

# Research on The Influencing Factors of Stock Industry Based on Linear Regression Model

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**Abstract.** With the development of society, people's living standards are constantly improving. The price model of farm products is strongly connected to fluctuations in the cost of the food & processing industry as a whole. This paper selects stock prices of COFCO, China Oil and Foodstuffs Corporation and CPI of Chin, the S&P 500 index, from macro trends. All the variables mentioned above range from 2018 May to 2019 September with a monthly interval. Based on the above data and variables, use a linear regression model to study the relationship between stock prices and other independent variables. The results show that both the Standard & Poor's 500 Index and the Consumer Price Index have a certain impact on the COFCO, and the positive and negative impacts are different.

**Keywords:** linear regression model, CPI, S&P500, Interest rate

## 1 Introduction

At present, as people's living standards continue to improve, people's wages and income increase, and the increase in disposable income stimulates people's desire to invest, and more and more people choose to invest in stocks. So why are people more willing to choose stocks compared to other investment methods? The low interest rate of bank savings makes it difficult to fight inflation, and it is easy to make ends meet. The threshold of real estate is too high for most people to reach. In contrast, stocks have the advantage of high returns and low thresholds. Tencent shares worth 300,000 Hong Kong dollars in 2009 have risen to 66.35 million Hong Kong dollars in 2020.

The price model of farm products is strongly connected to fluctuations in the cost of the food & processing industry as a whole, which makes the research on that topic pragmatic and profound. First, the price of farm products directly affects its retail prices in supermarket chains, grocery stores, or individual distributors. Everyday customers usually buy products at a retail price, so it would be important for them to understand such a model and use it in everyday shopping in order to minimize unnecessary spending or produce better purchasing plans and shopping lists for the future. Second, futures buyers and capital can utilize the model to lead to a summarization of patterns in the farm products market, and predict financial variations of farms and agricultural firms. By doing so, investors could plan investments accordingly with the model and maximize their benefit from investing in the market. Finally, the relationship between

variables and product prices explained by the model could be effectively used in areas of short food supply. Through manipulating such variables, administrations and firms could make reasonable prices for farm products and solve hunger issues worldwide. Above all, there is huge potential in the linear regression model of farm product prices.

At the same time, the stock market is changing rapidly. With the continuous improvement of people's living standards and more and more people's income, more people will invest their money in the stock market for investment. However, the instability of the stock market can cause huge losses to investors and individuals. For example, in the U.S. subprime mortgage crisis in 2008, the loose currency at the beginning caused many banks to issue a large number of additional loans, but they ignored the control of lenders' credit. With the bursting of the real estate bubble, house prices have fallen sharply, so many lenders have returned their mortgaged houses to the bank. The burst of the real estate bubble and the bad debts of bank loans made many people go to the bank to withdraw money. As a result, the bank has a problem of insufficient liquidity. The bank's funding problems have led to the emergence of panic problems in the banking industry. As a result, the stock market saw a sharp drop in stock prices, and many companies went bankrupt as a result. In the 2008 US subprime mortgage crisis, the stock prices of Fannie Mae and Freddie Mac fell by 97% and 98%, respectively, and the Standard & Poor's 500 Index fell by 48%. This crisis quickly spread to all parts of the world, causing huge damage to the global economy. Therefore, it is particularly important to stabilize stock prices, especially those related to the people's livelihood.

China has been trying to implement modern technology into agriculture in the past few decades. Until 2018, total farmland size and grain production in China had been decreasing. Nonetheless, in 2019, grain production reached its point of inflection and started to increase, for the first time in many years. Total grain production in China in 2019 reached 663.84 million tonnes, which is 0.8% more compared to 2018's 658.54 million tonnes. The fact that total grain production boosted while farmland size decreased implies that China's policy of implementing technology & machinery in agriculture was successful. On the other hand, agriculture in China still faces some other challenges: decrease in farmland sizes speeding up because of rapid urbanization and the increasing cost of labor as new generations tend to move to cities. The research would benefit such problems by creating better purchasing plans for customers through the utilization of mathematical models. Not only will the model profit the agricultural industry, but also will speed up modernization of the relatively traditional agriculture in developing countries and prevent idle products from being wasted.

