FIN42070 Research Dissertation

Empirical Analysis of Asset Pricing Models, Prospect Theory and Covid-19 Pandemic: Evidence from Hong Kong Stock Market

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Abstract

Covid-19 causes hundreds of deaths globally meanwhile it brings higher volatility on Hong Kong Stock Market which is the financial center of Asia. It attracts to investigate whether Asset Pricing Models, Prospect Theory and Covid-19 Pandemic can clearly illustrate variations in stocks returns on the market via a set of regression analysis. The empirical findings demonstrate that Hong Kong Stock Market experiences large fluctuations during the pandemic; Hang Seng Index positively relates to constructed portfolios; Government interventions such as Lockdown and Traveling Restrictions bring higher returns on the index; Crude Oil is another factor that affects the stock market negatively; Stocks with the highest previous monthly returns tend to have higher returns in the current month; Asset Pricing Models can provide assistance on assessing whether market efficiency exists in Hong Kong Stock Market.

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Table of Content

Introduction

Covid-19 outbreak started at the end of December in 2019 when the first case of the virus was found in Wuhan, Hubei Province which spreads across the whole world within three months. 30th January 2020 is the day of World Health Organization issuing the first global alert of the Covid-19 and with the number of confirmed cases soaring at the highest growth rate, WHO announced that Covid-19 was recognized as the global pandemic on 11th March 2020. The Chinese Government imposed a lockdown on Wuhan City starting from 23rd Jan of 2019 when they recognized serious of the situation meanwhile it established a set of countrywide travel restrictions for dealing with the pandemic. According to World Health Organization Official Website, it can be found from statistics of infected cases that until 19 July 2021 the global confirmed cases of Covid-19 are 190.6 million including 4.09 million deaths and the current weekly growth rate is about 1.84%. There is no doubt that Covid-19 is the most serious disease in the current world.

Covid-19 devastated ruthlessly health system of the current society and it also has impact on global financial market. The pandemic brings higher volatility in global stock market and daily standard deviation was 1.36 in American Stock Market which represents the extreme stock price and daily stock returns incurred during the pandemic. Similarly in Chinese Stock Market, the extreme daily return was about -9% in Feb of 2020 with standard deviation of 1.47%. Hence, the volatility in American stock market lagged behind the Chinese stock market. Except for the stock market, according to Lo, Bassene and Sene (2021) it reported that US crude oil future market experiences a sharp decline in price of a barrel of crude oil and it reached at -37.63 US dollar on 21 March 2020.

Hong Kong is a worldwide financial center and Stock Exchange of Hong Kong Ltd. is a platform for investors to conduct investing activities. Its operation scopes of the stock exchange include: IPO, buying or selling shares, options, futures and gold.

There are around thousands of companies coming from all over the world listed in Hong Kong Stock Exchange and its history lasts about fifty years which is recognized as the most mature and active financial market in the world. Hence, Hong Kong Stock Market experienced large fluctuations during the pandemic as well and Covid-19 brought volatility in the stock market. It attracts us to investigate what the determinant factors in stocks returns listed in Hong Kong Stock Market using asset pricing models and evaluate whether market efficiency exists in the Market during the pandemic.

Asset Pricing Models are widely used in valuing assets such as stocks, bonds and other financial assets. Capital Asset Pricing Model is one of the models proposed by William Sharpe which represents a linear relationship between systematic risks of individual stocks called Beta and its required rate of return used for evaluating mutual funds' performance by fund managers. But it is impossible for CAPM to capture market anomalies in Hong Kong such as fundamentals effect and size effect, etc. meanwhile it has some unrealistic assumptions such as short selling is unrestricted as its drawbacks.

With the aim of improving CAPM model, Fama French Three and Five Factor models were created which adds size, earnings-price, debt-equity and book-to-market ratios into explanation of expected stock returns. They can clearly explain the variations in cross-section stocks returns by considering these risk factors in the models and it can enhance the accuracy of models through overcoming spurious problems in CAPM.

Moreover, prospect theory requests us to pay more attention on the investing activities which can be seen as another risk factor affecting the variations in stock returns. The theory shows that people's preferences in choice are inconsistent with expected utility theory and it generates two additional factors what 'Peak' and 'End' variables measures utility of 'gain' and 'loss'. It further improves the accuracy of the models applied into the regression analysis.

The paper consists of Covid-19 Pandemic, Prospect Theory and Asset Pricing Models

Segments. It is going to deeply understand and critically analyze Asset Pricing Models in details containing Capital Asset Pricing Model, Arbitrage Model and Fama-French Three or Five Models. Besides, the paper is going to outline the fundamentals of prospect theory which includes four core components. Meanwhile, it analyses the impacts of Covid-19 on global financial markets and the selected countries are the US, African Countries and China. Finally, the paper will deploy several econometric models for investigating what the determinants of variations in cross section stock returns listed on Hong Kong Stock Market in the past 15 years and explores whether market efficiency exists in the stock market. Section (3) is Literature Review of the thesis, Section (4) is the Data Design of the paper, Section (5) is Empirical Findings Analysis and Section (6) is Findings and Recommendations.

Literature Review

Asset Pricing Models

Sharpe (1964) proposed Capital Asset Pricing Model based on Markowitz's Modern Portfolio Theory and there are two assumptions under the model that investors can borrow and lend at a common interest rate, besides it points that investors' expectations are homogeneous which is unrealistic and restrictive. Risks of financial assets comprise of systematic risks and unsystematic risks. Investors can eliminate unsystematic risks called idiosyncratic risks through holding diversified portfolios but they cannot avoid risks of economic activities called systematic risks. CAPM measures the responsiveness of assets' returns relative to systematic risks which denotes beta and it is widely used to appraise the performance of mutual funds and other managed portfolios.

According to Fama and French (2004), one of the most important drawbacks of the model is that it is difficult to distinguish what right and available data should be included into the market portfolios and the CAPM has never been tested or demonstrated. In other words, excess market return is the core component of CAPM and it is hard to find the accurate proxy of market portfolio. Meanwhile, they recognized that it fails to evaluate whether passively managed portfolios are able to generate abnormal returns and criticized that the model cannot inspect the market anomalies in stock market such as, low beta stocks and value stocks are more likely to produce positive abnormal returns.

CAPM can not clearly explain the variations in the cross-section of average stock returns because stock market contains a series of market anomalies and it only considers the impact of board stock market on portfolios returns. Fama and French (1996) realized that market anomalies in stock market has been identified by researchers that there is a reversal trend in stock price where increasing stock returns continue to decline in long term and short-term growing returns tend to climb up.

Besides, Fama French Three Factors Model was introduced for analyzing that expected excess return of portfolio $E(R_i)-R_f$ can be explained by three factors regarded as market anomalies including that sensitivity of its returns to the excess return on a broad market portfolio, differences between returns on a portfolio of small stocks with large stocks and differences between returns on a portfolio of high book-to-market stocks with low book-to-market stocks. Fama French Five Factors Model as the improvement in Asset Pricing Models helps enhance ability of prediction and it can clearly clarify variations in cross-section stock returns better than FF Three Factors Model because it includes two more variables reflecting market anomalies: risk factor of investment styles and profitability (Mosoeu and Kodongo, 2021).

Arbitrage model was developed by Ross (1976) and it was projected as the alternative model of CAPM based on mean-variance criterion which becomes a significant method for explaining market anomalies or specific phenomena observed in capital market. Hence, in order to find out what factors can affect Hong Kong Stock Market, arbitrage model is helpful for exploring whether variables exist significant relation to index returns.

Empirical findings of Asset Pricing Models

Fama and French (1992) found that average returns on small stocks are higher than the larger stocks and returns on American stocks are positively related to ratios of book value to market value which is recognized as size effect and it also can be applied into explaining the cross-section of return pattern in Japanese stocks but its empirical evidence violates Capital Asset Pricing Models.

According to Fama and French (1996), it can be found in Fama French Three Factors Model that weak firms have higher BE/ME ratio because it has lower market performance relative to its higher book value of firms and the slope of HML is positive but the slope of strong firms has reversed direction and coefficient of the

variable is negative. That means HML variable is the proxy for relative distress of companies meanwhile showing that it can predict reversal returns in long term and short-term trend of stock returns are not predictable in this model. As for Fama French Five Factors Model, Mosoeu and Kodongo (2020) wrote that 'Profitability' is the best performing factor in the model and the market portfolio is redundant because of similar quantitative results generated by a set of regressions for 'Emerging' and 'Global' portfolios on 313 weekly data comprising of emerging and developed equity markets after which they found that average returns of stocks are higher in large-size firms than small-size firms and growth firms performed well than value firms.

FF Five Factors Models can be applied in evaluating price of stocks or bonds and the five risk factors include SMB, HML, CMA and RWA. Fama and French (1993) argued that FF Five Factor Model can appraise both stocks and bonds but the five risk factors used in analyzing variations in common stock return can not be appropriate into investigating variations in bond markets which can be explained by factor of TERM and DEF. At the same times, its evidence shows that slope of SMB can help explain why small stocks' returns are much volatile and HML can illustrate the low BE/ME portfolio can generate higher return than the highest BE/ME portfolio because the factor is negative correlated with profitability.

Besides, R-Square measures accuracy of regression models and Covid-19 background can influence performance of regression models. It was reported by Horvath and Wang (2021) that R-Square of Asset Pricing Models is declining in the pandemic and it also experienced the similar trend in financial crisis in 2008 but FF Five Model has a rising R-Square recognized as the best performing model for predicting stock returns.

Arbitrage Model, improvement of Capital Asset Pricing Model can capture specific phenomena and some market anomalies in stock market. The empirical findings of Bodilsen and Eriksen (2021) suggest that it has a positive and strong relation between returns on stocks with the announcement days of press conference which is held by

Federal Open Market Committee, indicating that investors can absorb higher stock returns on announcement days of PC accompanying with growth and monetary news otherwise the correlation is going to be negative in the other days.

Covid-19

Covid-19 spreads over the world and enables worldwide economy to enter into a clear economic downturn with stock price declining (Liu and Huynh, 2021). And Ciner (2021) noted that Covid-19 pandemic caused huge volatility in American stock market which shows that global stock markets experienced a sharp decline in their price about 25% comparing with the previous month, the 10-year US treasury yield was lower than 1 percent and VIX has reached to levels of 2008 Financial Crisis at the end of March of 2020. American stock market experienced a decline in S&P 500 around 30% result in Covid-19 and price of a barrel of crude oil on American futures market has cut down below zero which has reached at -37.63 US dollar on 21 March 2020 (Lo and Bassene, 2021). As well as shown in Zhang and Hamori (2021), Covid-19 pandemic is going to generate a series of unpredictable risks including changes in oil prices and damages in American stock market which brings huge losses for investors in a short period, specifically Covid-19 triggered the fluctuation of oil and global stock markets about 80% consistent with the influence of 2008 global financial crisis.

It is stated by Liu and Huynh (2021) that global stock market is likely to be impacted by information that changes in the number of confirmed cases and new infection cases can amplify the volatility and crash risks of Chinese stock market. According to Albulescu (2020), it found that new infection cases and fatality ratio are the core factors of volatility in American financial market. Similarly, Covid-19 uncertainty has adverse effect on the Canadian economy and it is negative related to stock returns (Xu, 2020). Moreover, National Covid-19 case numbers and Related government intervention are considered as risk factors which could affect a country's stock market performance (Scherf and Matschke, 2021). When the pandemic outbreak across

worldwide countries, the stricter preventive measures could lead to further decreases in stock market performance and experiences negative economic consequences.

