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The Research on the Relationship of Domestic Investment, Government Consumption, Household Consumption and Economic Growth -an Empirical Study of Fujian Province

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Abstract

With Fujian Province as object of study, panel data from 1981 to 2012 is selected in this paper. Besides, VAR model is established. Co-integration test, Granger causality, impulse response function and variance decomposition are used for quantitative analysis on correlation between domestic investment, government consumption, household consumption and economic growth in Fujian Province. The author reveals long-term stable balance among investment, government consumption and household consumption in Fujian Province as well as bidirectional causal relationship between economic growth and domestic investment, government consumption and household consumption. For a short term, household consumption is of relatively strong positive impact effect on economic gain, which is served as major impetus of economic growth. Domestic investment is of relatively obvious promotion for economic growth in a short term and of certain negative effect on economic growth in a long term. However, government investment is of relatively small positive impact to economic growth. Such promotion lasts for a longer period. On this basis, the author proposes some policies and recommendations for macroeconomic regulation and control in Fujian Province.

Keywords*: Domestic Investment, Consumption, Economic Growth, VAR*

1. Introduction

Investment and consumption are significant driving force to drive economic growth in Fujian Province. To further accelerate construction of Western Taiwan Straits Economic Zone, the central government attaches great importance to economic development in Fujian Province and has issued "three plans and two schemes" in order to promote sound and fast development of economy in Fujian Province. Through statistical analysis of panel data of Fujian Province in 1981-2012, the tendency chart of effects of domestic investment, government consumption and household consumption on economic growth of Fujian is drawn, as shown in the Figure1.

In the Figure1, GINV represents percentage of domestic investment to GDP, GGCONS represents percentage of government consumption to GDP, GHCONS represents percentage of household consumption to GDP,. It can be seen from Figure1 that GHCONS reached the maximum value 67% in 1982, and presented continuous downtrend from 1982. In 2012, the proportion declined to 30%, down 37%. GINV kept fluctuant between 20% and 30% before 2003, and presented quick rising trend form 2003. Besides, it exceeded household consumption in 2005 and became the first factor of economic growth. Government consumption was kept about 10% from 1981 to 1987 and was maintained at about 15% after 1987, with the rising range of about 5%. Based on the analysis, domestic investment, government consumption and household consumption have different effects on economic growth in different phases.

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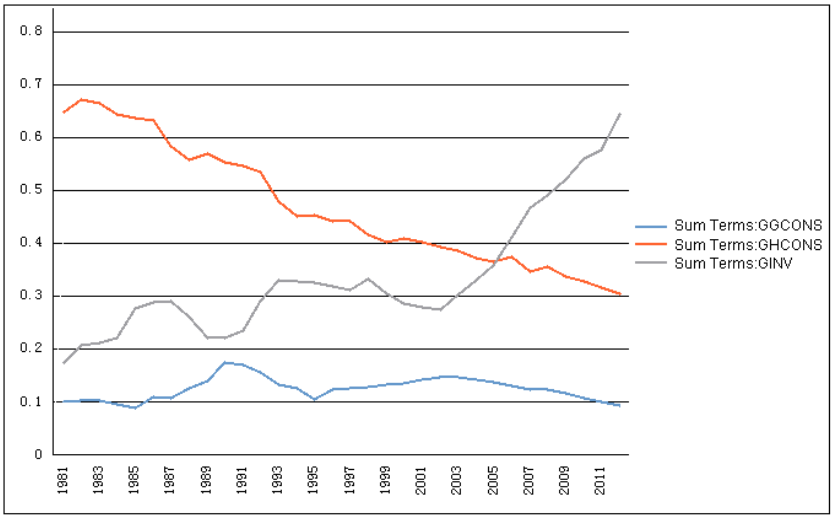

Figure 1. Percentage Tendency Chart of Investment, Government Consumption and Household Consumption to GDP

But, how much influence of domestic investment, government consumption, household consumption and are generated on economic growth? In a short term or long term, what about influencing mechanism and internal relations of domestic investment, government consumption, household consumption on economic growth? The solutions to these problems contribute to providing theoretical basis for government sector of Fujian Province to formulate effective policies and have realistic significance for rapid development of economy in Fujian Province. Thus, panel data of Fujian Province from 1981 to 2012 are chosen in this paper. The relations among domestic investment, government consumption, household consumption and economic growth are studied through empirical analysis.

