



Hedge Fund Strategy Performances during Corona Virus Disease 2019

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Abstract

The COVID-19 has brought huge impact on the capital market around the global. Since hedge fund is regarded as a useful risk manage tool, investors became curious of the profitability of this financial strategy. This article presents the performance of two main strategies-merger arbitrage and long short equity trade-utilized in hedge funds from the beginning of 2020 to the end of 2021. Stocks in each strategy are chosen from fields covering consumption, luxury, medicine and real estate. The cases of merger arbitrage strategy analyzed in this paper were chosen from presented news or announcements, while the portfolios of long short equity trades were selected based on its correlation and beta. In the following analysis, historical data of all involved stock prices were analyzed through line charts. Furthermore, the performance of each hedge case was measured through excess return, Sharpe ratio and Sortino ratio. Based on comparisons, long short equity outperforms merger arbitrage in usual cases and field profitability follows luxury > medicine > consumption > real estate. These results shed light on guiding investment decision in terms of hedge fund strategies.

Keywords: Merger Arbitrage Strategy; Long Short Equity Trade; Hedge Fund Strategy; Industries; COVID-19

1. INTRODUCTION

Hedge fund means "risk-hedged fund", referring to conducting two market-related transactions simultaneously, which are in opposite directions, equal amounts, and even equal profits and losses [1]. The logic hind is asset pricing, the theory which is heavily dependent on Markowitz risk-return model, CAPM, ATP and Fama-French three factor model. The world's first recorded hedge fund strategy is believed to be funded by Jones in 1949, which was initially used to magnify revenue through leverage and transfer risk through derivatives trading. It used long short strategy which made profits by longing and shorting two similar securities. Hedge fund raises capital from only small group of institutional investors and wealthy individuals and has a wide choice to pick underling assets from stocks, bonds and derivatives markets [2]. Contemporarily, hedging strategies have gone varied and the flexibility of hedge funds and their high returns by using leverage have been continuing attracting abundant investors. According to Ref. [3], scholars found identified seven strategies performed better than the S&P500: Global Macro, Multi Strategy, Emerging Markets, Long/Short Equity, Event Driven, Convertible Arbitrage, and Fixed Income Arbitrage.

Since the broke out of COVID-19, most hedge fund strategies received an average positive return. According to the historical data, the long short strategy and global

macro trade outperformed other strategies due to an economic recovery K-trend in terms of technological analysis as well as direct macro information such as the federal reserve's decision about lifting the interest rate to control high inflation. Meanwhile, trades based on commodities and fix-income securities have been widely added into portfolios for its character as risk management tool. On the other hand, merger arbitrage based on event studies showed its shortcomings which had the lowest average return [4].

Some previous studies have focused on the performances of the most typical long short equity trade hedge fund strategy. Fung and Hsieh looked into the most classic long short strategy and found that among more than three thousand similar style hedge funds, only less than 20 percent of them had an alpha return [5]. Lan and Wang used a dynamic model to estimate the performance of short side trade and found leverage is usually plays the key role in earning positive returns [6]. Other studies have investigated the proper method to correctly estimated strategy performances. Prado studied VAR estimation in 2005 using various strategy under the existence of market risk to identify potential loss, but found that if time independent and normal distribution are not satisfied, then VAR is not efficient [7]. Subsequently, Capocci built a multi-factor performance analysis model in 2007 and introduces sharpness and skewness into the risk-return two factor system [8]. This new method subtly analyzes the performances of various hedge fund strategies by

considering the side risks. Conlon, Crane and Ruskin took correlation between underlying assets into consideration by measuring changes in portfolio risk in hedge funds using matrix of correlation coefficients calculated a certain period of over time [9]. In addition, although little work has been done on the concept of COVID-19, a number of scholars have been discussing the performance of different strategies under unusual scenarios such as the 2008 financial crisis. Falkowski, et al. investigated the effectiveness of hedge fund strategies with the influence of the global financial crisis [10]. They compared the strategy performances in the period of 2007 and 2009 with a longer holding period from 1994 to 2015 and discovered that total risk will still be diminished under global crisis, indicating the effectiveness of hedge fund strategies.

To summarize, hedge fund has a great performance and possesses high value in research, while COVID-19 has brought much volatility to the global financial market. Hence, there is an urgent need to study the performances of different hedge fund strategies and better instruct future hedge fund municipals. The rest part of the paper is organized as follows. The Sec. II will introduce the data origination and analysis methods. Subsequently, the Sec. III will demonstrate the results and give explanations accordingly. Eventually, a brief summary will be given in Sec. IV.

2. METHODOLOGY

This section reveals the selected stocks and the approach to measure the performances of both merger arbitrage strategy and long short equity trade.

