured, and following steps are collected, reported and analyzed after the analyzing of the data it can be visualized with images, graphs or with another analysis tools.

Data as a general concept imply to the fact that some existing information or knowledge is coded or represented in some form suitable for better usage or processing (Wikipedia, 2017). Unprocessed data or raw data means that a collection of data (numbers or characters) before any kind of procedure (cleaned or corrected) done by researchers. Raw data needs to be corrected in order to remove outliers or obvious instruments or data entry errors (Wikipedia, 2017). Also, data processing usually composed of stages or steps, such as the following stage of the "raw data" can consider as "processed data".

After describing the data, it is necessary to mention about the World Bank that one of the biggest and accepted organization all around the world.

#### **3.2 World Bank**

World Bank founded in 1945 and today it has over than one hundred (150) member countries. Headquarter of the World Bank is in the Washington, D.C., United States (Wikipedia, 2017).

The mission of the World Data Bank is to supply the reliable, high-quality national and international statistical data to clients. Also, due to be a part of the international statistical system,

the Data Group works with other communities and organizations to improve new statistical methods, statistical capacity programs, and data collection activities.

World Bank is “*free and open access to global development data*” (The World Bank, 2017). The World Bank is an international financial institution that supplies loans to countries of the world for capital programs. World Bank composed of two institutions which are the International Bank for Research and Development (IBRD), and the International Development Association (IDA). World Bank is also a component of the World Bank Group (The World Bank, 2017).

The main aim of the World Bank is the reduction of poverty. On the other hand, based on its Articles of Agreement, “*all its decisions must be guided by a commitment to the promotion of foreign investment and international trade and to the facilitation of capital investment*” (Wikipedia, 2017).

Demand for reliable statistical data is continuously increasing. Because people such as managers would like to develop effective strategies and in order to accomplish that purpose, timely and reliable statistics are the key inputs.

According to the World Bank, in order to gather good data, it is necessary to set baselines, identify effective public and private actions, set goals and targets, monitor progress and evaluate the impacts (The World Bank, 2017).

At the World Bank, the Development Data Group coordinates statistical and data work preserves many macros, financial and sector databases. Group works closely with the Bank’s regions and Global Practices, the group is guided by professional standards in the collection, compilation and distribution of data to provide that all data users can have confidence in the quality and integrity of the data produced (The World Bank, 2017).

Most of the data come from the statistical systems of the member countries (over than 150 countries), also the quality of the global data depends on these national systems, basically these national systems perform directly effects to quality of the data. Hence, World Bank helps to developing countries in order to improve the capacity, efficiency, and effectiveness of the national statistical systems. Also, without quality data, it is impossible to develop effective policies.

World Bank databases are one of the most important tools due to importance on supporting crucial management decisions, providing key statistical information for Bank operational activities. Hence, it has critical importance to use internationally accepted standards and norms.



## **Global Statistical Strategy**

In order to use in any area, statistics must be both reliable and relevant. They should be compiled correctly, following standards and methodology. Also, they must meet with the users need and questions posed by policymakers (The World Bank, 2017). But sometimes developing countries have problems about the ensuring these criteria. Usually, they find themselves in a vicious cycle, due to break that circle World Bank helps to the developing countries.

One of the priorities of the World Bank is an effort to improve the statistical infrastructure of developing countries is the preparation of national strategies for development of statistics as recommended in the Marrakech Action Plan for Statistics (The World Bank, 2017). Beside Marrakech Action Plan, there are several World Bank's statistical capacities improving programs listed below:

- Improving Statistical Capacity
- Trust Fund for Statistical Capacity Building
- International Comparison Program

## **The International System**

World Bank has close relationships with the international statistical organizations, institutions, and communities. Such as agencies of United Nations, Organization for Economic Co-Operation and Development (OECD), the International Money Fund (IMF) and the regional development banks. Also, World Bank supports several programs to collect transnational data. This kind of data can only be collected by a globally coordinated program (The World Bank, 2017).

## **Publications**

The World Bank produces and the array of data publications in different kind of formats (such as print and electronic) that cover a wide range of development issues. These publications project the scope of the data work and the wide range of user interest. They also make the data more available, better accessibility particularly through the charts and graphs (The World Bank, 2017).

### **3.3 Visualization of the Data**

Data visualization implies the methods, techniques that used to communicate data or information through encoding it as visual objects (such as points, lines, bars etc.) contained in graphics. The main goal of the data visualization is to visualize the data and communicate information clearly

and efficiently to users. Data visualization is one of the important steps in data analysis (data science). Especially when there is 'big data' the data visualization is necessary. Because without the visualizing the data, having massive data sets might be quite hard to use it.

Using another word, the main purpose of the data visualization is to communicate information clearly and effectively through graphical means. It is not important that the data visualization needs to look boring due to being functional or extremely sophisticated due to it needs to look beautiful. To convey ideas effectively both aesthetic form and functionality needs to be together, so that visualization can provide the information through graphs to users from massive and complex data sets (Friedman, 2008). But even despite these criteria designers may have fails to achieve a balance between form and function. Because creating magnificent visualization might cause of the failure about to serve to the main purpose that is to communicate the information clearly and efficiently. In the world, there are many massive data sets or with another word 'the big data' sets. Also, it is possible that whole this data become meaningless and liability unless there is not the simple and effective way to use this data.

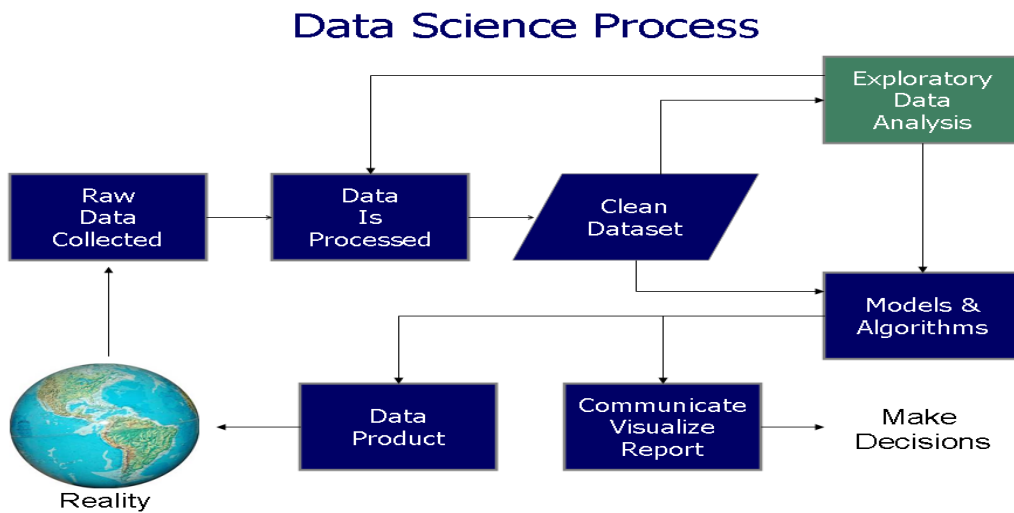
When people such as managers have massive and complex data sets, commonly they use the data visualization to understand the data and make an effective decision. Data visualization is a technique or process to analyze the data through graphics so that the managers can be able to see information that is inside the complex data sets.

Data visualization is both art and science. Also, data visualization has close relationships with information graphics, information visualization, scientific visualization, statistical graphics, and data analysis. Recently, data visualization has become active and popular research area (Wikipedia, 2017).

As mentioned it before data visualization is one of the steps in the analyzing the data and presenting the results to users. Basically, this process works under the several steps. It starts with the collection of the raw data from the real world. After collecting the data in order to get clean data sets this raw data needs to have some process. So that 'clean data sets' can cause of the 'exploratory data analysis' and creating 'models and algorithms'. These models and algorithms create the visual reports and data products (Wikipedia, 2017). Hence, managers can be able to decide and apply the results reality. (Also, these results can use to do estimation about the future)

The data science process is described in Figure 1.

Figure 1: Data science process



(Wikipedia, 2014)

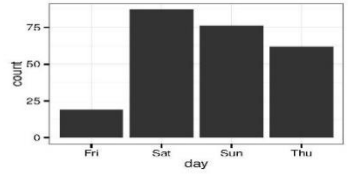
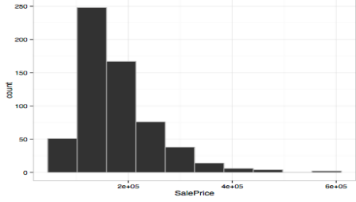

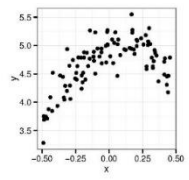
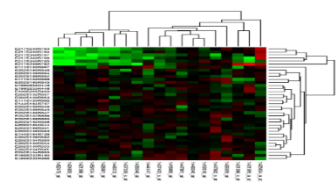
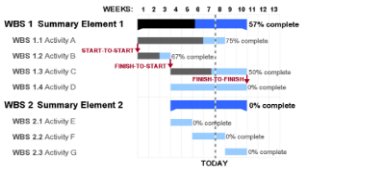
A set of data can be present whether in a table or in a chart. But charts might have more advantages. Simply with a statistic's version of some old proverb "A *chart says more than a thousand table cells*" (Wallgren, Wallgren, Persson, Jorner, & Haaland, 1996). In the charts, users can't see the whole details but charts help to users to see where there are differences or patterns about the datasets. There are many graphics types which can use in data visualization. Commonly well knows information graphics types are listed below:

- Line Chart
- Bar Chart
- Histogram
- Scatterplot
- Boxplot
- Pareto Chart
- Pie Chart
- Stem-and-leaf Display
- Cartogram
- Sparkline table
- Etc.

Also, it is possible to use some programming language with data visualization, such as JavaScript through Python. Because Python might be the natural complementary language to JavaScript's monopoly of browser visualizations (Dale, 2016).

In Table 1, there are brief explanations of commonly used diagrams types for data visualization with examples of it.

**Table 1: Diagrams used for data visualization**

Example	Name	Visual Dimensions	Examples Usages
	Bar chart	<ul style="list-style-type: none"> <li>Length/count</li> <li>Category</li> <li>(Color)</li> </ul>	Comparison of values such as sales performance, a single variable measured over time
	Histogram	<ul style="list-style-type: none"> <li>Bin limits</li> <li>Count/length</li> <li>(color)</li> </ul>	Determining the frequency of annual stock market percentage returns within particular ranges(bin) such as 15-18% etc.
	Network	<ul style="list-style-type: none"> <li>Nodes size</li> <li>Nodes color</li> <li>Ties thickness</li> <li>Ties color</li> <li>Spatialization</li> </ul>	Finding clusters in the network such as Facebook Discovering bridges between clusters
	Scatter plot	<ul style="list-style-type: none"> <li>X position</li> <li>Y position</li> <li>(symbol/glyph)</li> <li>(color)</li> <li>(size)</li> </ul>	Determining the relationship such as correlation
	Heatmap	<ul style="list-style-type: none"> <li>Row</li> <li>Column</li> <li>Cluster</li> <li>Color</li> </ul>	Analyzing risk with the representation of the color, respectively
	Gantt chart	<ul style="list-style-type: none"> <li>Color</li> <li>Time(flow)</li> </ul>	Schedule/progress such as school schedule

(Wikipedia, 2017)

Table 1 is about the diagrams which have been using for data visualization. In Table 1, some of these diagrams have been briefly described and given some features with examples.

To use effectively data visualization and these diagrams, charts, infographics etc., commonly managers and people who need to decide based on these kinds of big data sets, they get help with some software and tools. Because, to obtain these diagrams, charts etc. the big data needs to be used with right and effective tool or software. There are many kinds of tools and software which can be used in data visualization. But managers and people who need to decide, need to use right and simple one for their purposes. Therefore, managers need to know follow developments and studies in this area.

As mentioned before whole these big data sets, whole this complex data can become a liability, or it might be a liability unless there are not simple and effective data visualization tools. Data visualization is about the presentation of the data, at the right place and to the right person or people, with aiming to enable them to obtain insights most effectively as much as possible.

Nowadays there are many good tools, web pages, and software for these kinds of purposes. Based on a research conducted by Forbes Magazine best and most popular also most innovative data visualization tools listed. Some of the data visualization tools listed below:

- Tableau: They have effects on data visualization area. It's a well-known data visualization software. Especially, it is well suited to handling the huge and very fast-changing datasets which are used in Big Data operations such as artificial intelligence and machine learning applications. It has over 57.000 customer accounts.
- Qlikview: It is the Tableau's biggest competitor and another important tool in data visualization area. It offers powerful business intelligence, analytics and enterprise reporting capabilities and another plus of this tool might be the clean and clutter-free user interface. It has over 40.000 customer accounts.
- Fusion Charts: It is a widely-used, JavaScript-based charting and visualization package. It can provide around 90 different chart types and it can integrate with a large number of platforms. One of the important features in here is that users can pick from a range of "live" example templates and basically plug in their own data sources as needed.
- Plotly: It allows off more complex and sophisticated visualizations thanks to integration with analytics-oriented programming language (such as Python and MATLAB)

- Data Wrapper: Especially among media organizations which commonly use it to create charts and present statistics, it is getting more popular. Because it has quite simple and clear interface that ensures it very easy to upload CSV data and create maps and charts that can be easily embedded into reports.

(Marr, 2017).

### **3.4 Official Statistical Institutes of Turkish Republic and the Czech Republic**

#### **Brief History of Turkish Statistic**

##### The Ottoman Empire Period

Registry systems at the Ottoman Empire had crucial importance among the bureaucratic traditions developed by the administration. Quantitative information was compiled in detail, systematically and regularly while performing financial and administrative functions conducted by the institutions.

##### Republic of Turkey Period

- 1926-Central Statistic Department was established in line with the Presidential Decree as of 26 April 1926, numbered 3517.
- 1927-The first population census was conducted after the proclamation of the Republic.
- 1930-All responsibilities and duties of Central Statistic Department were reorganized, and the name was changed as Public Directorate of Statistics.
- 1939-Regional Offices and Price Statistics Division were found it.
- 1955-According to the law, it was decided to conduct a general population census in the years ending with (5) and (0), general business census in the years ending with (1) and general agriculture census in the years ending with (0).

With this new law, penal sanctions were put into force for persons who do not take responsibility without any acceptable reasons and does not give any answers or gives unrealistic answers during business, agriculture and general population censuses.

- 1962-The Institution was affiliated with the Primary Ministry, named as State Institute of Statistic.
- 2005-Turkish Statistical System and the Institute were reorganized in 2005 with Turkish Statistical Law No.5429. Since the new law, the name of the Institute has changed as

Turkish Statistical Institute. Turkish Statistical Institute has an association with the Statistical Council and Presidency of Turkish Statistical Institute.

- 2006-2008-Some articles about Turkish Statistic Law were rearranged.
- 2011-2012-Headquarters of the Institute was reorganized.

(Turkish Statistical Institute, 2017).

### **Turkish Statistical Institute at Present**

Turkish Statistical Institute (mostly known as TurkStat; Turkish: Türkiye İstatistik Kurumu or TÜİK) is a research institution affiliated with the Ministry of Development. The center of the Institute is in Ankara. On November 18, 2005, the name of the institution has changed from "T.R. Prime Ministry State Institute of Statistics" to "Turkish Statistical Institute". There are 26 regional directorates in Turkey.

The State Institute of Statistics (Turkish: Devlet İstatistik Enstitüsü or DIE) was the former name of the TUIK, the state's main data collection institution. The main tasks of the institution are General Population Census, General Census of Agriculture, General Industry or Business Censuses, National Income Estimates, Consumer Price Index and Producer Price Index and Inflation Account. The name has changed to the Turkish Statistical Institute (TurkStat) in 2005 with a new law (Wikipedia, 2017).

Also, based on the records from 2017, TUIK has a budget around 388.106.000 Turkish Lira and 3640 employees in 2013 (Wikipedia, 2017).

Duties and authorities of the Institute:

- To prepare the Official Statistics Programme,
- To organize and manage the statistical activities specified in the Programme and ensure their realization,
- To choose the statistical methods, definitions, classifications, and standards to be used in the production of official statistics in line with national norms and international norms,
- To compile, evaluate, analyze and publish statistics in the fields of economy, demography, environment, social issues, culture, science and technology, and in the other required areas,
- To provide scientific and technical explanations to the results of official statistics,
- To follow up the recent developments in scientific research techniques, and methods and information technologies in the field of statistics and to take relevant measures for the adoption of these developments,

- To determine the areas where statistical data are needed as well as data compilation methods in cooperation with the relevant institutions and organizations, by considering the national and international priorities,

- To follow the performance of tasks assigned by the Programme to the institutions and organizations in relation to official statistics, to examine statistics produced by these institutions and organizations in compliance on their international standards, to perform quality control and to provide technical support and ensure coordination in these issues,

- To develop medium and long-term strategies and policies of the Institute within the framework of development programmes, plans, relevant legislation and principles adopted; to take measures to continually improve the organizational structure, service quality standards, and managerial services and processes in line with the strategic plans and annual objectives and targets of the Institute,

- To prepare Annual Monitoring Reports relevant to the implementation of the Programme,

- To coordinate the establishment of a national and international information network and information flow system to ensure the storing of statistical information, its submission to users and development of systems pertaining to these areas,

- To define and choose the standards for the establishment of the national register systems, implement these standards, and to ensure their observance through inter-agency coordination,

- To follow, evaluate and publish, when required, the indicators related to other countries or country groups in order to create international comparisons,

- To draft, develop and implement research and technical assistance projects in cooperation with the national organizations and international organizations and institutions for the production of data in the required areas and for the enhancement of existing technical capacity,

- To cooperate with other countries and international organizations, and to organize international meetings in the field of statistics,

- To perform other duties assigned by the Law.

(Turkish Statistical Institute, 2017).

The main duty of the TurkStat office is that the Population Censuses have been announced on the basis of Address Based Population Registration System (Turkish: Adrese Dayalı Nüfus Kayıt Sistemi or ADNKS).



In earlier years this census was conducted in every five years, but since 2007 this census has been changed into annually (Turkish Statistical Institute, 2017).

In addition, the Presidency may establish national and international training and research centers regarding working fields in association with universities and other this kind of institutions where the duties of the higher education institutions are reserved.

### **International Relations**

International relations under the named International Activities are;

- Coordination of Turkish Statistical Institute's cooperation studies and relations with international organizations and national statistical institutes on "Statistics",
- Coordination of projects regarding the duties and authorities of the Institute and compliance works on EU Acquis,
- Management of the statistical cooperation activities and projects financed by international organizations in the frame of the contracts are performed.

