

TIME SERIES ANALYSIS IN THE APPLICATION RESEARCH OF THE PERSONAL INCOME TAX PLANNING IN COLLEGES AND UNIVERSITIES

Liu Jiaorao and Yu shanshan

Department of Economics and Management, Hechi University, Yizhou 546300, China.

Email: 1349828724@qq.com

ABSTRACT

In order to reduce the personal income tax burden of university teachers, this paper based on 2009-2012 monthly income data of Teacher Zhang who is in a university in Guangdong Province, using time series analysis method, using the Excel and SPSS statistical analysis software, establishing autoregressive integrated moving average model ARIMA(P, D, q), through the autocorrelation and partial autocorrelation test, calculation to complete the teacher 2013 revenue forecast, has carried on the tax planning research, puts forward the reasonable tax advice.

Keywords: Time series analysis, Personal income tax, Tax planning.

1. INTRODUCTION

In recent years, due to the state increased investment in education funding, the national various universities staff wages and salaries continue to increase, and the payment of individual income tax amount increasing. How to plan personal income tax to reduce personal income tax burden of university teachers has become a topic which cannot be ignored. Its importance is self-evident for teachers in colleges and universities. Time series analysis is a commonly used method of dynamic data analysis and processing, according to the research object of known historical data, analysis the rule of data changes over time, makes the corresponding object model to predict the future trend of development. The time series analysis methods applied to colleges and universities in

the personal income tax planning, through the establishment of models to predict future revenue teachers, help financial personnel adjust pay way, optimize the pay system and conduct reasonable tax planning.

2. TEACHERS' INCOME ARIMA MODEL

2.1 The data time series analysis

The wages of Mr. Zhang who is in a university in Guangdong Province from January 2009 to December 2012 are given in the following table 1.

Table 1. Teacher Zhang's income statement from January 2009 to December 2012

Year Wage Month	2009	2010	2011	2012
January	5,230.30	5,640.70	6,476.70	7,123.20
February	5,027.30	5,687.60	6,556.80	7,148.20
March	5,172.90	5,749.10	6,661.30	7,192.20
April	5,268.00	5,775.80	6,703.30	7,256.80
May	5,305.70	5,870.70	6,768.00	7,360.70
June	5,358.70	5,931.40	6,825.00	7,416.40
July	5,071.90	5,544.60	6,611.30	7,042.20
August	5,127.30	5,604.90	6,709.70	7,083.50
September	5,367.20	5,996.80	6,853.10	7,501.40
October	5,411.70	6,092.10	6,870.30	7,536.60
November	5,458.80	6,165.70	6,900.50	7,617.50
December	5,496.10	6,248.80	7,017.60	7,698.80

Make Teacher Zhang's income curve using spss17 software in Figure1.

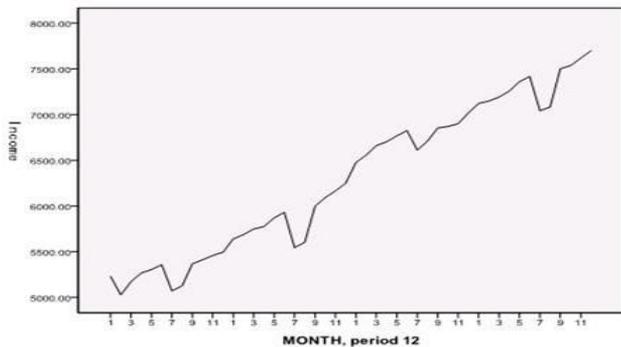


Figure 1. Teacher Zhang's income curve

Revenue trend is clearly visible from the graph, intuitively show the non-stationary series. And from the point of view of income, although the overall rise curve, but the annual income of July and August will be a little less, we can preliminarily see teachers wage income changes in a time series of the season.

Income from wages and salaries to pay personal income tax threshold changed from September 2011 to 3500 Yuan, We calculate personal income tax according to the calculation method of the adjusted. As is shown in table 2.

Table 2. Teacher Zhang's personal income tax payable table from January 2009 to December 2012

	2009	2010	2011	2012
January	359.55	421.11	546.51	257.32
February	329.10	428.14	558.52	259.82
March	350.94	437.37	574.20	264.22
April	365.20	441.37	580.50	270.68
May	370.86	455.61	590.20	281.07
June	378.81	464.71	598.75	286.64
July	335.79	406.69	566.70	249.22
August	344.10	415.74	581.46	253.35
September	380.08	474.52	230.31	295.14
October	386.76	488.82	232.03	298.66
November	393.82	499.86	235.05	306.75
December	399.42	512.32	246.76	314.88

Personal income tax payable given series diagram in Figure 2.