2.1. Portfolio selection

In terms of merger arbitrage strategy, four typical merge events are chosen including IFF buying DuPond, KERING buying MONCLER, AZN buying ALXN and SHIMAO buying FUSHENG, among which, both

SHIMAO and IFF announced their decision in 2019 whereas the other two companies made announcement in the early 2020. Next, to make more stringent comparisons, the four portfolios of long short equity trade are built respectively toward the mentioned four merger arbitrage representing industries of consumption, medicine, luxury and real estate. The paper uses EYE and MAIRUI to represent medicine, PEP and MDLZ to represent consumption, HRMS and CFR to represent luxury, BAOLI ESTATE and LVDI to represent real estate. According to test in EXCEL and price trends in Fig. 1, there is high correlation within each portfolio. In addition, to better figure out the performance of strategies happened under the impact of COVID-19, this paper looks into a time series starts from 2020.1 and ends in 2021.12 with semi-annual frequency. Hence, there are four-time windows in this research.

According to previous research, three methods are included: excess return, Sharpe ratio and Sortino ratio. Initially, Stocktrak is utilized to track the abnormal price movements and recent news related to more than 30 stocks. Later, 16 stocks are chosen to form 8 hedge fund portfolios including 4 merger arbitrage and 4 long short equity trade. In the end, the data of 16 daily stock prices are downloaded from yahoo finance and investing, whereas risk free interest rate of China is selected from CSMAR data base, and risk-free rates of U.S. and Europe are collected from CEIC data base. The detailed data sorting procedure is with the aid of EXCEL and STATA14. Table 1 shows the data of risk-free rates of the U.S., Europe, and China which will be used in following sectors.

TABLE 1. RISK FREE RATES OF DIFFERENT REGIONS

Country	U.S.	Europe	China
Risk free interest rate (2020.1-2021.12)	2.83%	-0.5%	1.5%

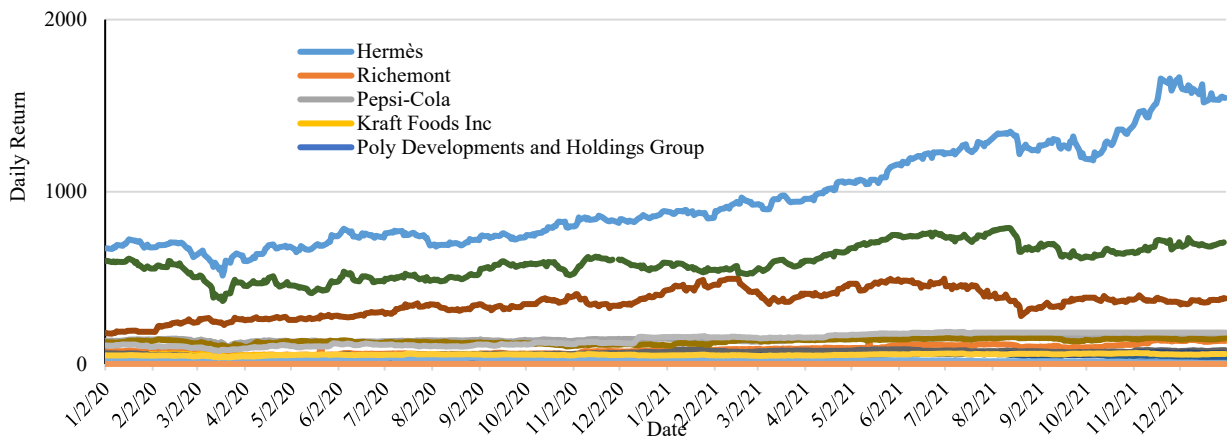


Figure 1. Price trends of selecting underlying assets

2.2. Portfolio performance measurement

For one thing, return is the percentage that reflected how much profit investors can get through the price change of a particular asset. Usually, return is calculated on a daily basis. When calculating the daily return of a portfolio, this paper simply averaged the two stock returns on each day assuming investors hold two stocks with equal amount.

$$\text{Daily return of a stock} = \frac{P_{t+1} - P_t}{P_t} \quad (1)$$

where P_{t+1} represents current stock price, whereas P_t represents stock price of lasting trading day. The Daily average return of the portfolio equals to a half of daily return of stock A plus daily return of stock B. On the other hand, excess return focus on the fracture that daily return exceeds the risk-free interest rate. It is more often referred to because investor can know how much more money, they can make through this investment instead of allocate this amount of fund in treasuries which is less volatile and have stable income. The daily excess return equals to the daily average return minuses risk free rate. Generally, different countries have various indicator for the risk-free interest rate. This paper covers three regions in total, including the U.S., Europe and China.

