

# An Empirical Analysis of the Development of Stock Market and the Income Gap between Urban and Rural Areas

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**Abstract**—The impact of the development of the stock market on the income gap between urban and rural areas is one of the issues that the financial theorists and the industry pay close attention to. This paper uses the 2005-2019 China stock market development data and urban and rural residents' income data as an object of the research, and uses Granger causality test to analyze the relationship between stock market development and urban and rural income gap. We find that the development of the stock market has a significant positive impact on reducing the income gap between urban and rural areas. Therefore, the state should speed up the development of the stock market and improve financial efficiency through the development of the stock market.

**Keywords**—Urban and Rural Income Gap; Stock Market Development; Co-Integration Test; Granger Causality Test

## I. INTRODUCTION

The theory of financial development, which began in the 1970s, has systematically studied the relationship between financial development and economic growth, and accumulated a large number of empirical research literature (Levine and Zervos, 1996; Rajan, Zingales, 1998). According to the theory of modern economic development, in an economic system, the problem of income distribution and economic growth also deserves attention. Greenwood and Jovanovic (1990) are pioneering in exploring the relationship between financial development and income distribution. Based on a dynamic model, under the assumption that the initial income distribution is born out of economic growth and financial development, and that there is a "threshold effect" between financial development and economic growth, they think that the relationship between financial development and income distribution is inverted "U", that is, financial development will not only promote economic growth but also expand the income gap in the early stage. With the growth of income, financial development We will gradually narrow the income gap. However, the empirical analysis of Clark, Xu and Zou (2003) based on global data shows that financial development is negatively related to income distribution gap, and financial development will significantly reduce the income distribution gap of a country.

This paper use co-integration analysis method to investigate whether there is a long-term equilibrium relationship between financial development and urban-rural income gap, and on the

basis of co-integration analysis, make a specific judgment on short-term causal relationship between financial development and urban-rural income gap. This paper finds that the research and development of the stock market has a significant positive impact on reducing the income gap between urban and rural areas. Therefore, the state should accelerate the development of the stock market and improve financial efficiency through the development of the stock market

## II. RESEARCH AND DESIGN

### A. Selection and description of main variables

#### 1) Income distribution gap (CR)

More than half of the Chinese total income gap can be explained by urban-rural income gap. According to the World Bank report (1997), 75% of Chinese total income gap changes in 1984-1995 can be explained by urban-rural income gap (teacher civilization, 2009). Therefore, Zhang Qi, Tao Ran (2004), Yao Yaojun (2005) and others used the disposable income of urban residents and net income of rural residents as indicators to measure the income gap between urban and rural residents. Referring to the practice of the above scholars, this paper uses the urban-rural income gap as the quality assurance to measure the income distribution gap.

#### 2) Stock market development indicators

##### a) Capitalization rate (CAP)

In this paper, the Shanghai Stock Exchange and Shenzhen Stock Exchange are used as indicators to measure the capitalization rate. Among them, the total market value of Shanghai Stock Exchange and Shenzhen Stock Exchange in each quarter is the arithmetic means of the market value of all trading days of the A-share stock market in that quarter. This index mainly measures the scale of the Chinese stock market. The scale of the stock market is directly proportional to the total market value of the stock. That is to say, the higher the total market value of the stock is, the larger the scale of the stock market is. The stock market has a stronger ability to raise capital and disperse risks.

##### b) Transaction value ratio (VAL)

In this paper, the ratio of the total turnover of the stock and the nominal GDP of each quarter of the Shanghai Stock

Exchange and Shenzhen stock exchange is used as the index to measure the ratio of the transaction value. As an index reflecting the liquidity of the stock market, this index mainly reflects the liquidity of the stock market under the current economic aggregate and measures the trading of the stock market relative to the current economic scale.

3) *Quarterly turnover rate (turn)*

In this paper, the ratio of the total turnover of the stock market in the quarter to the average market value of the stock market in the current period is used as an indicator to measure the quarterly turnover rate. Similar to the transaction value ratio, this indicator reflects the liquidity of the stock market. But compared with the trading value ratio, the quarterly turnover rate reflects the trading relative to the size of the stock market. The quarterly turnover index is not only a supplement to the market size index, but also a supplement to the transaction value ratio.

