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The comparison of economic impacts of COVID-19 between China and the United States

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Abstract

The outbreak of the COVID-19 in 2020 has a severe impact on all countries. This paper first studies the impact of the epidemic on the macro-economy in China, which is one of the countries with early epidemic situation, in the rapid development stage of the epidemic situation, and the specific performance in macro-economy aspects. On this basis, study the development trend and macroeconomic performance of the United States as one of the most serious countries, and the relationship between the epidemic development and macro-economy in the United States. As for the differences in epidemic control measures between China and the US, China's indicators are significant in terms of sentiment factors, but the impact of COVID-19 on the sentiment factors in the US is different . The Chinese government has not adopted unlimited easing and maintained consistent policies. At present, the economic impact of COVID-19 on the US is far greater than that of China.

Keywords: COVID-19, macro economy, sentiment factors, non-sentiment factors

1. Introduction

Along with the continuous improvement of global economic integration, labor, goods, capital, information and other elements in each country (region) between the liquidity is increasing day by day, breaking the economic impact of infectious disease among major pathways between complex country (region) flow is increasing day by day, a public

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health emergency on economic impact, causing the social impact of the COVID-19 is far more than its economic loss. The research on the relationship between public health events and economy and finance is of great significance to social economy and finance.

Before, China is facing the severe test of COVID-19. Since the outbreak in Wuhan in December 2019, the epidemic has rapidly spread to the whole country and even some overseas countries and regions. According to the World Health Organization (WHO), the number of COVID-19 affected countries and regions outside China has reached 136 by 12:00 Beijing time on March 14, 2020.As of 21:52 on the same day, there had been 81,032 confirmed cases in China and 67,211 cases overseas.

In response to the national epidemic prevention and control measures, all provinces and cities postponed the resumption of work and production. 68.75% of the provinces and cities stopped work for 17 days, 28.13% for 10 days, and Hubei province, an epidemic area, delayed the resumption of work and production for 46 days until March 10.The overall delay in the resumption of work and production has caused a certain impact on China's labor force, enterprise order squeeze, and even on exports and imports.

At present, the epidemic situation in the United States is still in dire straits. The number of confirmed cases is still about 50000 every day. As of August 31, 2020, the total number of confirmed cases has reached 6141788, which is more than six times of the one million people previously mentioned by US President trump. At the same time, the number of infected people in the United States is still expanding, and many colleges and universities have reported confirmed cases. Moreover, the development of the epidemic in the United States is far from reaching the inflection point, and the final number of confirmed cases is difficult to determine, and the scope of the impact is even more difficult to estimate. What is certain is that the development of the epidemic in the United States has had an important impact on all aspects of the U.S. economy, including output, consumption, trade, investment, finance and other fields. We have to admit that the Federal Reserve has made immortal contributions to the real economy and finance in the development of the epidemic. First, the Federal Reserve gave up raising interest rates, and then took unlimited QE measures, which made funds continuously enter the real economy and created security for the development of American enterprises. This is what most central banks around the world do. So what are the indicators of the U.S. economy during the outbreak, and what is the correlation between the U.S. economy and the epidemic. With these problems, this paper begins to study.

The structure of this paper is as follows: The second part describes the impact of COVID-19 to economy in China. The third part is the impact to US's economy. The fourth part provides correlation analysis and the comparison of economic impacts between China and USA. The fifth part is the conclusion.

2. The impact of COVID-19 to economy in China

Many macroeconomic indicators, such as Purchasing Manager index(PMI),Consumer confidence index (CCI) , Stock market index and the monthly issue of currency and Bond can use to measure the impact of COVID-19 to economy in China.

