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# STATA Empirical Analysis of Fiscal Revenue Influencing Factors in Heilongjiang Province

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**ABSTRACT**
Fiscal revenue is the monetary revenue obtained by government departments to meet public needs in a certain period of time, which is an important guarantee of national financial resources. However, the growth of fiscal revenue is not controlled by the government, but influenced by economic growth, price level, production technology level and many other factors. In terms of regions, Heilongjiang province is located in the northernmost part of China and is remote. Its economic growth rate is relatively slow compared with other regions, and its fiscal income level is low compared with other regions. In order to improve the fiscal income level of Heilongjiang Province, it is particularly important to study the influencing factors of fiscal income. According to the fiscal revenue of Heilongjiang province from 1999 to 2020, this paper selects 7 factors such as domestic VALUE-ADDED tax as explanatory variables to construct the model, and uses Stata software to conduct ADF test and co-integration test on the model, and carries out statistical analysis. It is found that GDP has the most significant impact on fiscal revenue, and other explanatory variables also have different correlations. Finally, based on the economic analysis of the model, corresponding suggestions are put forward for how to increase the fiscal revenue of Heilongjiang Province.

***Keywords:*** *Fiscal revenue, Model analysis, Inspection and correction.*

## 1. INTRODUCTION

Fiscal revenue is a means by which the government distributes activities to fulfill its functions by virtue of public power. Since the reform and opening up, China's total fiscal revenue has grown greatly, but due to the impact of various factors such as population, geographical location, production technology level in each region, the economic growth is fast or slow, resulting in the growth rate of fiscal revenue in each region is also very different. In recent years, with the favorable guidance of national policies, the fiscal revenue of Heilongjiang Province has been increasing year by year. However, as Heilongjiang province is located in the northeast of China and belongs to an underdeveloped province, the growth rate of fiscal revenue is slower than that of other regions. In this paper, through in-depth study of the factors affecting fiscal revenue, the aim is to find out the key indicators and put forward appropriate suggestions accordingly, so as to promote the steady and rapid increase of fiscal revenue.

## 2. MULTIPLE LINEAR REGRESSION SIMULATION

### *2.1. Data and variable selection and processing*

#### *2.1.1. Selection of indicators*

The components of fiscal revenue are tax, non-tax revenue and debt revenue. Tax revenue refers to a kind of fiscal revenue obtained by the state with its political power, guns and free participation in the distribution of national income, accounting for about 90% of fiscal revenue. In the tax system, value-added tax (business tax), corporate income tax and personal income tax are the three main types of taxes in the tax system structure. Therefore, this paper selects the above three kinds of tax revenue as explanatory variables of fiscal revenue influencing factors.

The GROSS national product (GNP) is the final result of the initial distribution of income among all permanent units in a given period of time.[1] Regionally, it is the total value of final goods and services owned by the owners of factors of production in the province during the year,

 

which constitutes an important source of fiscal revenue. There is a close relationship between fiscal revenue growth and GDP growth.

The CONSUMER price index (CPI) is a macroeconomic indicator that reflects the price changes of consumer goods and services purchased by a household. It is closely related to people's lives, and consumer consumption is also one of the important sources of fiscal revenue, playing an important role in the price system of the entire national economy.

The natural population growth rate is an important index to reflect the population development rate and make population plan, and it is used to indicate the degree and trend of the natural population growth. Population is one of the important components of social factors, and to a certain extent, it also affects the scale of fiscal revenue.

### *2.1.2. Data sources and processing*

Through the analysis, it can be seen that the above 6 factors have an important relationship with fiscal revenue. Therefore, this article from the China statistical yearbook from 1999 to 2019 in heilongjiang province regional financial income, value-added tax, business tax, enterprise income tax in the province in the province, in the province in the province of individual income tax, in the province of gross domestic product, the consumer price index in the province, the natural population growth rate in the province, the sum total of the business tax and value-added tax in the province (since 2016 on May 1st, Business tax payers in China have changed from paying business tax to paying VALUE-ADDED tax, so this paper directly selects the sum of business tax and value-added tax as the explanatory variable. According to the above variables and the actual economic significance, the following model is established:[2]

(1).

