

## Analysis on the Influencing Factors of Tax Increase in China

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**Keywords:** GDP; regional fiscal expenditure; retail commodity price level; taxation;

**Abstract:** Taxation is the basic factor of China's fiscal revenue, but also affects the development of China's economy. Economy is the source of taxation. Economy decides taxation, and taxation reacts on economy. This is the general principle of Taxation and economy. In recent years, the rapid growth of China's tax revenue, or even "super-rapid growth", has attracted wide attention. Taxation, as an important part of fiscal revenue, plays an indispensable role in the development of national economy. In order to study the main reasons affecting China's tax revenue growth, analyze the growth law of central and local tax revenue, and predict the future growth trend of China's tax revenue, this paper selects the factors of local gross domestic product, local fiscal expenditure and retail commodity price level for empirical analysis.

### 1. Model Setting

#### 1.1. Variable Selection

In order to analyze the impact of various factors on tax revenue, we choose "various tax revenue" as the explanatory variable (expressed in Y), GDP (expressed in X1), local fiscal expenditure (expressed in X2) and commodity retail price index (expressed in X3) as the explanatory variables. Explain variables. Relevant data for 2013 from China Statistical Yearbook.

#### 1.2. Statistical Description

To analyze the relationship between tax revenue (Y) and explanatory variables of GDP (X1), regional fiscal expenditure (X2) and commodity retail price index (X3), a graph is drawn.

