**Pandemic and Stock Returns: The Effects of Covid-19 on Industry Profitability and Investor Attitudes towards Risk**

**Introduction**

Changes in profitability and investor attitudes towards risk drive the stock market. In March 2020, stock prices fell sharply when uncertainty about the economic impact of COVID-19 spiked the world. Subsequently, stock prices retraced their losses as governments and central banks worldwide introduced measures to mitigate the effects of the pandemic. A closer look reveals that some groups of stocks, as measured by their industry classifications, outperformed others throughout the pandemic. Studies found that Covid-19 negatively affected businesses around the world. According to Ramelli and Wagner (2019), COVID-19 negatively impacted firms exposed to trading and companies in China, where the virus originated. However, as the virus spread globally, domestic debt in the United States drove the stock market earnings.

Other evidence suggests that the government restrictions on commercial activities were the main reason the US stock market reacted forcefully to the COVID-19 pandemic (Baker, Bloom, Davis & Kost, 2020). Similarly, other studies demonstrate that COVID-19 disrupted many household earnings (Garcia & Cowan,2022; Carlson, Petts, and Pepin, 2022). In this project, we aim to replicate studies that found that the Covid-19 pandemic had an impact on stock market returns and industry profitability (Ramelli & Wagner, 2020; Baker, Bloom, Davis, Kost, Sammon, Viratyosin, 2020) by addressing the following questions: Which industries experienced a higher equity market performance since the beginning of 2020? Which industries are relatively risky in 2019, 2020, and 2021? What is the relationship between risk and return? Does the riskiness of an industry affect returns?

**Data and Key Variable Measurement**

We employed two data sets for the analysis. The first data set is the daily weighted average returns of 12 industry portfolios. The second data set is the US market portfolio, which contains information on the Fama and French factors, all available on Kenneth French's website. The daily time series spans from 1926 to 2022; however, this study limits the analysis to 2019,2020 and 2021. The data set has a total of 757 observations. The primary variable of interest is abnormal returns for the 12 industries. There are two approaches to computing abnormal returns. A naïve approach subtracts the market returns from the daily weighted average returns. This approach does not account for other risks in the market and might underestimate or overestimate the abnormal returns of the industries. The second approach, which is more robust, computes the abnormal returns from a regression of excess returns on the five Fama and French risk factors (Market risk-free premium, Small Minus Big (SMB), High Minus Low (HML), Robust (high), Minus Weak (low) (RMW), and Conversative Minus Aggressiveness (CMA)). This study calculates abnormal returns by subtracting the expected return of the last regression year (2018, for example) from the current daily excess return (2019 excess return) (Fama & French, 2015).

**Presentation of Results**

**The Naïve Approach—Difference in Daily Returns and Market Return**

**Summary Statistics**

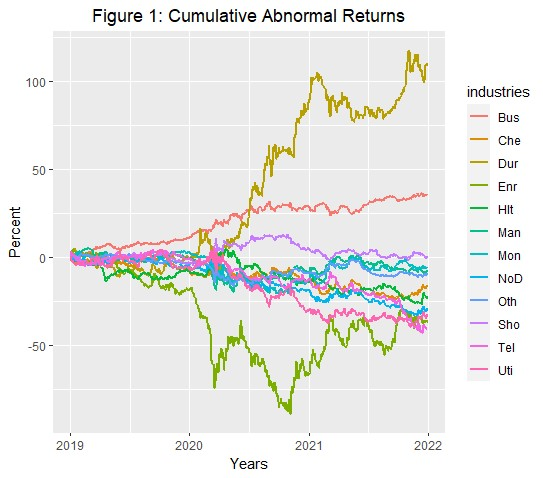
Table 1 summarizes abnormal returns for the 12 industries with 757 observations. Business and Equipment and Consumer Durables had a positive average growth in abnormal returns between 2019 and 2021. Specifically, on average, Consumer Durables and Business and Equipment grew by 0.08% using their median values. The remaining industries had negative average percentage growth between 2019 to 2021. Energy, Manufacturing, Telecommunication, Utilities, and Money fell respectively by 0.18%,0.057%, 0.049%, 0.036% and 0.026%. This result shows that the stock market significantly reduced abnormal returns during the COVID-19 pandemic.

