

Extended Pair Trading Strategy Using Information of Firms' Competition & Industry Structure

Summary

Pair trading is one of the most popular arbitrage strategy backed by statistics. This strategy takes into consideration of two stocks which move closely which must be defined more specifically. This kind of strategy enables people who trade to make money in any kind of market condition. This strategy matches the long position in one stock to a short position in another stock, both stocks being very highly correlated. While setting up a pair trading strategy, there are two parts to it. The first part is the selection strategy where we decide on the anchor firm, and the pairs to build the strategy. The second part is the implementing the trading strategy.

Industry Overview

We explored the business similarities and complementarities of various firms and industries in great detail. For building the trading strategy, we chose Airlines Industry. The reason for choosing airlines is that the market share of airline industry is 132 billion with a steady 1.5% annual growth. The Domestic airlines in the United States have 354,039 flights. Airline industry is projected to grow in the next five years and one of the reason being growth in the disposable income. We also took the help of SEC Edgar website to access 10-K annual filings of the companies.

Data Collection

We filtered the number of Airlines by opting for large market capitalization in US. For this we took the help of Yahoo Finance. We would consider that this phase of the project was challenging and time consuming. The data was kind of fluctuating for the Airlines Industry in this period. Some airlines who were performing well 8-9 years back shut down their operations 5-6 years back. For some airlines, the data is available only from past 5 years. This was a big challenge in what factors to consider and what not. All the factors data has been collected from Wharton Research Data Services and Bloomberg Terminal.

Determining Anchor Firm, Ally, and Rivals

We have collected a lot of independent factors for different Airlines, but we finalized on Earnings per Share, Return on Assets, Leverage Ratio, Current Ratio and Fuel Expenses. We also conducted factor analysis on all available factors initially to find out important ones and eliminate the rest. But incomplete information for few years meant that analysis would have been biased. We have finalized the above mentioned independent variables to determine the anchor firm because those variables have proven to provide most of the data which helps us decide how the firm is doing when compared to the market. Next, we value weighted the companies' rankings or the time-period. After this, we have assigned weights to all the independent variables based on its importance. The following tables below show us the respective weights we assigned for each time-period and factor:

Weights	Time-Period
0.5	T
0.25	T-1
0.125	T-2
0.0625	T-3
0.0625	T-4

Weights	Variable/Factor
0.4	EPS
0.2	ROA
0.1	Leverage Ratio
0.15	Current Ratio
0.15	Fuel expenses

However, assigning equal weights to factors will not be impacting much in determining anchor firm for most of the years as we have already filtered out the most important factors. This conclusion is based on in-depth analysis and experimentation from our end. The idea to implement "weighting" strategy is inspired from one of the research papers - "The Value of Assessing Weights in Multi-Criteria Portfolio Decision Analysis" by "Jeffrey Keisler" from "University of Massachusetts Boston", whose link is cited in the references.

All the firms were ranked based on weights assigned to the time-periods and factors. We determined the least ranked one to be our Anchor firm. To find the Allies and Rivals, we needed the similarity scores between each of the firms. We can calculate the firm-by-firm pairwise similarity scores by parsing the product descriptions in item 1 or 1A from the firm's 10-K's and forming word vectors of each firm to compute continuous measures of product similarity for every pairs of firms in each year. It is an application of web crawling and text parsing algorithms which process text from 10-K's of SEC Edgar website. Due to convenience and time constraint, we have directly used the similarity scores already determined by researchers "Hoberg" and "Phillips" from their website. Construction of similarity matrix for required companies was done in MS Excel using "Linux programming". Alternative could be using Notepad++.

Ally Calculation: 50% weightage to Performance of the firm + 50% weightage to similarity scores

Rival Calculation: 40% Similarity of Anchor + 40% Similarity of Rival + 20% Performance of the firm

Year	2007	2008	2009	2010	2011
Anchor	Skywest	Skywest	Skywest	Skywest	Skywest
Ally	ExpressJet	Delta	Alaska	Hawain	Alaska
Rival 1	Alaska	Alaska	Hawain	American	American
Rival 2	Southwest	Hawain	ExpressJet	Delta	Delta

Year	2012	2013	2014	2015	2016
Anchor	Alaska	Alaska	Alaska	Alaska	United
Ally	Delta	Hawain	Delta	United	Alaska
Rival 1	American	American	American	American	Hawain
Rival 2	Skywest	Delta	Skywest	Delta	Delta