Sharpe ratio is an indicator of portfolio performance. Compared to excess return, it takes risk into consideration. Sharpe ratio refers to the benefit investors will gain when bearing one more risk. Usually, the higher the Sharpe ratio the better, indicating the more risk taken the higher the return. In addition, positive Sharpe ratio means portfolio return is high than risk free return, whereas negative ratio means the return is less than the risk-free return.

$$\text{Sharpe ratio} = \frac{E(R_p) - R_f}{\delta_p} \quad (2)$$

where $E(R_p)$ is the expected return of the portfolio, R_f is the risk-free rate, and δ_p is the standard deviation of stock price measuring total risk.

Sortino ratio is a similar indicator with Sharpe ratio, which uses lower partial standard deviation (LPSD) that only focuses on the part return below risk free rate. Thus, Sortino ratio is the average excess return to LSPD. The Sortino ratio is sometimes more reasonable to use compared to Sharpe ratio because the distribution may not be asymmetric in reality, especially when the distribution of the rate of return function is skewed to the left, underestimating the risk. Meanwhile, it is common

sense that positive excess return is more adorable while only negative excess returns are remained. Overall, history data cannot fully guide the past, especially when there is extreme risk. Therefore, the Sortino ratio becomes a more prudent evaluation tool.

$$\text{Sortino ratio} = \frac{E(R_p) - R_f}{LPSD} \quad (3)$$

$$LPSD(R_1, \dots, R_n) = \sqrt{\frac{1}{n} \sum_{R_i < R_f}^n (R_i - R_f)^2} \quad (4)$$

where $E(R_p)$ is the expected return of the portfolio, R_f is the risk-free rate, R_i is the return of individual stock, and LPSD the standard deviation of negative excess return which measures the downside risk.

3. RESULTS & DISCUSSION

3.1. Performance of Merger Arbitrage

Merger arbitrage strategy refers to longing the target company stock and short the bidder. This paper chooses 4 representative merger cases happened around the outbreak of COVID-19, including industry in consumption, luxury, medicine and real estate. The paper will examine performance of each trade and summarize a common conclusion.

Consumption is an industry of high resilience even under COVID-19. In December 2019, International Flavors & Fragrances Inc. announced that it has reached a deal to acquire the business of nutrition and biology science(N&B) from DuPont de Nemours, Inc. for \$26.2 billion [11].

Regarding to the background of the acquisition, International Flavors & Fragrances Inc. is founded in 1958 and has become the second largest company of world flavors and fragrance industry around 2017 due to consecutive merger acquisitions. After the acquisition with DuPont, IFF will provide products with better balance of taste and nutrition.

Figure 2 presents the change of daily return of this trade after the announcement from Jan. 2020 to Dec. 2021. It can be seen that after the first outbreak of the epidemic, the return fluctuates in a range from negative 4% to positive 4%. However, the return of COVID-19 on this trade drastically decreases in the third six month with a huge loss of -12%.