**Table 1: Summary of abnormal Returns (%) of the 12 industries from 2019-2021**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Industries | Mean (%) | Std.Dev (%) | Min (%) | Pctl25 (%) | Median (%) | Pctl75 (%) | Max (%) |
| Business & Equipment | 0.046 | 0.593 | -2.88 | -0.27 | 0.08 | 0.391 | 2.07 |
| Chemicals & Allied products | -0.021 | 0.666 | -2.84 | -0.436 | -0.02 | 0.361 | 3.324 |
| Consumer Durables | 0.144 | 1.865 | -9.57 | -0.73 | 0.08 | 0.86 | 9.8 |
| Energy | -0.038 | 0.682 | -2.62 | -0.44 | -0.04 | 0.37 | 2.874 |
| Money (Finance) | -0.048 | 1.851 | -11.906 | -1.057 | -0.18 | 0.779 | 13.18 |
| Healthcare, Med Equipment | -0.03 | 0.706 | -2.97 | -0.4 | -0.02 | 0.364 | 3.084 |
| Manufacturing | -0.01 | 0.731 | -3.27 | -0.399 | -0.057 | 0.381 | 4.424 |
| Consumer non-durables | -0.008 | 0.857 | -3.516 | -0.42 | -0.026 | 0.38 | 7 |
| Other industries | -0.012 | 0.516 | -3.306 | -0.259 | -0.01 | 0.234 | 2.26 |
| Shops | 0.001 | 0.585 | -3.316 | -0.3 | -0.019 | 0.29 | 3.064 |
| Telecommunication | -0.054 | 0.787 | -3.576 | -0.487 | -0.049 | 0.4 | 3.22 |
| Utilities | -0.042 | 1.044 | -4.946 | -0.646 | -0.036 | 0.584 | 5.894 |
| Observations | 757 |  |  |  |  |  |  |

**Industries with Higher Equity Market Performance During the Pandemic**

Figure 1 shows a daily series line graph of cumulative abnormal returns for the 12 industries. As noted, from the beginning to the middle of 2019, many industries had a negative cumulative abnormal return; however, from the beginning of 2020, some industries began to experience positive cumulative abnormal returns. One such industry with a consistent trend is the Business and Equipment industry, which had a positive cumulative abnormal return from the first quarter of 2019 to 2022. Also compatible with Table 1, the consumer durable industry bounced back from the shocks of the pandemic beginning in 2020, rising through to 2021 and falling slightly in the middle of 2021. Unlike Consumer Durable, the Energy industry continued to experience a negative cumulative abnormal return from the beginning of 2019 to 2021. As noted, only the Consumer Durable, Business and Equipment industries and shops had a positive cumulative return at the end of 2021. The rest of the industries all had negative cumulative returns.



**Daily Average Weighted Return and Market Return**

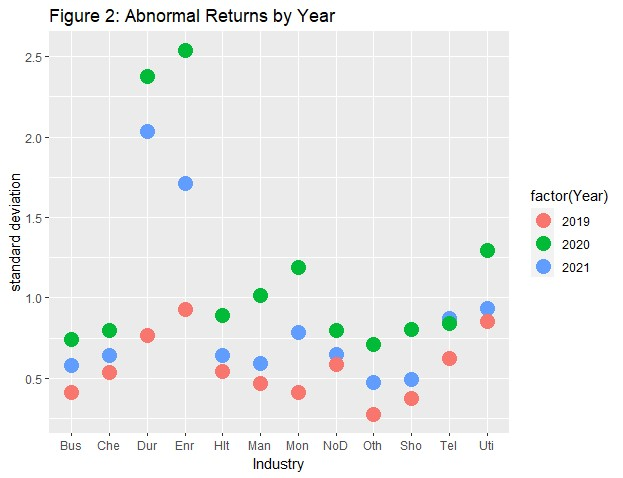
Table 2 shows Welch's two-sample t-test of average return and market return for the 12 industries. The null hypothesis is that the difference between the industry average and market returns is zero. The alternative hypothesis is that there is a significant difference between the average returns and the market during the Covid period. Table 2, column 2 shows the average returns for the 12 industries from 2019-2021. Column three shows the average market return, which is constant for the industries. Column four shows the difference between the average and market returns, and the last two columns, t-statistic and p-value, respectively. Using a significant level of even 10%, it is clear from the Table that the p-values are larger than the significance level. We fail to reject the null hypothesis and conclude that the average return and market return from 2019 to 2021 are not statistically different from zero.

