

Research on the Impact of Digital Economy on China's Real Economy: An Empirical Study based on Big Data Analysis of Household Consumption from 2010 to 2020

Yan Zhang

Xi'an Mingde Institute of Technology, Xi'an, Shanxi, China

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Abstract: Digital Economy has become an important engine of China's economic growth. A large number of enterprises represented by the Digital Economy, such as Alibaba, bytedance, tencent and Meituan, are rising rapidly, the decrease of the store, the depression of the large-scale Shopping Mall and the economic depression have become the important factors that hinder the economic development of our country. Based on the big data, this paper studies the residents consumption from 2010 to 2020, combs the existing research results of the academic circles, selects the research variables to construct the Var model, and studies the relationship between the Digital Economy and the real economy in China, through the Var model, we get the following conclusion: The moderate growth of the digital economy is beneficial to the promotion of the consumption level of the residents and the development of the economic aggregate, however, we should pay attention to and develop the integration of digital economy and real economy to form new industrial upgrading and innovation.

1 INTRODUCTION

Digital Economy is to take digital as an important factor of production, through data mining, processing, screening, processing to produce a new economic value. At the technical level, including big data, cloud computing, Internet of things, blockchain, artificial intelligence, 5g communication and other emerging technologies, represents the future direction of technology development. In the development process of China's real economy, domestic demand is the basis of national economic development, China's real economy is also an important indicator of regional economic development. The current national epidemic, rising prices, low consumption rate has become an important factor hindering China's economic development. In the development of Digital Economy, we should consider the sensitivity of residents' consumption to digital economy in different periods, so as to better realize the rapid development of digital economy. At the same time, China's real economy also presents a typical dual characteristics, urban and rural residents in the consumption concept, consumption structure, there

are obvious differences. Although the contribution rate of consumption to the total economy is larger than that of investment and export, there is still a big gap between China and developed countries. Whether it is based on the perspective of economic development, or the perspective of China's real economy, this paper is of great significance.

2 LITERATURE REVIEW

Domestic scholars began to pay attention to the impact of Digital Economy on China's economic development, but mostly from the production efficiency, resource integration, employment and so on. Zhou Zhihan and Yang Xi (Zhou, 2021, Yang, 2021) studied the impact of Digital Economy on industrial productivity, intra-industry resource integration and social welfare. The results show that after the introduction of the Digital Economy, the critical productivity of exports increases, the changes of the critical productivity of production and the average productivity of industries are determined by the critical value of the corresponding productivity increase index, while the degree of

intra-industry production competition is alleviated, intensification of intra-industry Export Competition. Wang Dong, LV Yanfang (Wang and LV , 2021) mathematical model of the effect of digital technology on employment in real economy, and a nonlinear empirical framework was used to test the effect of digital input on employment in real economy during 2003-2019. The empirical results show that narrow-sense digital technology index has a negative impact on labor employment, but with the increase of industry output, the negative inhibition tends to weaken; The effect of generalized digital technology on the employment of labor force shows a complicated non-linear trend, which first suppresses, then promotes, then suppresses, the cross-product of digital technology and output has a positive effect on the employment of labor force, and digital technology has a significant positive effect on the employment of labor force in low-tech industries. Thus, while digital technology can induce unemployment in the real economy through substitution, when digital technology is deeply integrated with the real economy, it can lead to the expansion of industry scale and ultimately promote employment in the real economy. Liu Shijin (Liu , 2022) , deputy director of the Economic Committee of the National Committee of the Chinese People’ s Political Consultative Conference , published an article in the Beijing Daily: Promoting the effective integration of the digital economy and the real economy. In the article, the author talks about the trend of digital economy, and how to integrate the real economy with the digital economy is the focus of attention.

