Study on the Influencing Factors of Tax Revenue in Fujian Province Based on Econometric Modeling

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Abstract. In the 21st century, China's economy continues to develop steadily which tax plays an important role, not only is an important part of China's fiscal revenue and is an important means of regulating economic operation, while taxes as an important source of national revenue. This paper aims to study the important factors affecting tax revenues in Fujian Province, and establishes a multiple linear regression model based on the statistical data of relevant economic factors in Fujian Province from 2007 to 2022 to study the impact of GDP, general government budget fiscal expenditure, total retail sales of consumer goods, total investment in fixed assets of the society growth ratio, total imports and exports, money supply, and per capita disposable income on tax revenues in Fujian Province.

Keywords: tax revenues; fiscal expenditures; total exports and imports of goods; local taxes

1 INTRODUCTION

According to China's Regional Taxation Development Report[2]: the eastern region is still the "leading goose" of China's economy and tax revenue, so the tax revenue of Fujian Province, which is located in the east of the country, has a very significant impact on the national economic development. The stability of tax revenue will lead to financial stability, which will help local governments to better plan economic development strategies and realize economic transformation and sustainable development. Therefore, it is of practical significance to study the impact of various economic factors on tax revenue in Fujian Province to consolidate the tax sources and improve the quality of tax sources in Fujian Province.

2 LITERATURE REVIEW

Based on the important position of taxation in the development of national economy, many scholars have carried out various researches on the influencing factors of tax revenue: for example, the results of the principal component analysis of Liang Li (2023) show that the gross domestic product, financial expenditure, total investment in fixed

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assets of the whole society, money supply, total import and export, total retail sales of consumer goods and added value of the tertiary industry are the main influencing factors of China's tax revenue[1]. There are also some scholars who focus on studying the degree of influence of individual factors on tax revenue growth Example: Wu Di et al. (2017) selected China's macro data during the period of 1981-2014 using the lagged variable model, focusing on China's tax reform in 1985, using dummy variables introduced into the model, and the results show that the tax reform is positively correlated with the tax revenues[4];

Foreign scholars' studies include Yuting Zhang (2021) based on multiple stepwise regression empirical analysis of the factors affecting fiscal tax revenue in Sichuan Province, based on 25 years of macroeconomic data in Sichuan Province, established a multiple stepwise regression model, the results show that the value-added of the secondary industry, the per capita disposable income of rural households, and the total amount of import and export trade have a significant positive impact on the total tax revenue of Sichuan Province, and the R city's internal expenditures have a significant positive impact on the total tax revenue of Sichuan Province[5].

To sum up, it is not difficult to find that China's current research still lacks the research on the factors affecting the tax revenue in different geographical areas. Since the economic development of each region is not the same, the factors affecting the tax development of different regions may also be different, therefore, in this paper, the factors affecting the tax revenue of Fujian Province are explored.

3 DATA SOURCES AND MODELING

By collecting the relevant economic indicators of Fujian Province from the official website of National Bureau of Statistics, we try to establish a multiple linear regression model to study the influencing factors of tax revenue in Fujian Province.

（1） Gross provincial product

The higher the GDP is, the better the local economic development is and the stronger the local capacity for tax revenue is.

（2） financial expenditure

Increases in fiscal expenditures may lead to an increase in the tax burden, which in turn affects the economic activities and consumption behavior of taxpayers and thus has an impact on tax revenues.

（3） Total retail sales of consumer goods

The higher the Gross Retail Sales of Consumer Goods, the higher the tax revenue, i.e. the tax revenue of Fujian Province is affected by the Gross Retail Sales of Consumer Goods.

（4） Percentage increase in investment in social fixed assets

Social fixed asset investment in Fujian Province is mainly concentrated in real estate and urban infrastructure renovation, mainly through investment to promote economic growth and expand tax sources, which in turn drives the overall growth of fiscal tax revenues and has an impact on tax revenues in Fujian Province.

（5） Total exports and imports of goods

The more imports there are, the more value-added tax (VAT) , consumption tax and customs duties are levied on imports; the more exports there are, the more output (income) is generated, which in turn promotes a further increase in consumption and investment, albeit with an export rebate.Thus, both imported and exported goods lead to increased regional tax revenues.

(6) money supply

The changes in the supply and demand of money, will be directly manifested in the rise or fall of the general price level, while changes in the price level will in turn cause changes in the nominal national income, and will in turn affect the tax revenues based on the national income as the basis for taxation.

(7) Per capita disposable income

The actual amount of personal income tax paid will have an impact on an individual's disposable income. And personal income tax is an important part of tax revenue, so the per capita disposable income of each place has a certain impact on local tax revenue.

3.1 Modeling

Using relevant data to analyze the factors affecting the growth of tax revenue and constructing tax revenue regression models to forecast and control tax revenue.

