Investigate the Impact of the Covid-19 Epidemic on Stock Investments in the American Insurance Industry Based on the Fama-french Five-factor Model

Xinyuan Zhang[1,*]

[1] Department of Economics, Lanzhou University, Lanzhou, 730000, China
* Email: zhangxinyuan2019@lzu.edu.cn

ABSTRACT

As one of the most important indicators in financial markets, stock markets can reflect the changing trends of the market. In this paper, using the background of the American insurance industry, according to the Fama-French Five-Factor model and Multiple Linear Regression, the pertinence relations between the five impact factors and the stock excess return rates in the re-epidemic period, post-epidemic before vaccination period, and post-epidemic after vaccination period are calculated respectively. Then, longitudinal changes of each factor are compared to explain the changes in stock investment situations. Empirical research shows that affected by the epidemic, investors make varying degrees of investment changes in five aspects. Finally, some suggestions are given to investors. In this model, insurance industry investors should allocate small-cap stocks, value stocks, and aggressive stocks considering the impact of the COVID-19 epidemic.

Keywords: *Fama-French Five-Factor model, COVID-19 epidemic, Insurance industry, US stock market.*

1. INTRODUCTION

1.1 Background

The global pandemic outbreak became a "Black swan" incident in global markets in 2020, which gave tremendous shocks to the global economy, especially in financial markets. Since the outbreak of the epidemic began at the global level, the markets represented by US stocks were caught in a liquidity crisis and the stock markets in many countries appeared to unprecedented intensive circuit breaker phenomenon. Whereafter, to hedge against the negative impact of the epidemic and stabilize the liquidity crisis, countries launched massive fiscal incentives and interest rate cuts. And that started a phase of ultra-loose global monetary policy, central banks all over the world expanded their balance sheets dramatically. Under a series of operations, American capital markets were soon improving and venture capital investment created a new record. According to statistics published by Pitchbook, as of 14 December 2020, American total venture capital investment reached $147.9 billion, with 10,379 deals involved, which set a record in the past decade.

For the insurance industry, COVID-19 increased the risk to our lives. So many companies raised the costs of insurance for the sake of ensuring their better financial condition. In addition, reinsurance companies raised reinsurance commissions of insurance companies, which could improve their ability to resist risk and take a risk together with insurance companies. Beyond that, considering the circumstance of low-interest rates and global outbreaks, insurance companies should add reserves to make more power to resist risks. Above all, increasing costs of insurance forced companies to take a battery of measures, including the change of investment in stocks.

1.2 related research

Great changes took place in economic conditions and capital markets. Ashford researched that the COVID-19 crisis had already shown an existing trend in the economy which had the probability of being undermined. The pandemic affected the serious unemployment and bad business situations suffering from the weight of severe demand shock. In addition, the economic state impacted by COVID-19 could not only potentially destroy the

health of the American economy, but weaken the strength of future spending [1].

In finance, Albulescu researched that under the circumstance of COVID-19, the death ratio significantly influenced the volatility in all investigated models, and new cases reported in and outside China had a mutual effect on market volatility, especially more significantly outside China. The spread of the pandemic raised financial volatility. There was also an estimation about the emergence of coronavirus might cause a new period of international financial stress [2]. Beirne et al. empirically examined the reaction of financial markets to COVID-19, considering a sample of 38 economics, especially focusing on the capital flow in 14 economies in emerging markets. And of Asia and Europe experienced the most serious shock mainly in exchange rates, stock, and substantial capital flows. What's more significant was the quantitative easing measures controlled by central banks produced positive spillovers to EME stock markets in Asia, Latin America, and Europe. Though with the decline of concerns about uncertainty due to the resolution of the pandemic, there was still an estimation about the long-range impact on EME capital markets and emerging markets [3].

Then, as one of the most consequential categories in financial markets, stock markets made great responses to the shock. Bazzana et al. introduced a model about the process of learning and making decisions of economic agents facing the unprecedented large-scale impact on stock markets with bounded rationality in the period of the pandemic. Within the key hypothesis on the agents' confidence and price expectations, the overreaction time of agents and the extent of the price fluctuations could be stated. Through the experiment, two key views were offered. One was that the changes in stock price from unprecedented events are delayed, the other was that agents have the trend to be sensitive to relative news and ensure their beliefs [4]. Kusumahadi and Permana examined the stock return volatility affected by COVID-19 in 15 countries all over the world using the fundamental equation and the TGARCH model. The conclusion said that each country's stock profits showed high volatility during the pandemic and these changes were negatively affected by the changes in the exchange rate in most of the countries in their research. Based on the findings, some factors which may have an impact on stock return volatility need more studies [5].