In order to recover from Covid-19 pandemic and stimulate the financial market, Federal Reserve are suggested to purchase both investment grade, high yield corporate bonds and ETF treasury securities related ETF (Ciner, 2021).

Empirical Findings of Covid-19 Pandemic

Ciner (2021) found that movement of stock returns in the extreme financial market follows a Cauchy distribution in the Covid-19 pandemic which is the stable state of distributions and has fatter tails than normal distribution. Therefore, it is necessary for US companies to pay more attention on risk management activities because sanitary crisis enhances the S&P 500 volatility and official announcements of new infection cases or fatality ratio are sources of volatility in American financial markets (Albulescu, 2020).

Developed countries like the US, Spain, the United Kingdom, Italy, France and Germany become more speculative and can obtain more abnormal returns during the Covid-19 because stocks are not priced correctly due to insufficient data and returns are unpredictable caused by traders' behaviors (Ozkan, 2021). Therefore, it encourages policymakers to be more proactive and emphases the importance of regulatory in stock market. Unlike developed economy markets such as the UK, the US, Germany and South Korea, Chinese stock market experience lower volatility in share prices in both epidemic and pandemic periods of Covid-19 (Ali, et al., 2020). The phenomena is determined by culture factors written by Fernandez-Perez and Gibert (2020) that developed countries have culture characteristics of higher individualism and lower uncertain avoidance which could lead to higher volatility in stock returns during the pandemic and stock prices are mispriced so that investors can grab abnormal returns, on the contrary Chinese investors prefer to share information with others and equip with higher awareness of risks so that volatility of stock prices in Chinese Stock Market is relative lower.

To be details, Fernandez-Perez and Gibert (2020) thought that investors who are overconfident and interested into taking risks are seen as individualistic characteristics and it can influence their trading behaviors because investors are more overconfident and are likely to take risky actions under-reacting the public news with self-attribution bias, causing higher volatility in stock market. Conversely, stock prices suffer less volatility in countries with higher individualism and low uncertainty avoidance.

In African Stock Market, OwusuTakyi and Bentum-Ennin (2020) wrote that Covid-19 has negative relationship with economy development and stock market performance in African Countries which consists of 13 selected African countries with help of a novel Bayesian structural time series model. It reflects that Mauritius experienced around 20% reduction in stock price during the Covid-19, followed by Morocco about 17% but some countries remain the same in Covid-19, for example South Africa and Uganda. That's to say, Covid-19 influences global financial market restrictively and no doubt that the pandemic is negative related to the stock market performance. And another evidence Lo and Bassene (2021) shows that Covid-19 has an influence on African countries and the volatility in African Financial Market is higher over the period from 27 January 2020 to 22 October 2020 which is caused by disease's progression rather than fear and panic, besides fatality rate has a negative relationship with the volatility of African financial markets but the relationship is not meaningful because it can not be observed by the regression models due to lower death rate in the African countries.

Generally Speaking, the number of deaths of Covid-19 have negative impact of stocks returns but it is positively related to the volatility of major securities under help of regression analysis meanwhile exchange rates have reverse impact on stock returns through GARCH regression analysis (Kusumahadi and Permana, 2021). And new infection cases and fatality ratio positively influence the volatility of financial market written by Albulescu (2020). Besides, Xu (2020) found that changes in the number of Covid-19 cases are the core concern of Canadian Stock Market because it can cause

stock market's asymmetric responses. But some researchers argue that it exists those significant positive returns correlated with an increase in the number of Global Covid-19 cases but it disappears in local Covid-19 cases (Scherf and Matschke, 2021). That means the pandemic of COVID-19 is likely to accelerate the volatility of stock returns in all observed countries and it lowers prices of most of financial products.

After conducting a set of research work, some risk factors observed can affect variations in stock returns such as governments restrictions, fear sentiment and Covid-19 media coverage index. Scherf and Matschke (2021) realized that restrictions posed by governments have negative impact on stock market one day before and up to two days after the implementation which means that restriction relaxation has a significant positive impact on the stock market two days before the relaxation. According to Liu (2021), it illustrates that fear sentiment in Covid-19 pandemic negatively impacts on stock returns and it causes fluctuations in stock market because announcements of lockdown in Wuhan and the number of confirmed cases publicly disclosed could bring people into panic, meaning that fear is going to exacerbate the negative impact of Covid-19 and remind investors of maintaining optimism rather than panic about the crisis. Taking Chinese Stock Market for example, it becomes worsen and falls into crash when the fear sentiment is incorporated.

Finally, Coronavirus Media Coverage Index covering about 84 percent of all news sources of Covid-19 could affect American Stock Market especially in 15 distinct topics. There is evidence showing from Biktimirov and Sokolyk (2021) that hype scores of Covid-19 related topics such as Debt Market or Financial market has a significant relationship between the S&P 500 index returns and it is informative for negative sentiment scores to predict stock market performance.

Prospect Theory

According to Gregoriou and Healy (2019), it describes that Prospect Theory as one of the useful alternative models for expected utility theory provides people an approachable way to appraise decisions under risks and uncertainty using a series of psychological criterion including reference dependence. Prospect Theory has four components including reference dependence, value function, diminishing sensitivity and probability weighting (Barberis, 2013). Reference Dependence of Prospect Theory can be measured by 'Peak-End Rule' and it can help investors recognize utility of 'Gains' or 'Losses' comparing with reference points rather than absolute level of wealth noted in (Gregoriou and Healy, 2019).

Besides, Barberis (2013) stated that in prospect theory value function slope of value function in loss area is deeper than the gain indicating that investors dislike losses more than gains which has violated expected utility framework that evaluates the gamble in an essentially risk-neutral way.

There is another description of prospect theory value curve made by Barberis and Lawrence (2021) is that it has a kink at its origin and observes a greater sensitivity to losses than to gains which is known as 'Loss Aversion' and makes the curve concave in gains part, convex in losses part. It means that investors are risk aversion regarding to moderate-probability gains and risk-seeking when they face moderate-probability losses.

According to Kaustia (2010), it analyses that disposition effect is related to the S-shaped value function of prospect theory where the curve indicates that investors who experiences losses are risk seeking because they prefer to hold the losing stocks rather than realizing losses due to the effect, on the other hand they are willing to sell them once stock prices are initially higher than the purchasing price.

And the curve also shows that some facts violate the tendency of realizing profits that if investors gain a large capital in the long holding period, they are associated with a

lower propensity to sell because investors receive less utility from realizing gains and slope of value function is easing as the gain is increasing. On the other words, if investors receive 70% and 100% of large gains in the investing activities, there is a decline in propensity of selling stocks due to lock-in effect of capital gains tax. As for probability weighting, Barberis and Lawrence (2021) stated that probability weighting is the core component of Prospect Theory and people weight outcomes of each case by transformed probabilities rather than objective probability.

Conversely, a limitation of prospect theory is that it is a purely psychological explanation meaning that it depends on investors' feelings about utility of realized outcome coming from the investment and the theory aims to determine whether it is possible for investors to recognize profits. Besides, it can lead to disposition effect.

Stocks' fundamental information can be another motive for trading which can form disposition effect and is solely driven by investor psychology which means that it is seen as a risk factor for testing whether they can clearly explain the variations in stock returns listed in Hong Kong Stock Market.

Empirical findings of Prospect Theory

João*do et al.* (2021) examines that there is a negative relationship between PTV and the subsequent returns in Brazil Market but in Mexico it found a positive relationship between PTV and returns driven by culture factors such as individualism and tightness so it has the same trend in China Market and Brazilian Market because their culture exhibit a higher degree of tightness and collectivism.

Grinblatt and Han (2005) have clarified that investors prefer to hold stock A where it has larger losses than stock B although the two stocks have negative return. Besides, investors have less willing to hold large winners which is stock D than stock C where they are smaller winners because it is likely to avoid some uncertainty and it can be illustrated in figure 1 named Prospect Theory Value Curve meanwhile its equation is

followed. Lambda is the loss aversion parameter and it times a function utility for losses as mentioned in Wakker (2010).

And it can be captured by disposition effect showing that investors are likely to hold stocks which has incurred a large amount of loss and they could sell stocks which has generated certain returns conversely.

Prospect theory can help investors predict and evaluate financial products using prospect theory value of historical returns distribution. According to Zhong and Wang (2018), it can be applied in bonds market and bonds with higher prospect theory value become attractive which makes the bonds overvalued meanwhile investors will earn lower future returns, besides its predictive power of prospect theory is stronger in junk bonds and loss aversion component plays an important role of predictivity in prospect theory. Because most institutional investors are not allowed to buy the junk bonds and the theory tends to be applied for individual investors who are likely to make decisions under their own thinking systems.

Research Design

Dataset Description

In order to investigate what risk factors are going to affect Hong Kong Stock Market in the past 15 years, 158 companies were selected from Hong Kong Stock Exchange which covers 80% of market capitalization in Hong Kong Stock Market and can provide at least 15 years historical data as shown in Table 1.

Hang Seng Index is used as proxy of Hong Kong Stock Market and representatives of Chinese stock market consist of Shanghai Composite Index and Shenzhen Composite Index. Besides, NASDAQ Index represents American stock market (Table 2) and three or five factors of Asset Pricing Models were organized from Kenneth R. French Online Library on a monthly basis in the past 15 years.

In terms of portfolio construction, 158 companies are organized into four groups in criterions of market capitalization and the largest size group is labeled as ‘Portfolio 1’ relative to ‘Portfolio 4’ the smallest size group. Each group is constructed into both value-weighted portfolio and equal-weighted portfolio. Portfolio index returns are calculated by value-weighted and equal-weighted formats. The paper will conduct a set of regression analyses on the basis of 2006: 01 to 2021: 01 counting for 15 years about 186 monthly observations in full sample and four groups. That means the monthly data will be used in the analysis. Monthly stock prices are mainly exported from EIKON and some of the series are obtained from Yahoo Finance. Additionally, the paper will conduct volatility and data statistics in subperiod analysis of Hong Kong Stock Market using the past 15 years daily returns.

Data Summary

The Section describes data characteristics of each group stock returns and Hang Seng Index Returns. Besides, it contains correlation between the explanatory variables. According to Table 3, it can be found that objective of the table is each stock's monthly return. There is total 29,388 observations in full sample and annualized mean of the dataset is around 1.68% with standard deviation of 2.05 which indicates that the variation in full sample is wider than the other groups. Besides, the dataset is not distributed normally because excess kurtosis is greater than 3.0 and skewness is negative about -0.26 which shows that investors tend to experience losses if they hold one of stocks in the full sample and the statistics are close to the mode of full sample. To be specific, Portfolio 2 has the highest monthly stock return about 258.35% among the four groups meanwhile Portfolio 3 has the lowest monthly stock return about -356.21%. It means that some of monthly returns are outlier in each group and might influence the whole sample's distribution. The kurtosis of Portfolio 2 is about 0.77 thus the monthly stock return distributes towards positive and investors might win a small number of abnormal returns in investing Portfolio 2. Moreover, the average of annual return in Portfolio 1 and Portfolio 2 are positive around 10.8% and 5.16% separately. Portfolio 4 has higher volatility and standard deviation is 1.59, indicating that this group experiences larger fluctuation among the four groups.

