

On the Econometric Model Setting of Influencing Factors of Consumer Goods Expenditure in China

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Abstract

It has been forty-two years since the reform and opening up. In these forty-two years, under the influence of emancipating the mind, China's economic and social development is rapid, its comprehensive national strength is significantly enhanced, and its economic strength is becoming stronger and stronger. Economic development is inseparable from everyone's consumption every day. Therefore, residents' income is also growing continuously and rapidly, and the living standards of urban and rural residents are significantly improved. Achieving common prosperity does not rely solely on the improvement of experience. At the same time, China's distribution gap continues to narrow, which can be described as the implementation of all-round economic development. With these, China's consumption quality has improved significantly, the proportion of food expenditure has gradually decreased, and the living area has increased significantly. The continuous improvement of living standards is accompanied by the promotion of consumption. Especially in recent years, the expenditure of Chinese residents on consumer goods is also increasing, especially after the 18th National Congress of the Communist Party of China. Combined with the actual situation of China's residents' consumption expenditure and consumption tendency, it is concluded that the following factors have a significant impact on the consumption expenditure of consumer goods, including national income, national living habits and shopping tendency, preventive investment and savings, economic market maturity and national macro-control policies. Due to the diversity of factor analysis variables and the characteristics of a large number of potential production and measurement variables, structural equation analysis is selected as the research method of this paper.

Keywords

Consumer Goods Expenditure; Income; Tax.

1. Raising Question

Consumption is a unique human behavior. Marx pointed out very early in *Das Kapital* that "in order to create history, people must be able to live, but in order to live, they first need to eat, live, wear and other things." It can be seen that consumption is the primary problem of human life. Residents' consumption is an important part of consumption and a necessary prerequisite for residents' survival, reproduction and development. In the market economy, it is the continuous and sustainable development of residents' consumption that provides an inexhaustible driving force for - China's economic and social development. On the one hand, the continuous development of residents' consumption constantly makes the products produced become "realistic" products.

The sustainable development of residents' consumption is of great significance. However, for a long time, the development of residents' consumption in China is lack of sustainability. The specific performance is the long-term depression of residents' consumption and the sluggish development of residents' consumption. The resident consumption rate is the proportion of a country's total consumption in the gross national product. It is an important indicator to measure the growth level of a country's resident consumption. Internationally, since 1995, the average consumption rate of residents in Britain, France, Germany, Japan and South Korea has "been maintained at 55% - 57%. During this period, the resident consumption rate in the United States remained above 60% and rose to more than 70% after 2001. Japan and South Korea, which are located in the same Asian region as China, also maintain a household consumption rate of 50% - 70%. In the same period, China's household consumption rate has always been in a depressed state - staying below 50%, turning down from the highest level of 45.5% since 2000, and hitting an unprecedented record low of 35.3% in 2008. The long-term low consumption rate shows that China's residents' consumption has been sluggish and weak growth for a long time. On the other - hand, since the beginning of this century, the development of residents' consumption in China has shown an obvious stagnation. Since 2000, China's resident consumption rate has accelerated year by year. Not only the upgrading of consumption structure is delayed, but also in medical treatment, education, house purchase, and even necessary for residents' daily life, such as ginger, garlic, oil and rice, have become the difficulties of residents' consumption. In addition, China's residents' consumption is increasingly contradictory with economic growth mode, social development level, resources, environment, population and other factors. This shows that the development of residents' consumption in China is lack of sustainability. At this time, we can design an econometric model to find out the most important factors affecting China's residents' consumer goods expenditure, and finally make a targeted plan to improve China's consumer goods expenditure.

2. Theoretical Review

First, a country's GDP and GNP determine a country's basic consumption level, which is the most basic factor affecting China's consumption level.

China's residents' income will also affect consumption. Let the function form be $C = C_0 + CY$, in the short term, no matter how much disposable income is, whether it is equal to zero or not, consumer expenditure is always greater than zero. Consumer spending when disposable income equals zero comes from previous savings or current debt. This part of consumption expenditure has nothing to do with disposable income, which is called spontaneous consumption C_0 . With the increase of disposable income, consumption also increases. Consumption that increases with the increase of disposable income is called induced consumption C , but the increase of consumer expenditure is less than that of disposable income. At the same time, $0 < C < 1$, which is more in line with the practical significance. The funds used for consumption should be less than the disposable income $y > 0$. When people's income is 0, people borrow money to buy some necessities in order to meet the basic living conditions.