3 VARIABLE SELECTION AND MODEL INTRODUCTION

3.1 The Selection of a Variable

The digital economy, as an integral part of the national economy as a whole, will have an important impact on economic development, and the impact of the digital economy on the real economy will vary at different stages of economic development; The aim of developing the digital economy is to ensure that our country’ s technological development can keep pace with the global technological progress and make breakthroughs in new fields. Different types of digital economy are usually identified according to the economic cycle, and technical growth rates are used to reflect changes in the digital economy when

selecting research variables, the following factors should be considered in the study of Digital Economy:

(1) the stability and continuity of the development of digital economy are closely related to the current information technology, artificial intelligence technology and blockchain technology. (2) the development of the digital economy will also promote and realize the stable and rapid development of the economy. Whether the digital economy can promote the development of the real economy is the focus of our consideration. (3) apart from the goal of driving economic growth, the digital economy also has the goal of technological development and global strategy. The Central Bank should keep prices stable within the range acceptable to the residents and avoid irrational price increases impacting their normal lives, because of the global impact of the epidemic, the extent of inflation will also have an important impact on the development of the Digital Economy, prices will affect the development of the real economy.

To sum up, according to the existing research results and the availability of data in the academic circle, this paper selects the price level (WZ) , the growth rate of information technology (MN) , and the resident consumption (CZ) as the research variables, to explore the relationship between digital economy and real economy in China.

3.2 Model Introduction

When studying the impact of the digital economy on residents’ consumption, this paper intends to use the variable auto-regression model to study the relationship between them. The expression of the VAR model is:

$$y_t = A_1 y_{t-1} + \dots + A_p y_{t-p} + \varepsilon_t, t=1, 2, \dots, T \quad (1)$$

Expand the above formula (1) to:

$$\begin{bmatrix} y_{1t} \\ y_{2t} \\ \vdots \\ y_{kt} \end{bmatrix} = A_1 \begin{bmatrix} y_{1,t-1} \\ y_{2,t-1} \\ \vdots \\ y_{k,t-1} \end{bmatrix} + \dots + A_p \begin{bmatrix} y_{1,t-p} \\ y_{2,t-p} \\ \vdots \\ y_{k,t-p} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \vdots \\ \varepsilon_{kt} \end{bmatrix}, t=1, 2, \dots, T \quad (2)$$

In formula (2) the AP is:

$$A_p = \begin{bmatrix} A_{11,p} & \dots & A_{1k,p} \\ \vdots & \ddots & \vdots \\ A_{k1,p} & \dots & A_{kk,p} \end{bmatrix} \quad (3)$$

In the Var model, the lag term is included on the right side of the equation, and the random perturbation term is independent constant variance.

4 AN EMPIRICAL STUDY ON THE IMPACT OF DIGITAL ECONOMY ON REAL ECONOMY

4.1 ADF Unit Root Test

Before the Empirical Analysis, ADF unit root test was conducted to determine the validity of the data. It can be seen from Table 1 that the ADF test value of variable dlz is -5.93832, p value is 0.0503, the data of variable $nwdlz$ is stable at 10% level, the ADF test value of variable $DlnMN$ is -3.79849, p value is 0.0112, the data of variable $DlnMN$ is stable at 5% level. The ADF test value of $DlnCZ$ was -5.37192, P value was 0.0561, which was significant at 10% level.

Table 1: ADF unit root test.

Variable	ADF test value	Prob	1% critical value at significant level	5% critical value at significant level	10% critical value at significant level	Conclusion
$DlnWZ$	-5.93832	0.0503	unstable	unstable	stable	stable
$DlnMN$	-3.79849	0.0112	unstable	stable	stable	stable

$$\ln CZ = -0.6465 \times \ln WZ(-1) - 0.7089 \times \ln WZ(-2) + 2.0781 \times \ln MN(-1) + 1.7842 \times \ln MN(-2) + 1.8503 \ln CZ(-1) + 1.6782 \ln CZ(-2) + 0.9847 \quad (4)$$

The regression coefficients of $LNWZ(-1)$, $LNWZ(-2)$ and $LN(CZ)$ are both negative, which shows that the price level has a significant negative correlation with the resident consumption. The regression coefficients of $LNMN(-1)$ and $LNMN(-2)$ with $LN(CZ)$ are both positive, which shows that the growth rate of information technology has a significant positive correlation with residents' consumption, it also shows that the moderate development of digital economy can promote the consumption of residents. The regression coefficients of $LNCZ(-1)$, $LNCZ(-2)$ and $LN(CZ)$ are both positive, which shows that residents' consumption has a certain path dependence effect and has a certain consumption inertia in a certain period of time, the previous consumption habits and consumption ideas will have an important impact on the follow-up consumption behavior, it is difficult for residents to get rid of the solidified consumption habits in a short time.

