

## An Empirical Study on the Influencing Factors of Education Expenditure in China

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### Abstract

Education expenditure refers to the total expenditure of a country on education, which is a very important part of China's financial expenditure. Since the reform and opening up, China's total investment in financial education has increased significantly. However, due to the problems of economic structure and distribution, and China's population base is relatively large, the total amount of educational resources is always in shortage. Therefore, the empirical analysis of the influencing factors of China's education expenditure has important practical significance. Based on the econometric knowledge and framework system, this study first selects the statistical data from 2000 to 2018 to analyze the factors affecting the scale of education expenditure, then establishes an econometric model, numerically analyzes the relevant data with the help of econometric software, analyzes the relevant parameters and improves the relevant model, Then determine the final ideal influencing factor model of education expenditure, and finally expand the application of the obtained education expenditure model and put forward feasible suggestions.

### Keywords

Education Expenditure; Gross National Income; Expenditure.

### 1. Raising Question

Since the reform and opening up, the people's material living standard has been improving day by day. With the development and progress of society, education has been paid more and more attention. Education has become an important livelihood issue. Science and technology are the primary productive forces, and education is the source and foundation of this primary productive force. Therefore, the development of education is directly related to the development of people's material living standards. In the continuous international competition and development, China has more clearly realized the importance of education, put forward the strategy of rejuvenating the country through science and education and strengthening the country with talents, and constantly stressed the important role of education in national competition. [1]

For a long time, China's residents' demand for education consumption has increased year by year, but China's education investment channel is relatively single, which is mainly borne by the central government and local governments, which leads to the shortage of education funds, which greatly restricts the development of education. For a long time, China has supported the huge education scale with 25% of the world's students with 5% of the world's public funds. Internationally, there is a basic line to measure education investment, that is, when the per capita GDP reaches 800 ~ 1000 US dollars, the proportion of fiscal education expenditure in GDP should reach 4.07% ~ 4.25%, so as to realize the benign development of education and economy.

Through the above analysis, it can be seen that although the total investment in education in China has increased year by year, it is still insufficient compared with the increasing educational demand in China. To solve this problem, we should study the influencing factors of education expenditure, and then put forward targeted suggestions.

## 2. Theoretical Review

In terms of the scale of national education expenditure, domestic scholars have a wide range of research on the education expenditure of colleges and universities, and their achievements are also diverse. Li Tong (2013) published a review on the performance research of higher education financial expenditure, which starts with the current situation of higher education financial expenditure, objectively evaluates its operation and performance, and then puts forward many feasible countermeasures. Lu Deyue (2009) based on the structure and scale of China's education, through the analysis of income demand elasticity, compared with the development law of world education expenditure, and based on the data such as the ratio of China's financial education expenditure to GDP and total financial expenditure since the 1990s, [2] obtained the targeted education on China's education structure reform.

The research of this paper is divided into the following four modules:

First, it makes a theoretical analysis on the factors affecting China's education expenditure and determines the explanatory variables in the follow-up empirical analysis.

Second, according to the relevant econometric knowledge, establish the relevant multiple linear regression model.

Thirdly, the regression model is tested by autocorrelation and heteroscedasticity.

Fourth, according to the established education expenditure model, provide policy suggestions for the application in relevant fields.

## 3. Model Setting

gross national income

Gross national income is an important indicator to measure a country's economic development. The following will analyze its impact on education expenditure from several aspects.

First, the increase of gross national income will directly lead to the increase of national tax. National tax is a strong guarantee for national financial expenditure. The increase of national finance will make financial expenditure very abundant. Therefore, the expenditure on education will increase. Therefore, gross national income has an important impact on education expenditure.

Second, the increase of gross national income will promote technological innovation, because the increase of income will lead to the increase of financial expenditure, so as to increase investment in science and technology. The improvement of technology has greatly updated teaching equipment, which points out that it has contributed to the government's investment in education imperceptibly.

expenditure

Fiscal expenditure is not only an important measure of government transfer payment, but also the source power of education expenditure growth. Although the annual education expenditure will be adjusted according to institutional policies and relevant uncertain factors, the growth of fiscal expenditure undoubtedly gives the government more spending space, and then the positive promotion impact is much greater than that of other uncertain factors. Therefore, fiscal expenditure plays an important role in education expenditure.

