European Airline Stocks In Response To World Cup

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1 Introduction

2018 World Cup in Russia attracted 5 millions of tourists [1] to the hosting cities. This event may have boosted up ticket sales in Europe, where soccer games flourish. This report explores the opportunity of return of trading European airline stocks in World Cup events.

2 Dataset

From Yahoo Finance, we selected of 6 European airline companies. We downloaded the data that Yahoo can provide at maximum. For the sake of this report, we only used 360 days data starting from 2017-07-01. Among these, we mainly used data of 180 days starting from 2017-10-01. We will soon show the reason for this decision.

Symbol	Stock Name	Data Range
RYA.L	Ryanair Holdings plc	2001-01-02 – 2018-12-07
AFRAF	Air France KLM SA	2012-03-14 – 2018-12-07
DLAKF	Deutsche Lufthansa AG	2010-01-05 – 2018-12-07
AFLT.ME	Aeroflot - Russian Airlines	2010-03-03 – 2018-12-07
TKHVY	Turkish Airlines	2013-01-22 – 2018-12-07
IAG.L	International Consolidated Airlines Group, S.A.	2003-01-02 – 2018-12-07

Since some of them have missing data (with null values or simply no row for that date), we dropped those rows as a data cleaning procedure. This cleaning process resulted in 237 observations for 360-day range starting from 2017-07-01, and 117 for 180-days range starting from 2017-10-01.

3 Project Goals

Some Experts claimed that International Airline Group stock (IAG.L) was a strong position to benefit from World Cup [2]. Speaking of a big picture of the goal, we want to validate this conclusion, and possibly generalize the conclusion to more airline stocks.

Firstly, we will analyze the log-returns for each stock separately. We will see if the data is

consistent with normal sample and fits normal distribution. We will then use mean and variance to analyze their performance over time.

Next, we will compare their log-returns to find out their correlations, if any. We will test if the means of their log return are equal, and then perform linear regression for analyzing correlation. The more evidences that they move in similar trends, the more possibility that World Cup is a major factor for their moves, and therefore the safer the investment is.

4 Single Stock Analysis

At the very first step, we drew normal probability plots for each of the stocks and then a regression line along the data points. We used 90-day, 180-day, and 360-day data starting from 2017-07-01, 2017-10-01, and 2018-01-01 respectively to generate in total of 36 normal probability plots. These plots showed that stocks RYA.L, AFLT.ME, and IAG.L had close-to-normal data, while the others had less normal data. However, with an appropriate combination of start date and date range, all plots showed good normality. These selections include: 90 days after 2017-10-01, 180 days after 2017-10-01, 90 days after 2018-01-01, and 180 days after 2018-01-01. In the following analysis, we will mainly use 180-day data starting from 2017-10-01 for demonstration. However, every conclusion we made in this report came from analysis of not only this data range but also the other three.

Next, we studied the 95% confidence intervals of the means and variances of log returns from these 4 date ranges. We used the sample means and sample variances to calculate the t-distribution and chi-square distribution test statistics, respectively. Confidence intervals for the variances were extremely small, indicating that the data had steady trend. Confidence intervals for the means were also small, possibly implying small return of investment.

	ci_mean	ci_var
RYA.L	-0.00260061,-0.00247893	9e-08,1.5e-07
AFRAF	-7.728e-05,-7.714e-05	0,0
DLAKF	0.00032128,0.00032498	0,0
TKHVY	0.00038493,0.00039071	0,0
AFLT.ME	-0.00183682,-0.00169191	1.2e-07,2.1e-07
IAG.L	0.00094868,0.00100705	2e-08,3e-08

Figure 1: Confidence intervals for 180-day data after 2017-10-01

Our next step was to run linear regression on log return against number of days after the start dates. Looking at the plots for the above 4 date ranges, we were not able to find a strong relationship between the day and the log return. The respective beta0 values for the model were, though small, slightly more positive. And the respective beta1 values were generally negative. This seems to indicate that we would benefit from trading early, and benefit opportunities were diminishing through time.

But we need to investigate further to validate this point. We took a closer look at some of the statistics on the linear regression models.

	b0	b1	R.std.err	R2	t.b1	p.b1
RYA.L	-0.071817	1.6e-05	0.018298	0.001056	0.348649	0.727991
AFRAF	-0.003418	1e-06	0.00063	0.002069	0.488346	0.626234
DLAKF	0.003444	-1e-06	0.003192	7e-05	-0.090042	0.928411
TKHVY	-0.013035	3e-06	0.003987	0.000835	0.310017	0.757109
AFLT.ME	-0.302135	6.9e-05	0.019811	0.016669	1.396214	0.165339
IAG.L	0.037386	-8e-06	0.012675	0.000608	-0.264511	0.79186

Figure 2: Linear regression statistics for day against log-return of 180-day data starting from 2017-10-01

As shown in the table, the R-squares are generally close to zero, meaning that the models are not fitting well at all. The small t-values for beta1 further indicated that there is no strong relationship between day and log return. AFLT.ME, the stock of the company local to the game site, has a much better ratio of residual standard error to b0 (6.6%). But its flat slope does not make the model any better. In conclusion, the day and log return does not have linear relationships, so it is hard to predict future returns using this model.