**Table 2: One Sample T-Test**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Industries | Average return  (%) | Market return (%) | Difference  (Abnormal returns-%) | T-statistic | P-value |
| Business & Equipment | 0.148 | 0.102 | 0.046 | 0.577 | 0.564 |
| Chemicals & Allied product | 0.081 | 0.102 | -0.021 | -0.290 | 0.772 |
| Consumer Durables | 0.245 | 0.102 | 0.144 | 1.344 | 0.179 |
| Energy | 0.054 | 0.102 | -0.048 | -0.452 | 0.652 |
| Money (Finance) | 0.072 | 0.102 | -0.030 | -0.422 | 0.673 |
| Healthcare, Med Equipment & Drugs | 0.092 | 0.102 | -0.010 | -0.120 | 0.905 |
| Manufacturing | 0.094 | 0.102 | -0.008 | -0.093 | 0.926 |
| Consumer non-durable | 0.064 | 0.102 | -0.038 | -0.549 | 0.583 |
| Other industries | 0.090 | 0.102 | -0.012 | -0.163 | 0.871 |
| Shops | 0.102 | 0.102 | 0.001 | 0.008 | 0.993 |
| Telecommunication | 0.048 | 0.102 | -0.054 | -0.754 | 0.451 |
| Utilities | 0.059 | 0.102 | -0.042 | -0.555 | 0.579 |

**Risky vs. Safe Industries across Years using Standard Deviations**

Figure 2 shows the standard deviation of the abnormal returns for the 12 industries by year. From the graph, the variability in the abnormal returns across the 12 industries was similar in 2019. Notwithstanding, the Energy industry, Consumer Durables, Utilities, and Telecommunication industry standard deviations stood out as high. On the other hand, the other industries, Shops, Business and Equipment, Manufacturing, and Money (Finance) industries had fewer variations during the same period. In 2020, the Consumer Durables and Energy industry had significant variability. Utility, Money (Finance), and Manufacturing also had comparable larger variability within the same period. In 2021, the Consumer Durable and Energy industries again stood out with a higher standard deviation. These findings mean that the variation between daily returns was high. Furthermore, in 2021, the Utility, Telecommunication, and Money (Finance) industries also had a comparable higher standard deviation. Overall, the Consumer Durable, Energy, Money, Utilities, and Telecommunication industries had greater volatility in their abnormal returns in 2019, 2020, and 2021.



**Relationship between Risk and Return**

Figure 3 compares 2019 standard deviations with 2020 cumulative abnormal returns. The group variable risky vs. safe is computed using the 2019 median standard deviation. Four observations are noticeable in Figure 3. First, six industries (Consumer Durables, Energy, Healthcare, Medical equipment and Drugs, Consumer Non-Durables, Telecommunication, and Utilities) are risky because their standard deviation exceeds the median 2019 standard deviation. Similarly, six industries (Business and Equipment, Chemical and Allied products, Manufacturing, Money, Other industries, and Shops) are safe since their standard deviation fell short of the median 2019 standard deviation. Second, the relationship between risk and return seems to be obscure. Specifically, only two safe industries (Business and Equipment, shops) had a positive cumulative abnormal return, while the remaining four experienced a negative abnormal return.

Similarly, only one of the risky industries (Consumer Durables) had a positive cumulative return, while the remaining experienced a negative cumulative value. Third, industries with a variability close to the median standard deviation experienced a negative cumulative abnormal return. Fourth, the two riskier industries (Consumer Durables and Energy) had the opposite outcome, with Consumer Durables experiencing a positive cumulative abnormal return.

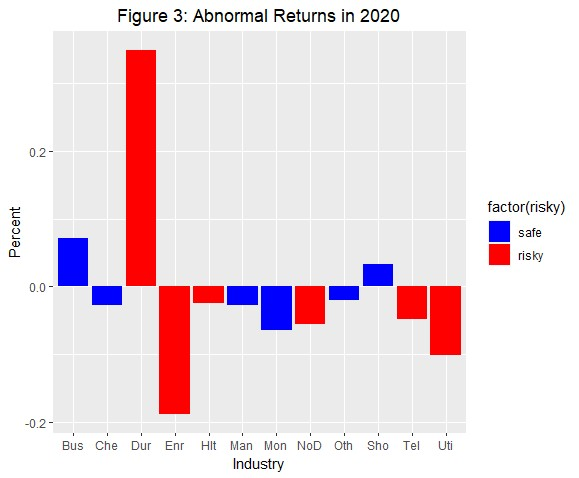


Figure 4 compares the 2020 standard deviation with 2021 cumulative abnormal returns. There are several observations. First, some industries switched from risky to safe and vice versa. Notably, manufacturing and Money changed from being safe in 2019 to risky in 2020, and Consumer Non-Durables and Telecommunication changed from risky in 2019 to safe in 2020. Second, the changes in industry classification—risky vs. safe did not significantly alter cumulative abnormal returns. More precisely, the Manufacturing, Money, Consumer Non-Durable, and Telecommunications industries continued the negative growth in cumulative return in 2021. Third, riskiness seems to be associated with either large growth cumulative return or huge losses. Specifically, Consumer Durables experienced large growth in 2021, while the Energy industry experienced large negative growth. Fourth, the reward for being safe seems to fall short of being risky. Remarkably, the cumulative abnormal return of Business and Equipment is not even close to half of the cumulative abnormal return of the Consumer Durable industry.

