Estimation of the Number of Foreign Tourist Visitors in Solo Based on Tourism Object Using the Arima Method

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Abstract. Solo is one of the areas in Central Java that has a cultural diversity that is thick with Javanese traditions and is a characteristic. This is what attracts foreign tourists to come to visit the city of Solo to enjoy the culture of Solo through the Mangkunegaran Palace tourism object. In 2020, the number of foreign tourists and foreign tourists has decreased, so that it affects the number of foreign tourists and local tourists in Solo City. This happened due to the impact of COVID-19. The data used in the study is monthly tourist visitor data from 2015–2019. So, we want to estimate the number of visitors, especially foreign tourists, using the ARIMA method. The model used is ARIMA(1,1,2) by differencing the data once. The results show that the MA(2) variable is not significant, so it is recommended to overfit and underfit the model. The final result will be an estimate of the number of visitors to Solo Tourist Attractions for the next 1 year.

Keywords: Tourism · Tourist Attraction · Estimation · ARIMA

1 Introduction

Surakarta or better known as Solo is one of the areas in Central Java which in ancient times was a hamlet chosen by Sultan Pakubuwana II in establishing a new palace. This is the origin of the mention of Solo City as an area with a very rich Javanese historical background. The city of Solo holds so much wealth, both in the form of artifacts, sites, or also types of activities. In addition, the cultural or religious diversity that lives in it also revives several types of traditions that have become colors in Javanese culture that are thick in the area of the former residency of Surakarta. The diversity of cultures that often contributes to the number of tourism visitors in the city of Solo.

The Big Indonesian Dictionary (KBBI) defines tourism as everything related to travel for recreation. Meanwhile, Law Number 10 of 2009 concerning Tourism emphasizes that tourism is a variety of tourism activities and is supported by various facilities and services provided by the community, businessmen, government and local governments. Meanwhile, tourism objects can be interpreted as an embodiment of human creation, way of life, arts and culture, national history, and natural conditions that have an attraction for tourists to visit. Until now, the city of Solo is still attached to its cultural impression. Even

in every infrastructure development, there is always an element of the typical culture of the City of Solo embedded. Batik and wayang kulit are two of the many aspects that are always included in every development of tourist attractions as well as public infrastructure in this area. This condition has succeeded in making the City of Solo always bring a sense of awe in the minds of tourists, both local and foreign.

The Central Bureau of Statistics of the City of Surakarta managed to collect data regarding the number of passengers arriving and departing from Adi Sumarmo Airport with domestic destinations in 2020 [1]. Based on this data, it is known that there was a decline from January to December 2020. In January 2020, the number of passengers arriving was as much as 57,718 passengers, then in the middle of the year it decreased to 3,221 passengers, until finally at the end of 2020 the number of domestic passenger arrivals at Solo Adi Sumarmo Airport rose to 23,398 passengers. Likewise, the number of passengers departing on domestic flights from Solo airport, initially at 63,049, then decreased drastically to 19,710 in December 2020.

Not much different from this data, BPS also noted that the number of passengers arriving and departing from Adi Sumarmo Airport with international destinations in 2020 also decreased. The BPS for the City of Solo stated that the passengers who entered the city of Solo with international flights in January 2020 were 4,540 passengers. Then, it decreased to 3,582 passengers in February and 1,108 passengers in March. In line with the arrival rate, the number of departures for international flights has also decreased.

Although there had been an increase in the number of international passengers from the original 3,897 passengers in January 2020 and increased to 4,053 passengers in February 2020. However, in March 2020 there was only 1 passenger who departed on international flights from the Solo City airport. Five passengers in June, 8 passengers in August, and as many as 4 passengers in October. This decrease in the number of passengers seems to be proof that the Covid-19 pandemic has had a big impact that has really harmed many parties and many aspects of life. Starting from health, education, social, economic, even to the law though.

Referring to the data calculated by the BPS, the Surakarta City Government is optimistic and fully believes that this number will continue to increase from year to year as evidence of the rise of Solo City from adversity due to the Covid-19 pandemic that hit the world [2]. Efforts to increase the number of arrivals and departures of passengers from Adi Sumarmo Airport, both domestically and internationally, continue to be intensified by the local government. The improvement of public facilities and the implementation of new regulations that are more adaptive to the development of people's lives are continuously carried out for the sake of this noble ideal. Another effort that is no less important is to introduce various tourist objects that are often visited by national and foreign tourists.