Thereupon, the epidemic influenced the investment preferences and investment strategies of investors. Liu et al. explored the unprecedented epidemic effects on financial markets. The research indicated that confirmed cases of COVID-19 hurt major stock indices, especially the conditions in Asia which experienced a sharp decrease. And investor's concern about the uncertainty was proved to be the mediator for the coronavirus's effect on the stock markets and the inner fear plus policy

measures also caused a supply shock, especially in the labor-intensive and manufacturing sectors. The indications of the findings were mainly for policymakers. Bank authorities should allow deregulation on loans for badly damaged economic sectors [6]. Wang et al. investigated how infectious diseases affected the changes in biotechnology stocks with a background in Taiwan. There were some abnormal profits on company shares in their biotechnology industry due to the epidemics. And with the analysis between the financial ratios and abnormal returns in the company confirmed that it positively affected R&D ratios, current ratios, and assets. So the investors ought to adjust their investment portfolios during the outbreak of the diseases [7].

Refined to the insurance industry for observation, Choi et al. stated that unemployment rates in the United States following the COVID-19 epidemic were sharply increasing, which signified that many of them would lose employer-sponsored dental insurance(ESDI). This is related to hindering dental care and then make a negative influence on health. The condition that lacking dental insurance was more serious in the state which hadn't broadened Medicaid [8]. Berkowitz and Basu discussed receiving unemployment insurance in the household was connected with less social needs of health and a better state of mental health. But some people didn't get unemployment insurance as social subsidies, especially those with low education levels. Whatever unemployment insurance might help ease the tension of economic disruption and policymakers should recognize the beneficial results of the insurance for working people in the US [9].

According to FF5F, some scholars studied the overall capital market by empirical analysis. Horváth and Wang used the Fama-French model to show monthly excess returns in specific events. And rolling R^2 coefficient was the reference of the ability of the model. During the period of the Financial crisis in 2008, the R^2 of growth portfolios quickly went down. As a result of the outbreak of COVID-19, only one R2 of the model went up and reached the highest level of R2. According to the coefficients of regression in OLS, only the market risk-free rate and the profitability factor had an impact on the results. In contrast with that in GMM regression, all beta coefficients were insignificant [10].

1.3 Objective

Most of the research and reports focused on American whole financial markets influenced by the COVID-19 epidemic and how to rebalance investment portfolios responding to the emergency. Few researchers separated the insurance industry and paid attention to how investors invested in stocks when facing the risks brought by the epidemic and whether there was a significant change in investment preference before and after the outbreak. In this paper, the scope of industry research is reduced to the

insurance industry in the United States, and the investment market is locked in the stock market of the United States.

Then, using the Fama-French Five-Factor model, evaluate the influence of the public health emergencies on the United States insurance stock market.

2. METHOD

2.1. Fama-French Five-Factor Model Theory

To improve the explanatory ability and predictive ability of CAPM, Fama and French claimed that the Fama-French Three-Factor model (FF3F) expanded on CAPM by adding two new factors, namely size and book-to-market. And FF3F explained the size effect and value effect which were inexplicable in CAPM. But excess earnings of value strategies challenged the effectiveness of FF3F and emphasized the analysis of firms' profitability and state of business. Then two new factors, namely operating profitability and investment, were added to FF3F and therefore generated FF5F.

The size of a firm is measured by market capitalization (ME):

ME=(share price)*(number of outstanding shares in issue)

$$(1)$$

The book-to-market ratio(BE/ME) represents a firm's value premium, reflecting its book value to market value:

$$\frac{BE}{ME} = \frac{book\ value\ of\ equity}{market\ value\ of\ equity} \qquad (2)$$

The operating profitability is measured by return on equity(ROE) :

$$ROE = \frac{retained\ profits}{net\ asset} \qquad (3)$$

The investment can be expressed by the reinvestment rate. And the annual growth rate of total assets can be used to calculate the reinvestment rate.