The Table 4 displays that data summary of Hang Seng Index monthly returns and PetroChina Company. Hang Seng Index is the proxy of Hong Kong Stock Market and its monthly return is used as explanatory and dependent variables in the following tests. The table describes that data size is 186 ranging from the past 15 years and counting frequency is on monthly basis, besides annual standard deviation of the data is less than four groups about 1.27 and annual return of the index is about 4.32% which means that the index is a well-diversified and market efficient portfolio with lower risks than other portfolios. PetroChina Company is selected as the

representative of Crude oil in Hong Kong Stock Market which is seen as another risk factor affecting the stock returns. The maximum monthly return of it is 0.28 and -0.27 is the minimum monthly return. Comparing with Hang Seng Index Monthly Returns, crude oil in the stock market has lower volatility with annual standard deviation about 0.84 whereas its annual mean is about 12.48% with 183 observations.

Table 5 reports Correlation of Each Explanatory Variables: Excess Market Return, SMB, HML, RMW and CMA. The variable of Excess Market Return is positively related to variables of SMB, HML and is negative impact on RMW, CMA. Variable of RMW has a negative correlation with SMB and HML, besides their respective coefficients are -0.34 and -0.04 but CMA positively correlated with SMB, HML and RMW.

Models Design

In order to investigate the determinant factors of variations in Hong Kong stock returns, the paper has designed the following economic models with the help of (Gregoriou and Healy, 2019). A series of econometric models are shown in the Appendix that (1) is Capital Asset Pricing Model which considers the impact of board stock market listed in Hong Kong Stock Market. (2) and (3) are Fama French Three and Five Factors Models which they add the size effect, fundamental effect, investment styles and profitability factors into the asset pricing models for capturing market anomalies in the stock market. The next section of model's design is about prospect theory which contains 'Peak' and 'End' variables into the models. Model (4) explores the simple relation of the two variables with stock returns and Model (5) to Model (7) apply the two variables into Fama French 3 and 5 factors models. This measure aims to explore whether 'Peak and End' rule can significantly explain the stock returns listed on Hong Kong and clarify if market efficiency exists in the stock market. The final section is called Covid-19 Proxy Model which comprises of combination Market Model and two variables 'Lockdown' or 'Restriction' separately. (8) is named as Market Model + Dummy $_{\text{Lockdown}}$; (9) is Market Model + Dummy

$_{Restriction}$ and (10) is classified as Market Model + Dummy $_{Lockdown}$ + Dummy $_{Restriction}$.

Variables Descriptions

Table 6 displays variables descriptions of econometric models in the paper. Dependent variable is the excess return of each portfolio or full sample and independent variables also called explanatory variables are excess market return, SMB, HML, CMA, $MaxPi_{t-1,}$ Pi_{t-1} and $Dummy_{Lockdown}$, etc. Log return is used as each asset's return in the paper and the formation is below:

$$R_{i,t} = \mathrm{Ln}\left(\frac{P_{i,t}}{P_{i,t-1}}\right)$$

$P_{i,t}$: Stock price in the current month$_i$;

$P_{i,t-1}$: Stock price in the previous month$_{i-1}$;

$R_{i,t}$: Log return in asset$_i$.

R_f is risk free rate and return on riskless assets. It selects the average deposit rates of Chinese Commercial Banks such as: ICBC, CMB and CCB, hence the fixed rate is 2.75%. R_m is market portfolio return and the proxy of Hong Kong Stock Market is Hang Seng Index. And R_m-R_f represents an expected excess return of individual stocks or portfolios (Grauer and Janmaat, 2010). The statistics of SMB, HML, CMA and RMW are taken from Kenneth Online Data Library which is created by Kenneth R. French who is an expert on the behavior of security prices and investment strategies (French, 2021). β_{MKT} measures sensitivity of assets' return to variation in market return. β_{SMB} is the beta factor firm size and it measures sensitivity of returns on the smallest three groups minus returns on the largest three groups relative to portfolios' returns which is regarded as size premium. β_{HML} measures sensitivity of differences in returns on the biggest BE/ME ratio with returns on the smallest BE/ME ratio which emphasis the importance of firms' fundamentals. Similarly, CMA and RMW are risk factors that consider investment styles and profitability factors thus

they contribute profitability premium and book-to-market premium. Finally, Max_{Pit-1} and Pi_{t-1} are the explicit representatives of 'Peak-End' and evaluate 'gains' or 'losses' comparing with the benchmark rather than the absolute wealth (Gregoriou and Healy, 2019). $MaxPi_{t-1}$ implies that maximum excess daily return of $portfolio_i$ in the previous month and Pi_{t-1} is the excess monthly return of $portfolio_i$ in the previous month. Besides, Lagged Monthly Returns is the one, two and three months lagged returns and Crude Oil is the monthly return of PetroChina Company.

Hypothesis:

Hypothesis1: Market Efficiency exists in Hong Kong Stock Market.

Hypothesis2: Asset Pricing Models can significantly be applied to Hong Kong Stock Market.

Hypothesis3: Prospect Theory has statistically significant impacts on Hong Kong Stock Market.

Hypothesis4: Covid-19 factor can strongly influence the Hong Kong Stock Market.

Empirical Regression Findings

Asset Pricing Models

Capital Asset Pricing Model:

The Table 7 describes CAPM regression results of the full sample and four individual groups. In terms of full sample, investors who hold the value-weighted full sample can earn abnormal returns in Hong Kong Stock Market because the alpha is positive about 0.021 and it has a positive relationship between excess market return with the portfolio which indicates that 1% increase in the excess market return could cause the return on portfolio goes up around 1.52%. Besides, the coefficient of excess market return is meaningful at significant level of 1%, 5% and 10%. Comparing with value-weighted portfolio, equal-weighted portfolio has the similar trend but it does not have better performance than portfolio constructed by value-weighted formats. Besides, portfolio1 and portfolio2 consisting of large companies can beat Hong Kong Stock Market meanwhile it violates market efficiency hypothesis because of positive alpha. The excess market return is significant at any levels among the ten regression models and most of the models can highly fit into datasets properly because R-square is greater than 0.50 but the accuracy of Group 4 is acceptable.

Fama - French Three Factors Model:

It can be found from FF-3 Factor Model Regression Analysis Results (Table 8) that the R-Square in portfolio 4 consisting of smallest market size companies is 0.40 which means the accuracy of model is acceptable, on the contrary other models perform well because their R-squares are greater than 0.5. Concerning with market efficiency, larger market size of portfolios and value-weighted portfolios are likely to occur abnormal performance around 2.5% and violate market efficient hypothesis in Hong Kong Stock Market.

Besides, it still exists a positive relationship between excess market return and each portfolio's return which means one percent of increase in excess market return causes

that each portfolio's return goes up about certain amount of beta which is similar to CAPM in terms of 'Excess Market Return' variable and the coefficients are statistically significant at 1%, 5% and 10%.

Beta of SMB is positive in all groups and full sample except for Group4, indicating that one increase in returns of small firms bring higher returns in portfolios. Taking Value-Weighted full sample for example, there is more than 0.31 times growth in the portfolio's return accompanying with one percent of small firms' returns increasing. Besides, coefficients of SMB are economically significant at level 10% in Value-weighted Portfolio and Group1 – Group 3 through comparing T-statistic and P-value with their critical value.

Regarding to HML risk factors, the coefficients are negative in Full Portfolio and Group1 -- Group 3 but it appears positive in Group 4. It means that portfolios tend to contain growth stocks which have the lower market value of each company because it has potential ability to generate more returns than others. However, the coefficients are not statistically significant at any levels at 1%, 5% and 10% thus HML cannot explain the relevant market anomalies in Hong Kong Stock Market and it is unrelated to the variations in returns of cross-sectional companies listed on the market.

Fama - French Five Factors Model:

Conducting Fama French Five Regression Analysis (Table 9), it adds two additional risk factors like CMA and RMW which considers impacts of profitability and investment styles on Hong Kong Stock Market. It can be found that after adding the two risk factors it makes other explanatory variables insignificant in the econometric models apart from 'Excess Market Return' variable. And coefficients of CMA and RMW are statistically significant in the Value-Weighted full sample and Value-Weighted Portfolio 1 at level 1%, 5% and 10% meanwhile they are negative which illustrates that the level of firms' profitability has adverse influence on the portfolios' returns, meaning that if companies have higher profitability about 1% than

the previous years the portfolio may afford the same level of risks and the value could experience losses about 50% as shown in value-weighted portfolio. Besides, RMW measures firms' investment styles and if firms are less frequent for undertaking investing activities, they would afford more risks and cause 44% losses per unit of decrease in frequency of investing activities of companies.

Prospect Theory

Peak-End Rule + CAPM

Peak-End Rule includes 'Peak' and 'End' Variables which indicates that the highest daily return of the previous month and the monthly return in the previous month. It is used to measure reference dependence comparing with the relative utility rather than absolute wealth. The figure 8 shows the model regression's results.

The first econometric model is CAPM plus 'Peak' and 'End' Variables. It can be found from the Table 10 that the excess market return, 'Peak' and 'End' factors have positive impact on the portfolio returns in the full equal-weighted and value-weighted portfolios which means that the increase in highest previous monthly and daily returns of stocks could lead to higher portfolios' returns whereas the 'Peak' variable in the full portfolio is not significant at any levels. Besides, the coefficient of 'Peak' variable in Group4 is negative which means that it has negative impact on returns, and it is statistically significant at 10% and 5%. According to considering 'Peak' and 'End' in account, the evidence shows that investors can beat the stock market and receive abnormal returns through holding portfolios consisting of large market capitalization stocks because alpha of the model is positive and about 1% meanwhile violating market efficiency hypothesis of Hong Kong Stock Market.

Peak End Rule + Fama French 3 Factor Model.

After adding HML and SMB additional risk factors, the regression analysis (Table 11) shows that the alpha are positive about 1% to 2% in the full sample and Group1 -Group2, besides the coefficients of HML are below zero in the whole samples and

they are not meaningful which can be seen as a redundant variable. The 'Peak' variable contains the highest daily returns of portfolios in the previous month and can predict the consecutive monthly return that when the highest daily return goes up 1 % Group4 equal-weighted portfolio return is going to decline the corresponding value about -9%.

As for 'End' variable, the coefficients of 'End' is not economically significant at 1%, 5% and 10% in Group 4 and Group1 VW, but the figures are positive around 0.20 and 0.08 in the full VW, EW samples indicating that the previous monthly return of portfolio goes up 1 percent then the current portfolio's return will increase more than 20% and 8% respectively which has positive relation to each other.

Peak End Rule + Fama French 5 Factor Model.

The combination of Fama French Five Factor Model and 'Peak-End Rule' makes five independent variables such as SMB, HML, CMA, RMW and MaxPi insignificant in the full sample and Group 1 to Group3, besides the remaining variable Pi is explanatory and economically significant in the model which represents the previous monthly returns for the full sample portfolio and Group 1 to Group 4. It indicates that the higher previous monthly return is, the higher portfolio return is for instance the unit of one increase in previous monthly return brings more returns about 20.32% in the full Equal-weighted Portfolio meanwhile the beta of 'End' variable is economically significant at 1%, 5% and 10% as shown in (Table 12).

Covid-19

According to Narayan and Phan (2020), it demonstrates that government policies related to Covid-19 have positive influence on the G7 country stock market excess returns and they can mitigate impacts of the pandemic effectively. Hence, Covid-19 is recognized as the global pandemic and it is a potential factor that could affect Hong Kong Stock Market. In order to find out whether stock market is likely to be impacted

by Covid-19, in the section it will run Covid-19 Proxy Model which contains the excess market return, full sample portfolio's return, Lockdown Dummy and Traveling Restrictions Dummy.

