The Impact of the COVID-19 on the Media Industry: Evidence from China

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Abstract. The COVID-19 pandemic has had a severe impact on the global economy. Under the influence of the global pandemic, all industries are facing enormous challenges and tests. This article starts from the media industry, adopts the VAR model and the ARMA-GARCH model, comprehensively considers the overall performance of the media industry during the pandemic, and systematically analyzes the effect of the new COVID-19 pandemic on the media industry. However, the pandemic has had a substantial long-term impact on the media industry globally. The study found that the impact of the pandemic on China's media industry is relatively small. At the same time, from a short-term perspective, the COVID-19 has a negative shock effect on the stock market's volatility, but this relationship does not exist in the long term. Based on the conclusions, this thesis also explores the implications that different market roles can gain from this article.

Keywords: COVID-19, Media Industry, China.

1. Introduction

The COVID-19 outbreak in 2020 has had a significant impact on people's lives and social and economic development worldwide. According to the statistic of Johns Hopkins, by February 21, 2022, before the conflict between Russia and Ukraine, 4,2663,3157 confirmed cases and 593,7938 deaths had been reported worldwide. Moreover, there is still a net increase of 141,0996 cases on that day around the world [1]. At that moment, the pandemic has been brought under control in mainland China, merely sporadic confirmed cases. However, in most countries and regions in the world, the COVID-19 has not been effectively controlled, which seriously threatens global social stability and affects the global economy.

In the past two years, the rampant COVID-19 pandemic has been the superposition of the public health crisis and the economic crisis. The supply and demand have been hit simultaneously in the pandemic, resulting in a higher impact on the global economy than before. The measures such as quarantine, blockade, and closure required for pandemic prevention have caused a large number of negative impacts, such as the abrupt shutdown of economic activities, disruption of supply chains, restricted activities in the manufacturing and service industries, and high uncertainty in financial markets [2], which further undermined the global economy that has become fragile due to many uncertainties and exacerbated the negative attitudes of major economies towards globalization, and the tendency of anti-globalization, populism, and nationalism has become increasingly prominent [3].

Specifically in China, the COVID-19 has also negatively impacted the Chinese economy from both the demand and supply sides. These impacts include direct losses on the consumer side and indirect losses caused by insufficient capacity utilization due to the delay in the resumption of work and production, and the reverse impact caused by the blockage of some fractions in the global supply chain and shrinking external demand caused by the spread of the pandemic [4]. Under the premise that the Chinese economy is affected, the impact of the pandemic on different industries is different [5]. The service industry is one of the most affected industries. The transportation industry fell by about 50% when the pandemic broke out in 2020, the catering industry fell by 43.1%, and most other tertiary industries, such as tourism, dropped dramatically after the outbreak [6]. The sales revenue of the film and entertainment industry also fell sharply during the pandemic. For the financial industry, the COVID-19 pandemic has had varying degrees of negative impact on various Chinese financial markets or industries, aggravating the risks in the financial markets, and financial risks will be contagious between various markets and industries, leading to a risk spillover effect [7].

The media industry is one of the most valuable industries among tertiary industries during the pandemic. The pandemic has both advantages and disadvantages for the media industry. For traditional broadcast, television, film, and other communication channels, the pandemic has caused a severe negative impact on these industries. Since the pandemic outbreak in early 2020, the operating costs of various broadcast and television agencies have increased, operating income has been greatly reduced, the loss of work stoppage has increased, and their survival has faced enormous pressure. Data shows that in the first quarter of 2020, 11.88% of the enterprises' revenue fell less than 20% in the broadcast and television industry. 14.85% of companies suffered a 20%-40% decrease in revenue. 27.73% of companies lost their revenue by 40%-60%, and 26.73% of their revenue fell by 60%-80%. Moreover, even 18.81% of the institutions received almost no grains [8]. The outbreak of the pandemic has led to a reduction in the supply of program content for traditional media and hindered the progress of imperative projects, resulting in a sharp decline in business revenue and an unprecedented severe imbalance of revenue and expenditure. For example, the film and television bases were closed, and the crew could not start shooting, which caused many TV series to stagnate that made the film and television companies suffer many losses; most TV variety shows stopped recording, and some new programs that were about to be launched had been postponed. Many small and medium-sized enterprises go out of business. Objectively speaking, TV viewership has increased during the pandemic. At the beginning of the outbreak, the average startup time of home TVs in the country was about 330-380 minutes per day. The ratings of urban residents increased even more, and more than half of the users had a high startup time of 7 hours each day. One of the fundamental reasons is people's concern about the pandemic situation [9]. However, this does not change the fact that the traditional media industry faces severe challenges in this pandemic.