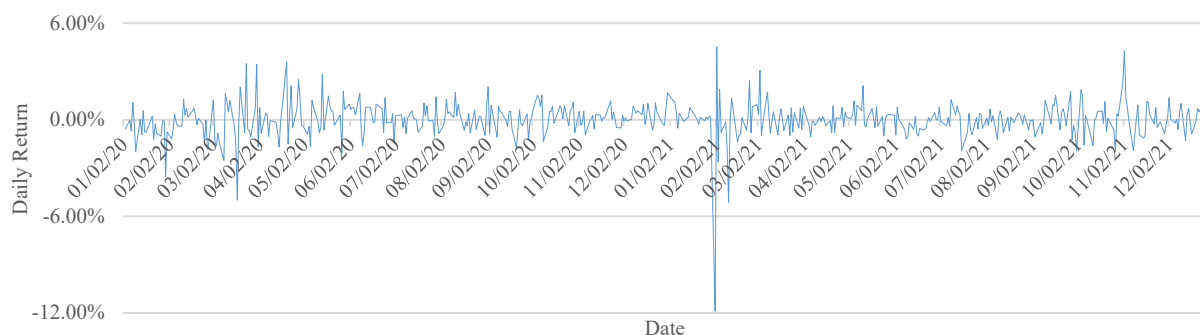


Figure 2. The daily return from IFF and DD merger arbitrage

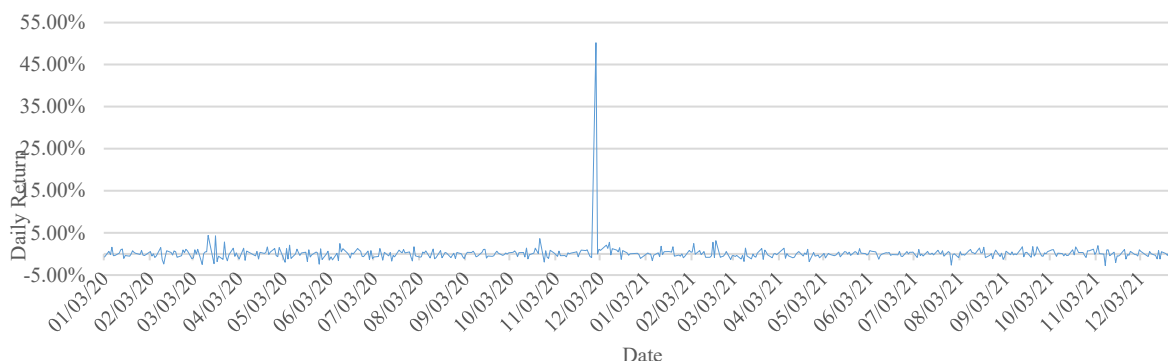


Figure 3. The daily return from KERING and MONCLER merger arbitrage

Seen from Table 2, analysis on time series performance shows that the trade only outperforms the market between 2020.7-12 with an excess return of 21.3%. The Sharpe ratio is 12.92 indicating earning 12.92 for every additional risk taken. In addition, the Sortino ratio is relatively higher at 14.16.

TABLE 2. IFF AND DD MERGER ARBITRAGE TRADE MEASUREMENT

	Long DD	Short IFF	excess return	Sharpe ratio	Sortino Ratio
2020.1-6	-16.33%	3.99%	-9.00%	-2.57	-3.47
2020.7-12	35.91%	12.35%	21.30%	12.92	14.16
2021.1-6	10.08%	42.18%	18.88%	-12.64	-15.51
2021.7-12	2.77%	-0.84%	-1.86%	-1.45	-1.64

The giants in the luxury sector may be looking for mergers and acquisitions again. After LVMH, luxury giant Kering, which owns well-known brands such as Gucci and Saint Laurent, may also strengthen itself through new acquisitions. News in the beginning of December 2019 illustrates that executives from Kering Group have held preliminary discussions with Italian clothing brand Moncler about a merger between the two companies [12]. Though this hasn't been public acknowledged by the two companies, stock price reacts obviously under the news. Thus, hedge fund portfolio can still be formed.

Figure 3 illustrates the daily return of taking KERING as the bidder and MONCLER as the target. Apparently, merger arbitrage strategy performs stable throughout the aimed years with daily return fluctuating around 0%. To the surprise, the return skyrocketed in the end of 2020 with a 50% return.

When measuring the average performance of this merger arbitrage during the four-time windows, Table 3 shows that the strategy did not perform well in the first time period of the pandemic with excess return of -20.40%. Yet, the profit was much better in the next three consecutive halves with excess return of 31.79%, 17.62% and 0.51%. The risk is especially high in the third half which means a great trade-off.

TABLE 3. KERING AND MONCLER MERGER ARBITRAGE TRADE MEASUREMENT

	Long MONCLER	Short KERING	excess return	Sharpe ratio	Sortino Ratio
2020.1-6	-16.14%	-19.01%	20.40%	-6.85	-9.33
2020.7-12	46.35%	22.89%	31.79%	6.71	6.67
2021.1-6	14.12%	26.77%	17.62%	12.56	13.62
2021.7-12	11.38%	-4.71%	0.51%	0.28	0.30

Most medicine companies have experienced a heyday during the pandemic. On December 12th 2020, British pharmaceutical giant AstraZeneca announced that it had agreed to acquire US pharmaceutical company Alexion

for \$39 billion in cash and stock. The acquisition is expected to close in the third quarter of 2021 [13].

AstraZeneca focuses on the cancer drug which is a high profit track. However, the patent protection period of the company's ace drugs has gradually expired one after another, and a large number of cheap generic drugs have emerged, resulting in a Sharpe decline in the company's revenue. Alexion has about \$6 billion in annual sales, most of which is contributed by the rare blood disease drug Soliris, which is one of the most expensive drugs in the world, making it lucrative simultaneous. Hence, the acquisition of Alexion would strengthen AstraZeneca's

competitiveness and boost the company's revenue and cash flow over the next few years.

Figure 4 demonstrates the daily performance of this case. This paper assumes that before the announcement, there has been insider information, so the strategy is counted from the beginning of the pandemic. It can be seen that after the final announcement, the return of the portfolio immediately lifted from near 0% to 18%. Then, it soon dropped back to normal but obviously turned out to be a successful case with more positive returns and less volatile.

