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CALENDAR EFFECTS IN THE HONG KONG STOCK MARKET

Bachelor's thesis

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I hereby declare that I have compiled the thesis independently
and all works, important standpoints and data by other authors
have been properly referenced and the same paper
has not been previously presented for grading.
The document length is 8284 words from the introduction to the end of conclusion.

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ABSTRACT

This study examines the potential calendar effects in the Hong Kong stock market. Aim of the research is to find out if there are seasonal anomalies in the Hong Kong market, focusing on the Hang Seng Index and the mid-, and large-capitalisation segments of the Hong Kong stock market. Additional aim is to find if these anomalies occur consistently and to include the transactions costs to the analysis of the results.

Theoretical framework is linked to the Efficient Market hypothesis, Adaptive Market Hypothesis, and seasonal anomalies - focusing on the monthly effects, Chinese New Lunar Year effect and day of the week effects. Calendar effects in the market are against the efficient market hypothesis and shouldn't occur if the efficient market hypothesis holds ground in the market.

The method of the study is to analyse historical returns of Hong Kong market, applying a linear regression and autoregressive conditional heteroskedasticity modelling to the historical returns to find out any anomalies in the selected samples. Study period is from January 2002 to the end of 2021, totalling 20 years of historical data. For the study of the consistency of the effects study period was divided to 5-year samples to check for the similarity of the effects in the returns. For the transaction costs, trading strategy based on the negative Monday effect was employed to check if it is possible to trade profitably in a way that transaction costs were included to the process of eliminating the negative Monday returns from the portfolio returns.

Study results indicated that there is evidence of calendar effects in the Hong Kong market. Results had evidence of negative Monday effect, negative Thursday effect and positive pre–Chinese Lunar New Year effect. From the monthly effect study the results showed that there was no evidence of January effect, or any other Monthly effects. Results related to the consistency indicated that it is not possible to draw the conclusion that the existence of calendar effects in the market were statistically consistent. Regarding the transaction costs, study results indicated that at least directly removing negative Monday return did not lead to positive market adjusted returns when transaction costs were also considered.

Keywords: Calendar effects, efficient markets, Hong Kong stock market

INTRODUCTION

Since the introduction of efficient market hypothesis, there has been speculation and controversy about different anomalies in the stock markets across the world. Seasonal anomalies challenge the fundamentals behind efficient market hypothesis as they shouldn't occur in the efficient markets. Even though seasonal anomalies are probably one of the most studied areas in the financial field, there is still uncertainty and clearly no consensus on if there really are seasonal anomalies to be found in the financial markets and to what extent. Thus, it remains important subject to research and widen the knowledge on the subject. It is also important to expand the study to different markets, majority of the previous literature on this subject is focused on the US markets and to some extent in the more developed western markets. There seems not to be any recent studies on this subject that would focus on the Hong Kong market. The latest research on this subject suggests that significance of calendar effects is decreasing across different markets, and it is good to test if this applies to the Hong Kong market as well.

Aim of the study is to find out if there are calendar effects occurring in the Hong Kong stock market, focusing on the companies in the Hang Seng Index and the MSCI Hong Kong ETF.

RQ1: Are the seasonal anomalies in the market consistent?

RQ2: Do the seasonal anomalies still occur if the transactions costs are included?

Research will be carried out by studying the monthly and daily historical returns of companies that are listed in the Hong Kong Stock Exchange. Monthly-, and holiday effects are studied for the period from 2002 to 2021. Daily effects are studied from 2007 to 2021. Meaning that monthly-, and holiday effects the study period is 20 years, and for the daily effects the study period is 15 years. The daily and monthly returns are extracted from the adjusted closing prices for the companies and linear regression analysis and GARCH model is used to analyse any anomalies within the dataset. Last part of the study tests if there is profitable way to employ a trading strategy based on the results when the transaction costs are considered.

Structure of the thesis is split into three sections. First chapter of the thesis is focusing on the theoretical background on calendar effects and on overview of the previous literature on the subject. Relevant theory is related to the Efficient market hypothesis, Adaptive market hypothesis and behavioural finance. Theory of January effect, different day of the week effects, turn of the month effect and different holiday effects are brought up in the literature review. Second chapter is data and methodology, where the research methods and chosen data for the study is introduced. Research methods used in this study are most notably linear regression and Garch (1,1) model. Last section of this study is the empirical results from the calendar effect study and discussion about the results.

1. Theoretical background on calendar effects

1.1 Efficient markets

Efficient market hypothesis is one of most controversial and widely studied subject of financial theory. The theory was firstly introduced by Paul A. Samuelson and Eugene F. Fama in the 1960's. The idea is one of the standpoints of financial theory and is widely applied to different models and financial studies. It gives fundamental insight about price-discovery process. Even though the theory was firstly introduced in the 1960's, and there have been thousands of published studies, there is still no clear consensus among economists if the financial markets are truly efficient. (Lo, 2008)

Malkiel (2003) defined efficient financial markets to occur when there is no possibility to make excess returns, without taking excessive risk as well. Fama summarised the efficient markets hypothesis as prices fully reflecting all available information.

The history of the EMH model is traced back to two different studies made by Paul A. Samuelson and Eugene F Fama. Paul Samuelson's study that was titled 'Proof that Properly Anticipated Prices Fluctutate Randomly' and Fama's papers written in 1963, 1965a; 1965b and 1970 that were based on his studies on statistical properties of stock market pricing and in the debate between technical- and fundamental analysis. Fama was one of the first to deploy modern digital tools to study finance markets and the first one to categorize the term Efficient Market Hypothesis, EMH. (Lo, 2008)

Efficient market hypothesis is closely associated with the Random Walk theory, popularized by Burton Malkiel in his book titled A Random Walk Down Wall Street, published in 1973. Theory of Random Walk indicates that future price series for certain security price cannot be predicted by previous price series of said security, stating that future price series are random and unpredictable. Malkiel (2003) concludes in his follow up publication that uninformed traders picking up diversified portfolio will reach to same returns as the experts actively trying to find undervalued securities.

