Research on the Relationship Between High Tech Company Stocks & Investment
——Take Workday Company for Example

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ABSTRACT

This paper presents a stock investment strategy that can be applied relatively effectively under the current situation. We propose to design this recommendation based on the analysis of three main fields: finance, economics, and marketing. We examine and identify the damage extent of COVID-19 towards the economy and market, promising stock type nowadays, and methods of hedging the risks. These three aspects are attained by stock valuation, option valuation, sensitivity analysis, and marketing analysis research. According to the result of our previous studies, the comparatively optimal stock investment strategy was proven to be highly related to three elements: stock type, which should be high-tech related. Company size should be relatively small or middle-sized, and risk hedging is achieved by purchasing power. In particular, these three aspects are more efficient and significant under the current economic crisis period.

Keywords: *Power Option, COVID-19, stock investment strategy, WDAY DCF analysis, BSM mod*

1. INTRODUCTION

Stock investment has long been considered as a method for the most mainly to avoid inflation, maintain savings' value, or increase income. For this function of stock investment, by far, researches aiming at exploring the optimal investment strategies have been conducted in widely separated fields globally. To be more specific, in the psychological area, there are studies implementing recognition heuristic into stock investment strategy in Europe [1]. There is an analysis of the implications of herding behavior and the effectiveness of contrarian strategy [2]. For the Technology field, combining the deep learning ability of sentiment analyzer with investment strategy has become a new method investors might consider comprehending the extent of the impact of news sentiment on the stock market [3]. Furthermore, technology was also studied accompanied by mathematical methods: the embracement of the support vector machine, referring to its function of parameter optimization algorithm, in investment strategy in the Chinese stock market [4]. In

another viewpoint, since stock choosing is narrowly interlinked with financial elements, some studies devised novel investment strategies based on financial ratios, technical indicators, and predictions of the fluctuation of future stock prices according to "grey prediction theory" [5]. Judging from a wilder point of view, research focusing on using technology to attain financial network indicators to construct investment strategies in the global stock market had been carried out as well [6].

The effectiveness or efficiency of these investment strategies is still questionable. However, plenty of experts, researchers, surveys, etc., have concluded their investment strategy recommendations together with the proof of its profitability, stability, or feasibility. This can be traced back to the current economic crisis we are facing. Under the attack of COVID-19, the economy has been hurt significantly. Governments, to assist and fund health institutions and exhibit reliability and potency of their policies, revealed the intention for deploying economic firepower globally [7]. Mutual independence

between macroeconomy and microeconomy further deteriorates the extent of damage towards nations and citizens. In addition, alternations of people's ideologies towards information due to the uncertainty and anxiety immersed in coronavirus "infodemic". It leads to irrational investing strategies or panicked behaviors–storing food for decades, purchasing a large number of toilet paper, buying piles of mouthwash, etc.–contributed to the scale of economic recession to some degree. Therefore, it is reasonable to believe the deduction on "fiscal and monetary policies used to combat the contraction" being mitigated and the time requirement for the economy to "claw[s] back to where it was at the start of 2020" being protracted [7]. In this case, investment strategies, as many have mentioned in the previous paragraphs, might uncover defects for one of their common attributes: strategies based on investing in a portfolio. Were we under normal economic status, investing in various stocks would undoubtedly be a foundational method for people to avoid risks since although one stock dropped, others might compensate for the loss. However, under the attack of the pandemic, it would be quite hard for the compensation to function. First, most companies, being obedient to governments' requirements, face the bankruptcy issue as shutting down for several months, meaning there might be limited numbers of companies with marvelous or even acceptable provisions to attract our attention. Second, the majority's proneness to the confidence of large companies under the chaotic condition would become an element for the prevention of investing in a portfolio. To be clearer, since most people are struggling financially caused by layoffs, suspensions, bankruptcy, or any other reason, they might find it difficult to purchase such a big number of stocks of corporations like Amazon, Apple, Tesla, etc. Thus, even if those preceding investment recommendations were indeed fruitful and achievable, it seems to be somehow inappropriate and less effective in this special period.

