Research on Effects of COVID-19 on China’s Stock Market

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Abstract

Since the establishment of China’s stock market in 1991, it has had 30 years of development, and money supply has gradually become one of the major factors affecting the stock market. Under general condition, the changes of monetary policy trigger stock price volatility by altering the money supply, which ultimately has an impact on investment and the overall economy. In a known long term market situation, the qualitative research and quantitative analysis about the effect of money supply on stock prices is conductive to the monetary authorities to formulate monetary policy and also can effectively encourage people to invest more. It also has the certain promotion function on open policy transmission channels and normal operation guarantee of stock market. Especially after the epidemic, the stock market can well reflect the influence of coronavirus on China’s stock market and economy. The purpose of this paper is to investigate the impact of money supply and exchange rate movements on stock prices in long term stages. On the basis of combing the existing literature, firstly, we have theoretical analysis on it and then we studied the correlation between money supply and stock prices by using the method of descriptive statistics. At the same time, we use the ADF test and VAR model to study the impact of money supply on stock prices under different monetary policy background. Finally, we have the empirical analysis of the ways which affect stock prices. The result of our research shows that in order to stabilize China stock market we put forward suggestions to comprehensively improve the market efficiency First, making great efforts to improve the business environment and further promote the reform of the business environment in line with international standards. Besides, we need to strengthen the policy of opening-up and expand the entire industrial chain to strengthen domestic independent supply.

Keywords

Inflation; Investment; Exchange Rate; Interest Rates; Stock Price.

1. Introduction

With the coronavirus, the impact on Chinese economy was enormous, as a result the stock market in China had also been hit hard. Our team decide to use the method of multiple regression and analyze our data by time series method to prove whether the pandemic would influence the stock market. We choose VAR medal to test our hypothesis, that’s just because the VAR could associate the macroeconomy with monetary policy close together and VAR could also show the external impact on stock prices clearly.

From figure 1 it shows about exchange rate and inflation changing trend in China from 2000 to 2020. The exchange rate remained constant (a little above 8) during 2000 and 2005 and it decreased to 7 in 2010, it continued to decline until 2015, reaching 6 in 2015.2015-2020, there was several small fluctuations on exchange rate. Also the inflation started with the lowest value...
(only a little above 0) and it first rose relatively slowly during first part of first 5 years period and after a little decline it increased sharply to 5 in 2005, then it fell again to 3. During 2005 and 2010, inf value first rose most quickly to above 8 and then it dropped most sharply to negative 2 in 2010. After this significant decrease inf rose relatively quickly to 6 in first part of next 5-year-period, then it remained relative low value (around 2) from 2010 to short period before 2020, then the inflation stared to rise more reaching 5 in 2020 and fell to 0 after 2020.

And figure 2 shows about the Shenzhen index B prices changes between 2000 and 2020. You can see that the stock prices were low and constant (remain at around 500) between 2000 and 2005, after 2005 the prices started to rise sharply to 1500 and it fell to original price before 2010. The years between 2010 and 2015 witnessed small fluctuations of rising on prices then price rose to the highest value 3000 in 2015. Prices decreased to 1500 in 2020.

2. Economic losses caused by COVID-19

With the outbreak of COVID-19, COVID-19 has a profound impact on the world economy, and the economy of all countries will regress. According to the United Nations Trade and
development organization's 2020 trade and development report, the global economy will shrink by more than 4% this year, trade and investment will decrease by one fifth, and the total GDP output will drop by 6 trillion US dollars. Especially for China's economy, the United Nations Trade and Development Organization predicts that China's economy will grow by 1.3%. Compared with 2019, China's GDP at that time was 99.1 trillion yuan. Our normal growth rate was about 6%, but now it has dropped by five points. Therefore, the overall impact on China's economy is about 5 trillion yuan. In these cases, there are many factors that affect the Chinese stock price.

2.1. **The most important factor is the business cycle.**

To start with, the most important factor is the business cycle. Since the changes of the country's financial situation, balance of payments and industry economic status affected by the COVID-19, the country is forced to adjust the national exchange rate, and the stock market is directly affected by the economic situation, it will inevitably show a cyclical fluctuation. When the economy is in recession, the stock price is bound to fall. People will sell the stock along with the trend, and the stock price will fall. But when the economy recovers and prospers, both producer profits and stocks will increase, so people will scramble for stocks.