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**Two Sample T-test of Abnormal Returns between Risky and Safe Industries**

Table 3 shows the result of two sample, two-sided t-tests of the difference in abnormal returns between risky and safe industries. The null hypothesis is that the difference in abnormal returns between risky and safe industries is zero. The alternative hypothesis tests that the differences are not zero. That is a statistically significant difference in abnormal returns between risky and safe industries. In Table 3, the p-values of 0.903 and 0.112 for 2020 and 2021 are statistically larger than the significance level of 0.01. Thus, we fail to reject the hypothesis and conclude that the difference in abnormal returns between risky and safe industries during COVID-19 is zero. Therefore, the risky and safe industries all suffered from the Covid-19 pandemic.

**Table 3: Test of Means between Risk and Safe Industries in 2020 and 2021**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Category | T-statistic | P-value | Risky (%) | Safe (%) |
| 2020 | risky vs. safe | 0.122 | 0.903 | -0.011 | -0.005 |
| 2021 | risky vs. safe | -1.590 | 0.112 | 0.0312 | -0.026 |

**Robust Approach—Fama and French Five-Factor Model**

**Summary Statistics**

In the naïve approach, we compute abnormal returns by subtracting the market return from the daily returns. In this approach, we calculate the abnormal returns by first regressing the risk-free premium on the excess return along with the Fama and French risk factors: Small Minus Big (SMB), High Minus Low (HML), Robust (high), Minus Weak (low) (RMW), and Conversative Minus Aggressiveness (CMA). Table 4 shows the summary statistics. Using median values, we note that only Telecommunication had an average abnormal return to be negative from 2019 to 2021. The remaining industries all had positive average abnormal returns. The maximum and minimum abnormal returns within the period are Utilities and Consumer Durable, respectively. Again, Consumer Durables, Energy, and Utilities exhibited a higher variable in their daily abnormal returns when compared with the rest of the industries.

**Table 4: Summary of abnormal Returns (%) of the 12 industries from 2019-2021**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Industry | Mean (%) | Std.  Dev (%) | Min (%) | Pctl25 (%) | Median (%) | Pctl75 (%) | Max (%) |
| Business & Equipment | 0.065 | 1.679 | -13.264 | -0.592 | 0.198 | 0.878 | 10.596 |
| Chemicals & Allied product | 0.08 | 1.342 | -8.834 | -0.468 | 0.11 | 0.663 | 9.536 |
| Consumer Durables | 0.15 | 2.572 | -14.508 | -0.947 | 0.188 | 1.355 | 14.902 |
| Energy | 0.043 | 2.571 | -19.714 | -1.15 | 0.036 | 1.315 | 15.956 |
| Money (Finance) | 0.031 | 1.291 | -9.695 | -0.551 | 0.049 | 0.637 | 6.915 |
| Healthcare, Med Equipment | 0.035 | 1.741 | -12.482 | -0.678 | 0.073 | 0.874 | 12.168 |
| Manufacturing | 0.019 | 1.867 | -14.747 | -0.641 | 0.077 | 0.803 | 13.063 |
| Consumer non-durable | 0.021 | 1.259 | -9.957 | -0.399 | 0.069 | 0.543 | 7.363 |
| Other industries | 0.044 | 1.527 | -11.711 | -0.545 | 0.125 | 0.769 | 10.819 |
| Shops | 0.043 | 1.305 | -10.753 | -0.488 | 0.117 | 0.659 | 6.957 |
| Telecommunication | -0.018 | 1.336 | -9.208 | -0.553 | -0.003 | 0.598 | 8.962 |
| Utilities | -0.021 | 1.544 | -11.764 | -0.573 | 0.047 | 0.574 | 11.666 |
| Observations | 757 |  |  |  |  |  |  |

**Regression Analysis—Fama and French Factor Model**

Appendice A-C show the result of the Fama and French five-factor model. We run separate Fama and French models for 2018, 2019, and 2020. We used the 2018 predicted values to compute the abnormal return in 2019. Similarly, we use 2019 predicted values of the OLS regression to calculate the abnormal return for 2020 and repeat this process for 2021. There are three noticeable points. First, in all the 12 industries, risk-free premium (Mkt-RF) had a positive and significant at a 1% significance level. One percent increase in the market risk-free premium increases the excess return for the 12 industries. Second, the Fama and French factors had a statistically significant association with the excess return in almost all the industries. However, the level of significance and direction of the association differs by the type of industry. This result shows the importance of factoring other sources of risk in the market in the relationship between risk and return. Third, the constant term (the market beta) is not statistically significant in all the regressions. This result indicates that there are no abnormal gains in the market. We also note that the models had a higher R square, suggesting that the risk-free premium and the Fama and French risk factors explain the variations in the excess returns.