(Turkish Statistical Institute, 2017).

Activities can be collected under the three main headlines:

1. EU Coordination Studies
2. External Projects
3. International Cooperation Activities

### **EU Coordination Studies**

#### **TurkStat & EUROSTAT**

TurkStat conducts the appropriate activities in close cooperation with the EuroStat. The first step of this relationship began in 1993 with “Cooperation Protocol”. The year 1999, after the Helsinki Summit relations between two official institutes, continued gradually (Turkish Statistical Institute, 2013).

Like other national statistical offices, TurkStat sends data to EuroStat. An important milestone between TurkStat and EuroStat relations starts is in 2000 in the candidacy process, it was a study visit which is done by top level to EuroStat. This visit has quite an important role due to it was

aimed at gathering information about statistics compliance works, exchange of views and determining the general strategy of compliance works.

### **Classification**

Statistical data is required to be used in the analysis of economic and social structures of countries. Yet, providing the same meaning about the data among the users and also in international areas requires that statistical data would be arranged on the base of certain and some specific standards. Since we live in the information age and the globalization has been aimed recently, communication of information users (who speaks different languages or who may have different purposes) would be possible needed just with a common language constituted by means of classifications and codification systems. Turkish institution, so far, has produced statistical data based on International Standard Industrial Classification of All Economic Activities ISIC prepared by United Nations and these systems are mostly accepted in all around the world.

The Turkish Statistical System is in the development process of change into European Union Classification System (based on international classification system) instead of international classifications that have been used for many years. Now, there will be in accordance within both international classification and European classifications, to obtain data comparability and at the same time to respond data requests at the national level (Turkish Statistical Institute, 2006).

Main statistics:

- ❖ National Accounts
- ❖ Employment, Unemployment, and Wages
- ❖ Inflation and Price
- ❖ Foreign Trade
- ❖ Construction and Housing
- ❖ Industry
- ❖ Trade and Services
- ❖ Agriculture
- ❖ Environment and Energy
- ❖ Population and Demography
- ❖ Income, Living, Consumption, and Poverty
- ❖ Education, Culture, Sport, and Tourism
- ❖ Health and Social Protection

## **The Big Data**

Very large datasets or with another word complex data sets that cannot be managed or analyzed by simple methods are called big data. There is expression called 3V, which consists of the initials of the world volume, velocity, and variety, and these worlds express the characteristics of the big data. Big data can be mean one or several of these characteristics at the same specific time. The data have crucial importance to be reliable to produce statistics, to implement machine learning algorithms, and to create future from the big data otherwise without the reliable data whole these things can be misleading (Turkish Statistical Institute, 2017).

These kinds of huge and growing datasets usually used by private companies. The companies that based on the one simple principle “knowledge is power” have started to become stronger. Also, the use of the big data has started to gradually increase in Turkey.

The importance of big data on official statistical production, the use of big data sets, when the big data sets or complex data sets interpreted with accurate analysis methods it starts to obtain important strategic information, and these kinds of methods have become even more significant in an increasingly competitive environment with globalization. Using the advantages of big data, it can produce faster, more accurate, more effective and more statistics. In addition, in economic aspect using the big data offers the possibility of reducing the statistical production costs in the long term (Turkish Statistical Institute, 2017).

## **Brief History of Czech Statistical Office**

The Czech Statistical Office can trace its history back to the communist era in 1969 when it was created by the Act of the Czech National Council No. 2/1969. It has existed continuously since that time, although its remit changed somewhat over time. It was reauthorized in 1995 by the current Czech Republic. Even so, in the years between 1969 and 1995, some controls over the statistical matters had started to pass through to local government. So that, while the simple provisions of the modern Czech Statistical Office were brought into effect on 15 June 1995, the authorizing legislation allowed until 1 January 1996 for complete control over statistic throughout the Republic to be exercised by the CSO (Wikipedia, 2008).

Based on the Czech Official Statistic Pages, Czech statistical history can divide into two groups: History of Czech Statistic Before 1918 and History of Czech Statistic After 1918.

## **History of the Czech Statistic Before 1918**

The statistic has related to the history in the Czech Republic too as in many countries in the world. Because the reason is quite simple and obvious. Every shop, every independent community or with another word every sovereign wanted to know how big his land, how many soldiers, how many shop, how many serfs he has or from whom and how much taxes he can collect it. These kinds of simple questions have been related to a statistic in every era. Hence, the first lists and general overviews emerged. In the Czech statistical history considered the oldest preserved “statistical document” is an inventory of the property of the Litoměřice church of 1058, which is a part of Prince Spytihnev’s II deed of foundation (Czech Statistical Office, 2012).

One of the important milestones can be the when a patent of Empress Maria Theresa on an annual census of population was issued, 13 October 1753 (Czech Statistical Office, 2012). Development of the records on population was connected to large reform of Maria Theresa. Due to make many reforms, it had crucial important to obtain objective information on the population.

In 1754, as a new chapter of the history of population censuses in the Habsburg Empire started with the census carried out. It is the first time that it took place at the same time and in the whole territory of the group of states (Czech Statistical Office, 2012).

Between the 1777 and 1851, a new letters patent was issued that (with slight changes and modifications) became the basis for listening up in this period (Czech Statistical Office, 2012).

Another important milestone in the Czech statistics is beginning of an independent collection of the data in the Czech territory relate to the knight named Joseph Anton Riegger (lived between 1742-1795) who is the founder of organized statistical service and first competent statistician within the country borders.

Another important milestone is in the modern history of population censuses in Austria was opened by the adoption of a new law in the year 1869. Based on this law, a population census was carried out at the beginning of 1870, which captured the situation as of 31 December 1869 (Czech Statistical Office, 2012).

The first genuine statistical body of the territory of the Czech Republic is Statistical Office of the Kingdom Bohemia is founded on 6 March 1897. It is the first centralization of the all statistical units in the Czech Republic. In 1909, The “Statistical Handbook of the Kingdom of Bohemia” was issued and followed by next one in 1913 (Czech Statistical Office, 2012).

## History of Czech Statistic After 1918

After the founding of Independent Czechoslovakia on 28 January 1919, The State Statistical Office(SSO) was founded in the same year as a body of authorized to engage in national statistical surveying, also, it was including a population census as one of the most important kinds of surveys. Between the both World Wars the office has continued to develop and expanded its activities.

In the publication of Czechoslovak Statistics in the First Decade of the Republic since 1928, the function of state statistics was characterized as follows:

*“The purpose of the statistical service is to provide a picture of the state and development of conditions in the entire country, the final target of which is to achieve economic welfare, good morals, wellness and fitness of the entire population. These efforts, however, cannot be managed by chance or traditionalism and mere instinct – it has to be done consciously, according to a plan, precisely and continuously, i.e. in a scientific way. Nevertheless, it needs a prerequisite knowledge of all facts and conditions in the state. To continuously find out the facts, to pick up what is typical for them, what relations and mutual causal relationships are among them, what regularities are in their development, that is namely the task of the statistical service”* (Czech Statistical Office, 2015).

With the foundation of State Statistical Office (SSO), it would be needed new technological devices. It was necessary due to big statistical data such as surveys, population census. In 1920 the SSO hired on trial punching machines and 4 sorting machines with the Powers Accounting Machine company. Later, the machinery of the office has started to gradually be increased. In 1929, the SSO had 6 automatic punching machines, 14 sorting machines, 1 manual perforator and 4 accounting machines in the machine room where around 60 people worked. In 1928, there were already more than 15 kinds of various statistics were proceeds with the help of these machines (Czech Statistical Office, 2015).

Dobroslav Krejčí was the president of the SSO between 1929 and 1939. He devoted his entire life to statistics. In 1898, he started to work in Statistical Office of the Kingdom Bohemia and with the foundation of the SSO, he promoted to become the first president of the SSO. He dealt with the historical development of the Czech Statistics besides he is the author of the handbook which is called Basics of Statistics (1920 and 1923) and of the textbook called Statistics (1928).

Other important representatives of the SSO which listed below:

- František Weyr

- Jan Auerhan
- Antonín Boháč

Due to war conditions during the World War II, the statistical activities in the Bohemia and Moravia was limited. The president of the SSO Dr. Jan Auerhan forced to being retired due to his works on minority policy. On 6 June 1942, he arrested by Gestapo and after 3 days later on 9 June 1942 he shot (Czech Statistical Office, 2015). Also, some of the employees were executed and some of the employees died in Nazi prisons and concentration camps.

After the World War II, the SSO was set-up and aimed to recover the Czech statistics. The War had significant effects on the national structure of the Czech lands.

On 1 January 1993, Czech Republic was founded by Tomáš Garrigue Masaryk (after communist regime collapsed in 1989) and the Czech Statistical Office (CZSO) assumed all responsibilities of a body of statistics (Wikipedia, 2017). Duties, principles, tasks, and assignments of the State statistical service within the country borders, were laid down in the Act No. 89/1995 Sb. Called “Collection of the Laws” on Statistical Service with the last amendment which is made in 2006 (Czech Statistical Office, 2015).

### **Czech Statistical Office**

The Czech Statistical Office (Czech: Český statistický úřad) is the central organization in the Czech Republic which collects, analyzes and disseminates statistical information to be used in country’s benefit of the various parts of the local and national governments of the Czech Republic. It has established this aim through the management of the Czech Statistical Service (Wikipedia, 2008).

### **Czech Statistical Council**

The Czech Statistical Council is established by the Czech Statistical Office as an advisory body. Head of the Council is the President of the Czech Statistical Office. The members of the Council are appointed and recalled by the President of the Czech Statistical Office from among experts in statistical theory and practice (Czech Statistical Office, 2017). The Council has minimum 11 and maximum 25 members. The Council considers the Programme of Statistical Surveys. Other duties and working methods of the Council are stipulated by its Statue, issued by the President of the CZO.

## **Data Collection**

Statistical surveys in the Czech Republic are following Act No. 89/1995 Coll., on the State Statistical Service, as amended, managed by the Czech Statistical Office and individual workplaces of the state statistical service at the ministries (Czech Statistical Office, 2013).

A general overview of the statistical surveys is published every year in the form of a Decree on the Programme of Statistical Surveys. Based on the Decree a reporting duty arises. A simple general overview about the number of surveys will be mentioned later.

## **Activities**

Czech Statistical Office has many activities within the country borders, also it takes part in some international activities. These kinds of activities have a big effect on the improvement of the statistics for the country. For example, some of the activities of CZSO are Open data approach, Surveys, The project of Webarchiv, etc. (Czech Statistical Office, 2012).

As for international activities, this part is focused on one of the activities called European Statistical System (ESS).

## **European Statistical System**

This system guarantees, that the whole European statistics data from the Member of States of the European Union are reliable and whole data gathering process includes appropriate ways so that whole data is always comparable among the Member of the States of the EU. The main of this system is to guarantee statistics data that have harmony, reliable, appropriate and usable.

The ESS comprised of Eurostat (the statistic office of EU), the statistics office among the all Member States (different National Statistics Institutes) and other institutes collect European Statistics. Also, this system has European Statistical Programme which includes the statistical planning for every five years. This European Statistical Programme is passed by the European Parliament and by the Council (Czech Statistical Office, 2012).

## **Surveys collected by the Czech Statistical Office (CZSO)**

The statistical surveys are collected in the following areas:

- ❖ Business (economic) statistic
- ❖ Sectoral Statistic
- ❖ Agriculture and forestry
- ❖ Industry, construction, and energy
- ❖ Tourism

- ❖ Waste, the environment, and water management
- ❖ Social statistic
- ❖ Cross-sectional statistics
- ❖ Demography
- ❖ Price statistics and external trade
- ❖ Business cycle surveys
- ❖ Registers

Most of the surveys are performing annually. However, some surveys are performing once in a few years (such as continuing vocational training survey, and survey on orchards once in 5 years, a questionnaire on innovations once in 2 years, a structural survey in agriculture once in 10 years and so on). Most of these surveys are performing based on a regulation of the European Union (Czech Statistical Office, 2013).

**Table 2: Overview of statistical surveys with the reporting duty in 2009 – 2013 (by CZSO)**

Number of surveys	Programme of Statistical Surveys in the Year				
	2009	2010	2011	2012	2013
CZSO	125	119	114	114	110
Total	228	210	203	205	197

(Czech Statistical Office, 2013)

### **Surveys Carried Out by Ministries**

Recently in the Czech Republic, there are 9 ministries that managing the statistical surveys in compliance with the Decree of the CZSO on the Programme of Statistical Surveys (there is also 4 other workplaces of the state statistical service that do not perform the survey in compliance with the Decree). The CZSO manages these surveys, assesses them from the view of their methodology and observes that ministries do not collect duplicate data, that is already collected by the CZSO and, vice-versa, that means the CZSO does not collect any same data as ministries (Czech Statistical Office, 2012). Also, collecting the same data it might cause of losing time, and that situation not good for both sides (Because when there is a need to use both data type, there are agreements on data transmission). The following brief characteristics of the surveys which are performing by ministries in compliance with the Decree of the CZSO:

- ❖ Ministry of Transport
- ❖ Ministry of Culture
- ❖ Ministry of Labor and Social Affairs
- ❖ Ministry of Regional Development



- ❖ Ministry of Industry and Trade
- ❖ Ministry of Education, Youth, and Sports
- ❖ Ministry of Health
- ❖ Ministry of Agriculture
- ❖ Ministry of Environment

From the Table 3 below, see the number of surveys which is performing by Ministries.

**Table 3: Overview of statistical surveys with the reporting duty 2008 – 2012 (by Ministries)**

Number of surveys	Programme of Statistical Surveys in the Year				
	2008	2009	2010	2011	2012
Ministries	106	103	91	89	92
Total	233	228	210	223	206

(Czech Statistical Office, 2012)

Main statistics:

- ❖ Agriculture
- ❖ Business Cycle Surveys
- ❖ Construction, Dwellings
- ❖ Crime, Accidents
- ❖ Culture
- ❖ Education
- ❖ Elections
- ❖ Employment, Unemployment
- ❖ Environment
- ❖ Financial Data
- ❖ External Trade
- ❖ GDP, National Accounts
- ❖ Healthcare, Incapacity for Work
- ❖ Industry, Energy
- ❖ Social Security
- ❖ Science, Research, and Innovation
- ❖ Tourism
- ❖ Wages and Labor
- ❖ Price, Inflation
- ❖ ...

### **3.5 Forecasting**

This topic has been chosen in order to show the importance of forecasting and analysis of time series data, and how these methods are used.

Analysis of time series data started a long time ago, and forecasting has an even longer history. Objectives of the two studies may differ in some situations, but forecasting is often the goal of a time series analysis (Tsay, 2000).

Forecasting is one of the simplest and basic ways to do prediction about future behaviors. It has been using for long years. It is possible to see it through history. Because people would like to have an idea about future behaviors so that people can be able to prepare themselves for what is coming. In every area of the history people have been doing forecasting, people were trying to have some idea about future, and either it is same for nowadays. Because obscurity is one of the worst things for people especially who have responsibilities for future of the companies or communities, such as leaders and managers.

Managers and leaders, also people who have the power for decisions, they would like to have some ideas about future behaviors before making a decision. Forecasting is one of the best ways to have some idea about future behaviors. This is one of the main reason that why managers are using forecasting methods.

Forecasting methods have quite widely applicable usage areas. In many areas of the life, it is possible to use it effectively.

Everybody can try to do forecasting but in terms of quality of the forecasting, using the reliable and right data has quite an important role. Because trustable forecasting brings the success, and it can make the leaders and managers closer to their purposes, goals.

Decision makers often confuse about the process such as forecasting and planning. These two processes are different than each other.

Planning is a process of determining how to deal with the future. On the other hand, forecasting is the process of predicting what the future will be like. Forecasts are used as inputs for planning the process (Groebner, Shannon, Fry, & Smith, 2007).

According to the decision makers who are actively involved in forecasting constantly say that forecasting is both science and art.

There many ways to predict the future. Broadly these ways can be collected under the two main headlines, techniques: qualitative and quantitative. Qualitative forecasting based on ideas,

opinions, and judgments. But quantitative forecasting techniques are based on statistical methods for analyzing quantitative historical data (Groebner, Shannon, Fry, & Smith, 2007). Here will be focused on quantitative techniques.

Determining the appropriate forecasting method might be challenging but regardless of the method that is used to generate a forecast, the same procedures can be followed.

**Table 4: Steps to forecasting procedures**

<p>Steps to Forecasting</p> <ol style="list-style-type: none"><li>1. Determine the use of the forecast- what objective are we trying to obtain?</li><li>2. Select the items or quantities that are to be forecasted.</li><li>3. Determine the time horizon of the forecast-is it 1 to 30 days (short-term), one month to one year (medium term), or more than one year (long-term)?</li><li>4. Select the forecasting model or models.</li><li>5. Gather the data needed to make the forecast.</li><li>6. Validate the forecasting model.</li><li>7. Make the forecast.</li><li>8. Implement the results.</li></ol>
---

(Render & Stair, JR, 1997)

These eight steps represent a systematic way to designing, initiating, and implementing a forecasting system.

The main goal of developing a forecasting model is; using the simplest available model that meets forecasting needs.

### **Index Numbers**

Index numbers are one of the basic and important components of the analysis of time series data. While mentioning about time series data it is necessary to mention about index numbers. It is one of the simple ways to do comparison through time. It has many ways such as simple equations to use in this comparison.

Index numbers are quite helpful for managers also for people who would like to see changes or differences. It helps to managers to see the difference about prices, income, expenditures etc.

It is important to know and understand the index numbers due to their effective usage areas. It may consider as effective methods that provide trustable results about comparison for managers.

Because of these reasons and importance of index numbers, there will be briefly mentioned about index numbers.

Index numbers are the one of the well-known and common method for characterizing business and economic time series data to compute. Index numbers are measures the changes of a time series over time. In order to do this procedure there needed to be some constant point in time so that other values can be measured at different times. For this purpose, to make a fair comparison the index numbers used the base period index.

One of the important uses areas of index numbers is to characterize changes in stock prices over time.

An index number is a number that measures the change in a variable over time relative to the value of the variable during a specific base period (McClave, Benson, & Sincich, 1998). This base period is defined as 100.