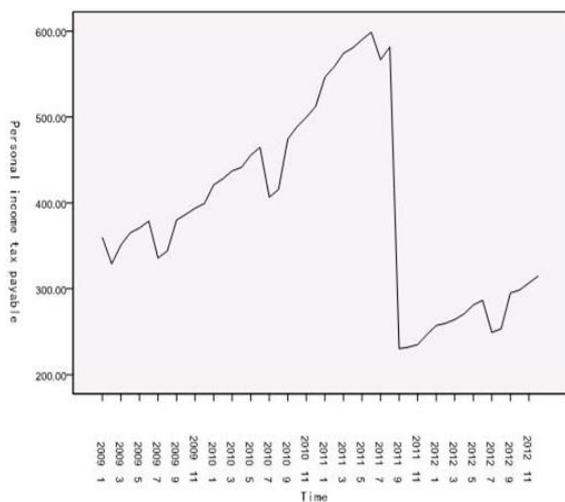


Figure 2. Teacher Zhang's personal income tax payable series diagram

From Teacher Zhang's time series diagram to see individual income tax, the tax payable first rise in small amplitude fluctuation, midway plummeted to the end point, and then from the bottom of a small rise in amplitude fluctuation, proves the significant change before and after our country personal income tax adjustment.

2.2 Preliminary judgment of the model

Teacher Zhang's income for time series seasonal difference, autocorrelation and partial autocorrelation test.

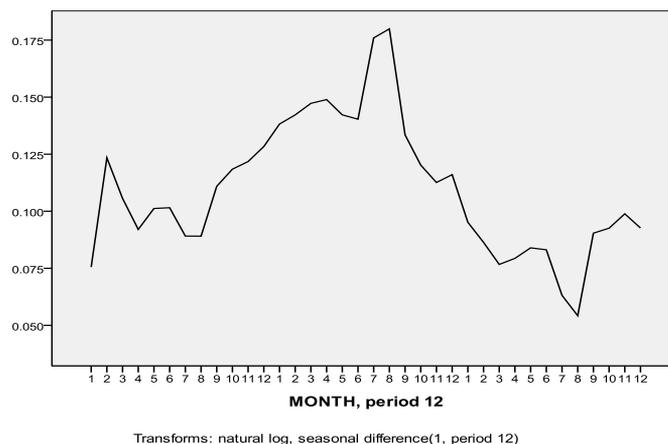


Figure 3. Differential time series chart of Teacher Zhang's income

As can be seen from the figure, this number is a stationary series, namely fluctuates up and down in 0.

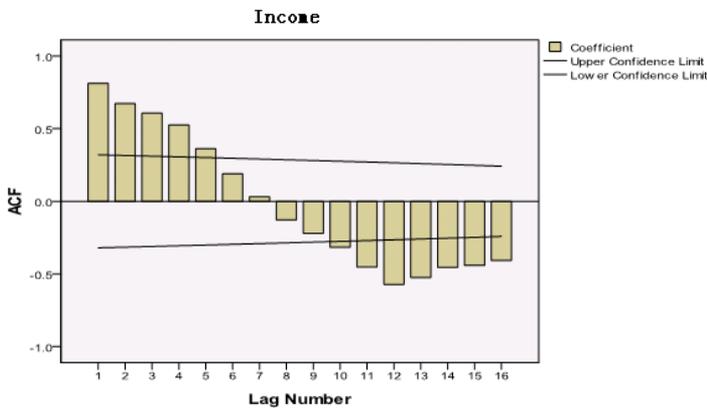


Figure 4. Autocorrelation figure

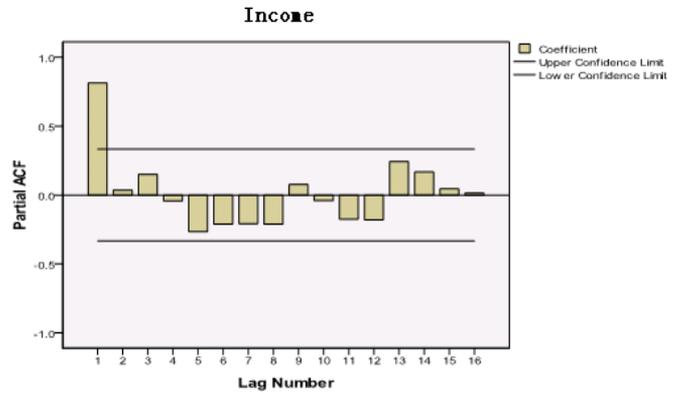


Figure 5. Partial autocorrelation figure

From the autocorrelation and partial autocorrelation figure, this series model can be preliminarily judged as ARIMA (1, 0, 0) (1, 1, 0), which can also be written as ARIMA (1, 1, 0).

2.3 Verify the model

As can be seen from the table 3, R-square is 0.980 and the fitting is very high, so we have reason to believe that the forecast was acceptable.

Table 3. Scale model residual error statistics

Model Statistics							
Model	Number of Predictors	Model Fit statistics		Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	R-squared	Statistics	DF	Sig.	
Revenue model_1	0	.755	.980	13.021	16	.671	0

As can be seen from the table above, the constant is 0.112, $t = 18.652$, $P = 0.000 < 0.05$, AR coefficient of 0.776, $t = 6.809$, $P = 0.000 < 0.05$, AR, Seasonal, $t = -4.746$, $P = 0.000$

< 0.05 , which suggests that the model coefficients are significantly effective. Therefore, the established model is ARIMA (1, 1, 0).