New four factors-size, book-to-market, operating profitability, and investment are shown in four portfolios "Small Minus Big(SMB)", "High Minus Low(HML)", "Robust minus Worse(RMW)" and "Conservative minus Aggressive(CMA)". So, in FF5F, the expected return of asset I can be estimated as:

$$E(R_i) - R_f = \alpha + \beta_1 * [E(R_m) - R_f] + \beta_2 * SMB + \beta_3 * HML + \beta_4 * RMW + \beta_5 * CMA + \gamma_i$$
$$(4)$$

$E(R_i)$ is the expected return on asset, R_m is the expected return on the market, R_f is the risk-free rate. SMB, HML, RMW, and CMA refer to size premium, value premium, profit premium, and investment premium respectively. And $\beta_{1,2,3,4,5}$ means factors coefficients.

2.2. Data sources and research method

The research background is the American insurance industry stock market, using the effective data from French Data Library during the period of May 15, 2019, to September 29, 2021. And time is divided into three segments, respectively, the time before the outbreak of the epidemic(large area outbreak in March 2020), the time after the outbreak but before vaccination(the first vaccination in the United States on December 14, 2020), and the time after vaccination. Every variable in every segment contains the same sample size of 200.

The explained variable is the excess return rate on US insurance stocks, five explanatory variables are the yield of $[E(R_m)\text{-}R_f]$, SMB, HML, RMW, and CMA. The statistical description of variables is shown in Table1, every variable has a sample size of 600.

Research method: multiple linear regression method is used. Explore the relevance of five explanatory variables and the explained variable during the period of three time periods respectively. Then, compare the change of correlation through statistical significance (P-Value Test) and regression coefficient and analyze the reasons.

Table 1. the statistical description of variables

Variable	Obs	Mean	Std. Dev.
E(Ri)-Rf	600	0.068	1.826
E(Rm)-Rf	600	0.091	1.546
SMB	600	0.009	0.913
HML	600	-0.027	1.283
RMW	600	0.015	0.576
CMA	600	-0.003	0.451

3. RESULTS AND DISCUSSION:

According to FF5F, OLS regression results are shown in Table2, Table3, and Table4. (Noting that ***, ** and * represent significance levels of 1%, 5% and 10% respectively. Standard errors are shown in brackets.)

Table 2. Estimation of the influence of five factors on excess return rate: The period before the outbreak of the COVID-19 epidemic (at 5% significance level)

E(Ri)-Rf	Coef.	t-value	p-value	Lower 95%	Upper 95%
E(Rm)-Rf	0.886*** (0.032)	27.49	0	0.823	0.95
SMB	0.033 (0.06)	0.55	0.586	-0.086	0.151
HML	0.231*** (0.061)	3.80	0	0.111	0.351
RMW	-0.513*** (0.101)	-5.05	0	-0.713	-0.313
CMA	0.403*** (0.119)	3.39	0.001	0.169	0.637
Constant	0 (0.027)	0.01	0.995	-0.053	0.053

Mean dependent var	-0.004		SD dependent var		0.863
R-squared	0.815		Number of obs		200
F-test	170.748		Prob > F		0.000
Akaike crit. (AIC)	182.132		Bayesian crit. (BIC)		201.922

Table 3. Estimation of the influence of five factors on excess return rate: The period after outbreak but before vaccination (at 5% significance level)

E(Ri)-Rf	Coef.	t-value	p-value	Lower 95%	Upper 95%
E(Rm)-Rf	0.954*** (0.02)	48.32	0	0.915	0.993
SMB	0.354*** (0.05)	7.11	0	0.256	0.453
HML	0.465*** (0.041)	11.26	0	0.383	0.546
RMW	-0.127 (0.087)	-1.47	0.144	-0.298	0.044
CMA	0.051 (0.111)	0.46	0.647	-0.169	0.271
Constant	-0.013 (0.043)	-0.30	0.764	-0.098	0.072

Mean dependent var	-0.112		SD dependent var		2.866
R-squared	0.957		Number of obs		200
F-test	858.945		Prob > F		0.000
Akaike crit. (AIC)	371.486		Bayesian crit. (BIC)		391.275