**Industries with Higher Equity Market Performance During the Pandemic**

Figure 5 shows a graph of cumulative abnormal returns for the 12 industries. The results demonstrate a trend in which many industries had positive cumulative returns. For example, Consumer Durables, Energy, Health, Medical Equipment, and Drugs, Manufacturing, Money, Consumer non-durables, and other industries had positive cumulative abnormal returns at the end of 2021. Consistent with Figure 1, Consumer Durable had the highest cumulative returns. Again, utilities and Telecommunications also had a negative cumulative abnormal return in 2021, consistent with Figure 1. As noted, only the Utility industry had a consistent cumulative abnormal return below zero from 2019 to 2021.

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**Risky vs. Safe Industries across Years using Standard Deviations-Fama & French**

Figure 6 shows the standard deviations of the abnormal returns. Like the findings in Figure 2, the Energy industry, Consumer Durables, Utilities, and Telecommunication standard deviations stood out as high as the other industries. Conversely, other industries, such as Shops, Business and Equipment, Manufacturing, and Money, had less variability in their standard deviations. The pattern seemed to follow in 2020, with the Consumer Durables and Energy industry as the largest variability. Consumer Non-Durables, Healthcare, Medical Equipment and Drugs, and Chemical and Allied products also had comparable larger variability within the same period. In 2021, Consumer Durables, Energy, utilities, and Telecommunications had a larger standard deviation. Thus, it is clear from the evidence that the Consumer Durables, Energy, Utility, and Telecommunication industries were relatively risky from 2019 through 2021. Further, industries with less variability in 2021 standard deviations are comparable to those in 2019.

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**Relationship between Risk and Return- Fama & French**

Figure 7 shows the abnormal return in 2020 using the 2019 standard deviation of the abnormal return to classify the industries as risky and safe. Notably, six industries were risky (Business and equipment, Consumer Durables, Energy, Healthcare, Medical Equipment, and Drugs, Manufacturing, and Money), while the remaining six were safe industries (Chemical and Allied products, Consumer non-durable, other industries, and Shops, Telecommunication, and Utilities). As noted, three safe industries had abnormal returns above zero, with the Chemical and Allied product industry experiencing the highest growth in 2020. Chemical and Allied products and Shops had a higher abnormal return for the safe industries in 2020. Energy, Manufacturing, and Money had abnormal returns below zero for the risky industries. Consumer Durable and Business and Equipment experienced a higher abnormal return despite their riskiness. Similarly, Consumer Durables and Energy also had significant abnormal returns.

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Figure 8 shows the abnormal return in 2021 using the 2020 standard deviation to determine the risky and safe industries. We note that the composition of risky and safe industries in Figure 7 has changed slightly. Using standard deviations, Chemical and Allied Products changed from a positive abnormal return to a negative one. Similarly, consumer Durables moved from positive return to negative. The number of compositions for risk and safe industries remains the same. The Chemical and Allied products products from positive to negative. The utility industry changed from being safe in 2020 to risky. Healthcare, medical equipment, and drugs will switch from risky to safe in 2021. Another important observation is that three risky industries had a positive abnormal return in 2021 compared to the safe industries, except for the utility industry, which continued the negative trajectory.

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**Abnormal Returns between Risky and Safe Industries**

Table 5 shows the results of two sample, two-sided t-tests of the difference in abnormal returns between risky and safe industries. The null hypothesis is that the difference in abnormal returns between risky and safe industries is zero. The alternative hypothesis tests that the differences are not zero. In Table 5, the p-values of 0.741 and 0.604 for 2020 and 2021 are larger than a significant level of 0.01. Thus, we fail to reject the hypothesis. Therefore, the abnormal returns between safe and risky industries are not different.

