



温州肯恩大学  
WENZHOU-KEAN UNIVERSITY

**Chinese Zodiacs and Chinese stock performance**

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by

WANG Liyu

1026054

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Wang Liyu

1026054

### **Abstract**

To reflect the stock performance in different Zodiac years in China, the stock returns are used to indicate it. Daily returns of selected zodiac years are used to estimate the stock returns. The previous research showed that the stock performance of different Zodiac years has a difference. The year of the Snake has smaller stock returns than the year of others. Some certain Zodiac may have an influence on the stock performance. Based on the hypothesis, the data is selected from the recent 24 years from 1995 to 2018, which consists of 2 cycles of Zodiac years. The regression test is done based on daily returns. After the data is analyzed, the result can prove the hypothesis. In this way, the outcome of the research can give investors some suggestions about which Zodiac year they can earn more from the stocks in China.

*Keywords:* Stock Performance, Chinese Zodiac, Investment, Index

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## **Introduction**

The first study on the relationship between the zodiac signs and the stock performance began in 2013. Meisami(2013) is the first person who compares returns of equity markets for different zodiac years. In his study, he sorted out several markets in different places-Hong Kong and the US. He found convincing evidence for a higher rate of return in the Year of the rat and lower rate of return for the Year of the snake in Hong Kong from 1964 to 2013. As for the US market, rates of returns in the Year of the snake and the Year of the rooster are below average rate. Besides these two places, research on the Chinese zodiac calendar confirms that these twelve zodiacs affect the stock market as well.

Depending on the investigation, the Asian countries show more concern about the Lunar Calendar, which is related to the Zodiac signs. For the demography aspect, the number of births in the Year of the dragon is the highest among twelve zodiac years, which is documented by Wong and Yung(2005). It is because some symbols of the zodiac have lucky meanings that carry better prospects of life. If everybody in the society has the belief that the dragon children will be more successful in the future, they will have the preference of dragon. This demography phenomenon maybe not directly related to the stock performance, but it represents the culture in one country.

This paper focuses on the Chinese Zodiac calendar and contributes to future literature in the following ways. First of all, we add the data of the stock market in recent years. A time series of 27 years consists of three zodiac cycles is convincing because the previous research is not up-to-date, respectively. Second, the Chinese stock market is attractive for investors from the world. Few studies are on the relationship between Chinese zodiac and stock performance. Based on this paper, more suggestions about the investment in China in different zodiac years can be adapted by investors. Third, we investigate daily returns instead of the total stock market returns.

We do not perform the test in a time series of 27 years in China. Two complete cycles of 27 years are selected. The reason is that the stock market in China mainland exists for a limited number. The Shenzhen Stock Exchange opened in July 1991, and the Shanghai Stock Exchange opened in December 1990. Moreover, other research has already analyzed the returns in Hong Kong Exchange. So we do not repeat this process.

We used A-shares in Shanghai Stock Exchange to represent the overall stock performance. Also, we tried to keep the data updated.

The zodiac signs all have their positive and negative characteristics, and none of them are considered bad or good. Like mentioned before, some zodiacs have gained more reputation than others. Also, there is a difference between Western and Eastern society. Furthermore, we will compare the application of the three-factor model in America and China. The purpose of our study is analyzing the data of stock performance objectively and give suggestions based on the results.

## Literature Review

### 2.1 Chinese Zodiac

In Chinese culture, the myth has a significant influence on the people. In ancient years, people worshiped animals and believed the mysterious story of these animals. Later, the scientist used the earth branches to record the year. In this way, they combined the twelve in-order earthly branches with twelve kinds of animals. These animals have the order--rat, ox, tiger, rabbit, dragon, snake, horse, goat, monkey, rooster, dog and pig. Twelve Chinese zodiac signs are vital components of traditional Chinese culture. Earthly branches are essential in concepts of ancient astronomy in China.

Each kind of animal represents one year and consists of one cycle of twelve years. Every zodiac animal has different lucky meanings. Chinese People call them *sheng xiao* and create an association between animals and different characteristics. Traditionally, the Chinese believe that the birth year of one person, according to the Chinese zodiac, determines the fate of that person. It is thought that people born in a given year have personalities similar to those of animals in that year. The most recent zodiac sign years are shown below. Moreover, in this paper, we choose 1995 as the beginning year and 2019 as the ending year.