## **2 Review**

Using the GARCH model, this research studied influences of developed markets on developing markets. The research found out that developed markets not only have a huge impact on developing markets, but also influence developing markets by the languages they use [1]. This research studied how variables affect the stock prices of pharmaceutical companies. The expected profit of each stock has a positive relation with stock prices, and interest rate also contributes to some fluctuation in stock prices [2]. This research focused on how different variables affect stock prices of the environmental preservation industry in order to develop an investing strategy to help protect the environment [3]. Based on the ARMA-GARCH model,

this research focused on ST type stocks in SHANGHAI-SHENZHEN market without distribution, which led to a conclusion that the risk in investing in such markets is higher than common perception [4]. Through a comprehensive analysis of the status quo of my country's stock market, the most representative indicators are selected from the macro-social-economic level to the enterprise micro-economic level for a comprehensive analysis, and the multiple stepwise regression model is used for calculation. Through research, the following conclusions are obtained: GDP, CPI, and M2 have a great influence on the comprehensive index, and the influence is positively correlated with it; the business climate index and the Standard & Poor's 500 index have no obvious influence on the comprehensive index. Among them, the influencing factors of GDP and M2 are lower than that of CPI, indicating that changes in CPI have a greater impact on stock prices [5]. With reference to the impact of the financial statements of listed companies in China's stock market from 1993 to 2001 on the stock price of listed companies, the Feltham-Ohlson model is used to study the impact of company growth, capital structure, core asset profitability, and liquid stock size on stock prices. The research results show that accounting surplus, net assets, the company's profitability growth, the company's core asset profitability, the size of the company, and the size of current stocks are not only related to stock prices, but can also explain the reasons for changes in stock prices. But the capital structure cannot perfectly explain the changes in stock prices [6]. Randy Anderson, Jim Clayton, Greg Mackinnon, Rajneesh used the variance decomposition method to examine the investment characteristics of stock real estate investment trusts in a multi-factor model, and compared them with small-cap value stocks, small-cap growth stocks, large-cap stocks, and bonds. Related to the rate of return of private real estate. The results show that real estate has an important small capital value component, but also shows a large sector-specific component that has increased in importance in recent years. On the contrary, the volatility of real estate returns has little to do with small capital growth stocks, and the contribution of big capital drivers to the volatility of real estate returns declines over time [7]. Recently, many scholars have incorporated artificial intelligence models into the analysis of factors affecting stocks. A method that can quickly extract investor transaction characteristics from massive stock transaction detail data is proposed, and then based on machine learning algorithms such as logistic regression, decision trees, and random forests, to find the main influencing factors of the large inflection point of the stock market, and predict. The time range during which the transaction characteristic variable generates a larger turning point in the stock market. Experiments conducted on the Shanghai and Shenzhen stock indexes show that compared with the traditional model, the method proposed in the article can increase the accuracy of the prediction of the large inflection point of the stock market by about 10%, and the accuracy rate is still maintained in the 6-month backtest experiment. At the level of about 70%, it proves the effectiveness of the model [8]. A article uses the latest consistent and effective IVX-QR quantile predictive regression model to study the distribution of returns of the Shanghai Stock Exchange to explore the influencing factors of market risk. The results show that a loose monetary environment, speculative behavior, and overreaction will all lead to increased market risks; market risks increase during the boom of the economic cycle, and macro-prudential countercyclical management models should be strengthened; increased dividend intensity will help reduce market risks. Establishing a sound and complete dividend system is conducive to the healthy and stable development of the capital market [9]. By quantifying the influencing factors of stocks, this paper proposes a stock price prediction method based on an optimized generalized additive model, using Fourier series and a logistics retarded growth model to quantify the prediction function in the