Table 4. Estimation of the influence of five factors on excess return rate**:** The period after vaccination (at 5% significance level)

E(Ri)-Rf	Coef.	t-value	p-value	Lower 95%	Upper 95%
E(Rm)-Rf	0.872***	20.58	0	0.788	0.956
	(0.042)				
SMB	0.328***	6.00	0	0.22	0.435
	(0.055)				
HML	0.476***	10.87	0	0.39	0.562
	(0.044)				
RMW	0.177**	2.58	0.011	0.042	0.312
	(0.069)				
CMA	-0.542***	-6.30	0	-0.711	-0.372
	(0.086)				
Constant	-0.026	-0.81	0.419	-0.09	0.037
	(0.032)				

Mean dependent var	0.095	SD dependent var	1.034
R-squared	0.815	Number of obs	200
F-test	171.457	Prob > F	0.000
Akaike crit. (AIC)	254.050	Bayesian crit. (BIC)	273.840

3.1 $E(R_m) - R_f$

The market risk factor all along had a positive impact on the excess return rate at the significant level of 1%. According to "The greater the risk, the higher the return", when market risk premium is higher, the excess return of stocks is more. And its regression coefficients were the biggest compared with that of other factors, which had the greatest influence on the excess return rate of the insurance stocks among the five factors. Besides, under the influence of the epidemic (before the vaccination), financial markets were more sensitive than overall markets. In the insurance industry, premiums increased during this period. According to the data of NAIC, in 2020, the total insured premiums of 761 personal insurance companies in the United States reached $1009.509 billion, which registered year-on-year growth of 6.8%. But after vaccination, the sensitivity went down and was even lower than that before the outbreak.

3.2 SMB

The size factor SMB had an insignificant impact on the excess return rate before the outbreak of the epidemic. But after the outbreak, the coefficients were observably positive. This could certificate that size factors made a remarkable impact on the excess return rate due to the epidemic. Apart from that, small-cap stocks yields were significantly higher so investors had a preference for small-cap stocks. Generally speaking, small-size firms aren't as stable as the big-size ones and they have a high risk that needs high yields to compensate.

3.3 HML

The book-to-market factor HML influenced the excess return rate in a favorable way at the significant level of 1% throughout the whole period and the values of correlation coefficients were increased. This suggested that the changes in asset yields were more sensitive than the book-to-market of firms under the effect of epidemic and vaccination. Meanwhile, value stocks had higher yields so investors leaned toward value stocks. Value stocks that had a higher book-to-market ratio owned greater investment risk and the stocks of firms with high book-to-market ratios had increasing prospective earnings in the future according to the book-market effect.

3.4 RMW

The operating profitability factor RMW had a negative effect on the excess return rate at a significant level of 1% before the outbreak of the epidemic. When RMW increased by 1%, the excess return rate decreased by 0.513%. During this period, investing in low-profit shares could gain more benefits than high-profit ones. Therefore, investors were in favor of low-profit ones. This behavior was speculative. But after the outbreak of the epidemic even after the vaccination, RMW had an insignificant impact on the excess return rate. Under the

shock of the epidemic, the unemployment rate in the United States surged. The rate jumped to 14.7% in April 2020 and this also set a record since the Great Depression in the 1930s. The overall economic operation was hit seriously, inevitably, and gave a heavy blow to the insurance system, especially the healthcare system.

3.5 CMA

The investment style factor CMA had a positive impact on the excess return rate at the significant level of 1% before the emergency. And during this time, conservative stocks yields were visibly higher than aggressive ones, so investors undoubtedly chose conservative ones. After the outbreak of the epidemic but before the vaccination, there was no significant effect. After the vaccination, CMA had a negative influence on the excess return rate at a significant level of 1%. When CMA increased by 1%, the excess return rate decreased by 0.542%, which was exactly the opposite of what happened before the outbreak. At this moment, aggressive stocks yields were higher than conservative ones so the insurance industry had a preference for aggressive ones. Because of the spread of the information about vaccination aimed at the COVID-19 epidemic, money poured into the American stock market. Aggressive investments had more cash flow and opportunities to expand the market, also with the influence of optimistic mood and other factors, investors' enthusiasm for investment was boosted. There was some information about insurance firms announcing deals or acquisitions. A big-scale healthcare insurance firm named Centene purchased Magellan Health(MGLN) for $95 a share. This was a case of radical investment in the insurance industry.