EMH can be divided up to three different hypotheses, the three different variants are called 'weak', 'semi-strong' and 'strong' form. Weak form efficiency, which is also known as the random walk theory, states that future securities prices are random and not influenced by historical events in the stock market (independent yields). Weak form efficiency means that there is no possibility to predict future stock prices based on events in the past. Semi-strong form efficiency theory suggests that stock prices rapidly adjust to new public information, meaning that all past and current public information reflect the current price of the security. Strong form efficiency is the strictest of the three hypotheses, in strong form efficiency all past and current public and private information reflect in the price of the security. Meaning there is no excess returns to gain on information-based investing, all information is already considered in the price of the security. (Khanh & Dat, 2020)

The concept of Efficient market has counter-intuitive nuance. Most effective market also has the most random sequence of price changes generated by said market, also the price changes in the most efficient market are totally random and not predictable. This phenomenon occurs because in the most efficient market the participants in the market are more active and are actively trying to profit from all available information. This leads to all information directly pouring into the market prices and quickly eliminating all profit opportunities from public information, if this occurs instantly, this leads to so called frictionless market or said efficient market. In frictionless and efficient market setting there is no possibility to increase expected returns by doing information-based trading because all the information is already in the price of security. (Lo, 2008)

However, there is some discussion about the impossibility of efficient markets. Grossman & Stiglitz (1980) argue that only way to increase profits for the informed trader is to take positions that are better than the ones uninformed traders take. However, if the Efficient market hypothesis is true the market prices should reflect all available information at any time, meaning that there is no value to gain in trying to get any information and take positions based on that information. The paradox that is named after Grossman and Stiglitz is that if the market is truly efficient, there would be no point for gathering information and trying to beat the market. If there is no point in gathering information, market participants would not do it, leading to mistakes in the security prices and ultimately to inefficient markets.

Common reasoning about the markets and EMH is that the investors tend to overreact and underreact to new information in the market. This might lead to overeacting based on performance, buying stock that have risen in the past and selling stock that recently have experiences losses. Such reactions tend to push the stock prices beyond their ‘right’ or ‘rational’ price. However, according to EMH theory the prices should fall back to their ‘rational’ price after some time. (Lo, 2008)

Adaptive Market Hypothesis, a theory firstly introduced by Aw. Lo, is a follow up from the traditional Efficient Market Hypothesis EMH. In the Adaptive Market Hypothesis, A.W Lo describes a framework where the traditional models of modern financial economics coexist with new behavioural finance models. There is some evidence that seasonal anomalies seem to be diminishing from certain markets as they develop more, and the characteristics of the AMH model suggest that market efficiency improves over time. (Lo, 2005)

Adaptive Market hypothesis implies that the market efficiency is related to the environmental factors characterising the market such as number of market competitors, the number of profit opportunities and the degree of which the competitors are willing to adapt. The AMH suggest that many of the behavioural biases that behavioural finance theories see as violations of rationality, are in fact consistent with evolutionary model of market participants reacting to change in the market environment. (Lo, 2005)

The AMH hypothesis can be viewed as the new version of the classical EMH model, that is conducted from progression principles. The main differences to the EMH model are that the AMH assumes that investors do in fact make mistakes but will learn from them through evolution and will act more optimally in the future, thus meaning that market efficiency improves over time. Whereas in the EMH model the market is always in equilibrium and there is no room for learning and adaption. (Lo, 2005)

1.2. Seasonal anomalies

Seasonal anomalies in equity markets have gained extensive amounts of attention both in academia and among practitioners. There is speculated to be daily, weekly, monthly, and even yearly seasonal anomalies. One of the pioneers and first ones to study seasonal anomalies was EW Kemmerer in his paper published in 1911 titled ‘seasonal variations in the New York money market’. Over the century after EW Kemmerer published his paper, there has been thousands of publications, using different methods, data and time periods that have studied different markets all over the world, that support the idea of monthly anomalies. (Darrat et al 2011)

Seasonal anomalies relate to the assumption that certain patterns that have occurred in the past in the stock market could predict the future behaviour of certain stock or market. If said behaviour would occur constantly there is possibility to gain excess returns following investing strategy utilized by understanding the patterns of seasonal anomalies in the market. This would mean that seasonal anomalies contradict the Efficient market hypothesis, especially in its weak-form sense. (Darrat et al, 2011)

Seasonality in stock market returns is fascinating mystery in finance theory. Despite substantial research on different security markets, the evidence of seasonal anomalies remains mixed. The presence of return seasonality should interest all market participants, there could be possibility to increase returns and to find the optimal timing for firms issuing new shares in hopes of new capital. (Darrat et al, 2011)

There are several theories on what might explain the monthly seasonality in the stock market. Theories such as tax-loss selling hypothesis and the gamesmanship are suggested to be the reasoning behind the anomalies, both suggest that average stock returns of small risky firms are higher in January. The Gamesmanship hypothesis is a theory that suggest that institutional investors rebalance their portfolio to affect performance-based bonuses by the end of the year. Tax-loss selling simply refers to the fact that investors might realise losses in December to decrease their taxable capital gains. (Darrat et al, 2011)

1.2.1. January effect

One of the most well-known seasonal anomalies is the January Effect, which is said to occur when stock returns are significantly higher in January. Generally, January effects has been found more in returns of the smaller companies rather than larger companies and January Effects can be found more in the beginning of the month. Some of the reasoning behind this effect is discussed in the previous chapter, but the main hypotheses behind January Effect are the Tax Loss selling hypothesis and the behaviour of institutional investors close to the year end and again in January. This hypothesis argues that Institutional investors 'store' money in market index that is used to track their performance until the end of the year, and then buying stocks after the year has changed, thus leading to upward pressure in the prices of the securities and ultimately creates the January Effect. However, on the contrary to the Tax-loss selling hypothesis. Study by Gultekin and Gultekin (1983) showed evidence that January Effect occurs even when there are different tax calendars in use. They studied 16 international stock markets with different tax calendars and reported that January Effect can be found in fifteen of these markets. (Mehdian & Perry 2002)

In the US equity markets from the years 1964 to 1998 studying the three major market indexes that were NYSE, DJCOMP and SP500 there were evidence that January Effect can be found in all the three indexes mentioned before. However, the stock market crash of 1987 makes significant intertemporal break to the sample. With further study and dividing the sample into two periods between and after the crash the results indicate that the January Effect is statistically insignificant in the period after the crash. Meaning, that the January Effect does not exist in the post 1987 period. Additionally, there is no statistical support for the Tax Loss selling or the Institutional investor behaviour hypotheses mentioned before in the post market crash of 1987 period. (Mehdian & Perry 2002)