Based on data released by the Central Statistics Agency for the City of Solo, it can be understood that the Mangkunegaran Palace with a number of visits of 902, is the most visited tourist attraction by foreign tourists visiting the city of Solo. Meanwhile, local tourists still love tourism objects that carry the theme of nature and are outdoor, namely Balekambang Park with a number of foreign tourists visiting 210,014 visitors. Figures 1 and 2 is a diagram of the attraction of visitors to tourist objects in the city of Solo in 2020.
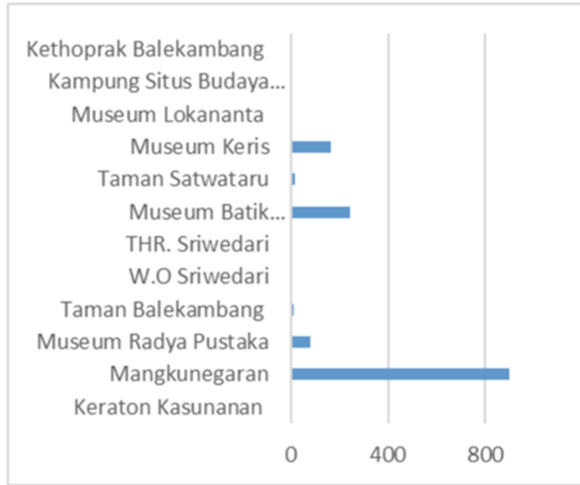
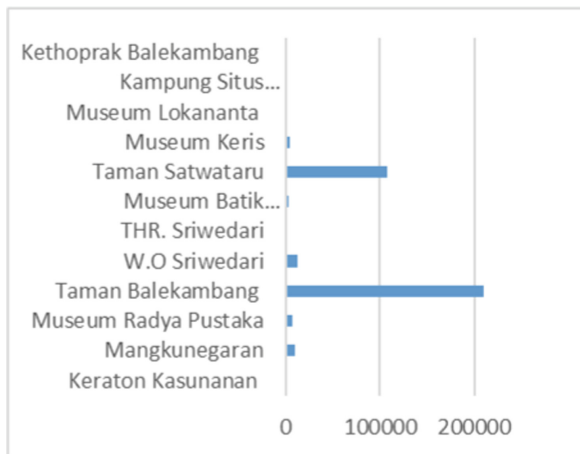**Fig. 1.** The attraction of Solo city tourism objects for foreign tourists.

Fig. 2. The attraction of solo city tourism objects for local tourists.

When viewed from Figs. 1 and 2, it is clear that the city of Solo has many attractions in terms of tourist objects. The wealth of natural resources in the city of Solo cannot be underestimated. However, sometimes there are several things that trigger visitor dissatisfaction with these attractions. The main thing that is often questioned is related to the public facilities available at tourist attractions scattered throughout Surakarta. Not infrequently the visitors find it difficult to find a toilet or washbasin in the tourist attraction. This is one of the PRs that the Solo City government should pay more attention to.

In addition, the availability of clean water also needs to get more attention from the tourism object manager or from the local government in the tourism sector. Considering that currently there are many tourist attractions in the city of Solo that worry about clean

water. Even though the availability of clean water is considered very urgent and must be provided by all tourist attractions in Surakarta City and even Indonesia.

The third important point that needs to be improved is related to the consistency of tourist attraction managers in maintaining and caring for existing tourist objects. It is common knowledge that some tourist attractions in Solo City can only maintain their quality and beauty for some time. Not a few attractions that are damaged with age and are not taken care of by their managers. Rust that gnaws at its iron body or yards that have become shrubs and insect nests are not new to tourist attractions that are not crowded with visitors. And no less often, managers of a tourist attraction are inconsistent in managing existing attractions, so they only take care of places that are crowded by the eyes of visitors and manage the outer or front tourist attraction only. Meanwhile, the back of the tourist attraction is left to become a wilderness that can make the hairs stand on end.

Those are some things that need to be improved and facilitated by the tourism object manager or the Solo City government. With the improvement, it is hoped that it will increase the interest of domestic and international tourists to visit tourist attractions in this cultural city. It doesn't stop there, improving the quality of a tourist attraction is also believed to be wrong.

One factor increasing the income of the community and the Solo City Government because it has succeeded in inviting many tourists to visit existing tourist attractions. Therefore, it is important to improve facilities and improve the quality of all tourist attractions in the city of Solo in order to optimize the opportunities that exist in building a more advanced and competitive Surakarta economy.

2   Discussion

2.1   Time Series

Statistics is the study of data, based on the time of data collection it can be divided into 3, such as:

(1) cross-section data is a type of data collected for the number of variables at a certain point, (2) time Series is a type of data collected according to a time sequence within a certain range, and (3) panel data is a type of data that is collected in a time series within a certain range in a number of categories.