**Table 5: Test of Means between Risk and Safe Industries in 2020 and 2021**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Year | Category | T-statistic | P-value | Risky (%) | Safe (%) |
| 2020 | risky vs. safe | -0.330 | 0.741 | 0.039 | 0.008 |
| 2021 | risky vs. safe | -0.519 | 0.604 | -0.014 | -0.037 |

**Study Key Findings**

This study determined the relationship between the Covid-19 pandemic and stock market returns. The study addressed the following questions: Which industries have experienced a higher equity market performance since the beginning of 2020? Which industries were relatively risky in 2019, 2020, and 2021, and what is the relationship between risk and return? We employed two main methods in computing the abnormal returns of the industries. The naïve approach takes the difference between daily and market returns, while the Fama and French (robust approach) consider other risk factors in the market in calculating the abnormal return.

The pandemic affected the industry portfolio performance from the first quarter of 2019 to 2021. On average, Consumer Durable had the highest abnormal return from 2019 to 2021. Consumer Durables, Energy, and Utilities had the highest variability in their daily abnormal returns from 2019 through 2021. Further, the findings show that, in general, the variability in industries' abnormal returns in 2019 is comparable to 2021. The only exceptions are consumer durables and the energy industries. Second, the Consumer Durable industry had the highest equity market performance in both measures of abnormal returns. The findings revealed that the Energy and Utilities industries had negative cumulative abnormal returns in the naïve approach.

In contrast, in the Fama and French approach, only the Telecommunication industry experienced a negative abnormal return. Third, both approaches had an equal composition of risky and safe industries (six in each category). Further, three risky and safe industries had a positive cumulative return in the naïve approach. The study found a similarity between the Fama and French approaches. In both approaches, the difference in abnormal returns between risky and safe industries is almost the same. Lastly, evidence shows no statistically significant difference in abnormal returns between risky and safe industries in both approaches.

**Conclusion**

The study concludes with the following. The pandemic affected industry performance in 2020 and 2021. The Business and Equipment, Consumer durable, Energy, manufacturing, and Money industries were risky during the pandemic. On the other hand, chemical and allied products, consumer non-durables, shops, other industries, and telecommunications were safe during the pandemic. Again, safe industries yield lower returns.

In contrast, some risky industries earn higher returns in profit and losses. Finally, there is no statistical difference between the daily average and market returns. Similarly, there is no statistical difference in abnormal returns between risky and safe industries during the phase of the COVID-19 pandemic.

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APPENDICES

Appendix A: Fama and French Factor Model - Year 2018

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | BusEq | Chems | Durbl | Enrgy | Hlth | Manuf | Money | NoDur | Other | Shops | Telcm | Utils |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| `Mkt-RF` | 1.071\*\*\* | 0.882\*\*\* | 1.131\*\*\* | 1.116\*\*\* | 0.953\*\*\* | 1.168\*\*\* | 1.013\*\*\* | 0.708\*\*\* | 1.076\*\*\* | 1.034\*\*\* | 0.874\*\*\* | 0.387\*\*\* |
|  | (0.019) | (0.033) | (0.055) | (0.052) | (0.032) | (0.030) | (0.018) | (0.035) | (0.020) | (0.030) | (0.042) | (0.052) |
| SMB | -0.093\*\*\* | -0.033 | 0.288\*\*\* | 0.024 | -0.031 | 0.153\*\*\* | -0.005 | -0.059 | 0.151\*\*\* | 0.080 | 0.038 | -0.290\*\*\* |
|  | (0.035) | (0.062) | (0.104) | (0.096) | (0.059) | (0.056) | (0.033) | (0.065) | (0.037) | (0.056) | (0.078) | (0.098) |
| HML | -0.408\*\*\* | -0.143\*\* | 0.221\* | -0.022 | -0.228\*\*\* | -0.019 | 0.874\*\*\* | -0.074 | 0.213\*\*\* | -0.212\*\*\* | 0.113 | -0.214\* |
|  | (0.041) | (0.072) | (0.120) | (0.112) | (0.069) | (0.066) | (0.039) | (0.076) | (0.043) | (0.065) | (0.090) | (0.113) |
| RMW | -0.208\*\*\* | 0.504\*\*\* | 0.245 | -1.255\*\*\* | -0.034 | 0.317\*\*\* | -0.127\*\*\* | 0.704\*\*\* | 0.062 | 0.350\*\*\* | 0.496\*\*\* | 0.266\* |
|  | (0.051) | (0.090) | (0.149) | (0.139) | (0.085) | (0.081) | (0.048) | (0.094) | (0.054) | (0.080) | (0.112) | (0.140) |
| CMA | -0.550\*\*\* | 0.752\*\*\* | 0.149 | 1.320\*\*\* | 0.207\*\* | 0.535\*\*\* | -0.664\*\*\* | 0.743\*\*\* | 0.058 | 0.035 | 0.572\*\*\* | 0.769\*\*\* |
|  | (0.062) | (0.109) | (0.182) | (0.169) | (0.104) | (0.099) | (0.059) | (0.114) | (0.065) | (0.098) | (0.137) | (0.171) |
| Constant | 0.008 | -0.026 | -0.043 | -0.064 | 0.027 | -0.032 | 0.020 | -0.050 | -0.007 | 0.037 | 0.009 | -0.005 |
|  | (0.018) | (0.031) | (0.052) | (0.049) | (0.030) | (0.028) | (0.017) | (0.033) | (0.019) | (0.028) | (0.039) | (0.049) |
| Observations | 251 | 251 | 251 | 251 | 251 | 251 | 251 | 251 | 251 | 251 | 251 | 251 |
| R2 | 0.963 | 0.759 | 0.666 | 0.743 | 0.838 | 0.875 | 0.948 | 0.648 | 0.936 | 0.873 | 0.654 | 0.244 |
| Adjusted R2 | 0.962 | 0.754 | 0.660 | 0.738 | 0.835 | 0.873 | 0.947 | 0.640 | 0.935 | 0.870 | 0.647 | 0.228 |
| RSE | 0.279 | 0.493 | 0.821 | 0.764 | 0.470 | 0.447 | 0.265 | 0.516 | 0.295 | 0.441 | 0.617 | 0.773 |