1.2.2. Holiday effects, Halloween effect

There are also studies made about so-called 'Sell in May -effect' or 'Halloween effect'. Halloween effect refers to the significantly lower returns during summer months (May – October), compared to the winter months (November – April). Study made by Bouman & Jacobsen (2002), shows that investors would be better off by simply avoiding investing during the summer. In the study one third of the 37 countries shows returns below zero and close to zero in the rest of the focus group during the summer months. (Jacobsen et al, 2005)

Another significant and well-studied anomaly is the holiday effect. The holiday effect refers to the tendency of securities to show increased returns prior to the holidays. Holidays that are usually studied with this effect are: Good Friday, Memorial Day, July 4^{th}, Labor Day, Thanksgiving, Christmas, and New Year's Day. Many of these holidays are not celebrated out of the United States but there is some evidence that the holiday effects still can be found in other markets because of the ever-growing globalisation in the financial markets. (Brockman & Michayluk (1998)
Study from Josef Lakonishok and Seymour Smith, published in (1988) found that there is notable increase in returns prior to the holidays. Results from the study was that the preholiday rate of return is 23 times larger than the regular daily rate of return and that 63,9 percent of returns before holidays show positive returns. Furthermore, the study shows evidence that holidays account

around 50 percent of the increase in the Dow Jones Industrial Average index for years 1987 to 1986. (Lakonishok & Smidt, 1988)

However, there is different holidays for the Asian markets that are taken into consideration when studying Asian markets.

1.2.3. Day of the week effect

Like the study of monthly returns, there is also a lot of research made about the returns of different days within the week. One of the most puzzling and widely researched is the Monday effect, which is also called the weekend effect. This effect refers to the negative returns on Mondays, compared to any other weekdays. Gibbons and Hess (1981) found that there are negative returns in stock market on Mondays studying the 30 securities from Dow Jones Industrial index. Keim and Stambaugh (1984) undertook a further investigation of the 'weekend effect' in stock returns, they extended the study period to 55 years and found evidence that the returns are consistently negative on Mondays studying the S & P Composite Index. They conclude that the last price of the week tends to 'high'. In the Asian markets, Ho (1990) found that in the five of the ten studied Asia Pacific Markets have negative returns on Mondays as well, further supporting the evidence of weekend effect. Markets of Hong Kong, Japan, Malaysia, the Philippines, and Singapore showed evidence of negative returns on Monday. However, marginally significant were only the markets of Malaysia and Philippines. In the more recent studies, it seems that the 'weekend effect' seems to be diminishing, particularly in the more developed markets. Olson et al (2015) made a comprehensive study, focusing on the seven major US stock market indices, and concluded that Monday returns had become about the same as the returns for the rest of the of the week in the US market. Rossi & Gunardi (2018) studied the markets of Germany, France, Italy, and Spain. They concluded that there is no strong evidence of weekend anomaly in the developed European stock markets. However, the consensus among scientistic seems to be that the phenomime still exist in the Emerging markets at least to some degree. Choudhry (2000) studied emerging Asian stock markets in 2000 and found that the negative returns on Mondays persist on the markets of Malaysia, Indonesia, and Thailand. For the Hong Kong market, in (2012) H. Chan & K. Woo Studied the Hong Kong H-shares Index, and found evidence, that the Monday and Friday returns are positive. However, the argue that the Friday effect becomes insignificant when the market risks of different days are considered. They further speculate that when the transactions costs are also included, the Monday effect also becomes insufficient, and the efficient market hypothesis remains unchallenged. It seems that there is a little bit of contradictory results for the studies in the Hong Kong markets regarding the day of the week effects.

1.2.4. Turn of the month effect

Turn of the month effect is another interesting calendar anomaly in the stock market, firstly found by Lakonishok and Smidt (1988). Results from their paper indicated that turn of the month effect can be found on US equity markets. The hypothesis behind this effect is that the first trading days of any month will have remarkably higher returns compared to the rest of the days within the month. Turn of the month is categorized to include the last trading day of previous month and three first days of trading in the next month. Lakonishok and Smidt (1988) studied the Dow Jones Industrial Average Index and found evidence that the four days at the turn of the month accounted for all the positive returns in DIJA for the 90-year period from 1897-1986. In more depth, the study indicated that the return for the four trading days at the turn of the month 0,476 percent, whereas the average cumulative return was only 0,349 percent for the whole month, meaning that the average return was negative for the remaining days in the month.

Further studies carried by McConnell and Xu (2008) found that the turn of the month effect still exist in the Dow Jones Industrial Average 20 years after the study by Lakonishok and Smidt. They expanded the study period to end in 2005 and concluded that in the 109-year period under study that all the positive returns on average occurred during the turn of the month period. They also ruled out that the effect is only related to:

1) Small capitasation or low price of stock
2) Only to calendar year-end or quarter-end
3) Not related to increase in risk free rate or interest rates in general

They found evidence of the higher returns in 30 of the 34 markets they studied, meaning that the effect is not only related to US market.

Behavioural Finance tries to understand the behavioural biases that market participants might have leading to irregular behaviour and seasonal anomalies. Ever since Fama introduced the Efficient Market Hypothesis, it was considered the best model explaining stock market behaviour. Behavioural Finance studies challenge the existence of efficient markets and try to give some understanding on why the Efficient Markets do not occur in the real world. In 1985 Bondt and

Thaler studied the overreaction behaviour in the NYSE, they applied the theories of behavioural finance and found that investors overreact to unexpected news and events. (Singh et al, 2021; Bondt & Thaler 1985)

In behavioural Finance, it is assumed that information and attributes on the market are highly influential to the investment decisions that market participants make and to market outcomes. As a result, investors make irrational and not most optimal decisions leading to sub efficient markets. The Efficient Market Hypothesis is based on the premise of rationality and doesn't consider that investors don't always behave rationally. Irrational behaviour might explain the causes of different anomalies in different markets. (Singh et al, 2021)

1.3. Calendar effects on Asian markets

Compared to western markets the Asian markets like Hong Kong have some unique characteristics when discussing calendar anomalies. In the Asian markets one of the most persistent and widely reported effect is the so-called Chinese Lunar New Year effect. Chinese New Year Effect indicates that stock returns during the New Year are much higher compared to stock returns in other time periods. This effect has been studied widely with empirical studies and it is said to affect the Asian-Pacific markets such as: Hong Kong, Singapore, Taiwan, South Korea, New Zealand, Japan, and Malaysia. (Abidin et al, 2012)

Literature regarding the seasonal anomalies in the Hong Kong stock market is quite limited, if compared to the various studies made for US and European markets. Cheung & Coutts (1999) studied the Hang Seng index from 1985 to 1997. The findings in that study indicated that there is no evidence for January Effect in the Hang Seng Index. The study agreed that the returns for some months were significantly positive, but it wasn't possible to draw the conclusion that there is persistent January Effect, or any other monthly effects in the Hang Seng Index. Contrary to the evidence from other markets, they concluded that there is no indication of any persistent monthly effects.

