**Background for Publicly Traded Stocks:**

Once a tool primarily for the rich, publicly traded stocks have become a popular and powerful vehicle for people of various socioeconomic levels to use to build their wealth. Ownership of stock, also known as shares entitles the shareholder to voting rights within a company, a portion of the company’s distributed profits, known as dividends, and also the right to sell shares to others. Fifty four percent of all Americans are invested in the stock market through stocks, mutual funds, pensions and retirement plans such as 401Ks.

Investors in stocks profit from their investment primarily in two ways, appreciation of the value of the stocks held, known as capital gains, and portions of the profits paid out to investors, known as dividends. Investors can be either individuals are institutions and their strategies vary based on their goals which balance risk and reward.

**Problem Addressed**

Publicly traded companies are required to report on various metrics to inform current and prospective investors. These reports typically are issued quarterly or annually and it is rare to hear information such as sales growth announced between those reports. When employers hire new employees it indicates growth. In that sense how many people a company hires or lets go may indicate the health of the health of the company and help as a tool to evaluate a stock. What this experiment is meant to accomplish is to determine if there is a relationship between hires and layoffs, and a company stock price.

**Assumptions Made:**

When taking data from Linkedin, we are assuming that the reported data on linkedin is generally correct and that the number of people who have failed to update their linkedin profiles after changing jobs or deliberately falsified information is statistically insignificant. We are also assuming that the data for Linkedin is for the beginning of the month as October is already listed. We also assume that Yahoo Finance has provided reliable historical information.

**Data Issues**

Data for this project was sourced from Yahoo and Linkedin. Yahoo provided clean monthly intervals of data on this historical price for the closing price on first of each month. In order to get the data from linkedin, I needed to access the sales navigator tool, a premium tool designed to aid sales representatives with prospecting and customer relationship management. The tool contains information on current company headcount as well as information on whether is is growing or shrinking with records for each month. Because of the way it was formatted, I needed to manually record each month of data into the spreadsheet. Originally I had planned to take a sample of 100 stocks, but settled for a sample of 34 stocks for 408 total months of data. In order to assure that the samples would be free of bias, I created a simple python program and had it run a sample without replacement of the 505 tickers that make up the S&P 500. (5 of the listed companies have two tickers such as Alphabet inc which has goog and googl).

**Statistical Methods:**

Hypothesis Testing was done in order to test the difference between the means of the stock price and of the employee headcount.

Null Hypothesis: There is no correlation between a company’s stock price and their headcount

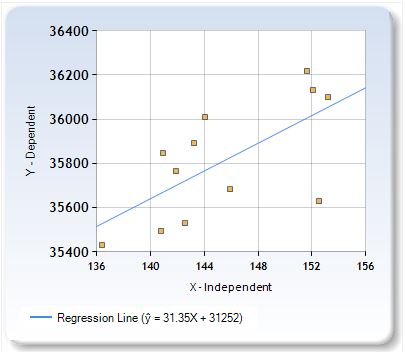
Alternative Hypothesis: There is a correlation between a company’s stock price and their employee headcount

The samples were taken randomly by a python program that took 34 random samples without replacement ensuring random unbiased results.

A two tailed t-test was used in order to test for significant differences between the stock price and the employee headcount each month. The confidence interval was set to 99%.

|  |  |  |
| --- | --- | --- |
| Stock Price and Employee Headcount | | |
|  | Stock Price | Employee Headcount |
| Mean | 145.428 | 35810.941 |
| Standard Deviation | 194.6 | 71109.111 |
| Population Size | 408 | 408 |
| Difference Between Means | 35665.513 |  |
| Degrees of Freedom | 814 |  |
| Standard Error | 3520.439 |  |
| T - Value | 10.131 |  |
| P - Value | <0.0001 |  |

The table indicates that there is a strong relationship between the price of a stock and the employee headcount at that company, there is a significant difference between the values of P and of T, but the pattern shows a relationship.



A regression calculator was also used to test the means of the stock price and employee headcounts for each month. The regression line indicates a positive linear relationship between stock price and employee headcount. The mean is used because a lot of companies vary wildly in employee headcount and stock price.

**Conclusions:**

Based on our findings we can reject the null hypothesis that there is no correlation between a company’s stock price and their headcount. We can make the conclusion that as companies grow in headcount that their stock price seems to generally go up. What this can mean for investors is that when combined with other value metrics, that it may be possible to identify an undervalued stock in part by the fact that it is still bringing on new employees. We should be cautious to rely too heavily on this relationship as there are things that can boost profitability while reducing the workforce, and there was at least one REIT in this sample which pays out 90% of its profits as dividends, slowing appreciation of stock price despite a growing headcount.

**Further Study:**

Since we were able to reject the null hypothesis, this relationship does warrant further study. Through the use of data infrastructure and mining tools, a much stronger study could take place in the future with a much larger sample. The possibility also exists to break down the results by profession, which could give insights to other metrics. An example that comes to mind is a company that is hiring more operations may be doing so because they have had a large increase in sales and need to fulfill more orders. Company career pages could also be mined to give insights as to who the company is planning to hire to predict these trends months in advance. This could also be tested in reverse as linkedin allows for screening companies which have lost a certain percentage of workers.

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