To construct a relatively more profitable, practical, and compelling stock investment strategy to fit in a temporary situation, we would like to draw our conclusion after trying to answer the following questions in this paper: (1)What is the current market situation and tendency, (2)What would be the industries that can possess the comparatively bright provision, (3)What is the extent of damage brought by COVID-19 on the stock market, and (4)How can people reduce the risks and maintain the possibility of generating higher payoff of investment simultaneously. Although providing without searches of previous questions, we would like to develop our expectation: investment in only one or relatively small amount of high technology-related company stocks should be profitable. It can be highly recommended in our investment strategy and options such as power options to hedge the

risk, and both allow investors to generate greater payoff.

2. DATA & METHODOLOGY

2.1 Data

Our sample of Workday, Inc. stock uses historical data from 2020/1/2 to 2020/12/31, according to the database of yahoo finance. This paper applied mainly DCF analysis which includes Operating Cash Flow, Capex, Cash interest, Direct leasing, Net Debt, Number of Common Shares. A dataset covering the period from January 31st, 2018 to January 31st, 2020 was obtained from Workday Annual Report 2020 From 10-k (NASDAQ: WDAY), published on March 3rd, 2020. The macroeconomic variable risk-free rate is adapted from the U.S. Department of the Treasury in 2020.

2.2 Method

2.2.1 Stock valuation

Inspired by J.P. Morgan's stock valuation towards Tesla, Inc., which is 50% DCF and 50% 2020-based multiples analysis–itself a blend of P/E, EV/EBITDA, and price-to-sales) [8], we derive our price target, and ratio analysis of Workday Inc. Our analysis only adapted part of J.P. Morgan's analysis method: Equity Value-DCF valuation method for analysis of implied share price.

2.2.2 Stock simulation and sensitivity analysis with the option

Fischer Black and Myron Scholes published the BSM model with significant help from Robert Merton, often known as "Black-Scholes" in 1973. Our paper used this method for stock simulation. It is assumed that stock prices were lognormally distributed, meaning the future stock price would be represented as a function of "Z". Therefore, the model is expressed as

$$S_T = S_0 * e^{[(\alpha - (1/2) * \sigma^2)T + z\sigma\sqrt{T}]} \tag{1}$$

Where the S_T stands for future stock price, S_0 means the current stock price.

In this paper, we use Excel to randomly generate 1129 z values and calculate based on the assumption where strike price is $250 with 0.42 years for maturity. Besides, the current stock price of WDAY is the one on January 12th, 2021 which is $225.62, the risk-free rate is the one in 2020 which is 0.108%, and the dividend rate of WDAY Inc., is 0.00%. Finally we set a contrast for purchasing power option in which strike price and maturity date are set respectively as $250.00 and 0.42 years.

Furthermore, for valuation of option, we chose power option and implemented regression as a tool. The calculation of call option value at maturity for each S_T using $C_T = \max(S_T - X, 0)^2$. Then we can regress C_T on S_T so that $C_T = a + b S_T$. Then the present value of the option can be identified by the the following formula

$$C_0 = ae^{-rT} + bS_0 e^{-dT} \qquad (2)$$

Finally, for sensitivity analysis of power option, Control Variate Method is adopted to determine the sensitivity of option price toward five variables: T, Volatility, Stock Price, Strike Price, and Power. For each of the variables, we increased the base number sequentially can computed each option price for them with a graph as assistance in identifying the relationship more explicitly. To be more specific, T value starts from 0.21 as a based and is increased by 0.02, Volatility with the base 40.00% added 2.00% each, Stock price begins with $200 and increase with the factor of $5, strike price starts the same value as the stock price but grows with the factor of $10, and finally the power starts from 0.5 and adds 0.02 each.

2.2.3 Market analysis

To construct a relatively most profitable and appropriate stock investment strategy, analysis on two fields of the stock market is necessary: the extent of negative impacts brought by COVID-19 and the popularity of stock types. To achieve this purpose, researches of Scott R Baker et al., referring to evaluation of governmental, commercial, and citizens' behaviors or activities, that reveal the stock market reaction towards COVID-19 in the U.S. in 2020 is embraced for our measurement of degree of COVID-19 damages [9]. Further, this is supported by more detailed and scrutinized estimations of brunt of the pandemic towards stock made by SENOL and ZEREN [10], related to global market status, and Uddin et al., referring to stock volatility universally [11]. With the previous two materials, we finally would introduce the investigation of stock market performance in the US under the pandemic with S&P 1500 as evidence, conducted by Mieszko Mazur et al. to prioritize the popularity of different fields' stocks mentioned in the article, combining with our personal opinions[12].