And dataset used in the regression analysis is value-weighted full sample portfolio the best model performed by the previous tests which purposes to reduce multicollinearity issues. The dependent variable is the value-weighted full sample portfolio index consisting of the selected 158 companies' monthly return. And explanatory variables are Lockdown Dummy about lockdown imposed by Chinese Government in Wuhan and Restriction Dummy about worldwide traveling restrictions issued by Chinese Government. Value of the Dummy equals to 0 if 'Lockdown' is released and equals to 1 if the measure is imposed as well as in 'Restrictions' Dummy. Researching from Chinese Government Official Website, it can be learnt that Lockdown on Wuhan City was valid on 23rd of Jan to 8th of August and Traveling Restriction was implemented during 26th of March to 25th of September.

After that, the paper also considers impacts of lagged returns and crude oil returns on the index. Lagged returns comprise of one month, two months and three months lagged index return, besides it takes PetroChina Company as a proxy of crude oil market in Hong Kong.

Asset Pricing Models and 'Lockdown' Dummy, 'Restriction' Dummy.

The First regression model is 'Asset Pricing Models + Lockdown Dummy'. The Table 13 displays the model's results that Lockdown Dummy has positive influence on the portfolios' returns which means while the lockdown is implemented returns on the index experience a higher increase and the level of growth is about 2%, but they are not meaningful in the model at 1%, 5% and 10% levels. And the average coefficient of excess market return variable is about 1.10, representing that one unit of increase in excess market return variable brings 1.10 times more returns in the portfolio which is also significant at any levels. Besides, the beta of SMB factor is positively related to

the index returns which displays 0.30 and 0.19 meaning that small firm stocks can earn higher returns in the portfolio. Moreover, in FF5 Model factors of RMW and CMA are negative about -0.45 and -0.51 separately meanwhile it has a significant negative relationship with portfolio returns at 5% level. The Second regression model is 'Asset Pricing Model + Lockdown Dummy'. It is clear that results are similar to the previous regression and the coefficients are 0.02 in Lockdown Dummy which shows that Chinese government intervention like traveling restriction is likely to increase stock returns in Hong Kong Stock Market but it is insignificant as well. Then, the final regression model is 'Asset Pricing Model + Lockdown Dummy + Restriction Dummy' which has added the two dummies at the same time and Table 13 shows the impact of 'Restriction Dummy' on portfolio returns is slightly stronger than 'Lockdown Dummy'. As for performance of regression analysis, accuracy of the model becomes better after adding two and three risk factors as evidenced by rising R-square from 0.70 to 0.73.

Market Models and Lagged Return Variable, Crude Oil Variable.

After considering board market factor as elements of trend in stock price, lagged return and crude oil become another additional risk factors applied in econometric models for investigating whether the variables are significant related to the portfolio returns which represents the Hong Kong Stock Market. The First regression model is 'Market Model and Crude Oil'. Table 14 shows that the selected value-weighted portfolio is positively correlated to the board stock market of Hong Kong which is highly significant after adding crude oil variable and is the same with the previous sets of regressions. Besides, there is a negative link between returns of crude oil and the index returns that one percent of increase in returns on crude oil cause about 11% losses in the portfolio return which is significant at level of 10%. The Second regression model is 'Market Model and Lagged Return' and it focuses on importance of lagged returns. It can be found from the Table 14 that the coefficients of one and three lagged months returns are positive about 4.2% and 1.7% separately which

means that it has the same direction between lagged returns with the index returns whereas they are not statistically significant. That reflects momentum effect exists in the stock market where upward trend in portfolio returns will continue to follow the movement. The Third regression model is 'Market Model and Lagged Return, Crude Oil Return' which shows that the two coefficients of excess market return and lagged return are positive related to the portfolio returns but crude oil returns have negative impact on the portfolio returns where the beta equals to -0.108.

Covid-19 Proxy Models, Asset Pricing Models and Time Dummy

Time Dummy focuses on the importance of Time Period in Covid-19 and it equals to 0 which indicates before the time period of Covid-19 starting from 1st of April 2006 to 1st of December 2019, besides the dummy equals to 1 after that. The first regression is combining market models with the dummy and the model's result is that time dummy is positive related to portfolio' returns with coefficients of 0.002 which means that Covid-19 pandemic stimulates the growth in returns on portfolios slightly whereas it is not statistically significant at any significant levels, besides excess market return is highly related to the index. And in this model, it reaches out that investors can earn abnormal returns and it violates hypothesis of market efficiency existing in Hong Kong Stock Market due to positive alpha about 0.02 which is shown in Table 15.

Besides, regarding to Fama French Three Factors Model and it found that there is small difference that Time Dummy is negative related to returns on the index, which means that Covid-19 is likely to attract small number of losses and the beta is below to zero around -0.001 meanwhile it is not significant at any levels and it should be neglected. After adding Time Dummy in Fama French Three Factors, performance of the original model is not affected by the dummy because beta of SMB is 0.236 meaningful at 10% significant level and HML is about -0.147 which is consistent with the former set of regression analysis and in practical it means that when small size stocks composite into portfolios then returns on the index are likely to increase and strong financial performance of portfolios tend to empower with negative coefficients

which has the reverse effect on the index returns in a long term.

The third model combines Time Dummy and Fama French Five Factor Model. Apart from Variable of Excess Market Return which is still positively correlated to returns on the index strongly, Profitability and Investment Styles factor negatively affect the constructed portfolios in this experiment which coefficients are -0.45 and -0.47 separately, it indicates that portfolios consisting of higher profitability companies are more likely to suffer higher losses in the future because of its coefficient. Besides, conservative investment styles refer to the negative coefficient of CMA and it usually lower down returns of the whole portfolio because of its higher risks. Regarding to the Time Dummy variable, although it is not meaningful at any level of significance it shows that investors are likely to earn higher returns in the period and beat the whole stock market because alpha is 0.02 and beta of the variable is 0.001.

The final regression model integrates Covid-19 Proxy Models and Market Model which contains Crude Oil, Lagged Month Returns Variables and Time Dummy. And some results of Table 16 are identical to the previous relevant tests that Time Dummy influences the portfolio slightly and Covid-19 could bring small profits to the index due to coefficients of 0.002 but it is not statistically significant. Similarly, Lagged Month Return has a positive relationship with the returns on portfolios and Crude Oil has an adverse effect on the index.

Volatility and Data Statistics in Subperiod Analysis.

Overview of volatility in Hong Kong Stock Market for the past 20 years has been shown in Figure 2. Hang Seng Index was selected as proxy of Hong Kong Stock Market for conducting basis analysis of the 60 days rolling volatility in the stock market. Excel plays an important and useful role in calculating the rolling volatility and logarithmic HSSI returns on daily basis. After plotting into chart, it can be clearly found from the figure that there are five main periods of fluctuation in the past 15 years such as 2007-2008, 2011-2012, 2014-2015, 2017-2018 and 2019-2020. (1) In

the first period of fluctuation, the volatility of Hang Seng Index reached at the peak that the highest 60 rolling daily standard deviation is about 5.0%. Reasons of the volatility are subprime crisis and 2008 financial crisis in the US which has spread all over the world and caused a sharp decline in financial products such as stocks, bonds and futures. (2) In the 2011-2012, the stock market suffered 2.5% daily standard deviation. This is because China Securities Regulatory Commission conducted general election and made effort to against inside trading and illegal behaviors of managers who are responsible for brokerage company, etc. Besides, some environmental issues exist in steel industry and the regulatory had impacted on their profitability. (3) In third period, the daily volatility of Hong Kong Stock Market has reached between 1% and 2%. According to the main index of Chinese stock market, it can be found that the indexes have climbed consecutively around 5% on daily basis at the starting of 2015 and the market experienced reversal effect that it entered into bear market in the later six months that returns on the index have decreased around 6%. (4) US-China trade war has mainly contributed to the fluctuation in Hong Kong Stock Market and brought 1.5% in 60 rolling daily standard deviation which means that the announcement of trade war would be likely to affect stocks price negatively during periods in 2017-2018. (5) As for the last period of 2019-2020, the Covid-19 pandemic has outbreak at the end of 2019 and it triggered 2% of volatility in Hong Kong Stock Market and that means investors are likely to experience higher volatility in the stock market which makes the market more volatile.

Data statistics of the rolling 60 days volatility (Table 17) has been generated by Excel and it shows that in the past twenty years the highest rolling 60 days volatility is around 5.12% and 0.56% is the lowest daily volatility. The excess kurtosis is 8.18 and skewness is 2.85 which indicates that the distribution of rolling 60 days volatility toward to be leptokurtic distribution and could happen some extreme values. Besides, the average of rolling 60 days volatility is around 1.27 and median of the dataset is around 1.09%.

Full Sample is selected for conducting experiment of volatility and data statistics (Table 18). The volatility measured by standard deviation of the sample which excludes 2008 Financial Crisis risk factor and starts from 2010 to now. There is total 2817 observations of Daily Returns in the full sample and the evidence describes that the annual returns on the equal-weighted full sample is lower than the value-weighted which is -3.41% and 25.62% separately meanwhile standard deviation in the dataset of Value-Weighted Full sample is 5.65 larger than the Equal-weighted Full sample. Besides, the value-weighted full sample exhibits toward to Normal Distribution where its kurtosis is 2.13 and skewness is -0.20 close to 3.0 and 0 comparing with the equal-weighted full sample.

Then, full period of the whole sample is split into two sub-period groups comprising of 'Before Covid-19' and 'After Covid-19'. There is total 2463 observations excluding 2008 Financial Crisis Risk Factor in 'Before Covid-19' Sub-Period. Similarly, returns on the sub-period constructed by Value-Weighted Style are higher than the Value-weighted Style which indicates that returns are 0.77% and -0.168% respectively. Thus, it means that the risk of Value-weighted Sub-Portfolio is higher than the Equal-Weighted Sub-Portfolio where its annual standard deviation is 0.36% and 0.26%. Concerning about Covid-19, 'After Covid-19' Sub-Period counts about 353 observations and has higher average annual returns about 0.81% than the previous Sub-Period with higher volatility in this period dataset.

When it takes 2008 Financial Crisis Risk Factor into account, the total observations of daily returns are around 3806 in full sample. Its annual standard deviation of Value-Weighted and Equal-Weighted Portfolio are 40.06% and 4.21% individually higher than the former dataset which excludes the risk factors. Besides, in 'Before Covid-19' Sub-Period, it is clear that investors can earn around 39.93% annually in value-weighted portfolio and 3.78% in equal-weighted portfolio where the standard deviation in the sub-period is slightly higher than the subperiod of 'After Covid-19', indicating that its annual standard deviation in the dataset is 81.53 and 52.10. It means

that the impact on 2008 Financial Crisis is deeper than the Covid-19 Pandemic in terms of volatility and people investing into Hong Kong Stock Market are likely to receive higher returns in the period.