In February 2020, China's PMI and comprehensive PMI were 29.6% and 28.9%, respectively, with a decrease of 14.3% and 24.1% compared with the previous month, and 19.6% and 23.5% lower than that of the same period in 2019. Data show that affected by the impact of the epidemic, the production and operation activities of Chinese enterprises have slowed down in general. Compared with the 50% of the boom and bust line of the PMI, it is obvious that the PMI in the first quarter of 2020 fall down due to the impact of the epidemic, and the economic rebound bears greater pressure. With the steady progress of resumption of work and production, the negative impact on the production side is gradually weakening, and the market confidence is steadily recovering. the PMI has significantly improved in the second quarter of 2020. Judging from the comprehensive strength of the world's second largest economy at this stage, China's ability to resist external shocks has been greatly improved. The short-term impact of the epidemic does not constitute a long-term economic crisis. The PMI is expected to recover in the third quarter of 2020, and will continue to develop above the boom and bust line in the next few years. COVID-19 will affect the production progress of the manufacturing industry in the first quarter, and will drag down the production and sales of the whole year. In serious cases, it will affect the normal operation of the global related industrial chain. This epidemic situation will severely damage the manufacturing industry in the short term, and the long-term supply stability of the manufacturing industry may take a long time to repair.

From 2017 to 2019, China's CCI showed a steady upward trend, increasing from 112.6% in January 2017 to 126.6% in December 2019. Looking back on the SARS epidemic period in 2003, the average CCI in the first quarter was 114%, and then the SARS epidemic broke out completely. The average CCI in the second and third quarters was only 102.3% and 107.7, which only recovered to 111.2% in December 2003. To sum up, the consumer satisfaction index and CCI decline significantly in the first and second quarters of 2020, with a decrease rate of about 10%. As the negative impact of the epidemic gradually dissipates, the third quarter will rebound strongly. It is expected to resume the previous development trend in the fourth quarter and maintain the annual growth rate of 3% in the future.

The impact of the new epidemic on the financial market is mainly reflected in the impact on the stock market, bond market and foreign exchange market. The impact of the new epidemic on the stock market is mainly reflected by the closing price and turnover of the Shanghai Composite Index; the impact on the bond market is mainly from the perspective of bond issuance and default; the impact on the foreign exchange market is mainly analyzed from the fluctuation of RMB exchange rate. During the SARS period in 2003, the Shanghai composite index showed a phased increase, and the turnover also increased significantly in April 2003. After the SARS ended, the Shanghai composite index began to decline gradually, and slowly rose at the end of the year. During the period of COVID-19, the performance of the stock market before the Spring Festival in 2020 is not significantly affected by the epidemic. During the Spring Festival, the policy of enterprise shutdown and production suspension was issued, which directly led to a sharp drop in the stock market on the first trading day after the Spring Festival. Based on the basic judgment that China's short-term economic development is obviously affected, but the long-term economic growth expectation remains unchanged, the stock market reflects the rational expectation of Chinese and foreign investors, especially domestic investors, that China's capital, policy and economy are back on track. In the following period of time, the Shanghai Composite index fluctuates and returns to 3000 on February 20, 2020 Point, and continue to hover. Exchange rate fluctuation is reflected in the appreciation or devaluation of currency, which is closely related to international trade and investment. During the SARS epidemic, the RMB exchange rate fluctuated little. During the new epidemic period, especially after the Spring Festival in 2020, the RMB exchange rate fluctuated greatly, and the depreciation rate expanded, and then gradually recovered to be stable. COVID-19, as a major public health emergency, has become one of the factors disturbing the RMB exchange rate.

At present, the epidemic situation in China has been effectively controlled, and the return to work rate of various industries has been close to 100%. Worldwide, the development of the epidemic is still in dire straits. As long as the epidemic situation exists, trade and investment of all countries will be greatly affected. Therefore, it is of great significance to take the development of China's epidemic situation as an example, and to examine the stage of epidemic development in other countries and the possible economic impact. Considering that the United States is currently more seriously affected by the epidemic situation, this paper will focus on the development of the epidemic situation in the United States, the development of the U.S. macro-economy under the epidemic situation and the correlation between the epidemic situation and the U.S. macro-economy, so as to provide important reference for the subsequent development of the U.S. economy.