3. RESULTS

3.1 WDAY equity value-DCF valuation

Table 1.1 and Table 1.2 presents the expected stock price as $299.47, indicating a growing value of the company. Besides, compared with the $144.96 as its stock price only one year ago, Workday also exhibits great variability in its stock prices.

Table 1. WDAY DCF analysis

WDAY DCF Analysis (in thousands)	2018	2019	2020
Operating Cash flow	$465,727	$606,658	$864,598
Less: Capex	-141536	-202507	-243694
Add: Cash interest	44549	60209	58685
Add: Direct Leasing	NA	NA	NA
Unlevered Free Cash Flow	$368,740	$464,360	$679,589
PV of FCF		$464,360	$622,432
Terminal Value		$8,150,940	
Implied Terminal Value Factor		15x	
PV of Terminal Value		$7,465,403	

Table 2. WDAY equity Value

Equity Value	
PV of FCFs	$1,086,792
PV of terminal Value	$7,465,403
Enterprise Value	$8,552,195
Net Debt	$5,440,577.00
Equity Value	$3,111,618
Number of common shares	990000
P/B Ratio	3.14
Expected stock price	$299.47

3.2 Stock simulation

Figure 1 presents the positive relationship between future stock price and payoff of WDAY stock. The relationship can be further shown more explicitly by using the regression formula: $y=87.295x-16991$, where the intercept can be read as -16991, and b the slope can be identified as 87.295. Furthermore, based on the risk-free rate, maturity date, and dividend rate mentioned in the method section, the EXP(-rt) is 0.9996, and EXP(-dt) is 1.0000. Therefore, combining the regression with time zero values, the current value of the power option can be obtained as $2712.02, meaning that under our contrast, the power option might be relatively expensive. It also indicates the high return it could bring back to investors.
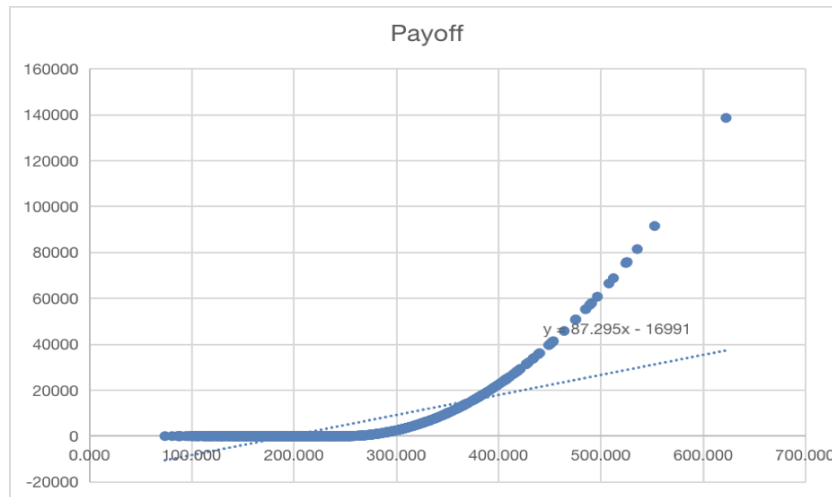

Figure 1. Payoff and Future stock price (Regression Formula)

Note: the x-axis represents the future stock price, and the y-axis represents payoff.