Zodiac Animal	Recent Years	Personality Traits
Rat	1924, 1936, 1948, 1960, 1972, 1984, 1996, 2008, 2020	Quick-witted, resourceful, versatile, kind
Ox	1925, 1937, 1949, 1961, 1973, 1985, 1997, 2009, 2021	Diligent, dependable, strong, determined
Tiger	1926, 1938, 1950, 1962, 1974, 1986, 1998, 2010, 2022	Brave, confident, competitive
Rabbit	1927, 1939, 1951, 1963, 1975, 1987, 1999, 2011, 2023	Quiet, elegant, kind, responsible
Dragon	1928, 1940, 1952, 1964, 1976, 1988, 2000, 2012, 2024	Confident, intelligent, enthusiastic
Snake	1929, 1941, 1953, 1965, 1977, 1989, 2001, 2013, 2025	Enigmatic, intelligent, wise
Horse	1930, 1942, 1954, 1966, 1978, 1990, 2002, 2014, 2026	Animated, active, energetic
Goat	1931, 1943, 1955, 1967, 1979, 1991, 2003, 2015, 2027	Calm, gentle, sympathetic
Monkey	1932, 1944, 1956, 1968, 1980, 1992, 2004, 2016, 2028	Sharp, smart, curiosity
Rooster	1933, 1945, 1957, 1969, 1981, 1993, 2005, 2017, 2029	Observant, hardworking, courageous
Dog	1934, 1946, 1958, 1970, 1982, 1994, 2006, 2018, 2030	Lovely, honest, prudent
Pig	1935, 1947, 1959, 1971, 1983, 1995, 2007, 2019 ( <a href="http://travelguide/chinese-zodiac/pig.htm">/travelguide/chinese-zodiac/pig.htm</a> ), 2031	Compassionate, generous, diligent

Table 1-the year and the personality of Zodiac

Each animal, which represents one year in a 12-year cycle in the Chinese zodiac calendar, is described in detail by using the precise knowledge of astronomy that existed at the time.

There are four significant types of lunar calendars in the world: Chinese, Islamic, Hebrew, and Hindu. The Chinese type is the most influential one partly because it has the most significant number of observers, and Chinese people have beliefs on the lunar calendars since it is originated from the ancient days. And most people are familiar with the lunar calendar before the 21<sup>st</sup> century. In the past, the lunar calendar plays a more critical role than the solar calendar. For example, the most important festival in one year in China is the Spring Festival, which is deriving from the lunar calendar. And the date of the Spring Festival is adjusted by the lunar calendar.

## *2.2 Chinese Stock Performance*

Typically, the stock returns are the indicator of the stock performance. Generally, the annual returns are used to estimate the stock returns. Different from the previous article, we focus on the selected sample year. To have an overview of this year, we use daily returns to track the whole year's stock performance. After comparing the different year's daily returns, we do a regression analysis to explore the relationship.

In China, the stock began in 1991, which is relatively late compared to stocks in other countries. Starting from zero in 1990, the Chinese stock market has become one of the fastest-growing capital markets of all time in the world. At the end of 2002, the number of listed companies exceeded 1,200, and total market capitalization for tradable shares stood at USD 140 billion, or 12 percent of China's GDP. At the establishment of the stock markets, A-share stocks were available only for domestic investors using money denominated in RMB. The B-share market, intended for foreign investors using U.S. dollars, was introduced in February 1992. A-share and B-share stocks are listed on the mainland China stock exchanges.

In this paper, the period between 1995-2018, the recent 24 years, will be selected to explore the relationship between Chinese Zodiac and Chinese stock performance. And we focus on A shares because A shares are much bigger than B shares. Historically, the B-shares were very illiquid and sold at a massive discount relative to A-shares. The

discounts fell substantially after domestic investors were allowed to invest in B-shares in 2001. Because the B-share market, with less than 10 percent of the total number of stocks outstanding, is much smaller than the A-share market, we focused our research on the A-share market. These recent 24 years are two complete cycles of Zodiac, and it begins in the year of Pig and ends in the year of Dog.

Usually, the stock returns are the indicator of the stock performance. To predict the stock return, three effects are introduced to serve as the predictors, which are the momentum effect size effect, and value effect.

Similarly, Fama and French (1992) show that firms with higher book-to-market ratios subsequently have higher returns. Lakonishok et al. (1994) report that future returns are positively correlated with cash flow-to-price ratio and negatively correlated with past sales growth. They suggest that investors overvalue firms' past performances, so these variables are often jointly regarded as value or contrarian indicators. Fama and French (1993) construct mimicking portfolios for the underlying risk factors related to size (SMB) and book-to-market(HML). The market, SMB, and HML portfolios capture a substantial part of the time-series variation in the returns on 25 stock portfolios formed on size and book-to-market over the period 1963–1991. Fama and French interpret this as evidence that size and book-to-market proxy for sensitivity to common risk factors in stock returns. Fama and French (1995) find that size and book-to-market factors exist in earnings. And the SMB factor in returns is related to the SMB factor in earnings. Fama and French (1996) show that their three-factor model also captures the returns on portfolios formed based on other anomalies, such as cash flow to price and the long-term return reversal documented by DeBondt and Thaler (1985). Fama and French argue that the empirical success of the three-factor model indicates that it is an equilibrium pricing model, a three-factor version of Merton's (1973) Intertemporal CAPM.