Findings and Recommendations

After deploying Asset Pricing Models containing CAPM and Fama French Three or Five Models in Hong Kong Stock Market, there are some common findings that board stock market is an important factor which can have positive impacts on returns of the full sample portfolio and each group, meaning that one unit increase in returns of the board stock returns can bring higher returns on the index. Risk factor of SMB the size effect exists in portfolios comprising of larger companies that adding small size firms into the portfolios can bring higher returns in portfolios, but it does not incur into the smaller size portfolios. Besides, risk factor of HML represents relative distress of companies and the coefficients are negative in some models among all tests when companies have strong financial performance as demonstrated into the result table, conversely beta of HML is positive in the smallest size ranked groups because of weaker market value than other groups. Variable RWA measures 'Profitability' of companies and it indicates that companies with higher profitability are likely to suffer a small number of losses due to higher risks in long-term accompanying with reducing in the index returns which is statistically significant on value-weighted full sample portfolio. The final risk factor is CMA considering each portfolio's investment styles and returns on index might increase if portfolios take aggressive investment styles by holding diversified assets. However, looking through the outcomes of regression it can be found that variable of investing styles is not significantly related to most of regression models in the experiment and it has negative impacts on portfolios' return. Besides, it is possible to find that the main difference of results between value-weighted and equal-weighted portfolios is that portfolios weighted by market capitalization lean towards to produce higher abnormal returns than equal-weighted portfolios. Meanwhile, it can reject the hypothesis that market

efficiency exists in Hong Kong Stock Market.

Prospect theory has limited impacts on the Hong Kong Stock Market which reflects that the previous monthly stock returns have a significant and positive relationship with returns on portfolios which comprises of large market capitalization firms while the relation does not exist in smaller firms' portfolios. But the highest previous daily return is not statistically significant for being applied in running regression analysis on large market capitalization portfolios and smaller size portfolios have characteristics that there is a negative relationship between their returns with the daily returns. Thus, stocks with the highest previous monthly returns tend to have higher returns in the current month.

Chinese government intervention such as traveling restrictions and government has positively impact on Hong Kong Stock Market where profits on stocks increase when the measures are imposed by the governments but it is not statistically significant. Besides, the one and three month lagged returns have positive relationship with the returns on index but they are not meaningful at any level of significance as well. Moreover, PetroChina Company represents Hong Kong Crude Oil Market and has reverse impacts on the full sample portfolio. Fama French Five Factor Model has better ability of predictivity than Fama French Three Factor Model as shown by rising R-square which indicates that the model's accuracy is higher. Besides, Time Dummy is positively related to the index although it only has limited influence which demonstrates that Covid-19 restrictively impacts on Hong Kong Stock Market.

After that, empirical findings coming from sub-period analysis are that volatility of 'After Covid-19' Sub-Period is higher than 'Before Covid-19' in the dataset excluding 2008 Financial Crisis Risk Factor meanwhile the risk factor compensates relatively higher returns for investors since Covid-19 becomes as a pandemic. However, 2008 Financial Crisis Risk Factor can bring higher volatility reflecting in its standard deviation of 'Before Covid-19' than 'After Covid-19' which means that the impact of the financial crisis is deeper than the Covid-19 Pandemic in terms of their standard

deviations.

Some recommendations are given to the paper is that the test of prospect theory should expand into 25 or more portfolios analysis covering wider range of time series for example it should count the past fifty years dataset at the same times it suggests that momentum factor should be encompassed in the experiment (Gregoriou and Healy, 2019). In addition, Asset Pricing Models are capable for predicting assets' value and it needs to consider Prospect Theory Value into the models which can be regarded as another risk factor in determining stocks returns as it can be found in that US market where stocks with high (low) PTVs have a following low (high) return (Joãodo *et al*, 2021). The third recommendation is that groups of companies need to be classified via one or two different dimensional criterions because in the paper the companies are only organized by their market capitalizations and it should be improved by adding fundamentals of companies such as Book-to-Market Ratio in criterion of classification following from Fama and French (1993). Finally, extension of the paper is to overcome issues of insufficient data about individual stocks through exporting from professional platform such as Bloomberg meanwhile analyzing relevant news for exploring reasons.

Conclusion

Covid-19 is a global pandemic and affects financial market deeply covering Hong Kong Stock Market and American Stock Market, etc. Asset Pricing Models are used for detecting the risks factors in the Stock Market helpfully. Capital Asset Pricing Model measures about the sensitivity of board stock market to returns on assets which emphasis on the market risk effect. But it does not capture any market anomalies in financial market which is caused by traders' behavior such as disposition effect. Thus, Fama French Three and Five Factors Models were introduced for containing these anomalies into account including size effect and fundamental effect which is improvement of asset pricing models. Moreover, Prospect Theory is an additional factor considered in asset pricing which can help investors make decisions under uncertainty and risks, meanwhile it can attribute to improving performance of models. Therefore, the paper has conducted a set of regression analysis for investigating whether market efficiency exists in Hong Kong Stock Market and the explanatory factors can clearly explain trend of portfolios returns. And the evidence demonstrates that Covid-19 related factors such as ratability ratio and time dummy are the core factors of volatility in Hong Kong Stock Market, Prospect Theory can explain the market partially and it violates hypothesis of market efficiency in Hong Kong Stock Market via models' results.

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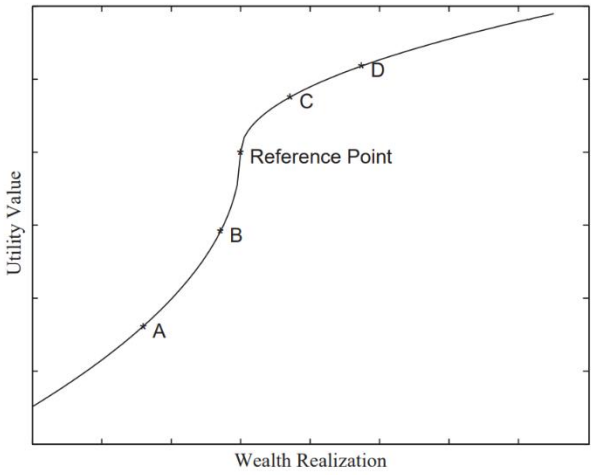
Appendix



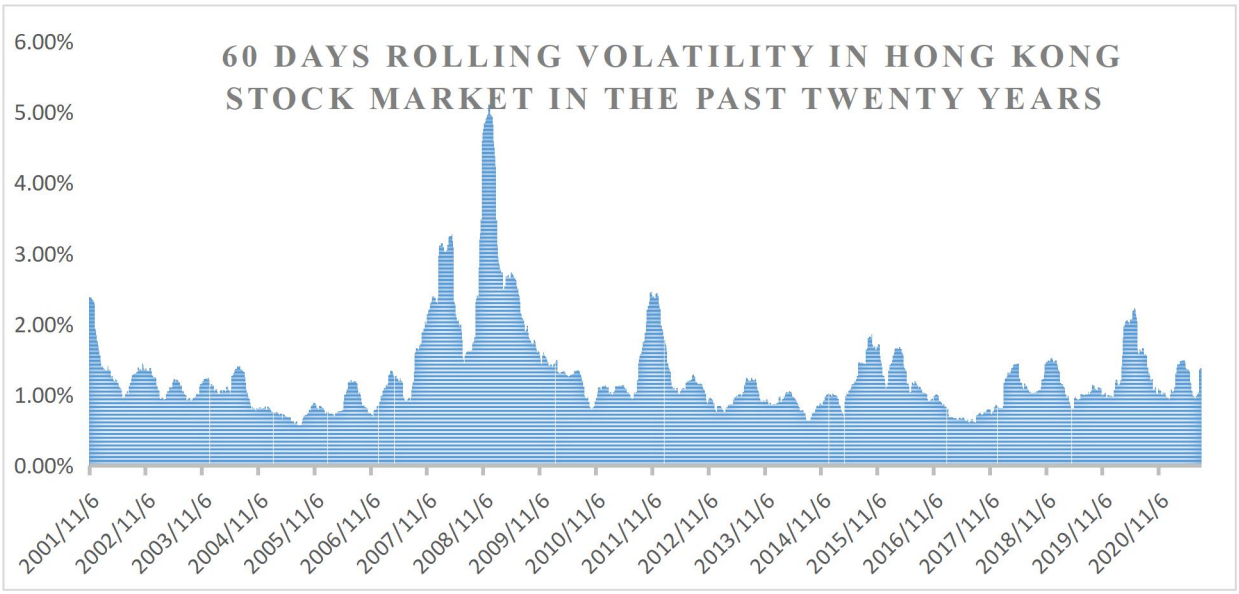
(Figure 1. Prospect theory value and prospect theory value function)

$$U(\mathrm{W}) = \frac{(\mathrm{W}-\mathrm{R})^{1-\gamma}}{1-\gamma} \quad \text{if } \mathrm{W} \geq \mathrm{R};$$

$$U(\mathrm{W}) = -\lambda \frac{(\mathrm{W}-\mathrm{R})^{1-\gamma}}{1-\gamma} \quad \text{if } \mathrm{W} < \mathrm{R}.$$

Where R is a reference level, $\gamma = 0.5$, and $\lambda = 2.25$.

(Figure 1. Prospect theory value and prospect theory value function)



(Figure 2. 60 days rolling volatility in Hong Kong stock market in the past twenty years)

No.	Ticker	Company (CN)	Market Size	% of Total Market Size
1	**700**	**Tencent Holdings**	5,593.9	54.551%
2	**2318**	**Ping An Insurance**	604.7	5.897%
3	**388**	**Hong Kong Exchange and Clearing**	560.6	5.467%
4	**883**	**CNOOC Limited**	383.9	3.744%
5	**2388**	**BOC Hong Kong (Holdings) Limited**	310.8	3.031%
6	**66**	**MTR Corporation Limited**	271.1	2.644%
7	**981**	**Semiconductor Manufacturing International Corporation.**	187.6	1.830%
8	**2888**	**Standard Chartered PLC**	171.5	1.673%
9	**2319**	**China Mengniu Diary Company Limited**	168.6	1.644%
10	**2331**	**Li Ning Company Limited**	160.4	1.564%
11	**1177**	**Sino Biopharmaceutical Limited**	160.1	1.562%
12	**2688**	**ENN Energy Holdings Limited**	155.5	1.517%
13	**1211**	**BYD Company Limited**	150.7	1.470%
14	**762**	**China Unicom (Hong Kong) Limited**	135.9	1.325%
15	**2628**	**China Life Insurance Company Limited**	118.3	1.154%
16	**386**	**China Petroleum & Chemical Corporation**	102.8	1.003%
17	**1066**	**Shandong Weigao Group Medical Polymer Company Limited**	82.1	0.801%
18	**2899**	**Zijin Mining Group Company Limited**	67.1	0.655%
19	**857**	**PetroChina Company Limited**	65.4	0.638%
20	**2333**	**Great Wall Moto Company Limited**	54.8	0.534%
21	**2328**	**PICC Property and Casualty Company Limited**	52.4	0.511%
22	**966**	**China Taipaing Insurance Holdings Company Limited**	51.0	0.498%
23	**836**	**China Resources Power Holdings Company Limited**	48.5	0.473%
24	**728**	**China Telecom Corporation Limited**	35.8	0.349%
25	**2338**	**Weichai Power Company Limited**	32.3	0.314%