3.3 sensitivity analysis

3.3.1 t-sensitivity analysis

It can be revealed by Figure 2 that the relationship between T and option price is positive, meaning that with a longer time, the option price would show the tendency to increase accordingly. Therefore, if the power option is purchased together with a stock that has a relatively longer maturity date than others, the option price of this stock, correspondingly, would be the highest compared with the option prices when combining with other stocks.
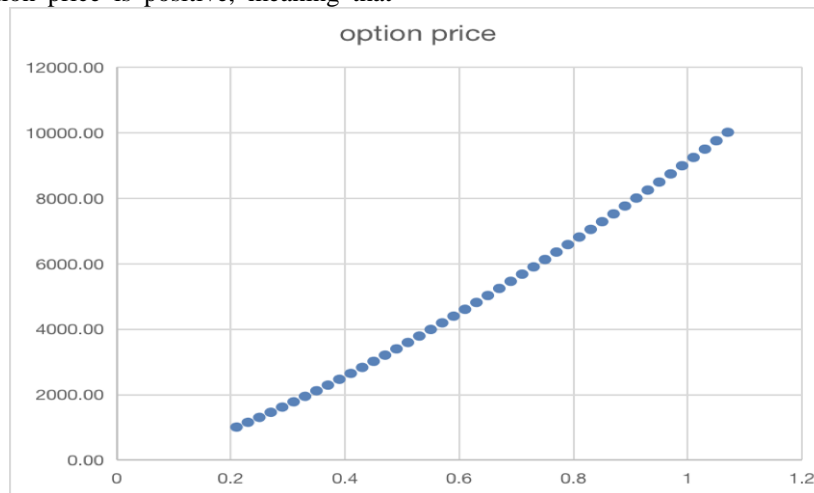

Figure 2. Sensitivity to change in T value

Note: the x-axis represents T values, and the y-axis represents option price.

3.3.2 volatility- sensitivity analysis

Figure 3 shows the positive relationship between volatility and stock price. A stock, if selected, is comparatively volatile. The power option under this circumstance would accordingly be expensive under this circumstance. Thus, it is reasonable to mention that

power options purchased together with stocks related to high technology, especially those cooperations focusing purely on high-tech, such as artificial intelligence, IT technology, and machines, would be costly.
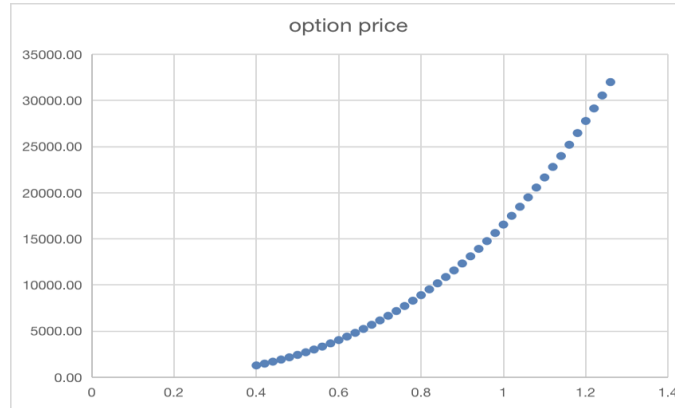

Figure 3. Sensitivity to change in volatility

Note: the x-axis represents volatility, and the y-axis represents option price.

3.3.3 stock price-sensitivity analysis

Figure 4 revealed the relationship between stock price and option price, which is also positive, just like the situations of the previous two factors. In this case,
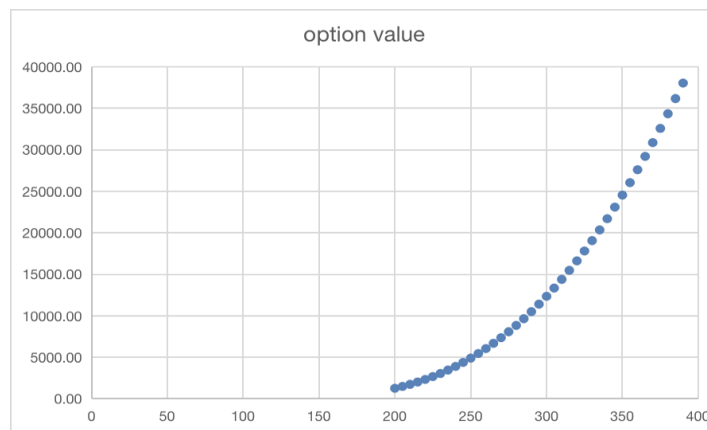
the pricier the stock we chose, the higher the option price would consequently become. Therefore, stocks of large cooperations or industries like Amazon, Apple, or Huawei would enlarge the expenditures to a relatively larger degree for the investors when they purchased options along with them than the extent other stocks would cause.

