

Analysis on The Influence of College Teachers' Personal Literacy – Based on Co-integrated Test

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Abstract: With the rapid development of economy, the requirement for the high-quality talents increases day by day. To meet the demand of social development, it is urgent for the government and universities to employ high-quality of teachers, who cultivate high-quality talents. As a prerequisite, it is imperative to establish a reasonable and scientific evaluation system for the teacher quality. In this paper, we use the ADF test method to test the stationarity of the sequence. And then on the basis of the sequence is first order and single integral, we utilize the co-integrated test to analyse the five indicators affecting the quality of Teachers, which includes responsibility, professional level, work performance, moral character and willingness to work. The results indicate that the factor of teacher responsibility plays a guiding role in improving the quality of teaching staff. The greater value of responsibility indicator means the better comprehensive quality of teachers. Therefore, it is a practical solution to improve the quality of teachers by improving teachers' sense of responsibility. The overall research is beneficial for enhancing the quality of college teachers, and ultimately, to improve the level of education in China.

Keywords: Quality of teachers; Responsibility; Unit root test; Co-integration test

1 Introduction

The Chinese contemporary higher education has gone through a process for 30 years, and its development and reform have achieved some progress to a certain degree. In the process of Chinese modernization, the importance of education has become increasingly prominent, and become a powerful force and important resources gradually. At the same time, education is confronting great crisis and challenge. As important issues in China's higher education, educational reform and innovation are not only the key to breakthrough bottleneck of current education but also the way to achieve socialist modernization educational goal. Faced with more and more fierce international competition, it is urgent to cultivate a group of high-quality talents in this era of rapid development of economy, knowledge and science and technology. The cultivation of talents is closely related to the guidance of teacher. The quality of teachers is the active and decisive factor in quality education [1]. The evaluation indexes of teachers' quality mainly include responsibility, professional level, work performance, moral practice and willingness to work and so on. It is the key to improve the quality of teachers to determine the main evaluation indexes that affect the quality of teachers.

There are many methods to determine the main evaluation index of teachers' quality, such as grey analysis, fuzzy comprehensive evaluation, principal component analysis, co-integration test, etc. Chinese researches Julong Deng put forward the grey system theory in 1982 for the first time, which was used in many fields, including society, agriculture, engineering and economic management control [2–4]. The work had been hailed as a significant development of one of the natural science discipline [5]. Gray theory is applied broadly in evaluation of teacher quality. Huang used the multilevel gray theory to construct the performance evaluation model of University teachers. Specifically, the model was constructed based on the principle of integration from qualitative to quantitative, and considered the requirements of teachers' quality from three major tasks: teacher teaching, scientific research and social service [6]. This model made the evaluation of

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teachers' performance more scientific, objective and reasonable. Jiang adopted fuzzy analytic hierarchy process (FAHA) to determine the index weight at the first, and then the quality of the evaluation objects were evaluated by using fuzzy comprehensive evaluation, which provided a scientific and feasible method for the evaluation of teachers' comprehensive quality [7]. Similarly, Wei and Jiang combined AHP and fuzzy comprehensive evaluation method to evaluate the overall quality of teachers. The results showed that the method can effectively evaluate the overall quality of college teachers, and made the evaluation results more scientific and reasonable [8, 9]. Chu also evaluated the teachers' comprehensive quality by applying the fuzzy comprehensive evaluation and precedence order method, and got a more objective evaluation result [10]. In addition, the principal component analysis (PCA) method is also one of the common methods of evaluation of teachers' comprehensive quality [11–13]. It can eliminate the influence of evaluation index and reduce the workload of index selection [14, 15].

