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Empirical Analysis of the Relationship between the Consumption and Income Levels of Rural Residents in Anhui Province, China, Based on Econometric Tests and the Error Correction Model

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Abstract: In this study, the error correction model and econometric tests were used to empirically analyze the correlation of the income and consumption levels of rural residents during 1990-2012 in Anhui province, China, by means of the software Eviews 6.0. Based on the data generated and analyzed, the relationship between the rural consumption and income levels were confirmed and further explored. It was found that there was a statistically significant correlation between the levels of the rural income and the rural consumption from the point of view of elasticity coefficient, i.e., 0.858616, while the Pair-wise Granger causality test suggested the authors to accept the hypothesis that income precedes consumption in Anhui province. Together with the Granger causality tests, it was indicated that the elasticity of the variable X (income level) driving or promoting the variable Y (consumption level) was 0.858616 estimated in the Error Correction Model (ECM). That is to say, whenever the rural income level increases by 1%, the rural consumption level will be driven or promoted by 0.858616 in Anhui province.

Key words: Consumption, income, rural resident, co-integration test, Granger causality test, error correction model

INTRODUCTION

The level of rural-urban income gap in 1978 broke the institutional equilibrium on which the traditional rural urban relationship relied, leading to overall reform in rural China. According to China's official statistical poverty data in the website of National Bureau of Statistics, the rural poverty was reduced from 250 million people surveyed in 1978 to 26.88 million people surveyed in 2010, with the overall incidence of poverty dropping from 30.7-2.8%. The data reflect a trend of substantial declines of poverty in China in the past 30 years, although the poverty line of China has remained lower than the international standard. However, there are still some issues concerned by the public and scholars, such as the sustainable growth of rural households' incomes, the rural-urban income gap and the direct and indirect subsidies and public finances in rural areas. At present, there are few reports and little understanding of the rural households' various incomes and their relative contribution and possible correlation to the consumption levels of rural households, especially in China.

Zhong *et al*. (2004) first reported the status of farmers, agriculture and countryside and development measures in the Tibet autonomous region, China. They found there was still a big gap in Tibet province compared with east and middle China. Li *et al*. (2005) also investigated the pattern of changes on the farmers and herdsmen's income sources in the Tibet autonomous region during 1990-2004. Cai (2007), systematically reviewed and analyzed the rural urban income gap and its critical points for change in an analytical framework based on institutional economics. Tatlidil *et al*. (2009) conducted an investigation on the farmers' perception of sustainable agriculture and its determinants with a stratified sample of 208 farmers from four districts in Kahramanmaras province of Turkey. The survey found that the higher or more frequent the socio-economic status and the greater the access to information and finally the greater the perceived importance of sustainable agricultural practices. Yao *et al*. (2009) made an empirical analysis of the effects of China's land conversion program on farmers' income growth and labor transfer. They found that local participation status, economic conditions, program extent and political

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leadership indeed had significant impacts on the household income and off-farm employment. Qin (2010) analyzed and discussed the rural-to-urban labor migration, household livelihoods and the rural environment in the municipality of Chongqing and Southwest China.

Wang (2010) reviewed and analyzed the income uncertainty, risk coping mechanism and farmer production and management decision with an empirical study from Sichuan province. Obermaier *et al.* (2012) made an assessment of electricity and income distribution trends following rural electrification in Northeast Brazil. They found that rural consumers took up electricity consumption after electrification and low consumption levels gave way to higher electricity consumption levels, in which it was indicated that there were immediate social benefits for households in the consumption. However, they could not verify a direct link between electricity use and rural income generation in the short term. Niu *et al.* (2012) also surveyed the variations in energy consumption and survival status between rural and urban households based on the “Energy ladder” hypothesis in the Western Loess plateau of China. They found that the ladder feature of energy consumption was obvious. High-income residents in urban areas consumed more high-quality energy and they enjoy an affluent lifestyle, while low-income households, who were still at the level of basic survival in rural areas, obtained less effective heat and poor quality fuels. Van Leeuwen and Dekkers (2013) analyzed the determinants of Dutch off-farm income and its local patterns using spatial micro-simulation with GIS techniques. Their analysis showed that the farmers that benefit most from off-farm job opportunities were the ones close to the larger cities, as well as the ones in the regions where the farmers were younger and where they were often involved in dairy or arable farming. Liu *et al.* (2013) reported a study on the impact of China’s Priority Forest Programs on rural households’ income mobility.