Number of students in Colleges and Universities

The number of students in Colleges and universities directly reflects the scale of colleges and universities. As the fastest developing field of education in China, [3]higher education maintains a trend of rapid development in terms of enrollment, enrollment rate, number of teachers and number of schools. Therefore, the number of students in Colleges and universities can be directly used as an indicator to measure education investment.

#### Institutional factors

China's administrative system enables local governments to reasonably arrange expenditure according to the supply and demand of local education expenditure. Compared with the central government, local governments have more information advantages in terms of region, can understand in detail the requirements of local residents and the problems in the development of education, and ensure that the supply of Education can meet people's needs in time. Secondly, while developing education, China must also pay attention to the reasonable investment in projects such as people's livelihood security, which will affect the financial support for education.

#### social factors

The core of social factors is population. As the world's most populous country, China's population density is extremely large. The excessive growth of population will not only directly lead to the increase of education cost, but also strengthen the national load on education expenditure. Therefore, it will directly lead to the increase of government expenditure on education. Secondly, with the development of economy, people's living standards have been continuously improved, and their overall quality has been greatly improved. Especially in education, people's demand will be stronger and higher. In this process, there is no doubt that education expenditure will be increased.

## 4. Collection of Partial Data

**Table 1.** Data on education expenditure and influencing factors from 2000 to 2018

Major year	Education expenditure y (10000 yuan)	Gross national income X1 (100 million yuan)	Financial expenditure x2 (100 million yuan)	Number of students in ordinary colleges and universities X3 (10000)
2000	38490806	99066.1	15886.5	556.1
2001	46376626	109276.2	18902.58	719.1
2002	54800278	120480.4	22053.15	903.4
2003	62082653	136576.3	24649.95	1108.6
2004	72425989	161415.4	28486.89	1333.5
2005	84188391	185998.9	33930.28	1561.8
2006	98153087	219028.5	40422.73	1738.8
2007	121480663	270704	49781.35	1884.9
2008	145007374	321229.5	62592.66	2021
2009	165027065	347934.9	76299.93	2144.7
2010	195618471	410354.1	89874.16	2231.8
2011	238692936	4833928	109247.79	2308.5
2012	286553052	537329	125952.9	2391.3
2013	303647182	588141.2	140212.1	2468.1
2014	328064609	644380.2	151785.56	2547.7
2015	361291927	686255.7	175877.77	2625.3
2016	388883850	743408.3	187755.21	2695.8
2017	425620069	831381.2	203085.49	2753.6
2018	461429980	914327.1	220904.13	2831

After analyzing the factors affecting education expenditure, we select the three main internal factors as the three explanatory variables of econometric analysis, which are: gross national income x1, fiscal expenditure X2, the number of students in Colleges and universities X3, and the explanatory variable is education expenditure y. [4]

On this basis, the data of gross national income, fiscal expenditure and the number of students in Colleges and universities from 2000 to 2018 are selected. The data are from the statistical yearbook 2019 on the official website of the National Bureau of statistics. See Table 1 for details

### 5. Model Initial Estimation

Use Eviews software to analyze the correlation coefficient, correlation diagram and correlation trend diagram of explanatory variables and explained variables x1, X2, X3 and y, as shown in the figure below.