Figure 4. Sensitivity to change in stock price

Note: the x-axis represents stock prices, and the y-axis represents option value.

3.3.4 strike price-sensitivity analysis

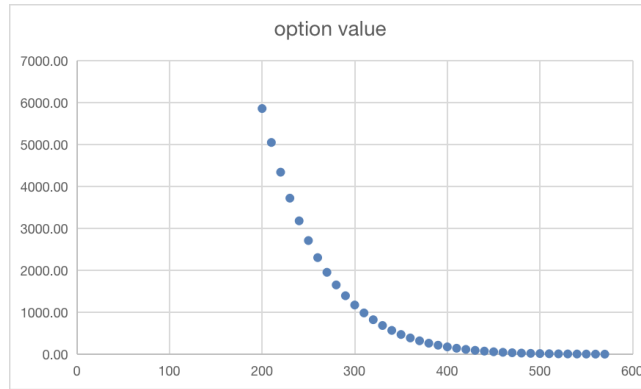It can be recognized from Figure 5 that the strike price and option price, on the contrary of the previous

three factors, possess a negative relationship. Thus, general conclusions can be deducted as that the higher the strike price is set in contrast. The lower investors need to pay for the power option brought along with it.

Figure 5. Sensitivity to change in strike price

Note: the x-axis represents strike prices, and the y-axis represents option value.

3.3.5 Power- sensitivity analysis

Figure 6 shows that the relationship between the power of the option and the option is positive.

Furthermore, compared with the European option, which has one as its power under the same circumstances, based on our calculation, the power option tends to be more expensive since the EU option worth $21.90, while the power option, as mentioned in the previous stock simulation section is $2712.02. The comparison and sensitivity analysis also facilitates our estimation towards the expensive extent after attaining the power option value.
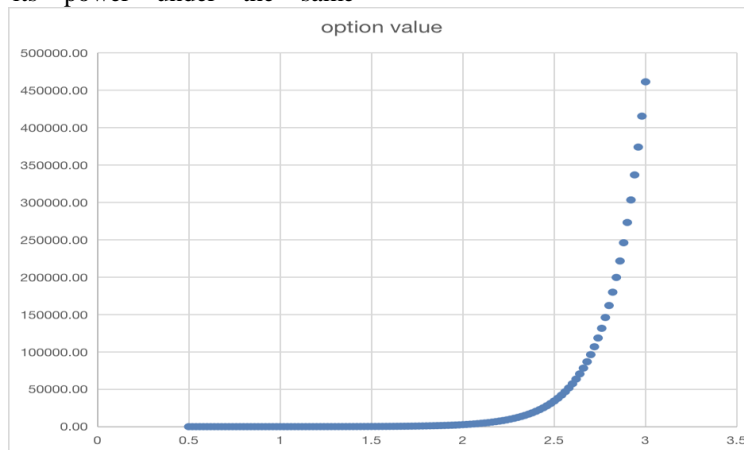

Figure 6. Sensitivity to change in power

Note: the x-axis represents power values, and the y-axis represents option value.

3.4 market analysis

3.4.1 impacts of COVID-19 on the stock market

According to our authentic materials, it is revealed that the damage brought by COVID-19 towards the stock market is extraordinarily severe and can be interpreted from several aspects.

First, viewing from a journalism perspective, it can be concluded that although COVID-19 might not lead to such a high death rate if compared with that in 1900, news of COVID-19, regardless of the directions of judging COVID-19 proposed, become "dominant driver of large daily U.S. stock market moves" [9]. To be more specific, in 1900 there were two biggest and influential pandemics took place: the Spanish Flu in 1918-1920, which is responsible for nearly two percent of the population globally [12] and the 1957-1958 and 1968 influenza, resulting in mortality rates in America greater compared with that of the COVID-19 on June 23, 2020 [9]. However, according to Baker et al. obtained data, numbers attributed to economic fallout of pandemics and policy responses to pandemics on January 2, 1900, to February 21.2020 are both zero [9]. The numbers of those two sections from February 24, 2020, to April 30, 2020, were 13.4 and 10.4 [9]. Furthermore, the case study of the daily U.S. stock market by Baker et al. supplementarily supports the devastating damage brought by COVID-19: the fluctuation of the daily stock market had never exhibited such a serious furious status during the period when the infectious disease broke out [9].