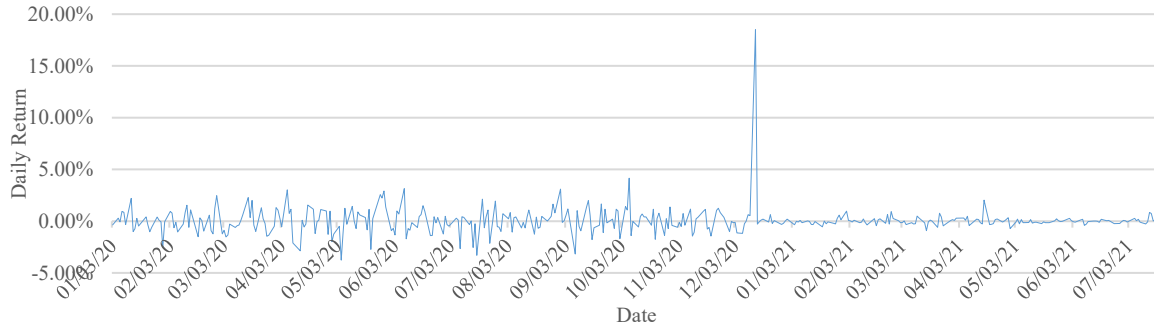


Figure 4. The daily return from AZN and AXLN merger arbitrage.

TABLE 4. AZN AND AXLN MERGER ARBITRAGE TRADE MEASUREMENT

	Long ALXN	Short AZN	excess return	Sharpe ratio	Sortino Ratio
2020.1-6	4.08%	-4.96%	-3.27%	-1.39	-1.65
2020.7-12	39.02%	6.25%	19.80%	3.92	16.42
2021.1-6	17.15%	18.57%	-3.54%	-0.53	-3.25
2021.7	-1.40%	3.42%	-1.82%	-0.41	-1.26

Real estate is usually a high profitable industry. According to news released in January 13th 2020, the Guangdong-Hong Kong-Macao Greater Bay Area with a construction area of 10 million square meters was handed over to Shimao who will fully manage the Fusheng project [14]. This is a section merger case happened in 2019 and officially announced in 2020.

