

# Investment Analysis of the Logistics Industry

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**Abstract.** After Covid-19, the American stock market experienced a big impact. This paper mainly focuses on the consequent influence on the logistics industry in US and the investment portfolio on them. This paper also aims to compare the average return, standard deviation and sharp ratio of two classic investment portfolio models: the Markowitz model and the Index model in logistics industry in US before and after covid-19. Through analyzing the data of 10 logistics industry stocks in America and the data of Standard Poor 500 as a reference from 2019 to 2021 using these two models, it is found that the average return was much higher with a corresponding higher standard deviation after covid-19, disregard of the investment models on the portfolio. It is also found that the Markowitz model had a better overall performance (smaller standard deviation and higher sharp ratio) than the Index model (although they always had the same average return), disregard of the impact of the pandemic.

**Keywords:** Covid-19; Logistics industry; Investment portfolio.

## 1. Introduction

With the present condition that Covid-19 is sweeping the world, in order to control the epidemic and bring down the number of infected people, countries have implemented controls on the circulation of people and transportation. At the same time, it has brought pressure on economic operation from consumption and production, and the speed of economic growth in many major economies shows a significant downward trend, and the impact is more obvious in developed countries than in developing countries.

At the same time, for the cross-border logistics industry, the income of these enterprises has decreased. The level of the consumer index has declined, and there has been a certain change in the consumption structure, which has led to a decrease in aggregate demand. In addition, logistics providers need to disinfect regularly and restrict the flow of personnel, which reduces labor efficiency and increases logistics costs to a certain extent. On the other hand, the uncertainty of the number of people going to work affected by the epidemic makes it impossible to assess working hours and work efficiency, this increases labor costs. For the U.S. transportation and logistics industry, retailers have relied more on delivery companies to deliver online orders amid a sharp drop in store traffic during this year's shopping season due to the COVID-19 pandemic. The NRF estimates that online shopping jumped 44% year over year in the five-day period that includes Black Friday and Cyber Monday, so there has been a significant increase in demand for the homegrown logistics industry.

Asli et al. found a statistically important negative correlation between stock market and the financial ratios with short and long term debt to total equity of firms [1]. Kale et al. found that companies that have larger alliance experience and those who invest in a dedicated alliance function have a higher rate of success. Therefore, one method to build and increase an alliance capacity can be creating a dedicated alliance function [2]. Cooper et al. contended that the public does not have a common perspective of what SCM is or should be by showing in the literature and practice. And many writers hold the opinion that SCM goes beyond functions, firms and business processes, thus leading it more than just logistics [3].

Wachter interpreted the equity premium without assuming a high value of risk aversion, thus showing the stock market's high level of volatility. Because of a trade-off between a rising desire for the same due to the increasing increment of disaster and a simultaneously rising risk of default, the volatility of the government bill is kept in a low range [4]. Campbell and Shiller indicated that the dividend-price and price-smoothed-earnings ratios have a special significance [5]. Stasys et al. analyzed the origin of the formation of stock market bubbles and dealt with them [6].

Mentzer et al. argued that there are many factors related to logistics service quality, such as market competition and international cooperation [7].

Wang showed that the enterprises must maintain safety inventory rate in order to achieve long-term development [8]. Francis and Robert indicated that using the often-used approximation, the development of fish was obtained through calculation [9]. Zhao and Wang studied the whole logistics system in which storage is the middle link between supply and consumption. It is the basis of the design of the whole system and plays the role of cushion and balance. Hence, it is of great significance to apply computer simulation technology to help with the storage system management, to reduce the cost of logistics [10].

Therefore, based on some financial analysis, this paper focuses on the investment logistics industry.

## 2. Data and Method

### 2.1 Description of the selected companies

Landstar System is Founded in Delaware in January 1991, Inc. The company serves customers across multiple modes of transportation, primarily throughout the United States, but they also provide some basic services in other countries in North America. The company's services emphasize security and information coordination, using the Internet to link independent commissions and sales agents and third-party manufacturers to serve customers. The company only uses cargo transportation and storage services provided by third-party manufacturers. The nature of the company's operations is that a large portion of operating costs is directly proportional to revenue.

