Available online www.jocpr.com

Journal of Chemical and Pharmaceutical Research, 2014, 6(4):59-64

Research Article

ISSN : 0975-7384
CODEN(USA) : JCPRC5

The impact of ODI on the GDP in Fujian Province

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ABSTRACT

This paper chose Fujian province GDP as the representative of macroeconomic indicators, selected years 1988-2008 data, made use of the methods such as cointegration, Granger causality tests and establishing error correction model and at last obtained the conclusion that the effects of ODI on the GDP.

Keywords: ODI, GDP, Economic Effect

INTRODUCTION

Foreign investment in Fujian Province started in 1979, is one of the earliest provinces "going out" in the nationwide. In 2001, ODI had been on the stage of rapid development and showed a rising trend year by year under the state support and the enterprises efforts. According to the Office of Fujian Provincial Foreign Trade Statistics, 2001-2007, Fujian had resulted in nearly 500 enterprises with total investment of about 364 million U.S. dollars, in 52 countries and regions as the number of investment companies is increasing, and investment is expanding. [1]In 2008, the whole year GDP was up to 1.082311 trillion yuan and ranked 14th, in per capita GDP 30,123 yuan, at the same time 108 foreign-invested enterprises newly approved, up 20% over the previous year, which non-financial overseas direct investment was 249 million dollars, up 83.6% over the previous year and ranked 8 th. [2][3]

1 THE STATUS AND FEATURES OF ODI IN FUJIAN PROVICE

1.1INVESTORS INCREASINGLY DOMINATED BY PRIVATE ENTERPRISES

Considering the investment scale, the state-owned and state holding enterprises in ODI still dominated the investor (funds accounting for 80%).Considering the number of enterprise, non-state enterprises in the province by foreign direct investors accounted for 65%. Private enterprises with rapid growth (Table 1) have become an important force for ODI in Fujian. The investment advantages are becoming increasingly prominent.[4]

Table 1: The Number and scale of ODI enterprises changes in Fujian Province, 2004-2011

Year	2004	2005	2006	2007	2008	2009	2010	2011
Number of Enterprises	58(47)	66（52）	73(68)	90(74)	108(92)	131（117)	145（128）	176（*）
Investment amounts(Million)	3350.0	5383.2	8749.6	13600.0	24900.0	43600.0	81400.0	95400.0
Average individual amounts(Million)	56.76	81.56	119.86	151.11	230.56	332.82	561.37	542.04

Source: Bureau of Fujian Province, Fujian Foreign Economic and Trade Cooperation Office, Fujian Yearbook.
**Figures in brackets are the number of private enterprises in the overseas direct investment. The number of private enterprises in ODI in 2011 is unknown while it is estimated that proportion is more than 90%.*

1.2 ASIA IS STILL THE MAIN INVESTMENT LOCATION THAT DIVERSIFIED INCREASINGLY

Considering the investment region, Asia, Europe, North America, respectively accounted for 61%, 13%, 9%. Hong Kong, Macao and Taiwan regions and neighboring countries such as Japan and South Korea are still the focus of investment, and investments in Africa are increasing. [5]Resources Development and Industrial Cooperation are

invested in Latin America, North America and Africa; labor-intensive industries are invested in Southeast Asia, Latin America and Africa and other developing countries; capital-intensive industries are invested in Eastern Europe, Latin America and more developed countries and regions in Asia-Pacific; knowledge and technology-intensive industries are invested in the United States, Japan and Western Europe and other more developed countries and regions.[6] There in, Asia, mostly Hong Kong and Macao; America, mostly the United States; Africa, the majority of South Africa and Egypt; Europe, mostly Germany.

1.3 FORM OF INVESTMENT DIVERSIFICATION

Fujian not only adopted traditional forms of investment such as cross-border mergers and acquisitions, greenfield investments, but also encouraged to guide the qualified enterprises to construct industry district, processing trade area, trade networks, and investment Centre overseas. Industry construction in foreign is the national pioneer. Now it has been the formation that the favorable situation of coexistence based on diversified investment in the form such as trade promotion, resource-developing, production and processing trade promotion type, technology and brand use types, residential construction investment type and cluster-based. For example, Fujian Overseas Chinese Industrial Group, built "Cuba (Fujian) Industrial Area", in San Diego in Cuba. [3]Currently there have been a number of productive enterprises in the district of camp such as shoes, kitchenware equipment, mosquito coils, which also has led a number of enterprises in the province out development.[6][7]