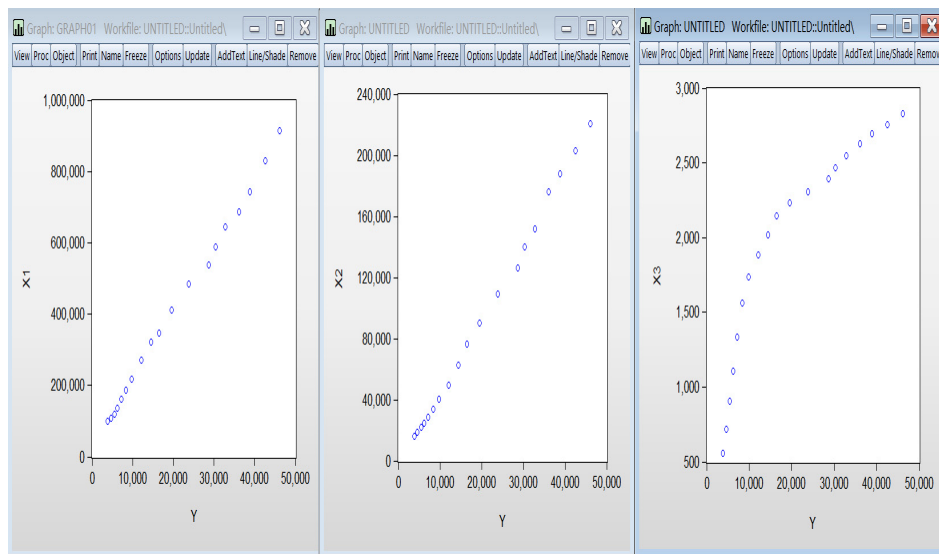


Figure 1. Fitting graph

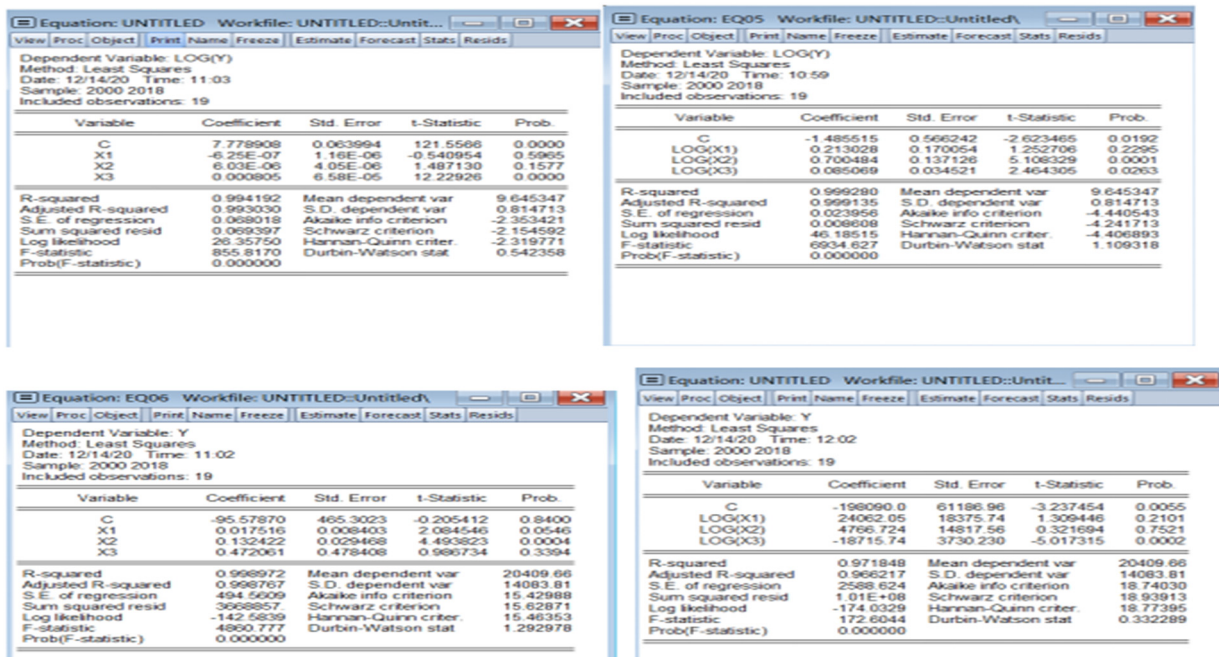


Figure 2. Different form models

It can be seen from the figure that with the growth of time, education expenditure y and gross national income x1, financial expenditure x2 and the number of students in Colleges and universities X3 show different growth ranges, the growth ranges of the three are relatively large and obvious, and all explanatory variables and explained variables show a growth trend. Now the function is preliminarily set as linear, double logarithm, logarithm, exponent, etc., and then compared and analyzed.

It can be seen from the above figure that the linear regression model has high goodness of fit, so this model is selected for the next regression analysis test.