Banz(1981) mentions that the size effect and the value effect are the earliest assumed stock return forecasting indexes. Fama and French (1992) claim that firms with more excellent book-to-market ratios have higher returns subsequently.

As for the momentum effect, Jegadeesh and Titman (1993) point out that stocks with higher returns in the past have higher returns subsequently, ranging from 3 to 12 months. It is widely known that momentum strategies are purchases of past winners and sales

of past losers. As claimed by Fama and French (1988), the momentum effect is not included in size or value effects. For Fama and French (1992), the three-factor model is generally used to reflect the stock performance, which are the market effect, size effect, and value effect.

### *2.3 The relationship between Chinese Zodiac and Chinese Stock Performance*

#### ***Hypothesis: The Chinese Zodiac influences the Stock Returns in China***

In the previous research, some historical facts are showing that some years of Chinese Zodiac are better than others for stock markets. Iskyan (2019) claims that the year of the Pig, which starts on February 5, has above-average returns for Chinese Stock. Besides, Wong and Yung (2005) discovered that the birth rate of the dragon year is the highest above all years. Meisami (2013) investigated that stock returns in the rat year are lower than these in snake year.

Beyond investigating, the Asian community is more concerned with the lunar calendar, which is similar to the zodiac. China is the representative of this community. At the same time, Chinese stock is the most rapidly growing market in the world.

As mentioned before, the zodiac signs all have their two-sided characteristics, and none of them are considered bad or good. However, among the twelve zodiacs, people have their preferences, which have significant influences on their investments because many business people believe the myth. Some years have acquired a reputation for better outcomes. Throughout history, Chinese zodiac astrology has had a high impact on the way people live, feel, or make daily decisions. Based on different zodiacs, the amount of investments in stock markets influences the predictors of Chinese stock returns. The capital investment in the stock influences the stock price of every firm. In this way, the size and value of the whole stock will be influenced subsequently. Then we assume that the Chinese Zodiac influences the stock performance in China. If we use the Chinese Zodiac to invest, it is likely to get more returns from the investment. Some specific zodiac is more likely to provide more chance for investors to earn more from the Chinese stock.

The remainder of this paper is organized as follows: in the next part, I will give you the research approach I use which includes research design and data source; then, I will

provide my in-depth analysis of data and findings from the results; finally, the contribution and the limitations are discussed.

## Research Approach

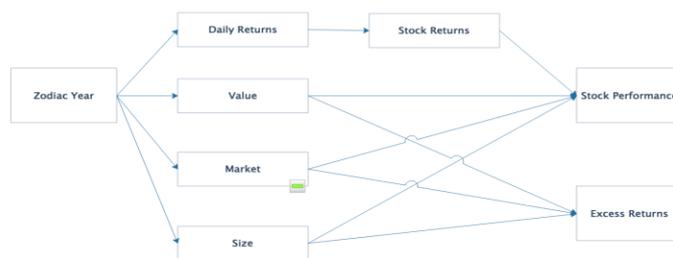
### 3.1 Research Design

We used two pathways to build the relationship between the zodiac year and stock performance. The first pathway is analyzing the daily returns, which indicates stock returns. We selected 24 years as sample years, which began in 1995. For the methodology, we investigate the additional annual returns for each of the zodiac years based on the cumulative daily excess returns during the whole year. In every same zodiac year, we start on the first day of the Lunar New Year and end on the last day of this zodiac year. It is because the zodiac year is based on the lunar calendar. In this way, we need to use the zodiac calendar to calculate the data to be more accurate. All the returns are daily returns.

All the returns are related to the risk. In order to predict the risk-return relation, we introduced Fama and French (1993) three-factor model, which includes size, market, and value effect. And the form of the three-factor regression model is:

$$R_{it}-RF_t = \alpha_i + b_iRMRF_t + s_iSMB_t + h_iHML_t + \varepsilon_{i,t}$$

For this formula,  $R_{it}-RF_t$  is the daily returns of portfolio  $i$  in excess of the risk-free daily rate.  $RMRF_t$  is the market return in excess of the risk-free rate;  $SMB_t$  and  $HML_t$  are the monthly size and book-to-market factors, respectively. Regressions are performed using average monthly returns of each decile-sorted predictor variable during the entire sample period. We follow procedures provided in Fama and French (1993) to compute  $SMB$  and  $HML$  using 24 years' daily returns data. As mentioned before, although there are A shares and B shares in the Chinese Stock Exchange, we focus on A-shares. So the whole model consists of two parts. Furthermore, the following is that the model is this paper.



