Does Monday Effect Exist in U.S. or Other Stock Markets?

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Summary

The object of this project is to investigate the Monday Effect, which is a non-random relationship between the equity market return rate on Monday and the previous Friday. We shall focus on stock indexes instead of single stocks to get a more realist insight into the whole stock market. We selected 8 typical stock indexes of the US and abroad, and did statistical analysis of index log-return. Specifically, we examined the distribution and other features of index log-return on Monday and Friday, then analyzed two-index comparison. Based on the result, we researched the Monday Effect in multiple equity markets by these indexes.

1 Project Goals

Financial practitioners claim that the Monday effect, which says the asset return on Monday will follow the trend of the previous Friday, exists in various markets. From the behavioral finance point of view, the Monday effect is mainly due to "Anchoring Bias". The "Anchoring Bias" says that investors tend to rely too heavily on the first piece of information seen, therefore, on Monday, investors will still rely on the information of the last trading day, the previous Friday. Additionally, the information does not diffuse immediately, investors usually digest multiple pieces of information during the weekend to make the investment decision of the next week. Therefore, investors who do not hold these outstanding stocks on Friday will open complementary long positions of these targets on Monday. If this non-random pattern of asset return does exist, investors can utilize a strategy that long assets which have a good performance on the last Friday to obtain an extra return rate and bit the market. To get a rational and

quantitative insight into this phenomenon, we conducted a statistical analysis of the log-return of stock indexes.

Firstly, we analyzed the statistics features of one single stock index, including the randomness, distribution, confidence level of return rate, and the tendency. To investigate the distribution of log-return, we plotted the normal probability plot of the data set to determine if it is normally distributed. Based on these results, we researched the behavior of these index log-returns' mean and variance, using the fact that this large sample is asymptotically normally distributed. Lastly, we used linear regression analysis of the log-return and the time to examine the tendency.

Additionally, we did a comparative analysis of the two-index pair to investigate the performance of two indexes to see if a stock market can over perform than another one or has a non-random relationship with another. To answer this question, we calculated the confidence intervals of the difference between the mean and the variance. Moreover, we performed a linear regression of the log-return of an index on another, to determine whether they are correlated.

2 Date Set

Our sample consists of open price and close price of stock index in the US, China, Japan, Canada, and Europe. The sample period is from Dec 1, 2015, to Dec 1, 2019, which is approximately 1000 data points depending on the index. The ticker, index name, and the number of data points are listed in table 1. [1]

Table 1: Data set

Ticker	Index	Market	Data Points
DJI	Dow Jones Industrial Average	U.S.	1008
GSPC	S&P 500	U.S.	1008
IXIC	NASDAQ Composite	U.S.	1008
000001.SS	SSE Composite Index	China	975
HSI	HANG SENG INDEX	China	986
N225	Nikkei 225	Japan	980
GSPTSE	S&P/TSX Composite index	Canada	1005
N100	EURONEXT 100	Europe	1024

[1] Our data source is Yahoo Finance.

3 Single Stock Index Analysis

In the stock market, everyday emerges tons of information which affects the market situation in a random way. Thus, we assume our data are random samples. We conducted following tests on each stock index.

3.1 Normal distribution

We test if the data have an approximate normal distribution. From the histogram of log-returns of each index, it looks indeed middle data points showed more frequent and extreme values are less frequent. To see a more quantitative result, we plotted a normal probability graph.

By definition, if the data are consistent with a sample from a normal distribution, the points should lie close to a straight line. From the normal probability plot, we found that the Hang Seng Index and Nikkei 225 have a thin tail and S&P/TSX Composite Index has a long left side branch. Generally speaking, these stock indexes data are quite normal. Otherwise, this sample is large enough to be tested.

3.2 Confidence interval

Now that our data is a random sample and approximate random distributed, we calculate the confidence interval of the means and variances. Because μ and σ^2 are unknown, we use t-distribution with $n-1$ degrees of freedom to get C.I. for μ; and χ^2 distribution with $n-1$ degrees of freedom to get C.I. for σ^2. 95% confidence interval is reported in table 2. From the table we can find confidence

Table 2: 95% Confidence Interval for μ, σ^2

Stock Index	C.I. for μ	C.I. for σ^2
Dow Jones Industrial Average	[-7.31E-04, 1.19E-03]	[1.20E-04, 2.10E-04]
S&P 500	[-8.16E-04, 1.10E-03]	[1.19E-04, 2.09E-04]
NASDAQ Composite	[-7.60E-04, 1.24E-03]	[1.31E-04, 2.28E-04]
SSE Composite Index	[-6.37E-04, 2.87E-03]	[3.74E-04, 6.55E-04]
HANG SENG INDEX	[-1.15E-03, 8.70E-04]	[1.26E-04, 2.21E-04]
Nikkei 225	[-2.29E-03, 1.12E-03]	[3.54E-04, 6.19E-04]
S&P/TSX Composite index.	[-6.49E-04, 1.01E-03]	[8.91E-05, 1.56E-04]
EURONEXT 100	[-1.75E-03, 6.02E-04]	[1.85E-04, 3.24E-04]

intervals for means are all tiny intervals around 0, i.e., these samples have zero means distribution. Confidence interval for variances are all slightly above 0,

that is to say our sample is distributed with very small volatility.