Table 4. ARIMA (1, 0) model parameters estimation results

ARIMA Model Parameters								
Revenue model_1	Revenue	Natural Log			Estimate	SE	t	Sig.
			Constant		.112	.006	18.652	.000
			AR	Lag 1	.776	.114	6.809	.000
			AR, Seasonal	Lag 1	-.652	.137	-4.746	.000
Seasonal Difference			1					

2.4 Forecast the model

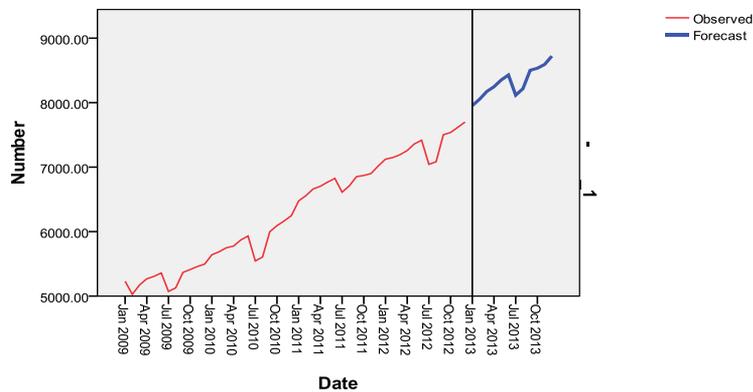


Figure 6. Revenue in 2013 forecast figure

Table 5. Teacher Zhang’s income in 2013 forecast table

Time (Year)	Time (Month)	Predictive value (Revenue)
2013	1	7953.52
2013	2	8052.11
2013	3	8172.41
2013	4	8246.74
2013	5	8351.62
2013	6	8428.78
2013	7	8115.29
2013	8	8215.97
2013	9	8502.25
2013	10	8533.44
2013	11	8592.39
2013	12	8721.42

2.5 Model analysis

Time series model is normally only used for short-term forecasting, error accumulated for medium and long term prediction is likely to happen, so the model can only predict college teachers’ income in recent years. We’ve learned from the revenue forecast model, teacher Zhang’s income is in line with the ARIMA (1, 0) model, the growth trend in the coming year will still be, his revenue in 2013 will exceed 8000 Yuan. After investigation, through the model prediction results compared with teacher Zhang’s real income in 2013, the error is very small, thus further illustrate time series analysis method the results of the analysis of existing data obtained can be applied to the university teachers’ income prediction.

3. CONCLUSION

As the institution reform of distribution system and promote the performance salary system of colleges and universities, colleges and universities teachers’ income increase gradually, and gradually become the key regulatory objects of personal income tax. According to seven progressive tax rate table by “Personal Income Tax Law”, earning more than 8000 Yuan would be the rate of 20% of the payable tax amount range, which is far higher than the rate of 10% suitable for below 8000 Yuan. With this situation, this article through the establishment of time series model analysis and projections for university teachers’ income, helps financial personnel in colleges and universities adapt to the tax situation of the practical need of timely, improve the suffering consciousness, reduce the tax burden, increase in real disposable income and improve teachers’ work enthusiasm by adopting incentive fees, making part of the wages and salaries welfare, selecting rational year-end bonus payments, making full use of the preferential tax policy of the tax law and carry on the reasonable tax planning methods and measures.

ACKNOWLEDGMENT

The authors are highly thankful for the Guangxi Education Science Education Financial Management special subject (ID: 2013ZCW060), Guangxi university research projects (ID: 201308LX321), Hechi University youth issues (number: 2012B-H003).

REFERENCES

- [1] Keith R. Fevurly, “Income tax planning and management” [M], *Plan Your Financial Future*, 2013:155-166. DOI: [10.1007/978-1-4302-6065-3_12](https://doi.org/10.1007/978-1-4302-6065-3_12).
- [2] Laszlo Goerke, “Income tax buyouts and income tax evasion” [J], *International Tax and Public Finance*, 2014(2):120-143. DOI: [10.1007/s10797-013-9302-z](https://doi.org/10.1007/s10797-013-9302-z).
- [3] Robert Sarikas, Liu Xiaobing, Yin Zi, Arsen Djatej, “Tax reform needs in china and the United States: perhaps a chance to learn from each other” [M], *Plan Your Financial Future*, 2008:423-432. DOI: [10.1007/978-0-387-25712-9_22](https://doi.org/10.1007/978-0-387-25712-9_22).
- [4] Tuanye Yu, Rui Chen, Qin Liu, “Study of China’s personal income tax reform chain based on balanced scorecard strategic map” [Z], *Proceedings of the 2nd International Conference on Green Communications and Networks*, 2012. 2013:553-561.
- [5] Peter C. Young, “An Introduction for the student and practitioner” [M], *Recursive Estimation and Time-Series Analysis*, 2011:187-196.
- [6] Gebhard Kirchgässner, Jürgen Wolters, “Introduction to modern time series analysis” [M], *Springer Texts in Business and Economics*, 2013:225-243. DOI: [10.1007/978-3-642-33436-8](https://doi.org/10.1007/978-3-642-33436-8).