*Table-Conceptual Framework*

### 3.2 Data

The data on Chinese equity stock returns is from RESSET database. The data is available at the daily frequency, which allows us to make the portfolios based on zodiac years when the Chinese Lunar New Year begins. The calendar information is from the China Highlights. Depending on every year's lunar calendar, the beginning day and the ending day of each zodiac year are sorted. And the table of it is attached in the appendix. The daily returns are available from 1995 to 2018 which covers the two complete zodiac cycles of Chinese Stock. Every year zodiac has different amount of trade days. After collecting the data of trade days, beginning day and ending day of one zodiac year, we calculate the average of every year's returns.

Also, we collect the data of risk-free rates daily. In this way, the excess returns are calculated by the formula: daily returns minus the risk-free rate. The risk-free interest rate is the interest rate you can get by investing money in an investment object without any risk. The difference between the daily returns and risk-free rate represents the variation of the Zodiac.

We used data for A-shares, which are available only to domestic investors, for nonfinancial companies. These stocks are traded on either the Shanghai Stock Exchange or the Shenzhen Stock Exchange. And we choose 000001 as our observation index, which shows the overview of the whole stock.

For the three-factor model, RESSET database provides the daily data of size, value and market effect. And it is divided into two kinds-TMV and MC. We choose A shares of Shanghai Stock Exchange as our sample. Besides the individual analysis of these three effects, the equally weighted combination is calculated at the same time. We will do the regression analysis in these ways.

To support the results of regression analysis, we do the ANOVA test in addition. And depending on the ANOVA test result, we can deeply analysis the p-value, significance, and coefficients to explore the relationship between Chinese Zodiac and Stock Performance. Also, with the descriptive statistics table, according to three factors, we can compare the Chinese Stock Exchange with the American Stock Exchange. We select America and China as the representatives of eastern and western society due to the different attitudes towards the zodiac in a different culture. And the data of three-factor

model is from the previous research, which is made by Janice Phoeng and Laurens Swinkels. Based on the same method of ANOVA test and descriptive statistics, we can compare the results in several aspects.

## Analysis and Findings

### 4.1 Daily Returns

For the first pathway to estimate the stock performance, based on the trade days, we combined two years, which are the same zodiac. Every year's daily returns are calculated and ranked. And the following table shows the rank of the average daily returns.

Zodiac	Average Daily Returns
Snake	-0.09%
Tiger	-0.03%
Rat	-0.02%
Monkey	-0.01%
Goat	0.00%
Rooster	0.01%
Rabbit	0.05%
Dragon	0.08%
Horse	0.10%
Pig	0.12%
Dog	0.14%
Ox	0.15%

*Table 1-Rank of Average Daily Returns*

From the table, the rank conforms to the background statement that the year of Snake has the lowest rate of returns, which is -0.09%. On the other hand, the year of Ox, Dog and Pig has the average daily returns above 0.10%. And the average rate of daily returns of 12 zodiacs is 0.04%.

To show the details of each year's daily returns, we draw the table of daily returns. And the table is attached in the appendix. From this table, the highest rate of returns happens in 2006 which is over 0.30%. And the lowest rate of returns happens in 2008 which is below -0.30%.

#### 4.2 Excess Returns

Apart from the daily returns, the risk-free rates are collected on daily basis. Based on the risk-free rate collected from the bank, we calculate the excess rate of returns based on daily basis. The following table is the detail of every year's excess returns.

Year	Excess Returns
1995	0.02%
1996	0.26%
1997	0.12%
1998	-0.04%
1999	0.16%
2000	0.13%
2001	-0.12%
2002	0.00%
2003	0.03%
2004	-0.09%
2005	0.00%
2006	0.34%
2007	0.20%
2008	-0.33%
2009	0.17%
2010	-0.03%
2011	-0.09%
2012	0.01%
2013	-0.08%
2014	0.18%
2015	-0.04%
2016	0.05%
2017	-0.01%
2018	-0.09%

*Table - Excess Returns*

From this table, we can see the year which has the highest excess returns is 2006. The zodiac of this year is dog. And the year which has the lowest excess returns is 2008.

The zodiac of this year is rat. It is directly related to the rank of average daily rates which is mentioned before.

#### 4.3 Three-Factor Model

For three factors- size, value and market effect, the descriptive statistic test is made. The analysis consists of average, minimum, median, maximum and standard deviation. Besides these three factors, we add the equally weighted combination to give more comprehensive detail of three factors. For size effect, we use SMB tradable market value weighted which means small minus big company to reflect the size effect. For market effect, we use RMRF tradable market value weighted which means market rate minus risk-free rate to represent market effect. For value effect, we use HML tradable market value weighted which means that the high-value company minus low-value company to indicate the value effect. And the following table is the detail of descriptive Statistics.