Some other previous studies with Hong Kong stock market shows that the holiday effects can be found on the Hong Kong market, there is evidence of 'local' and even inherited US pre-holiday return effects in the past. Earlier studies in the Hong Kong Stock exchange shows evidence that especially the Chinese New Year is affecting the returns in Hong Kong. The CLNY event seems to be affecting returns even month before the actual event.

There are holiday effects as well in the western markets as discussed before, but the importance of Chinese lunar calendar and Chinese New Year festival to Chinese culture could indicate that CNLY effects is stronger in the Asian markets compared to the other holiday effects in the western markets. Chinese Lunar calendar is important to the business managers in the Asian markets when they make business decisions sometimes based on customs and superstition. Study made by Chan, Khanthavit & Thomas (1996) that studied the seasonal anomalies in the Stock Exchange of Singapore, they found that holidays with cultural background show significantly stronger holiday anomalies than the holidays with no cultural background. The study indicated that there are positive abnormal returns before the cultural holidays. (Abidin et al, 2012)

For the Hong Kong stock market especially, the two most persistent and well documented seasonal anomalies are 'turn-of-the month-effect' and the (CLNY) Chinese Lunar New Year effect. Both seem to appear in the Hong Kong market over the period from 1995 to 2010. Especially the CLNY effect seems still to exist in the Hong Kong Stock market, showing increased returns one day prior and one day after the trading break when the Lunar New Year occurs. It seems, that the holiday effects that widely influenced the US markets during the 60's, 70's and 80's and are now decreasing in significance, are still widely affecting the Hong Kong and mainland Chinese markets. (McGuinness & Harris, 2011)

Furthermore, the Hong Kong stock exchange provides interesting focus for the study because of the taxation system of Hong Kong. As discussed before, one possible explanation to the January Effect was the 'tax loss selling' which shouldn't occur in the Hong Kong market as there is no incentive to sell in December at loss, as there is no capital gains tax for profits in Hong Kong. (Hsu & Yuen, 2001)

2. Methodology and Data

2.1. Data

The study focuses on monthly-, daily-, and holiday effects occurring in the Hong Kong market. Focus for the Monthly effect study is the Hang Seng Index (HSI) in the Hong Kong stock market. The index includes the largest and most liquid stocks in the main board of Stock Exchange of Hong Kong. The launch date for the index was 24th of November 1969.

The Index is free float-adjusted and market capitalisation weighted. Single securities are capped to 8 percent to avoid any single company domination in the index. Base currency in the index is the Hong Kong Dollar. There are 64 constituents in the Index in April 2022, but there is a target to increase the companies in the index to 80 by mid 2022 and ultimately fixed to 100 companies. Current companies in the Index cover 58% of the Hong Kong Market by market value. The Index is further divided up to four sub-indexes by industry, the sub-indexes are:

- Hang Seng Finance
- Hang Seng Utilities
- Hang Seng Properties
- Hang Seng Commerce & Industry

Biggest industry represented in the Index is finance by the weight of 38,70%, second biggest is Information Technology by weight of 24,24% and third biggest industry is Consumer Discretionary by weight of 9,36%.

For monthly effects different companies are picked that are listed in the Hong Kong stock exchange and part of the components of the Hang Seng Index. 30 companies are picked from the index to the analysis. Companies with biggest market capitalization are picked for the study to get good representation of the market. It was determined that it is better practice to choose multiple companies rather than one ETF to gain multiple observations for each month in the monthly effects study. List of the companies can be seen on the Appendix 1.

For day of the week effects, the regression analysis is directly applied to the daily closing prices of the iShares MSCI Hong Kong ETF, that follows the MSCI Hong Kong 25/50 index.

MSCI Hong Kong 25/50 index is designed to focus the performance of the large and mid-cap segments of the Hong Kong market. There is 35 constituents and the index covers approximately 85% of the free float adjusted market cap of the Hong Kong market.

For the study of the Chinese New Lunar Year, regression analysis was also applied to the iShares MSCI Hong Kong ETF, more precisely described above. For the CLNY -effect, 20 years of daily closing data was studied.

Table 1. Descriptive statistics of used data.

Descriptive statistics of used data.

	(1)	(2)	(3)	(4)
VARIABLES	N	mean	sd	kurtosis
Daily returns from MSCI ETF	3,775	0.000217	0.0160	14.213
Monthly returns from HSI	5,735	0.00868	0.101	15.920

Source: Author's calculations based on data from Yahoo Finance.

Table 1 shows descriptive stastics for the two datasets that are used for the study. There is positive mean return for both datasets used in the study. Kurtosis for both datasets is quite high and indicates that there is outliers within the data. When kurtosis is over 3 the data is usually considered not normally distributed, meaning both datasets in the study are not probably normally distributed.

Historical data is collected from Yahoo Finance. The returns are calculated from the adjusted closing prices from the companies that are selected for the study from the Hang Seng Index.