Liu *et al.* (2014) discussed whether the Key Priority Forestry Programs affected the income inequality in rural China. Their empirical results indicated that direct and overall contributions to total income inequality had experienced an inverted u-shape and changed over time during the study period and differed from one county to another. Zhou *et al.* (2013) analyzed the phenomenon of inequitable healthcare utilization in rural China based on the data from National Health Service Survey (NHSS). They found the utilization of the outpatient and inpatient services were pro-rich in rural China with the exception of outpatient service in 2008. Under the same needs for healthcare, rich rural residents utilized more healthcare service than poor rural residents. Meanwhile, utilization of inpatient service was more inequitable compared to utilization of outpatient service.

The review stated all the relevant aspects of the living consumption and income levels of rural residents. However, there are few reports for the econometric research on the correlation analysis and the Granger causality relationship between the rural consumption and income levels. In the present study, the relationship between the consumption and income levels of rural residents in Anhui province from 1990-2012, was comprehensively analyzed based on econometric tests and the error correction model by means of the software Eviews 6.0. Based on the data generated and analyzed, the relationship between the rural consumption and income levels were confirmed and further explored. The econometric methods conducted in this study were unit root, co-integration and Granger causality tests.

MATERIAL AND METHODS

Data acquisition and pre-processing: The annual data of the consumption and income levels of rural residents in Anhui province were in time series (1990-2012) collected with references to “Anhui Province Statistical Yearbook” and “China Rural Statistical Yearbook”. It should be noted that the logarithms of the prices were used before the subsequent analysis in this study after the processing and transforming with necessary adjustments based on the basic price of 1990 in order to eliminate possible hetero-scedasticities from the annual data.

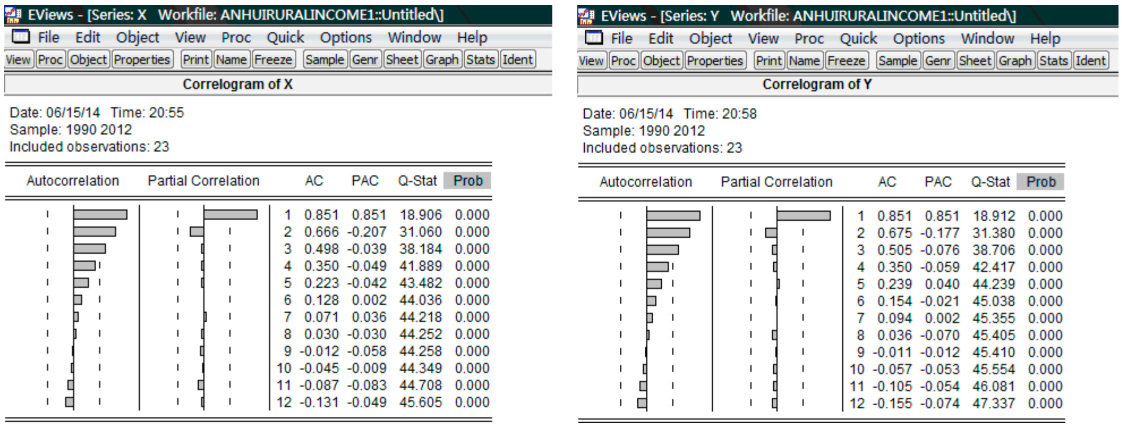
All the data were subsequently dealt with the econometric software package Eviews 6.0 (Quantitative Micro Software Inc., USA) after pre-processing. The auto-correlogram plot of the variables (X, Y) to be analyzed was shown in Fig. 1.

Unit root test: In the unit root tests, the null hypothesis is that a unit root exists and the sequenced variable or time series data is non-stationary. In the present study, the Augmented Dickey-Fuller (ADF) tests were used. For any sequenced variable, the general form of the ADF test is defined as following:

$$\Delta x_t = \alpha + \beta t + \gamma x_{t-1} + \sum_{i=1}^{p} \gamma_i \Delta x_{t-i} + \varepsilon_t,\ \ \varepsilon_t \sim I(0)$$

where, the letter “α” was a constant, “t” was a variable of time trend and “p” meant the number of lags. The null hypothesis (H_0) of the test was, r = 0, while the alternative hypothesis (H_1) was, r ≠ 0. If the null hypothesis was accepted, then there existed a unit root within the variable tested, i.e., non-stationary.