Co-integration test is an econometric method, and it is also one of the most important tools to analyze the quantitative relationship between non-stationary economic variables [16]. Zeng used co-integrated test to study the relationship between the development of service industry and urbanization in the eastern, central and western regions of China. The results showed that in the long run, the development of service industry in Central China was the cause of urbanization, and urbanization promoted the development of service industry to a certain extent in the short term [17]. In order to explore the relationship between financial R&D investment and economic growth of Chinese government, Zhao used co-integrated method to test the relationship during 1989-2007. The empirical results showed that government investment in financial research and development investment can promote economic growth [18]. Zhao made co-integrated test between China's futures market and international futures market. This showed that China's futures market had the effectiveness of market basically, and the formation of the price self-restraint mechanism [19]. Lu utilized the empirical data to conduct co-integration test. The results found that there was a long-term equilibrium relationship between teaching quality and teachers' salaries. Increasing the salary of teachers was an effective way to improve the quality of teaching in colleges and universities [20]. Co-integration test is usually used in macro econometric analysis. The current study only considers one or two factors, but few studies on multiple factors, especially in the evaluation of teachers' quality.

This paper evaluates the teacher quality based on the co-integration test. The rest of paper was structured as follows: Section 2 deals with the data, and analyzes the stability of the data. Next we use co-integration test to simulate the results in Section 3. At last, Section 4 draws the conclusion.

2 Source and stability analysis of data

2.1 Data sources

In this paper, the factors that influence teacher quality evaluation in a university and its related data comes from Wang [21]. We randomly select 20 teachers to evaluate their quality from five aspects. The comprehensive evaluation indexes of teachers' quality include responsibility, professional level, work performance, moral conduct and working willingness. The specific data is shown in Table 1.

2.2 Stability analysis of data

The co-integrated test is based on the stable sequence. The non-stationary sequence without regression would cause the false regression. Therefore, the stationarity of time series must be tested before regression. The judgment method of the stationarity test is mainly the unit root test. The usual approaches are ADF test, PP test and so on. ADF test is adopted in this paper.

Eviews software is used to perform the ADF test for the original sequence and the first order difference sequence of the correlation variable. The test results are shown in Table 2. Among of them, X_1 represents responsibility, X_2 represents professional level, X_3 represents work performance, X_4 represents moral conduct, X_5 represents work willingness, ΔX_1 , ΔX_2 , ΔX_3 , ΔX_4 , ΔX_5 represent the first order difference of the corresponding factors, respectively.

As shown in Table 2, in the original sequence, the ADF statistic of X_2 and X_5 is greater than the critical value at the significant level of 1%, and the time series contains unit root. Under the first order difference condition, the ADF statistics of all sequences are less than 1%. The critical value at the significant level is a stationary sequence. Therefore, X_1 , X_2 , X_3 , X_4 and X_5 are all first-order single integral.

Table 1: The indexes of teacher evaluation and its value

Numbers	responsibility	professional level	Work performance	Moral conduct	Work willingness
1	22.5	14.3	14.5	14.2	7.2
2	26.3	16.7	16.3	16.2	8.3
3	27.4	17.4	17.6	17.6	9.3
4	28.4	18.6	18.7	18.5	9.4
5	24.2	14.8	14.4	14.8	8.4
6	26.3	15.5	16.1	15.7	8.2
7	24.9	14.6	15.1	14.8	7.7
8	25.3	15.5	15.7	16.0	8.5
9	28.1	18.4	18.3	18.4	9.1
10	28.2	18.5	18.8	18.8	9.5
11	24.7	15.3	15.1	14.8	8.0
12	27.4	17.0	17.2	16.9	8.9
13	28.5	18.3	18.4	18.7	9.3
14	26.5	17	15.2	18.2	8.1
15	27.1	26.5	17.2	14.8	8
16	28	18.1	17.9	16.8	7.9
17	25.2	17.6	18.8	15.8	8.5
18	25.3	17.5	16.2	16.5	8.3
19	24.8	18	17.1	16.2	8.1
20	28	15.8	16.1	15.2	8.1

Table 2: Stability analysis of influencing factors after ADF test

Test object	t-Statistic	Prob.	Critical values			Conclusion
			1% level	5% level	10% level	
X_1	-4.8761	0.0011	-3.8315	-3.0300	-2.6552	stable
ΔX_1	-5.5658	0.0003	-3.8574	-3.0404	-2.6606	stable
X_2	-3.8038	0.0106	-3.8315	-3.0300	-2.6552	unstable
ΔX_2	-6.6160	0.0000	-3.8574	-3.0404	-2.6606	stable
X_3	-4.5911	0.0021	-3.8315	-3.0300	-2.6552	stable
ΔX_3	-5.9508	0.0001	-3.8574	-3.0404	-2.6606	stable
X_4	-4.0210	0.0067	-3.8315	-3.0300	-2.6552	stable
ΔX_4	-5.1053	0.0008	-3.8574	-3.0404	-2.6606	stable
X_5	-3.7015	0.0131	-3.8315	-3.0300	-2.6552	unstable
ΔX_5	-4.4198	0.0032	-3.8574	-3.0404	-2.6606	stable