Where, the meanings of variables are as follows: Y: provincial fiscal revenue, X1: provincial enterprise income tax, X2: provincial individual income tax, x3: sum of provincial business tax and VALUE-ADDED tax X4: provincial gross product (GDP), X5: Current year consumer price index (CPI), X6: current year natural population growth rate, all variables except X5 and X6 are dimensionless, the other units are ten thousand yuan.

## *2.2. OLS parameter estimation*

As shown in Figure 1, when the significance level $\alpha = 0.05$, x1, x3, X4 and X5 reject the null hypothesis, while the other two variables fail the T test, which means that the estimated values of x1, x3, X4 and X5 are not 0 significant. Namely the enterprise income tax, value added tax (or total), gross domestic product and the consumer price index in the province of the financial income have a significant impact, but it can be seen from the correlation coefficient of the x1, x3, x4 is positive correlation and x5, x6 is negative correlation, is the enterprise income tax, value added tax (total), is positively related to GDP in the province, The cpi is negatively correlated with the natural population growth rate. On the other hand, for hypothesis H0: $\beta1 = \beta2 = \beta3 = \beta4 = \beta5 = \beta6 = 0$, at the significance level $\alpha = 0.05$, F= 755.92gt in the F test; 2.85, which indicates that the model has passed the overall significance test, that is, the 6 explanatory variables found have a significant impact on the fiscal revenue of the year. Therefore, the model has multicollinearity.[3]

```
reg y x1 x2 x3 x4 x5 x6
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| Source | SS | df | MS | Number of obs | = | 21 |
|---|---|---|---|---|---|---|
| | | | | F(6, 14) | = | 755.92 |
| Model | 4.0439e+14 | 6 | 6.7398e+13 | Prob > F | = | 0.0000 |
| Residual | 1.2482e+12 | 14 | 8.9160e+10 | R-squared | = | 0.9969 |
| | | | | Adj R-squared | = | 0.9956 |
| Total | 4.0564e+14 | 20 | 2.0282e+13 | Root MSE | = | 3.0e+05 |

| y | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| x1 | 3.763537 | 1.481322 | 2.54 | 0.024 | .5864177 | 6.940657 |
| x2 | .0114045 | 2.203782 | 0.01 | 0.996 | -4.715239 | 4.738048 |
| x3 | 1.010566 | .3026236 | 3.34 | 0.005 | .3615033 | 1.65963 |
| x4 | 458.2259 | 145.9733 | 3.14 | 0.007 | 145.1442 | 771.3075 |
| x5 | -95930.75 | 41306.29 | -2.32 | 0.036 | -184523.9 | -7337.574 |
| x6 | -22995.25 | 115920.9 | -0.20 | 0.846 | -271620.9 | 225630.4 |
| _cons | 8797070 | 4096226 | 2.15 | 0.050 | 11539.76 | 1.76e+07 |

**Figure 1** Model.

## *2.3. Model checking and revision*

### *2.3.1. Modeling*

The above analysis shows that financial income (Y) in heilongjiang province is mainly influenced by the following factors: enterprise income tax (x1), in the province in the province of individual income tax (x2), in the province of business tax and value-added tax sum (x3), GDP (GDPx4) in the province, the consumer price index (CPIx5), the natural population growth rate (x6). In order to reduce the degree of data fluctuation, the equations of the model mentioned above are logarithmically processed. Formula (1) after treatment can be expressed as:

(2)