2. Literature Review

In terms of theory, Mandyville's excessive saving theory indicates excessive saving without consumption will result in national economic depression and poor life, just like the scene described in Bee Prediction: an originally rich state carries out saving and controls normal transactions, which leads to sharp decline in consumption, the rise in unemployment rate and asset depreciation [1]. Thus, both the state and the people are down and out. In the opinion of Malthus, saving is a kind of investment in currency sense; national saving and consumption should develop evenly; saving can promote social economic growth and boost output of some industries and social capital accumulation; excessive saving will result in product surplus and the decrease in product price due to under-consumption. Under-saving will lead to insufficient productivity, the decrease in output and slow social wealth accumulation [2]. Engels indicated in General Theory of Employment, Interest rate and Currency, consumption and investment can decide national income. Consumption is decided by consumption tendency and income, while investment is decided by interest rate and marginal efficiency of capital. If total demand is insufficient due to under-consumption, investment is remedied. When private investment is insufficient, the government should increase investment.

In terms of empirical study, Chenery (1975) considers that when economic development level is low, since social capital is limited, resident income is mainly used to purchase necessities of life, so investment rate is low. With economic development, residents' living standard boosts, people will increase investment to boost productivity. When industrialization process reaches certain level, investment efficiency will decline and output is surplus. Meanwhile, investment rate also declines. Erlandsen S. (2008) gains

the conclusion related to consumption structure and age structure on the basis of consumption data of Norway. Zhang Zhaoping and Jiang Shihui (2007) takes Henan Province as the object of study and adopts Johansen co-integration test and error correction model to conduct co-integration analysis of the relationship among investment, consumption and economic growth. the result indicates that long investment, consumption and economic growth have obvious promotion effect. In a short term, such relationship presents dynamic and continuous adjustment [3]. Based on panel data analysis for eleven provinces in China, Jiang Yang and Deng Xiang(2009) start from household consumption features and gains such conclusion that government consumption has crowding-out effect on household consumption, with the crowding-out coefficient of 1.04 to 1.44, and the government needs to increase household consumption stimulus and reduces government consumption [4]. Hu Xuemei and Li Huixin (2010) applies co-integration test, error correction model and Granger causality to indicates Shandong government, government and economic growth have co-integration relationship from1978 to 2007,, but there is no causal Granger causality relationship, which does not comply with the theory of modern economics [5]. Sun HaiTao (2011) analyzes relevant factors of economic growth and gains such conclusion through Granger causality relationship that, consumption and economic growth have two-way Granger causality relationship and such influence is positive; investment and economic growth have bidirectional relationship and such influence is also positive [6]. Through regression analysis of panel data, Yang Fukuan (2012) indicates that China's economic growth is mainly driven by investment in the fixed assets; the increase of investment in the fixed assets can form effective demand, increase social total demand in that phase, enhances social productive force, produce more commodities and services for society, increase national income and promote economic growth [7]. Based on proportion utility theory, Wang Shouyuan (2013) carries out static analysis of relations among government consumption, household consumption and investment. The results indicate that government consumption has obvious crowding-out effect on household consumption, and investment has obvious crowding-out effect on household consumption. Due to the increase in GNP, consumption investment effect is also on the rise [8]. Zhu Zhongguo (2013) takes Sichuan Province for example and establishes VAR model to study effects of investment and consumption on economic growth under the background where investment proportion is on the rise and consumption is insufficient. The research indicates that investment level of Sichuan Province is excessive on the whole, but some industries have insufficient investment. Relative to government investment, private investment has greater contributions to economic growth, while consumption is insufficient on the whole. Such economic growth mode of high investment and low consumption lacks sustainability, so it is necessary to change investment and consumption structure [9].

Based on domestic and overseas literature review, domestic and overseas experts and scholars adopt different research methods and analyze relevance among domestic investment, government consumption, household consumption and economic growth from different perspectives. However, no in-depth research has been carried out on dynamic relationships among domestic investment, government consumption, household consumption and economic growth in Fujian Province so far. In this paper, investment in the fixed assets and final consumption serve as the objects of study. Causal relationship among domestic investment, government consumption, household consumption and economic growth are analyzed through Granger causality. VAR Mathematic model, impulse response function and variance decomposition are applied to study dynamic regulation mechanism between the three and economic growth. In addition, long-term equilibrium influencing mechanism is deeply studied through examination and setting up equations.