Table 3: Least squares regression of X_2, X_3, X_4, X_5 by X_1

Variable	Coefficient	Std.Error	t-Statistic	Prob.
c	8.6592	3.5205	2.4597	0.0265
X_2	0.1474	0.1205	1.2237	0.2399
X_3	0.2408	0.3063	0.7862	0.4440
X_4	0.4744	0.2976	1.5940	0.1318
X_5	0.3932	0.7464	0.5267	0.6061
R-squared	0.6680	Mean dependent var		26.3550
Adjusted R-squared	0.5794	S.D.dependent var		1.6819
S.E.of regression	1.0907	Akaike info criterion		3.2239
Sum squared resid	17.8458	Schwarz criterion		3.4728
Log likelihood	-27.2391	Hannan-Quinn criter.		3.2725
F-ststistic	7.5446	Durbin-Watson stat		1.8731
Prob(F-statistic)	0.0015			

Table 4: Stability analysis of influencing factors after ADF test

Test object	t-Statistic	Prob.	Critical values			Conclusion
			1% level	5% level	10% level	
resid	-4.8587	0.0015	-3.8868	-3.0522	-2.6666	stable

3 Simulation results

The co-integration test was used to test the data. Engle and Granger put forward the EG two step method and Johansen tested the method in 1987 [?]. EG two step method is applicable to co-integration test between two variables, and Johansen test is applicable to co-integration test among multiple variables. In terms of the long-term relationship between X_1, X_2, X_3, X_4 and X_5 , the Johansen method is used to test it. Johansen method first uses OLS (ordinary least squares regression) to estimate the co-integrated regression equations, and the results are shown in Table 3. We get the co-integration regression equation.

$$X_1 = 8.6592 + 0.1474X_2 + 0.2408X_3 + 0.4744X_4 + 0.3932X_5 + u \tag{1}$$

Then, the unit root test was carried out to check the stationarity of the residual sequence u by Eviews software, that is, the ADF test was performed on *resid*, and the results are shown in Table 4.

As shown in Table 4, the ADF test value is -4.858654, which is less than the critical value when the significance level is 1%. Therefore, it can be considered that the u is stable. There is a co-integrated relationship between X_1, X_2, X_3, X_4 and X_5 , that is, there is a long-term equilibrium relationship between them.

The quality of teachers is mainly influenced by five factors: responsibility (X_1), professional level (X_2), work performance (X_3), moral conduct (X_4) and work willingness (X_5). The co-integration regression equation shows that the five factors are related to each other, and the responsibility factor has the greatest impact on the factors. Namely, the professional level, work performance, moral conduct, work willingness have a certain impact on teachers' quality to a certain extent, but the responsibility has the greatest influence on teachers' quality and plays a decisive role.

4 Conclusions

The quality of teachers is the key to train high quality talents in modern society. It plays an important guiding role in the development of modern education in China. This paper uses co-integrated test to study the main factors which affect the quality of College Teachers in China. The study mainly considers five indicators (responsibility, professional level, work performance, moral conduct, work willingness). The stability of the data is analyzed and tested by using the unit root test. Then the long-term equilibrium relationships are explored between 5 indicators by the co-integration test. Finally, determining the most important factors which affect the quality of Teachers through the analysis of co-integration regression equation. The result shows that responsibility is the most important factor in the construction of teachers' quality. The greater the responsibility index, the better the overall quality of the teacher. Therefore, improving the sense

of responsibility of teachers is a practical solution to improve the quality of teachers. Of course, other indicators also have some influence on the improvement of teachers' quality, and the improvement of teachers' quality also needs the progress of other indicators. Comprehensive research will help to enhance the quality of college teachers, and ultimately, to improve the level of education in China.

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