Classical economists (Marshall) believe that interest is the reward for delaying consumption. People have a time preference for income or consumption: for the same dollar, the utility of current consumption is always more than that of future consumption. In order to make people willing to reduce current consumption and move part of current consumption to future consumption, certain remuneration must be given. The reward is interest. We set the interest rate as R . the higher the interest rate, the more people are reluctant to use their funds for consumption and are more willing to use their funds for savings. The impact of interest rate on consumption can be explained by two effects One is the income effect, the other is the substitution effect. The generation of substitution effect makes consumers save part of their

income, sacrifice current consumption and increase future consumption. Through saving, consumers can maximize the current and future total utility. Substitution effect has a reverse relationship with consumption and income effect.

The rise of interest rate can increase the total income of consumers. From the perspective of substitution, the rise of interest rate can promote consumers to increase consumption. There is a positive relationship between income effect and consumption.

The size of the total effect is equal to the sum of the substitution effect and the income effect. Whether the total effect has a positive or negative relationship with the current consumption depends on the arithmetic symbol of the sum. If the sum is positive, the two have a positive relationship, and vice versa.

Tax revenue is the main form and source of revenue of the state (government) public finance. The essence of tax is a special distribution relationship formed by the state to meet the social and public needs, rely on public power, participate in the distribution of national income and forcibly obtain financial income in accordance with the standards and procedures stipulated by law. It reflects a specific distribution relationship between the state and taxpayers in the interest distribution of collection and tax payment under a certain social system [1]. Compared with other distribution methods, tax has the characteristics of mandatory, free and fixed. At the same time, it will also affect residents' income, thus affecting residents' consumption. At the same time, tax itself will also affect the expenditure of consumer goods. For example, the setting of tariffs and consumption taxes will affect consumers to choose consumer goods and reduce people's desire to consume. As an economic means, tax not only undertakes the function of financing public goods, but also undertakes the function of regulating the economic activities of microeconomic subjects. Tax will affect the amount or type of consumption by changing or affecting the choice of taxpayers. As an operational policy tool, tax can affect the behavior of taxpayers, to adjust the combination and quantity of consumer goods at the same time. Therefore, expanding consumption can start with the change of tax rate and the choice of tax types.

3. Model Setting

Set the explanatory variable

X1 as the total value of China's GDP

X2 is the income of Chinese residents

X3 is the total amount of taxes

The explanatory variable y is China's consumption expenditure

4. Collection of Partial Data

5. Correlation Diagram Analysis

Enter scat X1 y in eviews3.0 respectively

SCAT X2 Y

SCAT X3 Y

According to the correlation chart, there is a positive linear correlation between the explanatory variables GDP x1, gross national income X2, various taxes X3 and the total retail sales of social consumer goods y.

Table 1. China's consumption expenditure from 2000 to 2019

	Total retail sales of social consumer goods / Y (100 million yuan)	GDP / X1 (100 million yuan)	Gross national income / X2 (100 million yuan)	Various taxes / X3 (100 million yuan)
2000	35647.9	90564.4	89366.5	10682.6
2001	39105.7	100280.1	99066.1	12581.5
2002	43055.4	110863.1	109276.2	15301.4
2003	48135.9	121717.4	120480.4	17636.5
2004	52516.3	137422	136576.3	20017.3
2005	59501	161840.2	161415.4	24165.7
2006	68352.6	187318.9	185998.9	28778.5
2007	79145.2	219438.5	219028.5	34804.4
2008	93571.6	270092.3	270704	45622.0
2009	114830.1	319244.6	321229.5	54223.8
2010	133048.2	348517.7	347934.9	59521.6
2011	158008	412119.3	410354.1	73210.8
2012	187205.8	487940.2	483392.8	89738.4
2013	214432.7	538580	537329	100614.3
2014	242842.8	592963.2	588141.2	110530.7
2015	271896.1	641280.6	642097.6	119175.3
2016	300930.8	685992.9	683390.5	124922.2
2017	332316.3	740060.8	737074	130360.7
2018	366261.6	820754.3	820099.5	144369.9
2019	380986.9	900309.5	896915.6	156402.9