Co-integration test: The relationship between co-integration and error correction models, first suggested by Granger (1981, 1983), is here used to develop



	AC	PAC	Q-Stat	Prob
1	0.851	0.851	18.906	0.000
2	0.666	-0.207	31.060	0.000
3	0.498	-0.039	38.184	0.000
4	0.350	-0.049	41.889	0.000
5	0.223	-0.042	43.482	0.000
6	0.128	0.002	44.036	0.000
7	0.071	0.036	44.218	0.000
8	0.030	-0.030	44.252	0.000
9	-0.012	-0.058	44.258	0.000
10	-0.045	-0.009	44.349	0.000
11	-0.087	-0.083	44.708	0.000
12	-0.131	-0.049	45.605	0.000

	AC	PAC	Q-Stat	Prob
1	0.851	0.851	18.912	0.000
2	0.675	-0.177	31.380	0.000
3	0.505	-0.076	38.706	0.000
4	0.350	-0.059	42.417	0.000
5	0.239	0.040	44.239	0.000
6	0.154	-0.021	45.038	0.000
7	0.094	0.002	45.355	0.000
8	0.036	-0.070	45.405	0.000
9	-0.011	-0.012	45.410	0.000
10	-0.057	-0.053	45.554	0.000
11	-0.105	-0.054	46.081	0.000
12	-0.155	-0.074	47.337	0.000

Fig. 1: Auto-correlogram plot of variables (X, Y) used and analyzed

estimations, tests and empirical analyses. If each element of a vector of time series X_t first achieves stationarity after differencing but a linear combination $\alpha' X_t$ is already stationary and the time series X_t are said to be co-integrated with co-integrating vector α. There may be several such co-integrating vectors (α). Interpreting $\alpha' X_t = 0$ as a long run equilibrium, co-integration implies that deviations from equilibrium are stationary, with finite variance, even though the series themselves are non-stationary and have infinite variance. The main idea of co-integration test was to test the hypothesis whether there existed a long-term regression or a correlation relationship between two time series or sequenced variables. The common methods of the co-integration test are EG two-step method and the Johansen co-integration test. The later was used in this study and its objective was to determine the causality direction in the data during selected years.

Granger causality test: Pair-wise Granger causality test is a statistical hypothesis test for determining whether one time series is useful in forecasting another. Ordinarily, a time series X is said to Granger-cause Y if it can be shown, usually through a series of t-tests and F-tests on lagged values of X (and with lagged values of Y also included), that those X values provide statistically significant information about future values of Y. If a time series data is in stationary process, the Granger causality test is performed using the level values of two (or more) variables. If the variables are non-stationary, then the Granger causality test is done using first (or higher) differences. The number of lags to be included is usually chosen using an information criterion, such as the Akaike information criterion or the Schwarz information criterion. Any particular lagged value of one of the variables is retained in the regression if: (1) It is significant according to a t-test and (2) It and the other lagged values of the variable jointly add explanatory power to the model according to an F-test. Then the null hypothesis of no Granger causality is not rejected if and only if no lagged values of an explanatory variable have been retained in the regression.

Error correction model: If the differential variables for both the endogenous and exogenous variables are stated in stationary process and co-integration (Note: The number of lags to be included is usually chosen using an information criterion too), it could be deduced the following equation to estimate the long-run equilibrium or relationship between variables:

$$y_t = \beta_1 x_{1t}+\beta_2 x_{2t}+\ldots.+\beta_n x_{nt}+\varepsilon_t,\quad \varepsilon_t \sim I(0)$$

The corresponding Error Correction Model (ECM) equation could be expressed as the following:

$$\Delta y_t = c + \sum_{i=1}^{m} \alpha_i \Delta y_{t-i} + \sum_{i=1}^{n}\sum_{j=0}^{m} \beta_{ij} \Delta x_{i,t-j} + \delta ecm_{t-1} + e_t$$

where, the mark "Δ" stands for the first difference variable and the word "ecm" is the long-term regression equation residual.

RESULTS AND DISCUSSION

The relationship between rural consumption and income is not only an important issue but also a controversial problem for both academicians and policy makers.