3.3 Regression on time

We performed a linear regression of the log-return on time. The result for different indexes are showed in table 3. The result shows that the R squares of

Table 3: Single Index Regression

	β_0	β_1	R^2
DJI	0.00030	-2.6576E-07	0.00011
GSPC	-0.00004	-2.0982E-07	0.00013
IXIC	0.00044	-5.6107E-07	0.00037
000001.SS	0.00143	-9.4703E-07	0.00063
HSI	-0.00035	2.1963E-07	6.41722
N225	-0.00055	9.2063E-07	0.00089
GSPTSE	-0.00004	-2.0982E-07	0.00013
N100	-0.00032	6.2424E-07	0.00067

all these regressions are approximately equal to zero, therefore, we can conclude that there is no tendency of these indexes. In other words, the dynamic of an index is a random walk.

4 Two Stock Indexes Analysis

This part we first test two stock indexes a time to test the equality of the two population means. As stated in section 3.1, our data is a random normal sample with unknown variances. Our null hypothesis is $\mu_1 = \mu_2$, the alternative hypothesis is $\mu_1 \neq \mu_2$. Because the sample is large we use the standard normal distribution to test it.

As calculated in our Jupyter widgets, for any pair of the stock indexes, we do not reject H_0 at the confidence level of 95%. Therefore we "accept" that $\mu_1 = \mu_2$ for each pair of stock indexes.

Next, we regress log-returns of one stock indexes on another. For example, we regressed index DJI on the rest of the indexes and results are reported in table 4. R^2 means the portion of variance explained by the model. From the results, we can find DJI regression has higher R^2s with other two U.S. stock indexes GSPC and IXIC, smaller R^2 with Canadian market index GSPTSE, but rather small with Asian markets' indexes. This makes sense in that indexes within the same market share many common stocks while indexes in different markets hardly have stocks in common.

Table 4: Regress DJI on other Indexes

	β_0	β_1	R^2
GSPC	-8.084E-05	0.9647	0.937
IXIC	8.243E-05	0.6908	0.439
000001.SS	1.200E-03	-0.2202	0.016
HSI	-2.000E-04	0.1179	0.013
N225	-6.000E-04	0.1777	0.011
GSPTSE	9.742E-05	0.3681	0.183
N100	-7.000E-04	0.2739	0.049

5 Monday Effect Analysis

The Monday Effect that we are investigating states that returns on the stock market on Mondays will follow the prevailing trend from the previous Friday. Some theories have been put forward to explain this effect from different perspectives. In terms of behavioral finance, we assume that the Monday effect has a lot to do with the tendency of investors to rely on information from the last trading day, Friday. Abraham and Ikenberry (1994) argued that Monday's performance is conditioned on Friday's performance since investors who initiate Monday morning trades are particularly sensitive to the poor performance on Fridays. Thus, we examine the correlation of return changes on Fridays and Mondays and find evidence of this dependency.

In our empirical test, we focus our attention on the log-returns of the stock index of multiple stock markets. Our sample period consists of 199 sets of Fridays and following Mondays from 2015 to 2019. Then we use Friday returns as regressor and Monday returns as regressand to perform a linear regression. The results in

Table 5: Linear Regression of Monday Returns against Friday Returns

	β_1	p-value of β_1	R^2
DJI	0.100	0.155	0.011
GSPC	0.090	0.156	0.011
IXIC	0.102	0.111	0.014
000001.SS	0.053	0.534	0.002
HSI	-0.012	0.863	0.000
N225	-0.175	0.001	0.065
GSPTSE	0.033	0.702	0.001
N100	0.100	0.144	0.011

table 5 indicated that there does not appear to be a linear relationship between the Friday returns and Monday returns on most of the stock markets. The p values of the slope are not small enough to reject $H_0 : \beta_1 = 0$ and R^2 are less than 10%. We also note that Japan stock market (N225) is the only market that

Monday performance mirrors Friday's performance. Consequently, we conclude that the Monday Effect theory does not exist in most markets.

6 Conclusion

Imported the stock index data on worldwide stock markets from Yahoo Finance, our research maintains credibility and quality by analyzing eight different stock indexes for four years.

Concerning single stock analysis, we tell from the histogram and normal probability graph that these stock indexes data are quite normal. Besides, it turns out that the confidence intervals for mean return are around 0 with small volatility, following a random walk. When we compare two stocks, we find that for any pair of the stock indexes, we do not reject H_0 at the confidence level of 95%. And the result of two stock return regression shows that DJI regression has higher R^2s with other two U.S. stock indexes GSPC and IXIC, smaller R^2 with Canadian market index GSPTSE, but rather small with Asian markets' indexes. This makes sense in that indexes within the same market share many common stocks while indexes in different markets hardly have stocks in common.

Although some theories have been proposed to explain The Day-of-the-Week Effect, our regression output of statistically insignificant β_1 and small R^2 indicate that little or no evidence has been found to support the correlation between the Monday returns and Friday returns on most of the stock markets.

References

Abraham Abraham and David L Ikenberry. The individual investor and the weekend effect. *Journal of Financial and Quantitative Analysis*, 29(2):263–277, 1994.