Call for Robustness Check

Inclusion of “Fuel Expenses” as one of the factors meant regional players like “Alaska” and “Hawain” came into play. This result was a boost as we could verify it from the following analysis. To check the robustness in determining our Allies/Rivals, we have done Data Analysis and Visualization using the tool “**Tableau**”. Since this itself being a very complex process and time being a constraint we have done this effectively for the year 2015-2016. To implement this, we have taken entire Airlines data from BTS (Bureau of Transportation Statistics). Also, American Airlines being the rival (including 2015) for most of the years, we have done some analysis for that as well and concluded that our strategy is decent enough to make enough profits. This data visualization technique could also be implemented as one of the back-testing strategies if done for all years. However, it is only for verifying! Using, MS Excel is more robust as we can also calculate the returns. We have considered the Airline delays for this analysis because studies show that on-time performance metrics affects the companies’ market share too. An example would be sudden fall in United Airlines Share prices last year, when a passenger with a ticket was de-boarded off the plane.

Back-testing and Out-of-Sample test

We have taken the portfolio formation date to be Jan 2007 and back-test period to be Jan 2002 to Dec 2006. The data is monthly returns which is for a period of 60 months. We gave the weights of 50% to ally, anchor firm and -50% to the rival firms. We calculated the expected returns for each year and found to be profitable when compared with S&P500 index.

For out-of-sample test our portfolio formation date was Jan 2007 and test period was from Jan 2007 to Dec 2007. Here the data was for a period of 12 months. We again assigned weights of 50% to allies and anchor firm and -50% for rival firms. Finally, we determined the actual returns for each month. This process was repeated for all the 10 years. Apart from neutral portfolio, we analyzed only the anchor firm and its pair (the long portion), the two rivals (the short portion) and a hedged portfolio where the weight of the portfolio is one instead of zero. We also conducted a statistical significance test in MS Excel.

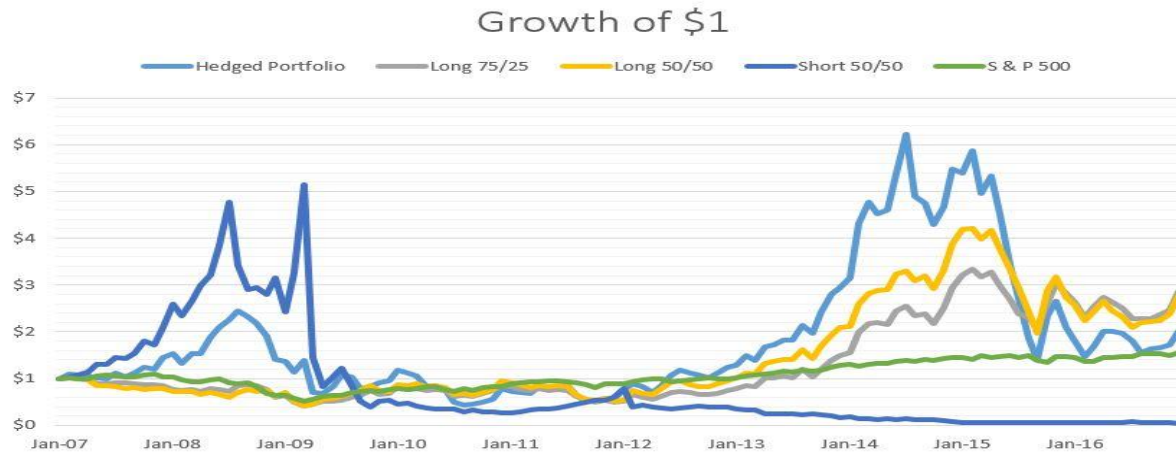
Risk Exposure Analysis

The results of the Fama French 4-Factor model are as follows:

R-Squared: 11.60%, B-RMRF: 0.44, B-SML: 0.17, B-HML: 0.08, B-UMD: 0.78, Alpha: 0.01

The momentum factor has a significantly positive beta which would mean the returns are higher.

This may be our evidence that correlated trading could affect the returns.



Turnover Ratio

We got the overall portfolio turnover ratio to be 52.5%. We took the charges as \$0.0015 per transaction from Stocktrack. Therefore, the overall charges are as minimal as \$0.0315

References

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