2.2. **The country's economic situation has a larger inflation.**

What is more, the stock price will also be affected when the country's economic situation has a larger inflation. Because of COVID-19, many people can not work normally, so people take the method of rising prices to increase their income. When the commodity price rises, if the production cost remains unchanged, or the sales price rises more than the cost, the company's profit can increase. However, if prices fall, commodities can only be sold at low prices, which will result in reduced income and losses. Therefore, when the price rises, the stock price will also rise.

2.3. **Policy changes in the country**

In addition, the third point is that the state changes its policies. Wars between countries, money disputes and even strikes in some countries often lead to stock price fluctuations. For example, in the China-United States trade war at the time of COVID-19, the trade war led to the reduction of orders of export enterprises, and due to bilateral sanctions and pressure, the import of goods will also be reduced, so the shares of some international trading companies will decline, but it also brought opportunities to some domestic companies, filled the lack of goods, and made some domestic companies' shares rise.

3. **Theoretical mechanisms of various influences**

3.1. **Gross domestic product and its calculation method**

Gross domestic product (GDP) reflects the final product of production, the final goods and services, and it has three different forms: value form, income form and product form. From the perspective of value form, GDP is the difference between the value of all goods and services produced by all resident units in a certain period minus the value of all goods and services invested in the same period, namely the sum of the added value of all resident units. From the perspective of income pattern, GDP is the sum of the original income generated by the production activities of all resident units in a certain period, including the payment of labor factors, the payment to the government, the value compensation of fixed assets, and the surplus obtained by resident units for their production activities. In terms of product form, GDP is the total value of all goods and services eventually used minus those imported. The three forms correspond to three accounting methods in national economic accounting, namely, production method, income method and expenditure method.
3.1.1. Production method.
The production method is a method by which the new generation values of a permanent unit are measured from the production position during accounting. In other words, the value added is calculated from the total product of the various sectors of the economy or from the value of intermediate products used in the production process.

3.1.2. Income method.
The infinitive is the generation of revenue from the production process, in which the respective proportion of the factors of production in the production process reflects the final product.

3.1.3. Expenditure.
The expenditure methodology shall measure the end-use of goods and services in accounting, including final and final expenditure, capital formation and net exports of goods and services. Since the results of the three calculation methods are theoretically consistent, we may choose the expenditure method as the calculation method of GDP in this study.

3.2. Relationship between GDP and investment
In an ideal world, we can think of spending and revenue as being in balance across the market, that is, spending = revenue. So when income goes up, spending goes up. And since investment can be regarded as expenditure on the market, GDP is calculated according to the expenditure method. When investment increases, GDP will theoretically increase. Thus it can be seen that GDP and investment are positive relation. In 1987, Robert E. Lipsey and Irving B. Krav believed that in the long run, economic growth had a strong promoting effect on capital formation. In 1991, Lawrence H. Dummers and James Bradford De Long argued that investment could drive economic growth, and investment in equipment and machinery would accelerate economic growth. In 1992, De Long and Summers studied the relationship between fixed asset investment and economic growth in the United States and found that the higher the investment rate of fixed assets, the faster the economic growth, and there was a significant positive correlation between the two. In 1992, Levine and Renelt used cross-section data to conduct research and found that investment was very sensitive and had a significant positive impact on economic growth. In 1996, Blomstrom, Lipsey and Zejan considered that fixed asset investment was not the key factor of economic growth, but economic growth played an obvious role in promoting fixed asset investment. In 2001, Elena Podrecca and Gaetano Carmeci studied the British economy and argued that economic growth was the cause of increased fixed asset investment, but that fixed asset investment was not the cause of economic growth. In 2002, Madsen and Jakob B. studied the economy of Australia and believed that economic growth and investment were mutually causal. In 2007, Ronewigren and Mates Wilhelmsson studied the relationship between GDP and construction investment and believed that there was a one-way causality between infrastructure investment and GDP growth in the short term, and there was a causal relationship between GDP and construction investment. Tan Shulin (2010) found that when fixed asset investment increased, GDP would also increase [1].

3.3. Relationship between inflation and stock price
Inflation for the stock market and stock prices have stimulative effect also has inhibitory effect, inflation is mainly due to a number of areas and increase the quantity of money supply caused inflation, the stock market itself is positive stimulus, the deterioration of inflation remains the financial contract, can bring some negative influence to the stock market.