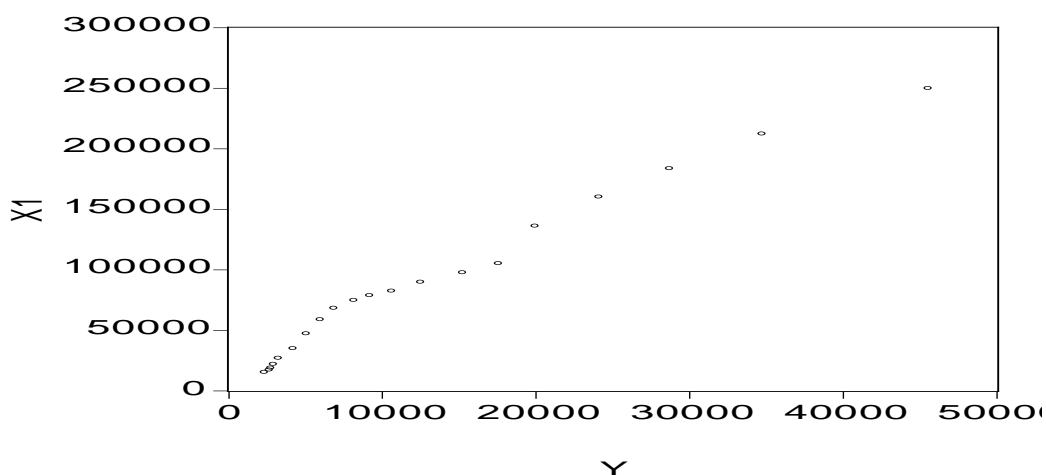


Figure 1 Linear Map of Gross Domestic Product and Tax Revenue

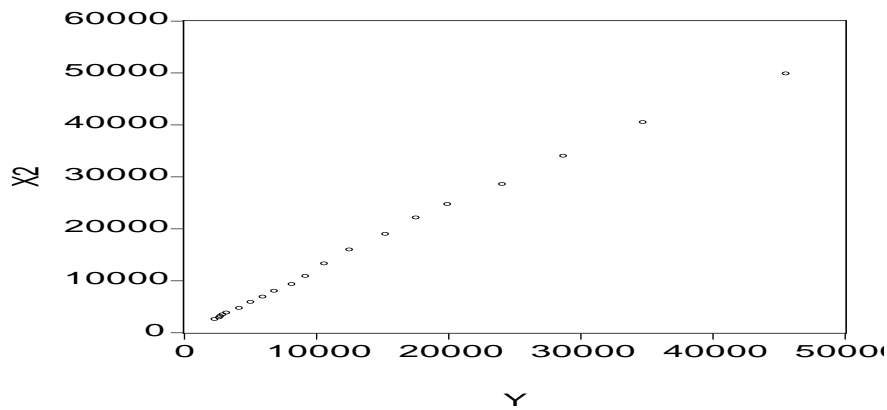


Figure 2 Linear Chart of Fiscal Expenditure and Tax Revenue in the Region

From the figure, we can see that tax revenue (Y) and regional gross domestic product (X1), regional fiscal expenditure (X2) and commodity retail price index (X3) generally show a linear relationship. In order to analyze the regularity of the amount of tax revenue (Y) changing with gross domestic product (X1), regional fiscal expenditure (X2) and commodity retail price index (X3), the following three-dimensional logarithmic regression model can be preliminarily established:

$$\ln Y = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 X_3 + u_i$$

## 2. Parameter estimation

Regression of  $\ln Y$  to  $\ln X_1$ ,  $\ln X_2$  and  $X_3$  by Eviews 7

### 2.1. Regression Results

Dependent Variable: LNY

Method: Least Squares

Sample: 1 26

Included observations: 26

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.334090	0.278144	-1.201142	0.2472
LN $X_1$	0.411202	0.061393	0.506888	0.6191
LN $X_2$	0.610785	0.057331	17.63061	0.0000
$X_3$	0.004174	0.001534	2.721708	0.0151
R-squared	0.998352	Mean dependent var		9.095684
Adjusted R-squared	0.998043	S.D. dependent var		0.922533
S.E. of regression	0.040806	Akaike info criterion		-3.383123
Sum squared resid	0.026642	Schwarz criterion		-3.183977
Log likelihood	37.83123	F-statistic		3231.721
Durbin-Watson stat	0.735725	Prob(F-statistic)		0.000000

According to the data in the table, the results of the model design are as follows:

$$\ln \hat{Y} = -0.334090 + 0.411202 \ln X_1 + 0.610785 \ln X_2 + 0.004174 X_3$$

$$(0.278144) \quad (0.061393) \quad (0.057331) \quad (0.001534)$$

$$n=26 \quad R^2=0.998352 \quad \bar{R}^2=0.998043 \quad F=3231.72$$

## 3. Model Checking

### 3.1. Test of Economic Significance

According to the model, assuming that other variables remain unchanged, tax revenue will increase by 0.411202% on average for every 1% increase in GDP.

Assuming that other variables remain unchanged, tax revenue will increase by 0.610785% on average for every 1% increase in local fiscal expenditure.

Assuming that other variables remain unchanged, when the retail price index of commodities increases by 1%, tax revenue will increase by 0.004174% on average. This is in line with the expected economic significance.

### 3.2. Statistical Significance Test

#### 3.2.1. Goodness of fit test (R2 test)

$R^2 = 0.998352$ ,  $\bar{R}^2 = 0.998043$ , which shows that the model fits the sample data well on the whole, that is, the explanatory variables "gross domestic product (X1)", "regional fiscal expenditure (X2)" and "commodity retail price index (X3)" explain the vast majority of the differences of the explanatory variables "tax revenue (Y)".

#### 3.2.2. F test

For  $H_0: \beta_1 = \beta_2 = \beta_3 = 0$ , given the significant level  $\alpha = 0.05$ , the critical value  $F(3,22) = 3.24$  of degree of freedom  $k-1=3$  and  $n-k=22$  is found in the F distribution table. From table 2,  $F=3231.72 > F(3,22)=3.24$  is obtained. The original hypothesis  $H_0: \beta_1 = \beta_2 = \beta_3 = 0$  should be rejected, indicating that the regression equation is significant, that is, the explanatory variables included in the model are "regional gross domestic product (X1)" and "regional fiscal expenditure (X2)". Combined with the Retail Price Index of Commodities (X3), it does have a significant impact on the explanatory variable "tax revenue (Y)".

