

2014

BioTechnology

An Indian Journal

FULL PAPER

BTAIJ, 10(20), 2014 [12230-12234]

Analysis of teacher demand of China universities based on time series

Wei Bo^{1*}, Zhou Lihui², Zhao Liangjun³
^{1,2,3}Hebei United University, Tangshan Hebei 063300, (CHINA)
E-mail: yixuegailun@163.com

ABSTRACT

Colleges and universities shoulder the important functions of talent cultivation, scientific research and social service, and provide intellectual support for national economic construction. The development of higher education need to increase number, improve quality and optimize structure in teachers. This paper uses four factors such as demand of Dr., higher education investment gross, ownership of young teachers and professors to analysis teacher demand of Chinese colleges and universities. Using ADF test, Johansen cointegration test, and Granger causality test, summed up the real reason that affects teacher demand of colleges and universities. Analysis the four variables in short term prediction with the impulse response, at last offer a proposal on the development of teachers in colleges and universities according to the results of the analysis.

KEYWORDS

Teacher demand; ADF test; Johansen cointegration test; Granger causality test.



INTRODUCTION

Chinese colleges and universities service the construction of socialist modernization, and play an irreplaceable important role in the country's social and economic life. Since 1998, in order to meet the growing teacher demand, the preparation of teachers is expanding in the colleges and universities of China. But some universities still cannot meet the student-teacher ratio (College student-teacher ratio = number of students/teachers) 18:1 of the eligibility criteria^[1]. To fill the vacancy part of college teachers, some universities emergence that education of new teacher low Dr., blind promotion degree, teachers "inbreeding coefficient" and so on. That seriously affects the quality of higher education. Therefore, a clear understanding of the teachers in Colleges and universities demand situation, analysis of the factors affecting the demand of university teachers, do a good job of forecasting the demand of university teachers, and provide scientific basis for the planning of university teachers and policy making, it is important theoretical and practical significance to guarantee healthy, stable, sustainable development of the higher education.

At present, the analysis of teacher demand in colleges and universities is mainly based on the whole higher education system to study the needs of teachers, in which includes the optimization configuration method, human capital pricing method, empirical analysis and comparative analysis^[2], for example: Dong Guoqiang in 2010 used the human capital pricing method to carry on the analysis to our country partial university teachers demand^[3]. The common features of these methods are based on some kind of economic theory or the theory of understanding of economic to establish model theory relations forms. However, these methods are subjective, possible because knew on insufficiently comprehensive, insufficiently penetrates causes the model not to be inaccurate, then causes deviation in the analysis result.

This paper uses the time series model, based on the research of teacher ownership of time-series data and the impact of the major factors of the time-series data, so as to find out the time variation law of teachers ownership with the influence factors. Taking teachers ownership and the main affecting factors as a function of time, a prediction graph of teacher ownership is made. The basic idea of the method is that change law of ownership of teachers with time in the future is consistent with change law of ownership of teachers in the past.

This article applies to all types of school teachers carrying out the short or medium term demand forecasting.

RESULT AND DISSCUSS

Data sources and variable selection

Analysis of the use of data is the 1998-2012 annual data statistics, which roots in "China Education Statistical Yearbook" and the Ministry of education of the People's Republic of China's official data sources^[4]. The data includes: Dr. demand (DD), higher education investment gross (IG), young teachers ownership (YO) and professors ownership(PO). In order to eliminate the heteroscedasticity, reduce data fluctuation, and the logarithm processing data obtained four variables LD, LI, LY and LP.

ADF stability test

To establish a regression model and time series model, the used data should be smooth^[5]. However, with the rapid development of colleges and universities after expansion enrollment, the most of teachers' data in time series are not stationary, and the traditional OLS estimation may not be suitable for long term model. Therefore, before establishing the model, the smooth should be carried on the examination. This paper use ADF unit root method to examine four variables LD, LI, LY and LP, and first order and two order differential stability level of the four variable difference, the specific results are shown in TABLE 1.

TABLE 1: Inspection results of ADF

Sequence	level		First order differential(D)		Second-order difference (DD)	
	ADF	P	ADF	P	ADF	P
LD	-0.067484	0.8363	-3.381480	0.0264	-4.510086	0.0030
	-2.656873*		-3.950650**		-3.859678**	
LI	-0.960945	0.7648	-5.442387	0.0010		
	-2.782560*		-2.624103*			
LY	0.379712	0.9642	-3.368136	0.0327	-6.767232	0.0001
	-2.656873*		-3.950650**		-2.654210	
LP	1.440461	0.9979	-3.398695	0.0269	-5.450425	0.0007
	-2.665459*		-3.950650**		-2.654210	

Note: *represents the 10% significant level, and **represents the 1% significant level.