3. COVID-19 impact to US's economy

Based on the spread of COVID-19 in China and the relationship between the number of confirmed cases and China's macroeconomic indicators. We also want to know if the relationship is the same in other countries in the world. Considering that COVID-19 in China is entering the peace period, the most important country affected by the epidemic is the United States. Therefore, we chose the US as the main object to investigate the relationship between the number of confirmed cases of the new crown pneumonia virus and the US macroeconomic indicators.

The economic growth of the United States is stable. Although the growth rate is not high, it also shows a state of sustained and stable growth. However, since 2020, that is, after the outbreak of the epidemic, the U.S. economic growth also began to show a cliff type decline. The economic growth rate in the fourth quarter of 2019 is -1.2627, and the economy in the first quarter of 2020 is -1.2627. The growth rate was -9.4947. It is conceivable that despite the US president's claim to increase jobs and encourage work. But affected by the epidemic, the U.S. economy and employment have been greatly affected.

After the epidemic spread in the United States, the CCI in the US showed a cliff like decline. Even though it recovered in June, it soon fell again. This made the consumer confidence index of the United States, which has been close to 100 or so for a long time, dropped to about 70. This shows the importance of the epidemic situation in the life of American residents and the uncertain impact on future income has been formed.

PMI of manufacturing industry has begun to decline in 2019, which is related to the overall situation of the U.S. economy. The US federal government is also constantly introducing new policies to stimulate the development of its manufacturing industry, but the effect is very small. In 2020, after the outbreak of the epidemic in the United States, import and export trade has been greatly affected, and some manufacturing enterprises have even entered the stage of stagnation, which makes the PMI decline seriously from March to June, with a decrease rate of about a quarter. In July, although the number of confirmed cases in the United States is still increasing, various industries have returned to work and production, foreign trade has gradually recovered, and PMI began to return to its original state.

For a long time, the business uncertainty index of the United States has been basically maintained at around 100, which indicates that the US economy has been in a stable growth trend for a long time. When the epidemic occurs in other countries, the business uncertainty index in the United States has shown an upward trend. As the epidemic spread across the United States, business uncertainty began to rise rapidly, which is now about three times that of a stable economy. This shows that the US macro-economy has entered a period of extreme instability.

Covid-19 has caused severe volatility in the US currency markets and has caused turmoil throughout the economy. In order to keep the market liquid and strengthen its balance sheet, the Federal Reserve launched its huge bond purchase program in March 2020. Monthly bond issuance rose sharply, bringing the U.S. bond issuance to an all-time high.

The U.S. financial market has generally been in an upward trend, and the degree of fluctuation is relatively small. The spread growth of the epidemic in the United States has made the financial market in the United States suffer an unprecedented impact. The stock market has continued to decline, and the Dow Jones industrial index once fell to about 22000 points. This is undoubtedly a major blow to the U.S. economy and a major impact on investors. However, with the timely action of the Federal Reserve, we can see that the US stock market has returned to normal, and the Dow Jones industrial index has reached 26000, which is expected to return to the state before the epidemic.

4. Correlation analysis and the comparison of economic impacts between China and US

In order to further analyze the correlation between these macro indicators and the development of the epidemic situation in the US and China, the analysis is carried out below.

4.1. Model Description

In this paper, PLS regression (Partial least squares regression) was used to verify the correlation between the number of confirmed cases and macroeconomic indicators.

PLS model is a multivariate regression analysis method, which can realize regression modeling, simplify data structure and analyze the correlation between two groups of variables at the same time, bringing great convenience to multivariate statistical analysis. It is considered that PLS is still stable in the case of non-normal distribution, small sample size and collinearity. The main difference from the ordinary least squares regression is that it adopts the techniques of data dimension reduction, information synthesis and screening in the regression modeling process to extract the new synthesis components of the optimal explanatory ability of the system. It is considered that PLS, integrating multiple linear regression analysis, canonical correlation analysis and principal factor analysis, can avoid potential problems such as non-normal distribution of data, factor structure uncertainty and model unidentification.

