

Research on Dynamic Relationship between Indian FDI and Economic Growth Based on SVAR Model

Yang Juanjuan *

School of Economics, Shanghai University, Chengzhong Road, Jiading Town, China

JJuanYang@163.com

*corresponding author

Keywords: Indian FDI, Economic Growth, SVAR

Abstract: Since the beginning of the 21st century, the BRICS (including Brazil, Russia, India, China, South Africa) has emerged as an emerging economy and has gradually become the main force in attracting foreign investment in developing countries. As a strong contender for China to attract FDI inflows, India, the important point of joining the BRICS strategy is because it is very interested in capital inflows. Therefore, the establishment of SVAR model empirically studies the dynamic relationship between Indian FDI and economic growth. The results show that the impact of FDI has a greater impact on the economy in the short term and tends to bring positive effects to economic growth, but it is not necessarily that economic growth will have a positive impact on foreign direct investment.

1. Introduction

Since the beginning of the 21st century, BRICS as representatives of developing countries, the economy has developed rapidly, GDP has grown steadily, international trade activities have been continuously enhanced, and foreign investment levels have been continuously improved. With various advantages and foreign investment introduction policies, the BRICS countries have attracted direct investment from many multinational companies, and undoubtedly this has had an important impact on the development of the BRICS countries. It can be said that the increase in the level of foreign investment has partially promoted the development of the BRICS national economy.

Foreign direct investment (FDI), with the core of controlling management rights and the purpose of obtaining profits, refers specifically to foreign enterprises, economic organizations and individuals in accordance with relevant policies and regulations to open foreign-owned enterprises, joint ventures, cooperative enterprises, etc. in other countries. For the host country, it can promote the formation of investment capital, make up for the shortage of funds, optimize the industrial structure, and improve the conditions of foreign trade. Therefore, studying the inflow of FDI is of great significance to the economic development of the host country.

This article considers that India is one of the BRICS countries. The BRICS strategy has far-reaching effects on international trade, capital flows and economic growth. It is important for India to join the BRIC strategy because it is very interested in capital inflows. . But academics have little research on economic growth in India's FDI. So, what impact will FDI have on India's economic growth? This paper conducts an empirical analysis of this issue.

2. A brief review of the theoretical and empirical literature

The impact of foreign direct investment on the economic growth of host countries has been one of the important issues studied by scholars at home and abroad for many years. Many scholars have done a series of studies on the relationship between the two.

2.1. Positive effects between FDI and economic growth

American scholar S. Hymer researched FDI in 1960 earliest and made it to develop into a

research field. In his paper, it is demonstrated for the first time that foreign direct investment is different from the commonly understood foreign financial asset investment, and it has set a precedent for theoretical research on FDI. The famous “Dual-gap model” proposed by American economists H.B.Chenery and A.M.Sturout (1966) holds that the inflow of foreign capital can promote economic growth. Romer (1986), Borensztein, Gregorio and Lee (1995), Balsubramanyam (1996), Ericsson and Manuchehr (2001), Marta Beng (2003) found the same result that FDI has a significant positive effect on the economic growth of the host country.

Chinese scholars have also done a lot of research on the impact of FDI on economic growth, such as Wang Xin (1999), Shen Kunrong (1999), Wei Houkai (2002), Wang Chengyu et al. (2002), Jiang Jinfan (2004), Ma Yan (2006), Hu Anjian, Hou Lei and Chang Zhiyou (2017). They studied the relationship between FDI and economic growth and concluded that there is a positive relationship between FDI and economic growth.

2.2. Negative effects between FDI and economic growth

Although the data and methods used by scholars are different, their research results basically support the view that FDI is conducive to economic growth. Of course, some scholars believe that there is no obvious positive effect between FDI and economic growth. Griffin (1970), Prebisch (1988), Haddad and Harrison (1991), Boyd and Smith (1992), Chen Liu and Liu Zhiwei (2006), He Juxiang and Wang Shouyang (2011) found that FDI does not significantly promote the economic growth of the host country, and what’s worse, FDI will actually slow down the economic growth of the host country.

However, most of the above studies have deficiencies. These studies mostly study the impact of FDI on economic growth from a static perspective, without considering their dynamic relationship. While the traditional VAR model can study the dynamic relationship between variables, the current structural relationship of the variables in the model cannot be determined. Therefore, this paper establishes the SVAR model to analyze the mutual dynamic influence between foreign direct investment and economic growth in India.

3. Data selection and model introduction

3.1. Setting of SVAR model

The structural VAR model (SVAR) is actually the structural formula of the VAR model. It introduces the current value of the endogenous variable into the model based on the VAR, extracts the structural relationship that was originally hidden in the disturbance term, and makes the variable The description of the economic relationship between them is more accurate.