Based on the above correlation analysis, it is determined that there is a high linear correlation between education expenditure y and gross national income x1, financial expenditure x2 and the number of students in Colleges and universities X3. Therefore, the multiple linear regression model is established as: Use Eviews software to estimate the multiple regression equation, and the relevant parameters are shown in Figure 3 below.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-95.57870	465.3023	-0.205412	0.8400
X1	0.017516	0.008403	2.084546	0.0546
X2	0.132422	0.029468	4.493823	0.0004
X3	0.472061	0.478408	0.986734	0.3394

R-squared	0.998972	Mean dependent var	20409.66
Adjusted R-squared	0.998767	S.D. dependent var	14083.81
S.E. of regression	494.5609	Akaike info criterion	15.42988
Sum squared resid	3668857.	Schwarz criterion	15.62871
Log likelihood	-142.5839	Hannan-Quinn criter.	15.46353
F-statistic	4860.777	Durbin-Watson stat	1.292978
Prob(F-statistic)	0.000000		

Figure 3. Relevant parameters

Report form:

$$\hat{y}_i = -95.57870 + 0.017516x_1 + 0.132422x_2 + 0.472061x_3$$

$$SE(\hat{\beta}) \quad (465.3023) \quad (0.008403) \quad (0.029468) \quad (0.478408)$$

$$t = (-0.205412) \quad (2.084546) \quad (4.493823) \quad (0.986734)$$

$$R^2 = 0.998972 \quad \bar{R}^2 = 0.998767$$

$$DW = 1.292978 \quad F = 4860.777$$

$$\hat{\sigma} = 494.5609 \quad \sum e_i^2 = 3668857$$

Goodness of fit test: = 0.998972, close to 1, indicating that the model has a high degree of fit to the sample data, or 99.8972% of the explained variable education expenditure y can be explained by gross national income x1, financial expenditure x2 and the number of students in ordinary colleges and universities X3.

=, assuming that other explanatory variables remain unchanged, for every 100 million yuan increase in the explanatory variable GNI x1, the education expenditure y of the explanatory

variable will increase by billion yuan on average, which is consistent with the actual economic significance.

=, assuming that other explanatory variables remain unchanged, the explanatory variable fiscal expenditure x2 will increase by 100 million yuan, and the explanatory variable education expenditure y will increase by billion yuan on average, which is consistent with the actual economic significance.

### 6. Multicollinearity Test

Correlation coefficient test:

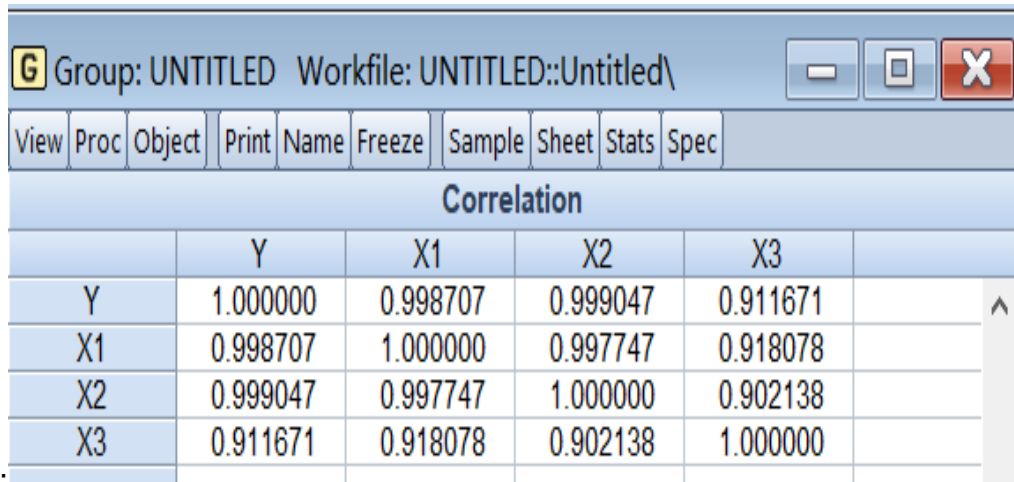


Figure 4. Correlation coefficient

It can be seen from the figure that the correlation coefficient between explanatory variables is at least 0.902138 and greater than 0.8, indicating that the model has significant multicollinearity.