The traditional media industry has suffered massive losses. However, the new media industry, represented by video platforms, animation, and games, has received excellent development opportunities during the pandemic. The new media industry's digital production characteristics and network service methods make it less negatively affected by the pandemic. For example, virtual entertainment represented by VR entertainment and online games, interactive audio and video, and screen fusion has accelerated a rapid development during the pandemic, which brought up the emerging digital cultural industry. Big cultural data such as online performances, exhibitions, and variety shows have accelerated the upgrade of the traditional cultural industry. High perception, high quality, new types, and new consumption have improved the quality of the cultural product. The large-scale and agglomerated corporate mergers and acquisitions and IP-based industrial collaboration optimized and adjusted the cultural industry structure [10]. The stay-at-home advice adopted to prevent the spread of the pandemic has provided a broad market for various digital cultural products. During the pandemic, the viewership of the video industry with convenient transmission methods and high flexibility rose rapidly. As of the 2020 Spring Festival, iQiyi has more than 100 million paid members, the Tencent video platform has nearly 100 million members, and Youku has also attracted 70 million members. The online numbers of major domestic animation websites and well-known game platforms at home and abroad continue to hit new highs, reducing the creative risk of the animation and game industry to a certain extent and providing more sufficient development funds than before the pandemic.

Heretofore, not many articles analyzed the impact of the COVID-19 on the media industry and even fewer quantitative analyses. Based on the general background of COVID-19, this paper studies how the media industry was affected by the pandemic. The following parts of the paper are organized as follows: section 2 is the research analysis, which contains the source of data and model specification; Section 3 contains estimation results of the VAR, ARMA- GARCH model. Section 4 is the discussion. Section 5 is the conclusion.

2. Research Design

2.1 Data Sources

The media industry index used in this paper is downloaded from the Investing website, which is a widely used financing website that includes the data of various industries. Data of new daily confirmed cases of global and China is garnered from the website of Johns Hopkins. In this paper, all data that are used in the analysis are logarithmic, which means that data of the media industry index refers to the logarithm of the index, and daily confirmed cases refer to the logarithm of cases.

2.2 ADF-test

Before constructing models, the volatility of each variable requires tests.

$$x_t = c_t + \beta x_{t-1} + \sum_{i=1}^{p-1} \emptyset_i \Delta x_{t-i} + e_t \quad (1)$$

In (1), the unit root of the statistics is tested to examine if they are stationary. The p-value will be the judgment standard.

As shown in Table 1, the ADF test shows that the global new confirmed cases, China's new confirmed cases, and media yield are all stationary with a p-value less than 0.05, while the price of media ETF is non-stationary with a p-value larger than 0.05.

Therefore, global new confirmed cases, China new confirmed cases, and media yield are qualified introduced variables in the ARMA model since all of them are stationary.

Table 1. ADF test

Variables	t-statistic	p-value
Price		
Media ETF	-2.314	0.4256
Media, yield	-5.712	0.0000***
Global new confirmed cases	-3.946	0.0105**
China new confirmed cases	-4.002	0.0087***

2.3 Model Specification: ARMA

After inspecting the volatility, the next step is to build an ARMA model. The model is as follows:

$$x_t = \emptyset_0 + \sum_{i=1}^{p} \emptyset_i x_{t-i} + a_t - \sum_{i=1}^{q} \theta_i a_{t-i} \quad (2)$$

In (2), $\sum_{i=1}^{p} \emptyset_i x_{t-i}$ stands for the AR(p) model, which uses the historical real value to forecast, where xt is the time series and i is the time lag. $\sum_{i=1}^{q} \theta_i a_{t-i}$ stands for the MA(q) model, which uses the volatility in the past to predict the future.

To be specific, in this paper the AR model uses the historical media industry index from the beginning of COVID-19 to the eve of the conflict between Russia and Ukraine, and the MA model uses the error term during the pandemic period to predict the future.