#### 3.2.3. T test

For  $H_0: \beta_1 = \beta_2 = \beta_3 = 0$  ( $j = 0, 1, 2, 3$ ), given the saliency level  $\alpha = 0.05$ , and the critical value  $t_{\alpha/2} (n-k) = 2.120$  of the degree of freedom of the t distribution table  $n-k = 22$ . According to the data, the absolute values of T statistics corresponding to  $\hat{\beta}_1$ ,  $\hat{\beta}_2$ ,  $\hat{\beta}_3$  and, respectively, -1.20114, 0.506888, 17.63061 and 2.721708 are not all greater than  $t_{\alpha/2} (n-k) = 2.120$ . This shows that at a significant level of  $\alpha = 0.05$ , only  $H_0: = 0$  can be rejected by  $\hat{\beta}_2$ ,  $\hat{\beta}_3$ . That is to say, when other explanatory variables remain unchanged, the explanatory variables of "regional gross product (X1)" and "regional gross domestic product (X1)" can be rejected. Regional fiscal expenditure (X2) and commodity retail price index (X3) have significant effects on the incomplete tax revenue (Y), Not all of them have significant effects, which may be due to the influence of multiple collinearity or autocorrelation.

### 3.3. Econometric Significance Test

#### 3.3.1. Multiple Collinearity Test

Regression of lnY and lnX1,lnX2

3-1

Dependent Variable: LNY

Method: Least Squares

Sample: 1 26

Included observations: 26

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.208507	0.227596	0.916126	0.3724
LNx1	-0.002932	0.071008	-0.041295	0.9675
LNx2	0.965745	0.064410	14.99361	0.0000
R-squared	0.997590	Mean dependent var		9.095684
Adjusted R-squared	0.997306	S.D. dependent var		0.922533
S.E. of regression	0.047883	Akaike info criterion		-3.102647
Sum squared resid	0.038977	Schwarz criterion		-2.953287
Log likelihood	34.02647	F-statistic		3517.899

Durbin-Watson stat 0.530570 Prob(F-statistic) 0.000000  
Regression of lnY and lnX3

3-2

Dependent Variable: LNY

Method: Least Squares

Date: 06/15/19 Time: 21:14

Sample: 1 26

Included observations: 26

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	16.28636	2.448852	6.650608	0.0000
X3	-0.068404	0.023237	-2.943795	0.0087
R-squared	0.324981	Mean dependent var		9.095684
Adjusted R-squared	0.287480	S.D. dependent var		0.922533
S.E. of regression	0.778718	Akaike info criterion		2.432304
Sum squared resid	10.91524	Schwarz criterion		2.531878
Log likelihood	-22.32304	F-statistic		8.665931
Durbin-Watson stat	0.306442	Prob(F-statistic)		0.008683

### 3-3 Coefficient Matrix

variable	lnX1	lnX2	X3
lnX1	1.000000	0.683982	-0.558932
lnX2	0.683982	1.000000	-0.592646
X3	-0.558932	-0.592646	1.000000

According to the results, the combination of lnY and lnX1 and lnX2 is the optimal equation, but the fitting degree of lnY and X3 = 0.287480 is not very high, much less than that of lnY after regression with lnX1 and lnX2, respectively. However, the change from 2-1 to 0.998352 after introducing X3 shows that introducing X3 as an explanatory variable can improve the overall model. From the correlation coefficient matrix of Table 3-1, it can be seen that the correlation coefficient of explanatory variables lnX1, lnX2 and X3 is not high. It can be considered that there is no multiple collinearity in the model, so the original equation can be retained, that is

$$\text{LnY} = -0.334090 + 0.411202 \ln X1 + 0.610785 \ln X2 + 0.004174 X3$$

This shows that, with other factors unchanged, the GDP of the region will increase by US\$100 million, the fiscal expenditure of the region will increase by US\$100 million, and the retail price index of commodities will increase by 1%. On average, tax revenue will increase by US\$4112.21 billion, US\$61078.5 billion and US\$0041.74 billion, respectively.