In general inflation, governments are pursuing the usual policy of controlling and reducing government expenditure and tightening monetary policy. This increases market interest rates and reduces stock prices. If inflation is very high (CPI 5:5), the real return on the stock market is in a negative correlation with the inflation rate. In the case of moderate inflation, the real return on the stock market is well matched by the level of inflation. [2]
In order to analyse the effects of inflation on the stock market, we should distinguish between the different levels of inflation. It is widely believed that very low inflation, for example, below 5% does not cause much damage and drives stock exchange rates further up. Inflation is primarily caused by an increase in the amount of money. An increase in the amount of money will normally only stimulate production, increase company profits and thus increase the monetary value of dividends. A higher dividend would make the shares more attractive and thus increase prices. When inflation is high and sustained, prospects and prices become unpredictable, and the situation becomes very unstable. In this case, the growth of enterprises may be volatile or unprofitable, hindering the inflow of new investments. On the other hand, the state would increase interest rates, which would reduce prices. Together, these two factors could lead to a sharp decline in stock prices.

The scholars have analysed the correlation between inflation and share prices and shared three views: there is a positive, negative correlation and uncertainty between inflation and share prices.

3.3.1. Positive correlation.
Li Chun, Luo Jianmei and Yang Zhibing (2001) made an empirical analysis of the relationship between China's stock market and inflation by using data such as Shenzhen Stock Exchange Index, Shanghai Stock Index and CPI Index, and concluded that there was a positive correlation between China's stock prices and inflation rate.

3.3.2. Negative correlation.
Chen Jinxian (2004) studied and analyzed China's statistical data from 1995 to 2002 and found that under the condition of procyclical money supply, there was an inverse relationship between inflation and stock prices.

3.3.3. Uncertain relationships.
Liu Jinquan and Ma Yanan (2009) studied the zone control state of inflation rate by adopting H-P filtering method and believed that the two theories of "Fisher effect" and "proxy hypothesis" could be established at any stage of the stock market. Su Yu and Wan Yuyan (2010) conducted an empirical study on the US consumer price index and the Standard & Poor's 500 Index from 1871 to 2009, and found that the correlation between stock prices and inflation was not obvious or stable in fact.

3.4. Impact of interest rates on the stock market
On the basis of the share price theory, the share prices are essentially determined by the expected return and discount rate.

Stock prices are positively correlated with expected return, and the discount rate is also negative. Higher interest rates make it cheaper for companies to take out a mortgage. It should increase, which has a direct impact on the current business of companies and can have a domino effect on company profits, thereby lowering share prices. Lower interest rates will reduce the credit costs of companies and thus increase the expected profits and share prices. From the point of view of investors, the higher interest rates will have a significant impact on short-term share trading, which depends on the banking mortgage-share trade or on marginal share transactions. This will increase transaction costs and lead to falling shares and share prices. Bernanke and kutner (2005) split the interest rate changes into expected and unexpected changes. Taking into account the expectations of the unexpected effects of interest rate changes on share prices, it has emerged that an unexpected change in interest rates would have a significant negative impact on share prices, with prices rising by an average 1% per unexpected decrease by 25 basic points. Martin and Pierre have also demonstrated the negative effects of an unexpected change in interest rates on share prices based on the armad model. At t-sa (2011) after an in-depth examination of the relationship between interest rates and share prices
between 1959 and 2011, it was found that an unexpected change in interest rates had a different effect on share prices. [2-7] For example, when interest rates rise, they affect stock prices more than when interest rates fall.

3.5. Influence of exchange rate on stock market

Since the influence of the exchange rate on the share market over the exchange rate of domestic currencies is based on the exchange rate of foreign currencies, there is a correlation between the exchange rate and the share market: when the exchange rate increases, the exchange rate between foreign currencies increases, capital requirements on the stock market are increasing and share prices are rising accordingly. Conversely, when the exchange rate falls and the currency increases against the foreign exchange market, capital flows to the foreign exchange markets, leading to a fall in the price of the stock exchange. Gluze kin and narcekenler (2007) examined it for the period 1986 together with the monthly data on the exchange rate and price of Turkish shares, an assumption that there was a positive causal link between Turkish share prices and the exchange rate. Aydemir(2009) also cited Turkey in studies, using the different sample parts and samples for the next seven years and drawing the same conclusion: there is a positive causal link between the exchange rate and share prices. İnci and li (2011) examined the interaction of share prices on the basis of gorilla cardinals, comparing in detail the exchange rates in eight countries, including the USA, Great Britain, Japan, Canada, Germany, France, Italy and Switzerland, with models for later stagnation. It is empirical evidence that there is a correlation between the exchange rates in these countries and the stock prices that is increasingly pronounced in times of depression. And then somya's (2012) includes the increased empirical analysis of the exchange rates and the share prices of India, Japan, Hong Kong, Singapore and South Korea within the framework of a system called johansencommit that records these data and share prices over the next ten years. The results came only in Singapore, namely in three countries and regions (Japan and Hong Kong). The long-term equivalent of China’s value development and share prices is [2-8].