Table 1: Stationary test results of the annual data during the period of 1990-2012

Variable	Inspection (C,T,P)	t-statistic	t-statistics for thresholds (%) 1	5	10	Durbin-Watson statistic	Stationary or not
ΔlnY	C,T,0	-2.787034	-4.467895	-3.644963	-3.261452	2.523177	No
ΔlnX	C,T,0	-3.761651*	-4.467895	-3.644963	-3.261452	1.937117	Yes
Δ(1)lnY	N,N,P	-3.207791	-4.467895	-3.644963	-3.261452	1.965309	No
Δ(1)lnX	N,N,P	-4.561881**	-4.467895	-3.644963	-3.261452	1.105460	Yes
Δ(2)lnY	N,N,P	-5.378312**	-4.498307	-3.658446	-3.268973	1.974745	Yes
Δ(2)lnX	N,N,P	-7.872768**	-4.498307	-3.658446	-3.268973	2.381744	Yes

C,T,P: Presence of a constant and time trend terms, N,N,P: Constant term and time trend does not exist.*,**Relevant variables meant significant at the levels of 5 and 1%, respectively. Lag order P was determined in accordance with the AIC rules

Table 2: Stationary test of variable X at the second difference

Null hypothesis: D(X,2) has a unit root			t-statistic	Probability*
Augmented Dickey-Fuller test statistic			-7.872768	0.0000
Test critical values at different levels (%)				
1			-4.498307	
5			-3.658446	
10			-3.268973	
Parameters	Coefficient	Std. error	t-statistic	Probability*
D(X(-1),2)	-1.136830	0.144400	-7.872768	0.0000
C	-0.021470	0.042663	-0.503253	0.6212
TREND (1990)	0.001455	0.003071	0.473872	0.6416
R^2	0.795388	Mean dependent variable		-0.023400
Adjusted R^2	0.771316	S.D. dependent variable		0.162526
S.E. of regression	0.077721	Akaike info criterion		-2.133894
Sum squared resid	0.102690	Schwarz criterion		-1.984534
Log likelihood	24.33894	Hannan-Quinn criterion		-2.104737
F-statistic	33.04197	Durbin-Watson stat		2.381744
Prob (F-statistic)	0.000001			

Augmented Dickey-Fuller test equation, Dependent variable: D(X,3), Method: Least squares, Sample (adjusted): 1993-2012, Included observations: 20 after adjustments. *Significance was measured using MacKinnon (1996) one-sided p-values

Table 3: Stationary test of variable Y at the second difference

Null hypothesis: D (Y,2) has a unit root			t-statistic	Probability*
Augmented Dickey-Fuller test statistic			-5.378312	0.0018
Test critical values at different levels (%)				
1			-4.498307	
5			-3.658446	
10			-3.268973	
Parameters	Coefficient	Std. error	t-statistic	Probability*
D(Y(-1),2)	-1.250223	0.232456	-5.378312	0.0001
C	0.023518	0.062879	0.374022	0.7130
TREND (1990)	-0.001355	0.004547	-0.298019	0.7693
R^2	0.629886	Mean dependent variable		-0.011800
Adjusted R^2	0.586343	S.D. dependent variable		0.181888
SE of regression	0.116984	Akaike info criterion		-1.316086
Sum squared resid	0.232648	Schwarz criterion		-1.166726
Log likelihood	16.16086	Hannan-Quinn criterion		-1.286929
F-statistic	14.46588	Durbin-Watson stat		1.974745
Prob (F-statistic)	0.000214			

Augmented Dickey-Fuller test equation, Dependent variable: D(Y,3), Method: Least squares, Sample (adjusted): 1993-2012, Included observations: 20 after adjustments. *Significance was measured using MacKinnon (1996) one-sided p-values

Unit root tests: Table 1 shows the result of unit root tests conducted for variables used in this study. The tests were conducted for the rural regional data of Anhui province, China. The results of ADF tests were identified from the unit root test results that all the variables analyzed were stated in stationary sequences at the levels of the first and/or second order differences (Table 1), i.e., I(1) and I(2). The results show that all the variables (both exogenous and endogenous) are stationary at their second order differences with individual effects and individual linear trends. Although, it was also indicated that some statistics for variable Y (or lnY) were non-stationary at the first differences, their second differences were stationary (Table 1-3) and there were few autocorrelations of these two variables with corresponding Durbin-Watson statistics. Therefore, it was suitable for subsequent analyses. Having established the stationary order of integration of these two variables with unit root tests, we thus could move on to conduct the pair-wise co-integration tests.