Auxiliary regression model test and variance expansion factor test:

When there are more than two explanatory variables and there is a complex correlation between them, the multicollinearity can be tested by establishing an auxiliary regression model between explanatory variables. The specific operations are as follows:

The explanatory variable is education expenditure y, and the explanatory variables are gross national income x1, financial expenditure x2 and the number of students in Colleges and universities X3. Eviews is used to conduct multiple linear regression on relevant variables, and the parameter statistical chart is shown in the figure below

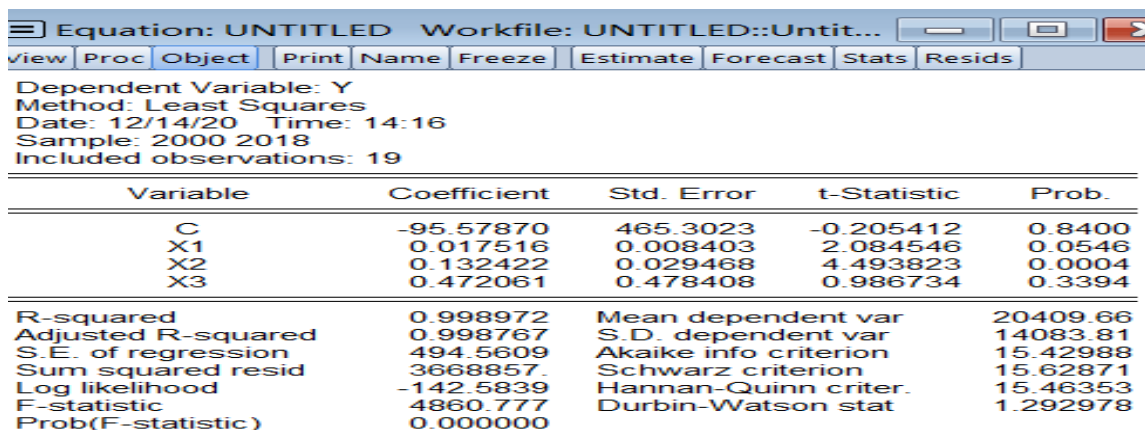


Figure 5. Statistical chart of multiple linear regression parameters

The regression model obtained from the figure is:

$$\hat{y}_i = -95.57870 + 0.017516x_1 + 0.132422x_2 + 0.472061x_3$$

The explanatory variables are gross national income x1, education expenditure y, financial expenditure x2 and the number of students in Colleges and universities X3. Eviews is used to carry out multiple linear regression on the relevant variables to obtain the parameter statistical chart, as shown in the figure

Equation: UNTITLED Workfile: UNTITLED::Untit...  
 View Proc Object Print Name Freeze Estimate Forecast Stats Resids

Dependent Variable: X1  
 Method: Least Squares  
 Date: 12/14/20 Time: 14:18  
 Sample: 2000 2018  
 Included observations: 19

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	14672.13	12025.35	1.220100	0.2413
Y	12.82397	6.151927	2.084546	0.0546
X2	0.997030	1.193900	0.835104	0.4168
X3	21.35944	12.16681	1.755550	0.0996

R-squared	0.997856	Mean dependent var	411088.4
Adjusted R-squared	0.997427	S.D. dependent var	263829.1
S.E. of regression	13381.94	Akaike info criterion	22.02586
Sum squared resid	2.69E+09	Schwarz criterion	22.22469
Log likelihood	-205.2457	Hannan-Quinn criter.	22.05951
F-statistic	2327.162	Durbin-Watson stat	1.182915
Prob(F-statistic)	0.000000		

Figure 6. Parameter statistical chart

The regression model obtained from the figure is:

$$X1 = 14672.13 - 12.82397*Y + 0.997030*X2 + 21.35944*X3$$

The explanatory variable is fiscal expenditure X2, and the explanatory variables are education expenditure y, gross national income X1 and the number of students in Colleges and universities X3. Eviews is used to conduct multiple linear regression on the relevant variables to obtain the parameter statistical chart, as shown in the figure

Equation: UNTITLED Workfile: UNTITLED::Untit...  
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Dependent Variable: X2  
 Method: Least Squares  
 Date: 12/14/20 Time: 14:21  
 Sample: 2000 2018  
 Included observations: 19

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2231.061	2602.407	-0.857307	0.4048
Y	4.333077	0.964230	4.493823	0.0004
X1	0.044560	0.053359	0.835104	0.4168
X3	-5.655068	2.417283	-2.339431	0.0336

R-squared	0.998604	Mean dependent var	93563.22
Adjusted R-squared	0.998325	S.D. dependent var	69118.62
S.E. of regression	2829.028	Akaike info criterion	18.91792
Sum squared resid	1.20E+08	Schwarz criterion	19.11675
Log likelihood	-175.7202	Hannan-Quinn criter.	18.95157
F-statistic	3576.516	Durbin-Watson stat	1.577952
Prob(F-statistic)	0.000000		