Factor	Statistic	Pig	Rat	Ox	Tiger	Rabbit	Dragon	Snake	Horse	Goat	Monkey	Rooster	Dog
	Average	0.15	0.02	0.22	-0.03	0.04	0.06	-0.09	0.03	-0.03	-0.02	-0.01	0.36
<b>Market (RMRF)</b>	Minimum	-5.12	-9.98	-7.11	-8.26	-7.92	-4.66	-6.70	-6.83	-3.13	-7.37	-4.02	-6.77
	Median	-0.01	0.19	0.47	0.01	-0.02	0.09	-0.02	0.09	-0.05	-0.02	0.08	0.38
	Maximum	3.85	10.37	6.59	5.56	7.05	4.66	9.84	9.84	3.25	5.30	8.02	5.54
	Std deviation	0.77	2.94	1.99	1.42	1.64	1.16	1.46	1.48	1.04	1.34	1.13	1.77
<b>Size (SMB)</b>	Average	0.01	0.01	0.10	0.10	0.01	0.06	0.08	0.03	-0.10	0.03	-0.08	-0.01
	Minimum	-5.12	-4.55	-2.43	-2.60	-2.53	-2.77	-4.05	-3.25	-2.71	-2.92	-3.07	-1.93
	Median	-0.01	0.07	0.12	0.14	0.07	0.09	0.12	0.09	-0.05	0.11	-0.01	-0.02
	Maximum	3.85	4.59	1.68	2.54	2.80	1.79	2.29	2.59	1.09	1.50	1.77	2.61
	Std deviation	0.77	1.00	0.64	0.68	0.61	0.53	0.54	0.62	0.46	0.60	0.69	0.70
<b>Value (HML)</b>	Average	0.09	0.02	-0.03	-0.02	-0.03	0.02	0.02	0.03	0.11	0.04	0.04	-0.03
	Minimum	-2.63	-2.19	-1.37	-1.81	-2.46	-3.17	-1.04	-3.42	-1.70	-1.61	-2.01	-1.59
	Median	0.07	0.02	-0.06	-0.03	-0.06	0.03	0.01	-0.01	0.00	0.02	0.03	-0.04
	Maximum	3.49	3.87	1.72	2.16	1.99	2.53	1.94	2.79	2.46	2.61	1.64	2.11
	Std deviation	0.74	0.66	0.50	0.56	0.55	0.53	0.37	0.55	0.50	0.48	0.44	0.51
<b>Equally Weighted Combination</b>	Average	0.09	0.02	0.10	0.02	0.01	0.05	0.00	0.03	0.00	0.02	-0.02	0.11
	Minimum	-5.77	-3.28	-2.67	-2.81	-3.12	-1.76	-2.57	-2.57	-1.50	-2.65	-1.62	-2.74
	Median	0.16	0.09	0.76	0.00	0.01	0.07	0.06	0.10	0.00	0.05	0.02	0.13
	Maximum	11.20	3.30	1.94	1.74	1.83	1.52	3.38	3.38	1.51	1.79	2.49	1.87
	Std deviation	1.07	1.12	0.76	0.56	0.58	0.48	0.62	0.62	0.47	0.51	0.02	0.66

Table - Descriptive Statistics of each zodiac year

For market effect, the year of dog has the highest rate of RMRF which is 0.36%. For size effect, the year of ox has the highest rate of SMB which is 0.10%. For value effect, the year of the goat has the highest rate of HML which is 0.11%. For Equally weighted combination, the year of the dog has the highest rate which is 0.11%. It supports the fact that the year of the dog has the highest daily returns. Also, from the table, we can find that most average number of four factors is small.

As the standard deviation in descriptive statistics indicates, the level of standard deviation of the market effect is higher than that of others. Almost all the standard deviation of market effect is over 1. It means that Chinese Stock is relatively unsteady.

#### 4.4 ANOVA Test and Regression Analysis

For different zodiacs, we use the excess returns to represent them. To test the relationship between the Chinese Zodiac and stock performance, we used ANOVA test to deliver the data of significance, p-value and coefficients. At the same time, we use the R Square to support the results provided by ANOVA. Also, we combine these three factors in equally average tradable market value weighted. This table shows the detail of the test.

	<i>Regression</i>	<i>ANOVA</i>		
	<i>R Square</i>	<i>Significance</i>	<i>P-Value</i>	<i>Coefficients</i>
<i>RMRF</i>	0.934	0.000	0.000***	0.864
<i>SMB</i>	0.188	0.391	0.391	-0.347
<i>HML</i>	0.011	0.960	0.960	-0.038
<i>Equally Average-TMV</i>	0.878	0.000	0.000***	2.368

\*\*\*  $p < .01$ , \*\*  $p < .05$ , \*  $p < .1$

Table - Regression and ANOVA test of the relationship between Excess Returns and Four Factors

We find that the market model  $R^2$ , a measure of stock price unformativeness, is much higher for China than for the U.S. Further, across these four factors, the RMRF and equally average-TMV have the R square which is close to 1. It means that for these factors, most of the data can fit the model.