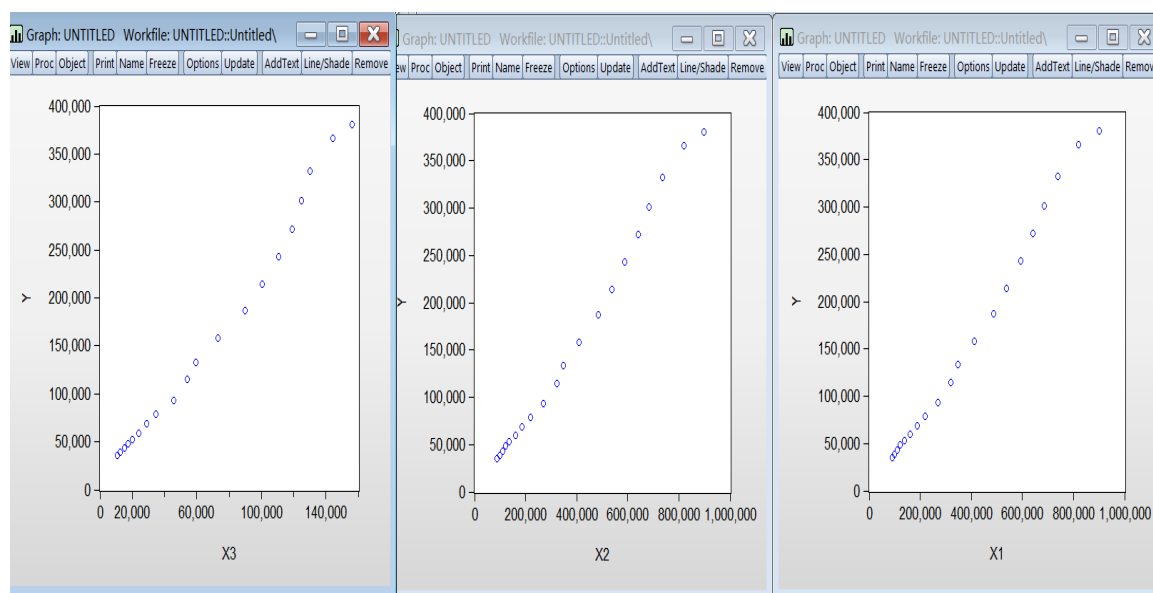


Figure 1. Correlation diagram

6. Estimation and Adjustment of Model

Based on the above data, the model is preliminarily established

$$Y = D + ax_1 + bx_2 + cx_3 + U \text{ (linear model)}$$

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-21656.85	5675.788	-3.815656	0.0015
X1	1.299113	1.507143	0.861971	0.4014
X2	-0.586547	1.485002	-0.394981	0.6981
X3	-1.443461	0.790819	-1.825275	0.0867

R-squared	0.993961	Mean dependent var	161089.5
Adjusted R-squared	0.992828	S.D. dependent var	117884.4
S.E. of regression	9983.273	Akaike info criterion	21.43207
Sum squared resid	1.59E+09	Schwarz criterion	21.63121
Log likelihood	-210.3207	Hannan-Quinn criter.	21.47094
F-statistic	877.7448	Durbin-Watson stat	0.620325
Prob(F-statistic)	0.000000		

Figure 2. Preliminary model

$$Y = -21656.851389 + 1.29911286953 \cdot X_1 - 0.586546856014 \cdot X_2 - 1.4434613543 \cdot X_3$$

$$T = (-3.815656) \quad (0.861971) \quad (-0.394981) \quad (-1.825275)$$

$$R = 0.993961 \quad \text{adjust}R = 0.992828 \quad DW = 0.620325 \quad F = 877.7448$$

It can be seen that although the goodness of fit of the model is very high, the t-test of x1, X2 and X3 fails, and the coefficient symbols of x2 and X3 are contrary to expectations, which indicates that there may be serious multicollinearity. Moreover, according to DW test, DL = 0.998, Du = 1.676 can be obtained by looking up the table, and the model still has autocorrelation.

F-statistic	5.193436	Prob. F(8,11)	0.0071
Obs*R-squared	15.81331	Prob. Chi-Square(8)	0.0451
Scaled explained SS	3.129697	Prob. Chi-Square(8)	0.9260

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.39E+08	1.59E+08	2.132718	0.0563
X1^2	0.456541	0.399491	1.142807	0.2774
X1*X2	-0.629981	0.410146	-1.535993	0.1528
X1*X3	-1.035523	2.141847	-0.483472	0.6382
X1	-51480.58	24071.03	-2.138695	0.0557
X2*X3	2.986344	2.177008	1.371765	0.1975
X2	48465.62	23397.14	2.071433	0.0626
X3^2	-5.462962	1.846914	-2.957886	0.0130
X3	12387.96	19487.37	0.635691	0.5380