Based on the PLS method to study the main ideas of the outbreak of macroeconomic, while reduce the macroeconomic variables, can be extracted from the reaction index of macroeconomic conditions effective master control factor, the model has better robustness, and we put the outbreak linked with macroeconomic policy factors, a model more persuasive.

4.2. Results and Analysis

When performing PLS regression, we divided the variables into sentiment factors and non-sentiment factors. Sentiment factors are used to reflect the operation of the macro economy, like CCI(the following will use C to represent), PMI(the following will use P to represent), the Shanghai Composite Index (S) and the consistent index of macroeconomic prosperity(M). In US they will be news-based index(N), C, P, business uncertainty index(U), Dow Jones Industrial Index(D). The non-sentiment factors are used to represent the influencing factors on the economy, including the number of confirmed COVID-19 cases(X)，monthly bond issuance(B) and money supply(M1). Due to the different frequency of data, we selected the number of confirmed cases and monthly macroeconomic indicators from September 2016 to June 2020, which basically cover all aspects of the macro-economy. The list of the correlation between factors in the analysis is provided in S1 Table. And in order to resolve the heteroscedasticity between the data, we take logarithms for X(more details are provided in S2 Table).

Table 1. Regression coefficient test table of China.

Sentiment factors	M_C			S_C		
non- Sentiment factors	lnX_C	B_C	$M1_C$	lnX_C	B_C	$M1_C$
coefficient	-0.426**	-0.305**	-0.525**	-0.183*	-0.131*	-0.225*
	（0.086）	（0.038）	（0.153）	（0.071）	（0.057）	（0.085）
Sentiment factors	C_C			P_C		
non- Sentiment factors	lnX_C	B_C	$M1_C$	lnX_C	B_C	$M1_C$
coefficient	0.209*	0.150	0.257**	-0.109**	-0.078	-0.134
	（0.103）	（0.100）	（0.052）	（0.037）	（0.079）	（0.095）

Note * $p < .05$ ** $p < .01$. Unstandardized coefficients are reported with standard errors in parentheses. In order to compare coefficients, variables included in the analyses were rescaled to the unit interval.

From the Table 1, the number of confirmed COVID-19 cases in China is highly negatively correlated with P, S and M, and the macroeconomic situation is strongly correlated with the control and spread of covid-19 cases. In the early stages of the COVID-19 outbreak, P, C, S and M fell as economic fundamentals worsened due to the rapid spread of the epidemic and the subsequent "Lock down" policy adopted by the Chinese government. However, as the epidemic situation in China was basically under control in March, China resumed work and production under the guarantee that the epidemic situation was under control. Moreover, the Chinese government adopted loose fiscal policy and steady monetary policy, the economic fundamentals began to recover. With the epidemic situation at home and the import from overseas well under control, the economy began to recover. Except that consumer confidence has not fully recovered. All kinds of indexes began to increase and gradually returned to the pre-epidemic level.

The US situation is different from China's，the processing of data is similar to the above.

Table 2. Regression coefficient test table of US.

Sentiment factors	N_U			C_U		
non- Sentiment factors	lnX_U	B_U	$M1_U$	lnX_U	B_U	$M1_U$
coefficient	-0.224**	0.220**	0.297**	-0.243**	-0.238**	-0.322**
	（0.066）	（0.071）	（0.071）	（0.063）	（0.086）	（0.050）
Sentiment factors	P_U			U_U		
non- Sentiment factors	lnX_U	B_U	$M1_U$	lnX_U	B_U	$M1_U$
coefficient	-0.212	-0.212	-0.281**	0.255**	0.250	0.338**
	（0.110）	（0.110）	（0.058）	（0.051）	（0.134）	（0.038）
Sentiment factors	D_U					

non- Sentiment factors	$\ln X_U$	B_U	$M1_U$
coefficient	0.099	0.097	0.132*
	（0.067）	（0.060）	（0.065）

Note * p < .05 ** p < .01. Unstandardized coefficients are reported with standard errors in parentheses.In order to compare coefficients, variables included in the analyses were rescaled to the unit interval.