**Equation 1: Simple index numbers**

Simple Index Number

$$I_t = \frac{y_t}{y_0} \cdot 100$$

Where:

$I_t$  = Index number at time period  $t$

$y_t$  = Value of the time series at time  $t$

$y_0$  = Value of the time series at the index base period

(Groebner, Shannon, Fry, & Smith, 2007)

The simple index number is the one of the easiest one. It is based on the changes in the quantity or price of a *single* commodity.

Another important point is that choosing the base period. Because it is the first step that needs to be done and also all other periods will be compared with this base period.

## Aggregate Price Index

Previous equation (Equation 1), is the index for computing only price or quantity of a single item. But if the managers would like to compare prices of a group item they might be constructing on an aggregate price index.

An index that is used to measure the rate of change from a base period for *a group of two or more* items, it is called Aggregate Price Index (Groebner, Shannon, Fry, & Smith, 2007).

### Equation 2: Unweighted aggregate price index

#### Unweighted Aggregate Price Index

$$I_t = \frac{\sum p_t}{\sum p_0} \cdot (100)$$

Where:

$I_t$  = Unweighted aggregate index at time period  $t$

$\sum p_t$  = Sum of the prices for the group of items at time period  $t$

$\sum p_0$  = Sum of the prices for the group of items at the base time period

(Groebner, Shannon, Fry, & Smith, 2007)

## Weighted Aggregate Price Indexes

The previous Index is appropriate when the set of costs or prices are same. (Good example for this purpose may be the determining the change in university costs because under the same set of rules each student would incur the same set of costs) However, it is quite possible that these set of prices and cost might be different. Hence, there are two kinds of the weighted aggregate price index. These are The Paasche Index and The Laspeyres Index.

### The Paasche Index

The idea for Paasche Index that the prices in the base period should be weighted relative to their current use, not to what use level was in other periods (Groebner, Shannon, Fry, & Smith, 2007).

Also, Paasche Index might be the one of the most appropriate when the managers want to compare current prices at current purchase levels.

### Equation 3: Paasche index

Paasche Index

$$I_t = \frac{\sum q_t p_t}{\sum q_t p_0} \cdot (100)$$

Where:

$q_t$  = Weighting percentage at time  $t$

$p_t$  = Price in time period  $t$

$p_0$  = Price in the base period

(Groebner, Shannon, Fry, & Smith, 2007)

But sometimes it is possible to have some problems due to Paasche index. First, it is necessary to have all the purchase quantities for every time period.

A second problem is that although each period is compared to the base period, it is difficult to compare the index at two other periods because the quantities used are different for each period (McClave, Benson, & Sincich, 1998).

### The Laspeyres Index

There is slightly different than Paasche Index which is in here instead of “weighting percentage at time  $t$ ” The Laspeyres index use “weighting percentage at *base period*”.

It is possible to use Laspeyres index when the base period quantities are acceptable weights to apply to all time periods.

### Equation 4: Laspeyres index

Laspeyres Index

$$I_t = \frac{\sum q_0 p_t}{\sum q_0 p_0} \cdot (100)$$

Where:

$q_0$  = Weighting percentage at base period

$p_t$  = Price in time period  $t$

$p_0$  = Price in the base period

(Groebner, Shannon, Fry, & Smith, 2007)

## Commonly Used Index Numbers

There are several index numbers which are commonly used in business and economic areas. These indexes have quite important roles in order to obtain the reliable data about the development of economy etc.

These indexes are:

1. Consumer Price Index: The CPI measures the average retail prices paid by consumers in return of good and services. Widely used, both in the public and private sectors. It is most commonly used in calculating the inflation rate for general purposes. Movement of the CPI implies the changes in the cost of living for urban customers. Labor unions usually use the CPI in bargaining for wage increases (Sahu, 2018).
2. Producer Price Index: PPI serves as an index that relevant to the producer's cost. Basically, it tells what is happening to the cost of production. The importance of PPI, then, is that it forewarns of changes in the CPI and, therefore, the cost of living of ordinary households (Sahu, 2018).
3. Stock Market Indexes (S&P 500 Index, NASDAQ Index etc.)

## Using Index Numbers to Deflate a Time Series

One of the common use areas of the index numbers is when the managers need to more comparable values to measure the values from different times they consider constructing this method.

**Equation 5: Deflation formula**

Deflation Formula

$$y_{adj_t} = \frac{y_t}{I_t} \cdot (100)$$

Where:

$y_{adj_t}$  = Deflated time series value at time  $t$

$y_t$  = Actual value of the time series at time  $t$

$I_t$  = Index (such as CPI or PPI) at time  $t$

(Groebner, Shannon, Fry, & Smith, 2007)

## Components of a Time Series

Many quantitative forecasting models have one factor in common and that is; using the past measurement of the variable of interest in order to generate a forecast (an estimation) of the future. Also, the past data, measured over time, are called time series data. The managers or basically any decision maker who plans to develop a quantitative forecasting model, they must analyze the relevant time-series data in order to be able to generate reliable forecast (Groebner, Shannon, Fry, & Smith, 2007).

There are 4 kinds of components for time series data and every time series data exhibit at least one or more of these components. These components are:

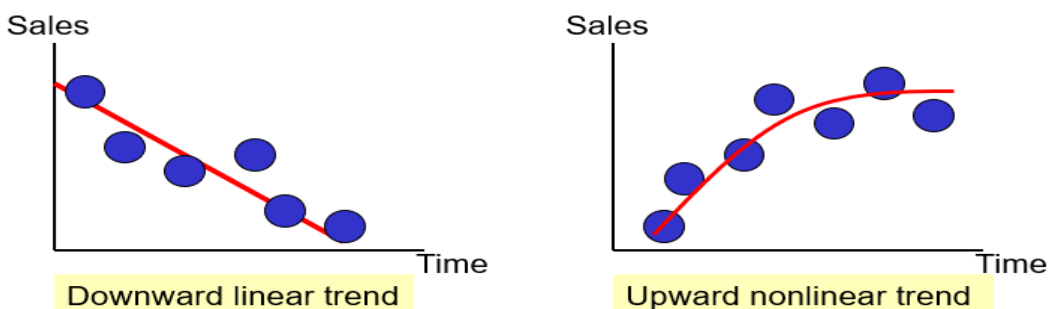
1. Trend Component
2. Seasonal Component
3. Cyclical Component
4. Random Component

### Trend Component

A trend is the long-term movement in a time series without time or irregular effects and is a reflection of the underlying level (Strickland, 2016). The trend can be increasing or decreasing. Also, the trend can be classified into linear or nonlinear. Basically, a linear trend is; a long-term increase or decrease in a time series in which the rate of change is relatively constant, but in a nonlinear trend, the rate of change is not constant (Groebner, Shannon, Fry, & Smith, 2007).

It may consider as the result of influences such as population growth, price inflation and general economic changes (Australian Bureau of Statistics, 2017).

Figure 2: Example of the trend component



(Groebner, Shannon, Fry, & Smith, 2007)

Figure 2, shows basic examples in order to better explanation and understanding of downward linear trend and upward nonlinear trend.

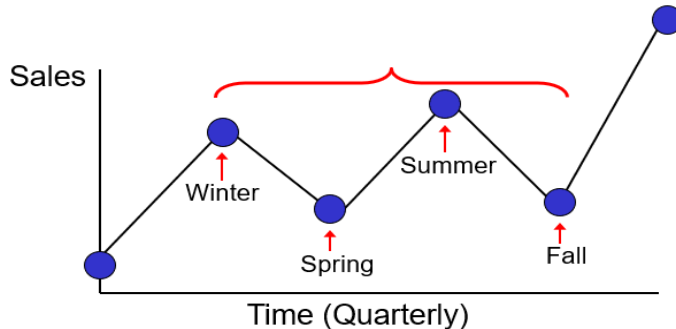


## Seasonal Component

Another component of the time series data calls the seasonal component. Seasonality is the data experiences regular and predictable changes that repeat in regular calendar intervals such as months or fiscal years. In order to observe seasonality in a time series, the data have to be measured weekly, monthly, quarterly or daily. Because annual data is not able to show seasonal patterns of highs and lows. Many time series demonstrate a repeating pattern over time.

In other words, seasonal component is a wave-like pattern that is repeated throughout a time series and has a recurrence period of at maximum one year. But, if the time series data exhibits a repetitious pattern with a recurrence period longer than a year, it means the time series exhibit a cyclical effect - it will be explained in next component (Groebner, Shannon, Fry, & Smith, 2007). For instance, sea clothes sell more in the summer than other seasons or similarly, in habitats with winters may consume far more heating gas and heating oil than other seasons. Another example might be the countries with coastlines can have more tourist population in the summer than other seasons, etc.

Figure 3: Example of the seasonal component



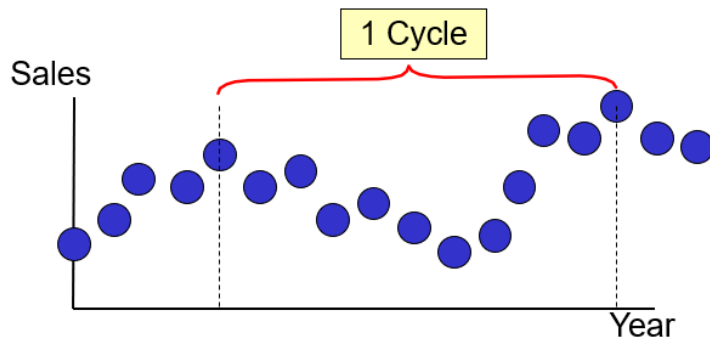
(Groebner, Shannon, Fry, & Smith, 2007)

Figure 3, shows a basic example of the seasonal component. As can be seen from the Figure 3, as a basic example in order to better understanding, the seasonal component has been measured monthly.

## Cyclical Component

It is similar to the seasonal component, but the length of the recurrence period separates this component from the seasonal components. Moreover, the recurrence period of the cyclical component is longer than a year. Usually, the time interval is at least 2 years. The length of the cycle is described as the period (Strickland, 2016).

Figure 4: Example of the cyclical component



(Groebner, Shannon, Fry, & Smith, 2007)

Figure 4, shows an example of the cyclical component.

### Random Component

The random component is unpredictable. It is irregular. It is the residual that remains after the trend, seasonal and cyclical components have been removed.

In other words, changes in time series data that are unpredictable and cannot be associated with a seasonal, cyclical or trend component. Unpredictable, random, 'residuals' fluctuations (Groebner, Shannon, Fry, & Smith, 2007).

### 3.6 Usage of the Analysis of Time Series Data in Management and Economy

In management, managers always try to make the right decisions. They should be able to choose the right option, right decision among many other options. They should be able to see the what can cause of their decision, how it can influence the company, what is the expected reactions due to their decision etc. because of these kinds of questions and more, analysis of TS data has crucial importance in management.

Managers are one of the important group that can influence the company's future. Either they can bring the success to the company or they can lead to the company for bankruptcy. Every manager who wants to be successful in his/her job needs to be able to use and understand the analysis of TS data effectively. Because analysis of time series data tends to lead them to the success.

While without having any idea about future behaviors of the decisions there is no way to be able to choose the right one. There are many ways to do forecasting about future, but analysis of time series data is one the most effective one.

Analysis of time series data can help to managers when they need to make decisions, it might be kind of guidance for managers. Because analysis of TS data uses past data in order to do prediction about future behavior and based on these past data they can have some idea about the future behavior. This prediction, forecasting may show to managers that whether the decision is beneficial for the company or not.

Another important and widely applicable area for analysis of time series data is economy. The economy is totally huge area due to own many indicators. There are many analyses, indicators, tools etc., the analysis of time series data is one these analyses.

In economy, TS analysis has many application areas. Such as to do a comparison between years for country's GDP, revenue, expenditures, unemployment rate, population, and also marketing and sales forecasting, financial market analysis, inventory management, economic forecasting, census analysis etc. It helps to people to see the development of these kinds of indicators.

Another applicable area might be the examining the immigration effects to population or to national revenue. It helps to evaluate is there any positive/negative effects due to immigration.

In economy, it has a widely important role. Because it is one of the simple and effective ways to understand many terms such as economic situations, development of the country, development of indicator, effects of the decisions and agreements etc.

Also, while governments planning budgets and annual plans, they use these kinds of methods. It helps to governments to prepare the appropriate plans for the country. The data may consider as an effective tool for countries. Because it provides information, a prediction about future behaviors, understandable analyses, and indicators. Hence, it has extremely critical importance for governments. Analysis of time series data is using by many countries and governments.

Also, with data visualization techniques it can help to better understanding and be able to show the differences. There are many web pages, software, and tools to help managers. Basically, whole these things make the data easy to understand and analyze the data simple and quickly. Data visualization techniques one of the important assistant for managers while they are dealing with the big data sets.

Without time series data, it won't be possible to understand these kinds of indicators and analyses. Hence the analysis of time series data has quite an important role in economy and management. These areas, not the only ones, there are many different areas that use analysis of time series data.

## **4. Development of Tourism in Turkey**

Tourism is one of the important revenue for any country. Especially when the country has many kinds of resources and high rate of potential on tourism. Countries every year prepare new plans budgets to increase the number of tourists within the country borders. Also, tourism revenues are an important role for any country's GDP. Especially for a peninsula country such as Turkey, it has quite an important role.

In this chapter will be focused on examining and evaluating the development of the tourism in Turkey. This topic has been chosen in order to examine and show the development of tourism within the country's borders in Turkey in last five years (2012-2016), and for this purpose, four tourism centers of Turkey have been selected. These tourism centers are; Istanbul, Izmir, Mugla, and Antalya and these cities are the tourism centers of Turkey. These cities are the many foreign and local tourist's destinations for holidays. Based on these cities this chapter will be focused on the development of the tourism in Turkey between the years 2012 and 2016. Also, these cities will be examined based on foreign tourist numbers over the observed period 2012-2016. All this data, which will be used in this chapter, has been obtained from reliable official statistical and tourism institution's pages.

In order to understand this process, this study will start to examine from by months and then it will continue to examine by years. At the end of this study, results will be helping to see the development of tourism in Turkey.

Also, these results may help to generate forecasting about next years and so that country can be able to have ideas about next year's tourist population. Besides, it may help to prepare new plans and budgets for tourism within the country's borders.

### **4.1 Tourism Potential and Resources of Turkey**

Turkey is one of the most famous tourist destinations due to its great location that centrally located between Asia and Europe. It is connecting Asia and Europe continents and it is a gateway between West and East. Turkey is a peninsular country that surrounded by seas on three sides; the Black Sea on the North, the Mediterranean Sea on the South and the Aegean Sea on the West. Turkey has a coastline of more than 8300 km<sup>2</sup> (Yolal, 2016).

Turkey has different climatic regions due to location. It is ranging from the Black Sea Region to the continental in the Central Anatolia and the subtropical Mediterranean on the south. It is possible to see clearly all four seasons in Turkey.

Turkey is a botanical paradise because it has around ten thousand species of vegetation. In addition, Turkey is on the migration routes of many bird species and there are some areas which the natural habitat for many various species are including rare ones.

Also, Turkey has a historical heritage of successive civilizations from Hittites, Phrygians, Lycians, Lydians, Ionians, Romans, and Byzantines to the Seljuks and Ottomans. In every city of Turkey, it is possible to see many kinds of historical places. There are some cities under the auspices of UNESCO, such as Cumalıkızık village in Bursa. Also, there are many historical artifacts in the museums. Historical assets of these past civilizations and more can be seen anywhere in Turkey from the big and crowded cities to smaller towns and villages (Association of Turkish Travel Agencies, 2017).

Another important and astonishing reason for tourists is that Turkey is where traditions and modern goes hand in hand. A simple example for it might be a multicenter tour, from İstanbul to the capital of Turkey which is Ankara, then smaller towns with traditional architectural buildings and style. All these historical, cultural, natural assets and values altogether compose of a tremendous potential and create the endless diversity of tourist resources of Turkey.

#### **4.2 Tourism Industry in Turkey**

The tourism industry is one of the most important revenue for the country. Also, tourism creates many work opportunities. Every year Turkey planning and implementing many investments in this area. Particularly last two decades Turkey has made significant investments in infrastructure and superstructure. These investments also include transport infrastructure such as development, modernization of terminals and airports as well as the building of new ones. Especially economic development of tourism sector's potential dependent on improvements to transportation infrastructure (Akgüngör, Kuştepe, & Gülcan, 2009).

Turkey has many international and domestic flights. It is possible to travel all major cities and tourism centers by plane. Also, the highways crisscrossing the whole country. There are many bus services and coach tours which are make traveling in Turkey easy, comfortable and enjoyable.

The accommodation industry in Turkey has a quite wide range of facilities from the top quality such as super-modern deluxe category hotels and holiday complexes, boutique hotels to the affordable ones. Most of the high standard hotels as many entertainment facilities.

Another important point is that Turkey has been recognized as a country of international reputation for hosting the most important meetings and conventions of the world. Also, most of those centers have huge capacities and advanced technological systems (Association of Turkish Travel Agencies, 2017).

Basically, Turkey with its huge tourism potential and a great range of its natural resources, historical and cultural values, activities, lifestyle, attractions and its efficient, dynamic tourist industry provides a wide selection of products that can satisfy the demand of travelers.

The year 2012 has seen a new record taking the annual tourist arrivals to 31 million in spite of the situation in the world travel and tourism market. Also, there is consensus supported by many research findings, that the Turkish tourism will continue to grow at a higher rate than European and world average (Association of Turkish Travel Agencies, 2017).

### **4.3 Tourism Centers of Turkey**

Turkey has 4 biggest tourism centers and these are; Istanbul, Antalya, Mugla, and Izmir.