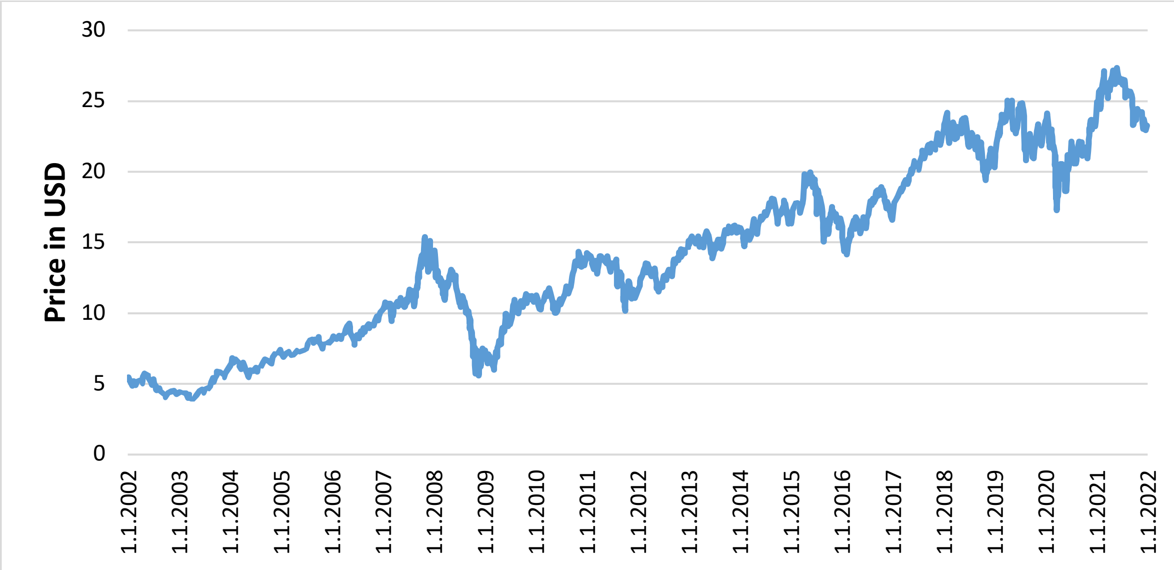

Figure 1. Historical performance of the iShares Hong Kong ETF period 2002 to 2021.
Source: Author's calculations based on data from Yahoo Finance.

Figure 1 represents historical performance of the sample data and the Hong Kong stock market. iShares MSCI Hong Kong ETF was chosen to represent the performance as it gives broad overview of the historical performance, considering the benchmark index it follows, covers approximately 85% of the market capitalisation in the whole Hong Kong stock exchange.

The graph shows general upwards trending slope. There is a drastic drop in 2008, when the global financial crisis occurred. There is also quite significant drop in 2011, possibly caused by the aftermath of the United States debt ceiling crisis and Black Monday. Another drop in 2015-2016, when there was major turbulence in the Chinese markets. Most recent drop in the graph is caused by the effect of the Covid pandemic in the markets. Overall, the historical performance of the Hong Kong market seems to be quite similar compared to the major indices around the world.

2.2. Research methods

Linear regression analysis is used as a main research method for this study. Linear regression is a quantitative research method where the aim is to find the relationship between the dependant variable and one or more independent variables. In this study the linear regression is used to find the correlation between stock returns and time of the week or time of the month. Where the dependant variable is the stock return and independent variables are the time of the observation. (Schneider & Blettner, 2010)

Additionally, GARCH (1,1) model is used to model the error term and to account for the possibility of volatility clustering in the data. Mandelbrot (1967) described volatility clustering to the theory that large movements are followed by large movements and small movements are followed by small movements. Similar method is used in different papers when studying calendar effects, for example by Choudhry (2000) studying day of the week effect in Asian stock markets.

Garch (1,1) specification below:

$$\sigma_t^2 = w_0 + \alpha_1 \in_{t-1}^2 + \beta_1 \sigma_{t-1}^2 \quad (1.1)$$

Where w, α and β are the coefficients to be estimated.
Where σ_t^2 is the conditional volatility.
Where $\in_{t-1}^2$ is the squared returns from previous periods.

Autoregressive conditional heteroscedasticity (ARCH) model, introduced by Engle (1982) and generalized autoregressive conditional heteroskedasticity (GARCH) model are used in the most recent studies regarding calendar effects. The benefit of these type of models is that they consider the possible heteroscedasticity into the estimation process, which might skew the results, compared to more classical linear regression methods that do not have this benefit. This model allows the error distribution to be conditionally heteroscedastic and not normal, and still provide accurate results. (Choudry, 2010)

Dummy variables are added to the equation to eliminate other factors from the analysis. Dummy variables are used to give numeral value of either 1 or 0 to the independent variable in the equation depending on the time of the observation. Dummy variables for monthly effects are added for each month of the year such that D1 = 1 if the time of the observation is in January and D2 – D12 will be 0. D2 = 1 if the time of the observation is in February and D1, D3, D4 etc. will be 0. Following the same logic dummy variables will be attributed for the whole year. One month will left out from the analysis in order to avoid the dummy variable trap. This has become the conventional way of studying seasonality in the stock market, also noted in the study made by Cheung & Coutts (1999) where they studied the seasonality in Hang Seng Index with similar model.

For the day of the week effects the same logic is applied to the dummy variables. D1 = 1 if time of the observation is Monday, D2 to D5 will be 0. D2 = 1 if the time of the observation is Tuesday and again D1, D3, D4, D5 = 0. Weekends are left out of the analysis as there is no historical data from the weekend when the markets are not open. Again, one day will be left out of the analysis to avoid dummy variable trap.

For the study of Chinese New Lunar Year effect, similar method was used. Daily returns were again calculated from the iShares MSCI Hong Kong ETF. Dummy variables were assigned to the dataset, 3 days before the New Lunar Year were marked as 1 and rest of the observations were marked as zero. Regression analysis was applied to the dataset after the dummy variables were assigned. Dataset for the CLNY effect study had 20 years of historical daily returns from the iShares MSCI Hong Kong ETF.

3. Empirical results and discussion

3.1 Empirical results

For the day of the week effect 15 years or historical returns from the iShares MSCI Hong Kong ETF was analysed. Period for the whole sample is from 2007 to 2021. Regression analysis was applied to the daily returns and Wednesday was used as reference group in the analysis. Dataset was further divided up to three different subsets to study the consistency of the day of the week effects in the Hong Kong market. Three regression analysis were applied to the daily returns for the periods of 2007 to 2011, 2012 to 2016, 2017 to 2021. Again, Wednesday was used as the reference group. Regression model is specified for the daily effects below:

$$Rt = a_0 + a_1 d_1 + a_2 d_2 + a_3 d_3 + a_4 d_4 \; + \in_t \qquad (1.2)$$

Where $\in_t \sim i.i.d.N\ (0, \sigma^{2)}$ but also modeled with Garch effects.

Where Rt is the return, d's represent the dummy variables. D1 = Monday if the observation is on Monday, D2 = Tuesday if the obseravion is on Tuesday etc. ∈ is the error term. Table 2 shows the results from the regression.