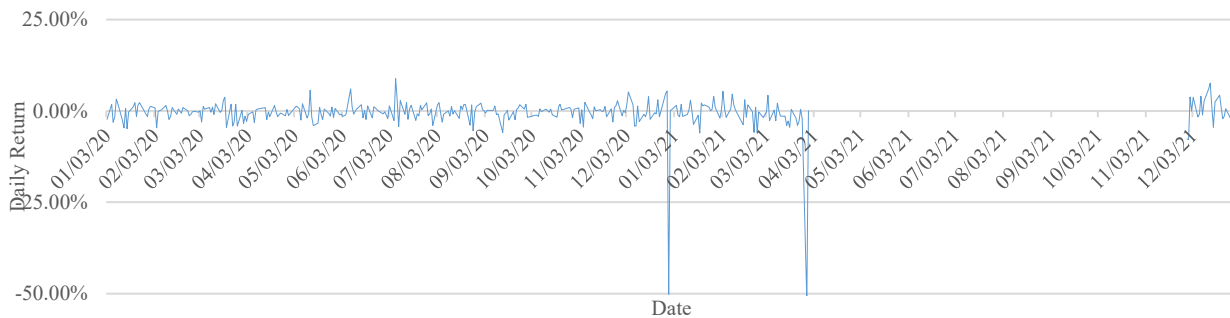


Figure 5. The daily return from SHIMAO and FUSHENG merger arbitrage

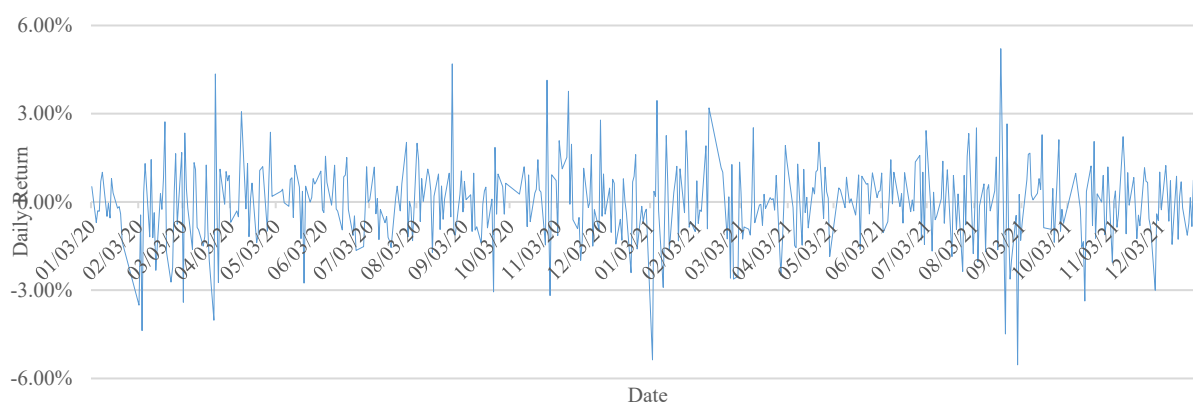


Figure 6. The daily return from EYE and MAIRUI

TABLE 5. SHIMAO AND FUSHENG MERGER
ARBITRAGE TRADE MEASUREMENT

	Long SHIMAO	Short FUSHENG	excess return	Sharpe ratio	Sortino Ratio
2020.1-6	-5.99%	-59.89%	34.44%	-14.03	-18.09
2020.6-12	28.51%	-51.39%	12.94%	-7.07	-2.49
2021.1-3	18.11%	-48.24%	16.56%	-14.73	-2.41
2021.12	73.44%	-42.86%	13.79%	9.49	3.43

FuSheng was once a dark horse in the real estate industry. In 2017 and 2018, the company acquired more than 100 billion real estate development resources and 300 to 400 billion old renovation resources. As of the end of 2018, the total value of goods exceeded 800 billion yuan. Simultaneously, Shimao has been full of momentum in the past two years and has developed well. In 2019, with sales of 55 billion yuan in Fujian province and 35 billion yuan outside the province, its annual performance exceeded 90 billion yuan, achieved high growth for the third year and ranked among the top ten in the industry.

Figure 5 shows that the daily return of the portfolio was most time stable and experienced two times' huge losses which were over -50%. From March 30th 2021 to November 26th 2021, FUSHENG had been forced to leave the stock market because of continuous losses.

Table 5 illustrates the under-performance case with huge losses in the first three time periods. Though as the target company, stock price of FUSHENG. Yet, as the pandemic last longer, the portfolio receives positive excess return.

3.2. Performance of Long short equity trade

Long short equity trade refers to longing a stock that is expected to outperform the market and shorting another in the same industry with high correlation. Thus, the systematic of risk can be hedged to a great extent. Usually, systematic risk is measured by β . β is first measured by asset pricing field known as CAPM model. The higher the beta, the more risk a stock will bear, along with higher

return. When beta is larger than one, it means that the stock is more volatile than the average market performance.

First case is the trade in medicine. Mindray Medical is a leading high-tech medical equipment R&D and manufacturer in China and one of the global innovation leaders of medical equipment. It was founded in 1991 has been committed to the research and manufacturing of clinical medical equipment. On the other hand, founded in 2002, EYE focuses on ophthalmic medical technology and development of telemedicine software and is much small on market size. From Table 6, it can be seen that the two company has high correlation higher than 0.9, meeting the requirement. Both two companies have beta lower than one. Since the PE ratio is higher for EYE, meaning this stock has been undervalued relatively. Hence, EYE is the long position and MAIRUI is the short one. Figure 6 shows the daily return of the portfolio. The return is locked between -4% and 4%. This is a relative high volatility compared to the former merger arbitrage trades.

TABLE 6. STRATEGY FORMATION OVER EYE AND MAIRUI

	EYE	MAIRUI
correlation		0.94
beta	0.96	0.75
Size(¥)	189.59B	398.89B
PE ratio(%)	82.38	49.79

TABLE 7. EYE AND MAIRUI TRADE MEASUREMENT

	EYE return	MAIRUI return	Excess return	Sharpee ratio	Sortino ratio
2020.1-6	43.02%	-69.52%	14.75%	-10.61	-9.96
2020.7-12	72.32%	-42.71%	13.30%	10.02	7.89
2021.1-6	34.89%	-10.64%	10.63%	9.05	4.84
2021.7-12	-	22.78%	-9.49%	-6.63	-4.19

Table 8 reports the measurement in four-time sectors. In this trade, the long strategy makes most of the profit.

There is a negative return in the first time zone and the last. Yet, the trade performed well from July 2020 to June 2021.

TABLE 8. STRATEGY FORMATION OVER PEP AND MDLZ

	PEP	MDLZ
correlation	0.87	
beta	0.65	0.71
Size(¥)	239.3B	88.31B
PE ratio(%)	30.77	20.98

The second case is consumption. PepsiCo is the famous global food and beverage company. Mondelez

International Inc is a snack company. The company manufactures and markets snack food and beverage products for consumers. Its products include various snack brands including "Nabisco", "Oreo" biscuits, "Cadbury", "Milka", "Toblerone" chocolates and candies. Considering the wide market of PEP during the pandemic and its recovery, PEP is expected to rise more according to Table 8. Thus, long PEP and MDLZ. Figure 7 illustrates there is a huge volatile in the beginning of the pandemic. However, after six months, this trend has been locked between 5% and -5%. From table 9, it can be seen that this strategy didn't perform well in the first three time periods but finally gain a positive return from July to December in 2021.