Makridakis et al. [3] revealed that an important step in choosing an appropriate time series method is to consider the types of data patterns that can be divided into 4, such as: (1) Horizontal patterns occur when data values fluctuate around a constant mean value. (2) A seasonal pattern occurs when a series is influenced by seasonal factors. (3) A cyclical pattern occurs when the data is affected by long-term economic fluctuations such as those associated with the business cycle. (3) Trend patterns occur when there is a long-term secular increase or decrease in the dataPola Horizontal terjadi saat nilai data berfluktuasi di sekitar nilai rata-rata yang konstan.

If a statistical process probability structure does not change with time, then the time series is stationary, but if the probability structure changes with time, then the time series is not stationary.

2.2   Model Arima

According to Wei [4] in practice a stationary time series model is very difficult to find, for that it is necessary to carry out a differencing process so that the data becomes stationary. The general ARIMA model is the result of a combination of AR and MA models, as an example, the following ARIMA(1,1,2) model will be shown:

$$Z_t = Z_{t-1} + \phi_1 Z_{t-1} - \phi_1 Z_{t-2} - \theta_1 a_{t-1} - \theta_2 a_{t-2} + a_t$$

Known.
Z_t = estimated value to – t
ϕ_1 = AR parameters to – 1
θ_1 = MA Parameter to – 1
θ_2 = MA Parameter to – 2
a_t = error value to – t

2.3   Data Dan Analysis

The data used is monthly data of foreign tourist visitors to tourism objects in Solo Cy from 2015–2019 [4–8]. The analysis used is Time Series analysis using the ARIMA model.

Based on Fig. 3, it can be seen that in 2014, the number of foreign tourists who visited Surakarta was 28,622 visitors. Then there was a significant decline in 2015, so that the number of foreign tourists visiting tourist attractions in Surakarta only amounted to 16,301 visitors. The decline in the number of visitors again occurred over the next three years, leaving the number of foreign tourists to 13,752 in 2016, 12,179 in 2017, and 12,111 in 2018. Then, in 2019, unexpectedly there was an increase in the number of foreign tourists visiting. Entered the city of Surakarta to 13,047 visitors. However, this increase in numbers did not last long and only lasted for one year. Because in the following year, namely 2020, the number of foreign tourist visitors decreased even more drastically to reach 1,406 visitors. The steep rate of decline in the graph is believed to be influenced by the presence of Covid-19 which tortures all elements of society in the world. Tourism is one of the fields that is exposed to the negative impacts of the Covid-19 pandemic that has occurred in all parts of the earth.
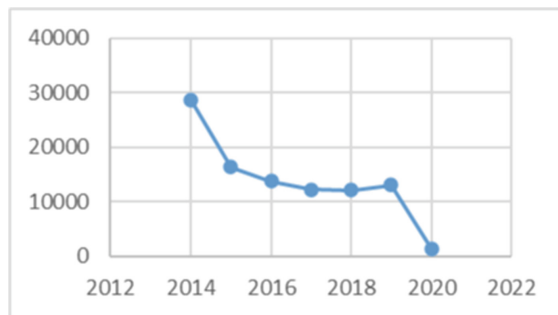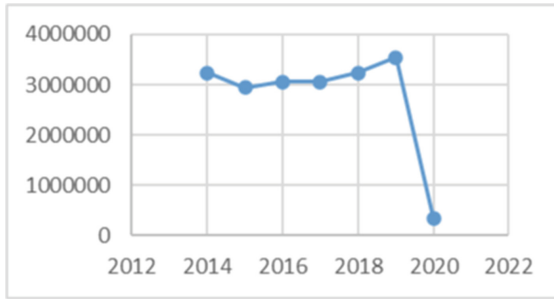

Fig. 3. Number of foreign tourist visitors to tourist attractions in surakarta.

Fig. 4. Number of visitors of archipelago tourist attractions in surakarta city.