For the hypothesis, to explore the relationship between excess daily return (daily rate of return minus risk-free rate) and these four factors, the RMRF, equally average-TMV, has a significant relationship. For the regression analysis, R square of these factors has the amount over 0.8. For the ANOVA test, the coefficients are almost greater than 1.0. Also, the coefficients and p-value are close to zero. We see that for each of the three factors as well as the equally weighted combination, the p-values of RMRF and equally average-TMV are below 0.01, the usual significance level. This means that there is enough statistical evidence to reject the null hypothesis. In this way, the hypothesis can be proved.

For the coefficients, except the SMB and HML, other two factors have the positive number. For RMRF, the number is 0.864 which is close to 1. For equally weighted combination, the number is 2.368 which is bigger than 1. It means that the correlation of combined three-factor model and excess returns of Chinese stock is high. This model can be applied to Chinese Stock Exchange.

#### 4.5 Comparison between American Stock Exchange and Chinese Stock Exchange

As mentioned before, there are huge difference between eastern and western society. It is because the influence of Zodiac on Americans and Chinese is at different significant level. This table shows the ANOVA test results of three-factor model in America.

	Equal means		Equal medians		Equal variances	
	Statistic	P-value	Statistic	P-value	Statistic	P-value
<b>RMRF</b>	0.31	0.98	7.04	0.80	1.52	0.14
<b>SMB</b>	1.51	0.15	12.69	0.31	0.99	0.46
<b>HML</b>	0.93	0.52	9.24	0.60	0.40	0.95
<b>MOM</b>	1.05	0.41	13.67	0.25	1.11	0.37
<b>EQ COMBI</b>	1.47	0.18	7.52	0.76	0.84	0.60

*Table-ANOVA test in America*

From the results, except the momentum effect which is not included in this paper, all the p-value is not at a significant level. Compared to the result in the Chinese Stock, we have two factors, RMRF and equally weighted combination, which have p-value below 0.01. It shows that the weighted model can be applied to Chinese Stock Exchange.

For descriptive statistics, the mean of American Stock Exchange is much higher than the mean of Chinese Stock Exchange. From the related, I find two explanations for the cause of weak return predictability in China. One possible explanation is that return predictors are more homogeneously distributed in the Chinese market than they are in the U.S. market. While we find evidence of greater homogeneity in the Chinese market, we also find the stock return sensitivity to return predictors is lower in the Chinese market than in the U.S. Another possible explanation for low return predictability in China is that there is high price inefficiency in China. The  $R^2$  of these two countries are compared. China has higher  $R^2$  than America. This evidence suggests that weak return predictability is related to low price informativeness.

#### *4.6 Reliability and Validity*

There is no participant error because I choose a long time period of 24 years to observe each variable of Chinese Stock Exchange. There is no participant bias because I collect the data from RESSET and each year's data is independent and accurate. There is no research error because I controlled the same year period for each factor. There is also no research bias because I use an objective way to get and analysis the data.

The construct validity of this research is good because I made ANOVA test to help me choose my research strategy. The internal validity is also good because in this research, every variable's type was defined clearly. The external validity is also good because the sample of this research includes the main shares of Chinese Stock Exchange-A shares. The sample is enough representative for this research.

#### *4.7 Findings*

After the comprehensive analysis of the data, for the two pathways, daily returns and three-factor model, which can show the relationship between Chinese zodiac and stock performance, we can find that the hypothesis is proven true. Chinese zodiac has an influence on the stock performance. But the influence is limited because two of three factors do not have significant influence individually.

For daily returns, some specific zodiac year has greater rate of return than other zodiac. The year of Ox and the year of Dog has significantly higher daily returns which means that the stock performance of these two zodiacs are better than that of other zodiacs. On the other hand, the year of Snake has lower rate of returns than other zodiacs which conforms to the background information.

For the three-factor model, after doing the regression analysis between the excess rate of return and RMRF, and between the excess rate of return and equally weighted combination show that these two relationships are significant. And the coefficients are close to 1. And the R square is greater than 1. It supports the hypothesis that Chinese Zodiac has an influence on the stock performance. It is different from American Stock Exchange which is proven to have no significance.

Compared to American stock, Chinese stock is relatively fresh and from the detail number of each factor of the three-factor model, we can find that almost all the number

of factors in Chinese stock is smaller than that in American. It is because there are more capital invested in America. In this way, the trading amount in America is much higher. However, the standard deviation of factors in China is lower.