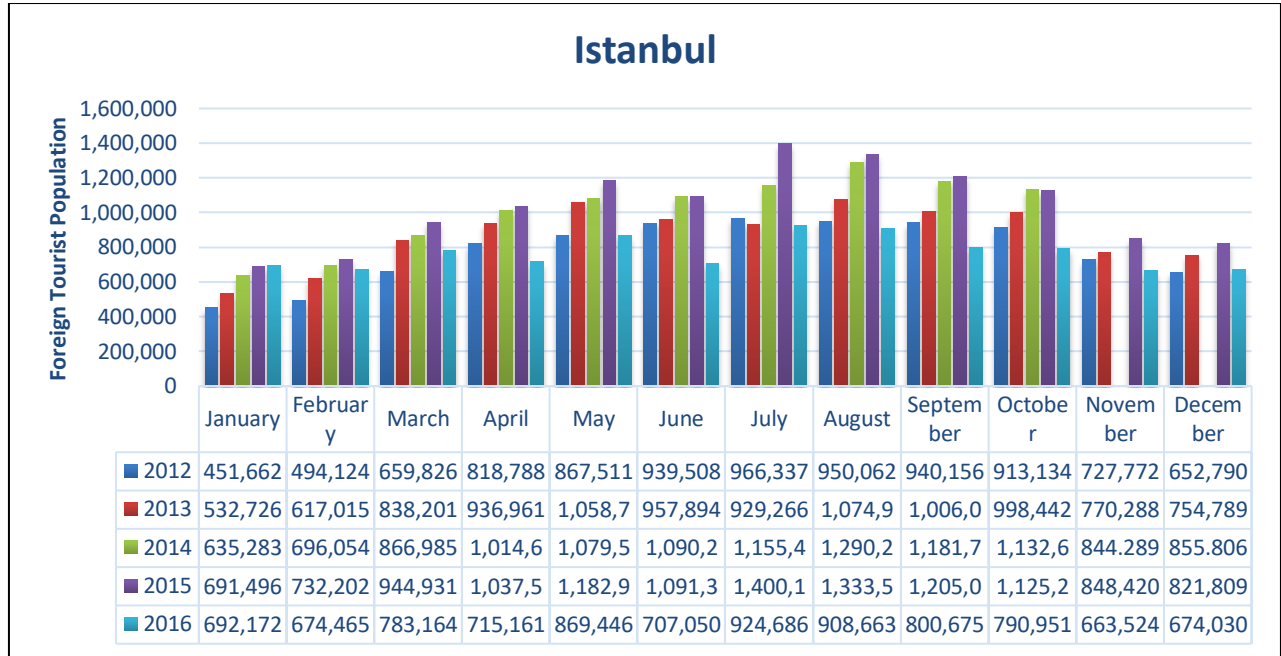
Following figures; Figure 5, Figure 6, Figure 8, Figure 9, Figure 10, Figure 11, Figure 12, Figure 13, Figure 14, Figure 16, and Figure 17 has been prepared with monthly data so that it will help to observe and examine the trend and seasonal components of each year effectively. In another word, it will provide a simple way to examine changes in months at each year.

#### **Istanbul**

Istanbul is one of the most important city in Turkey even may be for the world. It has many resources, historical places, architects and also due to its location it has quite an important role for the country.

Every year many tourists visiting the Istanbul. These tourists are reasonably important for the local shops and country's economy. Moreover, these tourist numbers have a wide slice of the total tourists within the country's borders.

**Figure 5: Foreign tourist population in Istanbul (2012-2016)**

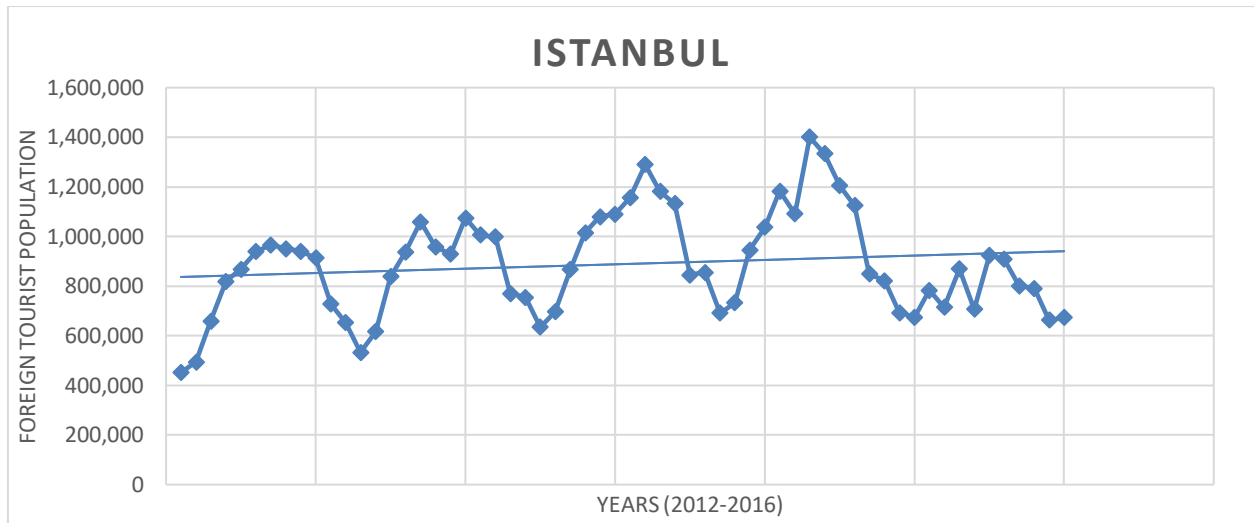


(Istanbul Provincial Directorate of Culture and Tourism, 2017)

Figure 5, shows the number of foreign tourist population in Istanbul between the years 2012 and 2016 by months. Based on Figure 5, a total number of foreign tourist population in Istanbul between these years are; 9.381.670 in 2012, 10.474.867 in 2013, 11.842.983 in 2014, 12.414.677 in 2015 and 9.203.987 in 2016. On January there is not too much tourist population but since March it has started to increase gradually and through the end of the year, it has been decreased. Tourism season usually starts around May and it continues until the end of warm weathers. Hence, the important season for tourism may consider as summer.

Figure 5, shows that every year foreign tourist population in Istanbul has been increasing gradually until 2016. But in 2016 there is a remarkable decrease in foreign tourist population. In 2012, foreign tourist population in Istanbul has been increased around 16% more than previous year's numbers.

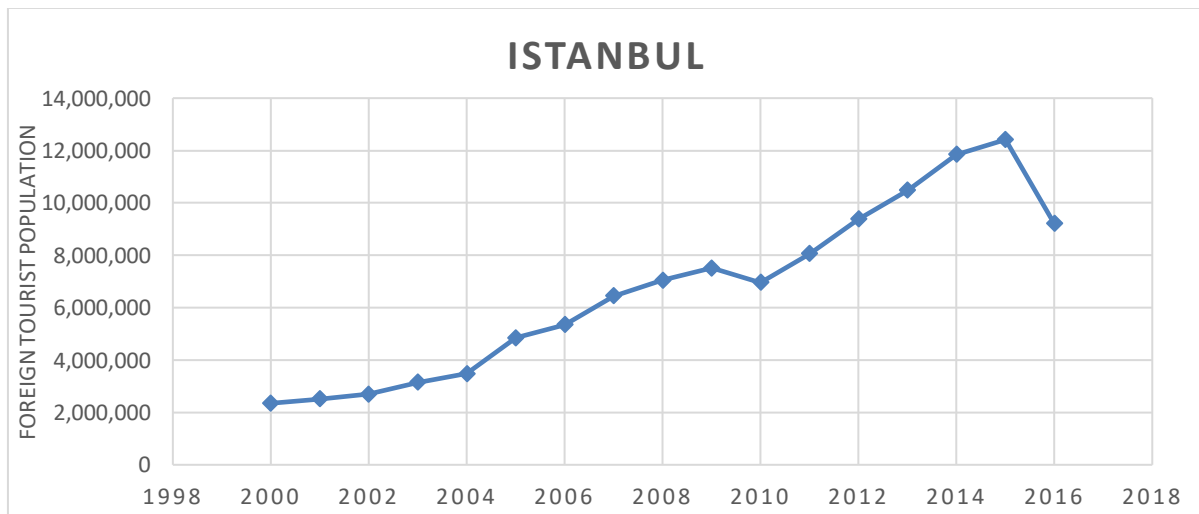
**Figure 6: Scatter diagram of the foreign tourist population in Istanbul (2012-2016)**



(Istanbul Provincial Directorate of Culture and Tourism, 2017)

Figure 6, shows the monthly changes about foreign tourist population in Istanbul by years. It helps to see changes month by month. Also, it indicates seasonal and trend components. Based on scatter diagram there are seasonal peaks (seasonal components). Figure 6, helps to see these seasonal peaks clearly. In order to be able to see these seasonal components, the data has been measured monthly. Based on Figure 6, between the years 2012 and 2016 seasonal components are fluctuating irregularly. Also, in Figure 6, there is a linear line on the diagram that helps to see a linear trend (linear component).

**Figure 7: Foreign tourist population in Istanbul (2000-2016)**



(Istanbul Provincial Directorate of Culture and Tourism, 2017)



Figure 7 shows that foreign tourist population in Istanbul has been increasing gradually. There is just a small drop in 2010 and then in 2011 there is bounce back to increase. One of the main causes of the decline in 2010 is the political problems with Israel.

In 2013, the number of foreign tourist in Istanbul has increased by 12%. Moreover, due to this increase, Istanbul tourism reached a record level in its history, exceeding the 10 million for the first time. This was a quite important succeed for Istanbul tourism. Also, it is obvious from Figure 7 that it has been happening a value consistently above the previous year's value (Istanbul Provincial Directorate of Culture and Tourism, 2017).

In 2014, the number of foreign tourist in Istanbul has been increased by 13%. The highest monthly increase of the year was in July, by 24.3% and the lowest increase was in May, by 2%. In any month of the year 2014, it has not fallen below last year's values. For the first time, this year there have been over a million-foreign tourist for seven months (Istanbul Provincial Directorate of Culture and Tourism, 2017).

In 2015, the number of foreign tourist population in Istanbul has been increased by 5%. The highest monthly increase of the year was in July, by 21.2% and the lowest decline was in December, by 4%. But despite the decline in December, this year there have been over a million-foreign tourist for seven months again (Istanbul Provincial Directorate of Culture and Tourism, 2017).

In 2016, the number of foreign tourist population in Istanbul has been decreased by 26%. The only month that has a higher value than previous year's month was January by 0.1%. For all other months, a decline compared to the previous year's values.

Based on the data in Figure 7, the decline in 2016 was the second decline that the number of foreign tourist population decreased compared to the previous years since 2000. The main causes of this decline are political problems with Russia and bomb attacks in some big cities within the country's borders.

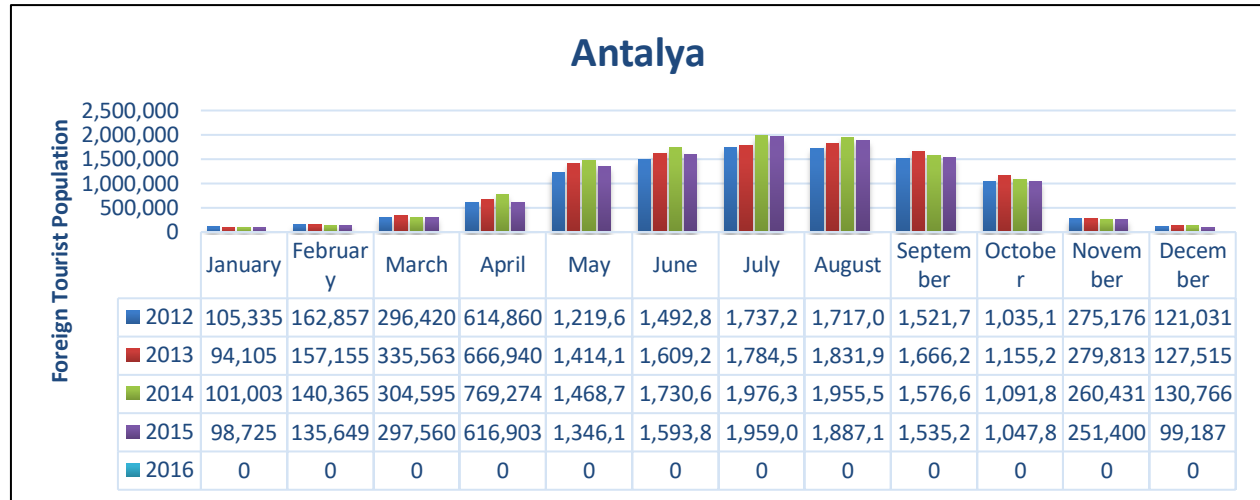
## **Antalya**

Antalya is one of the most important tourism centers in Turkey. Every year foreign and local thousands of foreign and local tourists are going to Antalya. Based on the official tourism records Antalya is the most tourist-attracting city in the Turkey (T.R. Prime Ministry Public Diplomacy Coordinator, 2013).

Antalya has many kinds of opportunity for tourists. Especially the Mediterranean Sea and natural beauty of the city are quite important factors while the visitors choosing the Antalya as a holiday

destination. Also, in the area, there are many local shops that tourists can buy local and traditional figures and souvenirs.

**Figure 8: Foreign tourist population in Antalya (2012-2016)**



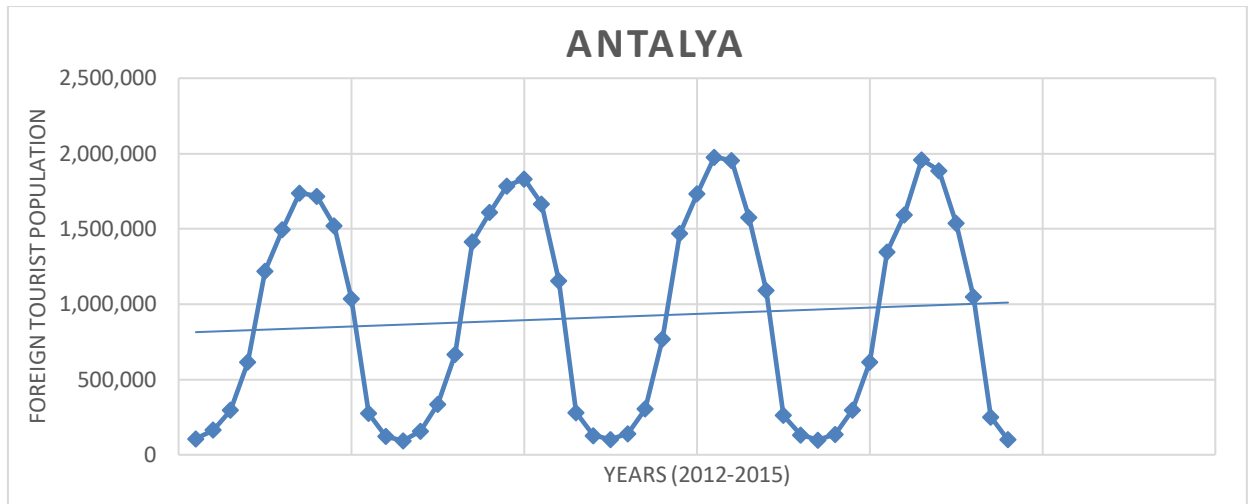
(Antalya Provincial Directorate of Culture and Tourism, 2017)

Figure 8, shows the number of foreign tourist population in Antalya between the years 2012 and 2016 by months. Based on Figure 8, a total number of foreign tourist population in Antalya between these years are; 10.299.366 in 2012, 11.122.510 in 2013, 11.506.350 in 2014, 10.868.688 in 2015 and 5.871.443 in 2016 (Turizm Data Bank, 2017).

Although there are not many foreign tourist populations at the beginning of the year, there is a significant difference in foreign tourist volume every year after the first quarter of the year. The main reason for this situation is the opening time of the sea season in Antalya.

Based on the results from Figure 8, there are increases between the years 2012 – 2013 and 2013 – 2014, after the year 2014 there is a small drop of foreign tourist population in 2015, and in 2016 there is a decline over 40%. The greatest reason for this decline is the political problems between Russia and Turkey that have been started with shoot down of the Russian jet by Turkish pilot. After this situation, many foreign tourists have been canceled their reservation in Antalya. Also, there are some extra reasons that have been caused to this decline such as civil war in Syria and immigration from Syria to Turkey.

**Figure 9: Scatter diagram of the foreign tourist population in Antalya (2012-2015)**



(Antalya Provincial Directorate of Culture and Tourism, 2017)

Figure 9 shows the scatter diagram of the foreign tourist population in Antalya, but because of the missing data from 2016, Figure 9 is not able to show the year 2016, hence it includes between the years 2012 and 2015. Figure 9 indicates a perfect example of seasonal components.

Also, because of that decline in 2016, official numbers of the monthly foreign tourist population have been removed from the official government statistical web pages by the Turkish government. In Figure 8, in the year 2016, '0' represents that data is missing.

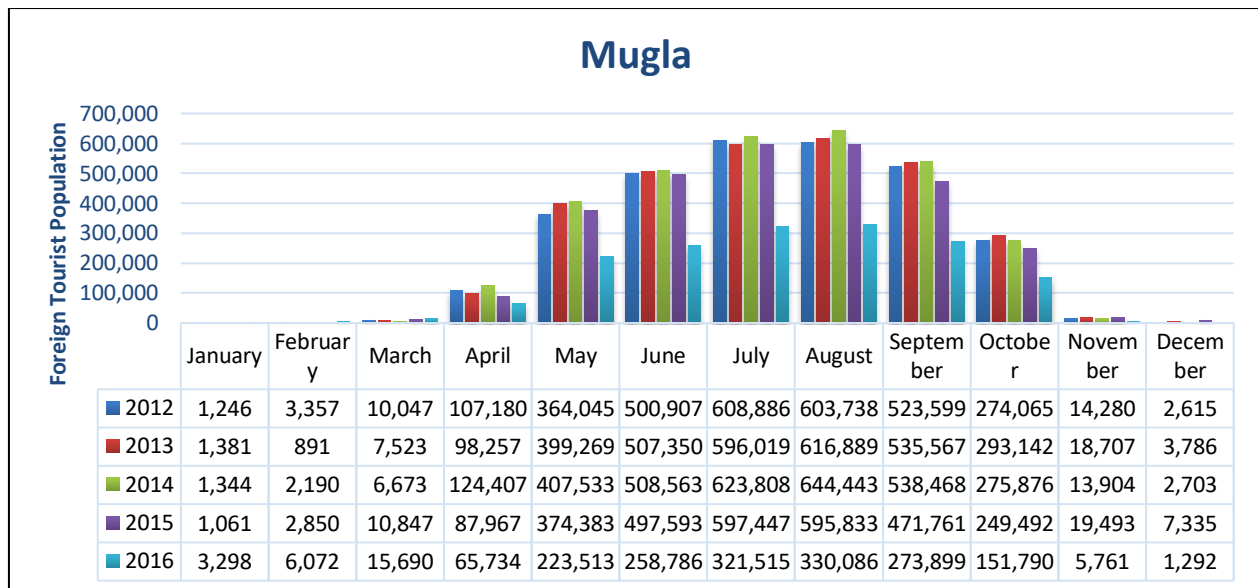
### **Mugla**

Mugla is one of the biggest tourism centers in Turkey. Mugla offers to tourist many different attractive opportunities. Such as amazing historical places, natural beauty, sea and sea sports, and paragliding. One of the most important historical places is Letoon Ancient City, and also this place has been chosen to world heritage list by UNESCO. In addition, there are many places in Temporary World Heritage list prepared by UNESCO.