By observing the scatter diagram of each explanatory variable and fiscal revenue in the province (FIG.2), this paper preliminarily judged their correlation, eliminated variables with insignificant correlation, and retained variables with relatively strong correlation.

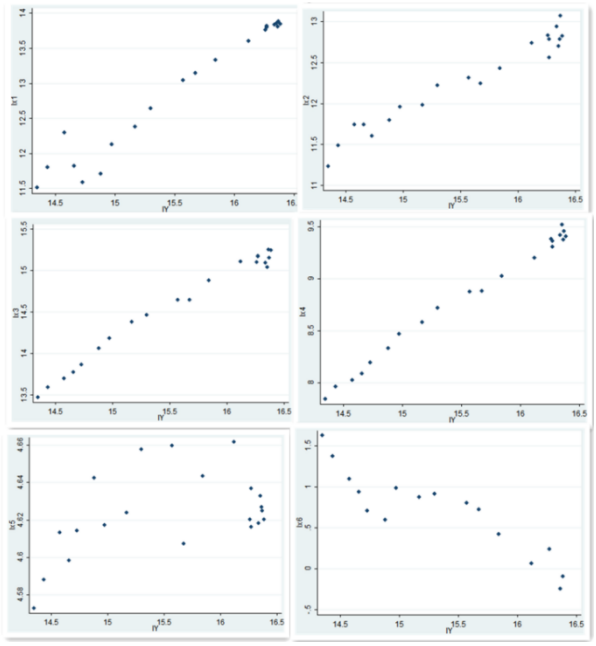

**Figure 2** Scatter diagram of related variables

It can be concluded from Figure 2 that there is little correlation between consumer price index (CPIx5), natural population growth rate (X6) and fiscal revenue (Y) of Heilongjiang Province. To sum up, the econometric model constructed in this paper can eliminate the two variables of consumer price index (CPIx5) and natural population growth rate (X6). Therefore, Formula (2) can be further expressed as:

(3)

### *2.3.2. Stationarity test*

In order to avoid the pseudo regression problem, when the economic variable used in the model is time series data, the stationarity test should be carried out. In this paper, STATa software is used for ADF test.

**Table 1.** Summary of ADF test results of each variable

| Variate | The ADF statistics | P values | Conclusion |
|---|---|---|---|
| lny | 0.312 | 0.9963 | Not smooth |
| Δlny | -2.176 | 0.2150 | Not smooth |
| lnx1 | -1.209 | 0.9087 | Not smooth |
| Δlnx1 | -3.281 | 0.0157 | Smooth |
| lnx2 | -2.374 | 0.3935 | Not smooth |
| Δlnx2 | -4.427 | 0.0003 | Smooth |
| lnx3 | 0.783 | 1.000 | Not smooth |
| Δlnx3 | -2.214 | 0.2013 | Not smooth |
| lnx4 | 0.053 | 0.9947 | Not smooth |
| Δlnx4 | -2.403 | 0.1409 | Not smooth |

As can be seen from Table 1, related economic variables themselves are not stable, and some variables can become stable after first-order difference. However, the linear combination of non-stationary time variables may also be stable, and there may be a long-term stable relationship between them. Therefore, the co-integration test of time series data is carried out below. Due to financial income (Y) in the province, in the province of business tax and value-added tax sum (x3), and (GDPX4) after the first order difference in gross domestic product (GDP) in the province is still not stable, so the removal of these three variables, the enterprise income tax (x1) in the province and the province of individual income tax (x2) for numerical is not smooth, but after the first order difference of the result is stable, That is, the log value of the provincial enterprise income tax (X1) and provincial individual income tax (X2) is one-order integration. Therefore, the co-integration test of the two unstable factors and the logarithm of fiscal revenue (Y) in the province is continued, and the process is shown in Figure 3. The co-integration regression formula is set as:

(4)

As can be seen from the figure, the process of co-integration test (Figure 3) shows that there is a co-integration relationship between the sum of business tax and value-added tax (X3) and the log value of gross domestic product (GDPX4).

varsoc lY lx3 lx4

Selection-order criteria

Sample:2003-2019 Number of obs = 17

| lag | LL | LR | df | p | FPE | AIC | HQIC | SBIC |
|---|---|---|---|---|---|---|---|---|
| 0 | 35.9456 | | | | 4.2e-06 | -3.87595 | -3.86134 | -3.72892 |
| 1 | 88.4731 | 105.05 | 9 | 0.000 | 2.6e-08 | -8.99683 | -8.93837 | -8.40868* |
| 2 | 96.4733 | 16 | 9 | 0.067 | 3.3e-08 | -8.87921 | -8.7769 | -7.84994 |
| 3 | 111.399 | 29.852 | 9 | 0.000 | 2.3e-08* | -9.57638* | -9.43022* | -8.106 |