2.4 Model Specification: VAR

In the third part, a VAR model is constructed to test the dynamic impact of COVID-19 on the media industry. In this model, variables are put together and made predictions as a single system so that predictions are mutually consistent.

The model is set as follows:

$$y_t = \begin{pmatrix}\beta_{10}\\ \beta_{20}\end{pmatrix} + \begin{pmatrix}\beta_{11}\gamma_{11}\\ \beta_{21}\,\gamma_{21}\end{pmatrix} y_{t-1} + \cdots + \begin{pmatrix}\beta_{1p}\gamma_{1p}\\ \beta_{2p}\,\gamma_{2p}\end{pmatrix} y_{t-p} + \varepsilon_t \quad (3)$$

In (3), $yt = \{y1t, y2t\}$ is a vector of two-time series, εt is the distractor and p refers to the time lag.

Impulse response functions examine how much the effect of one unit perturbation will cause other variables to change over time.

The model is as follows:

$$\frac{\partial y_{t+s}}{\partial \varepsilon_t} = \varphi_s \quad (4)$$

This equation calculates how much the value of the (t+s)-th period variable $yt+s$ is affected when the disturbance term εt of the t-th period variable increases by one unit, under the premise that other variables and disturbance terms in other periods remain unchanged.

2.5 Model Specification: ARMA-GARCH

The last step is to construct the ARMA-GARCH model to predict the index and volatility of the media industry at the same time. Both the daily confirmed cases in China and global are used as exogenous variables respectively. Thus, the correlation between the pandemic situation and the index and volatility of the media industry could be estimated.

The model GARCH(p,q) is set as follows:

$${\sigma_t}^2 = a_0 + a_1{\varepsilon_{t-1}}^2 + \cdots + a_q{\varepsilon_{t-q}}^2 + \gamma_1{\sigma_{t-1}}^2 + \gamma_p{\sigma_{t-p}}^2 \quad (5)$$

In (5), the term $a_1{\varepsilon_{t-1}}^2 + \cdots + a_q{\varepsilon_{t-q}}^2$ represents the ARCH part. ${\sigma_t}^2$ is the conditional variance of the perturbation term εt, and the subscript t indicates that the variance changes over the periods. ${\sigma_t}^2$ depends on the square of the distractor in the first p periods.

The GARCH model is built based on the ARCH model with the addition of ${\sigma_t}^2$ autoregression. GARCH models are designed to reduce the number of parameters. We can iteratively reduce ARCH(p) to GARCH (1,1).

3. Estimation Results

3.1 ARMA Model

First, the order of the AR model has to be determined by the PACF test.

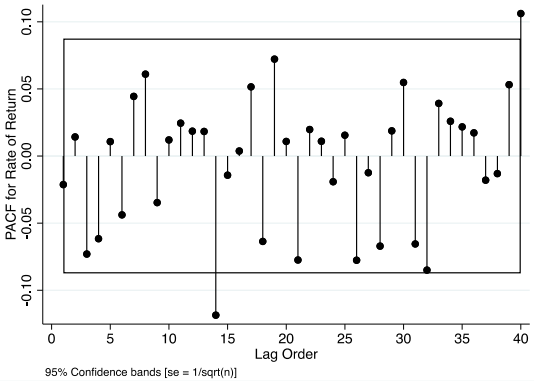

Fig. 1 PACF of the log of media industry index

Note: The Y-axis is the dependent variable, PACF of the log of the media industry index, and the X-axis is time lag order. The area bounded by $y = \pm 2\ stand\ error$ refers to the 95% confidence interval for AR(p).

Figure 1 shows that PACF begins to fall in the 95% confidence interval when lag=14. Then, the order of the MA model should be determined by the ACF test.

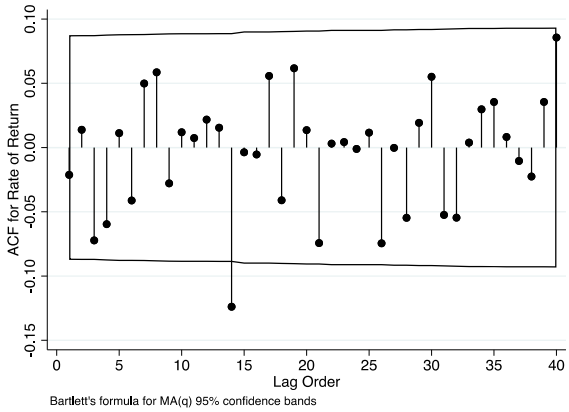

Fig. 2 ACF of the log of media industry index

Note: The Y-axis is the dependent variable, ACF of the log of the media industry index, and the X-axis is time lag order. The bounded area refers to the 95% confidence interval for MA(q).