Also, in this area, there are numerous kinds of local shops especially for tourists and these shops offer many kinds of amazing memories and beauties from Mugla.

Tourism is one of the important income channels for local people in the Mugla. Many locals directly or indirectly dealing with tourism.

**Figure 10: Foreign tourist population in Mugla (2012-2016)**



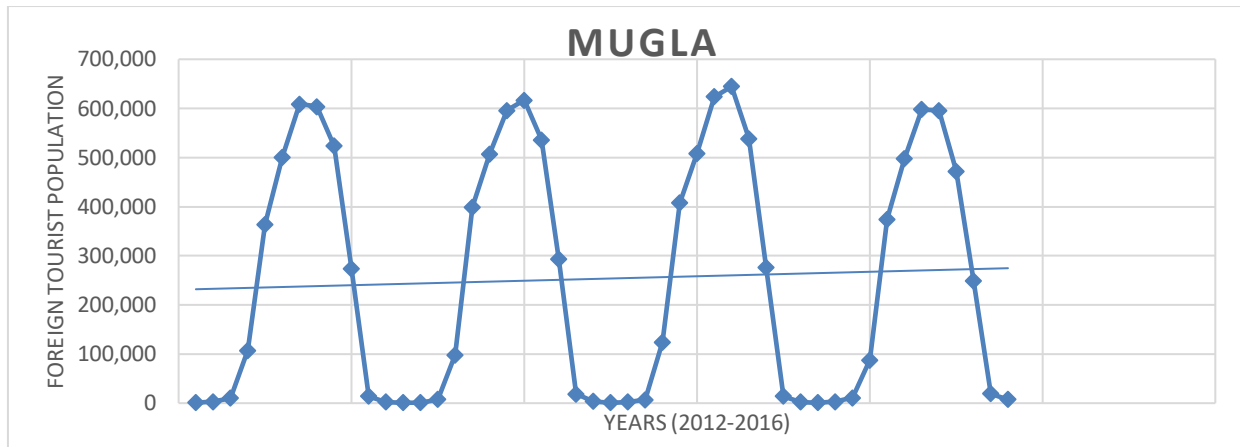
(Muğla Provincial Directorate of Culture and Tourism, 2017)

Figure 10 shows the number of foreign tourist population in Mugla between the years 2012 and 2016 by months. Based on Figure 10, a total number of foreign tourist population in Mugla between these years are; 3.013.945 in 2012, 3.078.781 in 2013, 3.149.912 in 2014, 2.916.062 in 2015 and 1.657.436 in 2016.

According to the results of Figure 10, there is not too much foreign tourist population at the beginning of the year. Moreover, first three months of the years the population of foreign tourist numbers around thousand. But since the April the number of foreign tourist population starting to increase and on May it continues to increase gradually until the August and then it starts to decrease again.

It is obvious from the Figure 10 that the foreign tourist population has been increasing between the years 2012 and 2013, 2013 and 2014. The year 2014 Mugla tourism reached a record level in its history. The biggest slice of this year belongs to United Kingdom citizens (Milliyet, 2015). But since the year 2015, there is a decline between the years 2014 and 2015, 2015 and 2016. Particularly there is a significant decline that around the 40% between the years 2015 and 2016. The greatest reasons for this decline are political problems with Russia and immigrants from Syria to Turkey.

**Figure 11: Scatter diagram of the foreign tourist population in Mugla (2012-2016)**



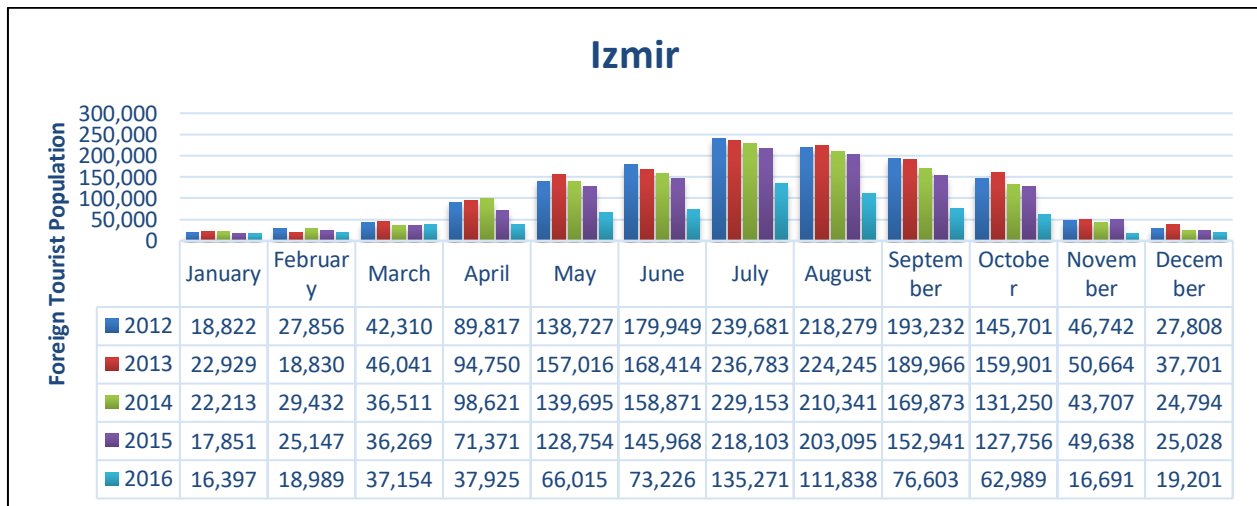
(Muğla Provincial Directorate of Culture and Tourism, 2017)

Figure 11 shows the scatter diagram of the foreign tourist population in Mugla. Seasonal components can be seen in the figure clearly. Based on Figure 11 it is possible to conclude that these seasonal peaks reach peaks at during summer seasons and then during the winter seasons foreign tourist population close to the bottom.

### Izmir

Izmir is one of another tourism centers in Turkey. Also, Izmir is the one of the well-developed city of Turkey. In many kinds of areas, Izmir has quite an important role in the development of the country’s economy and tourism is one of these roles.

**Figure 12: Foreign tourist population in Izmir (2012-2016)**



(Izmir Provincial Directorate of Culture and Tourism, 2017)

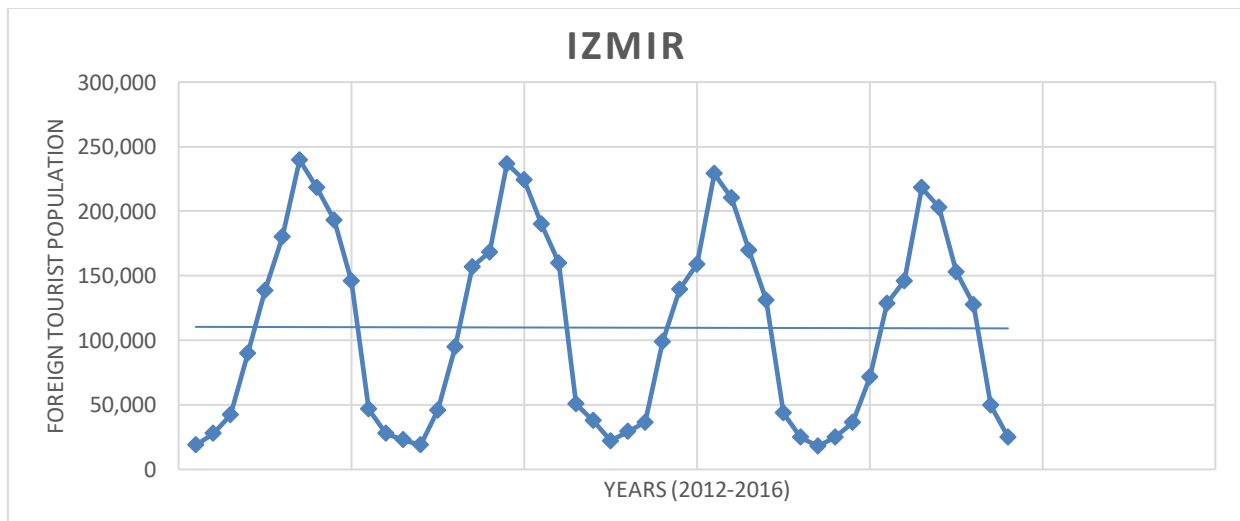
Figure 12 shows the number of foreign tourist population in Izmir between the years 2012 and 2016 by months. Based on Figure 12, a total number of foreign tourist population in Izmir between these years are; 1.368.924 in 2012, 1.407.240 in 2013, 1.294.461 in 2014, 1.201.921 in 2015 and 672.299 in 2016.

In 2012, there is less value in the first five months of the year compared to the previous year's values. Since the sixth month, there is an increase compared to the previous year's values until the eleventh month. But, at the end of the year, there is just a small decrease around 1.39% compared to the previous year.

In 2013, there are only four months that has less value than previous year's values. Despite the declines in these four months, at the end of the year, there is a higher value for the total foreign tourist population in Izmir around 2.80% than previous year's value.

Between the years 2013 and 2014, 2014 and 2015, 2015 and 2016 there is a decrease of the foreign tourist population in Izmir. Particularly there is a significant difference around -44% between the years 2015 and 2016. There is only a rise around %2 in March, rest of the months of the year there is just decrease. Reasons for this great decline in the Izmir tourism are political relations with Russia, terrorist attacks in some well-developed cities and etc.

**Figure 13: Scatter diagram of the foreign tourist population in Izmir (2012-2016)**



(Izmir Provincial Directorate of Culture and Tourism, 2017)

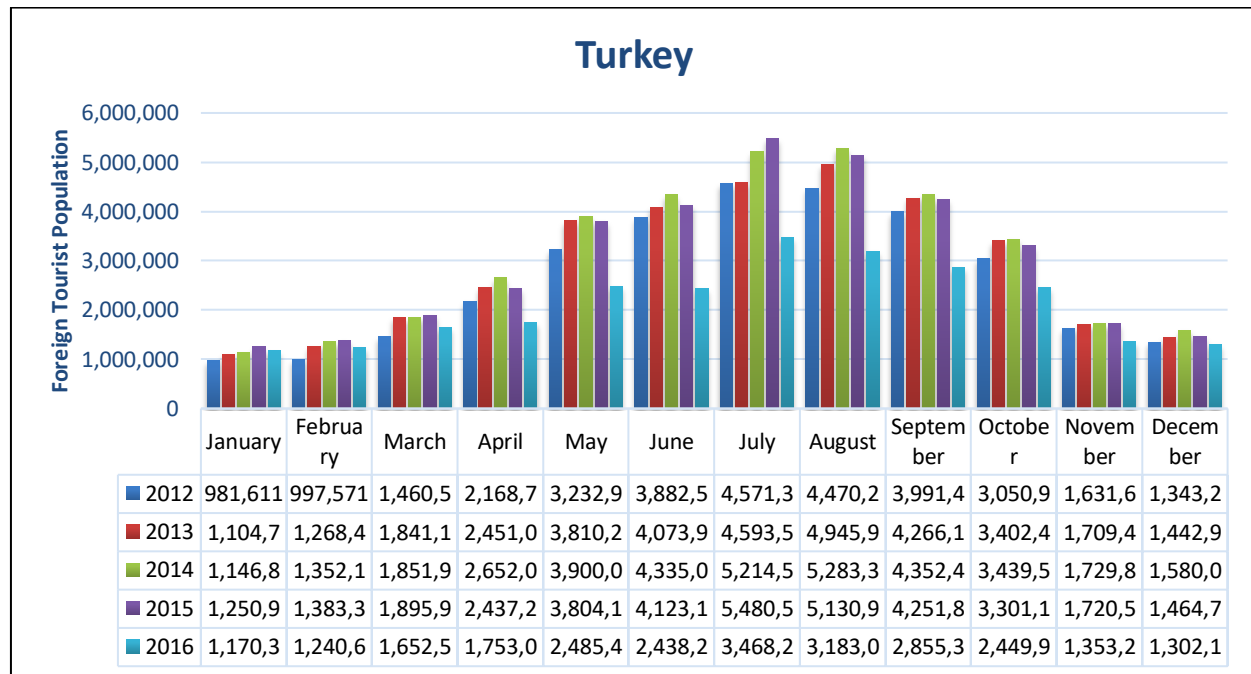
Figure 13 has been prepared in order to show scatter diagram of the foreign tourist population in Izmir. Again, here seasonal components can be seen clearly. In Figure 13, each year's seasonal

components reach the peaks in July. But these peaks are getting decreasing year by year as can be seen from the Figure 13 (Izmir Provincial Directorate of Culture and Tourism, 2017).

## Turkey

Based on all these results and reliable data from official statistical pages, Figure 14 has been prepared in order to see and understand the development of tourism across the country between the years 2012 and 2016.

Figure 14: Foreign tourist population in Turkey (2012-2016)



(Association of Turkish Travel Agencies, 2017)

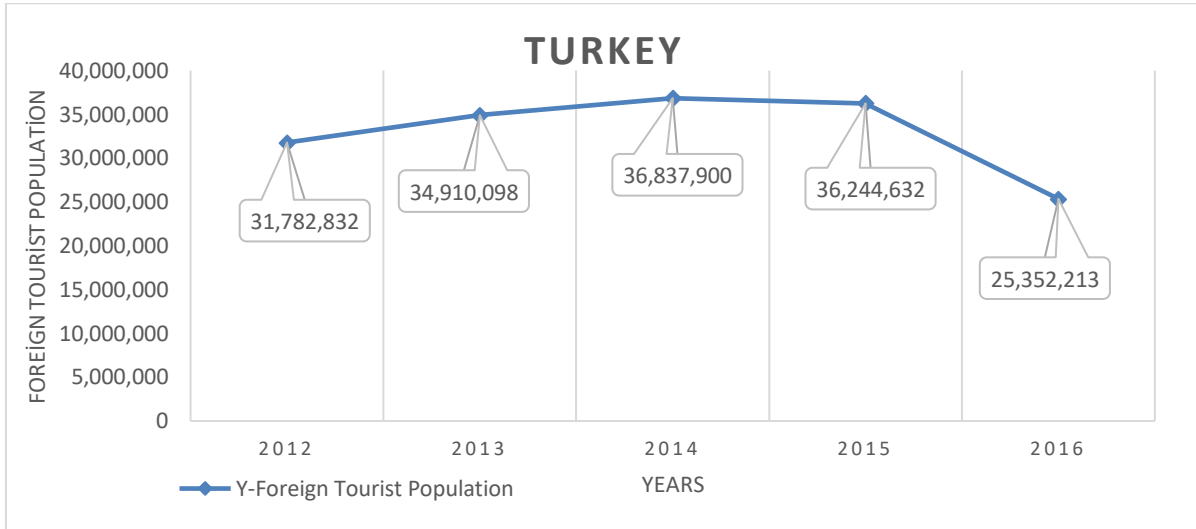
Figure 14, shows the foreign tourist population in the country's borders between the years 2012 and 2016 by monthly. Based on the records from Figure 14, the total foreign tourist population between these years are; 31.782.832 in 2012, 34.910.098 in 2013, 36.837.900 in 2014, 36.244.632 in 2015 and 25.352.213 in 2016.

In 2013, foreign tourist population increased around 9.8% compared to the previous year's values. This incline has been continuing in 2014 by 5.5%. But in 2015, there is just a small drop around 1.61%. Later, in the year 2016, there is a significant difference compared to the previous year's values around -30%.

One of the main reason for the decline in 2016 is the political problems with Russia, that is starting with the shoot down of the Russian jet. The largest declines among the top 15 countries that are

sending the tourist to Turkey, Russia is the first one with -76.26% and Iraq is the second one with -61.54% and the third one is the U.S.A. with -42.48% (Association of Turkish Travel Agencies, 2017).

**Figure 15: Line plot of the foreign tourist population in Turkey (2012-2016)**

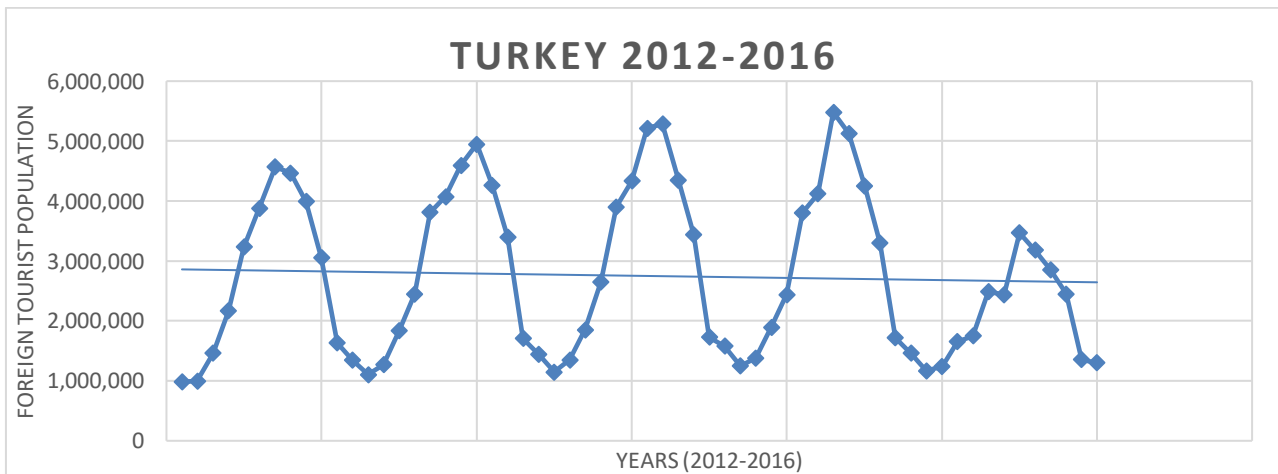


(Association of Turkish Travel Agencies, 2017)

Figure 15, has been prepared from a different perspective in order to show the movement of foreign tourist numbers between the years 2012 and 2016.

As seen in Figure 15, first 3 years the number of the foreign tourist population has been increasing and then the fourth year there is just a small drop, but there is a substantial decline in the last year around 30%.