Through the unit root test on model year data can be seen, the ADF test value of the log level of Dr. demand (LD) is -0.067484, it is greater than 10% test level of the critical value of -2.656873, therefore, LD is a non stationary series. The ADF test values of first-order differential DLD of LD is -3.381480, it is greater than the 1% test level under the critical value of -3.950650, so DLD is non-stationary; And the ADF test value of the two order differential DDL of LD is -4.510086, it is less than the 1% test level under the critical value of -3.859678, therefore, two order differential of Dr. demand logarithm DDL is a stationary sequence.

Similarly, according to the ADF test it can be seen: first-order differential of higher education investment gross logarithm DLI is stable, and two order differential of young teacher ownership logarithm DDLY, two order differential of professor ownership logarithm DDLP is stable.

Johansen co-integration test

To establish Autoregressive model (VAR) containing k variable and a vector y_t , if y_t is stable, it can use OLS to estimate the parameter of the model, and the variance is calculated; If all or part of a y_t variable is non-stationary, and then uses the OLS estimation, then residuals are non-stationary, which will produce spurious regression^[6]. Therefore, it should first be tested whether co-integration relationship exist in non-stationary variables. If co-integration relationship exists, then deal with non-stationary variables to establish the vector error correction model (VECM).

According to the results of single integration test TABLE 1, the data suits a co-integration analysis. Johansen co-integration test on four variables: LD, LI, LY and LP, and the test results show that: in a significant level of 5%, between two order differential of Dr. demand logarithm DDL, first-order differential of higher education investment gross logarithm DLI, two order differential of young teachers ownership logarithm DDLY and two order differential of professor ownership logarithm DDLP there is a co-integrating vector, and there is a long-term equilibrium relationship between the four. The regularization long term equation about two order differential of the Dr. demand logarithm DDL is as follows:

$$DDL = 0.067564 DLI - 0.534897 DDLY - 0.359689 DDLP$$

(0.22398) (0.28123) (0.22648)

According to the results of co-integration test, we can get the conclusion: Between higher education investment gross (IG) and demand of Dr. (DD) is a positive correlation, and the effect of IG on demand of Dr. is bigger. When the IG changes 1%, Dr. demand change 6.76%. However, influence of the changes of young teachers ownership and professor ownership on Dr. demand, which does not accord with the hypothesis, and which is a significant negative correlation.

Granger causality test

The basic foundation of Granger causality test is: the future can predict the past; If the change of variable y is caused by the variable x, the changes of x should take place before the change of y. Therefore, C.W.J.G ranger made a definition of the relationship between variables in 1969 as following: if x is the cause of change of y, the variable x should help predict y. That is to say, adding the past value of x as the independent interpretation variables on the regression of the past values of y, should increase significant interpretation ability of regression. At this point, x is called the Granger reason of y. If adding the lag variable to x does not increase significant interpretation ability of regression model, x is not the reason of y.

In this paper, a smooth sequence of four variables DDL, DLI, DDLY and DDLP after ADF test is dealt with the Granger causality test, to explore the causal relationship of demand of Dr., higher education investment gross, ownership of young teachers and professors. Test results are shown in TABLE 2.

TABLE 2 : The causality test granger

	F	P
DLI is not the reason of DDL Granger	4.15600	0.04156
DDL is not the reason of DLI Granger	1.27658	0.31276
DDLY is not the reason DDL Granger	0.24123	0.81456
DDL is not the reason DDLY Granger	1.56233	0.24567
DDLP is not the reason DDL Granger	2.65326	0.11687
DDL is not the reason DDLP Granger	3.81523	0.06510

The TABLE 2 shows: in the case of lag of two orders, according to the assumption "DLI is not the reason of DDL D Granger ", the F value of 4.15600 is greater than the critical value $F_{0.1}(2, 6) = 3.46$, which reject to the null hypothesis. That is to say, DLI is the change reason of DDL D, the first-order differential of higher education investment gross logarithm DLI is the change reason of the two order differential of demand of Dr. logarithm DDL D. According to the assumption "DDL D not cause of DLI Granger", $F = 0.24123$ is less than the critical value of 3.46, the null hypothesis is accepted. That is to say, DDL D is not the change cause of the DLI. Results show that since 1998, there exists a one-way causal relationship between the first-order differential of higher education investment gross logarithm DLI and he two order differential of Dr. demand logarithm DDL D. So DLI has a predictive effect to DDL D. This shows higher education investment gross IT has great effect on demand of Dr..