R-squared	0.790666	Mean dependent var	79732594
Adjusted R-squared	0.638422	S.D. dependent var	64333751
S.E. of regression	38684741	Akaike info criterion	38.08195
Sum squared resid	1.65E+16	Schwarz criterion	38.53003
Log likelihood	-371.8195	Hannan-Quinn criter.	38.16942
F-statistic	5.193436	Durbin-Watson stat	1.906377
Prob(F-statistic)	0.007101		

Figure 3. White test model

According to the white test, it can be seen from the input probability value (P value), as long as the significance level is greater than 0.0435, it can be considered that the function has heteroscedasticity, P = 0.0479 is less than 0.05, reject the assumption that there is no heteroscedasticity, and consider that the model has heteroscedasticity.

It can be seen that although the goodness of fit of the model is very high, the t-test of X1 X3 fails, and the coefficient symbol of X1 X3 is contrary to the expectation, which indicates that there may be serious multicollinearity. Moreover, according to the DW test, $DL = 1.00$, $Du = 1.68$ can be obtained by looking up the table, and the autocorrelation of the available model cannot be judged. At the same time, according to the white test, it can be seen from the input probability value (P value) that if the significance level is greater than 0.0435, the function can be considered to have heteroscedasticity, $P = 0.0294$ less than 0.05. The assumption that there is no heteroscedasticity is rejected and the model is considered to have heteroscedasticity. It is concluded that the goodness of fit of the linear model is good and in line with the setting of the model.

7. Eliminate Multicollinearity

Check the correlation coefficient matrix entered by entering cor y X1 x2 X3 in the command window according to the correlation coefficient.

Correlation					
	Y	X1	X2	X3	
Y	1.000000	0.996340	0.996303	0.992524	
X1	0.996340	1.000000	0.999983	0.998240	
X2	0.996303	0.999983	1.000000	0.998179	
X3	0.992524	0.998240	0.998179	1.000000	

Figure 4. Correlation coefficient

It can be seen from the correlation coefficient matrix that the correlation coefficients between the explained variable total retail sales of social consumer goods y and GDP x1, gross national income x2 and various taxes X3 are 0.996340, 0.996303 and 0.992524 respectively. The absolute values are greater than 0.6, which preliminarily shows that there may be a positive and highly linear correlation between the explained variable y of total retail sales of social consumer goods and GDP x1, gross national income x2 and various taxes X3. The correlation coefficient between explanatory variables is high, and there is serious multicollinearity between explanatory variables, according to the partial correlation coefficient, the strongest correlation between X1 and Y explained variables can be found, or an auxiliary regression model can be made to establish the auxiliary regression model of each explained variable to the other explained variables.

Further, with the help of auxiliary regression model test and variance expansion factor test, Eviews 3.0 related operations are carried out:

ls x1 c x2 x3

Genr VIF1=1/(1-r^2)

Genr TOL1=1/VIF1

X1 = 981.159457738 + 0.980651383833*X2 + 0.116477044355*X3

R=0.999967, F=256258.9, prob(F)= 0.000000

VIF1=1/ (1- R) =1/(1-r^2) = 30149.10, TOL1=1/VIF1

ls x2 c x1 x3

Genr VIF2=1/(1-r^2)

Genr TOL2=1/VIF2

X2 = -739.04337658 + 1.01011177982*X1 - 0.0673165530854*X3

R=0.999966, F=247587.3, prob(F)= 0.000000

VIF2=1/(1- R) =1/(1-r^2)= 29128.92, TOL2=1/VIF2

ls x3 c x1 x2

Genr VIF3=1/(1-r^2)

Genr TOL3=1/VIF3

X3 = -4920.42619565 + 0.423053618095*X1 - 0.237367989638*X2

R=0.996540, F=2447.990, prob(F)= 0.000000

VIF3=1/ (1- R) =1/(1-r^2) = 3288.9988, TOL3=1/VIF

Table 2. Auxiliary regression model

Model	R ²	F statistic	Adjoint probability of F	Variance expansion factor Vif	ToleranceTOL=1/vif
X1=f(x2,x3)	0.999967	256258.9	0.00000	30149.10	3.32E-05
X2=f(x1,x3)	0.999966	247587.3	0.00000	29128.92	3.43E-05
X3=f(x1,x2)	0.996540	2447.990	0.00000	3288.9988	0.003460

For the F statistics of the above auxiliary regression model, the adjoint probabilities are close to zero or less than the significance level of 0.05, indicating that the model has serious multicollinearity. This conclusion can also be obtained from the fact that the difference expansion factor (VIF) of all parties is greater than 10 and the tolerance is less than 0.1.