**Figure 16: Scatter diagram of the foreign tourist population in Turkey (2012-2016)**



(Association of Turkish Travel Agencies, 2017)



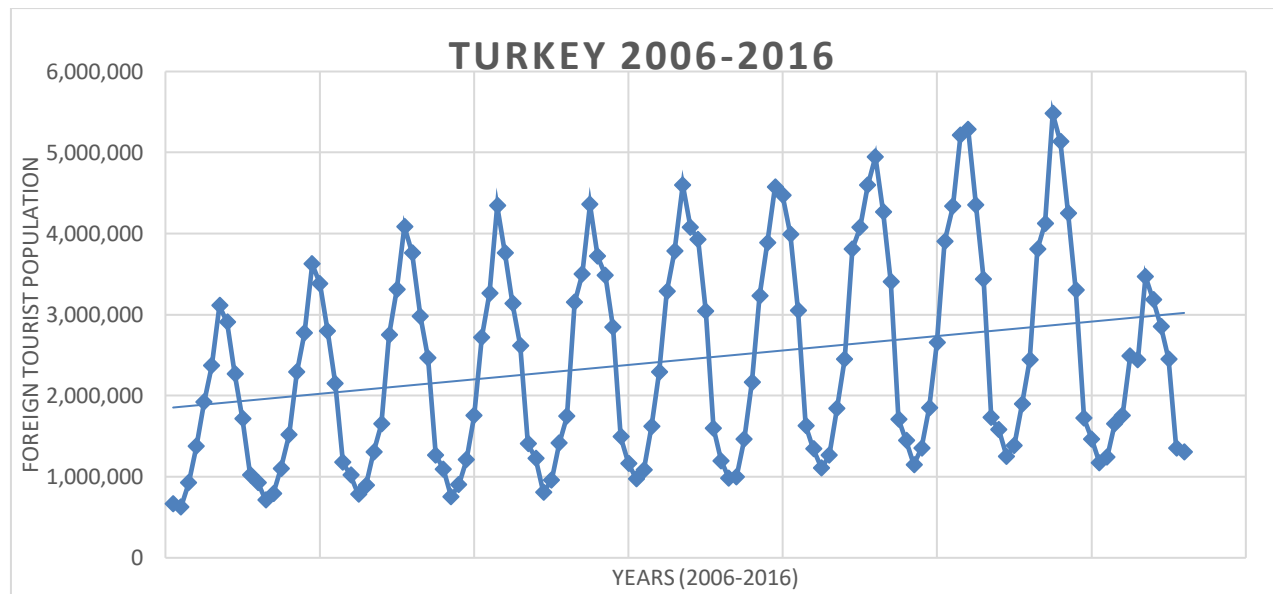
Figure 16, has been prepared in order to indicate seasonal and trend components. Based on scatter diagram there are seasonal peaks (seasonal components). Figure 16, helps to see these seasonal peaks clearly. In order to be able to see these seasonal components, the data has been measured monthly.

Also, in Figure 16, there is a linear line on the diagram that helps to see a linear trend (linear component). As mentioned before, a 'trend' is the long-term increase or decrease in a variable being measured over time.

Figure 16 shows that; the seasonal peaks are increasing progressively until the year 2016. As mentioned before there is a decline in the last year. There are several reasons for this decline. But the greatest one is the political problems with Russia. This is the cause of the spectacular effects on the foreign tourism population in the year 2016.

Also, in order to see the development of the tourism in longer-term Figure 17 has been prepared.

**Figure 17: Scatter diagram of the foreign tourist population in Turkey by months (2006-2016)**



(Association of Turkish Travel Agencies, 2017)

Based on Figure 17, it is possible to conclude that there is a progressively increasing incline in the seasonal component and trend component until the year 2016. In addition, the trend line increasing regularly as well until the year 2016. Also, this analysis may use to generate forecasting about future behavior.

Tourism is one of the important sectors in Turkey that is developing year by year. This development process can be clearly seen in Figure 17.

#### 4.4 Analysis of the Tourism Development Process in Turkey

In order to examine the development of the tourism in Turkey, another important analysis is the index numbers. Figure 18 has been prepared for this purpose.

Figure 18: Index numbers (2012-2016)

Years	Foreign Tourist Population	Index
2012	31.782.832	100
2013	34.910.098	109,84
2014	36.837.900	113,9
2015	36.244.632	114,03
2016	25.352.213	79,76

(Association of Turkish Travel Agencies, 2017)

Basically, index numbers measure how a time series change over time. To be able to do the calculation for index numbers it has to be chosen the index base period. Necessary information about calculations (such as formula) has been given before. In Figure 18, this base period has been chosen as 2012. Referring the index numbers in Figure 18, it is possible to conclude that;

- Foreign tourist population in 2013 is 9.84% above population in the base year 2012.
- Foreign tourist population in 2014 is 13.9% above population in the base year 2012.
- Foreign tourist population in 2015 is 14.03% above population in the base year 2012.
- Foreign tourist population in 2016 is 20.24% below population in the base year 2012.

Also, it is possible to use index numbers to compare values between any time periods. For instance, in order to find the foreign tourist population growth rate over the past two years the following calculation has been prepared;

The foreign population growth rate (Groebner, Shannon, Fry, & Smith, 2007), over the past two years (2015-2016):

$$\frac{79,76 - 114,03}{114,03} \cdot 100 = -30,053$$

Which means, the foreign tourist population growth rate over the past two years (2015-2016) has been -30.05% lower.

According to the results of this analysis foreign tourist population has been increasing in 2013, 2014 and 2015. Despite the positive development over the years, in the year 2016 also experienced

a notable decline. This decline is the only significant fall that has been experienced over the last 10 years and it affected in various ways to many local shops and especially some people who are living around the tourism centers and dealing with tourism.

Another important analysis which helps to examine the development of tourism in Turkey is seasonal index. Seasonal index, a number used to quantify the effect of seasonality in time series data (Groebner, Shannon, Fry, & Smith, 2007).

There are several steps to calculating the seasonal index, these steps are listed below:

Figure 19 has been prepared to show the steps for computing the seasonal index. It starts with calculating the moving average. A moving average is the successive average of n consecutive values of a time series. This moving average is associated with the middle time period of the data values in the moving average. Later, the second moving average found by dropping the value from period 1 and adding the value from period 5 and etc. (Groebner, Shannon, Fry, & Smith, 2007).

**Figure 19: Seasonal index for tourist population in Turkey (2012-2016)**

Year	Quarter	Foreign Tourist Population	4 Period Moving Average	Centered Moving Average	Ratio-to-Moving-Average
2012	1	3.439.745			
	2	9.284.233	7.945.708		
	3	13.033.006	8.139.359	8.042.533	1,621
	4	6.025.848	8.402.094	8.270.726	0,729
2013	1	4.214.348	8.595.253	8.498.673	0,496
	2	10.335.173	8.727.525	8.661.389	1,193
	3	13.805.643	8.761.682	8.744.603	1,579
	4	6.554.934	8.899.700	8.830.691	0,742
2014	1	4.350.979	9.160.859	9.030.279	0,482
	2	10.887.242	9.209.475	9.185.167	1,185
	3	14.850.281	9.254.286	9.231.881	1,609
	4	6.749.398	9.123.608	9.188.947	0,735
2015	1	4.530.224	9.126.873	9.125.241	0,496
	2	10.364.530	9.061.158	9.094.015	1,140
	3	14.863.339	8.944.471	9.002.815	1,651
	4	6.486.539	8.022.526	8.483.499	0,765
2016	1	4.063.477	6.683.342	7.352.934	0,553
	2	6.676.749	6.338.053	6.510.698	1,026
	3	9.506.602			
	4	5.105.385			

(Association of Turkish Travel Agencies, 2017)

The following step is calculating the centered moving averages. The way for computing this step is averaging each successive pair of moving average (Groebner, Shannon, Fry, & Smith, 2007). This step is necessary so that the resulting moving average will be associated with one of the data set's original time periods.

Next step is finding the ratio-moving-average by dividing the foreign tourist population for each quarter by the corresponding centered moving average. The final step is calculating the mean ratio-to-moving-average value for each season (Groebner, Shannon, Fry, & Smith, 2007). This step is presenting in Figure 20.

**Figure 20: Quarters of the seasonal index of Turkey (2012-2016)**

	1. Quarter	2. Quarter	3. Quarter	4. Quarter
	0,496	1,193	1,621	0,729
	0,482	1,185	1,579	0,742
	0,496	1,14	1,609	0,735
	0,553	1,026	1,651	0,765
<b>Total</b>	<b>2,027</b>	<b>4,544</b>	<b>6,46</b>	<b>2,971</b>
<b>Average</b>	<b>0,507</b>	<b>1,136</b>	<b>1,615</b>	<b>0,743</b>

Seasonal Indexes	
1. Quarter	0,507
2. Quarter	1,136
3. Quarter	1,615
4. Quarter	0,743

(Association of Turkish Travel Agencies, 2017)

Based on these index values presented in Figure 20, it is possible to conclude that:

- The seasonal index for the 1. quarter is 0,507. This indicates that foreign tourist population in Turkey during the 1. quarter is only 50.7% of the average for the year.
- The seasonal index for the 2. quarter is 1,136. This indicates that foreign tourist population in Turkey during the 2. quarter is 13.6% above the average for the year.
- The seasonal index for the 3. quarter is 1,615. This indicates that foreign tourist population in Turkey during the 3. quarter is 61.5% above the average for the year.
- The seasonal index for the 4. quarter is 0,743. This indicates that foreign tourist population in Turkey during the 4. quarter is 74.3% of the average for the year.

In order to examine the development process within longer-term same analysis has been done for the longer time period (2006-2016). Figure 21 indicates the results of this analysis.

Figure 21: Quarters of the seasonal index of Turkey (2006-2016)

1. Quarter	2. Quarter	3. Quarter	4. Quarter	
0,544	1,301	1,531	0,657	
0,532	1,328	1,539	0,663	
0,489	1,299	1,507	0,672	
0,504	1,315	1,515	0,696	
0,536	1,333	1,478	0,687	
0,492	1,314	1,471	0,684	
0,552	1,326	1,499	0,675	
0,538	1,322	1,456	0,685	
0,555	1,274	1,482	0,677	
0,59	1,105	1,514	0,698	
<b>Total</b>	<b>5,332</b>	<b>12,917</b>	<b>14,992</b>	<b>6,794</b>
<b>Average</b>	<b>0,533</b>	<b>1,292</b>	<b>1,499</b>	<b>0,679</b>

Seasonal Indexes	
1. Quarter	0,503
2. Quarter	1,292
3. Quarter	1,499
4. Quarter	0,679

(Association of Turkish Travel Agencies, 2017)

Based on these index values presented in Figure 21, it is possible to conclude that:

- The seasonal index for the 1. quarter is 0,533. This indicates that foreign tourist population in Turkey during the 1. quarter is only 53.3% of the average for the year.
- The seasonal index for the 2. quarter is 1,292. This indicates that foreign tourist population in Turkey during the 2. quarter is 29.2% above the average for the year.
- The seasonal index for the 3. quarter is 1,499. This indicates that foreign tourist population in Turkey during the 3. quarter is 49.9% above the average for the year.
- The seasonal index for the 4. quarter is 0,679. This indicates that foreign tourist population in Turkey during the 4. quarter is 67.9% of the average for the year.

## **5. Development of GDP and Its Comparison between Turkey and the Czech Republic**

### **5.1 GDP**

First of all, in order to better explanation and understanding, it is better to mention briefly what is GDP? What the GDP can show or what it can imply? etc. For these kinds of questions and more, there will be briefly mentioned about basic definition and principles of the GDP.

GDP is the abbreviation of the gross domestic product. GDP is the one of the best indicator/way to gauge the health of a country's economy. GDP is the monetary value of all finished goods and services that produced within a country's borders in a specific time period. Also, it is not important whether they are citizens or foreign-owned companies, because it is enough that they are located within the country's boundaries, the government counts their production as GDP. In order to be able to do a more accurate comparison with other countries, usually this monetary value calculated in whether euro or dollar. GDP is mostly calculated on annual basis, and also it can be calculated on quarterly basis. There is another term that is called GNP, it means gross national product. The difference in here, it calculates the value of everything produced by a country's citizens, it is not important whether they are within the country's boundaries or not, they can be anywhere of the world.

In another word, GDP is a wide measurement of a nation's overall economic activity – the godfather of the indicator world (Investopedia, LLC., 2018). Basically, GDP is an economy's all (Callen, 2017).

### **The Importance of GDP**

GDP mostly used as an indicator of the economic health of a country, and also a measurement of a country's standard of living. Since the mode of measuring GDP is uniform from country to country, it makes the GDP a perfect way to compare the productivity of various countries with a high degree of accuracy. Adjusting for inflation from year to year allows for the accurate comparison between current GDP measurements and measurements from previous years or quarters. So that a nation's GDP from any period can be measured as a percentage relative to previous periods. An important indicator that indicates whether an economy is expanding or contracting, also GDP can be tracked over long periods of time and used in measuring a nation's

economic growth or decline, as well as in determining whether an economy is in recession (Investopedia, LLC., 2018).

Another reason for GDP's popularity as a widely used economic indicator in part stems from its measuring of value added through economic processes.

### **Types of GDP**

There are many types of GDP that measure economic situation of countries. Here will be briefly mentioned about these types of GDP.

- Nominal GDP: This way is the raw measurement that includes price increases.
- Real GDP: It compares the economic output from one year to another, for this purpose, the effects of inflation have to be account.
- Growth Rate: The GDP growth rate is the percent increase in GDP from quarter to quarter. It helps to see how fast a country's economy is growing. Many countries use real GDP in order to remove the effect of inflation (Amadeo, 2018).
- GDP per Capita: It is the best way to do comparison gross domestic product between the countries. Because some countries have great economic output due to high numbers of the population. In order to get more accurate results, it is quite helpful to use GDP per capita. Basically, this method divides the gross domestic product by the number of residents of the country. Also, it is a good way to measure country's standard of living (Amadeo, 2018).

All these different types of measurements of GDP are great tools for comparing the economies of countries and observe how an economy changes over time.

### **Determining Gross Domestic Product**

There are three ways to determine the GDP. All, when correctly calculated should give the same results. These three approaches are:

#### **Expenditure Approach**

The expenditure approach or with another word the spending approach is one of the most common ones. Basically, it calculates the sum of the final uses of goods and services measured in purchaser's prices. It means those whole market goods which are produced are purchased by someone. Even, if there is a produced but unsold good, the standard accounting convention is that the producer has

bought the good for themselves. Hence, also it is known as a way of measuring production (Wikipedia, 2018).

Formula:  $(Y) = C + I + G + (X - M)$

- Y = GDP
- C = Consumption
- I = Investment
- G = Government spending
- X = Exports
- M = Imports

#### Production Approach

The production approach or value-added consists of summing the gross value added of all industries (resident sectors). For each of the industry, this involves first determining its output and then subtracting the goods and services that were used up in the process of generating that output. The goods and services that used up are referred to as inputs (or intermediate consumption). Basically, the production approach or gross value added is the difference between an industry's output and its inputs (intermediate consumption), (Statistic Canada, 2018). The production approach might be the most direct one. Because it sums the outputs of each class of enterprise to get the total.

#### Income Approach

It also called as gross domestic income. This way measures GDP by adding incomes that firms pay households for factors of production they hire. These are; interest for capital, wages for labor, rent for land and profits for entrepreneurship (Wikipedia, 2018).

Formula:  $GDP = COE + GOS + GMI + T_{P \& M} - S_{P \& M}$

GDP = compensation of employees + gross operating surplus + gross mixed income + taxes less subsidies on production and imports (Wikipedia, 2018).

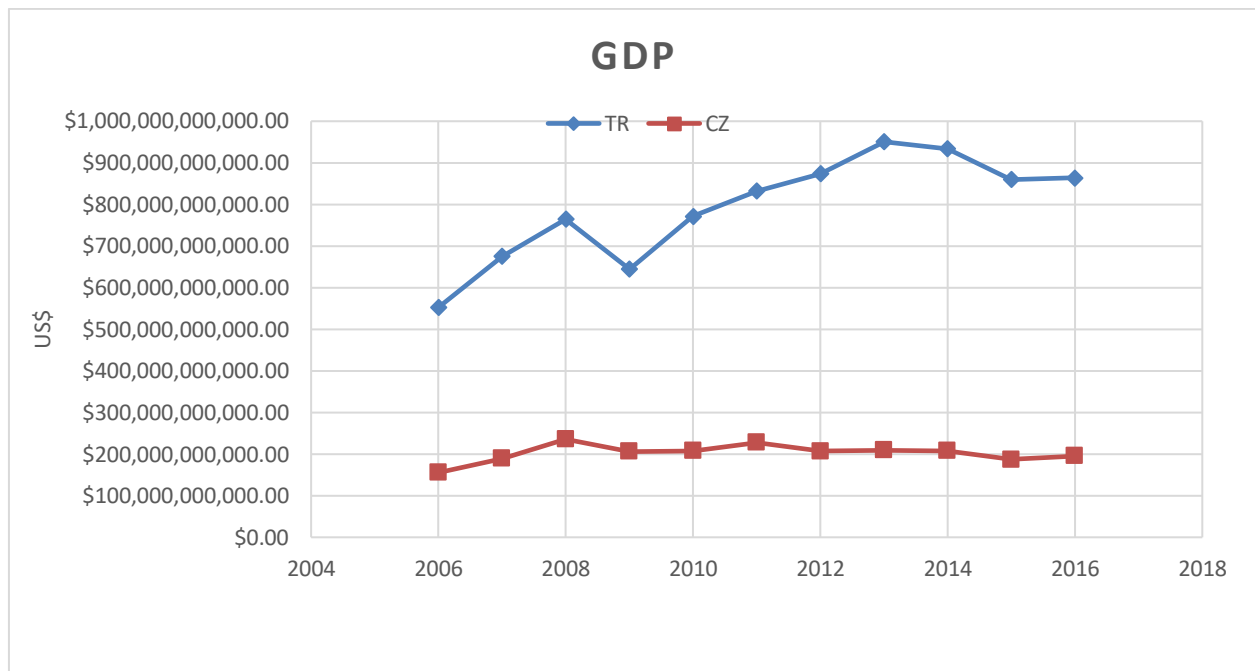
To sum up all these types, basically it is possible to say that; the production approach is the most direct one, it sums the outputs of each class of enterprise to reach the total. The income approach works on the principle that the incomes of the productive factors (producers) have to be equal to the value of their product, and determines the GDP by finding the total of all producers' income. On the other hand, the expenditure approach works on the principle that all of the products have to be bought by somebody, for this reason, the value of the total product must be equal to people's total expenditures in buying things (Wikipedia, 2018).