| 4 | 119.973 | 17.147* | 9 | 0.046 | 6.3e-08 | -9.52623 | -9.33622 | -7.61474 |

Endogenous: lY lx3 lx4
Exogenous: _cons

. vec lY lx3 lx4 ,lags(4)rank(1)

Vector error-correction model

Sample: 2003 - 2019 Number of obs = 17
AIC = -9.312014
Log likelihood = 114.1521 HQIC= -9.141496
Det(Sigma_ml) = 2.95e-10 SBIC = -7.596574

| Equation | Parms | RMSE | R-sq | chi2 | P>chi2 |
|---|---|---|---|---|---|
| D_lY | 11 | .085306 | 0.8690 | 39.79149 | 0.0000 |
| D_lx3 | 11 | .133414 | 0.6255 | 10.01944 | 0.5286 |
| D_lx4 | 11 | .06066 | 0.8787 | 43.44706 | 0.0000 |

**Figure 3** Cointegration experiment process

Cointegrating equations

| Equation | Parms | chi2 | P>chi2 |
|---|---|---|---|
| _ce1 | 2 | 3757.714 | 0.0000 |

Identification: beta is exactly identified

Johansen normalization restriction imposed

| beta | Coef. | Std. Err. | z | P>\|z\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| _ce1 | | | | | | |
| lY | 1 | . | . | . | . | . |
| lx3 | .212526 | .5494828 | 0.39 | 0.699 | -.8644406 | 1.289493 |
| lx4 | -1.606874 | .6199928 | -2.59 | 0.010 | -2.822037 | -.3917104 |
| _cons | -4.60624 | . | . | . | . | . |

**Figure 4** Cointegration test data results

It can be seen from FIG. 4 that the co-integration regression formula is:

(5)

This equation reflects the long-term equilibrium relationship between provincial fiscal revenue and the sum of business tax and value-added tax (X3) and provincial gross domestic product (GDPX4). If e=0, the model can be deformed to obtain:

(6)

This equation shows that the sum of business tax and value-added tax in Heilongjiang province has a negative and significant impact on fiscal revenue. The long-term effect of provincial GDP on fiscal revenue is positive and significant (the observed significance P value of lX4 variable coefficient is 0.000).

## 3. CONCLUSION

Through the above analysis, it can be seen that fiscal revenue has a small correlation with the CONSUMER price index, and a negative correlation with the natural population growth rate. Due to multicollinearity, only four variables were retained in the final model, namely, the sum of enterprise income tax, personal income tax, value-added tax and business tax, and the gross domestic product of the province. According to ADF test and co-integration test, fiscal revenue is correlated with corporate income tax and individual income tax, and is mainly positively correlated with the gross domestic product in the province. The combination of value-added tax and business tax in the province also has a great impact on fiscal revenue. Finally, the key index that affects fiscal revenue is GDP in the province. The higher the GDP in the province is, the higher the total fiscal revenue will be.

Heilongjiang province should enhance the adaptability of market economy system and promote the continuous development of industrial economy. According to the actual situation of regional economic development in the province, implement active and effective fiscal and tax policies, expand tax sources, ensure the proportion of VALUE-ADDED tax revenue in tax revenue, strengthen tax collection and management, prevent tax loss, ensure that gross product and tax revenue can play an effective role and promote the growth of fiscal revenue.

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