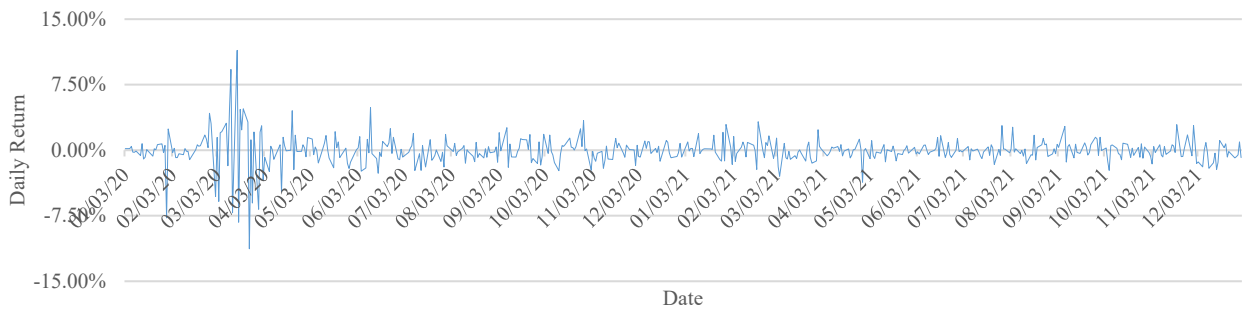


Figure 7. The daily return from PEP and MDLZ.

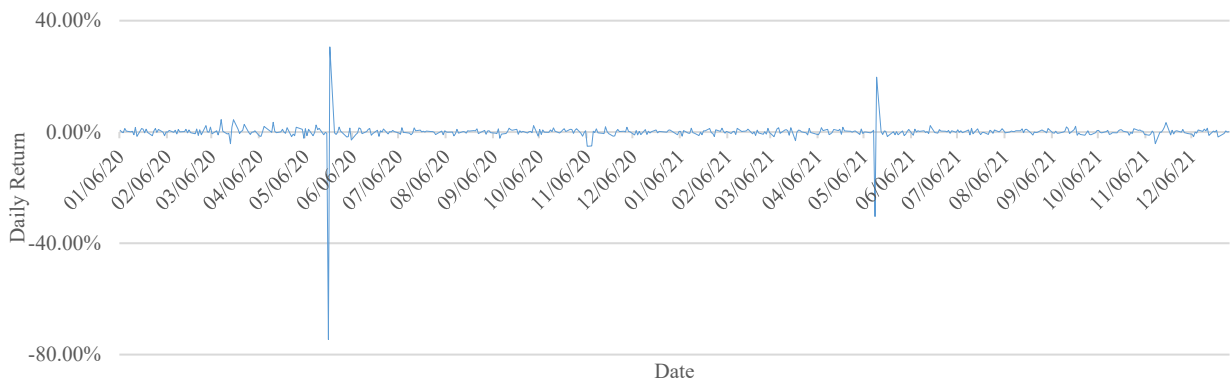


Figure 8. The daily return from HRMS and CFR

The third case is luxury. Hermès is a French luxury brand founded in Paris, France in 1837. It has 17 product lines including luggage, silk scarves, ties, men's and women's clothing and art of living. Richemont Group (CFR) is a company with dozens of luxury brands including Cartier, Montblanc, Lancel and etc. It has been the second largest luxury goods company in the world, ranking between LVMH and PPR.

As listed in Table 10, it can be seen that the case passes the correlation test at 0.95. And the beta of HRMS is only 0.44, relatively low compared to all the stocks discussed in this paper. It also has a high PE ratio and size. Therefore, the strategy can be constructed by longing HRMS and shorting CFR.

TABLE 9. PEP AND MDLZ TRADE MEASUREMENT

	PEP return	MDLZ return	Excess return	Sharpe ratio	Sortino ratio
2020.1-6	-2.62%	5.89%	1.20%	-1.58	-0.57
2020.7-12	12.04%	14.47%	4.04%	-12.09	-3.99
2021.1-6	2.70%	-7.80%	5.38%	-13.96	-6.15
2021.7-12	16.51%	-5.25%	2.80%	8.35	3.27

Table 11 shows the detailed profits of this case. There was only a negative return from July to December in 2020 for -5.61% whereas most time periods were positive returns. To be specific, HRMS and CFR happened to have

the highest return in the first period of the outbreak for 16.09% while the Sharpe ratio and Sortino ratio are only 2.18 and 3.60 respectively.