Besides, judging by the low mean index return, approximately equalling to zero, and a comparatively high standard deviation concerning the mean of log of trading volume, based on Uddin et al., samples, it is concluded that volatility index for the attack of COVID-19 in European market reached the peak [11]. Viewing from a worldwide perspective, depending on the information obtained from "MSCT World, emerging markets, European and G7" as the behalf of the global markets, SENOL and ZEREN concluded that with the outbreak of a pandemic, the stock market displayed rapid depreciation universally [10]. This depreciation can be traced back to the attributes of the sensitivity of stock exchanges towards factors–financial, economic, social, political, and cultural factors–changes [10]. To be more specific, for COVID-19 having engendered large-scale cessation of manufacturing, trading, or other economic activities more or less, the number of cooperations registering on the stock market, prices of financial instruments, and wealth of investors all declined in a relatively short time [10]. Therefore, the stock market, possessing such a high sensitivity towards alternations, would no doubt react to the emergency immediately [10].

3.4.2 promising stock types

As stated in Mazur, Dang, and Vega's report, for the devastating influence degree of COVID-19 towards mortality rate globally, healthcare and the medical devices industries illustrated the best performance among all of the industries [12]. For the shutdown of various restaurants or cafes, food and grocery concerning shops performed well in terms of daily life [12]. Moreover, for the rapidly increasing demand for remote working or studying, the software or technology sector also shows a great performance during this period [12]. Finally, since natural gas can be considered a byproduct to crude petroleum companies when under the attack of the pandemic, the decline of oil prices forced the crude producers to reduce the production of oil, which led to the reduction of the output of natural gas naturally. In this case, it is anticipated that COVID-19 would affect the natural gas industry affirmatively [12].

4. CONCLUSION

This paper analyzes the profitability, valuation, and sensitivity of financial instruments concerning particular cooperation, Workday, Inc, current economic status, and stock market trend under COVID-19. By way of conclusion, we reiterate the main generalizable results from this paper, which would further help us to establish our recommendation towards stock investment, together with a discussion of several limitations:

(1) Stock Investment thesis: Workday is an emerging force in human capital management services with an intuitive design, forward-thinking workplace model, and diverse product portfolio. After 16 years, the company is still led by its founders, representing the core values of integrity, diversity, innovation, and spirit. With state-of-the-art technology, Workday has become an indispensable tool to a number of large, influential clients. Workday's unique and all-in-one features set it apart from competitors, ensuring the relevance and necessity of this technology for a long time to come. Because Workday is a cloud-based technology and software company, there is significant risk involved. Data security in the face of cyberattacks, inherited risk from acquired companies, and competition with similar businesses all contribute to the volatility of the stock. However, this elevated level of risk means that there is a possibility for a high reward. Moreover, Workday has also shown great variability in its stock prices over the past few years, selling at $144.96 only a year ago. This indicates a growing value of the company, which is supported by our price target of $299.47. Therefore, we recommend that investors buy now while the value exceeds the price.

(2) Option Investment thesis: Power options belong to the exotic option category. Therefore, its payoff at expiry is firmly affiliated with its power. Among all of the factors we have analyzed in this paper, it can be illustrated that although option price is pretty susceptible to the maturity date, stock price, strike price, and volatility. The hypersensitive factor should be its power since our result exhibited a comparatively rapidly increasing curve of option price when there is only a little change in the power factor. For this attribute, investing in the power option would be rather risky, inferring the possibility of higher payoff since when investment happened at the right timing, the payoff would be squared. In short, two unique characteristics of the power option made it proportionately more attractive, reasonable, and optimal for considering as a choice of both hedging risks and generating higher growth in the payoff.