### 3.3.2. Heteroscedasticity Test

Heteroskedasticity Test: White

F-statistic	0.453777	Prob. F(9,16)	0.8847
Obs*R-squared	5.286989	Prob. Chi-Square(9)	0.8086
Scaled explained SS	5.268337	Prob. Chi-Square(9)	0.8013

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 06/15/19 Time: 22:20

Sample: 1 26

Included observations: 26

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.039357	0.693726	-0.280797	0.7819
LN <sub>X1</sub>	0.066538	0.273666	0.617732	0.5441
LN <sub>X1</sub> <sup>2</sup>	-0.003338	0.027325	-0.579891	0.5688
LN <sub>X1</sub> *LN <sub>X2</sub>	0.009975	0.046855	0.430661	0.6716
LN <sub>X1</sub> *X <sub>3</sub>	-0.000250	0.000877	-0.363992	0.7199
LN <sub>X2</sub>	-0.053403	0.214758	-0.248660	0.2300
LN <sub>X2</sub> <sup>2</sup>	-0.004296	0.997688	-0.283747	0.7797
LN <sub>X2</sub> *X <sub>3</sub>	-0.000320	0.263169	-0.710235	0.4862
X <sub>3</sub>	-0.001735	0.004341	-0.569733	0.5755
X <sub>3</sub> <sup>2</sup>	8.02E-06	1.47E-05	0.225869	0.8237
R-squared	0.256125	Mean dependent var		0.001139
Adjusted R-squared	-0.244236	S.D. dependent var		0.001937
S.E. of regression	0.002162	Akaike info criterion		-9.56662
Sum squared resid	7.08E+11	Schwarz criterion		-8.03810
Log likelihood	128.7160	Hannan-Quinn criter.		-9.71429
F-statistic	0.452882	Durbin-Watson stat		1.978095
Prob(F-statistic)	0.889788			

The statistic of White test is 5.268331, P value is 0.8086, which is greater than 0.05. White test shows that there is no heteroscedasticity.

#### 4. Model Application Analysis

These data show that GDP, regional fiscal expenditure and commodity retail price index do affect our tax revenue. GDP is positively correlated with tax revenue. This shows that the increase of GDP will bring about the increase of tax revenue. This is easy to understand, because the economy is the source of income, only to increase output, it is possible to raise taxes, which is the root cause. Fiscal impact on tax revenue is significantly positively correlated, which shows that fiscal expenditure increases, tax revenue will also increase. And its coefficient is higher than GDP. It should have been: in order to promote economic growth, the state often implements expansionary property policies, so that the development of the economy, all kinds of taxes will naturally increase, thereby increasing the total tax revenue. Retail commodity price index is positively correlated with tax revenue. It is obvious that the rise of price index means that the price rises, and the total income of each seller will increase, so that the various taxes that need to be paid will also increase, thus, the tax revenue of the country will increase significantly.

#### 5. Recommendations

With the new changes in the macro-background of economic operation, the current tax system should be adjusted.

##### 5.1. Improving the VAT system and changing the production VAT to consumption VAT

Improving the value-added tax system, transforming the production-oriented value-added tax into the consumption-oriented value-added tax, and ensuring the healthy development of the national economy are the top priorities. It is urgent to solve the problem of restraining investment in production-oriented VAT in time.

## **5.2. Strengthen tax situation analysis.**

Accurately grasp the tax revenue situation in the early stage. Deeply analyzing and accurately grasping the causes of income increase and decrease in the early stage is the cause of economic development, tax policy, or important measures or serious mistakes in collection and management, objectively reflecting the existing problems in organizational income work, and scientifically studying the trend of tax revenue.

## **5.3. Strengthen the analysis of policy effects.**

Closely follow the implementation of tax reform and tax policy changes, measure the quantitative impact of tax policy changes on economy and tax revenue, and put forward adjustment and optimization suggestions, so as to enhance the scientific nature of tax reform and tax policy adjustment programs, and promote the establishment of a scientific tax system.

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