B. *Model and estimation method*

This paper uses the test method proposed by Toda and Yamamoto (1995) to test Granger causality and empirically analyzes the relationship between the development of stock market and the income gap between urban and rural areas. Granger causality test principle is as follows:

1) *ADF Test (Automated Dickey Fuller Test)*

This paper uses capitalization rate, transaction value ratio, quarterly turnover rate and other indicators to measure the development of the stock market, and studies the impact of the development of the stock market on the income gap between urban and rural areas. In order to avoid the problem of pseudo regression due to the non-stationary time series, referring to the practices of Yao Yaojun (2005), Shi Wenming (2009), etc., this paper first conducts ADF test on the above three variables.

2) *Co-integration test*

In order to determine whether there is a long-term stable relationship between variables, Johansen co-integration is used to test whether there is a co-integration relationship between variables. Johansen Juselius test is a method to test the regression coefficient of the model based on VAR model, which is mainly used in multivariate co-integration test.

3) *Granger causality test*

Granger causality test mainly focuses on the extent to which the independent variables can affect the dependent variables in the past. When the lag value of the independent variables is added, whether the independent variables can improve the interpretation of the dependent variables. If the independent variable can improve the prediction accuracy of the dependent variable, or the independent variable has a significant correlation with the dependent variable, it can be said that "the dependent variable is caused by the independent variable Granger". That is to say, if one variable is affected by the lag of other variables, the above variables are called Granger causality.

III. EMPIRICAL RESEARCH

A. *Data source and data processing*

This part of the sample mainly selects the Shanghai and Shenzhen A-share data and urban and rural residents' income data from the first quarter of 2005 to the second quarter of 2019 as the research object, and makes an empirical analysis on the relationship between the development of the stock market and the urban-rural income gap. In this paper, the average market value of A-share of Shanghai and Shenzhen is calculated on a quarterly basis, and the average market value of A-share of each quarter is obtained. The data needed in this paper are all from wind client. Among them, the data of stock market is from wind database, and the data of urban residents' disposable income and rural residents' net income are from Chinese macro database. All data processing in this paper is completed by stata14.0.

B. *ADF test*

In this paper, Dickey and Fuller (1974) are used to test the unit root of the variables studied in this paper. There are three different test steps for ADF test model, so it is very important to choose the right test (Yao Yaojun (2005)). For example, for a set of time series with stable trend, if the test mode selected in the empirical test process does not include time trend, the possibility of unit root in ADF test results is very large. In this paper, according to the ADF test procedure proposed by Li Zinai et al. (2000), the variables in this paper are tested, and the lag order of the variables is selected according to the SiC criterion. TABLE I reports the ADF test results of each variable in this paper.

TABLE I. ADF TEST RESULTS

Variable	Inspection form (C, t, l)	Test value	Critical value
Income gap between urban and rural areas	(C, T, 1)	-4.6463	-3.5654***
Δ Income gap between urban and rural areas	(0,0,1)	-4.6473	-2.6111***
Capitalization rate	(C, T, 1)	-3.1890	-2.9166**
Δ Capitalization rate	(0,0,1)	-4.1839	-2.6120***
Transaction value ratio	(C, T, 1)	-2.8381	-2.5956*
Δ Transaction value ratio	(0,0,1)	-7.6738	-2.6085***
Quarterly turnover	(C, T, 1)	-2.8371	-2.5956*
Δ Quarterly turnover	(0,0,1)	-7.6417	-2.6085***
Financial development scale index	(C, T, 1)	-3.6046	-3.5654***
Δ Financial development scale index	(0,0,1)	-4.3162	-2.6111***

According to the empirical results in TABLE II, the variables selected in this paper are the all-time series of I (1). In order to ensure the robustness of the results, this paper also uses the Phillip Perron (1988) method to carry out the unit root test. The PP test results are consistent with the ADF test results in TABLE II. This paper will not elaborate.

C. Co-integration test

Although TABLE I proves that the indexes selected in this paper are all first-order non-stationary single integer time series, it is impossible to prove that there is a kind of stable linear combination that can reflect the long-term stable relationship between variables, i.e. co-integration relationship. In this paper, Johansen's co-integration test is used to test the relationship before each variable. As a co-integration test method based on VAR model, the structure of VAR model should be determined first when Johansen co-integration test is carried out. If the VAR model is converted to ECM model form, the VAR model can be converted to the following two forms:

$$\Delta X_t = \beta_0 + \alpha(\beta' X_{t-1} - \beta_1 - \sigma_t) + \sum_{i=1}^{m-1} \pi_i \Delta X_{t-i} + \varepsilon_t \quad (1)$$

$$\Delta X_t = \alpha(\beta' X_{t-1} - \beta_1) + \sum_{i=1}^{m-1} \pi_i \Delta X_{t-i} + \varepsilon_t \quad (2)$$

Where, represents vector, M represents lag order of VAR model, and represents error term. Equation (1) represents all or part of the time series with linear trend, and equation (2) represents the time series without linear trend. Since time variables are rarely included in the variable co-integration relationship, the value in equation (1) is usually 0. According to Johansen's test method, we use LR statistics to select formula (1) and formula (2). In which, logl (1) and logl (2) represent the maximum likelihood function value of formula (1) and formula (2), and Q represents the number of constraints imposed on formula (1).