generalized additive model, and transforming the nonlinear problem in stock prediction. For the linear problem, the time series forecast of the stock closing prices of international and domestic listed companies is carried out. The model is trained through anti-fitting algorithm and spline smoothing algorithm, combined with change-point prediction method and OLS regression algorithm to obtain a stock price evolution trend line that minimizes the smoothing error and has a better fitting effect, which makes the stock price prediction effect better [10]. Based on previous research results, this paper mainly studies the relationship between investors' limited attention and stock forecasts, and compares different methods of machine learning. In theoretical research, the thesis first defines limited attention and different theoretical foundations, and on the basis of existing research results, it puts forward the research significance of constructing investors' limited attention indicators based on text mining online stock comment data. From the perspective of sentiment analysis, the sentiment classification of all text information is mainly through natural language processing, and the sentiment of text data is divided into three categories: positive text, negative text and neutral text. Further, after the information is classified and processed, the vector space model and the emotional feature model are established, and the support vector machine regression and logistic regression are used to quantify the classification results of the text. In terms of practical application research, this article first uses the text data of the Shanghai 50 Index online stock comments obtained from the Xueqiu forum using crawler technology as the research object, expounds the data acquisition and preprocessing process, and further constructs a text mining-based Investors have limited attention to indicators. At the same time, the index of structured data selected in this paper is used as the independent variable together with the index of limited attention of investors, and the closing price of the Shanghai Stock Exchange 50 Index is selected as the dependent variable [11].

### **3 Influencing factors**

#### **3.1 Consumer price index**

The Consumer Price Index (CPI) is an economic index that indicates the variation in consumer goods and services related to civilian lives. Generally, the authorization of national economic policies relies strongly on its recent CPI, and the capital market (i.e. stock market, futures market, financial market) relies partially or relatively on its recent CPI. CPI also serves as an important factor in observing inflation. In most cases, inflation would cause a steady rise in product prices, which dramatically affects CPI values. On the other hand, the rise of CPI could, in fact, affect stock prices both ways. A rising CPI represents steady inflation, and steady inflation indicates rise in product prices, which results in stock prices increasing. However, a rising CPI could also mean an increase in customers' nominal wage, and more often than not, the rising speed of nominal wage does not catch up with inflation, and the actual purchasing power would decrease. Eventually, the amount of stocks that individuals can purchase is fewer, and stock prices fall. The importance of CPI in our farm product regression model is emphasized by its ability to alter, or predict, as in researchers' perspective, product prices. CPI's close relationship to consumer goods, which consists of farm products, makes it an indispensable part of our research. The study fluctuation of previous CPI and farm product prices would make CPI a crucial explanatory variable in the model of predicting farm prices.

### **3.2 Interest rate**

Another important factor in our model would be the interest rate. Interest rate is the ratio between interest and its principal. In other words, interest rate decides the loan burden that is put on companies and individuals. Because of that, Interest rate is a crucial factor in enterprises' spending, and it also affects enterprise financing and investment. Interest rate is usually controlled by the government or national banks, and it directly affects stock prices by controlling customers' willingness to invest. When interest rate is low, more people would like to acquire loans to invest more, since low interest rate means less money to be returned to banks after their investments, and stock prices would increase due to more investments. When the interest rate is high, less people would like to invest because the risk would be higher than that of when the interest rate is low. Stock prices then fall when less investments are made.

### **3.3 Standard & Poor's 500 Index**

The Standard & Poor's 500 Index is the oldest market capitalization weighted index, and it is a stock index that records the stock market of 500 listed companies in the United States. All the companies involved are listed companies on major US exchanges. It was first used by Standard & Poor's in 1957. Its original constituent stocks consisted of 425 industrial stocks, 15 railway stocks and 60 public utility stocks. Later, it was reorganized on July 1, 1976, and its constituent stocks were changed to 400 industrial stocks, 20 transportation stocks, 40 public utility stocks, and 40 financial stocks.