Table 2. Regression results for Daily effects

Results for Day of the week effect

VARIABLES	whole period (1) *2007 - 2021*	subset (2) *2007 - 2011*	subset (3) *2012 - 2016*	subset (4) *2017 - 2021*
Monday	-0.00145*	-0.000900	-0.00237**	-0.00108
	(0.000829)	(0.00202)	(0.000969)	(0.00108)
Tuesday	0.000742	0.000437	0.00102	0.000629
	(0.000811)	(0.00198)	(0.000950)	(0.00106)
Thursday	-0.00105	-0.00136	0.000148	-0.00193*
	(0.000814)	(0.00199)	(0.000953)	(0.00106)
Friday	0.000113	0.000366	0.000654	-0.000686
	(0.000816)	(0.00199)	(0.000954)	(0.00107)
Constant	0.000527	0.000370	0.000370	0.000846
	(0.000573)	(0.00140)	(0.000671)	(0.000750)

F-statistics	*2.36*	0.32	3.68	1.72
P-value (F)	*0.0509*	0.8644	0.0055	0.1439
Observations	*3,775*	1,258	1,256	1,257
R-squared	*0.003*	0.001	0.012	0.005

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Author's calculations

Table 2 shows that there were 3775 observations for the Day of the Week analysis in the whole period. Negative coefficients for Monday and Thursday indicate that returns for these days are negative compared to the returns from Wednesdays. The coefficients of Tuesday and Friday are slightly positive but with no statistical significance. Monday and Thursday show negative returns compared to Wednesday, and with Monday the results are within the 10% significance level. With these results for this sample, we can say there is statistically significant negative returns for Monday in the period from 2007 to 2021. Some previous studies have also found negative Monday effect in the Hong Kong market, for example Ho (1990) studied the Hong Kong market from January 1975 to November 1987 and found evidence of negative Monday effect as well. However, more recent study by Chan & Woo (2012) found signs of positive Monday effect studying the H-Shares index in Hong Kong from January 2000 to August of 2008. It seems that results with Monday effect are bit contradictory.

For the consistency study with the subsets 2, 3 and 4, there were roughly 1250 observations for each subset. The first subset shows no evidence of any significant daily effects. Monday and Thursday have slightly negative coefficients.

Second subset from the period of 2012 to 2016 also has evidence of negative Monday effect, with 5% significance level. Other days within this set show slightly positive returns compared to Wednesdays.

Third and last subset from 2017 to 2021 somewhat differs from the previous results. There are negative coefficients for Monday, Thursday, and Friday. The performance graph might explain these results as there has been quite a lot of downward slopes in the returns for this period, leading to lot of negative trading days. For this period there is negative Thursday effect within the 10% significance level.

Results from the further subset analysis shows that there is limited consistency in the day of the week effects with the selected sample. Negative Monday effects seems to exist in all the subsets as well, however there is only one subset with statistical significance. Thursdays seems to show slight negative returns as well when compared to returns of Wednesday. Tuesday is the only day with only positive returns for all periods. Monday seems to be the worst day with the returns but there is no statistical confirmation with these results considering the consistency.

For monthly effects 30 different companies were selected that are included in the Hang Seng Index. Monthly returns for each selected company were calculated and compounded to one vertical dataset. With monthly returns 20-year period for the sample was used. However, some of the companies that were in the sample were not listed in the Hong Kong Stock Exchange at the beginning of the dataset, so the monthly returns for these companies could only be calculated from the listing date. For the monthly effects study there were 5735 observations in total, and December was used as the reference group.

Table 3. Regression results for monthly effects.

Results for the monthly effects

	2002 - 2021		
VARIABLES	Coefficient	Std. Error	P-value
January	0.00592	(0.00650)	0.363
February	0.00464	(0.00650)	0.476
March	0.00315	(0.00651)	0.629
April	0.00459	(0.00650)	0.480
May	0.00502	(0.00655)	0.443
June	-0.00398	(0.00655)	0.544
July	0.00123	(0.00655)	0.851
August	-0.00295	(0.00654)	0.652
September	0.00641	(0.00653)	0.327
October	0.00322	(0.00653)	0.622
November	0.00177	(0.00651)	0.786
Constant	0.00625	(0.00460)	0.174
F-statistics	0.52		
P-value (F)	0.8914		
Observations	5,735		
R-squared	0.001		

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Author's calculations

Table 3 shows the linear regression results for the monthly effects. For monthly effects December was used as the reference group. Time period for the sample data is from 2002 to 2021, 20 years in total.

Results from the regression analysis indicate that the returns compared to December were positive for January, February, March, April, May, July, September, and November. Returns for June and August were negative compared to December. However, the results are not statistically significant for any of the months. Results for the regression analysis indicate that there is no evidence for any Monthly effects within this dataset. Results support previous literature in this area, Cheung & Coutts (1999) studied the Hang Seng Index for January effect and other monthly effects and concluded that there is no significant evidence of any persistent monthly effects within the index.

Table 4. Regression results for Holiday effects.

Results for the holiday effects

	2002 - 2021		
VARIABLES	Coefficient	Std. Error	P-value
pre CLNY	0.00369*	(0.00201)	0.066
Constant	0.000249	(0.000219)	0.255
F-statistics	3.38		
P-value (F)	0.0659		
Observations	5,032		
R-squared	0.001		

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Author's calculations

Table 4 shows the linear regression results for the pre-Chinese New Lunar Year holiday effect. For the pre CLNY effect all other trading days than the 3 days prior to the holiday were used as reference group.

For the pre–Chinese Lunar New Year effect (CLNY), 20 years sample of daily returns were studied. Number of observations for this dataset was 5032, where three days for every year were marked as with the dummy 1 in the regression, in total there were 60 trading days that were taken into consideration for this effect. Regression indicates statistically weakly significant result. Results indicate that the positive pre–Chinese Lunar New Year still exists in the Hong Kong Market. Previous studies within Hong Kong market regarding the CLNY effect support this result. Study by McGuinness and Harris (2011) also found evidence of CLNY effect within the Hong Kong market from 1995 to 2010.