26	**2357**	**AviChina Industry & Technology Company Limited.**	31.4	0.306%
27	**2314**	**Lee and Man Paper Manufacturing Limited.**	31.2	0.304%
28	**753**	**Air China Limited**	27.8	0.271%
29	**354**	**Chinasoft International Limited**	24.1	0.235%
30	**1686**	**SUNeVision Holdings Ltd.**	18.2	0.177%
31	**2380**	**China Power International Development Limited**	17.5	0.170%
32	**3633**	**Zhongyu Gas Holdings Limited**	17.5	0.170%
33	**2600**	**Aluminum Corporation of China Limited**	17.2	0.168%
34	**696**	**TravelSky Technology Limited**	14.8	0.144%
35	**2362**	**Jinchuan Group International Resources Co. Ltd.**	14.6	0.143%
36	**763**	**ZTE Corporation**	14.5	0.141%
37	**2883**	**China Oilfield Services Limited**	13.9	0.136%
38	**2343**	**Pacific Basin Shipping Limited**	13.0	0.127%
39	**2356**	**Dah Sing Banking Group Limited.**	12.1	0.118%
40	**694**	**Beijing Capital International Airport Company Limited**	10.5	0.102%
41	**581**	**China Oriental Group Company Limited**	10.4	0.101%
42	**2678**	**Texhong Textile Group Limited**	10.3	0.101%
43	**856**	**VETECS Holdings Limited**	10.3	0.101%
44	**1212**	**Lifestyle International Holdings Limited**	9.4	0.091%
45	**737**	**Shenzhen Investment Holdings Limited**	9.2	0.090%
46	**861**	**Digital China Holdings Limited**	8.7	0.085%
47	**598**	**Sinotrans Limited**	7.7	0.075%
48	**775**	**CK Life Sciences Int'l, (Holdings) Ltc.**	7.5	0.073%
49	**357**	**Hainan Meilan International Airport Company Limited**	7.4	0.072%
50	**751**	**Skyworth Group Limited**	5.8	0.056%
51	**686**	**Beijing Energy International Holding Co., Ltd.**	5.6	0.055%
52	**2866**	**COSCO Shipping Development Co., Ltd.**	5.6	0.054%
53	**2877**	**China Shineway Pharmaceutical Group Limited**	5.3	0.052%

54	**2342**	**Comba Telecom Systems Holdings Limited**	4.9	0.048%
55	**329**	**OCI International Holdings Limited**	4.9	0.047%
56	**1164**	**CGN Mining Company Limited**	4.5	0.044%
57	**2309**	**Birmingham Sports Holdings Limited**	4.1	0.040%
58	**2322**	**Hong Kong ChanShang Group Limited**	4.1	0.040%
59	**0678**	**Genting Hong Kong Limited**	3.9	0.038%
60	**1666**	**Tong Ren Tang Technologies Co. Limited.**	3.9	0.038%
61	**2008**	**Phoenix Media Investment (Holdings) Limited**	3.6	0.035%
62	**1198**	**Royale Home Holdings Limited**	3.5	0.034%
63	**698**	**Tongda Group Holdings Limited**	3.5	0.034%
64	**860**	**Apollo Future Mobility Group Limited**	3.5	0.034%
65	**746**	**Lee & Man Chemical Company Limited**	3.5	0.034%
66	**607**	**Fullshare Holdings Limited**	3.3	0.032%
67	**1061**	**Essex Bio-Technology Limited**	3.0	0.029%
68	**1385**	**Shanghai Fudan Microelectronics Group Company Limited**	2.7	0.028%
69	**2369**	**Coolpad Group Limited**	2.7	0.026%
70	**950**	**Lee's Pharmaceutical Holdings Limited**	2.6	0.025%
71	**809**	**Global Bio-chem Technology Group Company Limited**	2.6	0.025%
72	**2348**	**Dawnrays Pharmaceutical (Holdings) Limited**	2.5	0.024%
73	**931**	**China LNG Group Limited**	2.5	0.024%
74	**2368**	**Eagle Nice (International) Holdings Limited**	2.4	0.024%
75	**3886**	**Town Health International Medical Group Limited**	2.4	0.023%
76	**335**	**Asian Citrus Holdings Limited**	2.2	0.021%
77	**1126**	**Dream International Limited**	2.1	0.020%
78	**438**	**IRICO Group New Energy Company Limited**	2.1	0.020%
79	**169**	**Wanda Hotel Development Company Limited**	2.0	0.020%
80	**2886**	**Binhai Investment Company Limited**	1.9	0.019%
81	**733**	**Hopefluent Group Holding Limited**	1.9	0.018%

82	**2878**	**Solomon Systech (International) Limited**	1.9	0.018%
83	**64**	**Get Nice Holdings Limited**	1.8	0.018%
84	**1026**	**Universal Technologies Holdings Limited**	1.8	0.018%
85	**1349**	**Shanghai Fudan-Zhangjiang Bio-Pharmaceutical Co., Ltd**	1.8	0.017%
86	**2327**	**Meilleure Health International Industry Group Limited**	1.8	0.017%
87	**628**	**Gome Finance Technology Co., Ltd**	1.8	0.017%
88	**365**	**Sino ICT Holdings Limited**	1.6	0.016%
89	**346**	**Yanchang Petroleum International Limited.**	1.6	0.016%
90	**2383**	**TOM Group Limited**	1.6	0.016%
91	**2868**	**Beijing Capital Land Ltd.**	1.5	0.015%
92	**2341**	**EcoGreen International Group Limited**	1.5	0.015%
93	**299**	**Glory Sun Land Group Limited**	1.5	0.015%
94	**896**	**Hanison Construction Holdings Limited**	1.5	0.014%
95	**1639**	**AKM Industrial Company Limited**	1.4	0.014%
96	**1076**	**Imperial Pacific International Holdings Limited**	1.4	0.014%
97	**157**	**Korea Electric Power Corporation**	1.3	0.013%
98	**2280**	**HC Group Inc.**	1.3	0.013%
99	**3991**	**Changhong Jiahua Holdings Limited**	1.3	0.012%
100	**2317**	**Vedan International (Holdings) Limited**	1.2	0.012%
101	**565**	**Art Group Holdings Limited**	1.2	0.012%
102	**361**	**Sino Golf Holdings Limited**	1.1	0.010%
103	**1708**	**Nanjing Sample Technology Company Limited**	1.1	0.010%
104	**702**	**Sino Oil and Gas Holdings Limited**	0.9	0.009%
105	**228**	**China Energy Development Holdings Limited**	0.9	0.009%
106	**895**	**DongJiang Environment**	0.9	0.009%
107	**1161**	**Water Oasis Group Limited**	0.9	0.009%
108	**582**	**Landing International Development Limited**	0.9	0.009%
109	**653**	**Bonjour Holdings Limited**	0.9	0.008%

110	**2668**	**Pak Tak International Limited**	0.8	0.008%
111	**2698**	**Weiqiao Textile Company Limited**	0.8	0.008%
112	**2355**	**Baoye Group Company Limited**	0.8	0.008%
113	**65**	**GrandOcean Limited**	0.8	0.007%
114	**2488**	**Launch Tech Company Limited**	0.7	0.007%
115	**929**	**IPE Group Limited**	0.7	0.007%
116	**2389**	**Beijing Health (Holdings) Limited**	0.7	0.007%
117	**2218**	**Yantai North Andre Juice Company Limited**	0.6	0.006%
118	**690**	**Uni-Bio Science Group Limited**	0.6	0.006%
119	**1009**	**International Entertainment Corporation**	0.6	0.006%
120	**2358**	**Jiu Rong Holdings Limited**	0.6	0.006%
121	**831**	**Convenience Retail Asian Limited**	0.6	0.005%
122	**1129**	**China Water Industry Group Limited**	0.5	0.005%
123	**353**	**Energy International Investments Holdings Limited**	0.5	0.005%
124	**912**	**Suga International Holdings Limited**	0.5	0.005%
125	**362**	**Xinyang Maojian Group Limited**	0.5	0.005%
126	**2371**	**China Chuanglian Education Financial Group Limited**	0.5	0.005%
127	**1116**	**Mayer Holdings Limited**	0.5	0.005%
128	**821**	**Value Convergence Holdings Ltd.**	0.5	0.005%
129	**2323**	**Renco Holdings Group Limited**	0.5	0.005%
130	**997**	**Chinlink International Holdings Limited**	0.5	0.005%
131	**2326**	**New Provenance Everlasting Holdings Limited**	0.4	0.004%
132	**2336**	**Hailiang International Holdings Limited**	0.4	0.004%
133	**311**	**Luen Thai Holdings Ltd.**	0.4	0.004%
134	**629**	**Yue Da International Holdings Limited**	0.4	0.004%
135	**927**	**Fujikon Industrial Holdings Limited**	0.4	0.004%
136	**2308**	**Evoc Intelligent Technology Co. Ltd.**	0.4	0.004%
137	**980**	**Lianhua Supermarket Holdings Co., Ltd.**	0.4	0.004%

138	**399**	**Innovative Pharmaceutical Biotech Limited**	0.4	0.003%
139	**290**	**China Fortune Financial Group Limited**	0.4	0.003%
140	**1371**	**China Ecotourism Group Limited**	0.3	0.003%
141	**2349**	**China City Infrastructure Group Limited**	0.3	0.003%
142	**1073**	**Da Yu Financial Holdings Limited**	0.3	0.003%
143	**1002**	**V.S. International Group Limited**	0.3	0.003%
144	**264**	**China International Development Corporation Limited**	0.3	0.003%
145	**888**	**Bison Finance Group Limited**	0.3	0.003%
146	**274**	**China Billion Resources Limited**	0.3	0.003%
147	**111**	**Cinda International Holdings Limited**	0.3	0.003%
148	**379**	**China Ever Grand Financial Leasing Group Co., Ltd**	0.3	0.003%
149	**1075**	**S-Enjoy Group Co., Limited**	0.3	0.003%
150	**1265**	**Tianjin Jinran Public Utilities Company Limited**	0.3	0.003%
151	**459**	**Midland IC&I Limited**	0.3	0.003%
152	**188**	**Sunwah Kingsway Capital Holdings Limited**	0.3	0.003%
153	**2339**	**BeijingWest Industries International Limited**	0.3	0.003%
154	**1194**	**Bay Area Gold Group Limited**	0.3	0.003%
155	**2320**	**Hop Fung Group Holdings Ltd.**	0.3	0.003%
156	**928**	**Life Healthcare Group Limited**	0.3	0.003%
157	**682**	**Chaoda Modern Agriculture (Holdings) Limited**	0.3	0.002%
158	**812**	**Southwest Securities International Securities Limited.**	0.2	0.002%

(Table 1: 158 Companies listed on Hong Kong Stock Market)

Country	Ticker	Stock Index
Mainland China	SHH; SZCE	Shanghai Composite; Shenzhen Composite
Hong Kong SAR	HSI	Hang Seng Index
United States	GSPC; IXIC	S&P 500 Composite; NASDAQ Composite

(Table 2: The representatives of stock markets in China and the US.)