Table 4: Co-integration tests of variables Y and X (lnY and lnX) for unrestricted co-integration rank test (Trace)

Hypothesized No. of CE(s)	Eigen value	Trace statistic	Critical value 0.05	Probability**
None*	0.880648	46.27328	20.26184	0.0000
At most 1	0.074862	1.634064	9.164546	0.8488

Sample (adjusted): 1992-2012, Included observations: 21 after adjustments, Series: Y X. Trace test indicates 1 co-integrating equation (s) at the 0.05 level, *Rejection of the hypothesis at 0.05 level, **MacKinnon *et al.* (1999) p-values

Table 5: Co-integration tests of variables Y and X (lnY and lnX) for unrestricted co-integration rank test (Maximum eigen value)

Hypothesized No. of CE(s)	Eigen value	Max-Eigen statistic	Critical value 0.05	Probability**
None*	0.880648	44.63922	15.89210	0.0000
At most 1	0.074862	1.634064	9.164546	0.8488

Max-eigen value test indicates 1 co-integrating equation (s) at 0.05 level, *Rejection of the hypothesis at 0.05 level, **MacKinnon *et al.* (1999) p-values

Table 6: Co-integration tests of variables Y and X (lnY and lnX) for unrestricted co-integrating coefficients (normalized by b'*S11*b = I)

Y	X	C
7.973154	-7.872629	2.278207
-8.387334	7.725127	3.877519

Table 7: Co-integration tests of variables Y and X (lnY and lnX) for unrestricted adjustment coefficients (alpha)

Vatiable	C	S.E
D(Y)	0.045382	0.022757
D(X)	0.095317	0.008592
Normalized co-integrating coefficients (standard error in parentheses)		
Variables		Values
Y		1.000000
X		-0.987392 (0.01618)
C		0.285735 (0.12268)
Adjustment coefficients (standard error in parentheses)		
Variables		C
D(Y)		0.361839 (0.15943)
D(X)		0.759980 (0.08850)

Co-integrating equation(s): Log likelihood (67.13631)

Co-integration tests: The co-integration test was used couple with the Error Correction Model (ECM). As noted earlier, it was established that the two variables were integrated at the third order differences. Usually, researchers adopt both the Pedroni residual co-integration test and the Johansen fisher co-integration test to examine if there was a long run relationship between two variables used. As shown in Table 4-7, the null hypothesis of none co-integrating relationship between the variables Y (rural income) and X (rural consumption), i.e., lnY and lnX, could be rejected and in this study these are accepted that there was at least one co-integrating vector for these two variables of the rural areas in Anhui province at 5% level of significance (marked as "None*").

The error correction modeling: The regression model of rural consumption and income levels in Anhui province was established as followed using the least squares method (Table 8):

$$\text{InY} = 0.915001\,\text{lnX} + 0.417179 + \varepsilon \qquad (1)$$

where, the t-statistics for the variable X (lnX) and the constant (C) were 34.17801 (very significant; probability = 0.0000) and 2.042776 (nearly significant; probability = 0.0538), while the regression coefficient for lnX was revealed as 0.915001. Moreover, the statistics R^2, $\overline{R^2}$, DW (Durbin-Watson) statistic and F, were estimated as 0.982340, 0.981499, 0.606528 and 1168.136 (very significant), respectively. In addition, the two variables, i.e., Y (lnY) and X (lnX), should be regarded as co-integrated only if the variable ε was found being stationary in the unit root test.

Subsequently, the error correction model was established according to the co-integration test results and Granger causality theorem with those variables in co-integration tested and analyzed above. It should be noted that the variable ε was computed according to Eq. 1 for the error term variable (ecm) in normal distribution [ε = N(0, 1)]. It was found that the residual variable ε was in obvious trend of correlation and significantly stationary (significant at the level of 10% with a t-statistic probability of 0.0517 (Table 9). In this case, the corrected regression equation of the variables Y and X was established with the Error correction model as the following:

$$\text{InY}_t = 0.858616\,\text{lnX}_t - 0.283486\,\text{ecm}_{t-1} \qquad (2)$$

where, the t-statistics for the variables X (lnX_t) and ε (ecm_{t-1}) were 8.842398 (very significant; probability = 0.0000) and -1.687578 (nearly significant with probability = 0.1070). In addition, the statistics R^2, $\overline{R^2}$ and DW (Durbin-Watson) statistics were estimated as 0.574414, 0.553134 and 1.956382, respectively.