In this paper, the lag end of VAR model is determined according to SiC criterion. Therefore, according to SiC criterion, the lag order of VAR model is determined as 3. Therefore, the expression of VAR model is set as equation (2).

The results of Johansen co-integration test are reported in TABLE III. For a small sample or a limited sample, the progressive validity of Johansen co-integration test may be the increase of the probability that the model thinks there is a co-integration relationship between variables, so that the error of the model increases. Therefore, according to Ahn et al. (1992), the product of trace test statistic LR and (T-N K) / T of Johansen co-integration test can be used for adjustment, where T represents sample size, n represents number of variables, K represents lag order of VAR model, and trace test statistic in TABLE III is adjusted LR value.

TABLE II. JOHANSEN CO-INTEGRATION TEST RESULTS

Characteristic value	Trace Test Statistics	The significance level is a critical value of 5%	The original assumption of the number of co-integration vectors
0.436708	72.913	47.85613	R=0
0.371557	42.493	29.79707	R<=1
0.164638	17.874	15.49471	R<=2
0.145606	8.3402	3.841466	R<=3

According to the test results in TABLE II, at the significance level of 5%, there is only one co-integration relationship between variables, as shown in formula (3) below:

$$CR = -3.49CAP + 10.13VAL - 16.74TURN \quad (3)$$

$$(-0.50) (1.55) (-2.58)$$

It can be seen from equation (3) that, in the long run, there is a significant negative correlation between the urban-rural income gap and the capitalization rate representing the size of the stock market. According to the research of Shi Wenming (2009), the negative impact of the capitalization rate on the urban-rural income gap is mainly due to the short establishment time of Chinese stock market, and there are still a lot of places to be improved, which makes the financing of Listed Companies in the stock market unable to play a real role. In terms of physical economy, the results of this study are contrary to those of Shiwen (2009). It shows that with the development of the Chinese stock market, the stock market system is gradually improved, and the efficiency of resource allocation in the stock market has been effectively improved. Increasing the size of the stock market will help to narrow the income gap between urban and rural areas. It indicates that when the growth rate of trading volume is greater than that of economic growth, the liquidity of stock market has a negative impact on the income gap between urban and rural areas. That is to say, the speculative buying and selling of stock market should be reduced and the value investment of listed companies should be paid attention to. The amount of stock trading, which represents the scale of market trading, has a positive impact on reducing the income gap between urban and rural areas. At the same time, the above conclusions also prove that the realization of full stock circulation can help to narrow the income gap between urban and rural areas in China.

D. Granger causality test

After the co-integration test of the variables studied in this paper, this paper uses the LA-VAR method to test the causal relationship between the variables. According to SIC criterion, the lag order of VAR model determined in this paper is 3. Therefore, this paper chooses lag order 4 to regress VAR model. The regression results of VAR (4) are reported in TABLE IV.

TABLE III. EMPIRICAL RESULTS OF VAR (4) MODE

	Equation (1) CRT	Equation (2) capt	Equation (3) valt	Equation (4) turn
CRt (-1)	0.2152 [1.89324]	0.2194 [0.8125]	0.0571 [0.10988]	0.1721 [1.06203]
CRt (-2)	-0.2874 [-2.56570]	-0.2353 [-0.8841]	-0.4648 [-0.90803]	-0.1675 [-1.0489]
CRt (-3)	0.1678 [1.60428]	0.5739 [2.31015]	0.2134 [0.44665]	0.1498 [1.00473]
CRt (-4)	0.6216 [5.84228]	-0.3730 [-1.4758]	-0.0095 [-0.01958]	-0.0308 [-0.2030]
CAPt (-1)	0.0758 [0.92782]	1.3191 [6.79596]	0.1544 [0.41353]	-0.0845 [-0.7253]
CAPt (-2)	-0.1886 [-1.62153]	-0.0625 [-0.2260]	0.2031 [0.38196]	-0.0680 [-0.4102]
CAPt (-3)	0.1501 [1.36917]	-0.3160 [-1.2135]	0.4358 [0.87008]	0.2257 [1.44475]
CAPt (-4)	-0.1253 [-1.51167]	0.3471 [1.76220]	0.1374 [0.36267]	0.0150 [0.12677]
VALt (-1)	-0.0450 [-0.47606]	-0.8587 [-3.8249]	-0.2823 [-0.65380]	-0.0304 [-0.2254]
VALt (-2)	0.1521 [1.39255]	-0.0299 [-0.1154]	-0.8240 [-1.65122]	-0.1046 [-0.6719]