United Parcel Service, Inc. is a package delivery company founded in 1907 by Jim Casey and Cloude Ryan in Seattle, Washington, USA. Named the American Courier Company. The company initially provided transportation and logistics services primarily in the United States. In 1999, UPS went public successfully. Subsequently, UPS paid more attention to the direction of international services and acquired several companies to continuously expand global market channels, becoming the world's leading provider of aviation, marine, ground, and electronic services.

FedEx is a subsidiary of FedEx Corporation and is the core of the group's express business. It was founded in Little Rock, Arkansas, in 1971 by Frederick W. Smith, FedEx provides courteous services to customers in different forms, such as transportation, e-commerce, and commercial operations. By the late 1980s, FedEx was growing and firmly established as the leader in overnight express delivery in the United States. In 1989, it acquired its biggest competitor, Flying Tiger International. Meanwhile, FedEx is now gradually moving towards e-commerce.

B. Hunt Transport Services, Inc. was established in Arkansas, the USA in 1961 and listed on Nasdaq in 1981. It is the largest multimodal transport and integrated logistics service provider in the United States and a Fortune 500 company in the United States. At the same time, J.B. Hunt is also a Dow Jones Member stock of the transportation industry index, S&P500, and NASDAQ-100 index. The company provides logistics to customers in North America (United States, Canada, Mexico) through four main businesses: Multimodal Transportation (JBI), Customized Contract Logistics (DSC), Integrated Solutions (ICS), and Complete Vehicle Transportation (JBT) Services and solutions, the service industry involves consumer goods, electrical appliances, paper products, food and beverage, automotive and other industries, including many global top 500 customers.

## 2.2 Model

Then we use Markowitz and Index model for analysis. The Markowitz model was invented by Harry Markowitz in 1952. It is a optimization model for investment portfolio. It also provides assistance to select the portfolio efficiently through analyzing all different possible portfolios of the given stocks. Compare with the Markowitz model, the index model is a simpler asset pricing model to make the optimization on the portfolio through introducing the market return and market standard deviation. The model was developed in 1963 by William Sharpe. Firstly, it should determine the weight. To make a simulation, we set each equity's weight randomly for 1000 groups. In excel, we use random function to determine their weight:  $\text{Weight} = \text{rand}() * 3 - 1$ .

### 2.2.1 Markowitz model

$$\text{total return} = \Sigma(\text{weight} * \text{return}) \quad (1)$$

$$\text{standard deviation} \quad (2)$$

$$\text{sharp ratio} = \text{return} / \text{standard deviation} \quad (3)$$

Where x means weight, r means to return and cover means covariance. Then it puts the formula into excel, with the preprocessing data to calculate the return and standard deviation. It contains the followings steps:

$$\text{return} = \text{SUMPRODUCT}(\text{weight}, \text{return}) \quad (4)$$

$$\text{standarddeviation} = \text{SQRT}(\text{MMULT}(\text{MMULT}((\text{weight} * \text{return}), (\text{correlation})), \text{TRANSPOSE}(\text{weight} * \text{return}))) \quad (5)$$

$$\text{sharp ratio} = \text{return} / \text{standard deviation} \quad (6)$$

### 2.2.2 Index model

$$\text{return} = \text{sumproduct}(w_i * \beta_i) * r_M + \text{sumproduct}(w_i * \alpha_i) \quad (7)$$

$$\text{standard deviation } s^2_{IM} = (\text{sum-product}(w_i * \beta_i) * s_M)^2 + (w_i * s_r)^2 \quad (8)$$

$$\text{sharp ratio} = \text{return} / \text{standard deviation} \quad (9)$$

Where alpha is the expected excess return; beta: sensitivity coefficient;  $R_m$  means market return.  $S_m$  represents the market standard deviation. Then it put the formula into excel, with the preprocessing data to calculate the return and standard deviation. It contains the followings steps:

$$\text{Return} = \text{SUMPRODUCT}(\text{weight}, \beta) * \text{market return} + \text{SUMPRODUCT}(\text{weight}, \alpha) \quad (10)$$

$$\text{Standarddeviation} = \text{SQRT}((\text{SUMPRODUCT}(\text{weight}, \beta) * \text{market standard deviation})^2 + \text{SUMPRODUCT}(\text{weight}, \text{standard deviation})) \quad (11)$$

$$\text{sharp ratio} = \text{return} / \text{standard deviation} \quad (12)$$

Finally, after all, the calculations for 1000 weight groups, we can get the stocks' weight, standard deviation, and the sharp ratio in both Markowitz and Index models.

### 3. Results

As shown in Table 1, before Covid-19 (2019.02-2020.02), the average return of the industry equity portfolio in the Markowitz model and the Index model is the same (7.4079%). However, the Markowitz model had a better performance than the Index model with a standard deviation of 0.384 against 0.428. This also leads to a higher sharp ratio in the Markowitz model than in the Index model (0.383 against 0.323). As a result, the Markowitz model would have more advantages in portfolio investment on industry security.

**Table 1.** Essential Factors for Calculations of Markowitz and Index Model Before Covid-19 (2019.02-2020.02)

STOCKS	The annualized rate of return	Annualized StdDev	Beta	Annualized Alpha	Annualized Residual StdDev	Average Weight
SPX	0.24	0.13	1.00	0.00	0.00	0.53
UPS	0.10	0.28	1.36	-0.23	0.22	0.46
FDX	-0.07	0.27	1.89	-0.53	0.14	0.46
JBHT	0.16	0.27	1.13	-0.12	0.22	0.53
LSTR	0.15	0.19	1.26	-0.15	0.11	-0.99

**Table 2.** Results of Markowitz and Index Model Before Covid-19 (2019.02-2020.02)

	Markowitz Model	Index Model
Average Return	0.07	0.07
Average StdDev	0.38	0.43
Average Sharpe Ratio	0.38	0.32

After Covid-19 (2020.03-2021.03), Table 3 presents that the average return's performance was outstanding. The average return for the Markowitz model and Index model was both 41.08%, 5.54 times as much as the return before Covid-19. However, this also leads to an increase in standard deviation, for 0.604 and 0.651 respectively. Likewise, the Markowitz model had a better sharp ratio than the Index model (0.704 against 0.656), so the Markowitz model was still a better choice for investment.

**Table 3.** Essential Factors for Calculations of Markowitz and Index Model After Covid-19 (2020.03-2021.03)

STOCKS	The annualized rate of return	Annualized StdDev	Beta	Annualized Alpha	Annualized Residual StdDev	Average Weight
SPX	0.20	0.25	1.00	0.00	0.00	0.53
UPS	0.49	0.37	0.69	0.35	0.32	0.46
FDX	0.63	0.43	0.87	0.45	0.37	0.46
JBHT	0.34	0.31	0.96	0.15	0.19	0.53
LSTR	0.39	0.26	0.74	0.25	0.18	-0.99

**Table 4.** Results of Markowitz and Index Model After Covid-19 (2020.03-2021.03)

	Markowitz Model	Index Model
Average Return	0.41	0.41
Average StdDev	0.60	0.65
Average Sharpe Ratio	0.70	0.66

In conclusion, due to Covid-19, the industry equity portfolio was positively affected with much more return and a higher sharp ratio. The investment in industry equity will be a good choice after Covid-19. Furthermore, in comparison between the Markowitz model and Index model, the former always had a better overall performance, regardless of the impact of the pandemic.

## **4. Discussion**

### **4.1 Results of financial index**

#### **4.1.1 The aspect of data**

The average income of the Markowitz model and the Index model is about the same. The reason is that the data of these logistics companies we selected are relatively recent, and the amount of data was rather few. Therefore, the results of the two models will not be affected by the earlier historical data, and the amount of calculation is small. Also, the difference between the average standard deviation and the sharp ratio of the two models is small, which may be related to the amount of data and the low computational complexity of the model. In the future, more data can be collected for further analysis.

