# Project Report

## Introduction

The project which uses the data of paid subscribers of Apple Music and Spotify, aimed to see the correlation between these two streaming platforms and to forecast the next quarters subscribers for each. To observe the correlation and the covariance growth rates are used whereas to identify the next quarters subscribers plain data used.

The first challenge of the problem was that the data sets were not identical, in Apple Music data monthly amounts with sometimes having gaps up to six months were presented and in Spotify data quarterly data were presented. After filling the months which were not given with backward and forward fill methods and getting the average quarterly data from Apple Music data set, we still had two datasets with different lengths, so the first three and last quarterly data of spotify were left out to do further analysis.

Second challenge resulted from data being quarterly and hence low in number. In this project we had 13 periods for each streaming platform.

Third challenge was related to different business models of the platforms. While Apple Music is only available to those who pay for it Spotify can be accessed by the people who won’t pay fees and instead will be exposed to advertisements. So, in the data sets we used we had all customer base of the Apple Music but only the paying customers of Spotify.

With all these challenges, the data sets used in this project are highly manipulated and may not reflect the full truth about the future of the observed streaming platforms.

## Covariance and Correlation of Apple Music and Spotify

The businesses which are operating in the same industry as streaming platforms had positive relation. The covariance result was identified using the growth rates of the platforms. 0.0015 covariance indicates that they are moving in the same direction but the development they are experiencing is not fully related. The low strength in their relation can be pointed out by the correlation rate which is 0.2142.

Hence, we can say that apart from providing similar products their relation is much more complex for other reasons. Availability in different softwares, availability for non-paying customers and the content of library may be some of the reasons for weak relation of the datasets used.

## Estimation Methods

Different methods including Simple Average, Simple Moving Average, Simple Exponential Smoothing and Holt are tested. Naive estimation and Holt Winters methods are left out since last two quarterly values for Apple Music are created with filling methods Naive Estimation was not suitable and since manipulation of Apple Music data caused false seasonality Holt Winters method was not suitable.

Among the included methods to identify the best one we used RMSE. The method which resulted with the lowest total error was Holt method. We expected this result is due to our ability to adjust alpha and slope values used in in the Holt estimation. According to the optimal alphas and sloped identified the subscriber estimation for Apple Music and Spotify in order are, 58.4159 million and 99.1759 million.

## Conclusion

According to the results we would recommend to investors to prefers Spotify. However there are many factors which hasn’t been regarded in this analysis. For example growth of Apple Music in USA is greater than Spotify’s but for investors in countries using Android more Spotify would be a better option. Also the limited data we had influences our result to a great degree. Even with the help of a great tool, such as Python it still wasn’t possible to decrease the errors to acceptable numbers.

Ece Çınar

Bengisu Güler

Beril Fatma Beler

Dicle Çağla Kınık