The Eq. 1 and 2 can be applied to effectively correct and estimate the relationship between the consumption and income levels of rural residents in Anhui province, China. The elasticity coefficient in the short-run was revealed in Eq. 2 as 0.858616. Couple with the unit root and co-integration tests, Eq. 1 was the long-run equilibrium model of correlation relationship indicated in the annual data, while Eq. 2 revealed a short-term fluctuation relationship and mode between the consumption and income levels of rural residents in Anhui province analyzed by the modeling equation of Error Correction Model (ECM).

Table 8: Regression model established for variables Y and X (lnY and lnX)

Parameters	Coefficient	Std. error	t-statistic	Probability*
X	0.915001	0.026772	34.17801	0.0000
C	0.417179	0.204222	2.042776	0.0538
R^2	0.982340	Mean dependent variable		7.362870
Adjusted R^2	0.981499	S.D. dependent variable		0.711952
S.E. of regression	0.096838	Akaike info criterion		-1.748611
Sum squared resid	0.196930	Schwarz criterion		-1.649873
Log likelihood	22.10903	Hannan-Quinn criterion		-1.723779
F-statistic	1168.136	Durbin-Watson stat		0.606528
Prob (F-statistic)	0.000000			

Dependent variable: Y, Method: Least squares, Sample: 1990-2012, Included observations: 23, The significances were measured using MacKinnon (1996) one-sided p-values

Table 9: Stationary test of the regression model's residual variable ε

Null hypothesis: ε has a unit root			t-statistic	Probability*
Augmented Dickey-Fuller test statistic			-1.940856	0.0517
Test critical values at different level (%)				
1			-2.674290	
5			-1.957204	
10			-1.608175	
Parameters	Coefficient	Std. error	t-statistic	Probability*
E(-1)	-0.309356	0.159392	-1.940856	0.0658
R^2	0.152042	Mean dependent var		0.000582
Adjusted R^2	0.152042	S.D. dependent var		0.075415
S.E. of regression	0.069446	Akaike info criterion		-2.452155
Sum squared resid	0.101277	Schwarz criterion		-2.402562
Log likelihood	27.97370	Hannan-Quinn criter		-2.440472
Durbin-Watson stat	2.001721			

Augmented Dickey-Fuller test equation, Dependent variable: D(E), Method: Least squares, Sample (adjusted): 1991-2012, Included observations: 22 after adjustments. *Level of significance was measured using MacKinnon (1996) one-sided p-values

Table 10: Granger causality tests for variables Y and X with lags of 1

Null hypothesis	Observations	F-statistic	Probability*
X does not Granger cause Y	22	0.38385	0.5429
Y does not Granger cause X		4.30245	0.0519

Pair-wise Granger causality tests, Sample: 1990-2012

Table 11: Granger causality tests for variables Y and X with lags of 2

Null hypothesis	Observations	F-statistic	Probability*
X does not Granger cause Y	21	1.10111	0.3564
Y does not Granger cause X		12.6297	0.0005

Pair-wise Granger causality tests, Sample: 1990-2012

Table 12: Granger causality tests for variables Y and X with lags of 3

Null hypothesis	Observations	F-statistic	Probability*
X does not Granger cause Y	20	0.70534	0.5657
Y does not Granger cause X		4.76271	0.0188

Pair-wise Granger causality tests, Sample: 1990-2012

Pair-wise Granger causality tests: Pair-wise Granger causality test is a widely used methodology for inferring the correlation of variables in regression analysis. Using pair-wise Granger causality tests (Table 10-12), we could reject the null hypothesis that Y did not Granger cause X and inferred that X did Granger cause Y (Table 10-12). However, the null hypothesis that X did not Granger cause Y could not be discarded (Table 10-12). The decision rule for these types of tests is where the value of the F-statistic is low and the probability value is high, researchers reject the null hypothesis. On the contrary, where the F-statistic is high and the probability value is low, researchers should accept the null hypothesis. The overall empirical results revealed that the rural income levels, Granger caused the rural consumption levels in Anhui province. Therefore, researchers accept the hypothesis that income precedes consumption in rural areas of China.