Similarly, in the output results, according to the assumption "DDL D is not DDL Y Granger reason", the F value of 1.56233 is less than the critical value, which accepts the null hypothesis. That is to say, DDL D is not the change reason of DDL Y, namely the two order differential of demand of Dr. logarithm is not the change reason of second order differential of young teachers ownership logarithm. demand of Dr. has no effect on the young teachers ownership.

Similarly, in the output results, t according to the assumption "DDL D is not DDL P Granger reason", the F value of 3.81523 is bigger than the critical value, which reject the null hypothesis. That is to say, DDL D is the reason of changes of DDL Y, namely the two order differential of demand of Dr. logarithm is the reason of changes of the two order differential of professor ownership logarithm. demand of Dr. has a predictive effect on Professor ownership.

The impulse response based on VAR model

From the causality test: the first-order differential of higher education investment gross logarithm (DLI) is the information variable of the two order differential of Dr. demand logarithm (DDL D). It can short-term predict DDL D by monitoring changes in DLI. Therefore, this paper will put the Dr. demand and higher education investment gross as endogenous variables, and establish the first order VAR unconstrained model with DLD and DDL I. With the impulse response function based on VAR model (IRF), the Shock response of DLI and DDL D can be calculated. Figure 1-and Figure 2 shows the influence of shock pulse in variables.

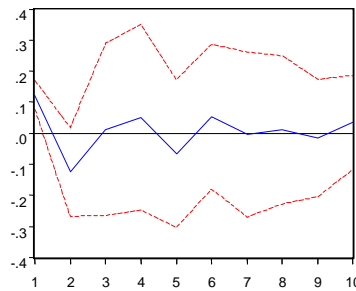


Figure 1 : DDL D to itself impulse response

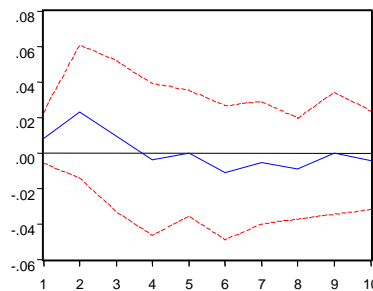


Figure 2 : DLI to DDL D impulse response

Figure 1: The impulse response graphs of the two order differential of demand of Dr. logarithm to itself standard deviation rushing. It shows that DDL D is a negative in the second period; then turns into positive after the third period. However, it turns into negative after 4.5th period and reduces later.

Figure 2: The impulse response graphs of the first-order differential of higher education investment gross logarithm to the two order differential of demand of Dr. logarithm. It shows that the two order differential of demand of Dr. logarithm is a positive response when DLI is given an impact of standard deviation. It turns into negative after 3.5th period and gets to the summit in the sixth period. After that it reduces slowly.

CONCLUSIONS AND SUGGESTIONS

From the results above, it comes to the conclusion that in order to increase the demand of Dr, it must increase the gross investing into the higher education. Considering from the aspect of economy and politics, improving higher education investment gross need to improve the national fiscal revenue, need to ensure economic and social development planning with priority development of education, need to ensure financial capital with priority security education investment, and need to ensure public resources with priority education and human resource development.

As the intellectual support for the development of the Chinese economy, higher education's development will have a direct impact on the smooth functioning of the national economy and the process of modernization. The revitalization of China lies not only in overall size of the economy, but also in the talent and science and technology progress. In order to ensure the healthy development of teaching in colleges and universities, we need to further perfect the related law and system in the teachers construction, further introduce the mechanism of competition, adopt a high-standard hiring teachers scheme, hire talented part-time teachers, strengthen teacher-training mechanism, improve the overall quality of teachers and so on.

REFERENCES

- [1] The ministry of education of PRC, *The Basic Conditions For Running Index Of Ordinary Higher School*, Beijing, (2004).
- [2] Pan Hongyu; *Time series analysis*, 1st Edition Beijing: Economic and Trade University Press, (2006).
- [3] Dong Guoqiang; *China university teachers' human capital pricing research*, PhD Thesis, Northwestern University, Xi'an, (2010).
- [4] National bureau of statistics of PRC, *Chinese education statistical yearbook*, China Statistics Press, Beijing, (2012).
- [5] Chatfield; *The analysis of time series an introduction*, 4th Edition, Chapman and Hall. C., (1989).
- [6] James; *Time series analysis*, Princeton, New Jersey, D.Hamilton, (1994).