4. The empirical analysis

Since this paper intends to analyze and study the impact of the epidemic on stock prices over a long period of time, interest rate (denoted as R), exchange rate (denoted as ER) and inflation (denoted as INF) are selected as variables. As for the stock price, the closing price of Shenzhen B component stock is selected as the benchmark and denoted as SP[9]

4.1. The data source

In this paper, the monthly data of 276 sample points from 1998 to 2020 are selected for empirical analysis. The data used are from Risi database, and the empirical analysis is conducted by means of econometric software Stata /SE12.0[10]

4.2. VAR model analysis of the impact of epidemic on stock prices

4.2.1. Data instability test (ADF test)

In order to guarantee the effectiveness of the results of the time sequence, the stability of the selected data must be confirmed. In order to avoid a false return, the first step of empirical analysis is to evaluate the selected data before the results are obtained. For the following empirical studies, we use methods that are examined in the units of the grid in order to evaluate the statistical stability of the data. [11]

The ADF is often tested during a data stabilization test. The ADF tests the hypothesis of Ho: Ho = null. That the sequence contains at least one root unit, we only take the approximate time of arrival of H1, estimated time without root contact. If the test results reject the original assumption and show that no root root was found in the sequence, then the sequence is a sequence[12,13].
It’s very soft. Otherwise, non-smooth sequences are treated separately until the test results match the original sequence. Set the paylist Y, integer If the sequence is intact, but the first deviation after the interface. If it is stable, we call the sequence Y a single, integer number, Y/I[13]

This contribution contained four variables: interest rates (R), exchange rates (ER), inflation, the "SP", the "SP" (SP) of the shenzhen B shares, all in chronological order. Consequently, the phase data was analysed using Stata/se12.0. [14]

<table>
<thead>
<tr>
<th>p-value</th>
<th>Test Statistic</th>
<th>1% Critical Value</th>
<th>5% Critical Value</th>
<th>10% Critical Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lsp 0.7851</td>
<td>0.909</td>
<td>3.458</td>
<td>2.879</td>
<td>2.570</td>
</tr>
<tr>
<td>Inf 0.1874</td>
<td>2.254</td>
<td>3.458</td>
<td>2.879</td>
<td>2.570</td>
</tr>
<tr>
<td>R 0.0000</td>
<td>5.700</td>
<td>3.458</td>
<td>2.879</td>
<td>2.570</td>
</tr>
<tr>
<td>Er 0.8209</td>
<td>0.794</td>
<td>3.458</td>
<td>2.879</td>
<td>2.570</td>
</tr>
</tbody>
</table>

Source: This was obtained by the author using STATA /SE12.0

First, we built a VAR model to select the lag order by comparing AIC, SC and HQ information criteria, LR statistics and FPE prediction error criteria. The results are as follows:

<table>
<thead>
<tr>
<th>lag</th>
<th>LL</th>
<th>LR</th>
<th>df</th>
<th>p</th>
<th>FPE</th>
<th>AIC</th>
<th>HQIC</th>
<th>SBIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-287.601</td>
<td>.000101</td>
<td>2.15203</td>
<td>2.17338</td>
<td>2.2052</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>239.351</td>
<td>1053.9</td>
<td>16</td>
<td>0.000</td>
<td>2.3e-06*</td>
<td>-1.61883*</td>
<td>-1.51209*</td>
<td>-1.35299*</td>
</tr>
<tr>
<td>2</td>
<td>248.109</td>
<td>17.516</td>
<td>16</td>
<td>0.353</td>
<td>2.5e-06</td>
<td>-1.56538</td>
<td>-1.37325</td>
<td>-1.08687</td>
</tr>
<tr>
<td>3</td>
<td>262.164</td>
<td>28.11</td>
<td>16</td>
<td>0.031</td>
<td>2.5e-06</td>
<td>-1.55103</td>
<td>-1.27351</td>
<td>-0.859845</td>
</tr>
<tr>
<td>4</td>
<td>278.642</td>
<td>32.956*</td>
<td>16</td>
<td>0.007</td>
<td>2.5e-06</td>
<td>-1.55456</td>
<td>-1.19165</td>
<td>-0.650702</td>
</tr>
</tbody>
</table>

Note 1:* represents the selection of Lag period under each standard, and LAG represents the number of Lag periods

In this paper, the unit root test is carried out to ensure the stability and accuracy of the VAR model. If the VAR model is unstable, the data does not meet the standards for model construction and cannot be tested for the next step of causality analysis. If the reciprocal of the module of all the roots of the estimated VAR model is less than 1, that is, it is located in the unit circle, then it is stable; otherwise, it is non-stationary. The results are shown below.

| Eigenvalue stability condition |
|-----------------------------|-----------------------------|
| Eigenvalue                  | Modulus                     |
| .9584975                   | .958497                    |
| .8303194                   | .830319                    |
| .3213024                   | .321302                    |
| .05367909                  | .053679                    |

All the eigenvalues lie inside the unit circle. VAR satisfies stability condition.