From the Table 2, the impact of COVID-19 on the sentiment index is different. Due to the impact of the epidemic, the uncertainty index is significantly positively correlated with the number of confirmed COVID-19 cases, while consumer confidence is strongly negatively correlated with the number of confirmed COVID-19 cases. The US economy fell into crisis in March and April, and the Dow Jones Industrial Index was brief slump, but as a result of the federal government's strong expansionary fiscal policy and monetary policy, such as the lower interest rates to zero and unlimited QE, etc., Dow Jones Industrial Index within the shortest possible time to realize the change from a "bear market" to "bull market", Reduced its relevance to the number of confirmed cases. At the early stage of the outbreak, China, as a country with a complete industrial chain, began to implement the policy of "Lock down" to control the epidemic, which caused a global industrial supply chain crisis. In May and June, despite the severe spread of the epidemic in the United States, the United States still did not implement the "Lock down" policy. In addition, China has well controlled the epidemic, and the whole world began to resume work and production. Although the epidemic in the United States worsened, the manufacturing sector began to recover, reducing the significance level of PMI. Since the outbreak of COVID-19, the epidemic has spread around the world and there is no trend to control the epidemic. The EPU index has risen sharply, and the global economic uncertainty news index is on the rise.

5. Conclusion

Our findings show that some of the sentiment factors can be an indicator of the economy during an epidemic. This reflects investors' attitudes (or hidden concerns) towards resisting the impact of the pandemic. At the same time, we found that non-sentiment factors are significantly associated with the trend of the epidemic in the US and China. Our illustrative exercise implies that economic fluctuations are largely caused by the uncertainty caused by COVID. To be sure, our confidence interval for the US economic forecast is very wide. And, as we have discussed, it is reasonable to think that our illustrative exercise underestimate the possible output effects of the COVID-19 pandemic. As for the differences in epidemic control measures between China and the US, China's indicators are significant in terms of sentiment factors, but not significant in terms of non- sentiment factors. The Chinese government has not adopted unlimited easing and maintained consistent policies. At present, the economic impact of COVID-19 on the US is far greater than that of China. But an important limitation of the study is that the unit of analysis is individual countries, not all. This may make our reported results vulnerable to fallacy.

In this part our research has made two important contributions. First, we found that the economy during the epidemic period is closely related to the sentiment factors, which can be measured by some sentiment indexes. Moreover, this connection with the national economy appears to account for effects that previous research has attributed to the non-emotional factors. Second, we provide a new angle from which we can view the economic impact hypothesis in the era of uncertain events such as the epidemic.

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Appendix A.

Note:

In the analysis of China:

X_c is the number of confirmed cases of the epidemic;

C_c is the consumer confidence index;

P_c is the manufacturing purchasing manager Index;

S_c is the Shanghai Composite Index；

M_c is the consistent index of macroeconomic prosperity；

$M1_c$ is the monthly issue of currency（M1）；

B_c is monthly bond issuance.

In the analysis of US:

X_U is the number of confirmed cases of the epidemic;

C_U is the consumer confidence index;

P_U is the manufacturing purchasing manager Index;

U_U is the business uncertainty index,

D_U is the Dow Jones Industrial Index, reflecting the situation of the US stock market;

B_U is the monthly bond issuance;

N_U is a news-based index.

Table 3. The correlation between factors of China

	$\ln X_C$	P_C	C_C	S_C	M_C	$M1_C$	B_C
$\ln X_C$	1						
P_C	-0.554***	1					
C_C	0.018	-0.151	1				
S_C	-0.176	0.328**	-0.207	1			
M_C	-0.856***	0.541***	-0.277*	0.401***	1		
$M1_C$	0.416***	-0.277*	0.683***	-0.439***	-0.639***	1	
B_C	0.321**	-0.072	0.241	-0.302**	-0.443***	0.620***	1