With the help of Fig. 4, it can be concluded that in 2014, the number of Indonesian tourists visiting tourist attractions in Surakarta was 3,236,482 visitors. Then it decreased to 2,942,105 visitors in 2015, and slightly increased the following year to 3,054,603 visitors. Then, there was an increase in the number of foreign tourists visiting the city of Surakarta even though the comparison was very minimal with the previous year. In 2017, the number of visitors increased to 3,057,418 Indonesian tourists. The graph also experienced an increase in the number of visitors to 3,549,504 visitors. Meanwhile, in the following year, to be precise in 2020, there was a very drastic decline. The number of visitors to Nusantara tourists in Surakarta City, which originally consisted of 7 digit, this time stood at 352,700 visitors. Just like the previous graph which stated that the decline in the number of visitors to Surakarta City was influenced by the presence of Covid-19 cases. In this case, a firm effort is needed from the government in revitalizing the Surakarta tourism sector in order to achieve a better community economy and according to the changing times.
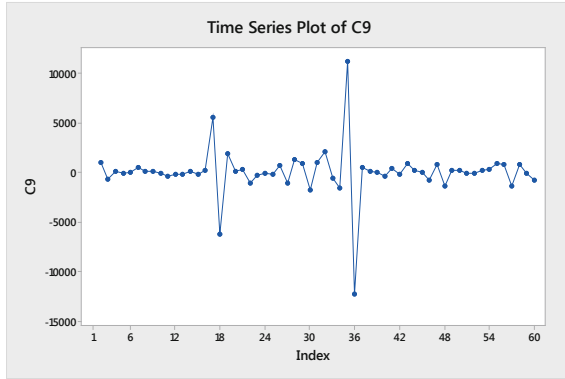
2.4 Stationary

The focus of this research is the number of foreign tourist visitors. It is hoped that the city of Solo will remain the main choice for foreign tourists to take a vacation. Before doing the modeling, we check for stationary in the data. Figure 5 shows the stationarity of foreign tourist visitor data that has been differencing once.

Judging from Fig. 5, that the data is not stationary. So it is necessary to make improvements before modelling the data in this study.
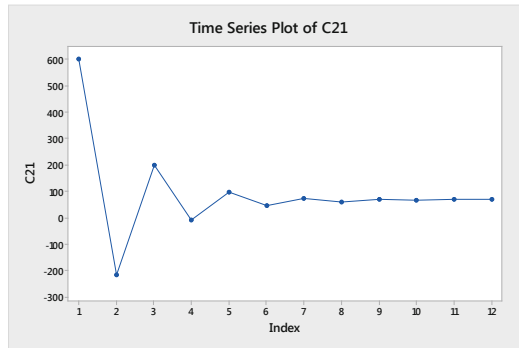
2.5 Model ARIMA (1,1,2)

In this study, the ARIMA (1,1,2) model is shown in model 1. This model will be used in estimating the value of one year ahead with conditions before COVID-19. Because the data used is only data in 2015–2019. The equations obtained are as follows:

$$Z_t = 1{,}47 - 0{,}5056AR(1) - 1{,}1186MA(1) + 0{,}1391MA(2)$$

Fig. 5. Stationarity test of data.

Fig. 6. Results of forecasting number of visitors.

With model verification as follows:

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Final Estimates of Parameters

Type          Coef  SE Coef       T      P
AR    1    -0,5056   0,1587   -3,19  0,002
MA    1     1,1186   0,0898   12,46  0,000
MA    2    -0,1391   0,1914   -0,73  0,470
Constant     1,47    16,23    0,09  0,928
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Reject Ho if the P value < 5%, it means that there is a variable effect on the estimated value. From the results above, it can be concluded that the MA(2) variable is not significant to the model. But in Time series analysis it is known as Overfitting and Underfitting.

2.6 Forecasting

The final result of the Time Series analysis is Forecasting. The estimation results for the next 1 year (12 months) are shown in Fig. 6.

3 Conclusion

The city of Solo is a city with a characteristic in the form of a thick palace culture. So that it becomes the attraction of the city of Solo to foreign tourists (tourists). From the results obtained that for the next 1 year, the number of tourist visitors in Solo City will continue to decline, one of the reasons is COVID-19 which is still hitting Indonesia until now.

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References

1. B. P. Statistik, "Surakarta dalam Angka Tahun 2020," vol. 2020, 2020.
2. B. P. Statistik, "Surakarta dalam Angka Tahun 2021," vol. 2021, 2021.
3. M. dan W. Makridakis, *Metode dan Aplikasi Peramalan Edisi Kedua*, 2nd ed. Jakarta: Binarupa, 1999.
4. W. Wei, *Time Series Analysis : Unyvariate and Multivariate Methods*. Amerika: Pearson Education, Inc., 2006.
5. Dinas Kepemudaan Olahraga dan Pariwisata, *Statistik Pariwisata Jawa Tengah 2015*. 2015.
6. Dinas Kepemudaan Olahraga dan Pariwisata, *Statistik Pariwisata Jawa Tengah 2016*. 2016.
7. Dinas Kepemudaan Olahraga dan Pariwisata, *Statistik Pariwisata Jawa Tengah 2017*. 2017.
8. Dinas Kepemudaan Olahraga dan Pariwisata, *Statistik Pariwisata Jawa Tengah 2018*. 2018.
9. Dinas Kepemudaan Olahraga dan Pariwisata, *Statistik Pariwisata Jawa Tengah 2019*. 2019.