In the error correction model, the differential coefficient could be regarded as the elasticity of the variables. In the model, the differential coefficient of the variable lnY was somehow at a high level, i.e., the elasticity coefficient was computed as 0.858616. In other words, together with the Granger causality tests, it was indicated that the elasticity of the variable X (income level) driving or promoting the variable Y (consumption level) was 0.858616 estimated in the Error Correction Model (ECM). That is to say, whenever the rural income level increases by 1%, the rural consumption level will be driven or promoted by 0.858616 in Anhui province.

Furthermore, we can discuss and analyze of the error correction term (ecm) in terms of the elasticity coefficient. The value of the coefficient of the error correction term ecm reflects the adjustment of variables deviating from the long-term equilibrium. The estimate of the coefficient of ecm is usually a negative value, such as -0.283486 in Eq. 2 estimated by the error correction model in this study. That is to say, the value of the variable lnY would slow down if Eq. 3 is set up at the moment of t-1. Similarly, the value of the variable lnY would accelerate if Eq. 4 meets the conditions of equilibrium at the moment of t-1. This process reflects the error control ability of the term ecm in the long-term equilibrium of the variables lnY and lnX.

$$InY_t>0.858616 1nX_t-0.283486ecm_{t-1} \quad (3)$$

$$InY_t<0.858616 1nX_t-0.283486ecm_{t-1} \quad (4)$$

In addition, to develop the provincial rural economy, promote and guarantee the improvement of rural residents' consumption level is one of the government's key goals in Anhui province. To this end, the most important thing to be done is to increase the incomes of rural residents in Anhui province. In terms of higher incomes, the government should focus on big and/or major consumer areas of rural residents and constantly explore new sectors of consumption growth with steadily increasing the income of their salary income and family business, in order to narrow the gap between the rich and the poor in rural area as far as possible. Currently, the most probably effective solution for narrowing the income gaps is to increase the income of rural residents or peasants, such as improving the rural residents' wage income, promoting the rural industrialization, guaranting the sustainable and stable growth of operating income of rural residents, increasing the property income and the transfer income of rural residents and so on. For example, it was found that the conservative production and diversified strategies play the most important role in farmers' reducing income fluctuations but it causes the low efficiency and widens the income gap between the poor and the rich in Sichuan province (Wang, 2010). Herein, some countermeasures and suggestions were brought out according to the econometric tests and analyses above in Anhui province, China.

Improve agricultural labor productivity to realize and accelerate the industrialization of regional agriculture: Since Anhui province is a large agricultural province in mainland China, the efficiency of agricultural production has become one of the key factors that affect the income growth of rural residents. Promoting the agricultural industrialization is a good way of narrowing the income gap between urban and rural residents. The agricultural industrialization is often referred to the transition or converting of agricultural production mode from traditional agricultural economy of peasants into modern agricultural economy of socialization. Through the industrialization of agricultural production mode, the state of low income of Chinese agriculture in long run can gradually be changed and rural residents also could gain practical average profit in making agriculture a strong independent industry. Meanwhile, vigorously development of labor-intensive production and export of vegetables and fruits could also handle the relationship between quality and yield and increase agricultural incomes in the industrialization of agriculture.

Expand investment and develop consumption hot spots in rural areas: There are mainly two measures suggested. One is the redevelopment of new houses of rural residents, as housing becomes one of consumption hot spots at present in rural areas. The other is to pay attention to the forming of correct and useful consumption idea of rural residents by guiding their consumption custom and hotspot consumer goods to raise their living standards and consumption levels. For instance, actively promote the activities of favoring rural residents or farmers, such as home appliance and electronics, car and steel rebates for consumers in the countryside.

Improve and perfect the relevant market and legal system, protect the property income of rural residents or farmers: The promotion of farmers to be able to participate and obtain legal income in fair and open market transactions is one of the working issues of local government. On the one hand, the government should build an orderly good yet loose market order and rural financial environment with rural financial service improved. On the other hand, it should promote the rural system innovation and explore new ways of increasing the property incomes of farmers, under the premise of adhering to the basic rural operation system, perfecting the contracted management of land circulation market, effectively solving the problems of farmers' property and land vacancy (but land should not be in free circulation) and realizing and reflecting the values of farmers property.