1.4MAIMLY INVEST IN THE TERTIARY INDUSTRY

Considering the industrial distribution, the three industries respectively accounted for 2.85%, 36.18%, 60.98% of the total number of foreign enterprises. The tertiary industry, especially wholesale and retail trade have become major areas of ODI. Meanwhile, the investment is still in the labor-intensive industry. Trading investments are mainly in the textile and garment and footwear industry. Production and processing of trade-based investment are mainly in stone, plastic, food, low-end appliances industries. [8]Resource development investments are mainly in mineral exploration and fisheries industries. Service industry has become specific in Fujian ODI in recent years, such as shipping transportation and consulting industry. Training overseas teaching and television industry were also involved for the first time in 2007.[9][10]

2 EMPIRICAL STUDY OF EFFECT ON GDP GROWTH OF ODI IN FUJIAN

2.1THE DATA SELECTION AND PROCESSING

This paper selected ODI flows (ODI) and the Gross Domestic Product (GDP) in 1988-2008. The data are rooted in " Fujian Statistical Yearbook" and " Statistical Bulletin in Fujian Province on social and economic development ", which ODI flows are at historical statistics caliber. To ensure the smoothness of data, firstly we took the natural logarithm, and then made a smooth test.

2.2TIME SERIES STATIONARITY TEST

Table 2 ADF unit root test results

Variable	inspection form （C，T，K）	ADF statistic	critical value 1%	critical value 5%	critical value 10%	Pvalue	stationary sequences
$\log GDP$	(C,0,4)	6.6236	-2.6857	-1.9591	-1.6075	1.0000	non-stationary
$d(\log GDP)$	(C,0,4)	3.7590	-3.8315	-3.0300	-2.6552	0.0116	stationary
$\log ODI$	(C,0,4)	1.7678	-2.6857	-1.9591	-1.6075	0.9771	non-stationary
$d(\log ODI)$	(C,0,4)	4.1716	-2.6924	-1.9602	-1.6071	0.0003	stationary

NOTE: inspection forms C, T, K represent test models with constant, trend variables, lag orders.

We can see from the Table 2, that GDP logarithmic at the 5% significance level is stable, ODI logarithmic at the 1% level is stable too. It is showing that the two sequences with the order one, there may be cointegration. Then cointegration test can be conducted to determine whether the long-term equilibrium relationship exists between the two or not.

2.3 CONTEGRATION TEST

Cointegration is the statistical description on long-run equilibrium relationship of the non-stationary economic variables. The long-term stable equilibrium relationship between the non-stationary economic variables, we called as co-integration. If two time series own the same order of single whole, maybe there is cointegration between them. Johansen's maximum likelihood estimates and track testing and EG two-step method are widely used in the system integration and estimate. If only two time series are in the cases, there can only be a linear cointegration relationship. At that time EG two-step method is more effective. The specific procedure is firstly got the regression model with ordinary least squares (OLS), and then made the test for unit root through the model estimation residuals.

Firstly, making the least square regression for logODI with variables logGDP, we can obtain the following regression equation:

$$\log GDP = 12.0830 + 0.4441 \log ODI$$
$$(28.6170) \quad (7.2519)$$
$$DW = 0.3495\text{，} \quad R^2 = 0.7346\text{，} \quad F = 52.5893\text{，}$$

We can get the analysis by regression result that goodness of fit of equation and modified were both of high, and the test parameters were significantly non-zero. F statistics showed that equation established significantly with good statistical properties.

Secondly, making stationary test on the equation resi -duals, ADF unit root test results were showing as Table 4.

Table 3 ADF unit root test results

Variable	inspection form （C，T，K）	ADF statistic	critical value 1%	Critical value 5%	critical value 10%	P value	stationary sequences
Equation residuals	(C,0,4)	-1.7018	-2.6857	-1.9591	-1.6075	0.0836	stationary

We can see from Table 3, the value of -1.7018 that is the ADF test of the equation residuals was significantly less than the value of -1.6075 that was at the critical level 10%.It is indicating that there is no root of the residual sequence and is stationary sequence. That is to say during 1988-2008 years GDP during the period in Fujian Province and the ODI are in line with cointegration and long-term stability of the equilibrium relationship also exists. Then the above analysis also shows that relationship between ODI and economic development in the province is balanced stability in the long term if the economic development of a province is measured by GDP.