	Obs.	Mean	Std. Dev.	Min	Max	Exc. Kurtosis	Skewness
Full Sample	29388	0.0014	0.1712	-3.5621	2.5835	25.63	-0.2585
Portfolio 1	7812	0.0093	0.1314	-2.4143	2.1293	27.41	-0.4818
Portfolio 2	7440	0.0043	0.1302	-2.9957	2.5835	28.07	0.7722
Portfolio 3	7440	-0.0015	0.1306	-3.5621	1.5404	30.51	-1.0243
Portfolio 4	6696	-0.0078	0.1327	-2.9907	2.2798	22.10	-0.2343

(Table 3: Data Statistics of Full Sample and Four Portfolios)

	Obs.	Mean	Std. Dev	Min	Max	Skewness
Hang Seng Index Return	186	0.36%	0.11	-0.25	0.16	-0.67
PetroChina	183	-1.04%	0.07	-0.27	0.28	0.55

(Table4: Data Statistics of Hang Seng Index and PetroChina)

	Rm-Rf	SMB	HML	RMW	CMA
Rm-Rf					
SMB	0.22				
HML	0.12	0.36			
RMW	-0.25	-0.34	-0.04		
CMA	-0.17	0.09	0.49	0.05	

(Table 5: Correlation Matrix)

Regression Models:

Asset Pricing Models:

$$r_{it} - r_{i,f} = \alpha_{i,t} + \beta_{mkt}(r_m - r_f) + \varepsilon_t$$ (1) Capital Asset Pricing Model

$$r_{it} - r_{i,f} = \alpha_{i,t} + \beta_{mkt}(r_m - r_f) + \beta_{SMB} r_{t,SMB} + \beta_{HML} r_{t,HML} + \varepsilon_t$$ (2) Fama-French 3 Factor Model

$$r_{it} - r_{i,f} = \alpha_{i,t} + \beta_{mkt}(r_m - r_f) + \beta_{SMB} r_{t,SMB} + \beta_{HML} r_{t,HML} + \beta_{RMW} r_{t,RMW} + \beta_{CMA} r_{t,CMA} + \varepsilon_t$$ (3) Fama-French 5 Factor Model

Asset Pricing Models + Peak End Rule:

$$r_{it} - r_{i,f} = \alpha_{i,t} + \beta_{MaxPi_{t-1}} MaxPi_{t-1} + \beta_{i,Pi_{t-1}} Pi_{t-1} + \varepsilon_t$$ (4) 'Peak End Rule'

$$r_{it} - r_{i,f} = \alpha_{i,t} + \beta_{mkt}(r_m - r_f) + \beta_{MaxPi_{t-1}} MaxPi_{t-1} + \beta_{i,Pi_{t-1}} Pi_{t-1} + \varepsilon_t$$ (5) CAPM+ 'Peak-End Rule'

$$r_{it} - r_{i,f} = \alpha_{i,t} + \beta_{mkt}(r_m - r_f) + \beta_{MaxPi_{t-1}} MaxPi_{t-1} + \beta_{i,Pi_{t-1}} Pi_{t-1} + \beta_{SMB} r_{t,SMB} + \beta_{HML} r_{t,HML} + \varepsilon_t$$ (6) FF3 Model + 'Peak-End Rule'

$$r_{it} - r_{i,f} = \alpha_{i,t} + \beta_{mkt}(r_m - r_f) + \beta_{MaxPi_{t-1}} MaxPi_{t-1} + \beta_{i,Pi_{t-1}} Pi_{t-1} + \beta_{SMB} r_{t,SMB} + \beta_{HML} r_{t,HML} + \beta_{RMW} r_{t,RMW} + \beta_{CMA} r_{t,CMA} + \varepsilon_t$$ (7) FF5 Model + 'Peak-End Rule'

Covid-19 Proxy Model:

$$r_{it} - r_{i,f} = \alpha_{i,t} + \beta_{mkt}(r_m - r_f) + \beta_{Lockdown_i} Dummy_{Lockdown_i}$$ (8) Market Model + Dummy 'Lockdown'

$$r_{it} - r_{i,f} = \alpha_{i,t} + \beta_{mkt}(r_m - r_f) + \beta_{Restrictions_i} Dummy_{Restrictions_i}$$ (9) Market Model + Dummy 'Restriction'

$$r_{it} - r_{i,f} = \alpha_{i,t} + \beta_{mkt}(r_m - r_f) + \beta_{Lockdown_i} Dummy_{Lockdown_i} + \beta_{Restrictions_i} Dummy_{Restrictions_i}$$ (10) Market Model + Dummy 'Lockdown'+ Dummy 'Restriction'.

Variables	Description
$\mathbf{R_f}$	Returns on risk free assets
$\mathbf{R_m}$-$\mathbf{R_f}$	Excess returns on board stock market
SMB	Firm size
HML	Firm fundamentals
CMA	Investment styles
RMW	Profitability factor
$\mathbf{MaxPi_{t-1}}$	The previous highest excess daily return of $portfolio_i$
$\mathbf{Pi_{t-1.}}$	The previous excess monthly returns of $portfolio_i$
Crude Oil $_t$	PetroChina company monthly returns
Lagged Return $_{t-n}$	N monthly lagged returns
Dummy $_{(Time)}$	Covid-19 appears in Wuhan on 23rd of December, 2019
Dummy $_{(Lockdown)}$	Chinese government implements lockdown on Wuhan
Dummy $_{(Restrictions)}$	Chinese government issues traveling restrictions

(Table 6: Descriptions of Each Variable)

CAPM Regression Results	α	β_{MKT}	R-Square
Full Sample (EW)	-0.002	0.996	0.64
	(-0.64)	(18.27)	
Full Sample (VW)	0.021	1.134	0.70
	(6.02)	(20.85)	
Portfolio 1 (EW)	0.009	1.120	0.81
	(0.00)	(28.03)	
Portfolio 1 (VW)	0.022	1.137	0.70
	(6.10)	(20.54)	
Portfolio 2 (EW)	0.003	1.078	0.58
	(0.62)	(16.06)	
Portfolio 2 (VW)	0.003	1.060	0.60
	(0.64)	(16.58)	
Portfolio 3 (EW)	-0.008	0.896	0.49
	(-1.75)	(13.37)	
Portfolio 3 (VW)	-0.006	0.915	0.51
	(-1.48)	(13.83)	
Portfolio 4 (EW)	-0.038	0.869	0.40
	(-8.21)	(11.17)	
Portfolio 4 (VW)	-0.038	0.859	0.40
	(-8.06)	(11.04)	

(Table 7: Capital Asset Pricing Model)

	α	β_{MKT}	βSMB	βHML	R-Square
Full Sample (EW)	-0.003	0.978	0.200	-0.015	0.65
	(-0.83)	(17.47)	(1.45)	(-0.15)	
Full Sample (VW)	0.020	1.114	0.309	-0.157	0.71
	(5.71)	(20.14)	(2.27)	(-1.34)	
Portfolio 1 (EW)	0.008	1.104	0.176	-0.002	0.81
	(3.12)	(26.98)	(1.75)	(-0.03)	
Portfolio 1 (VW)	0.021	1.117	0.303	-0.149	0.70
	(5.78)	(19.80)	(2.18)	(-1.26)	
Portfolio 2 (EW)	0.001	1.048	0.356	-0.062	0.59
	(0.33)	(15.30)	(2.11)	(-0.43)	
Portfolio 2 (VW)	0.002	1.034	0.320	-0.083	0.61
	(0.37)	(15.83)	(1.99)	(-0.60)	
Portfolio 3 (VW)	-0.007	0.886	0.321	-0.033	0.52
	(-1.73)	(13.10)	(1.94)	(-0.23)	
Portfolio 3 (EW)	-0.009	0.870	0.282	-0.031	0.50
	(-1.96)	(12.68)	(1.67)	(-0.22)	
Portfolio 4 (VW)	-0.037	0.865	-0.062	0.007	0.40
	(-7.97)	(10.77)	(-0.31)	(-0.04)	
Portfolio 4 (EW)	-0.04	0.870	-0.032	0.040	0.40
	(-8.11)	(10.83)	(-0.16)	(0.23)	

(Table 8: Fama French Three Factors Model)

	α	β_{MKT}	β_{SMB}	β_{HML}	β_{CMA}	β_{RMW}	R-Square
Full Sample (EW)	0.00	0.95	0.17	0.08	-0.35	-0.08	0.72
	(-0.84)	(16.22)	(1.19)	(0.60)	(-1.38)	(-0.38)	
Full Sample (VW)	0.02	1.06	0.20	0.00	-0.50	-0.44	0.72
	(5.93)	(18.60)	(1.43)	(0.04)	(-2.10)	(-2.04)	
Portfolio 1 (EW)	0.01	1.09	0.18	0.09	-0.34	0.04	0.82
	(3.00)	(25.37)	(1.66)	(0.90)	(-1.87)	(0.27)	
Portfolio 1 (VW)	0.02	1.06	0.20	0.01	-0.51	-0.43	0.72
	(6.00)	(18.27)	(1.37)	(0.10)	(-2.02)	(-2.04)	
Portfolio 2 (EW)	0.00	1.02	0.30	0.04	-0.34	-0.20	0.60
	(0.37)	(14.13)	(1.72)	(0.24)	(-1.09)	(-0.74)	
Portfolio 2 (VW)	0.00	1.00	0.26	0.03	-0.35	-0.25	0.61
	(0.43)	(14.59)	(1.52)	(0.17)	(-1.20)	(-0.99)	
Portfolio 3 (VW)	-0.01	0.86	0.30	0.10	-0.46	-0.04	0.52
	(-1.76)	(12.08)	(1.72)	(0.57)	(-1.51)	(-0.16)	
Portfolio 3 (EW)	-0.01	0.85	0.27	0.08	-0.39	-0.03	0.51
	(-1.98)	(11.72)	(1.49)	(0.46)	(-1.27)	(-0.11)	
Portfolio 4 (VW)	-0.04	0.83	-0.11	0.12	-0.38	-0.19	0.40
	(-7.53)	(9.86)	(-0.55)	(0.62)	(-1.06)	(-0.63)	
Portfolio 4 (EW)	-0.04	0.84	-0.07	0.14	-0.34	-0.14	0.41
	(-7.71)	(9.96)	(-0.35)	(0.71)	(-0.94)	(-0.46)	

(Table 9: Fama and French Five Factor Model)

	α	**β_{MKT}**	**$\beta MaxPi_{t-1}$**	**βPi_{t-1}**	**R-Square**
Full Sample (EW)	0.0053	0.9799	0.2703	0.2079	0.68
	(1.23)	(18.75)	(1.20)	(4.85)	
Full Sample (VW)	0.0245	1.1233	0.1977	0.0834	0.71
	(5.47)	(20.69)	(0.84)	(1.87)	
Portfolio 1 (EW)	0.0096	1.1064	0.0564	0.0837	0.82
	(3.70)	(28.01)	(0.33)	(2.64)	
Portfolio 1 (VW)	0.0195	1.1276	0.2611	0.0355	0.70
	(5.11)	(20.50)	(1.31)	(0.87)	
Portfolio 2 (VW)	0.0091	1.0516	0.3853	0.1987	0.64
	(2.11)	(17.04)	(1.52)	(4.46)	
Portfolio 2 (EW)	0.0089	1.0688	0.2979	0.2042	0.63
	(1.97)	(16.48)	(1.19)	(4.49)	
Portfolio 3 (VW)	-0.0047	0.8930	-0.2208	0.1458	0.53
	(-0.89)	(13.54)	(-0.77)	(2.83)	
Portfolio 3 (EW)	-0.0063	0.8674	-0.3053	0.1600	0.52
	(-1.19)	(13.01)	(-1.13)	(3.08)	
Portfolio 4 (VW)	-0.0278	-0.003	-0.0894	0.0130	0.03
	(-28.68)	(-0.21)	(-2.02)	(1.27)	
Portfolio 4 (EW)	-0.0279	-0.0028	-0.0962	0.0155	0.04
	(-28.07)	(-0.20)	(-2.17)	(1.49)	

(Table 10: Capital Asset Pricing Model and ‘Peak-End’ Rule)