Further analysis was applied to all datasets with GARCH (1,1) model. Garch model accounts for multiple types of volatility clustering over the time in the series. Significant arch and garch terms indicate that the variance is autocorrelated. The model predicts variance based on the weighted average of the long run average variance, the variance that is predicted for the current period and the new information which is the most recent squared residual. Arch (1) is the first lag of the squared return and Garch (1) is the first lag of conditional variance. (Engle, 2001)

Garch (1,1) model for the daily effects is specified below. It follows the logic from the study by Öncü et al (2017). Similar logic is used for the Monthly-, and holiday effects.

$$R_t \ = \sum_{i=1}^{5} \alpha_i D_{it+\,\epsilon_t} \qquad (1.3)$$

$$\epsilon_t \ | \ \varphi_{t-1} : N(0, H_t) \qquad (1.4)$$

$$ht \ = r_0 \ + r_1 \ \epsilon_{t-1}^2 + r_2 h_{t-1} \qquad (1.5)$$

R_t = Return

α = average return for each trading day

D = dummy variables with similar logic (D1 = Monday if observation is on Monday, etc)

∈ = error term

ht = Conditional variance

h_{t-1} = lagged conditional variance

Table 5. Results from the GARCH (1,1) model for all calendar effects.

Monthly Effects 2002 - 2021			Daily Effects 2007 - 2021			Holiday Effects 2002 - 2021		
	(1)	(2)		(3)	(4)		(5)	(6)
VARIABLES	Coefficient	GARCH (1, 1)	VARIABLES	Coefficient	GARCH (1, 1)	VARIABLES	Coefficient	GARCH (1, 1)
January	0.00365		Monday	-0.00138**		Arch (1)		0.0789***
	(0.00499)			(0.000550)				(0.00449)
February	0.000856		Tuesday	-0.000381		Garch (1)		0.909***
	(0.00544)			(0.000553)				(0.00496)
March	-0.00319		Thursday	-0.00135**		CLNY	0.00446**	
	(0.00530)			(0.000536)			(0.00174)	
April	0.00259		Friday	-0.000190		Constant	0.000525***	2.50e-06***
	(0.00549)			(0.000568)			(0.000160)	(3.53e-07)
May	-0.00217		Arch (1)		0.0850***			
	(0.00526)				(0.00474)			
June	-0.00381		Garch (1)		0.903***			
	(0.00508)				(0.00482)			
July	-0.000113		Constant	0.00113***	2.57e-06***			
	(0.00542)			(0.000396)	(3.83e-07)			
August	-0.00217							
	(0.00542)							
September	0.00202							
	(0.00549)							
October	0.00233							
	(0.00534)							
November	-0.000258							
	(0.00494)							
Arch (1)		0.132***						
		(0.00611)						
Garch (1)		0.861***						
		(0.00555)						
Constant	0.00857**	0.000197***						
	(0.00387)	(1.90e-05)						
Observations	5,735	5,735	Observations	3,775	3,775	Observations	5,032	5,032

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Author’s calculations

Table 5 shows the results from the GARCH (1,1) model for each dataset. Columns labeled 1, 3 and 5 show the return for each variable. Columns labeled 2, 4 and 6 show the results from the variance testing. Significant arch (1) and garch (1) terms indicate ARCH effects within the dataset.

Results for day of the week effect show that the negative Monday effect persists in the daily returns, with 5% significance level. Additionally, there is negative Thursday effect in the returns with also 5% significance level. With this model we can conclude that negative Monday effect cannot be explained by volatility clustering, and it is truly anomalous in the returns. Also, as new evidence, the negative Thursday effect can be seen in the results when time varying volatility is considered. Results for the arch and garch terms indicate that the daily returns are autocorrelated, both with 1% significance level.

Results are similar for the pre CLNY holiday effect. Positive pre CLNY effect also persists in the daily returns, with 5% significance level. Arch and Garch terms indicate autocorrelation within this dataset as well, similarly at 1% significance level.

For monthly returns, the results follow similar pattern in a sense that this dataset has autocorrelation as well. These results support the previous results with the linear regression, there is no evidence of any significant monthly effects with these results.

The effect of transaction costs was tested with portfolio backtesting. The trading strategy was based around the results from the daily effect study, in this case the focus was on the negative Monday effect. 15 years of daily returns from the iShares MSCI ETF were backtested. Figure 2 illustrates the results from the testing.

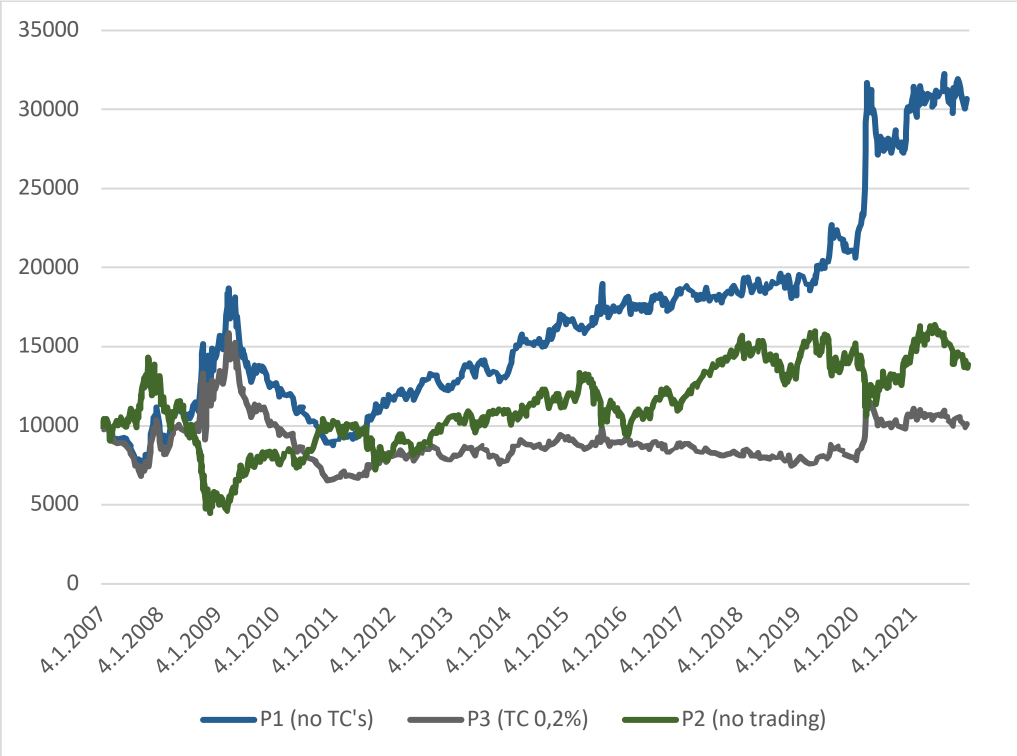

Figure 2. Results from the transaction cost testing applied to MSCI ETF Daily returns 2007 – 2021.
Source: Author's calculations based on data from Yahoo Finance.