Note: * 0.1 significance, ** 0.05 significance,*** 0.01 significance

Table 4. The correlation between factors of US

	$\ln X_U$	C_U	P_U	U_U	$M1_U$	D_U	B_U	N_U
$\ln X_U$	1							
C_U	-0.820***	1						
P_U	-0.551***	0.580***	1					
U_U	0.909***	-0.836***	-0.505***	1				
$M1_U$	0.874***	-0.709***	-0.604***	0.886***	1			
D_U	0.065	0.081	-0.203	0.105	0.487***	1		
B_U	0.720***	-0.593***	-0.552***	0.652***	0.708***	0.177	1	
N_U	0.822***	-0.717***	-0.636***	0.730***	0.748***	0.115	0.519*	1

Note: * 0.1 significance, ** 0.05 significance,*** 0.01 significance

Informations: The correlation analysis shows the correlations between these macro indicators and the development of the epidemic situations. From the test results, most of indicators have significant correlation with the number of confirmed cases.

Table 5. The factors of China

VARIABLES	N	mean	sd	min	max	Var	skewness	kurtosis
X_C	46	1,853	10,151	0	68,147	1.030e+08	6.275	41.35

P_C	46	51.34	3.593	29.30	54.80	12.91	-5.130	32.22
C_C	46	119.1	5.918	104.6	126.6	35.02	-0.733	2.414
S_C	46	3,028	228.6	2,558	3,457	52,240	-0.234	2.334
M_C	46	99.08	5.996	82.68	104.7	35.96	-1.531	4.272
$M1_C$	46	531,784	32,941	454,340	604,318	1.085e+09	-0.460	2.847
B_C	46	35,786	7,665	16,882	53,121	5.875e+07	-0.215	2.818
lnX_C	46	7.942	2.069	5.357	11.13	4.280	0.362	2.059
lnP_C	46	3.935	0.0881	3.378	4.004	0.00776	-5.657	36.45
lnC_C	46	4.778	0.0507	4.650	4.841	0.00257	-0.800	2.552
lnS_C	46	8.013	0.0765	7.847	8.148	0.00586	-0.381	2.451
lnM_C	46	4.594	0.0637	4.415	4.651	0.00405	-1.619	4.549
$LnM1_C$	46	13.18	0.0631	13.03	13.31	0.00398	-0.609	2.924
lnB_C	46	10.46	0.233	9.734	10.88	0.0542	-0.856	3.755

Table 6. The factors of US

VARIABLES	N	mean	sd	min	max	Var	skewness	kurtosis
X_U	46	58,244	207,392	0	879,671	4.301e+10	3.462	13.33
C_U	46	95.13	6.483	71.80	101.4	42.02	-2.388	8.566
P_U	46	54.56	4.764	41.50	61.30	22.70	-0.723	2.956
U_U	46	109.4	44.73	80.60	305.4	2,001	3.481	14.14
$M1_U$	46	3,764	390.1	3,327	5,210	152,146	2.189	8.197
D_U	46	24,094	2,695	18,142	28,538	7.266e+06	-0.556	2.403
B_U	46	676.0	156.7	448.1	1,188	24,552	1.099	4.500
N_U	46	183.3	85.15	86.34	504.0	7,250	2.069	7.354
lnX_U	46	1.264	3.790	0	13.69	14.37	2.852	9.313
lnC_U	46	4.553	0.0748	4.274	4.619	0.00559	-2.591	9.523
lnP_U	46	3.995	0.0909	3.726	4.116	0.00827	-0.933	3.525
lnU_U	46	4.649	0.269	4.389	5.722	0.0723	3.006	11.43
$LnM1_U$	46	8.229	0.0946	8.110	8.558	0.00896	1.840	6.926
lnD_U	46	10.08	0.117	9.806	10.26	0.0136	-0.744	2.650
lnB_U	46	6.492	0.219	6.105	7.080	0.0479	0.425	3.146
lnN_U	46	5.134	0.375	4.458	6.223	0.140	1.005	3.918

• Informations : From the perspective of skewness and kurtosis, the value of X is very sharp, which means that X needs to be logarithmic.