

## Bike Rental Analysis for year 2011-12

### Project Scenario

A bike rental company wants to improve its demand forecasting accuracy to optimize its fleet management and pricing strategy.

### Skills demonstrated

R programming language | Time series | Data Cleaning | Data Processing | Forecasting | ARIMA | ARDL | Smoothing | Modeling | Business Understanding

### Tools

R programming language  
R markdown  
GitHub (where the project will be uploaded)

### SUMMARY

The aim of the business is to determine the optimal number of bikes to keep enough bikes in every dock station and to set a dynamic changing price based on the predicted demand. As such, the goals are to:

1. Describe data to answer key questions to uncover insights.
2. Build well-validated time series models for forecasting future rental bikes demand.
3. Propose a dynamic pricing strategy based on demands movements due to different variables.

### RECOMMENDATIONS

- **Predictions shows a feeble upward trend for January.** Speaking of strategy, Keeping the prices low and rising them around the half of March may a) let January weak trend surge faster and even more upward; and b) maximize the profits due to higher prices when the trend is consolidated. It is advisable to re-decrease the prices around October/November in an attempt to slow down the (probable) downward trend.
- **Higher prices during summer periods and lower ones during winter may be a good strategy to increase profit.** This strategy may, respectively, increase the earning without preventing more users to ride a bike and push upward the number of users in the coolest month.
- **If it is a snowy day/week, re-organize the bikes by equally splitting them into various docks.** This will a) ensure the availability of bikes in every area when the weather get better and b) not create inconvenience since the number of users will be really low in those days.
- **Plan to do maintenance interventions during the coolest months (November, December and January).** In this way, disruption to the service will not happen when customers need (and use) it more.
- **Day to day volatility is explained by temperature, wind speed, humidity and working day.** As such, tailor the business strategies based also on this weather related parameters. Days with strong wind may be perfect to re-organize the bike positioning, while days with the warmer temperature may be the perfect occasions to offer daily ride buses (i.e discounted price on the 3rd rides if you do all three rides in the same day and so on) to attract even more customers.

### APPROACH

Daily bike data for two years (2011-2012) has been analyzed after being loaded and cleaned. In particular, the project focuses on the number of total rides within a day, considered as a proxy for the total demand of bikes. This time series has been meticulously scrutinized and checked for missing value and/or outliers. Then, it has been smoothed with several methods in order to detect the presence of trend and seasonality, and tested for stationarity, to inquire what forecasting model would be the best fit.

Concluded this preliminary phase, a) several ARIMA models have been built in order to predict the future demand for bikes and b) an ARDL model has been developed in order to understand which variables (among temperature, wind speed, humidity and working day) may be significant in determining the demand for bikes. By intersecting the outcomes of these models, this study was able to provide significant insights on how to tailor the business' strategy on the forecasted demand.

### PROJECT LINK

<https://github.com/Lulloooo/R-capitalBike-demand-forecast/blob/main/README.md>