3. Mathematical Models

3.1. Vector Auto Regression Model

In traditional econometrics, simple linear regression equation cannot well analyze dynamic relations among variables. In normal conditions, time series of variables is non-stationary. Vector auto-regression model proposed by Sims can better and more objectively analyze and reveal dynamic relations among variables than traditional econometrics method. Meanwhile, it can reveal variables in economics are usually non-stationary time series problem. Vector auto-regression model is adopted to analyze variables. The models are established as follows:

$$Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + \cdots + A_p Y_{t-p} + B_0 X_t + \cdots + B_r X_{t-r} + \varepsilon_t \quad (1)$$

In Formula (1), Y_t is k-dimensional endogenous variable; Y_{t-i} (i=1,2,•••, p) is lagged endogenous variable; X_{t-i} (i=0,1,…,r) is exogenous variable or lagged exogenous variable; p and r are lagged orders of endogenous variable and exogenous variable, respectively; A_i and B_r represent corresponding coefficient matrix; ε_t represents residual error term of the model.

Two aspects should be noticed during establishing VAR model: (1) variable selection. If variables are excessive, model effectiveness of the model will be influenced. If variables are too fewer, the relevance among variables cannot be reflected. (2) Lagged order selection. If lagged order is too large, degree of freedom is insufficient. If lagged order is too small, dynamic features of the model cannot be fully reflected.

3.2. Johansen Co-Integration Test

Co-integration relationship can express variables have long-term equilibrium relationship. There are mainly two testing methods: (1) E-G two-step method. Such method can be used for unit root test of residual error of regression equation. OLS model is established to check stationarity of residual error; (2) J-J trace statistics method is a kind of test based on regression coefficient. The precondition is to set up VAR model (*i.e.* the model complies with ADL mode). J-J trace statistics method cannot just test multi co-integration relationship, but also allows imposing restrictions to test co-integration relationship and speed adjustment coefficient. This paper selects Johansen co-integration test [10].

3.3. Unit Root Test

Unit root test is used to judge whether time series is stationary. Only stationary time series can be sued for modeling and analysis.

Null hypothesis of ADF test is $H_0 : |\rho| \geq 1$, alternative hypothesis is $H_1 : |\rho| < 1$.

Accepting null hypothesis means time series is non-stationary, while refusing null hypothesis means time series is stationary.

3.4. Granger Causality Test

Granger causality test may be used to test causal relationship of economic indexes and mutual influences. The test thought is that, if the change in X gives rise to the change in Y, the change in X will certainly happen before Y changes. The test supposes that all prediction information of X and Y are included in time series. First of all, Granger test requires estimating regression:

Granger causality test Model is:

$$Y_t = c_1 + \sum_{i=1}^{q} a_i X_{t-i} + \sum_{j=1}^{q} \beta_j Y_{t-j} + u_{1t} \quad (2)$$

$$X_t = c_2 + \sum_{i=1}^{s} \lambda_i X_{t-i} + \sum_{j=1}^{s} \delta_j Y_{t-j} + u_{2t} \quad (3)$$

Where, we suppose u_{1t} and u_{2t} are unrelated; c_1 and c_2 represent constant terms; Y_t and X_t represent two groups of variables; Y_{t-i} and X_{t-i} are lagged values of Yt and Xt, $\alpha_i, \beta_i, \lambda_i, \delta_i$ are regression coefficients.

For formula(2), null hypothesis H_0: $\alpha_1 = \alpha_2 = ... = \alpha_q = 0$, *i.e.* X is not Y's the Granger cause. For formula(3), null hypothesis H_0: $\delta_1 = \delta_2 = ... = \delta_s = 0$, *i.e.* Y is not X's the Granger cause.

Thus, there are four situations:

(i) If X is the cause for the change in Y, coefficient estimated values of lagged X and Y in formula(2) and formula(3) are on the statistical magnitude, not zero significantly and zero significantly.

(ii) If is Y the cause for the change in X, coefficient estimated values of lagged X and Y in formula(2) and formula(3) are on the statistical magnitude, zero significantly and not zero significantly.

(iii) If X and Y are of mutual causal relationship, two H_0s are accepted.

(iv) If X and Y are mutually independent, two H_0s are rejected.

3.5. Impulse-Response Analysis

Impulse response function is used to measure a standard deviation of random disturbance term on impacts of current and future values of endogenous variables and the influence of variation track. It can intuitively show interaction and effect dynamics of variables.

3.6. Granger Causality Test

Within VAR model system, a variable is decomposed to each disturbance term through variance decomposition operation in order to seek the influence degree of each disturbance term on each variable in the system.

