Can you really forecast the future trends of air travel using a time series analysis?

Air travel is one of the most important industries in the modern world, and accurately predicting passenger trends to meet the needs of this industry is of the utmost importance. In order to properly meet the demands of the people, airlines need to accurately forecast how many flights, capacity, destinations, and arrivals to stay competitive in this market. That is why this project is important. With this case study, you will have the opportunity to uncover trends in real airline data from the San Francisco International Airport and use advanced predictive modeling to forecast the future of air travel and passenger counts. You will get to use a variety of advanced techniques that drive data-based decision making, such as SARIMA (seasonal autoregressive integrated moving average).

Using predictive modeling is not simply a matter of creating a model, but also using it to make informed decisions for airline business models. Everyone involved in the airline industry relies on accurate forecasting of passenger demand to optimize operational costs and meet the demand of their customers. This project is not simply a time series analysis, but also a chance to hone real world skills that you can carry with you into future endeavors. These skills include cleaning and preparing datasets, exploratory data analysis, predictive modeling techniques, and communicating findings effectively. At the completion of this project, you will deliver a clean report that effectively demonstrates your abilities in working with complex data and conveying the results meaningfully.

Your Process (In Short):

- Data collection and refining
    - The initial dataset you will download has over 15,000 entries and over 15 variables regarding airline passenger statistics. You need to first clean the data, such as reducing unnecessary variables and properly structuring it for analysis. With Python scripts, you will be able to transform the “raw” dataset into usable data for exploration and analysis.
- EDA (exploratory data analysis)
    - Once the data is ready, you should find initial trends in the data, such as how passenger counts vary by airline and monthly passengers on average. The insights from the EDA will help guide decision making further down the line in this project.
- Prepare for Time Series Analysis
    - Data from air traffic is inherently related to time, but the data needs to be in a certain format for predictive modeling. You will need to convert the activity period to a datetime format, check the stationarity of the data, and apply any necessary transformations before undertaking the time series analysis.

- SARIMA Modeling and Predicting
    - The previous steps all lead up to creating a SARIMA model, which is a powerful tool for finding patterns and seasonality in a time series dataset. This model will be fitted to the data, and you will forecast predictions for 36 months after the data concludes. Confidence intervals should also be included.
- Result Interpretation and Communication
    - Lastly, you need to evaluate the model's performance and be able to communicate implications for the future. Also you need to think about the limitations of the model - have any significant world events occurred that would limit the accuracy of these predictions? With the aid of plots and visualizations, you can provide insights to the airline companies to make informed decisions about air travel.

Though this project requires several steps for success, the information provided to you should help you from beginning to end. The example code provided will set you up with examples of how to conduct this analysis, so you will have to worry less about starting from scratch, and focus more on interpreting what you are doing and providing meaningful results. Each step builds upon the previous, and you'll end with a well-structured model that lets you forecast a real-world scenario.

The skills you use to conduct this project are highly useful in almost every career setting. Time series analysis is used in several industries, such as finance and healthcare, to make informed decisions based on data. This case study is the opportunity to explore practical applications of data science, taking on real world problems and providing real world solutions.

I have attached some links to articles that should further motivate you to undertake this project!

Read more here about what time series analysis can do and its implications.
https://www.sigmacomputing.com/resources/learn/what-is-time-series-analysis#:~:text=Time%20series%20analysis%20can%20offer,and%20enhance%20long%2Dterm%20strategies.

There are already motions in place to predict the future of air traffic! Check out these articles from the Dulles airport and the FAA.
https://www.iata.org/en/services/data/market-data/20-year-passenger-forecast/
https://www.faa.gov/data_research/aviation

Good luck, and have fun!