## Conclusion

### *Contribution*

This paper focuses on Chinese stock and Chinese Zodiac. It advises on investment to investors in China. It indicates that investors who are involved in the Chinese market need to know the zodiac calendar. We calculate the returns for three well-known equity factor returns—the market, size, and value—for each zodiac calendar year from 1995 to 2018. We find that the point estimates of average returns for each zodiac sign can be substantially different. However, when we employ statistical tests, we find enough evidence to support the hypothesis of equal excess returns across zodiac signs. For an investor with an equally weighted portfolio in these four equity factors, the Year of the Dog may seem particularly good and the Year of the Rooster seems particularly poor, but also in this case the hypothesis of equal means or medians can be supported. Hence, we conclude that investment strategies based on zodiac signs are likely to generate returns.

In this paper, we used daily returns instead of monthly returns and calculated the average rate of returns based on the trade days. Also, as the Chinese lunar calendar is different from others, we adjusted the beginning day and the ending day based on different zodiacs. And in order to have the updated data and the complete cycle, I selected the sample from 1995 to 2019 which covers 2 complete cycles. Besides, the most known three-factor model is used for testing in this paper. And the combination of three factors can make the model more comprehensive.

Besides, we compared the Chinese Stock Exchange with the American Stock Exchange. American Stock Exchange is the most mutual Exchange in the world. And the Chinese Stock Exchange is the most rapidly growing one. Also, the difference between these two countries exists in the culture. The attitudes towards the zodiac are different. Based on the fact, Chinese people hold more belief on the zodiac than American people. And it shows in the results. The relationship between the Chinese Zodiac and Chinese stock performance is significant, but the relationship between zodiac and American stock performance is not significant at all. In this way, the strategies of referring to the Chinese Zodiac is likely in China.

### *Limitations*

Chinese markets have their particularity which cannot be applied to other countries. Chinese Stock Exchange began in 1991 which is later than many stocks in the world. Meanwhile, at the beginning of 1991, there are few stocks available and most of these stocks don't exist now. The range of our data is limited because there are only 27 years for us to investigate. Every Zodiac Calendar has a cycle of 12 years. In this way, less than 3 cycles are available for us to test the hypothesis. Besides, China has four Stock Exchanges. In this paper, we focus on the Shenzhen Stock Exchange and Shanghai Stock Exchange which are in the mainland in China. Hong Kong Stock Exchange and Taiwan Stock Exchange are also parts of China. However, we do not research on these two exchanges. In the future, we need to gather the data in these two places to make the whole paper more comprehensive. After analyzing all the data, we can also compare the relationship in different parts of China.

For the methodology, we use the daily returns to estimate the stock returns which is not advanced. But based on the research, we find more factors proved to indicate the stock returns. To make the study more convincing, we can add more factors to calculate the stock returns to deliver the updated relationship between the Chinese Zodiac calendar and Stock performance.

Besides, in the research process, we use the addition rate of returns to reduce the impact of the inflation. But in some certain years, there are some huge events which have great influence on the economy in China. In this paper, we don't consider these events' influence. In the future, we can sort out the events and analyzed the effects of these on the stock performance. Also, after analyzing the zodiac lunar calendar, we can analyze on the solar calendar and then compare the difference between these two kinds of calendar.

## References

- Chen, J., Kim, K. A., Yao, T., & Yu, T. (2010). On the Predictability of Chinese Stock Returns. SSRN Electronic Journal. doi: 10.2139/ssrn.972685
- Dijk, M. A. V. (2011). Is size dead? A review of the size effect in equity returns. *Journal of Banking & Finance*, 35(12), 3263–3274. doi: 10.1016/j.jbankfin.2011.05.009
- Fama, Eugene F., and Kenneth R. French. Permanent and Temporary Components of Stock Prices. *Journal of Political Economy*, vol. 96, no. 2, 1988, pp. 246–273.
- Fama, Eugene F., and Kenneth R. French. The cross-section of expected stock returns. *Journal of Finance*, vol. 47, 1992, pp. 427-465.
- Iskryan, K.(2019). What stock markets can expect in the year of the pig. Retrieved from <https://stansberrypacific.com/china/what-stock-markets-can-expect-in-the-year-of-the-pig/>
- Jegadeesh, N., & Titman, S. (1993). Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency. *The Journal of Finance*, 48(1), 65. doi: 10.2307/2328882
- Kelly. (2019, July 2). Chinese Zodiac: Find Your Zodiac Sign, Personality, Fortune. Retrieved from <https://www.chinahighlights.com/travelguide/chinese-zodiac/>
- Meisami, A. (2013). Zodiac Calendar and Market Returns. *Asian Journal of Finance & Accounting*, 5(1). doi: 10.5296/ajfa.v5i1.3637
- National Bureau of Statistics of China. (n.d.). Retrieved from <http://www.stats.gov.cn/english/Statisticaldata/AnnualData/>.
- Phoeng, J., & Swinkels, L. (2016). The Zodiac Calendar and Equity Factor Returns. *China Accounting and Finance Review*, 18(3). doi: 10.7603/s40570-016-0009-2
- Sullivan, R., Timmermann, A., & White, H. (2001). Dangers of data mining: The case of calendar effects in stock returns. *Journal of Econometrics*, 105(1), 249–286. doi: 10.1016/s0304-4076(01)00077-x
- Wang, F., & Xu, Y. (2004). What Determines Chinese Stock Returns? *Financial Analysts Journal*, 60(6), 65–77. doi: 10.2469/faj.v60.n6.2674
- Wong, K.-F., & Yung, L. (2005). Do Dragons Have Better Fate? *Economic Inquiry*, 43(3), 689–697. doi: 10.1093/ei/cbi048