Finally, the regression model is established according to the principle of stepwise regression Firstly, we establish a univariate regression model.

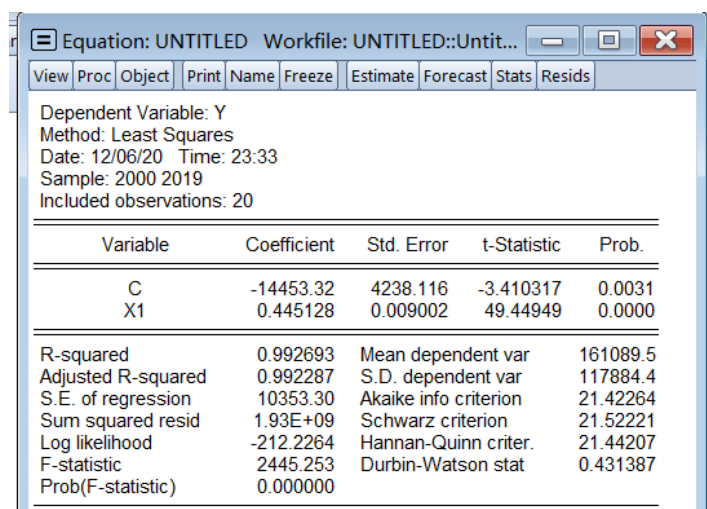


Figure 5. Univariate regression model (1)

According to the correlation coefficient chart, the correlation coefficient between Y and X1 is the largest, so the univariate basic linear regression model of Y and X1 is established first.

$$Y = bx_1 + a + u$$

$$Y = -14453.3181 + 0.4451 * x_1$$

The second variable is introduced into the univariate regression model, and a total of two binary regression models are established. A better model is selected from these models. The selection requires that each explanatory variable in the model has a significant impact, the parameter symbol is correct, and the adjusted R value is improved.

First, X2 is introduced

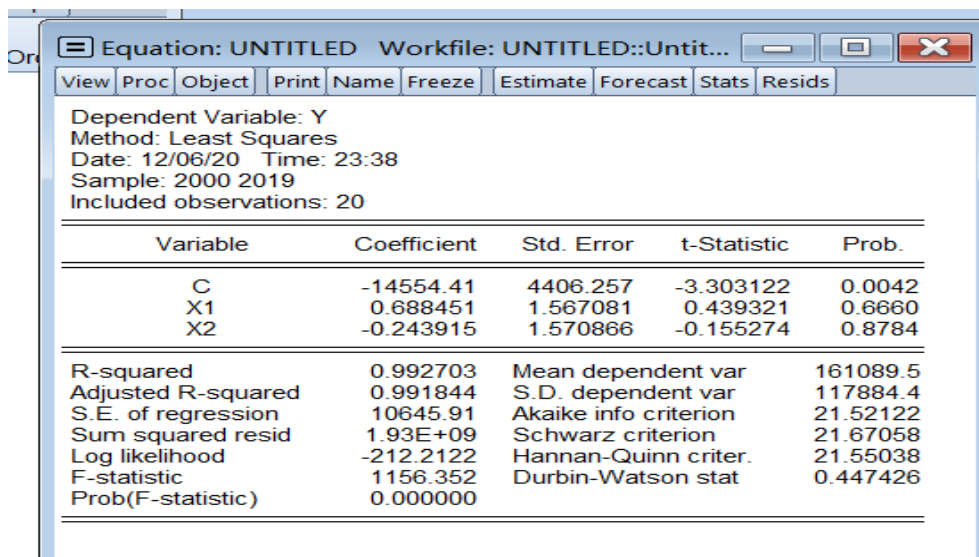


Figure 6. Univariate regression model (2)