4. Empirical Analysis

4.1. Data Collection and Data Processing

This study selects panel data from Fujian Statistical Yearbook over years since the reform and opening up between 1981 and 2012, and carries out data preprocessing. Variables of empirical research are gross national products, domestic investment, household consumption and government consumption denoted by GDP, I, H, G respectively. To get a stationary series more easily, take natural logarithm of each variable, which will not change co-integration relationship and short-term adjustment mode among variables, but eliminates possible heteroscedasticity among variables to a certain degree. The processed gross national products, domestic investment, household consumption and government consumption data series are named LNGDP, LNI, LNH, LNG respectively. Gross national products, domestic investment, household consumption and government consumption data series after first-order difference are named DLNGDP, DLNI, DLNH, DLNG respectively.

4.2. Unit Root Test

Unit root test aims to test stationarity of time series. Quantitative analysis can be conducted for only stationary time series, or else quasi-regression may be easily caused.

This paper adopts ADF method to test variable stationarity. The optimal lag phase is confirmed by AIC minimum rule to make sure residual error is non-auto-correlated. Through root test of each index variable after the logarithm and first-order difference are taken, we can gain each economic index variable of first-order difference is stationary, as shown in Table 1.

Table 1. Unit Root Test

Variable	(C, T, K)	DW	ADF	5% Critical Value	Result
LNGDP	(C, 0, 2)	1.72	-2.04	-2.97	Unstable
LNI	(C, 0, 2)	1.87	-0.92	-2.97	Unstable
LNG	(C, 0, 2)	2.07	-4.96	-2.96	Unstable
LNH	(C, 0, 1)	1.9	-1.45	-2.96	Unstable
DLNGDP	(C, 0, 1)	1.64	-3.18	-2.97	Stable
DLNI	(C, 0, 0)	1.75	-3.08	-2.96	Stable
DLNG	(C, 0, 0)	2.18	-4.69	-3.57	Stable
DLNH	(C, 0, 0)	1.90	-3.09	-2.96	Stable

C is constant term; T is time trend term; k is the number of lag phase; * means ADF stationarity test is passed at 1% significance level after variable difference.

It can be seen from Table 1 that, original series of each variable has unit root at 5% significance level, so original series of each variable is non-stationary. But, after first-order difference is conducted for each variable, ADF value of DLNG series is less than the critical value at 1% significance level, ADF value of DLNGDP, DLNI, DLNH, DLNI series is less than the critical value at 5% significance level. Thus, we can prove that the series of each variable is stationary after first-order difference.

Since original series of each variable is non-stationary, quasi-regression may exist in the regression of integration variable without co-integration relationship. Hence, co-integration test is used to confirm whether stable relation exists among variables.

4.3. The Optimum Lag Order

The selection of lag phase number is very important for estimation in VAR model, because different lag phases will result in significant differences of mode estimation results. This paper determines the optimum lag order in combination with SC information criterion, AIC information criterion, likelihood ratio test statistics, HQ information criterion and final prediction error method. SC information criterion and AIC information are to determine lag order according to the optimum degree of fitting of model; LR criterion uses the ratio of maximum values of likelihood function with and without constraints; HQ criterion, AIC and SIC have similar principles only with different degrees of punishment for damage of prediction precision by new parameters; FPE criterion is put forward in consideration of a series of changes brought by the decline of residual variance and the rise of model order, and thus further determines the optimum lag order. The results are shown as shown as follows.

Table 2. The Optimum Lag Order of LR, FPE, AIC, SC and HQ

Lag	LR	FPE	AIC	SC	HQ
0	NA	2.45E-10	-10.7802	-10.58822	-10.72312
1	46.44073	9.86E-11	-11.70596	-10.74608*	-11.42053
2	28.15597*	7.37e-11*	-12.08499	-10.35721	-11.57123*
3	16.86577	9.21E-11	-12.1045	-9.608819	-11.36241

4	15.04165	1.15E-10	-12.42348*	-9.159895	-11.45305

It is known from test results that when the number of lag order is 2, the optimal lag order recommended by LR, FPE and HQ is 2 except that the results of SC and AIC information norms are not optimal. Thus, we choose 2 as the best lag order.

4.4. Johansen Co-integration Test

Because VAR is an unconfined model, and co-integration test is constrained. Since the best lag order of VAR model is 2, the optimal lag phase of co-integration test is 1, after natural logarithm is taken for original variable, trace statistics and maximum eigenvalue are used for co-integration test. The E-views test results are shown as follows.