Figure 2 shows that ACF begins to fall in the 95% confidence interval when lag=14.

3.2 VAR Model

According to the results of PACF and ACF model, it could be determined that the order of the VAR model should be 12.

Table 2. VAR model identification

Lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	111.957				.000127	-.456841	-.446535	-.43063
1	1336.37	2448.8	9	0.000	7.8e-07	-5.55291	-5.51169	-5.44807
2	1406.68	140.63	9	0.000	6.0e-07	-5.81	-5.73786	-5.62652
3	1428.62	43.877	9	0.000	5.7e-07	-5.86425	-5.76119	-5.60214
4	1436.67	16.1	9	0.065	5.7e-07	-5.86026	-5.72629	-5.51952
5	1468.3	63.257	9	0.000	5.2e-07	-5.95514	-5.79025	-5.53577
6	1513.91	91.223	9	0.000	4.5e-07	-6.10865	-5.91284*	-5.61064
7	1512.52	15.22	9	0.085	4.5e-07	-6.10282	-5.8761	-5.52618
8	1526.89	10.742	9	0.294	4.6e-07	-6.0876	-5.82996	-5.43233
9	1534.16	14.54	9	0.104	4.6e-07	-6.08035	-5.79179	-5.34645
10	1552.3	36.271	9	0.000	4.4e-07*	-6.11865*	-5.79918	-5.30612
11	1556.38	8.1654	9	0.518	4.5e-07	-6.09804	-5.74765	-5.20687
12	1566.25	19.733*	9	0.020	4.5e-07	-6.10167	-5.72036	-5.13187

The stability of the parameters is required to be examined before estimating them.

The model is set as follows, (k>1)

$$Y_t = C + AY_{t-1} + U_t \tag{6}$$

All the roots of the equation $|A - \lambda I| = 0$ must be in the unit circle to substantiate this VAR system is stationary.

Figure 3 is the result of the examination. All of the black dots fall within the unit circle, which means the VAR system is stationary.

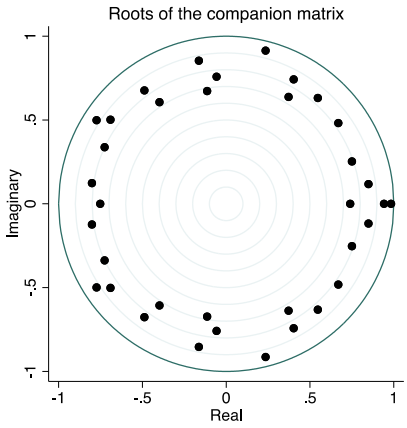

Fig. 3 Estimation of stationarity using roots of the characteristic equation

After that, the impulse diagram could be drawn, taking the media industry index as the response variable and the Chinese or global pandemic as the impulse variable respectively. Figure 4 evaluates the relation in China, and Figure 5 estimates the relation the global.

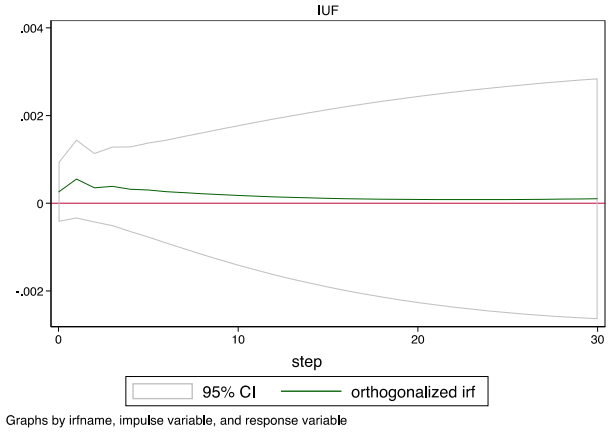

Fig. 4 Response of media industry index to the global pandemic

Note: The Y-axis is the result of the pulse of the global pandemic affecting the media industry index, and the X-axis refers to the change in period.