In this paper, variable X_1 is GDP; Variable X_2 is Fiscal Expenditure in Fujian Province ;variable X_3 is Total retail sales of consumer goods in Fujian Province ;variable X_4 is Percentage growth in social fixed asset investment; variables X_5 is Total exports and imports of goods; variable X_6 is Money supply; variable X_7 is Disposable income per inhabitant ;

model 1: $\hat{Y} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + u$

4 Estimation of Regression Parameters

In this paper, OLS regression is estimated for using Eviews software. Estimated equations are obtained:

$$Y = -741.3282 - 0.003222X_1 + 0.544435X_2 - 0.077279X_3 + 1.119857X_4 + 2.45 \times 10^{-6}X_5 - 0.002991X_6 + 0.208314X_7$$

(876.2582) (0.082157) (0.211298) (0.087254) (10.98428) (0.00000341) (0.001011) (0.188983)

t = (-0.846016) (-0.039215) (2.576622) (-0.885685) (0.101951) (0.717451) (-2.959430) (1.102291)

$R^2 = 0.981536$ F=60.7543 n=16

According to result, we can see that the$R^2$and adjusted R^2 values are high in this fit, and the overall F-test is passed, but we will find that the t-test of more parameters is failed, and observe that many of the parameter signs are not quite consistent with our predictions, so we have reason to suspect that there is an obvious multicollinearity

problem in this fit, as well as other common problems with time-series data. We need to test the model for economic significance as well as statistical inference, and on the basis of the tests, revise the model to obtain the most appropriate econometric regression model that can be used to describe the factors affecting tax revenues in Fujian Province.

5 TESTING AND MODIFICATION OF MODELS

As can be seen $R^2 = 0.981536$,the adjust$R^2 = 0.965380$.thus indicating that the model performs well in fitting the sample and that the model can explain most of the data. After testing at the significance level of $\alpha = 5\%$ the F value test is significant, indicating that the overall significance test is passed and each variable has a significant effect on the tax revenue of Fujian Province.

From the result, it can be seen that the t-values of X_1、X_3、X_4、X_5、X_7 are not significant at $\alpha = 5\%$ level of significance and at the critical value of 2.306 for t-test, but then again, since the model is well fitted under the goodness-of-fit test and the overall parameter is significant under the F-test, there are reasons to suspect that there is a serious multicollinearity in the model.

6 ECONOMETRIC TESTS AND CORRECTIONS

Through the above test we find that the model is well fitted with high decidable coefficients, but t-values of X_1、X_3、X_4、X_5、X_7 are not significant,and at the same time, the sign of the parameters of X_1、X_3、X_6 is contrary to the economic significance, which can be determined based on the knowledge of econometrics, and it is considered that there may be a possible multicollinearity between them.

6.1 Multicollinearity Test

According to the VIF test it is obvious that $VIF_j \geq 10$, indicating that the test results are consistent with our use of intuitive judgment, and there is a serious multicollinearity between the explanatory variables and the explained variables in the model.

In this paper, we use the stepwise regression method in R to deal with the multicollinearity, and use the forward-backward stepwise regression to synchronize the original model to correct the final elimination of the variables X_1、X_4.

According to the stepwise regression results, it can be seen that after three stepwise regressions, the excluded variables X_1、X_4.

The model that eliminates insignificant variables that cause multicollinearity is: $\hat{Y} = -672.8598 + 0.551026X_2 - 0.74099X_3 + 2.68 \times 10^{-6}X_5 - 0.003947X_6 + 0.1965X_7$

After bi-regression, the model has a goodness of fit of 0.9815 and an adjusted goodness of fit of 0.972268, which is a good model fit and the overall F-test is significantly passed.

6.2 Autocorrelation Test

By comparing the test results of lag order 2 decisive coefficients and adjusted decisive coefficients are relatively better.n this paper we choose to do the BG test with lag order 2, and we get the following test results (**Fig. 1.** BG test results.).

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	5.707499	Prob. F(2,8)	0.0288
Obs*R-squared	9.407158	Prob. Chi-Square(2)	0.0091

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 05/03/24 Time: 10:18
Sample: 2007 2022
Included observations: 16
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	487.1199	272.3349	1.788680	0.1115
X2	0.116651	0.074911	1.557204	0.1580
X3	0.085252	0.057788	1.475261	0.1784
X5	3.61E-06	2.26E-06	1.599893	0.1483
X6	0.001255	0.000670	1.874935	0.0977
X7	-0.164985	0.080429	-2.051308	0.0744
RESID(-1)	-0.998715	0.413841	-2.413283	0.0423
RESID(-2)	-0.939270	0.370111	-2.537806	0.0348

R-squared	0.587947	Mean dependent var	-4.14E-13
Adjusted R-squared	0.227401	S.D. dependent var	83.77889
S.E. of regression	73.63962	Akaike info criterion	11.74310
Sum squared resid	43382.35	Schwarz criterion	12.12939
Log likelihood	-85.94477	Hannan-Quinn criter.	11.76288
F-statistic	1.630714	Durbin-Watson stat	2.415441
Prob(F-statistic)	0.253622		

Fig. 1. BG test results.