Continue to increase the public finances of direct and indirect subsidies to rural residents or farmers and guarantee their stable transfer income: One is to gradually adjust the structure of national income redistribution and intensify government transfer payments to farmers. The other is to increase the direct and indirect subsidies to farmers for producing grain, continue to put money into to subsidies for growing superior seed varieties and purchasing agricultural machineries and tools and keep the floor price policy for grain farmers with stable supporting policies for grain production in the main agricultural area.

Increase the intensity of the economic system reforming and improve the wage income of rural residents: The highlight of narrowing the gap between rich and poor is to improve the rural incomes in the low and lowest groups of rural residents. Generally, the annual per capita net income of farmers ranked after 40% is the classification standard of the rural residents' low group in the province, in which the concept of narrowing the gap between urban and rural residents' wage incomes should be emphasized. At present, the wage income of rural residents or farmers is still low and in slow growth relative to the salary income of urban residents in Anhui province. The main measures and steps are to strengthen the rural poverty relief and subsidize the low-income farmers from the aspects of capital, technology, industry, intelligence increasing investment. Presently, it is also impendent to intensify reform, eliminate the urban-rural "dual" under the household registration system, such as housing, labor, personnel and education remoulding and so on and so forth. Additional adjustments and changes in many aspects of unequal institutional and policy barriers to rural residents, reducing the cost and difficulty of rural labor force working into cities, setting up peasant workers' minimum wage protection system and urban-rural integrated labor market, should be done too, in order to continuously or persistently increase the farmers' salary income.

Increase the property income and consumption in the capability of rural residents: The increase of property income of rural residents may be partly used for investment, stimulating the growth of investment demand directly. However, the property income of rural residents is currently not rich, while the national savings rates are too low to be put into investment with the high risk of stock market. This has affected the values of rural residents' personal and family and their consumption confidence. Therefore, the current work is to take effective measures to cultivate with rural characteristics, increase rural residents property income of diversified financing channels and improve the property of rural residents' personal and family (such as bank deposits and securities, etc.) and real estates (such as houses, cars, land, collection, etc) and other related assets for income, in order to enhance rural consumption demand and support for a long time.

Actively promote the rural industrialization and the urbanization construction and promote the sustainable and stable growth of operating income of rural residents: The rural industrialization and the urbanization construction are ongoing in rural areas in Anhui province. Due to some changes in the national macroeconomic environment, the business income of rural family accounted for the farmers' net income decline gradually. In 1978, the agricultural productive net income of farmers was mainly from the first industry by more than 90%. However, the agricultural productive income proportion of the farmers' net income fell 45.6% by 2013. Therefore, it is of importance to raise funds through various channels, increase investment in agriculture, launch and implement the system of industry feeding agriculture and the urban feeding the rural to establish a long-term mechanism of increasing of the farmers' income. Therefore, on the one hand, it is vital to speed up the rural industrialization and promote agricultural production and operation mode to intensive and large-scale production management and develop the high-yield, high-quality, efficient modern agriculture and characteristic agriculture. On the other hand, the government should step up its efforts to improve the rural support policy, strengthen the rural financial support for agriculture, establish and improve the farmers' loan guarantee system as soon as possible for promoting farmers micro-credit loans and farmers group lending to solve the issues of rural household loans and mortgage guarantee. These are the realizable ways or measures to promote the sustainable steady growth of rural operating income and agricultural economy efficiently in the process of agricultural industrialization in Anhui province.

CONCLUSION

The present study established the Error Correction Model and empirically analyzed the correlation of the income level and the consumption level of rural residents in Anhui province, China, with data sets from the years of 1990-2012. In the Error Correction Model, the differential coefficient could be regarded as the elasticity of the variables, i.e., 0.858616, as revealed in Eq. 2. Moreover, the Pair-wise Granger causality test suggested the authors to accept the hypothesis that income precedes consumption in Anhui province. In summary, it was found that the elasticity of the variable X (income level) driving or promoting the variable Y (consumption level) was 0.858616 together with the Granger causality tests. Whenever the rural income level increases by 1%, the rural consumption level will be driven or promoted by 0.858616 in Anhui province. All the econometric results indicated the rural consumption level was correlated significantly with the rural income level and its data appeared in an upward increasing trend. As can be judged from the elastic coefficient and Eq. 2, the potential impact or driving ability of the rural income on the rural consumption was very significant. In other words, the potential impact or driving ability of the rural income on the rural consumption would be very huge.

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