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Appendix B: Fama and French Factor Model - Year 2019

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | BusEq | Chems | Durbl | Enrgy | Hlth | Manuf | Money | NoDur | Other | Shops | Telcm | Utils |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| `Mkt-RF` | 1.187\*\*\* | 0.871\*\*\* | 1.100\*\*\* | 1.126\*\*\* | 0.947\*\*\* | 1.107\*\*\* | 1.034\*\*\* | 0.755\*\*\* | 1.002\*\*\* | 0.857\*\*\* | 0.741\*\*\* | 0.467\*\*\* |
|  | (0.023) | (0.044) | (0.057) | (0.070) | (0.034) | (0.035) | (0.024) | (0.038) | (0.022) | (0.030) | (0.048) | (0.049) |
| SMB | -0.088\*\* | -0.223\*\*\* | 0.615\*\*\* | 0.225\*\* | 0.205\*\*\* | 0.219\*\*\* | -0.121\*\*\* | -0.221\*\*\* | 0.137\*\*\* | 0.034 | -0.061 | -0.256\*\*\* |
|  | (0.037) | (0.070) | (0.091) | (0.112) | (0.055) | (0.057) | (0.038) | (0.061) | (0.035) | (0.049) | (0.076) | (0.078) |
| HML | -0.216\*\*\* | -0.038 | 0.206\*\* | 0.780\*\*\* | -0.577\*\*\* | 0.189\*\*\* | 0.645\*\*\* | -0.171\*\*\* | 0.118\*\*\* | -0.105\*\* | -0.027 | -0.383\*\*\* |
|  | (0.036) | (0.068) | (0.089) | (0.108) | (0.053) | (0.055) | (0.037) | (0.060) | (0.034) | (0.047) | (0.074) | (0.076) |
| RMW | 0.157\*\*\* | 0.140 | 0.603\*\*\* | -0.425\*\* | -0.593\*\*\* | 0.348\*\*\* | -0.289\*\*\* | 0.171\* | 0.137\*\*\* | 0.434\*\*\* | 0.045 | -0.220\* |
|  | (0.054) | (0.104) | (0.135) | (0.166) | (0.081) | (0.084) | (0.057) | (0.091) | (0.052) | (0.072) | (0.113) | (0.116) |
| CMA | -0.558\*\*\* | 0.307\*\* | -0.249 | 0.109 | 1.028\*\*\* | -0.008 | -0.285\*\*\* | 0.853\*\*\* | -0.067 | -0.263\*\*\* | 0.582\*\*\* | 1.087\*\*\* |
|  | (0.074) | (0.141) | (0.184) | (0.226) | (0.111) | (0.114) | (0.078) | (0.124) | (0.071) | (0.098) | (0.154) | (0.158) |
| Constant | 0.006 | -0.018 | -0.004 | -0.048 | -0.021 | -0.009 | 0.026 | 0.005 | -0.011 | -0.010 | 0.028 | 0.033 |
|  | (0.016) | (0.031) | (0.041) | (0.050) | (0.025) | (0.025) | (0.017) | (0.027) | (0.016) | (0.022) | (0.034) | (0.035) |
| Observations | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 |
| R2 | 0.946 | 0.654 | 0.742 | 0.637 | 0.817 | 0.854 | 0.918 | 0.626 | 0.924 | 0.835 | 0.520 | 0.342 |
| Adjusted R2 | 0.945 | 0.647 | 0.736 | 0.629 | 0.813 | 0.851 | 0.916 | 0.618 | 0.922 | 0.832 | 0.511 | 0.328 |
| RSE | 0.258 | 0.491 | 0.641 | 0.784 | 0.385 | 0.398 | 0.270 | 0.431 | 0.247 | 0.341 | 0.537 | 0.548 |