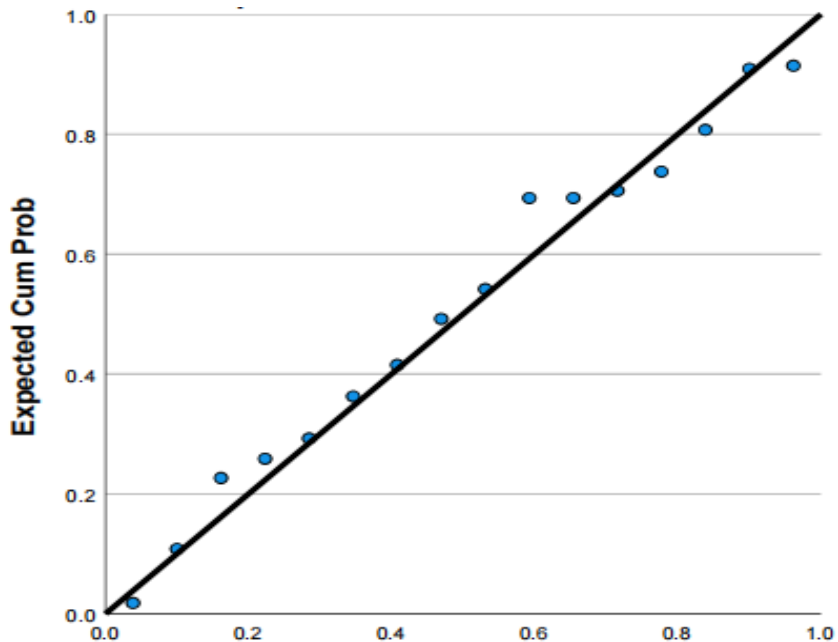
The Standard & Poor's 500 index, or S&P 500 index, is a collective index of the average American stock market with speculation spread across 500 companies developed and maintained by S&P Dow Jones Indices LLC starting from 1957. The 500 companies mostly consist of companies that trade their stocks on either the New York Stock Exchange or NASDAQ, and nearly all of them are the 500 stocks with the highest trading prices. The S&P has a large significance as a reference of the entire market to investors and stockbrokers due to its concerns about various industries and companies that make the risk of referring to this index significantly lower. Since the S&P 500 index represents the economy and market well, it would be reasonable to apply it to our model in farm product prices as the presence of the agricultural industry among all the industries that the index has taken into account. Therefore, the fluctuations in the S & P 500 index could represent the fluctuations in farm product prices to a certain extent.

## **4 Empirical Research**

In this research, stock prices of COFCO, China Oil and Foodstuffs Corporation are chosen as the dependent variable. COFCO is a Chinese state-owned food processing holding company, and it is the largest food processor, manufacturer, and trader in China. The significant impact of COFCO on the Chinese agricultural market makes it a good overall representation of the market [12].

On the other hand, the independent variables chosen are the CPI of China, from the economic research of federal reserve bank of St. Louis, and the S&P 500 index, from macrotrends. All the

variables mentioned above range from 2018 May to 2019 September with a monthly interval [13].



**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	96.183	16.024		6.002	<.001
	CPI	-.923	.159	-.901	-5.810	<.001
	SP500	.004	.002	.351	2.262	.041

a. Dependent Variable: COFCO

**Chart 1.** Normal P-P Plot of Regression Standardized Residual  
Dependent Variable: COFCO

From the chart 1 above, the beta values for both independent variables are -0.901 and 0.351. There is a linear, negative relation between CPI and stock prices of COFCO and a linear, slightly positive relation between the S&P 500 index and stock prices of COFCO.

For every one increase in the CPI of China, the stock prices of COFCO nearly drop by the same amount. It could be expected that the CPI goes the opposite way of stock prices of COFCO. It could be inferred from this result that foodstuffs act as essential needs to customers. Therefore, more attention would be put on more luxury products when the CPI goes up, and the stock prices of COFCO drop in turn. On the other hand, we see a slight increase in COFCO stock prices

when the S&P 500 goes up. As a general representative of the entire American economy and stock market, S&P indicates the trading activities between COFCO and United States buyers. Therefore, the partial reliance of COFCO on exports and imports from the United States makes it positively affected by the S&P 500.

## 5 Conclusion

In conclusion, this study implied a positive relation between foodstuff stock prices and S&P 500 index and a negative relation between foodstuff stock prices and Consumer price index. Investors and individual buyers would be able to utilize this model and estimate foodstuff stock prices for financial or purchasing purposes. This study also sparks ideas on similar linear regression models of other fields such as technology, automobile, and clothing since the fluctuations in stock prices of companies in those industries are also likely to be influenced by market and customer purchases, similar to foodstuff.

In the process of research, this article uses the arbitrage pricing model in economics. Use spss software for multiple linear regression analysis to sort and analyze data. However, in the process of research in this article, there can be more research on influencing factors, such as a comparative study of stock prices in the same industry, or further research on other influencing factors such as the Dow Jones Index. And in the research process, the time period of the research can be expanded, so that more data are selected, and the result analysis will be more accurate. Finally, many current researches have conducted artificial intelligence models, such as self-encoding networks. To optimize the model of stock influence factors, the result is more in line with the actual situation.

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