## Appendix

Year	Zodiac	Beginning	Ending
1995	猪 Pig	1994/2/10	1995/1/30
1996	鼠 Rat	1995/1/31	1996/2/18
1997	牛 Ox	1996/2/19	1997/2/6
1998	虎 Tiger	1998/1/28	1999/2/15
1999	兔 Rabbit	1999/2/16	2000/2/4
2000	龙 Dragon	2000/2/5	2001/1/23
2001	蛇 Snake	2001/1/24	2002/2/11
2002	马 Horse	2002/2/12	2003/1/31
2003	羊 Goat	2003/2/1	2004/1/21
2004	猴 Monkey	2004/1/22	2005/2/8
2005	鸡 Rooster	2005/2/9	2006/1/28
2006	狗 Dog	2006/1/29	2007/2/17
2007	猪 Pig	2007/2/18	2008/2/6
2008	鼠 Rat	2008/2/7	2009/1/25
2009	牛 Ox	2009/1/26	2010/2/13
2010	虎 Tiger	2010/2/14	2011/2/2
2011	兔 Rabbit	2011/2/3	2012/1/22
2012	龙 Dragon	2012/1/23	2013/2/9
2013	蛇 Snake	2013/2/10	2014/1/30
2014	马 Horse	2014/1/31	2015/2/18
2015	羊 Goat	2015/2/19	2016/2/7
2016	猴 Monkey	2016/2/8	2017/1/27
2017	鸡 Rooster	2017/1/28	2018/2/15
2018	狗 Dog	2018/2/16	2019/2/4

Table -Date of each Zodiac year

This table is based on Chinese unique lunar calendar year. And we select the 24 samples from 1995 to 2018 which begins at the year of Pig.

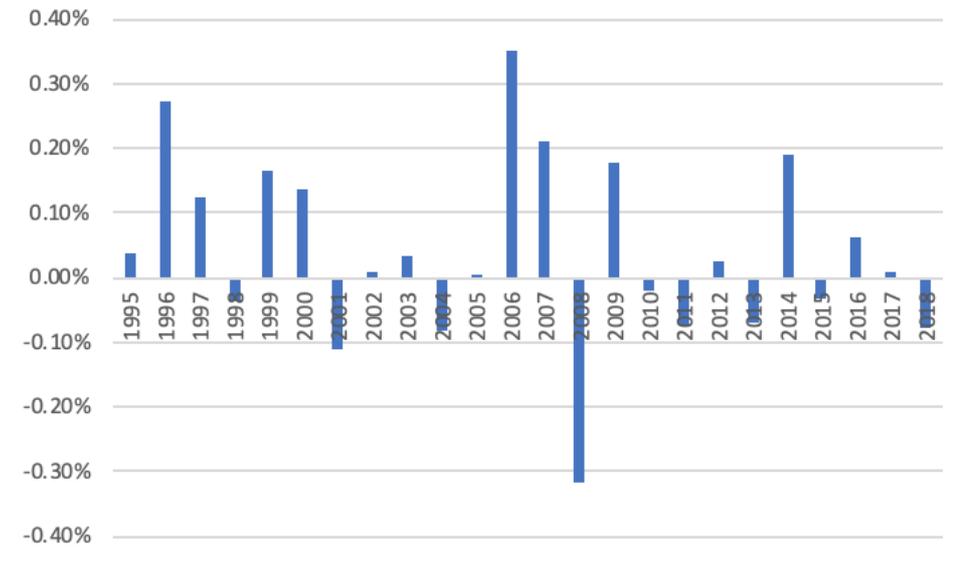


Table 2-Charts of Every Year's daily returns (1995/01/27 - 2019/02/01)