Figure 7. Parameter statistical chart

The regression model obtained from the figure is:

$$X2 = -2231.061 + 4.333077*Y + 0.044560*X1 -5.655068*X3$$

The explanatory variables are the number of students in Colleges and universities X3, and the explanatory variables are education expenditure y, gross national income X1 and fiscal expenditure x2. Eviews is used to carry out multiple linear regression on the relevant variables to obtain the parameter statistical chart, as shown in the figure

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	445.3458	214.8596	2.072730	0.0558
Y	0.129121	0.130857	0.986734	0.3394
X1	0.007980	0.004545	1.755550	0.0996
X2	-0.047272	0.020207	-2.339431	0.0336

R-squared	0.892600	Mean dependent var	1938.158
Adjusted R-squared	0.871120	S.D. dependent var	720.4871
S.E. of regression	258.6543	Akaike info criterion	14.13353
Sum squared resid	1003530.	Schwarz criterion	14.33235
Log likelihood	-130.2685	Hannan-Quinn criter.	14.16718
F-statistic	41.55480	Durbin-Watson stat	0.723511
Prob(F-statistic)	0.000000		

Figure 8. Parameter statistical chart

The regression model obtained from the figure is:

$$X3 = 443.3458+ 0.129121*Y + 0.007980*X1 -0.047272*X2$$

The goodness of fit determination coefficient, F statistic value, adjoint probability of F value and these statistical parameters of the above four auxiliary models are summarized in the table

Model	R <sup>2</sup>	F	F Probability value
Y=f (X1, X2, X3)	0.998972	4860.777	0.000000
X1=f (Y, X2, X3)	0.997856	2327.162	0.000000
X2=f (Y, X1, X3)	0.998604	3576.516	0.000000
X3=f (Y, X1, X2)	0.892600	41.55480	0.000000

Figure 9. Statistical chart of auxiliary regression model parameters



### 7. Model Test

DW inspection

According to figure 2, the DW value of the model is 0.984576. If the given significance level = 0.05, check the DW statistical table, DL = 0.998, Du = 1.676, and  $0 < DW = 0.984576 < DL = 0.998$ , indicating that there is a first-order positive autocorrelation in the model.

Partial correlation coefficient test:

Use Eviews software to test the partial correlation coefficient of the model, and select the lag period of 12 to obtain the autocorrelation coefficient and partial autocorrelation coefficient of each period of residual error and, as shown in the figure

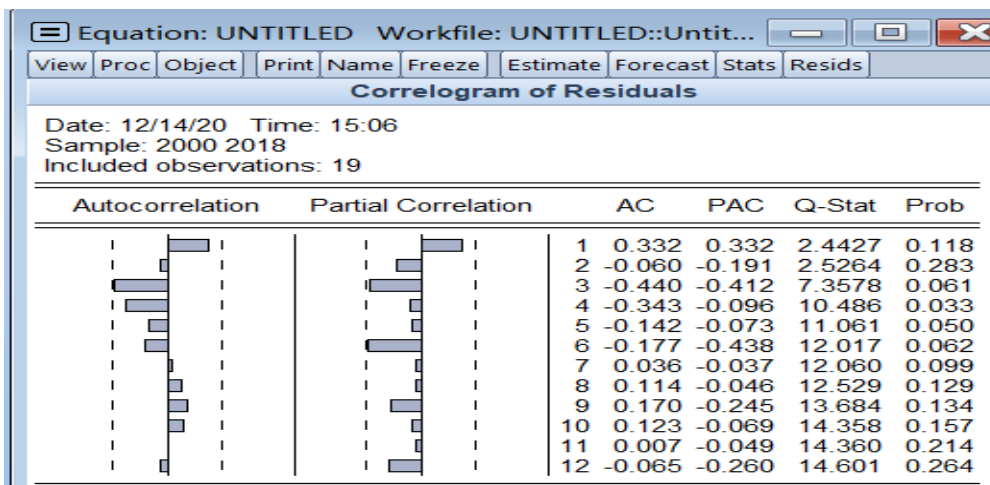


Figure 10. Partial correlation coefficient diagram

It can be seen from the above figure that the histograms of partial autocorrelation coefficient PAC in lag period are all in the dotted line, indicating that the regression model may have autocorrelation.