4. CONCLUSION

In this research, using the Fama-French Five-Factor model, through market risk factor, size factor, book-to-market factor, operating profitability factor, and investment factor changing in direction and degree of influence on stock excess yields, results probed into the insurance industry investors how had them made a shift in preference reflected in stock investments when facing this public health emergency, respectively in the pre-epidemic period, post-epidemic before vaccination period and post-epidemic after vaccination period.

The empirical analysis indicated that investors' five dimensions of stock investment strategies changed under the impact, especially focusing on the investment factor. This variable was respectively positive, insignificant, and negative effects on the excess return in three periods of time, indicating that investors had changed massively from conservative investment to aggressive investment. Compared with the book-to-market factor, it positively influenced stock excess return all along, which stating

investors were in favor of value stocks whether there was an epidemic or not.

The main meaning of this study is to show the average investment status and considerations of most people in the market, which gives certain references and guiding significance for the future investment in the insurance industry. Through the analysis, under the circumstance of the epidemic, investors should choose small-cap stocks, value stocks, and aggressive stocks to invest in. In the future, as an analysis model and method of stock investment, it can be compared with the research on stock investment in other industries to study the differences between industries and find the reasons. Even, it can also be applied to other kinds of investment. In today's society, with the occurrence of sudden events, there may be other factors affecting investors' thoughts and choices in the future. Therefore, this study is not limited to the epidemic or the short-term, but a long-term study. Apart from that, the influencing mechanism and influencing path should be further explored.

REFERENCES

[1]　E. Ashford, The Aftermath: American Power after COVID-19, Istituto Affari Internazionali (IAI), 2020.

[2]　Albulescu, Coronavirus and financial volatility: 40 days of fasting and fear, arXiv preprint arXiv:2003.04005, 2020. DOI: http://dx.doi.org/10.2139/ssrn.3550630

[3]　J. Beirne, N. Renzhi, E. Sugandi, U. Volz, COVID-19, asset markets and capital flows, Pacific Economic Review, vol.26, no.4, 2021, pp.498-538. DOI: http://dx.doi.org/10.1111/1468-0106.12368

[4]　Bazzana, M. Colturato, R. Savona, Learning about Unprecedented Events: Agent-Based Modelling and the Stock Market Impact of COVID-19 (No. 2395-2021-3002), Fondazione Eni Enrico Mattei (FEEM), 2021. DOI: http://dx.doi.org/10.2139/ssrn.3946217

[5]　T. A. Kusumahadi, F. C. Permana, Impact of COVID-19 on Global Stock Market Volatility, Journal of Economic Integration, vol.36, no.1, 2021, pp.20–45. DOI:http://dx.doi.org/10.11130/jei.2021.36.1.20

[6]　H. Liu, A. Manzoor, C. Wang, L. Zhang, Z. Manzoor, The COVID-19 outbreak and affected countries stock markets response, International Journal of Environmental Research and Public Health, vol.17, no.8, 2020, pp.2800. DOI: http://dx.doi.org/10.3390/ijerph17082800

[7]　Y. H. Wang, F. J. Yang, L. J. Chen, An investor's perspective on infectious diseases and their influence on market behavior, Journal of Business

Economics and Management, vol.14, no.sup1, 2013, pp.S112-S127. DOI:http://dx.doi.org/10.3846/16111699.2012.711 360

[8] S. E. Choi, L. Simon, C. A. Riedy, J. R. Barrow, Modeling the impact of COVID-19 on dental insurance coverage and utilization, Journal of dental research, vol.100, no.1, 2021, pp.50-57. DOI: http://dx.doi.org/10.1177/0022034520954126

[9] S. A. Berkowitz, S. Basu, Unemployment insurance, health-related social needs, health care access, and mental health during the COVID-19 pandemic, JAMA internal medicine, vol.181, no.5, 2021, pp.699-702.DOI: http://dx.doi.org/10.1001/jamainternmed.2020.704 8

[10] Horváth, Y. L. Wang, The examination of fama-french model during the covid-19, Finance Research Letters,   vol.41,   2021,   pp.101848. DOI:http://dx.doi.org/10.1016/j.frl.2020.101848