5 Two Stock Analysis

To compare two-stock data, we used 95% confidence level, unknown-variance t-test, and null hypothesis being "two means are equal". We also drew linear regression between every two log returns. For simplicity of demonstration, we chose RYA.L as our base of comparison; only this stock will be tested against every other stocks.

The tests return extremely small p-values, so we are certain to reject the null hypothesis; this means that all other stocks log returns are very different than RYA.L's. We therefore consider that there is little correlation among these stocks. The close-to-zero slopes and also the small R-squares also confirm this conclusion. AFLT.ME, the stock of the company local to the game site, has much better but still very tiny p-value. This may imply that even locating at the game site did not help a lot with stock return.

stock2	p_value	slope	r2
AFRAF	1.98120536262777e-103	-0.000512	0.000221
DLAKF	7.02570806098486e-111	0.042279	0.058804
TKHVY	5.86678604539875e-112	-0.000919	1.8e-05
AFLT.ME	1.22908233095706e-31	-0.117829	0.011659
IAG.L	5.30824391595917e-116	0.19964	0.083094

Figure 3: Data comparison between RYA.L and every other stocks

This result is out of our expectation, because we thought that the huge amount of revenues gained from millions of tourists may result in a general positive trend to all airline stocks. In order to see if our choose of data made up a special case of conclusion, we then ran all the above calculations for other date ranges, including 180 days from 2017-07-01 and 180 days from 2018-01-01. Unfortunately, we reached the same conclusion.

6 Conclusions

In order to verify the experts' claims on the positive influence of World Cup to airline stock prices, we chose several European airline stocks to do analysis. At the beginning of our analysis, we made sure that the data for subsequence analysis was normal, which allowed us to run various statistical tests on the data without much manipulation efforts or assumptions.

As a result of single stock analysis, we did not find a linear relationship between the closeness of date to game date to the log returns. Therefore our model is not able to predict future returns.

As a result of 2-stock analysis, we did not find correlation among the stocks we chose. As they did not follow a general trend, we consider that World Cup event was not really having an important impact on them. Therefore, a lot of deliberation is needed before making investment in these stocks. Speaking of risk management, we do not consider it safe to buy or sell these stocks by only using World Cup date's emerging.

Our report is pessimistic on predicting the airline stock against World Cup event, but not all hope is lost. Several choices on the data are deemed critical on drawing the conclusions. The price-event pattern may be better revealed if they can be adjusted in the future.

Firstly, we picked 2017-10-01/2018-01-01 and 180 days as the primary data range for our tests. Not mentioning the normality tests we performed on the data, We picked this range

primarily based only on life experience, not statistical analysis. In other words, because we are used to plan our trips half year ahead, we chose such start dates and ranges. Since our own habits cannot represent the majority, changing these numbers may give more positive result.

We also need to study the underlying categories of travel industry, so that we can better select the stocks. For this report, we picked the stocks almost randomly, without knowing how they function in the sector; we picked them as long as they were a IAG.L-related stock found on Yahoo or Google and had sufficient amount of data. In our analysis, even Russian Airline data did perform well, even if its company is local to the game site. This implied that an airline operating company may not benefit so much from tourism driven only by World Cup.

In addition, we are aware that analyzing the 6 datasets combined is not sufficient to draw a relationship between stock price and World Cup events, because their common data range only cover 1 game. To reduce the potentially big variance because of small number of games, we should consider using data from more time ranges. Using RYA.Ls data covers 5 games from 2002 to 2018. It may not be ideal, but can possibly provide more insights on the return in response to World Cup. Other important effects to the stock prices can be diffused by looking at data from multiple games. For example, England is where world-grade soccer teams reside, but the national team was not attending the 2018 game. If this fact negatively impacted the price of RYA.L, we can even out this impact by joining other years' data.

References

[1] Tyrin, Denis. More than 5 Million Tourists Visit FIFA World Cup Host Cities in Russia. TASS, 2018, www.tass.com/sport/1012057

[2] Aitken, Roger. FIFA World Cup 2018: Five Stock Market Winners For Your Portfolio. Forbes, Forbes Magazine, 2 July 2018, www.forbes.com/sites/rogeraitken/2018/06/30/fifa-world-cup-2018-five-stock-market-winners-for-your-portfolio