From Figure (**Fig. 1.** BG test results.) it is shown that $LM = TR^2 = 16 \times 0.587947 = 9.407152$, which has a p-value of 0.0091. also indicating the presence of autocorrelation. In the presence of autocorrelation, the classical assumptions of linear regression are violated, which shows that the conclusions of the t-statistic and F-statistic in the model are unreliable, and the estimated marginal propensity to consume is not necessarily realistic, and remedial measures need to be taken. In this paper, the Cochrane-Ocott iterative method is used for correction in pursuit of higher precision parameter estimates.

Dependent Variable: Y
Method: ARMA Maximum Likelihood (BFGS)
Date: 05/03/24 Time: 14:57
Sample: 2007 2022
Included observations: 16
Convergence achieved after 8 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-440.9988	209.0552	-2.109485	0.0679
X2	0.604037	0.066045	9.145892	0.0000
X3	-0.112837	0.084092	-1.341832	0.2165
X5	1.32E-06	2.59E-06	0.508748	0.6247
X6	-0.001774	0.000865	-2.049451	0.0746
X7	0.142015	0.054807	2.591183	0.0321
AR(1)	-0.867370	0.313032	-2.770870	0.0243
SIGMASQ	4340.560	2494.289	1.740199	0.1200

R-squared	0.987804	Mean dependent var	1657.816
Adjusted R-squared	0.977133	S.D. dependent var	616.1513
S.E. of regression	93.17253	Akaike info criterion	12.30086
Sum squared resid	69448.97	Schwarz criterion	12.68716
Log likelihood	-90.40692	Hannan-Quinn criter.	12.32065
F-statistic	92.56848	Durbin-Watson stat	2.807887
Prob(F-statistic)	0.000001		

Inverted AR Roots	-.87

Fig. 2. Results of the Cochrane-Ocott Iteration.

Due to Cochrane-Ocott iteration (**Fig. 2.** Results of the Cochrane-Ocott Iteration.) the estimated regression equation can be obtained as:

$$\hat{Y} = -440.9988 + 0.604037X_2 - 0.112837X_3 + 1.32 \times 10^{-6}X_5 - 0.001774X_6 + 0.142015X_7$$

6.3 Heteroscedasticity Test and Correction

The result shows that $(n-p)R^2 = (16-2) \times 0.500827 = 7.011578 > X_\alpha^2(p) = 5.99147$,Its p-value is 0.003, then the original hypothesis is rejected, indicating that there is heteroskedasticity in the random error term in the model.

This paper utilizes EViews for weighted least squares estimation. Weighted least squares (WLS) is a regression analysis method used to deal with the situation where there is heteroskedasticity in the data. in this paper we will take $1/X_i^2$ as the weights.

The above correction results:

$$\hat{Y} = -0.030101 + 0.708663X_2 - 0.034241X_3 + 6.5 \times 10^{-6}X_5 - 0.000655X_6 - 0.015997X_7$$

7 DESCRIPTION OF RESULTS

Through the above model, it can be found that: on the one hand, the financial expenditure of Fujian government, the total amount of import and export of goods has a significant impact on the local tax revenue and when the financial expenditure and total amount of import and export of goods in Fujian Province increases, the tax revenue of Fujian Province will increase significantly, while the total amount of retail commodities

in the whole society, the supply of money on the growth of the tax revenue of Fujian Province is also significant, but it has a negative correlation with the tax revenue of Fujian Province, and the tax revenue of Fujian Province will decrease when the total amount of retail commodities in the whole society and the supply of money increase.

8 POLICY RECOMMENDATIONS

8.1 Adjustment of the Structure of Financial Expenditures

The government should take the initiative to adjust and optimize the structure of financial revenue and expenditure, rational allocation of resources, improve the "addition and subtraction" of financial revenue and expenditure, increase expenditure in science and technology, people's livelihood and other important areas, reduce the general expenditure, strictly control the expenditure of administrative and public institutions, strengthen the performance management, optimize the structure of financial revenue and expenditure, and promote a steady increase in tax revenues[3].

8.2 Optimizing the Industrial Structure of Import and Export

Fujian Province to increase tax revenue should start from the total amount of import and export consumption, to create a favorable environment for the development of tax revenue, and promote the upgrading of residents' consumption to effectively increase the import of goods, in increasing consumer demand at the same time, effectively drive the businessman's production, stimulate the supply, and increase the export of goods.

8.3 Adjusting, Reforming and Improving the Tax System

China should adjust, reform and improve the tax system of local governments in order to adapt to the differences in development of each region and combine these three organically to fully fulfill their respective functions. The analysis reveals that increasing and decreasing tax revenue is related to adjusting and improving the local tax system. Therefore, if more consideration is given to improving the tax system, it will be possible to scientifically and rationally adjust the tax system by ensuring the stability of tax revenues.

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