	α	β_{MKT}	β_{SMB}	β_{HML}	$\beta_{MaxPit-1}$	β_{Pit-1}	R-Square
Full Sample (EW)	0.0048	0.9684	0.1505	-0.0270	0.2793	0.2037	0.69
	(1.11)	(18.09)	(1.13)	(-0.24)	(1.23)	(4.72)	
Full Sample (VW)	0.0236	1.1097	0.2598	-0.1535	0.2091	0.0782	0.72
	(5.28)	(20.10)	(1.90)	(-1.33)	(0.90)	(1.76)	
Portfolio 1 (EW)	0.0092	1.0938	0.1368	0.0061	0.0644	0.0806	0.82
	(3.50)	(27.06)	(1.36)	(0.07)	(0.38)	(2.53)	
Portfolio 1 (VW)	0.0182	1.1104	0.2842	-0.1489	0.0307	0.3039	0.71
	(4.75)	(19.83)	(2.03)	(-1.26)	(0.76)	(1.52)	
Portfolio 2 (EW)	0.0078	1.0474	0.2828	-0.0632	0.2951	0.1939	0.63
	(1.71)	(15.81)	(1.72)	(-0.46)	(1.18)	(4.24)	
Portfolio 2 (VW)	0.0082	1.0333	0.2557	-0.0745	0.3848	0.1899	0.65
	(1.87)	(16.38)	(1.64)	(-0.57)	(1.52)	(4.24)	
Portfolio 3 (VW)	-0.0057	0.8702	0.2909	-0.0531	-0.2119	0.1391	0.54
	(-1.08)	(12.93)	(1.75)	(-0.38)	(-0.74)	(2.69)	
Portfolio 3 (EW)	-0.0074	0.8474	0.2536	-0.0528	-0.3120	0.1533	0.53
	(-1.38)	(12.42)	(1.51)	(-0.37)	(-1.16)	(2.93)	
Portfolio 4 (VW)	-0.0278	0.0010	-0.0268	-0.0250	-0.0867	0.0144	0.04
	(-28.60)	(0.07)	(-0.75)	(-0.83)	(-1.95)	(1.39)	
Portfolio 4 (EW)	-0.0279	0.0012	-0.0290	-0.0231	-0.0944	0.0168	0.05
	(-28.01)	(0.08)	(-0.80)	(-0.75)	(-2.12)	(1.60)	

(Table 11: Fama French Three Factors Model and 'Peak-End' Rule)

	α	β_{MKT}	β_{SMB}	β_{HML}	β_{CMA}	β_{RMW}	$\beta_{MaxPit-1}$	β_{Pit-1}	**R-Square**
Full Sample (EW)	0.0044	0.9560	0.1588	0.0470	-0.2838	0.0719	0.2726	0.2032	0.69
	(1.02)	(17.01)	(1.14)	(0.36)	(-1.18)	(0.35)	(1.20)	(4.63)	
Full Sample (VW)	0.0238	1.0633	0.1646	-0.0004	-0.4712	-0.4126	0.2256	0.0590	0.73
	(5.40)	(18.65)	(1.16)	(0.00)	(-1.96)	(-1.93)	(0.98)	(1.33)	
Portfolio 1 (EW)	0.0088	1.0823	0.1524	0.0835	-0.3071	0.1090	0.0461	0.0813	0.82
	(3.35)	(25.62)	(1.45)	(0.85)	(-1.69)	(0.69)	(0.27)	(2.51)	
Portfolio 1 (VW)	0.0185	1.0589	0.1766	0.0064	-0.4852	-0.4662	0.3484	0.0140	0.72
	(4.89)	(18.32)	(1.22)	(0.05)	(-1.95)	(-2.18)	(1.77)	(0.35)	
Portfolio 2 (EW)	0.0077	1.0275	0.2632	0.0229	-0.3036	-0.0620	0.3009	0.1907	0.64
	(1.68)	(14.78)	(1.52)	(0.14)	(-1.02)	(-0.24)	(1.19)	(4.11)	
Portfolio 2 (VW)	0.0084	1.0065	0.2153	0.0306	-0.3570	-0.1558	0.4194	0.1847	0.65
	(1.90)	(15.27)	(1.31)	(0.20)	(-1.27)	(-0.64)	(1.65)	(4.08)	
Portfolio 3 (VW)	-0.0064	0.8519	0.3000	0.0524	-0.3973	0.0867	-0.2370	0.1349	0.55
	(-1.20)	(12.07)	(1.72)	(0.32)	(-1.31)	(0.33)	(-0.82)	(2.57)	
Portfolio 3 (EW)	-0.0083	0.8332	0.2708	0.0342	-0.3357	0.1144	-0.3500	0.1495	0.53
	(-1.52)	(11.59)	(1.53)	(0.20)	(0.44)	(-1.09)	(-1.29)	(2.80)	
Portfolio 4 (VW)	-0.0283	0.0167	0.0113	-0.0704	0.1303	0.1668	-0.0891	0.0197	0.11
	(-29.76)	(1.13)	(0.31)	(-2.06)	(2.08)	(3.09)	(-2.07)	(1.94)	
Portfolio 4 (EW)	-0.0284	0.0183	0.0118	-0.0737	0.1463	0.1774	-0.0952	0.0226	0.13
	(-29.33)	(1.23)	(0.32)	(-2.13)	(3.25)	(2.31)	(-2.22)	(2.20)	

(Table 12: Fama French Five Factors Model and 'Peak End' Rule)

	α	β_{MKT}	β_{SMB}	β_{HML}	β_{CMA}	β_{RMW}	$\beta_{Restriction}$	$\beta_{Lockdown}$	**R-Square**
MM+D. (Restri.)	0.02	1.14					0.02		0.71
	(5.74)	(20.96)					(1.42)		
FF3+D. (Restri.)	0.02	1.12	0.30	-0.12			0.02		0.71
	(5.46)	(20.20)	(2.23)	(-0.98)			(1.23)		
FF5+D. (Restri.)	0.02	1.06	0.19	0.05	-0.51	-0.45	0.03		0.73
	(5.67)	(18.68)	(1.36)	(0.40)	(-2.10)	(-2.19)	(1.46)		
MM+D. (Lock.)	0.02	1.14						0.02	0.70
	(5.89)	(20.84)						(0.92)	
FF3+ D. (Lock.)	0.02	1.12	0.31	-0.13				0.02	0.71
	(5.58)	(20.14)	(2.30)	(0.12)				(0.85)	
FF5+ D. (Lock.)	0.02	1.07	0.21	0.03	-0.51	-0.42		0.02	0.73
	(5.80)	(18.60)	(1.48)	(0.20)	(-2.05)	(-2.00)		(0.68)	
MM+D. (Restri.)+D.(Lock.)	0.02	1.14					0.02	0.01	0.70
	(5.70)	(20.89)					(1.16)	(0.44)	
MM+D.(Restri.)+D.(Lock.)	0.02	1.14					0.02	0.01	0.70
	(5.70)	(20.89)					(1.16)	(0.44)	
FF3+D.(Restri.)+D.(Lock.)	0.02	1.12	0.31	-0.11			0.02	0.01	0.71
	(5.40)	(20.16)	(2.25)	(-0.86)			(1.02)	(0.51)	
FF5+D.(Restri.)+D. (Lock.)	0.02	1.06	0.19	0.06	-0.51	-0.45	0.02	0.01	0.73
	(5.62)	(18.61)	(1.37)	(0.43)	(-2.10)	(-2.12)	(1.31)	(0.24)	

(Table 13: Asset Pricing Models, Dummy Variables of ‘Restrictions’ and ‘Lockdown’)

	α	β_{MKT}	$\beta_{Crude\ oil}$	$\beta_{Lagged\ (t-1)}$	$\beta_{Lagged\ (t-2)}$	$\beta_{Lagged\ (t-3)}$	R-Square
MM + Crude Oil Variable	0.02	1.19	-0.11				0.72
	(5.91)	(18.94)	(-1.87)				
MM + Lagged Return Variable	0.02	1.13		0.04	0.00	0.02	0.71
	(5.79)	(21.04)		(1.06)	(-0.09)	(0.43)	
MM + Lagged Return + Oil	0.02	1.19	-0.11	0.05	0.00	0.01	0.72
	(5.96)	(18.79)	(-1.90)	(1.18)	(0.02)	(0.28)	

(Table 14: Market Model, Lagged Returns and Crude Oil.)

	α	β_{MKT}	β_{Time}	β_{SMB}	β_{HML}	β_{RMW}	β_{CMA}	R-Square
MM+ Time Dummy	0.020	1.129	0.002					0.72
	(5.411)	(21.263)	(0.146)					
FF3 + Time Dummy	0.019	1.117	-0.001	0.236	-0.147			0.72
	(5.26)	(20.58)	(-0.05)	(1.74)	(-1.29)			
FF5+ Time Dummy	0.019	1.066	0.001	0.126	0.007	-0.452	-0.470	0.73
	(5.79)	(21.04)	(0.01)	(1.06)	(-0.09)	(0.43)	(0.242)	

(Table 15: Asset Pricing Models and Time Dummy)

	α	β_{MKT}	β_{Time}	$\beta_{Crude\ oil}$	$\beta_{Lagged\ (t-1)}$	$\beta_{Lagged\ (t-2)}$	$\beta_{Lagged\ (t-3)}$	R-Square
MM+Lagged Return+Oil +Time	0.020	1.194	0.002	-0.108	0.047	0.001	0.011	0.72
	(5.60)	(18.74)	(0.21)	(-1.90)	(1.18)	(0.02)	(0.28)	

(Table 16: Market Model and Covid-19 Proxy Model)

	Obs.	Mean	Std. Dev	Min	Max	Skewness	Kurtosis
60 Days Rolling Volatility	4874	1.27%	0.63%	0.56%	5.12%	11.18	2.85

(Table 17: Data statistics of 60 days rolling volatility in Hong Kong Stock Market)

		Obs.	Mean	Std. Dev	Min	Max	Skewness	Kurtosis
Full Sample (Ex. 2008 Financial Crisis)	**VW- Portfolio**	**2817**	25.62%	5.65	-8.12%	8.54%	-0.20	2.13
	EW- Portfolio	**2817**	-3.41%	3.92	-11.01%	15.78%	-0.41	27.89
Prior To Covid-19	**VW- Portfolio**	**2463**	23.35%	5.50	-8.12%	8.54%	-0.19	2.34
	EW- Portfolio	**2463**	-5.11%	3.93	-11.01%	15.78%	-0.36	31.26
After To Covid-19	**VW- Portfolio**	**353**	41.16%	6.61	-5.93%	6.47%	-0.24	1.06
	EW- Portfolio	**353**	8.19%	3.85	-4.04%	3.03%	-0.80	2.28
		Obs.	**Mean**	**Std. Dev**	**Min**	**Max**	**Skewness**	**Kurtosis**
Full Sample (In. 2008 Financial Crisis)	**VW-Portfolio**	**3806**	40.06%	6.78	-13.87%	11.24%	-0.05	3.79
	EW- Portfolio	**3806**	4.21%	4.30	-11.01%	15.78%	-0.66	17.42
Prior To Covid-19	**VW- Portfolio**	**3452**	39.93%	81.53	-13.87%	11.24%	-0.03	4.04
	EW- Portfolio	**3452**	3.78%	52.10	-11.01%	15.78%	-0.65	-0.65
After To Covid-19	**VW- Portfolio**	**354**	41.41%	79.24	-5.93%	6.47%	-0.24	1.07
	EW- Portfolio	**354**	8.43%	46.19	-4.04%	3.03%	-0.80	2.29

(Table 18: Volatility and data statistics in subperiod analysis)