BG inspection:

Use Eviews software to perform BG test on the model, and select the lag period as 1. The results are shown in the figure

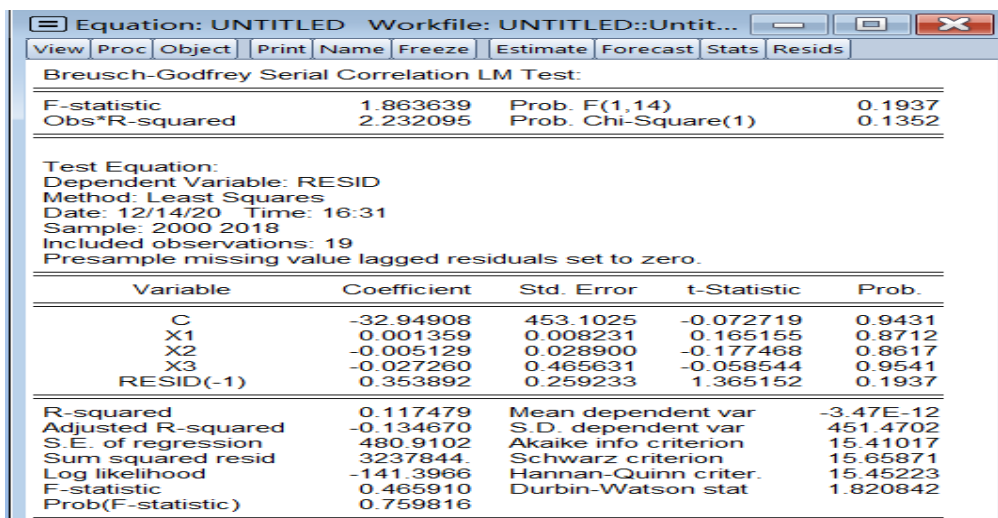


Figure 11. BG test parameter diagram with one lag period

As can be seen from the figure,  $nR^2 = 2.232095 > \chi^2_{\alpha}(1) = 3.84146$ , The absolute values of T statistics of ET-1 regression coefficients are less than 2, and the regression coefficients are significantly non-zero, indicating that the model has first-order autocorrelation.