The trading strategy was chosen based on the negative Monday effect in the returns. Portfolio was shorted every week at Friday closing price and then repurchased at the Monday closing price. Portfolio 1 (Blue line) indicates the results from this trading strategy when no transaction costs are assumed to the trading. This strategy would be very profitable if thre wouldn't be any transacion costs to consider. Portfolio 2 (Green line) illustared the results from just holding the portfolio over the whole period. Portfolio 3 (Brown line) illustrates the results when there is assumed to be transaction costs of 0,2% of the turnover for each transaction. From this results it is possible to see that it was not profitable to employ this strategy even with the negative Monday effect present in the returns in this period. Results follow previous stuedies in this area. Chan & Woo (2012) studied the H Shares index in the Hong Kong and also concluded that after adjusting for transacion costs, the abnormal returns become neglible.

Breakeven value for this strategy was found to be when transaction costs were assumed to be at 0,076% level of turnover for each transaction, where the strategy netted profit of $106.80 for the whole period when starting with portfolio of 10.000 US dollars. Further look into the results show that this strategy has been profitable even with transaction costs when the price of the security is going down or even crashing, which makes sense since in this strategy the portfolio is shorted at every Friday's closing price.

3.2 Discussion about the results

Regarding the daily effect study, evidence from the linear regression implied that there is signs of negative Monday effect within the returns. Additional studying with the Garch (1,1) model also had evidence of negative Thursday effect within the returns. Previous literature in this subject and in this market is bit contradictory as noted before. This result for negative Monday effect is supported by previous study from Ho (1990) where there was evidence of negative Monday effect. Results for the negative Thursday return is not found in previous literature within this market. More recent study at Hong Kong market by Chan & Woo (2011) had evidence for positive Monday effect. Regarding the consistency study, the results implied that there is no concistency in the seleceted sample period for the daily effects.

Results from the analysis of monthly returns indicated that there were no significant monthly effects to be found from the Hong Kong stock market. The results were similar with the Garch (1,1) model. Results follow the previous studies regarding seasonal anomalies in the Hang Seng Index. Cheung & Coutts (1999) studied the January effect and other monthly seasonalities within the Hang Seng Index and came to conclusion that there were no evidence of persistent January effect or other monthly effects. This might support the theory that calendar effects are diminishing from the markets as they evolve. Theory behind January effect suggests that the January effect is mainly found in the smaller capitalisation companies, so it is good to note that no small capitalization companies are studied in this paper.

For the holiday effect study, Chinese New Lunar Year effect was chosen for the study. Results had evidence of positive pre Chinese New Lunar Year effect with the linear regression and with the Garch (1,1) model. Previous studies support this finding, for example by McGuinness and Harris (2011).

Results with the variance testing indicated arch effects within all of the studied samples, meaning that residuals are not independent from each other. This result indicates that linear regression might not be the best research method in similar studies considering these results with the Garch (1,1) model.

Further analysis was applied to find out how the transactions costs effect the previous results. Negative Monday effect was chosen for the transaction cost study. The model was set up in a way that the test portfolio was shorted on Friday's closing price and purchased again at the closing price on Monday. Transaction costs were assumed to be at 0,2% level per each transaction for the purpose of this study. Evidence from this testing indicated that when the transaction costs are taken into account the negative Monday effect diminishes from the returns. Result is supported by Chan & Woo (2012). It seems that the abnormal returns altough statistically significant, are quite small in the real markets.

SUMMARY

This study examined the monthly-, holiday-, and daily effects in the Hong Kong market. Focus was on the Hang Seng Index and MSCI Hong Kong 25/50 Index. Linear regression and Garch (1,1) model were used as research methods to analyse the data.

Aim of this study was to find out the presence of calendar effects withing the Hong Kong market, focusing on the more recent years. Studied sample period was from January 2002 to December of 2021. Study results indicated evidence of certain calendar effects in the Hong Kong stock market, signs of negative Monday effect, negative Thurday effect and positive Chinese Lunar New Year effect were found. There were no evidence of January effect, or any other monthly effects. However, results with the transaction costs suggested that the efficient market hypothesis still holds ground in this market as the transaction costs seems to be higher than the abnormal returns from the calendar effects.

Results from the variance testing with Garch (1,1) model had evidence that all of the studied samples had volatility clustering in the returns. For future use it can be noted that the different Arch models seem to be better research method for this type of study, compared to the classical linear regression methods.

The results from this study show that there is evidence of calendar effects in the Hong Kong market. Study of the consistency of these effects indicated that the abnormal daily returns were not consistent within the sample period. Lastly, transcation cost study indicated that the abnormal returns that were found are quite marginal and will be eliminated from the returns when transcation costs are considered, meaning that efficient market hypothesis still holds ground in the market.

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APPENDICES

Appendix 1. Companies used for the monthly effect study

Ticker	Company
0011.HK	Hang Seng Bank Limited
1810.HK	Xiaomi Corporation
0017.HK	New World Development Company Limited
0016.HK	Sun Hung Kai Properties Limited
0960.HK	Longfor Group Holdings Limited
0386.HK	China Petroleum & Chemical Corporation
3690.HK	Meituan
1299.HK	AIA Group Limited
0005.HK	HSBC Holding plc
9988.HK	Alibaba Group Holding Limited
0939.HK	China Construction Bank Corporation
0388.HK	Hong Kong Exchanges and Clearing Limited
0002.HK	CLP Holdings Limited
1398.HK	Industrial and Commercial Bank Of China
0267.HK	CITIC Limited
9633.HK	Nongfu Spring Co,. Ltd
0669.HK	Techtronic Industries Company Limited
2688.HK	ENN Energy Holdings Limited
1038.HK	CK Infrastructure Holdings Limited
0992.HK	Lenovo Group Limited
1044.HK	Hengan International Group Company
0003.HK	The Hong Kong and China Gas Company
9618.HK	JD.com, Inc.
0883.HK	CNOOC Limited
0027.HK	Galaxy Entertainment Group Limited
1109.HK	China Resources Land Limited
2319.HK	China Mengniu Dairy Company Limited
0012.HK	Henderson Land Development Company
2018.HK	AAC Technologies Holdings Inc.
0101.HK	Hang Lung Properties Limited

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