2.4ERROR CORRECTION MODEL

In the actual economic environment, the internal balance mechanism will continue to eliminate bias, in order to maintain this balance if phenomenon that deviation from the balanced occurs by data for some reason. It is that this error correction mechanism exists in any group of time series variable of mutual cointegration with different degree of correction. Error correction model (ECM) is an econometric model combined short-term fluctuations and long-run equilibrium with the particular form and is also an extension of cointegration analysis, proposed by Sargan.

According to modeling approach from the general to specific from Hendry, firstly we select the lag variables order 4, and then gradually remove non-significant variables, at last get the error correction model for this article after numerous tests:

$$d\log GDP = 0.0247 + 0.0884 d\log ODI + 0.5186 d\log GDP(-3) + 0.5078 d\log GDP(-4) + 0.0353 d(\log ODI(-2)) - 0.2267 ECM(-1)$$
$$(0.6976) \quad (5.046) \quad (2.9180) \quad (4.0409) \quad (-2.531) \quad (-6.5454)$$
$$DW = 2.6401\text{，} \quad R^2 = 0.8500\text{，} \quad F = 11.3378\text{，} \quad P = 0.0007$$

As the above GDP (-3) and GDP (-4) are, lagged third-order items and lag fourth-order items to GDP, and ODI (-2) is ODI lag the second order, ECM (-1) is the error correction.

We can see the error term of coefficient from the results of the error correction model, -0.2267 is less than zero and consistent with amendments to the negative feedback mechanism to adjust the range of 22.67%.That is to say last year's GDP and ODI in non-equilibrium error to about 23% the ratio of the GDP growth this year to make amendments. It is showing that although ODI in the short term may deviate from its long-term equilibrium level with GDP, gradually returned to equilibrium in 4-5 years.

2.5 GRANGER CAUSALITY TEST

Granger causality test is a common method used to test the causal relationship between two variables. The concept of Granger causality can be expressed as: If the variable Xt is Granger cause to the variable Yt, then the Xt changes must be earlier than Yt changes. That is to say, if we predict Yt with the lag to Xt, and then plus Xt lagged values, it will be helpful in improving the prediction accuracy of Yt. In the following analysis, Granger causality test made use of the Fujian ODI and GDP in the number of each variable on the first difference, as the two time series is stationary, and are both of the the same order one sequence. Test results in table 4.

Table 4 Granger Causality Test Results

Lag order	null hypothesis	F statistic	P value	Conclusion
1	logODI does not Granger Cause logGDP	2.1786	0.1582	accept
	logGDP does not Granger Cause logODI	0.1536	0.7003	accept
2	logODI does not Granger Cause logGDP	1.1559	0.3431	accept
	logGDP does not Granger Cause logODI	7.5439	0.0060	reject
3	logODI does not Granger Cause logGDP	1.5027	0.2681	accept
	logGDP does not Granger Cause logODI	5.7842	0.0127	reject
4	logODI does not Granger Cause logGDP	4.9897	0.0258	reject
	logGDP does not Granger Cause logODI	4.7286	0.0298	reject
5	logODI does not Granger Cause logGDP	16.7528	0.0039	reject
	logGDP does not Granger Cause logODI	5.3329	0.0450	reject

We can see from Table 5, when the time lag is 1, ODI can not Granger cause GDP, GDP can not Granger cause ODI, either. When the lag time is 2 and 3, ODI can not Granger cause GDP, but GDP to Granger cause ODI. When the lag time is in longer period, GDP is the Granger for ODI, ODI is Granger GDP. That is to say, the promotion of the role between the province's economic growth and ODI will become increasingly apparent as the long time and deep development. These results coincide exactly with the expectation in this paper. The main reason for this result is well-developed regional economy, stable growth GDP, late development ODI. The two are very different from the development time and scale, but the two are bound to arise complement economic links from both of routes of the logical evolution and empirical data validation.

3 EMPIRICAL FINDING

Through the above analysis we can see, Fujian's GDP and ODI does exist a long-term dependencies. In the short term, economic growth can promote ODI, to some extent. The promotion of ODI to economic growth was not reflected from the data analysis. At present, ODI is still at the exploratory stage, therefore it is understandable the economic effect is not obvious in some ways. Fortunately, the error correction model shows that in the long time, even if the ODI and economic growth imbalances, they can be related to economic factors, and the greater the rate of recovery is to the equilibrium state.

Earlier stage of ODI has proved that of Fujian's economic cycle is in the third stage of theoretical definition of investment in the development. The amount of ODI is far less than the amount of IDI（inward direct investment）, net ODI per capita is still in the second stage, but there is a good future. The experiences of overseas investment in the development of other provinces and countries also shows that economic growth has a growing dependence on ODI as time is gone and economic is developing. We can consider that Fujian ODI is to consider more and more factors in economic development. Meanwhile, government policy factors are gradually reduced.