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Appendix C: Fama and French Factor Model - Year 2020

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | BusEq | Chems | Durbl | Enrgy | Hlth | Manuf | Money | NoDur | Other | Shops | Telcm | Utils |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| `Mkt-RF` | 1.124\*\*\* | 0.877\*\*\* | 1.158\*\*\* | 1.115\*\*\* | 0.868\*\*\* | 1.019\*\*\* | 1.084\*\*\* | 0.827\*\*\* | 0.922\*\*\* | 0.856\*\*\* | 0.778\*\*\* | 0.951\*\*\* |
|  | (0.013) | (0.020) | (0.072) | (0.055) | (0.020) | (0.019) | (0.015) | (0.020) | (0.015) | (0.017) | (0.021) | (0.038) |
| SMB | -0.066\*\* | -0.121\*\* | 0.393\*\* | 0.353\*\* | -0.041 | 0.290\*\*\* | -0.104\*\*\* | -0.037 | 0.240\*\*\* | 0.019 | -0.095\* | -0.201\*\* |
|  | (0.032) | (0.051) | (0.179) | (0.136) | (0.050) | (0.048) | (0.037) | (0.050) | (0.036) | (0.044) | (0.054) | (0.094) |
| HML | -0.368\*\*\* | 0.050 | -0.023 | 0.970\*\*\* | -0.178\*\*\* | 0.280\*\*\* | 0.744\*\*\* | 0.100\*\* | 0.224\*\*\* | -0.285\*\*\* | 0.253\*\*\* | 0.257\*\*\* |
|  | (0.027) | (0.042) | (0.149) | (0.113) | (0.042) | (0.040) | (0.030) | (0.041) | (0.030) | (0.036) | (0.044) | (0.078) |
| RMW | 0.255\*\*\* | -0.091 | -0.240 | -0.365 | -0.539\*\*\* | 0.172\*\* | -0.250\*\*\* | -0.155\* | 0.153\*\* | 0.371\*\*\* | 0.094 | -0.541\*\*\* |
|  | (0.054) | (0.087) | (0.306) | (0.233) | (0.086) | (0.082) | (0.062) | (0.085) | (0.062) | (0.074) | (0.091) | (0.161) |
| CMA | -0.217\*\*\* | 0.783\*\*\* | -0.919\*\* | 0.250 | 0.574\*\*\* | 0.359\*\*\* | -0.238\*\*\* | 0.584\*\*\* | -0.174\*\* | -0.263\*\*\* | -0.116 | 0.831\*\*\* |
|  | (0.070) | (0.111) | (0.393) | (0.299) | (0.110) | (0.105) | (0.080) | (0.109) | (0.080) | (0.095) | (0.117) | (0.206) |
| Constant | 0.006 | 0.025 | 0.284\* | -0.082 | -0.017 | 0.015 | 0.018 | -0.002 | 0.009 | 0.003 | 0.010 | -0.028 |
|  | (0.026) | (0.041) | (0.145) | (0.110) | (0.041) | (0.039) | (0.030) | (0.040) | (0.029) | (0.035) | (0.043) | (0.076) |
| Observations | 253 | 253 | 253 | 253 | 253 | 253 | 253 | 253 | 253 | 253 | 253 | 253 |
| R2 | 0.972 | 0.899 | 0.580 | 0.795 | 0.887 | 0.946 | 0.974 | 0.895 | 0.960 | 0.918 | 0.881 | 0.763 |
| Adjusted R2 | 0.971 | 0.897 | 0.572 | 0.791 | 0.884 | 0.945 | 0.974 | 0.893 | 0.959 | 0.916 | 0.879 | 0.758 |
| RSE | 0.406 | 0.647 | 2.281 | 1.735 | 0.639 | 0.610 | 0.465 | 0.633 | 0.464 | 0.553 | 0.681 | 1.197 |

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01