Cont. to TABLE III				
VALt (-3)	-0.1028 [-1.03497]	-0.1758 [-0.7448]	-0.6718 [-1.47958]	-0.2630 [-1.8572]
VALt (-4)	0.2047 [1.99199]	-0.2336 [-0.9567]	-0.3184 [-0.67790]	-0.0904 [-0.6172]
TURNt (-1)	0.1085 [0.38157]	2.338 [3.46084]	2.7065 [2.08239]	0.7746 [1.91066]
TURNt (-2)	-0.3122 [-0.96105]	0.6666 [0.86367]	3.4403 [2.31717]	0.4990 [1.07748]
TURNt (-3)	0.2221 [0.72882]	0.6142 [0.84832]	1.3867 [0.99566]	0.5979 [1.37635]
TURNt (-4)	-0.6431 [-2.04284]	0.3293 [0.44026]	0.8023 [0.55766]	0.3441 [0.76689]
Adj. R2	0.9284	0.8337	0.6189	0.5575
S.E.	0.1192	0.2832	0.5447	0.1699
F-statistic	42.3075	16.9852	6.1774	5.0155
Log L.	47.1142	2.1191	-31.8980	28.6849
AIC	-1.1582	0.5723	1.8807	-0.4494
Log L	111.4475			
AIC	-1.6711			

In the regression of VAR model, the system of seemingly unrelated regression (SUR) is used. When the regression equation in VAR model has the same independent variable, the seemingly unrelated regression can be simplified, and the OLS regression can be split for each equation. Wald test can be used under OLS regression of each equation. In this paper, we mainly focus on the impact of the development of stock market on the urban-rural income gap. Therefore, this paper does not discuss the causal relationship between the development of stock market and the urban-rural income distribution gap. The Wald test results are reported in TABLE IV.

TABLE IV. WALD TEST RESULTS

	Impose constraints	Original hypothesis	P value
Equation 1	a51= a61= a71 =a81=0	Cap is not Granger cause of Cr	0.00
	a91= a10 1= a11 1 =a12 1=0	Val is not Granger cause of Cr	0.00
	a13 1= a14 1= a15 1 =a16 1=0	Turn is not Granger cause of Cr	0.00
Equation 2	a12= a22= a32 =a42=0	Cr is not Granger cause of cap	0.00
Equation 3	a13= a23= a33 =a43=0	Cr is not Granger cause of Val	0.00
Equation 4	a14= a24= a34 =a44=0	Cr is not Granger cause of turn	0.00

From the Wald test results in TABLE IV, we can see that Chinese capitalization rate, A-share market transaction value ratio, quarterly turnover rate and urban-rural income gap have significant two-way Granger causality at a significant level of 1%. It shows that there is a long-term equilibrium relationship

between the stock market and the urban-rural income distribution gap, and the stock market has an important impact on the urban-rural income distribution gap.

IV. SUMMARY

This paper uses the Granger causality test to analyze the relationship between the stock market and the income gap between urban and rural areas. Research and development of the stock market have a significant positive impact on reducing the income gap between urban and rural areas. Therefore, the state should accelerate the development of the stock market and improve financial efficiency through the development of the stock market.

The policy implication of this study is that in order to develop the stock market and narrow the income gap between urban and rural areas, the state should guide rural funds into the stock market. Due to the strong professionalism of the stock market, the participation of rural residents is relatively low. On the other hand, the blind participation of rural residents will not only not improve their income, but also may cause losses for rural residents due to the fluctuation of the stock market. Therefore, the country adds the ginger block to rural financial reform, solves the problem of unbalanced financial development in urban and rural areas, establishes and improves the asset management industry, and enables rural funds to enter the stock market through financial products and other channels.

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