4 FORCAST OF THE SCALE OF FUJIAN ODI IN THE 12TH “FIVE-YEAR PLAN”

4.1 MODEL BUIDING AND ANALYSIS

This chapter selects data of foreign investment flow during 1991-2011(detailed in Table 5), to predicts the trend of time series. Based on ODI of Fujian Province presents a linear growth relationship changes over time, the trend variables taken from 1 to 21 can be eliminated deterministic trend. Use logarithmic ODI and time variables to establish a linear regression equation. The model is showed below:

$$\log ODI_t = c + \alpha TIME^2 + \mu_t$$

Use Eviews7.0 to do Least squares regression prediction, and the result is as follow:

$\log ODI = 4.992014 + 0.011166 \times TIME^2$
（27.60965^{***}）（16.73863^{***}）

$R^2 = 0.927196$ DW= 0.962056 F= 280.1819 P=0

As we can see from the regression results, the regression coefficients of T-value test and F-value test are significant. The value of R^2 is 0.911353, which means the high degree of fitting and explanation in this equation. By observing the fitting value of equation, we consider that future ODI of Fujian Province will still maintain a rapid growth(as showed in Figure 1).

Table 5 foreign investment related data of Fujian Province during 1991-2011
(Unit: Ten thousand dollars)

Year	IDI	ODI	GDP
1991	144871	324.00	1169566.04
1992	635101	604.65	1426690.91
1993	1136617	648.71	1921034.48
1994	717946	178.13	1912081.40
1995	890647	410.10	2493928.57
1996	653572	367.24	2993072.29
1997	453751	310.12	3458915.66
1998	500150	235.06	3807120.48
1999	489996	160.00	4113481.93
2000	431373	601.35	4535590.36
2001	500717	1042.70	4907048.19
2002	694419	1065.40	5382590.36
2003	725117	3182.00	6004421.69
2004	754307	3350.60	7028475.61
2005	855655	5383.20	8109790.12
2006	1080190	8749.60	9723538.46
2007	1233600	13600.00	12169907.89
2008	1141500	24900.00	15685666.67
2009	907600	43600.00	17913233.8
2010	1212000	81400.00	21769879.6
2011	1100000	95400.00	27095000.0

Note: the unit of GDP、NOIpc and GDPpc is dollar.
Source：Bureau of Fujian Statistics, Fujian Foreign Economic and Trade Cooperation Office

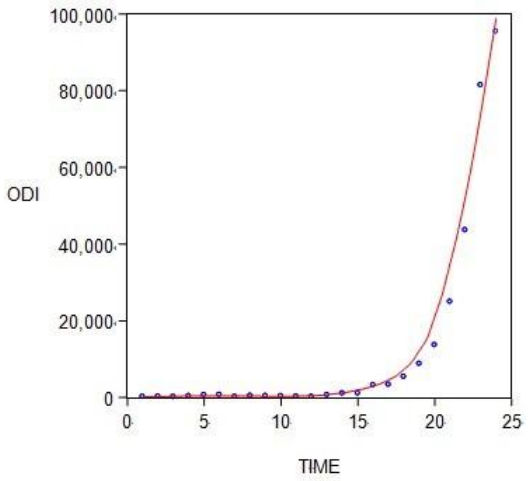

Figure 1 temporal variation of Fujian Province's foreign investment

4.2 TREND FORECASTING AND CONCLUSIONS

By regression prediction analysis, we get the predictive value of ODI in the next few years, as we can see in Table 6:

Table 6 Prediction of Fujian ODI in the 12th "Five-Year"
(Unit: Ten thousand dollars)

Year	2012	2013	2014	2015	2016
ODI	158065.3762	279352.5826	504855.7379	932997.6863	1763163.153

The regression prediction results indicate that Fujian Province's ODI will show sustainable rapid growth in the 12th" Five-Year Plan" and gradually shift from mostly FDI absorption based to overseas investment and attracting foreign investment balanced, which will achieve the historic leap from the second stage to the third stage.

Acknowledgement
Fund Project::(1)Supported by Program for New Century Excellent Talents in Fujian Province University; (2)Supported by the Fundamental Research Funds for the Central Universities, Huaqiao University(12SKGC-QT11); (3) The General Project of Ministry of Education: Humanities and Social Science Research(13YJA790140); (4) Fujian Provincial Academy of Social Sciences Plan (2013B112).

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