$DlnCZ$	-5.37192	0.0561	unstable	unstable	stable	stable
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4.2 Construction of Var Model

It is necessary to determine the optimal lag order before constructing the Var model, and choosing the appropriate lag time can not only guarantee the scientificity of the model, but also make the variables have dynamic characteristics. In this paper, SC criterion and AIC are used to judge the best lag order of the model. The test results are shown in Table 2. Table 2 shows that the AIC and SC values both reach the minimum when the variable lags the second order, which shows that the second order is the best lag order of the model.

Table 2: Test of the order of delay in Var model.

Lag	LogL	LR	FPE	AIC	SC
0	65.87489	NA	9.48431*	-9.74932	-11.84742
1	89.77491	148.93812	5.93832	-18.94412	-19.99588*
2	138.93135	47.98212*	2.08411	-19.08423*	-20.09459*

According to the test result of the lag order of Var model, the Var model is reconstructed. The output of the model is as shown in equation (4).

4.3 Robustness Test of Var Model

The robustness of Var model is very important to the research conclusion. This paper uses unit root test to test the robustness of Var model. The test result is shown in figure 1. It can be seen from Fig. 1 that all the unit roots of Var(-2) model constructed in this paper are in a single circle, and the Var model constructed in this paper is robust by robustness test.

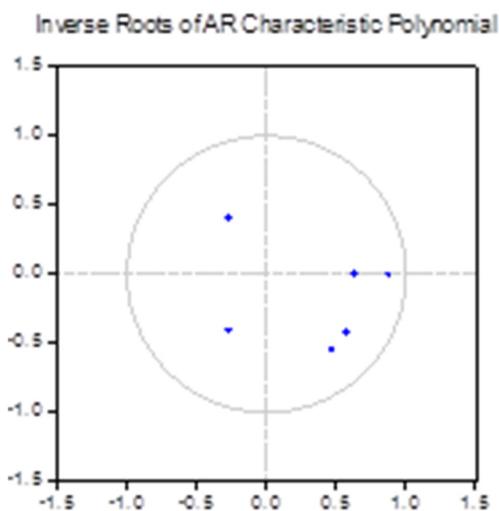


Figure 1: VAR Model Robustness Test Results.

4.4 Percy Grainger’s Causality Test

Granger causality tests were performed on $\ln w_z$, $\ln mn$ and $\ln cz$. The results are shown in Table 3. From Table 3, it can be seen that there is a mutual Granger causality between $\ln m_z$ and $\ln cz$, which shows that the price level and the resident consumption are Granger causality, and they are related and influence each other. $\ln mn$ is the Percy Grainger cause of $\ln cz$, and $\ln cz$ is not the Percy Grainger cause of $\ln mn$, which shows that the growth rate of information technology will affect the real economy of our country, but the real economy of our country will not affect the growth rate of information technology.

Table 3: Percy Grainger’s causality test.

Original hypothesis H_0	Lag period	F test value	Confidence Probability	Conclusion
$\ln w_z$ is not $\ln cz$'s Percy Grainger reason	2	2.7213	0.002	Refuse H_0
$\ln cz$ is not $\ln w_z$'s Percy Grainger reason	2	3.1653	0.025	Refuse H_0
$\ln mn$ is not $\ln cz$'s Percy Grainger reason	2	2.2093	0.037	Refuse H_0
$\ln cz$ is not $\ln mn$'s Percy Grainger reason	2	3.1403	0.026	Accept H_0

4.5 Impulse Response Test

In the Var model, the impulse response is mainly to

examine the impact of one variable’s change on another. This paper analyzes the impact of its growth rate and price level on China’s real economy, the result is shown in figure 2, where the red line shows the change trajectory of the variable after the pressure is applied, and the Blue Line shows the deviation region of plus or minus twice the standard deviation. As can be seen from figure 2, the impact of the growth rate of information technology on China’s real economy shows an obvious upward trend in the first and second periods, reaching the peak in the third period, and showing a clear downward trend after the third period, this shows that the appropriate growth of information technology is conducive to improving the level of consumption of residents, but the digital economy after a large-scale people’s lives, and form habits, such as online shopping is not conducive to China’s real economy. The impact of the price level on China’s real economy shows an obvious downward trend from the first to the sixth period, and the change tends to be stable after the sixth period, which shows that the rise of the price level is not conducive to the promotion of China’s real economy, this is also in line with the basic economic law.