The annualized rate of return of all the stocks increased largely after experiencing the Covid-19 period. To reduce the exposure to the virus and obey the regulations, customers increased their frequency of purchasing online and using e-commerce, which makes a large contribution to the logistics business. B. Hunt Transport Services (JBHT) and Landstar System (LSTR) provide logistics to customers mainly in North America. The growths of their annualized rate of return are relatively lower than FedEx Corp. (FDX) and United Parcel Service (UPS), which are the world's leading providers of aviation, marine, ground, and electronic services. Such a result may be caused by the uneven distribution of COVID-19 cases and the different regulations varied in the regions.

#### **4.1.2 Operation and Financial parts**

The investment companies we choose are all from the logistics field, which is relatively centralized, so these companies are highly relevant. However, the proportion of LSTR companies in the MM model is close to -1, which shows that the company's business model and risks are different from those of other logistics companies, and it can better hedge risks. Therefore, we have adopted investment decisions that are different from those of other logistics companies, resulting in a small average standard error in the final portfolio. In addition, we have also selected the S & P 500 index as the referenced investment. This index covers the stocks of Companies in many fields. Its income and risk trends are quite different from the stock trends of the logistics companies we selected. Therefore, its correlation with the stocks of the logistics companies we selected is small, that is, the covariance or correlation coefficient calculated in the MM model is small. Finally, the average standard deviation calculated in the MM model is smaller. On the contrary, in the IM model, we take the S&P 500 index as the reference standard for market investment, while the other four companies we selected are logistics companies. Their business operation mode and future development trend are quite different from that of the S&P 500 index because the S & P 500 index contains many companies and changes greatly. Therefore, the S&P 500 index is not very representative of the logistics companies we selected, so the standard error of the portfolio calculated with it as a reference is larger when compared with the MM model. At the same time, we can see that the Sharpe ratio calculated in the MM model is larger than that calculated in the IM model, mainly because the average returns calculated in the two models are similar, but the standard error in the IM model is larger, so the Sharpe ratio is smaller.

### **4.2 The Influence of the COVID**

From the data above, Covid-19 did not make much of a difference to the advantages and disadvantages of both models generally. Neither did it affect the average income and the standard deviation much. From the Sharpe ratio, the Covid is somehow good for the logistics stocks.

Different models would affect the different results of the investment. People who are risk-bearers can be braver and choose the Markowitz model which can offer a higher income rate with higher risks, while the people who are not risk bearers can choose the IM model to be more cautious.

## 5. Conclusion

This paper selected four logistics companies to make the investment analysis and combined the data from the companies with the S & P 500 index to construct an investment portfolio. The study used the MM model and IM model for analysis and calculated the average return, standard deviation (risks), and Sharpe ratio of the investment portfolio before and after the epidemic. Based on the research, we mainly came to two conclusions. First, in the comparison of the models, we found that the investment opinions of the MM model are bolder than that of the IM model, that is, the average returns of the two models are the same, but the standard deviation of the former is smaller, and the sharp ratio is higher, and the conclusion is applicable before and after the epidemic, that is, the epidemic will not affect the conclusion of the model on investment analysis. Second, through the analysis of the two models, it is found that the average return of the investment portfolio after the epidemic is significantly higher and the standard error is also increased compared with that before the epidemic, but the sharp ratio is significantly higher. Therefore, it may be more attractive to invest in logistics enterprises after the epidemic. When investing, one needs to think carefully, make rational investments, and give consideration to both risks and benefits. From our research results, it can see that the selection of models is very important, and the conclusions of different models will also lead to different conclusions. Therefore, we need to carefully analyze it in combination with our actual situation. As we all know, the epidemic has had a great impact on our production and life. Similarly, our financial investment will also be affected. For example, the logistics companies this paper analyzed will perform better after the epidemic, which needs attention, to live a richer return on investment.

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