## 5.2 Analysis of the Development Process of GDP for both Turkey and the Czech Republic

Based on the previous information, here will be examined the development process of GDP both Turkey and the Czech Republic. Because GDP is a simple and effective indicator to examine and observe the country's development. Figure 22 has been prepared in order to indicate the Turkey and Czech Republic GDP values and development process.

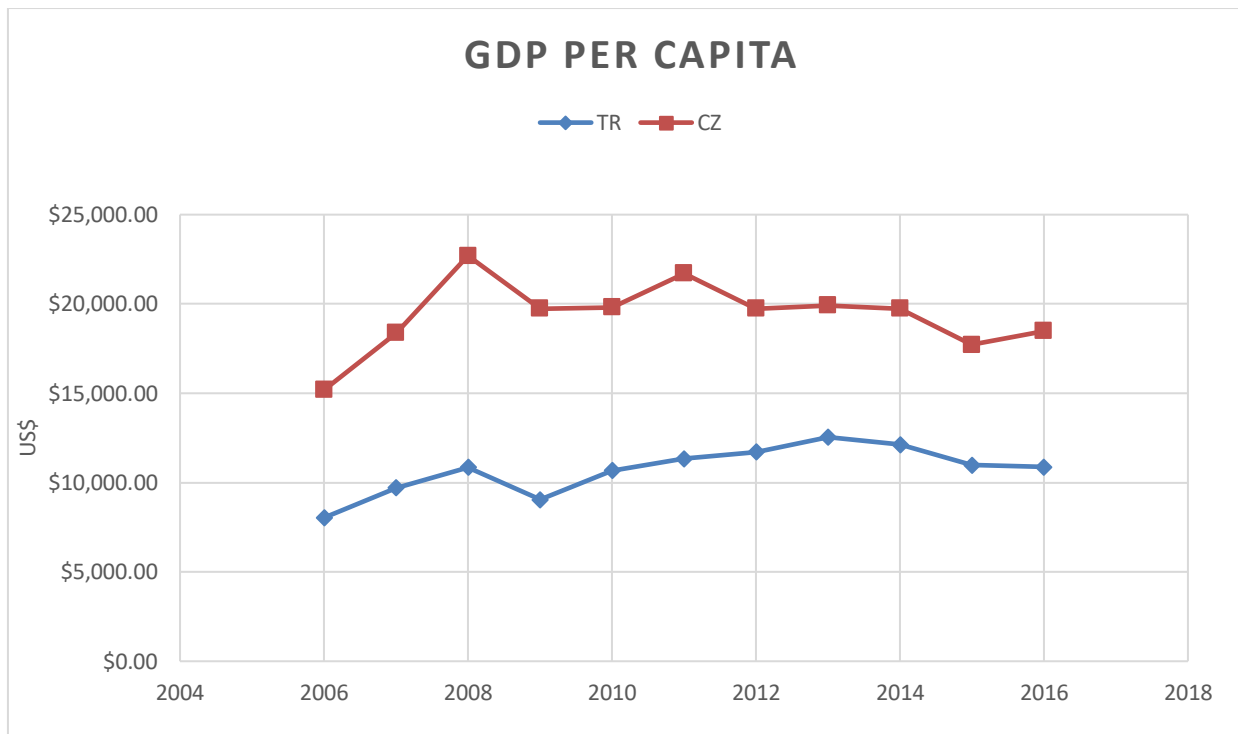
Figure 22: Scatter diagram of the GDP for both Turkey and the Czech Republic, The World Bank (2006-2016)



(The World Bank, 2018)

Figure 22 has been prepared on World Bank using by GDP (current US\$ values). Figure 22 shows the total GDP values for both countries between the years 2006 and 2016. In Figure 22, it seems that there is a huge difference between the two countries. The greatest reason for this difference it is about the population of the two countries. Because there is a very important difference between the population of the two countries. But, in order to get more accurate comparison results, it might be better to compare GDP per capita as well. So that this way provides to see the GDP values per person in the country. This way helps to eliminate the effects of the population values.

Figure 23: Scatter diagram of the GDP per capita for both Turkey and the Czech Republic, The World Bank (2006-2016)



(The World Bank, 2018)

Figure 23 has prepared again from the same resource by using the GDP per capita (current US\$ values). Here, Figure 23 indicates the GDP per capita for both countries Turkey and the Czech Republic between the years 2006 and 2016. There is a remarkable difference between Figure 22 and Figure 23. Figure 23, it may help to give more accurate ideas about both countries economic development process. Because Figure 22 shows the total GDP values of the two countries and it is including the population factors. But in some cases, the population can be a really big factor when comparing the development process of the countries. Figure 23 has been prepared to eliminate the effects of the population factor.

The table number 5, has been prepared to show the data and information which has been used to create Figure 22 and Figure 23. Also, in table 5, it is possible to examine and observe the GDP growth rate and GDP per capita growth rate year by year. Table 5 has been created based on official records.

**Table 5: Turkey and Czech Republic development indicator, The World Bank**

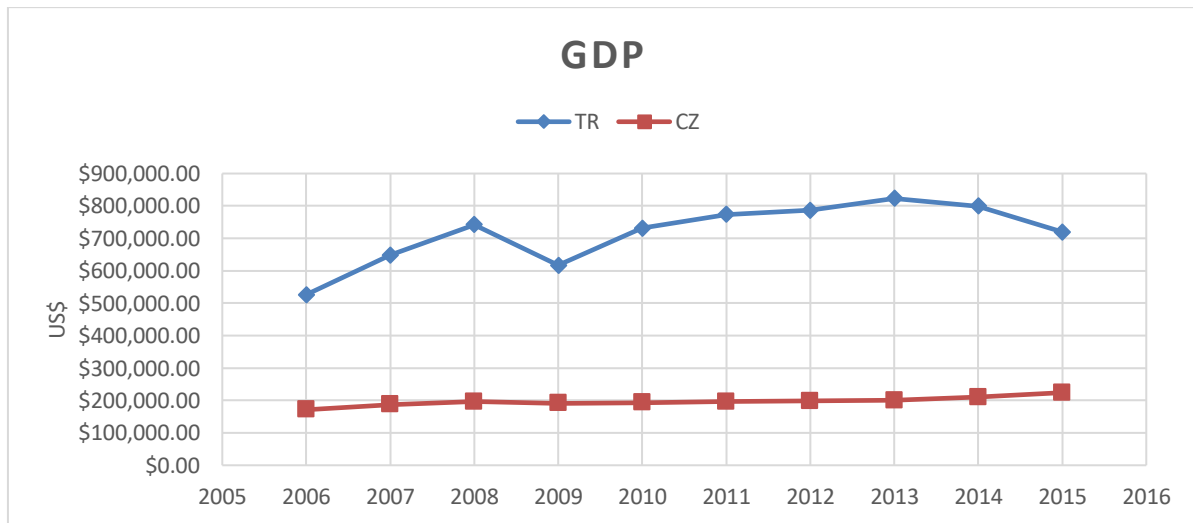
Years	GDP (current US\$)		GDP growth (annual %)		GDP per capita (current US\$)		GDP per capita growth (annual %)	
	TR	CZ	TR	CZ	TR	CZ	TR	CZ
2006	\$552.486.912.845,60	\$155.463.807.112,90	7.1	6.9	\$8.034,60	\$15.183,60	5.8	6.6
2007	\$675.770.112.825,20	\$189.227.050.759,60	5.0	5.6	\$9.709,70	\$18.373,60	3.8	5.0
2008	\$764.335.657.318,50	\$235.718.586.901,10	0.8	2.7	\$10.850,90	\$22.698,90	-0.4	1.8
2009	\$644.639.902.580,60	\$206.179.982.164,40	-4.7	-4.8	\$9.036,30	\$19.741,60	-5.9	-5.3
2010	\$771.876.791.231,80	\$207.477.857.918,90	8.5	2.3	\$10.672,10	\$19.808,10	7.0	2.0
2011	\$832.546.270.783,80	\$227.948.349.666,40	11.1	1.8	\$11.341,10	\$21.717,50	9.5	1.6
2012	\$873.981.786.532,10	\$207.376.427.020,80	4.8	-0.8	\$11.720,30	\$19.729,90	3.2	-0.9
2013	\$950.595.270.314,30	\$209.402.444.996,10	8.5	-0.5	\$12.542,90	\$19.916,00	6.7	-0.5
2014	\$934.167.809.301,70	\$207.818.330.723,80	5.2	2.7	\$12.127,20	\$19.744,60	3.5	2.6
2015	\$859.794.177.118,10	\$186.829.940.545,80	6.1	5.3	\$10.984,80	\$17.715,60	4.4	5.1
2016	\$863.711.710.426,50	\$195.305.084.919,10	3.2	2.6	\$10.862,60	\$18.483,70	1.6	2.4

(The World Bank, 2018)

In Table 5, it is possible to see the exact values and observe the development process of both countries.

Also, the same comparison has been done through using the data from both countries statistical offices.

**Figure 24: Scatter diagram of the GDP for both Turkey and the Czech Republic from official statistical pages (2006-2016)**



(Czech Statistical Office, 2018), (Turkish Statistical Institute , 2016)

Figure 24 may have the same appearance as Figure 22. It may look same but, as the content of the figures may have slightly difference because Figure 22 represents the data from World Bank but, on the other hand, Figure 24 represents the data from both of countries official pages.

Figure 24 has been prepared with the data that has been taken from both countries official statistical pages. Figure 24 shows the years between 2006 and 2015. Because the year 2016 has been missing from the Turkish statistical institute. Hence, Figure 24 has been prepared without the year 2016. Based on Figure 24 and values in Table 6, each year Turkey has significantly higher values than the Czech Republic. But, it is necessary to mention that these differences cause of the population factor, as mentioned before.

**Table 6: Turkey and Czech Republic development indicator, official statistical pages (2006-2015)**

GDP (current 000 000 US\$)		
Years	TR	CZ
2006	\$526.429,39	\$171.272,45
2007	\$648.753,61	\$187.231,45
2008	\$742.094,39	\$196.202,68
2009	\$616.703,32	\$191.633,79
2010	\$731.608,37	\$193.196,68
2011	\$773.979,67	\$196.672,60
2012	\$786.282,52	\$197.947,43
2013	\$823.044,43	\$199.811,21
2014	\$799.369,75	\$210.326,13
2015	\$719.620,44	\$224.075,23

(Czech Statistical Office, 2018), (Turkish Statistical Institute , 2016)

Table 6 has been prepared in order to show the exact values of both countries GDP, for this purpose data are taken from official statistical pages of both countries. Also, Figure 24 has been created by using these values.

Between the years 2006, 2007, 2008 both countries GDP's are increasing effectively. But in the year 2009, there is a decline for both countries, especially for Turkey this decline is more obvious than the Czech Republic. Despite the decline in 2009, both countries are starting to increase their GDP again in the year 2010. This increase is continuous to the year 2015 for the Czech Republic but on the other hand for Turkey, in 2014 there is a small drop at GDP value and then there is a significant decrease between GDP values of the years 2014 and 2015.

In order to arrive at simpler and more obvious results, Table 7 presents the results of index numbers analysis for GDP values of the Czech Republic.

**Table 7: Index numbers for GDP values of the Czech Republic (2006-2016)**

Years	GDP-CZ	Index
2006	\$ 171 272,45	100
2007	\$ 187 231,45	109,32
2008	\$ 196 202,68	114,56
2009	\$ 191 633,79	111,89
2010	\$ 193 196,68	112,80
2011	\$ 196 672,60	114,83
2012	\$ 197 947,93	115,57
2013	\$ 199 811,21	116,66
2014	\$ 210 326,13	122,80
2015	\$ 224 075,23	130,83
2016	\$ 232 727,45	135,88
*Base year = 2006		

(Czech Statistical Office, 2018)

In order to calculate the index numbers of GDP and GDP per capita of both Czech Republic and Turkey, the year 2006 has been taken as a base period (base year) for both countries, and it guides to calculate index numbers for other years. Index numbers show the development according to the base year. In order to compare GDP development of both countries, first of all, it is necessary to calculate countries index values.

Based on these index values presented in Table 7, it is possible to conclude that:

- GDP value for the Czech Republic in 2007 is 9.32% above GDP in the base year 2006.
- GDP value for the Czech Republic in 2008 is 14.56% above GDP in the base year 2006.
- ...

The same process has been done for the GDP values of Turkey as well. But because of the missing data at official pages about GDP values for 2016, it is not possible to conclude the year 2016. Index numbers for the GDP values of Turkey have been represented in Table 8.

**Table 8: Index numbers for GDP values of Turkey (2006-2016)**

Years	GDP-TR	Index
2006	\$ 526 429,39	100
2007	\$ 648 753,61	123,24
2008	\$ 742 094,39	140,97
2009	\$ 616 703,32	117,15
2010	\$ 731 608,37	138,98
2011	\$ 773 979,67	147,02
2012	\$ 786 282,52	149,36
2013	\$ 823 044,43	156,34
2014	\$ 799 369,75	151,85
2015	\$ 719 620,44	136,70
2016	missing	missing
*Base year = 2006		

(Turkish Statistical Institute , 2016)

Based on these index values presented in Table 8, it is possible to conclude that:

- GDP value for Turkey in 2007 is 23, 24% above GDP in the base year 2006.
- GDP value for Turkey in 2008 is 40, 47% above GDP in the base year 2006.
- ...
- Because of the missing data in the year 2016, it is not possible to conclude the year 2016.

Also, same data analysis has been done for GDP per capita of both countries. So that it will allow presenting the development process of the per capita (per person) in the country. For this analysis, data are taken from The World Bank. Because GDP per capita is able to show more accurate results while comparing different countries. As mentioned before time to time population can be a great factor. Because some countries have higher population values than others and, in this case, it is possible that they might have higher GDP values than some countries which have lower population values. In this case, in order to be able to compare the countries equally, it is necessary to eliminate the population factor and way to do this process is through GDP per capita. Hence it will be more appropriate to compare GDP per capita of both countries.

Table 9: Index numbers for GDP per capita of the Czech Republic (2006-2016)

Years (i)	GDP per capita (current US\$)-CZ	Index	$\frac{GDP_{(i)}}{GDP_{(i-1)}} - 1$
2006	\$15 183.60	100	
2007	\$18 373.60	121.01	0.21
2008	\$22 698.90	149.50	0.24
2009	\$19 741.60	130.02	-0.13
2010	\$19 808.10	130.46	0.00
2011	\$21 717.50	143.03	0.10
2012	\$19 729.90	129.94	-0.09
2013	\$19 916.00	131.17	0.01
2014	\$19 744.60	130.04	-0.01
2015	\$17 715.60	116.68	-0.10
2016	\$18 483.70	121.73	0.04
*Base year = 2006			

(The World Bank, 2018)

Based on these index values presented in Table 9, it is possible to conclude that:

- GDP per capita for the Czech Republic in 2007 is 21, 00% above GDP in the base year 2006.
- GDP per capita for the Czech Republic in 2008 is 49, 50% above GDP in the base year 2006.
- ...

Also based on the results from Table 9, it is possible to calculate the annual growth rate (geometric average) of the index numbers for the Czech Republic, based on the formula:

$$\sqrt[n-1]{\frac{y_n}{y_1}} = \sqrt[11-1]{\frac{18.483,70}{15.183,60}} = 1,01986 \text{ which means the Czech Republic has 1,986\% annual}$$

average growth rate (geometric average) for GDP per capita. In the formula, ‘n’ represents the number of the observations (here it means number of the years) and ‘y’ represents the GDP per capita.

In Table 9, there are two kinds of index numbers. First one is in the column called ‘Index’ and these numbers represent the growth rate compared to the base year (2006). Another one is in the

last column of Table 9 (column of the formula  $\frac{GDP_{(t)}}{GDP_{(t-1)}} - 1$ ), and these numbers are the running index numbers and these numbers represent the growth rate compared to the previous year's values.

**Table 10: Index numbers for GDP per capita of Turkey (2006-2016)**

Years (i)	GDP per capita (current US\$)-TR	Index	$\frac{GDP_{(t)}}{GDP_{(t-1)}} - 1$
2006	\$8 034,60	100	
2007	\$9 709,70	120,85	0,21
2008	\$10 850,90	135,05	0,12
2009	\$9 036,30	112,47	-0,17
2010	\$10 672,10	132,83	0,18
2011	\$11 341,10	141,15	0,06
2012	\$11 720,30	145,87	0,03
2013	\$12 542,90	156,11	0,07
2014	\$12 127,20	150,94	-0,03
2015	\$10 984,80	136,72	-0,09
2016	\$10 862,60	135,20	-0,01
*Base year = 2006			

(The World Bank, 2018)

Based on these index values presented in Table 10, it is possible to conclude that:

- GDP per capita for Turkey in 2007 is 20, 85% above GDP in the base year 2006.
- GDP per capita for Turkey in 2008 is 35, 05% above GDP in the base year 2006.
- ...

Also, here again, it is possible to calculate the annual growth rate (geometric average) for Turkey, the necessary formula has been given below the Table 9, based on the formula:

$\sqrt[11-1]{\frac{10.862,60}{8.034,60}} = 1,03061$ . The result of this calculation means Turkey has 3,062% annual average growth rate of GDP per capita.

Here, again, in Table 10, there are two kinds of index numbers. First one is in the column called 'Index' and these numbers represent the growth rate compared to the base year (2006). Another one is in the last column of Table 10 (column of the formula  $\frac{GDP_{(t)}}{GDP_{(t-1)}} - 1$ ), and these numbers are



the running index numbers and these numbers represent the growth rate compared to the previous year's values.

Results of the geometric average show that Turkey has higher annual growth rate (geometric average) than the Czech Republic between the years 2006 and 2016.

Based on the records from Table 9 and Table 10, it is possible to compare the results of both countries. These values have been represented together in Table 11.