Table 3. Unrestricted Co-Integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.72751	67.82973	54.07904	0.0019
At most 1	0.447136	28.82516	35.19275	0.2063
At most 2	0.198247	11.04586	20.26184	0.5377
At most 3	0.136914	4.417224	9.164546	0.3535
None *	0.72751	67.82973	54.07904	0.0019

Table 4. Test Result of Maximum Eigenvalue

Hypothesized No. of CE(s)	Eigenvalue	Maximum Eigenvalue	0.05 Critical Value	Prob.**
None *	0.72751	67.82973	54.07904	0.0019
None *	0.72751	39.00458	28.58808	0.0017
At most 1	0.447136	17.77929	22.29962	0.1901
At most 2	0.198247	6.62864	15.8921	0.7146
At most 3	0.136914	4.417224	9.164546	0.3535

Normalized cointegrating coefficients (standard error in parentheses)

LNGDP	LNG	LNH	LNI	C
1.000000	-0.206280	-0.617297	-0.212479	-1.008024
	(0.05570)	(0.14143)	(0.05953)	(0.31346)

Adjustment coefficients (standard error in parentheses)

D(LNGDP)	-1.330802
	(0.20172)
D(LNG)	-1.247456
	(0.38973)
D(LNH)	-0.848851
	(0.19333)
D(LNI)	-2.013865
	(0.46512)

Figure 2. Parameters of Co-Integration Regression Model Equation

It can be seen from the Table3 and Table4 that, the results of Johansen's trace statistic value and maximum likelihood value indicate original test without co-integration relationship is rejected at 5% significance level. Thus, we can judge the four index variables have co-integration relationship at 5% significance level.

Through co-integration test results, specific parameters of co-integration regression model equation can be determined and thus establish this equation. The formula is shown as follows.

$$LNGDP = 0.617297\ LNH + 0.212479\ LNI + 0.20628\ LNG + 1.008024 \quad (4)$$

$$S\tan dardError = (0.14143)(0.05953)(0.05570)(0.31346) \quad (5)$$

It is found from the equation that LNGDP、LNH、LNI 和 LNG have long-term stable equilibrium relationship. In other words, household consumption, investment and government consumption can facilitate national economy growth, where household consumption can best promote economy growth. According to formula, if the logarithm of household consumption increases by 1%, the logarithm of GNP will increase by about 0.62% accordingly. If the logarithm of investment increases by 1%, the logarithm of GNP will increase by about 0.21% accordingly. If the logarithm of government consumption increases by 1%, the logarithm of GNP will increase by about 0.21% accordingly. This equation only analyzes the influence of change of a variable on economic growth while other variables remain unchanged, but in fact there is mutual influence among variables. Thus, Granger Causality Test shall be further applied.

4.5. Granger Causality Test

For stationary data after difference, Granger causality test is adopted to analyze mutual relations of each index variable, establish variable model about GDP, household consumption, investment, government consumption and test null hypothesis. The test results are shown in Table 5.

Table 5. Granger Cause and Effect Test Results of Variables

Cause and effect relation assumption	LP	F value	P value	Decision	Conclusion
HC is not the cause of change of EG.	1	5.42137	0.0279	reject	HC is the cause of change of EG.
EG is not the cause of change of HC.	1	29.1734	1.E-05	reject	EG is the cause of change of HC.
GC is not the cause of change of EG.	5	3.22439	0.0382	reject	GC is the cause of change of EG.
EG is not the cause of change of GC.	5	2.58551	0.0739	accept	EG is not the cause of change of GC.
DI is not the cause of change of EG.	3	6.51054	0.0030	reject	DI is the cause of change of EG.
EG is not the cause of change of DI.	3	3.84809	0.0252	reject	EG is the cause of change of DI.
DI is not the cause of change of GC.	1	2.34058	0.1381	accept	DI is not the cause of change of GC.
GC is not the cause of change of DI.	1	3.63997	0.0675	accept	GC is not the cause of change of DI.
DI is not the cause of change of HC.	3	3.44536	0.0363	reject	DI is the cause of change of HC.
HC is not the cause of change of DI.	3	1.59502	0.2220	accept	HC is not the cause of change of DI.
HC is not the cause of change of GC.	1	1.09518	0.3050	accept	HC is not the cause of change of GC.
GC is not the cause of change of HC.	1	0.01778	0.8949	accept	GC is not the cause of change of HC.

It can be seen from conclusion that:

(1) Domestic investment, household consumption and economy growth have bi-directional causal relationship. In other words, Domestic investment and household consumption are the cause for growth of economy growth. Meanwhile, economy growth will stimulate changes in domestic investment and household consumption. government consumption is the Granger cause of economic growth, and the lag order is 5. This may be related to economic policy in China's "five-year plan". From 1953, a series of national economic development objectives would be formulated for every five years and relevant policies would be issued. Local governments also positively respond to the call of central government, enhance government expenditure consumption and stimulate economic growth, but economy growth is not the cause for the change in government consumption. This may be because economic growth's stimulus on government consumption is not obvious enough in a short term.