$$Y = -14554.4063289 + 0.688451321011 * X_1 - 0.243915336223 * X_2$$

$$T = (-3.303122) \quad (0.439321) \quad (-0.155274)$$

Introduction x3

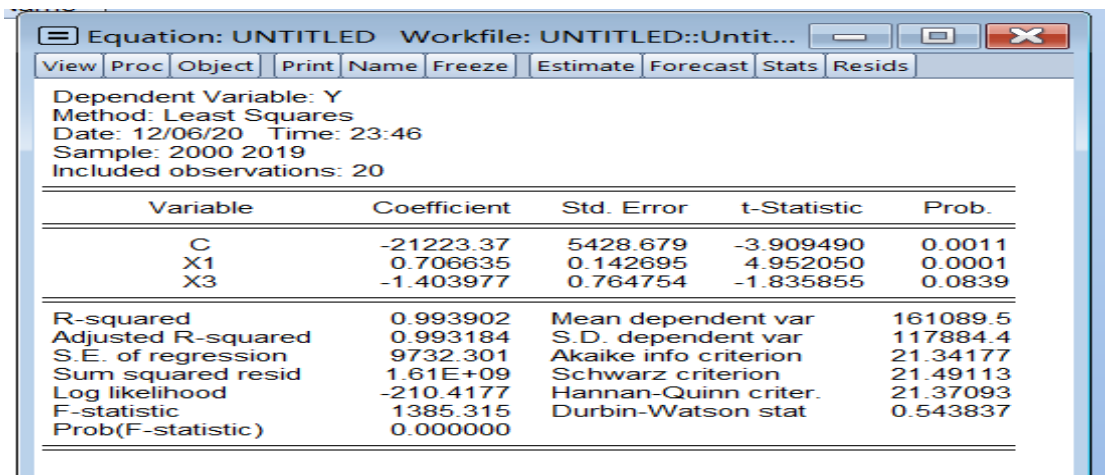


Figure 7. Univariate regression model (3)

$$Y = -21223.36782 + 0.706634980854 * X_1 - 1.40397704173 * X_3$$

Whether it is newly introduced X1 or X3, the coefficient of the parameter does not accord with the economic significance, and there is no significant change in the goodness of fit. It can be preliminarily judged that the new explanatory variable causes multicollinearity, so the variable is abandoned.

Therefore, establish the model $y = -14453.3181 + 0.4451 * x_2$

Table 3. Multicollinearity model

Model	x1	x2	x3	x4	x5	\bar{R}	R^2
y=f(x1)	0.445128 (49.44949)					0.992287	0.992693
y=f(x1,x2)	0.688451 (0.439321)	-0.243915 (-0.155274)				0.991844	0.992703
y=f(x1,x3)	0.706635 (4.952050)		-1.403977 (-1.835855)			0.993184	0.993902

After repeated introduction, inspection and elimination, the ideal model is finally determined as:

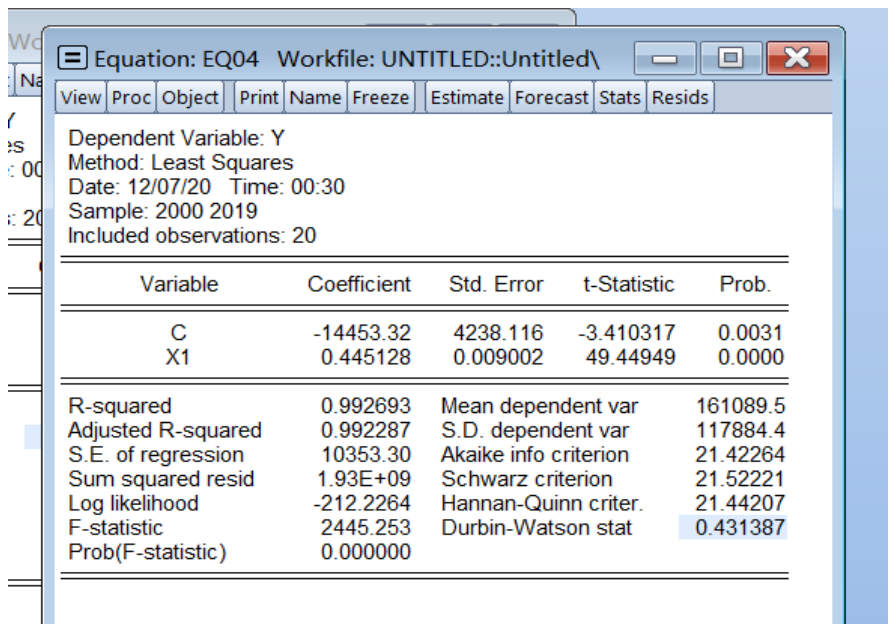


Figure 8. Final model

$$Y = -14453.3181 + 0.4451 * X_1$$

(4238.116) (0.009002)

t= (-3.410317) (49.44949)

$R^2 = 0.992693$, $F = 2445.253$, $\text{prob}(F) = 0.000000$ $DW = 0.431387$

The economic significance of the model is reasonable, and the decision coefficient is 0.992693, which is close to 1, indicating that the model has high goodness of fit for samples; The F statistic is 2445.253, and its adjoint probability is 0.000000, which is close to zero, indicating that the overall linear relationship of the model is significant; The regression coefficient is significant.