**Table 11: Index number for GDP per capita of Turkey and the Czech Republic**

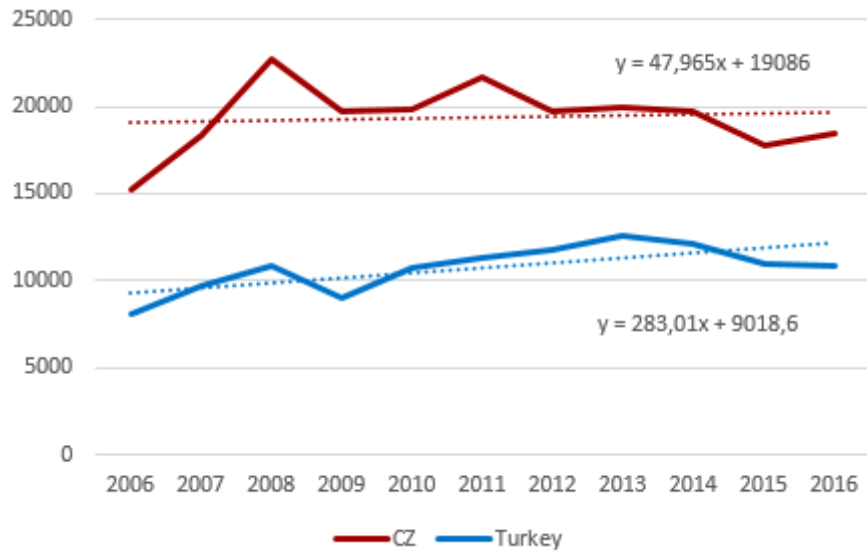
<b>Index numbers for GDP per capita</b>		
<b>Years</b>	<b>CZ</b>	<b>TR</b>
2006	100	100
2007	121,01	120,85
2008	149,50	135,05
2009	130,02	112,47
2010	130,46	132,83
2011	143,03	141,15
2012	129,94	145,87
2013	131,17	156,11
2014	130,04	150,94
2015	116,68	136,72
2016	121,73	135,20
*Base year = 2006		

(The World Bank, 2018)

Table 11, represents the results from Table 9 and Table 10. Table 11 shows the changes at GDP per capita of both countries based on the base period 2006. Until the year 2012 Czech Republic has higher index numbers than Turkey, between these years only the year 2010 Turkey has higher values than the Czech Republic. But, since 2012 Turkey has higher values than the Czech Republic while comparing the development of GDP per capita based on the base year 2006.

Also, based on the results of the analyses it is possible to see and conclude the regression lines of both countries GDP per capita.

Figure 25: Regression lines and model equations of both Turkey and the Czech Republic GDP per capita



(Groebner, Shannon, Fry, & Smith, 2007)

Figure 25 shows the regression lines of both Turkey and the Czech Republic between the years 2006 and 2016. These regression lines (time index settings 1, 2, ..., 11) have been created by using the GDP per capita (current US\$) for both countries. Test of hypothesis  $H_0$ : The slope of the line equals zero (there is no trend) was done at  $\alpha=0.05$  level for both models. It is possible to conclude, that trend line for GDP per capita of the Czech Republic is not significant,  $p = 0.815$ . But on the other hand, it possible to conclude that trend line for GDP per capita of Turkey is statistically significant,  $p = 0.016$  and it is possible to conclude that Turkey has a positive trend, GDP per capita of Turkey increases 283.0 \$ per year. This result corresponds with the difference found in the average annual growth rates.

## 6. Results

Tourism is the growing and important sector in Turkey. Tourism development process of Turkey has examined and analyzed through the data which has been collected from the Turkish official statistical institutes and pages.

Also, at the second subject which is aiming the compare the development process of GDP of Turkey and the Czech Republic, data has been taken from countries official pages and other reliable pages around the world, and whole these data have been analyzed using by statistical methods. In this thesis, in order to calculate these analyses, Microsoft Office Excel has been used.

The goal of this thesis is to answer research questions through available evidence in the available data in official statistics. These questions are about both subjects of this thesis.

**RQ1:** What is the time series data analysis and for which purposes can be used?

Basically, time series data is the past data that is measured over time and used to generate a forecast of future. Based on time series data analysis, it generates forecasting and this forecasting helps to have ideas about future behaviors. Decision makers who plan to develop quantitative forecasting model have to analyze the relevant time-series data. The main ideas to use time series data are to generate forecasting model about future in order to have an idea (especially for decision makers it has quite an important role) and observe the development process of the relevant data and subject.

**RQ2:** How is the development of statistic in Turkey and the Czech Republic?

According to the theoretical part, beginning of the statistical records at Turkey begins with Ottoman Empire and it continues with the Turkish Republic until the nowadays. During the years it had many names and duties. Nowadays it is called Turkish Statistical Institute (mostly known as TurkStat). The main duty of the TurkStat office is that the population censuses have been announced on the basis of address-based population registration system. Turkish institution has produced statistical data based on International Standard Industrial Classification of All Economic Activities ISIC that is prepared by United Nations. Also, it has many international activities, projects and relations, such as relations with EuroStat.

Again, according to the theoretical part, the beginning of the statistical records at the Czech Republic begins with the communist era 1969 and it continues until the nowadays. Nowadays it is called Czech Statistical Office and it has complete control over statistic throughout the Czech Republic since 1996. Czech statistical history divided into two group; History of Czech Statistic Before 1918 and History of Czech Statistic After 1918. The Czech Statistical Office has established

the Czech Statistical Council as an advisory body. It has many activities within the country borders, also it takes part in some international activities and it is a member of European Statistical System.

**RQ3:** What is the development of tourism in Turkey between the years 2012 and 2016?

Tourism is one of the important sectors in Turkey that is developing year by year. According to the practical part, until the year 2016 foreign tourist population has been increased all the time. Also, it is possible to see the same result since 2006 (there are just a few small slight drops since 2006) but in the year 2016, there is a remarkable decline in the foreign tourist population in Turkey. As mentioned before, the cause of decline is based on political problems with Russia.

**RQ4:** What is the development process of GDP in Turkey and the Czech Republic between the years 2006 and 2016?

According to the practical part, when analyzes of both countries' GDP have been done, results show that Turkey has remarkably higher values than the Czech Republic, but after including the population factor in order to get more accurate results about the development process, results of the GDP per capita indicates that the Czech Republic has better values than Turkey. Also, according to the data which has been taken both of countries official statistical pages and reliable statistical pages around the worldwide, values shows that Czech Republic has each year almost two times higher GDP per capita values than Turkey between the years 2006 and 2016.

Also, as can be seen before from the both Turkey and the Czech Republic regression lines, Turkey has significant positive trend line but, on the other hand, the Czech Republic has not a significant trend line.

To sum up, all briefly, tourism has a remarkable importance in the economy of Turkey. Under the normal conditions and relations of the country, a graph of the tourism (foreign tourist population) in Turkey has been increasing every year over the observed period 2012-2016. But, mainly political problems and situation within the country borders have a significant effect on the development of tourism.

Another important point is that GDP comparison between Turkey and the Czech Republic over the observed period 2006-2016, Turkey has remarkably higher GDP values than the CZ but, the reason of this difference is the population factor because Turkey has significantly more population than the CZ. But when the GDP per capita has examined and analyzed, the CZ has better values than Turkey (approximately CZ has two times higher values in each year).

## **7. Conclusions and Recommendations**

### **7.1 Conclusions**

At the end of this research and through the study of the analysis of time series data available in official statistics, the research questions have been answered through the theoretical part and the practical part.

Analysis of time series data seems to have an important role for many people and countries. Especially for decision makers in order to be able to decide reasonably it has quite an important role. Through evaluating and analyzing the data and generating forecasting model, analysis of time series data helps to have ideas about future behaviors.

The theoretical part of this study was explaining the general information about analysis of time series data, and information about the development of Turkey and the Czech Republic official statistical offices and general information about GDP. Also, in this study has been mentioned about important statistical pages around the worldwide.

The practical part of this study was evaluating and analyzing the time series data from Turkish official statistical pages and Czech statistical pages, and also additional analyses through World Bank. In order to calculate these analyses, it has been created many tables and graphs with explanations. As a study of analysis of time series data available in official statistics, it is concluded with the following results:

- Analysis of time series data is one of the simple and effective ways to generate forecasting model and it has an important role for many decision makers.
- Turkey has high tourism potential, and foreign tourist population has increased until the year 2016.
- In the year 2016, political issues with Russia cost remarkable decline in the tourism sector in Turkey.
- GDP is one of the effective ways to examine and observe the development process of a country and it helps to compare country's economy with other countries.
- Based on the general GDP, Turkey has significantly higher values from the Czech Republic between the years 2006 and 2016, but the results are the opposite when compared with GDP per capita.

- Turkey has less GDP per capita values than the Czech Republic between the years 2006 and 2006, but on the other hand, Turkey has higher annual growth rate than the Czech Republic in the years 2010, 2011, 2012, 2013, and 2014.
- GDP per capita is higher in the Czech Republic over the observed period 2006-2016, but the average rate of growth is higher in Turkey by one (1) percent.

Analysis of time series data might take a long time due to gathering the all necessary data and information from the reliable sources, but through this data, it provides trustable results. In order to complete this process successfully, the researcher should be careful and focus on the study/research.

## **7.2 Recommendations**

- Analysis of time series data is an effective and simple way to observe and evaluate the development of many types of process therefore many decision makers may use this method in order to analyze data and generate forecasting models.
- There are many data visualization tools that help to people who are dealing with massive data sets. Decision makers should have knowledge of these tools.
- Turkey has a spectacular tourism potential, with the right planning and investment can offer many opportunities and facilities for foreign tourists.
- Political issues may have a significant impact on the tourism sector in Turkey, therefore people who are in charge and dealing with tourism, they need to be aware of this factor.
- While examining and comparing the GDP of two or more countries, the researcher must be aware of the population factor and in order to get more accurate results researcher should examine the GDP per capita as well. Because the huge difference in population can cause the totally different results.
- The researcher who is analyzing with time series data can use the Microsoft Office Excel in order to get quick and more accurate results.
- In order to increase country's economic level and people's income, Turkey should try to offer new opportunities to citizens so that it may help to increase GDP per capita, and it can lead to increase living standards within the country's borders.

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## Appendix

### Appendix A

Foreign tourist population data of tourism centers of Turkey between the years 2012 and 2016.

Istanbul 2012-2016					
	2012	2013	2014	2015	2016
January	451.662	532.276	635.283	691.496	692.172
February	494.124	617.015	696.054	732.202	674.465
March	659.826	838.201	866.985	944.931	783.164
April	818.788	936.961	1.014.662	1.037.506	715.161
May	867.511	1.058.771	1.079.598	1.182.906	869.446
June	939.508	957.894	1.090.284	1.091.357	707.050
July	966.337	929.266	1.155.407	1.400.183	924.686
August	950.062	1.074.950	1.290.218	1.333.515	908.663
September	940.156	1.006.014	1.181.742	1.205.089	800.675
October	913.134	998.442	1.132.655	1.125.263	790.951
November	727.772	770.288	844.289	848.420	663.524
December	652.790	754.789	855.806	821.809	674.030
TOTAL	9.381.670	10.474.867	11.842.983	12.414.677	9.203.987

(Istanbul Provincial Directorate of Culture and Tourism, 2017)

Antalya 2012-2016					
	2012	2013	2014	2015	2016
January	105.335	94.105	101.003	98.725	unknown
February	162.857	157.155	140.365	135.649	unknown
March	296.420	335.563	304.595	297.560	unknown
April	614.860	666.940	769.274	616.903	unknown
May	1.219.630	1.414.189	1.468.790	1.346.160	unknown
June	1.492.881	1.609.252	1.730.668	1.593.864	unknown
July	1.737.281	1.784.568	1.976.349	1.959.016	unknown
August	1.717.009	1.831.906	1.955.595	1.887.130	unknown
September	1.521.767	1.666.222	1.576.642	1.535.256	unknown
October	1.035.119	1.155.282	1.091.872	1.047.838	unknown
November	275.176	279.813	260.431	251.400	unknown
December	121.031	127.515	130.766	99.187	unknown
TOTAL	10.299.366	11.122.510	11.506.350	10.868.688	unknown

(Antalya Provincial Directorate of Culture and Tourism, 2017)

Mugla 2012-2016					
	2012	2013	2014	2015	2016
January	1.246	1.381	1.344	1.061	3.298
February	3.357	891	2.190	2.850	6.072
March	10.047	7.523	6.673	10.847	15.690
April	107.180	98.257	124.407	87.967	65.734
May	364.045	399.269	407.533	374.383	223.513
June	500.907	507.350	508.563	497.593	258.786
July	608.886	596.019	623.808	597.447	321.515
August	603.738	616.889	644.443	595.833	330.086
September	523.599	535.567	538.468	471.761	273.899
October	274.065	293.142	275.876	249.492	151.790
November	14.280	18.707	13.904	19.493	5.761
December	2.615	3.786	2.703	7.335	1.292
TOTAL	3.013.965	3.078.781	3.149.912	2.916.062	1.657.436

(Muğla Provincial Directorate of Culture and Tourism, 2017)

Izmir 2012-2016					
	2012	2013	2014	2015	2016
January	18.822	22.929	22.213	17.851	16.397
February	27.856	18.830	29.432	25.147	18.989
March	42.310	46.041	36.511	36.269	37.154
April	89.817	94.750	98.621	71.371	37.925
May	138.727	157.016	139.695	128.754	66.015
June	179.949	168.414	158.871	145.968	73.226
July	239.681	236.783	229.153	218.103	135.271
August	218.279	224.245	210.341	203.095	111.838
September	193.232	189.966	169.873	152.941	76.603
October	145.701	159.901	131.250	127.756	62.989
November	46.742	50.664	43.707	49.638	16.691
December	27.808	37.701	24.794	25.028	19.201
TOTAL	1.368.924	1.407.240	1.294.461	1.201.921	672.299

(Izmir Provincial Directorate of Culture and Tourism, 2017)

## Appendix B

Foreign tourist population data of Turkey.

Turkey 2012-2016					
	2012	2013	2014	2015	2016
January	981.611	1.104.754	1.146.815	1.250.941	1.170.333
February	997.571	1.268.440	1.352.184	1.383.343	1.240.633
March	1.460.563	1.841.154	1.851.980	1.895.940	1.652.511
April	2.168.715	2.451.031	2.652.071	2.437.263	1.753.045
May	3.232.926	3.810.236	3.900.096	3.804.158	2.485.411
June	3.882.592	4.073.906	4.335.075	4.123.109	2.438.293
July	4.571.389	4.593.511	5.214.519	5.480.502	3.468.202
August	4.470.202	4.945.999	5.283.333	5.130.967	3.183.003
September	3.991.415	4.266.133	4.352.429	4.251.870	2.855.397
October	3.050.981	3.402.460	3.439.554	3.301.194	2.449.948
November	1.631.647	1.709.479	1.729.803	1.720.554	1.353.280
December	1.343.220	1.442.995	1.580.041	1.464.791	1.302.157
TOTAL	31.782.832	34.910.098	36.837.900	36.244.632	25.352.213

(Association of Turkish Travel Agencies, 2017)

	Turkey 2006-2016										
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
January	667 337	714 425	782 786	751 817	809 974	975 723	981 611	1 104 754	1 146 815	1.250.941	1 170 333
February	626 565	787 048	896 482	898 927	953 848	1 079 505	997 571	1 268 440	1 352 184	1.383.343	1 240 633
March	921 892	1 099 960	1 305 297	1 207 729	1 414 616	1 617 782	1 460 563	1 841 154	1 851 980	1.895.940	1 652 511
April	1 372 922	1 520 954	1 647 903	1 750 281	1 744 628	2 290 722	2 168 715	2 451 031	2 652 071	2.437.263	1 753 045
May	1 918 809	2 287 645	2 748 564	2 718 788	3 148 337	3 283 125	3 232 926	3 810 236	3 900 096	3.804.158	2 485 411
June	2 368 628	2 774 076	3 305 832	3 263 089	3 500 024	3 780 637	3 882 592	4 073 906	4 335 075	4.123.109	2 438 293
July	3 109 727	3 624 156	4 084 764	4 343 025	4 358 275	4 597 475	4 571 389	4 593 511	5 214 519	5.480.502	3 468 202
August	2 905 817	3 384 065	3 762 136	3 760 372	3 719 180	4 076 783	4 470 202	4 945 999	5 283 333	5.130.967	3 183 003
September	2 267 146	2 799 276	2 981 044	3 136 010	3 486 319	3 923 546	3 991 415	4 266 133	4 352 429	4.251.870	2 855 397
October	1 713 916	2 152 908	2 462 497	2 617 193	2 840 095	3 039 754	3 050 981	3 402 460	3 439 554	3.301.194	2 449 948
November	1 020 106	1 177 475	1 267 996	1 403 740	1 491 005	1 596 295	1 631 647	1 709 479	1 729 803	1.720.554	1 353 280
December	926 968	1 018 923	1 091 376	1 226 143	1 165 903	1 194 729	1 343 220	1 442 995	1 580 041	1.464.791	1 302 157
TOTAL	19 819 833	23 340 911	26 336 677	27 077 114	28 632 204	31 456 076	31 782 832	34 910 098	36 837 900	36 244 632	25 352 213

(Association of Turkish Travel Agencies, 2017)

Univerzita Hradec Králové  
Faculty of Informatics and Management  
Academic Year: 2017/2018  
Thesis field of study: Information Management

Study Programme: Systems Engineering and Informatics  
Form: Full-time  
Branch/comb.: Informační management (im2-p-an)

**Document for registration DIPLOMA STUDENT'S THESIS**

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**TOPIC IN CZECH:**

Analýza dat časových řad dostupných v oficiální statistice

**TOPIC IN ENGLISH:**

Analysis of Time Series Data Available in Official Statistics

**SUPERVISOR:**

prof. RNDr. Hana Skalská, CSc. - KIKM

**RESEARCH PLAN:**

The goal: Study and analyse selected indicators available in public statistical data collected in time series. Specify hypotheses about their potentials to describe and compare development of selected indicators in different countries. Stress attention to comparability of indicators and to the possibility to interpret findings based on data from official statistics. Content: 1. Introduction: Specify and explain the goal and characterize the issues. 2. Review of the literature. 3. Methodology: The problem solution, hypotheses, data resources, methods of analysis. 4. Results. 5. Discussion. 7. Conclusion. 8. References.

**List of recommended literature:**

Groebner et al: Business Statistics. A Decision Making Approach. IBM SPSS Time series forecasting Manual Time series analysis and Forecasting by Example (from Bisgaard S., or similar book of another author). Selected web pages, for example: Fundamental Principles of National Official Statistics <https://unstats.un.org/unsd/dnss/gp/fundprinciples.aspx> International World Comparison Programme <http://www.worldbank.org> The United Nations Economic Commission for Europe (UNECE) <http://www.unece.org/> <http://ec.europa.eu/eurostat/> Web pages of statistical offices CR and Turkey.

Student's signature: .....



Date: .....

18.9.2017

Supervisor's signature: .....



Date: .....

18.9.2017