The input lag is 2, and the results are shown in the figure

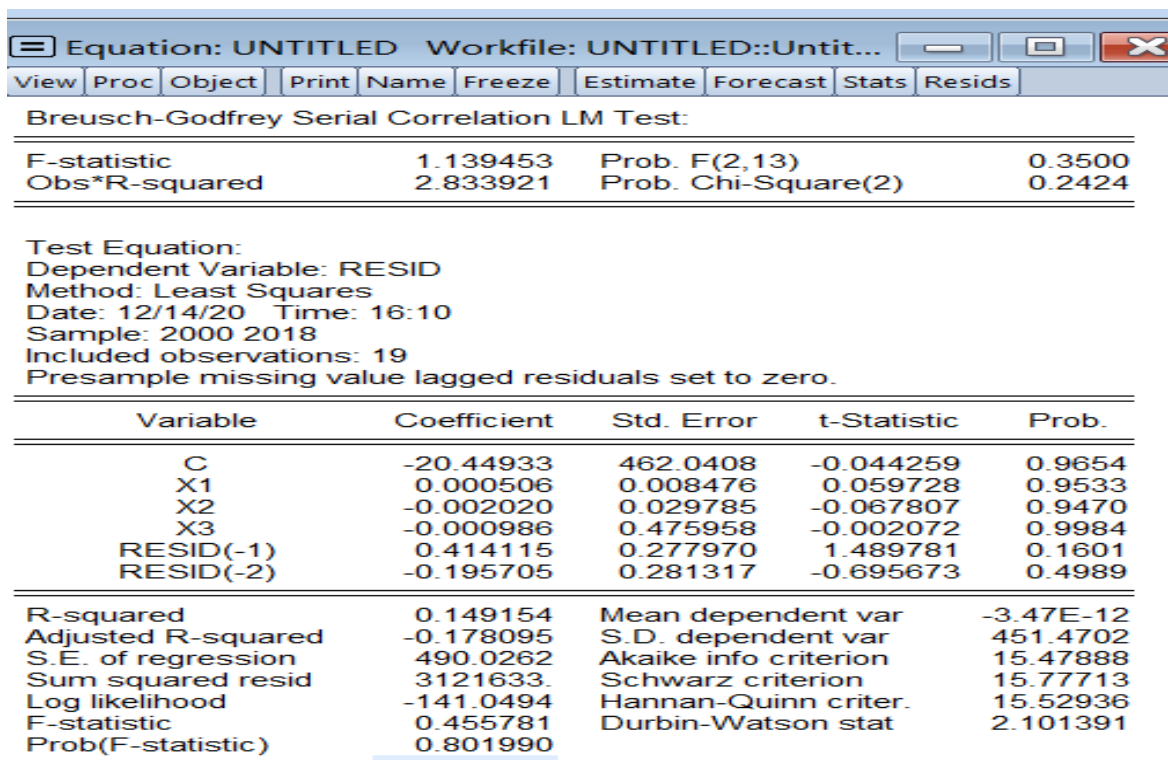


Figure 12. BG test parameter diagram with two lag period

## 8. Conclusions and Recommendations

### 1. Related applications

The education expenditure model can analyze and predict the annual budget of this project in China.

The education expenditure model can largely reflect the influencing and restrictive factors affecting the government's education expenditure. If we feed back to the government in time, the government can improve in relevant aspects, which has achieved the policy purpose.

The scale analysis model of education expenditure can indirectly analyze and refer to other government expenditure projects, which is of far-reaching significance to the macro control of the government.

Accelerating regional development and urbanization can improve the urbanization rate and enable residents to enjoy better education services, but the expansion of demand will lead to the government to increase investment in education and expand education expenditure.

Rational division of the government's administrative structure can fundamentally improve the efficiency of education expenditure. At the same time, it can also optimize the government's capital investment in other livelihood projects and balance the proportion of education expenditure at all levels. According to the correlation between the number of students in ordinary colleges and universities and financial expenditure, part of the overflow funds can be invested in small and primary schools, or upgrade teaching equipment to avoid waste of resources to a certain extent.

Optimize the scale of government education expenditure and standardize the model management of education expenditure. Strengthen the supervision of fund utilization, such as regular account verification. China's regional economic development is extremely unbalanced, and there is a wide gap in financial resources between different regions. We should constantly improve the intergovernmental transfer payment system in order to narrow the gap between regional education expenditure and development level.

With the acceleration of China's urbanization process and the rapid economic development, real estate has developed rapidly. At present, it plays an important role in economic development, has become a pillar industry of the economy, and its contribution to GDP is becoming increasingly prominent. It can drive the development of multiple industrial chains, from upstream production to downstream residence, stimulate the development of multiple industries, increase the contribution of various industries to GDP, and thus play an important role in economic development. With the continuous development of Hefei, a large number of people flow in, which leads to the increase of house purchase demand. Sufficient labor force, [2] employment and migrant population provide a broad consumer market for real estate in Hefei. At the same time, the development of urbanization is also that the population will be further concentrated. The radiation effect of mega cities on surrounding cities is becoming more and more obvious, and the degree of regional integration will be further improved, to drive the housing demand in the suburbs and surrounding areas, which will also stimulate the vitality of the city's real estate market.

As an integral part of GDP, the total retail sales of social consumer goods are the total amount of consumer goods directly sold by various industries of the national economy to urban and rural residents and social groups. It can reflect the social supply of various commodities from all walks of life and the total amount of consumer goods of residents; It is an important index to study the changes of domestic retail market and reflect the degree of economic prosperity. The troika driving economic growth are investment, export and consumption. The total retail sales of social consumer goods reflect the level of social consumption.

## 2. Proposal

As a pillar industry to promote economic growth, real estate has played an important role in economic growth, and its multiplier effect on economic growth is very prominent. Due to the huge radiation range of real estate, most industries are driven by it, which also leads to the contribution rate of real estate to economic growth of more than 10% in recent years. According to the estimates of relevant experts, for every 1 percentage point increase in investment growth in real estate, the growth rate of GDP will increase by 0.9 percentage points; In addition, according to incomplete statistics, the real estate industry has absorbed at least 30% of the floating population; Therefore, from the perspective of policy, it is suggested to focus on stability. Under the condition that the overall economic environment has not changed greatly, it is best to focus on strict real estate regulation policies and still play the role of long-term mechanism. The real estate industry is different from the stock market. The impact of house price fluctuations is immeasurable. Therefore, we must not let this industry affecting the social economy in an uncontrollable state, so it must be stable.

## References

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