(3) Current economic status: It has been widely recognized that COVID-19 damaged the economy on a relatively large scale. The mortality and morbidity brought along with the pandemic outbreak can be considered the root of the series of reactions afterward, referring to industry, finance, economics, or marketing. This chain reaction demonstrated the way of pandemics deteriorating the current circumstance. The mortality, first functioning as an accelerator of spreading anxiety, fear, and jitter among citizens, stimulated governments, politicians, and medical staff to enact new policies and not scrutinized cautions or solutions under the chaotic situation. This further crumbles the control of the growing death rate globally. Governments nearly in all of the countries, thus, forced by the condition,

announced the declaration of going into quarantine period, symboling the element in various fields. Since there were differences between shutting down cooperations or beginning quarantine, according to the divergent degrees of death rate, supply chains, both national and global experienced disruption. Moreover, transportations began to be limited or even restored among countries, dragging economic status [13], especially parts closely interlocking with international trade. The extent of the damage can be shown more explicitly and tangibly depending on our research: even combining the devastation of Spanish Flu and influenza in 1900, it didn't cause such a huge loss to human beings, supported by the index of the journalism industry and stock volatility [9][10]. The extent can also be exposed by the experts' anticipation of the lengthiness degree required for economic recovering, as mentioned in our introduction section [7].

(4) Stock market trend: For the stock market is hypersensitive towards any alternations that happened in society. The pandemic, from our view, changed the promising stock types a lot today. Based on our researches, the most auspicious stocks would be those related to four fields, specifically: medical area, food industry, technology field, and natural gas [12]. Our Workday, inc., stock valuation also proved the part where the technology-related stock would be one of the most promising stock types after the pandemic attack.

(5) Current stock investment strategy: Considering the previous four points, we developed our own recommendation of stock investing in adjusting to the alternations and still possess a positive return from investment under this special period. First, we would like to uphold technology stocks such as Workday stock. Though stock types related to the other three promising types should be paid attention to, they all suffer from some aspects or are less profitable than investing in the technology field. It is easier for some impressionable people to believe that medical products or industries will provide them high payoff in the medical field since the demand is growing dramatically currently. However, the boost might only stay for a while, especially until now. We are already access to vaccines in various countries, and the effectiveness and safety are also proved in various cases. Thus, after vaccinated, we speculate that the demand for medical services would drop rapidly. The food industry suffers the same issue as the medical industry. The demand for it is only increased during the quarantine period. For this reason, in the short future, the need for to food industry would drop as well for people no longer need to store extra food. Finally, for natural gas, as a byproduct of the oil cooperation, the stock price would highly interconnect with the oil price. Therefore, when the regional quarantine period is over, which has already happened in several countries, oil production would recover, and the price might go back to normal. In this case, the stock price of natural gas

would likely suffer in the future. Whereas the technology stock is distinctive. Though it seems that the technology field got people's attention with a similar reason to the previous three areas, it is not accurate. From our perspective, COVID-19 should be considered an accelerator for the increasing popularity of technology instead since many emerging high-tech products had already signaled the beginning of the information age, meaning the development of the technology will be perpetual will last for a decade. With this prediction, we believe recommending technology-related stock such as WDAY stock would be acceptable. Whereas, some might argue that though, with a promising future, the high volatility might prevent them from investing in a technology company. To solve this problem, we would introduce a power option to hedge the risks and attain a higher payoff. Besides, we would like to recommend relatively small size or middle-sized companies instead of large cooperations. This might be confusing for some, but it can be traced back to the prices of stocks. Like what we stated in the introduction, most people cannot afford big cooperations' stocks and power options. Thus, people should instead consider small or middle size companies' stocks.

(6) Limitations: The Black-Scholes model used in this paper is recognized as one of the most significant finical derivatives pricing models [14]. However, for there are too many famous models with various characteristics, we cannot promise that this will be the most optimal model applied to anticipate the price. The anticipated price for the same condition we provided in this article might not be the same if a different model is implemented. Furthermore, the investment strategy might be more profitable and suitable if used under the pandemic. This is especially because the reason for recommending investing in relatively small and middle-size companies is based on the current poor financial status many people are suffering.

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