(2) Domestic investment is the cause for the change in household consumption, but household consumption is not the cause for the change in domestic investment. This indicates household consumption in Fujian Province is influenced by investment. The plentiful introduction of capital boosts output of some industries, vitalizes corporate cash flow and reduces production cost. While stimulating household consumption, this also indirectly facilitates economic growth, while household consumption changes do not bring investment changes. This may be related to the economic growth model of "high investment and low consumption". As investment ratio improves continually, investment efficiency decreases and production capacity is surplus. Insufficient domestic demand cannot stimulate investment growth in a short term [11].

(3) Household consumption and government consumption have no bi-directional causal relationship. Government consumption and domestic investment have no bi-directional causal relationship. This may be because change range of the three is relatively small in a short term, and the influence is also weak.

4.6. Vector Auto Regression Model

In this paper, the best lag order is two to set up VAR model about LNGDP, LNI, LNH, LNG whether VAR model is stationary needs to be judged according to system stationarity, *i.e*. calculation the value of characteristic polynomial. Since lag length of the model is 2, and there are 4 endogenous variables, there are 2×4 unit roots of the model, as shown in Figure3. It can be seen from the figure that the module of 8 unit roots is less than 1, *i.e*. all roots are within the unit circle. This proves estimated VAR model is stationary.

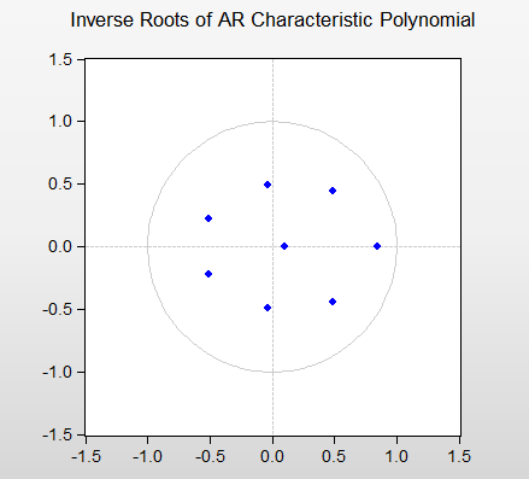

Figure 3. AR Test Result

4.7. Impulse-response Analysis

The function among GDP, household consumption, domestic investment and government consumption based on VAR model is set up. Short-term dynamic relation of the two is further analyzed. Correlation coefficient matrix of residual error of VAR model is shown in Table 6.

Table 6. Correlation Coefficients of Residual Error

	DLNGDP	DLNG	DLNI	DLNH
DLNGDP	1	0.081072713	0.645519432	0.816958257
DLNG	0.081072713	1	-0.460987961	0.047146873
DLNI	0.645519432	-0.460987961	1	0.67632225
DLNH	0.816958257	0.047146873	0.67632225	1

It can be seen from Table 6 that, correlation coefficients of residual error of Equation DLNGDP with Equation DLNH and Equation DLNI are 0.816958 and 0.645519, respectively. This indicates residual errors of these regression equations have great correlation. Correlation coefficient between residual errors of Equation GDP2 and Equation GCONS2 is 0. 081073. This indicates the correlation between residual errors of the two equations is relatively small. The above results reflect economic growth is more related to household consumption and domestic investment in Fujian Province, and the influence is small relative to government consumption. The above results are consistent with co-integration test result.

The results of impulse response functions are as follows:

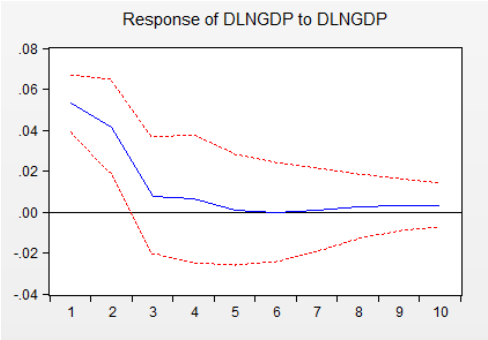

Figure 4. Economic Growth's Response to Economic Growth's Disturbance

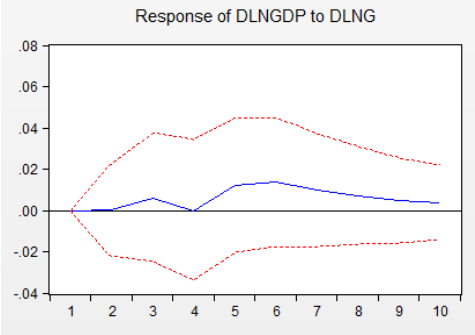

Figure 5. Government Consumption's Response to Economic Growth's Disturbance

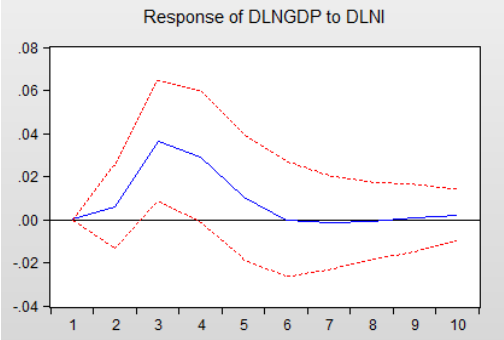

Figure 6. Investment's Response to Economic Growth's Disturbance

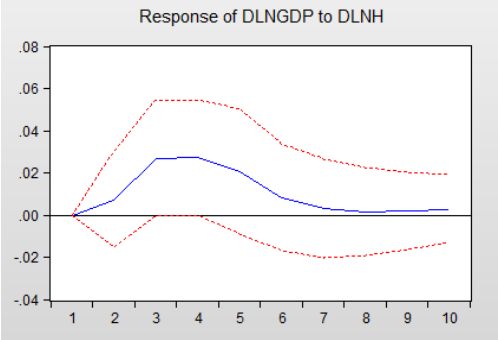

Figure 7. Household Consumption's Response to Economic Growth's Disturbance

In the Figure4 to Figure7, horizontal coordinate represents the number of phases; the vertical coordinate represents the magnitude of impulse-response function; the solid line represents the trend of economic growth after the impact; the imaginary lines at both sides represent twofold standard errors of the trend.

It can be seen from impulse response value that,

(1) Economic growth in Fujian Province makes an immediate response to standard deviation information (*i.e*. random disturbance term in VAR model). In the first phase, such response is maximum (about 0.053). Later, the impact of economic growth on itself gradually decreases. From the first phase to the fourth phase, positive impact effect is shown. After the fifth phase, the impact effect is basically 0. This indicates economic growth has obvious positive influence in a short term.

(2) Economic growth fails to make an immediate response to government consumption changes. The impact effect from the first phase to the second phase is 0. Positive impact effect is shown from the third phase to the fourth phase. From the fourth phase, the track first decreases slowly and then gradually increases, and the peak appears in the sixth phase (0.014). In addition, positive impact effects are shown from the fifth phase to the tenth phase. It can be seen from the track that the impact of government consumption on economic growth is small relative to other factors. This result is consistent with the results of co-integration regression test result and correlation coefficient matrix of residual error, but the influence duration of such impact on economic growth is long.

(3) After economic growth suffers positive impact of unit standard deviation of household consumption, impact peak is reached in the third phase (0.04). After the third phase, slow decline is shown. Until the seventh phase, it tends to be stable (near 0). The impact of household consumption on economic growth has been positive, and the impact reaches the largest from the second phase to the seventh phase. These indicate household consumption owns strong positive promotion effect on economic growth in a short term [12]. This confirms to results of co-integration test, granger causality mentioned above.

(4) The response of investment to economic growth is small in the first phase and the second phase. The impact grows fast from the second phase to the third phase, and the impact reaches the maximum in the third phase (0.21). Then, impact effect starts to decline. The impact from the first phase to the fifth phase is positive. From the fifth phase to the eighth phase, there is negative impact effect on economic growth. Later, the impact keeps stable near 0. On the whole, the impacts of household consumption in Fujian Province and domestic investment impose the largest effects on economic growth and they become main driving force of promoting China's economic growth.

4.8. ANOVA

After the response of domestic investment, government consumption, household consumption and economic growth to impacts is analyzed through impulse response function, equation decomposition method is used to continue to analyze contribution degree of domestic investment, government consumption, household consumption to economic growth. The results are shown in Table 7.