8. Heteroscedasticity Test

White test:

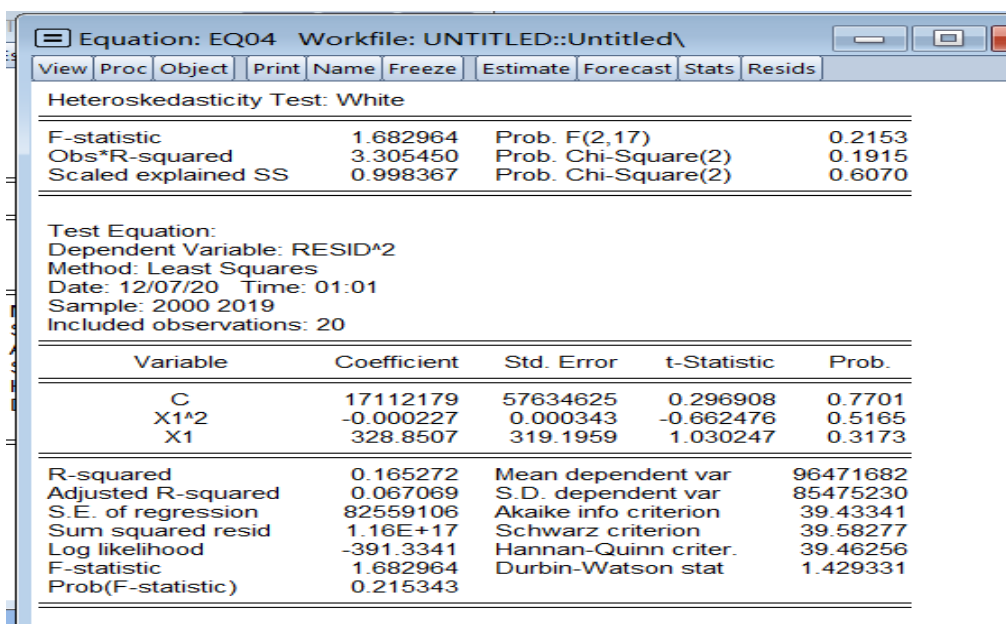


Figure 9. Heteroscedasticity test

From $nR^2 = 3.305450 < \chi^2_\alpha(2) = 5.991$, $\text{prob}(nR^2) = 0.1915 > 0.05$, It shows that there is no Heteroscedasticity in the regression model estimated by the generalized difference method.

Arch test:

After inputting LS Y C X1 AR (1) in eviews3.0, conduct a series of operations in the equation window, and the final results are as follows:

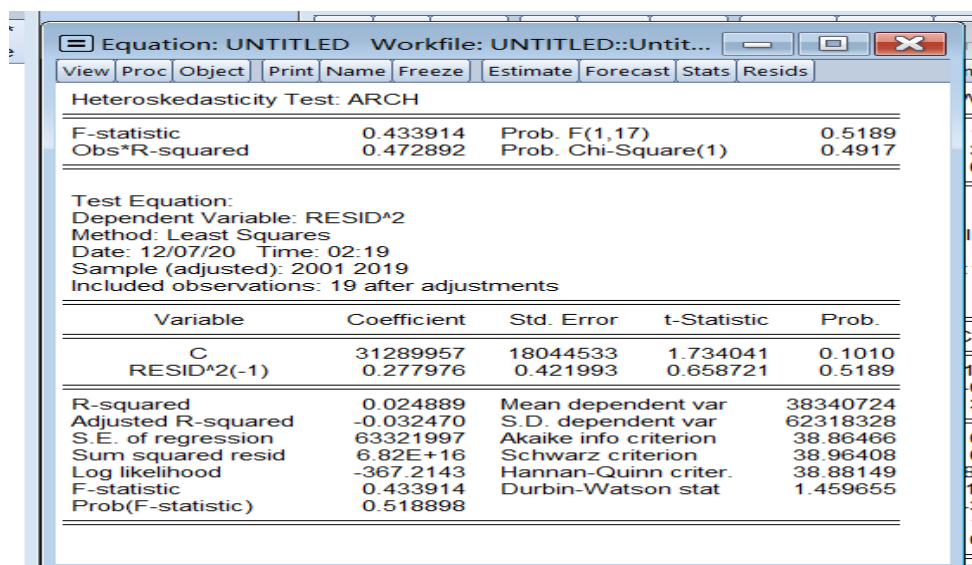


Figure 10. Arch test

From $(n - P)R^2 = 0.472892 < \chi^2_{\alpha}(1) = 3.841$, $\text{prob}((n-P)R^2) = 0.4917 > 0.05$, Again, it shows that there is no Heteroscedasticity in the regression model estimated by the generalized difference method.

9. Conclusions and Recommendations

The domestic consumer goods expenditure model constructed in this paper has been tested. Taking the total retail sales of social consumer goods as the representative of the consumption expenditure state of Chinese residents, taking the total social consumption as the explanatory variable and fitting with relevant factors as the explanatory variable can better fit the actual situation of the expenditure of domestic consumer goods [2], It can provide theoretical guidance for national economic management departments in practical management work. However, when using the model, we should pay attention to the characteristics of consumption itself. Because China's consumer goods expenditure has risen in recent years, the development trend of consumer goods has not formed a fixed model, and because the model itself is dynamic, the main factors affecting it in different time cycles are not necessarily the same. Of course, this model is only a preliminary conclusion of our research.

(1) Expand the impact of residents' consumption of consumer goods on gross domestic product (GDP), accelerate economic development and narrow the gap between regions Expanding residents' consumption can accelerate the economic development of central and Western China and narrow the income gap between regions as much as possible. By expanding residents' consumption, we can accelerate the construction and continuous improvement of infrastructure in central and Western China, increase the number of consumers in central and Western China, and improve the financial income of central and Western China, Moreover, it has promoted the increase of people's income in the central and western regions, to make the economy of the central and western regions develop in a virtuous circle. By expanding residents' consumption, people's purchasing power is continuously improved, which can drive the GDP of the central and western regions and rapidly increase the market sales of the central and western regions, To develop the economic level and people's] consumption level in the central and western regions, promote the construction of regional public facilities, and constantly improve the economic operation environment in the central and western regions, so as to increase the income of residents in the central and western regions[3], improve the consumption level of local residents, reduce the consumption gap between regions, and improve China's GDP.

(2) There is a strict positive correlation between gross national income and final consumption. Therefore, to increase consumption, the key is that the people should have money to spend. Therefore, the state should formulate reasonable policies to promote the growth of GDP and increase people's income, to better promote consumption and stimulate China's economic growth. In addition, the state should adjust corresponding policies to enhance the economic foundation of consumption and stimulate economic growth by increasing consumption, Stimulate consumption through economic growth. We should also guide the people to form a correct and rational concept of consumption, let the people spend the value of money, and promote the continuous improvement of people's living standards.

(3) Reasonably adjust the national tax burden to ensure the stable growth of residents' consumption: In this paper, China's gross national tax has not been strictly included in the final model, but it cannot be judged that tax has nothing to do with residents' consumption. According to the actual situation, tax and consumption are more or less related. Tax reduction is an important tool to promote consumption. Tax reduction can increase residents' income and promote residents' consumption, to improve the level of consumption rate. If tax reduction is to increase residents' income from subtraction to improve the consumption rate, then tax

rebate is to increase residents' income from addition to improve the consumption rate. Tax cuts and tax rebates to enrich the people and increase residents' income will lay a solid foundation for the improvement of residents' consumption rate. Only when residents' income is guaranteed can consumption move forward better and steadily. Therefore, it can be said that tax affects national consumption indirectly by affecting income.

To sum up, with the rapid development of China's social economy and the continuous increase of people's income, people's consumption is also undergoing great changes. People's consumption awareness is gradually improved, which not only stimulates people's consumption level and purchasing power, but also improves the increase of China's GDP to a certain extent. It can be seen that residents' consumption also plays a great role in promoting China's GDP. Expanding residents' consumption is a part of expanding domestic demand. Scientifically allocate residents' consumption expenditure and increase the proportion of Chinese residents' consumption in GDP. In the case of a great contraction in China's import and export, the economic means of expanding residents' consumption has a very significant effect, so that the GDP can maintain a stable development.

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