TABLE 10. STRATEGY FORMATION OVER HRMS AND CFR

	HRMS	CFR
correlation		0.95
beta	0.44	1.37
Size (Euro dollar)	130.8B	66.01B
PE ratio(%)	53.66	27.50

TABLE 11. HRMS AND CFR TRADE MEASUREMENT

	HRMS return	CFR return	Excess return	Sharpe ratio	Sortino ratio
2020.1-6	10.10%	21.08%	16.09%	2.18	3.60
2020.7-12	21.07%	-	-5.61%	-5.67	-6.92
2021.1-6	39.63%	-	1.36%	0.41	0.44
2021.7-12	27.56%	-	2.70%	3.13	2.09

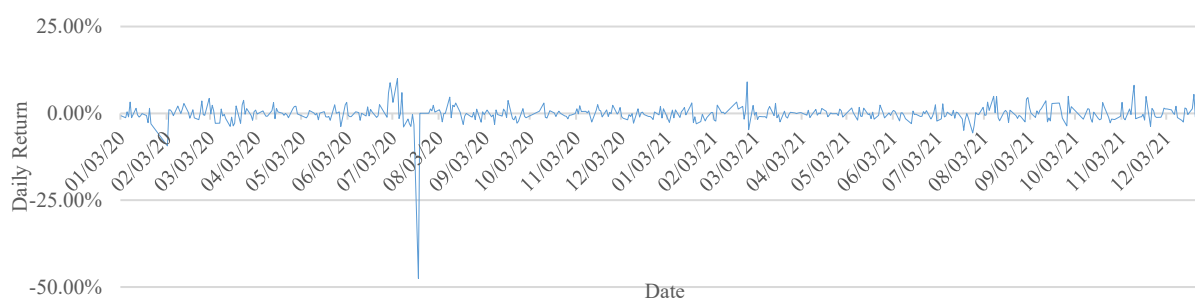


Figure 9. The daily return from BAOLI ESTATE and LVDI.

The last case is real estate. BAOLI is a company mainly engaged in real estate development and sales in China. The company is mainly engaged in the development and sales of commercial housing. Greenland Holding Group Co., Ltd. is a Chinese company with real estate as its core business. According to Table 12, the two company has a relatively high correlation. Since BAOLI is larger in size and higher on PE ratio, this paper longs BAOLI and shorts LVDI. Figure 9 shows that an expected loss happened in July 2020. The long short strategy in this case locked the return within -10% and 10%.

TABLE 12. STRATEGY FORMATION OVER BAOLI ESTATE AND LVDI

	BAOLI ESTATE	LVDI
correlation		0.68
beta	0.77	1.12
Size(¥)	226.6B	67.97B
PE ratio(%)	7.22	4.73

TABLE 13. BAOLI ESTATE AND LVDI TRADE MEASUREMENT

	BAOLI return	LVDI return	Excess return	Sharpe ratio	Sortino ratio
2020.1-6	-9.10%	-11.97%	-12.03%	-5.79	-8.01
2020.7-12	-0.50%	-14.26%	-8.88%	-3.45	-1.87
2021.1-6	-21.26%	-4.72%	-14.49%	-8.12	-13.14
2021.7-12	20.41%	-21.86%	-2.22%	-0.33	-1.60

To show the performance of the trade, Table. 13 presents the excess return and risk measurement including

Sharpe ratio and Sortino ratio. However, none of the time gained a positive return.

3.3. Comparison

Based on the analysis of the eight, hedge fund strategies on merger arbitrage and long short strategy all loss money in the beginning of the pandemic. In comparison, long short strategy might loss less. Meanwhile, when comparing cases through industries, the performance can be arranged as follow: luxury>medicine>consumption>real estate.

Since the stocks are picked randomly, there are probably a lot of errors. Comparing through different countries can be counted as an error term, since the paper hasn't taken macro-economic environment into consideration. Simultaneously, different stock has different beta which will alter the weight of each stock in the portfolio instead of dividing it into halves.

4. CONCLUSION

In summary, this paper investigates the hedge fund strategy performances under the impact of COVID-19 in terms of Sharpe ratio and Sortino ratio analysis. Specifically, comparisons are made between merger arbitrage and long short equity trade. According to the analysis, hedge fund strategies on merger arbitrage and long short strategy all loss money in the beginning of the pandemic. Nevertheless, long short equity trade loses less. Comparing cases through industries, it is found that luxury>medicine>consumption>real estate. However, the paper failed to take macro global environment into

consideration. In the future, research will be made within a specific country. Meanwhile, CAPM model will be exemplified to analyze the specific weight of each stock. Overall, these results offer a guideline for hedge funds strategies implementation.

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