Table 7. Variance Decomposition Table

Period	S.E.	DLNGDP	DLNG	DLNI	DLNH
1	0.053056	100	0	0	0
2	0.068032	98.26908	0.000327	0.686661	1.04393
3	0.082266	68.11059	0.563467	19.84906	11.47688
4	0.091603	55.39701	0.454723	26.10961	18.03865
5	0.095188	51.3096	2.067258	25.31799	21.30515
6	0.096488	49.9366	3.994373	24.64047	21.42856
7	0.097053	49.36346	4.97779	24.38183	21.27692
8	0.097354	49.1271	5.466234	24.23904	21.16762
9	0.097543	49.05624	5.674561	24.1487	21.12051
10	0.097713	48.97499	5.79653	24.10513	21.12336
Cholesky Ordering: DLNGDP DLNG DLNI DLNH					

In variance decomposition table, Line Period is the number of phases of variance decomposition (*i.e*. predication phase of economic growth standard deviation); Line S.E is predicted standard deviation of economic growth; Line DLNGDP is the percentage of the part caused by economic growth itself in predicted variance of economic growth. Line DLNG is the percentage of the part caused by government consumption in predicted variance of economic growth. DLNH is the percentage of the part caused by household consumption in predicted variance of economic growth. DLNI is the percentage of the part caused by domestic investment in predicted variance of economic growth.

In accordance with the analysis results that, standard deviation of economic growth predicted in the first phase is equal to 0.053056. Standard deviation in the second phase is 0.068032, larger than the standard deviation in the first phase. This is because the prediction in the second phase is affected by production uncertainty of government consumption, household consumption and forecasting uncertainty of domestic investment in the last phase. Besides, with the rise in prediction phases, the standard deviation used to predict economic growth also gradually increase. In the prediction of the first phase, predicted variance of economic growth is totally caused by the disturbance of economic growth. This is because the first input variable for variance decomposition is DLNGDP. in the prediction of the second phase, predicted variance of economic growth is caused mostly by economic growth itself (accounting for about 98.26908%); 0.000327% is caused by government consumption disturbance; 1.04393% is caused by household

consumption; 0.686661% is caused by domestic investment disturbance. With the increase in prediction phases, the part caused by economic growth disturbance decreases, but the part caused by non-economic growth variable increases in the prediction variance of economic growth. About in the sixth phase, decomposition result of economic growth is basically stable. In the predicted variance of economic growth, 3.994373% is triggered by government consumption disturbance; 21.42856% is triggered by household consumption disturbance; 24.64047% is triggered by domestic investment disturbance. Similar variance analysis result of economic growth can also be gained in the form of synthetic graphics.

5. Conclusions

Based on VAR model setup, such conclusion is gain that domestic investment, government consumption and household consumption have long-term stable equilibrium relationship. There is bi-directional causal relationship among domestic investment, government consumption, household consumption and economic growth in Fujian Province in middle and long term, household consumption has strong positive impact effect on economic growth, and also has great contributions to economic growth. It is major driving force for economic growth. Domestic investment has significant promotion effect on economic growth in a short term. However, over the time, B has certain negative effect on economic growth in later period. Government investment's positive impact on economic growth is relatively small, but such promotion effect is more lasting.

In combination of economic situations of Fujian Province, policy suggestions are proposed for macroeconomic regulation and control for Fujian Province:

(1) Fujian Provincial Government needs to adjust economic growth structure. Seeing from the percentage of investment and household consumption to GDP in Fujian Province, percentage of investment to GDP presents the rising trend year after year, while the percentage of household consumption to GDP presents downtrend year after year. Such economic growth mode of high investment and low consumption may easily result in excess production capacity and insufficient domestic demand. It can be seen from the pulse of investment on economic growth that, investment has significant promotion effect on economic growth in a short term, but as investment efficiency declines in later period, investment has certain negative effect on economic growth. From the perspective of stimulating consumption, Fujian Provincial Government should enhance to guarantee social welfare of labor force, reduce residents' precautionary saving motivation, utilize science, technology and large-scale production to boost marginal output and wage level of labor force and then facilitate household consumption. From the perspective of controlling domestic investment, it is required to reduce invisible subsidy for investment, such as lowers the price of production factors of state-owned enterprises such as land and capital to make enterprises own competitive edge and high investment propensity.

(2) See from consumption expenditure proportion of Fujian Provincial Government over the years, education occupies the largest proportion in government consumption and presents the progressive increase year after year. As of 2012, the proportion of education to government consumption reached 22%. It thus can be seen that Fujian Provincial Government attaches great importance to education and the improvement of national comprehensive quality. In a long run, labor productivity growth can be promoted, and science and technology also present science and technology year after year. However, as of 2012, the investment in science and technology only accounted for 2% of government consumption. "Science and technology are the primary productive forces". Hi-tech industry can improve productivity by a large margin and is the first factor of economic growth. This theory which was proposed by Deng Xiaoping according to China's conditions complied with China's social and economic development rules and trend. This theory also deeply sums up the practice of the reform and opening-up. Therefore, Fujian

Provincial Government should increase the expenditure in science and technology while keeping education expenditure so as to facilitate better and faster economic growth in Fujian Province.

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