Figure 4. Shows the data is stable
Figure 5. Shows Roots of the companion matrix
Source: This was obtained by the author using STATA /SE12.0

VAR model is stable discriminant basis for root of the size of the bottom and 1 relationship, if the root of the module and the reciprocal of less than 1, which is stable, as shown in figure 1 and shown in the table, all the eigenvalues and the coefficient of both all module and the reciprocal of the root in the unit circle, is less than 1, in this way the effectiveness of the impulse response function are verified. It shows that the VAR model can be used for impulse response analysis.

4.2.2. Granger causality test
The Granger causality test is carried out on the model to prove whether there is a causal relationship between the variables. The test results are as follows:

<table>
<thead>
<tr>
<th>Equation</th>
<th>chi2</th>
<th>df</th>
<th>Prob &gt; chi2</th>
</tr>
</thead>
<tbody>
<tr>
<td>disp</td>
<td>13.42712</td>
<td>4</td>
<td>0.009</td>
</tr>
<tr>
<td>inf</td>
<td>3376.816</td>
<td>4</td>
<td>0.000</td>
</tr>
<tr>
<td>r</td>
<td>714.7997</td>
<td>4</td>
<td>0.000</td>
</tr>
<tr>
<td>der</td>
<td>38.07549</td>
<td>4</td>
<td>0.000</td>
</tr>
<tr>
<td>All</td>
<td>4151.932</td>
<td>16</td>
<td>0.000</td>
</tr>
</tbody>
</table>

4.2.3. Impulse influence analysis of model
Due to the characteristics of VAR model, economic factors are not sensitive to the estimated value of a single parameter, so by comparison, the impulse response analysis is the most significant one in VAR model. Impulse response function is a series of influences on the current and future values of endogenous variables in the system when an error term in the VAR model is impacted.

Figure 6 is the impulse response diagram of COV1 in the model to the stock price, with the lag order set as the horizontal axis. The degree to which COV1 affects the stock price is set to the vertical axis. The calculated value is represented as a solid line in the figure, and the response function of the confidence interval plus or minus two standard deviations represents the shaded part.

As you can see from Figure 2, stock prices are barely impacted by exchange rates. After being hit by a positive standard deviation of one unit of inflation, stock prices will have an ambiguous positive response, which will peak at about 1-2 months with a value of about 0.5 and then stabilize at about 0.3. In the lag of 18 months, there was a positive shock effect, producing a positive effect. After the impact of interest rate, the stock price had a negative reaction and
reached the peak about one month later. Then the stock price kept rising and finally stabilized at 0 point. Almost zero impact from a lag of 10 months. The stock price was obviously impacted by itself. After being impacted by itself, the stock price immediately had a negative reaction, but it stabilized at 0 point only one month later, and then remained stable all the time with almost no influence.

Figure 6. Shows the impulse response diagram of COV1 in the model to the stock price

Figure 7. Shows the proportion of each shock.

Figure 7 shows the proportion of each shock. It can be clearly seen that the stock price is affected by itself, accounting for almost 100%, while the influence of the other three variables on the stock price is negligible.
5. **Conclusion**

In conclusion, in order to stabilize the stock market, I propose to improve the market efficiency in an all-round way. First, we should vigorously optimize the business environment, take the concept of serving enterprises as the guide, and further promote the reform of business environment in accordance with international standards, so as to make China the preferred place for global enterprises to invest. Second, we should strengthen opening up, improve the utilization level of foreign capital in the whole industry chain, expand the whole industry chain, strengthen domestic independent supply chain support, and advance to medium and high-end fields. The state needs to appropriately reduce the value-added tax of companies seriously affected by the epidemic, especially those in transportation, tourism, catering and accommodation, because these industries are in a state of no income during the epidemic period, and the relevant listed companies have suffered many twists and turns in the stock market, so the amount of loss can be used to offset the amount of profit month to reduce the income tax. Secondly, we can increase investment in transportation, education, medical and other industries to stimulate demand, stabilize employment, improve infrastructure, enhance the competitiveness of made in China and increase China's economic growth rate.

**References**