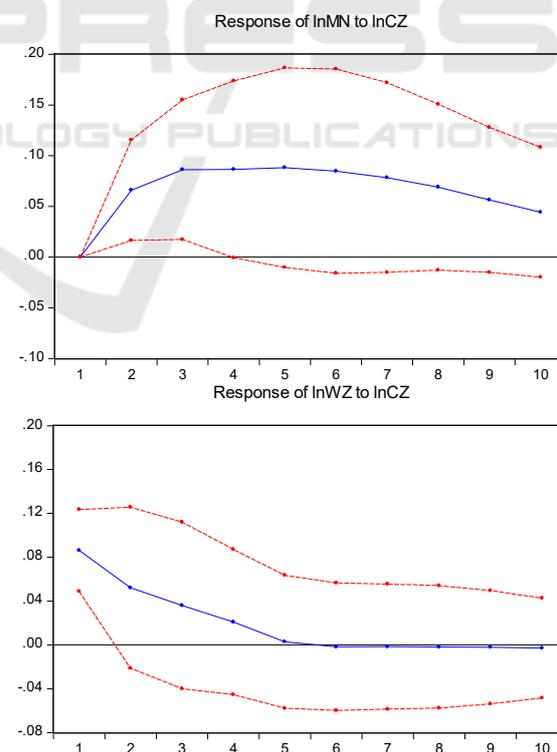


Figure 2: Impulse response of price level and information technology growth rate to China’s real economy.

5 CONCLUSIONS AND RECOMMENDATIONS

Based on the time series data from 2010 to 2020, this paper sorts out the existing research results in the academic circle, selects research variables to construct the Var model, and studies the relationship between digital economy and China's real economy, the following conclusions are obtained by Var Model: (1) the growth rate of digital economy and the regression coefficient of real economy in China are positive, showing a positive correlation between them. The impulse response analysis found that in the first and second periods, there was an obvious upward trend, reaching the peak in the third period, and after the third period, there was an obvious downward trend. This shows that the moderate growth of the digital economy is beneficial to the promotion of the consumption level of the residents, we will promote the development of our overall economic output. The excessive growth of digital economy is not conducive to the promotion of China's real economy. Attention must be paid to the integrated development of digital economy and real economy to form new industrial upgrading and innovation. (2) the regression coefficient between price level and real economy is negative, which shows that there is a significant negative correlation between them. The impulse response shows that there is an obvious downward trend from the first to the sixth period, and the change tends to be stable after the sixth period, which indicates that the rising of price level is not good for the promotion of China's real economy.

According to the above analysis, we can put forward countermeasures and suggestions to improve China's real economy. First, adjust the digital economy according to the actual economic situation. From the results of Var model, we can see that in different stages of economic development, the impact of digital economy on China's real economy is different. Second, external factors have been affected by the global epidemic since 2020, and the real economy has been severely impacted, and with the rapid development of information technologies such as big data, artificial intelligence, blockchain, and the meta-universe, the real economy and the digital economy have both grown and grown, but the digital economy is a part of the total economy, how to integrate the real economy and the digital economy, to upgrade industries and innovate, is one of the trends in the future. Third, stabilizing the price level is the first priority. Price level will

have an important impact on China's real economy, and there is a significant negative correlation between the two. Price is a key factor affecting the national economy and the people's livelihood, and also has a very important impact on social stability and harmony. The important aim of the implementation of the digital economy is to stabilize the economic development and promote the promotion of the national income level and the consumption level. In the implementation of the digital economy, we should proceed from the basic goal and promote the improvement of the real economy of our country, we will ensure steady and orderly economic development.

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