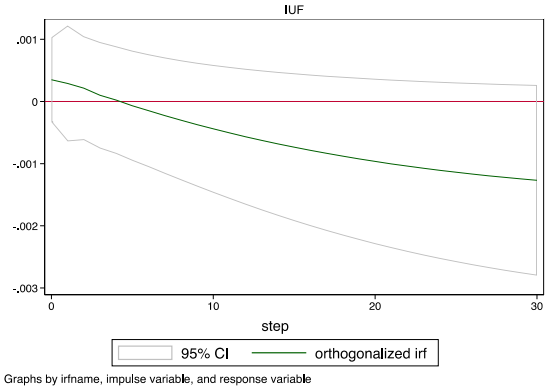

Fig. 5 Response of media industry index to the China pandemic

According to Figure 4 and Figure 5, from the estimated results of the impulse effect, the increase in confirmed cases in China has a positive impact on the media industry, but the effect is minimal and tends to 0 over time quickly.

Nevertheless, the impact of the global pandemic on the media industry index is vast in the long run, as a percentage increase in global confirmed cases will cause the media industry index to be negative after 4/5 periods, and the effect increases over time.

3.3 ARMA-GARCH Model

Table 3 is the results of the ARMA-GARCH model estimation. Judging from the estimation results of ARMA-GARCH, the coefficient of confirmed cases is not significant, indicating that in the long run, the COVIS-19 pandemic does not affect the daily fluctuation of the media industry's profitability.

Combining with the actual operation of the stock market, we can find that in the short term, the COVID-19 pandemic hurts the volatility of the stock market, but this relationship does not exist in the long term.

Table 3. ARMA-GARCH model estimation results

Variables	(1)		(2)	
	Coef.	Std. err	Coef.	Std. err
Global new confirmed cases	-.0001	.0002		
China's new confirmed cases			-.0001	.0002
ARCH (-1)	.0958**	.0289	.0627***	.0207
GARCH (-1)	0.872***	.0329	.9121***	.0265
Constant	-6.7331***	.5866	-14.7475***	1.4030

4. Discussion

According to the quantitative analysis done in this paper, it can be seen that the COVID-19 pandemic has a negative impact on the media industry in the short term, but in the long term, the impact of the pandemic on the media industry is not apparent. A similar conclusion can be drawn from the qualitative analysis of the performance of the media industry during the pandemic in combination with other articles; that is, the dual impact of public health and economic fluctuations caused some shocks to the media industry in the early stage of the pandemic. However, as various media fields gradually transform online, the pandemic's impact on the media industry has significantly decreased. The pandemic's impact on the media industry is limited in the long term.

By using the pandemic data of China and the worldwide respectively, the pandemic has less impact on the Chinese media industry, and the recovery of the entire industry is faster, indicating that China has been implementing the pandemic since the beginning of the pandemic. The active anti-pandemic policy has played a positive role in the industry's recovery. However, due to the failure to effectively control the pandemic globally, the media industry has been under tremendous pressure from the pandemic. Therefore, according to the conclusions of this paper, the government should still resolutely implement an active protest policy.

From the perspective of investors, it can be predicted that with the internal transformation of the media industry in the future, the relevant stock market will tend to stabilize, and it is still an investment direction worth considering in the long run.

5. Conclusion

The pandemic has had an enormous impact on the global economy, and the media industry is negatively affected by the pandemic as well. This paper focuses on the impact of COVID-19 on the index of the media industry and forecasts its future performance.

Several models are included in the paper to make accurate and reliable analyses and predictions. ADF-test formula is applied to examine the volatility of the statistics to ensure the reliability of the subsequent models. Next, ARMA model, VAR model, and ARMA-GARCH model are used to analyze the performance of the media industry during the COVID-19 period while providing the forecast for the future.

As a result, it could be figured out that although in the short term there is a negative effect on the media industry due to the pandemic, in the long term, it could be recognized that there is little impact of COVID-19 on it in both China and worldwide. As a result, it could be figured out that although in the short term there is a negative effect on the media industry due to the pandemic, in the long term, it could be recognized that there is little impact of COVID-19 on it in both China and worldwide. With the improvement of the pandemic, the performance of the media industry in the post-epidemic era is worth looking forward to after experiencing industrial upgrading during the epidemic.

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