The expression of the VAR model can be expressed as:

$$y_t = \Phi_1 y_{t-1} + \Phi_2 y_{t-2} + \dots + \Phi_p y_{t-p} + Hx_t + \varepsilon_t, \quad t=1,2,3,\dots, T \quad (1)$$

The general expression of the SVAR model is:

$$Ay_t = \Phi_1^* y_{t-1} + \Phi_2^* y_{t-2} + \dots + \Phi_p^* y_{t-p} + H^* x_t + e_t \quad (2)$$

the left and right sides of the equation (1) multiply:

$$Ay_t = A\Phi_1 y_{t-1} + A\Phi_2 y_{t-2} + \dots + A\Phi_p y_{t-p} + AHx_t + A\varepsilon_t \quad (3)$$

Compare (2) and (3):

$$A\varepsilon_t = e_t \quad (4)$$

If the matrix e_t in (4) can be normalized to $B\mu_t$:

$$A\varepsilon_t = B\mu_t \quad (5)$$

In equation (5), if both A and B are reversible matrices and meet the conditions

$E(\mu_t) = 0, E(\mu_t \mu_t') = I$, the above model is called an AB-type SVAR model. In order to estimate the p-order SVAR model of the variable, it needs to be identified, so it is necessary to impose $k(k-1)/2$ conditions on the matrix A, where k is the number of variables in the model.

3.2. Data selection and processing

Considering the comparability and availability of data, This paper uses the actual accumulated foreign direct investment inflows and real GDP as the indicators of FDI and economic growth. The data from 1991-2017 (in thousands of US dollars) was selected to establish a model for empirical analysis. Among them, the FDI indicator data comes from the Indian government website (<http://www.dipp.nic.in>), and the GDP indicator data comes from the World Bank database (<http://data.worldbank.org.cn>).

The logarithmic processing of each index data is performed to eliminate the heteroscedasticity in this paper, and the obtained data sequences are LGDP and LFDI, respectively. The establishment of the SVAR model requires that the time series data be stable, so it is necessary to use the ADF test to perform a stationarity test on the variables. The test results are shown in Table 1 below. All the treatments and tests in this paper use Eviews8.0.

Table 1 ADF test of the variables.

variables	ADF test statistic	Test critical values			test result
		1%	5%	10%	
LGDP	-1.6196	-4.3743	-3.6032	-3.2381	unstable
LFDI	-2.0750	-4.3943	-3.6122	-3.2431	unstable
Δ LGDP	-3.9341	-4.3943	-3.6122	-3.2431	stable
Δ LFDI	-1.9610	-4.4163	-3.6220	-3.2486	unstable
Δ^2 LGDP	-6.3367	-4.4163	-3.6220	-3.2486	stable
Δ^2 LFDI	-5.7221	-4.4163	-3.6220	-3.2486	stable

It can be seen from Table 1 that the LGDP sequence and the LFDI sequence are non-stationary sequences, but the sequences Δ^2 LGDP and Δ^2 LFDI produced by the second-order difference are stable at a significance level of 1%. Therefore, this paper adopts Δ^2 LGDP and Δ^2 LFDI to establish the SVAR model.

4. Empirical analysis

4.1. Construction of SVAR model

The lag order of the SVAR model is determined according to the relevant information criteria, and the optimal lag order selected according to each criterion has a "*" mark. The test results are shown in Figure 1.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	68.74439	NA	3.05e-06	-7.025725	-6.926311	-7.008901
1	73.43977	7.907999	2.85e-06	-7.098923	-6.800679	-7.048448
2	82.73235	13.69433*	1.66e-06*	-7.656037*	-7.158964*	-7.571912*
3	84.73511	2.529797	2.15e-06	-7.445801	-6.749898	-7.328026
4	87.31363	2.714238	2.74e-06	-7.296172	-6.401440	-7.144748
5	89.34018	1.706565	3.97e-06	-7.088440	-5.994879	-6.903366

Figure 1 Lag order test results.

It can be seen from Figure 1 that the optimal lag order of the SVAR model is 2. That is, the SVAR(2) model is established.

In order for the SVAR model to be recognized, the initial settings of matrices A and B are

$$A = \begin{bmatrix} 1 & 0 \\ a_{21} & 1 \end{bmatrix}, B = \begin{bmatrix} b_{11} & 0 \\ 0 & b_{22} \end{bmatrix},$$

The result of running is $a_{21}=0.0909$, $b_{11}=0.0592$, $b_{22}=0.0216$. Therefore, the SVAR model expression is

$$\begin{bmatrix} 1 & 0 \\ 0.0909 & 1 \end{bmatrix} \varepsilon_t = \begin{bmatrix} 0.0592 & 0 \\ 0 & 0.0216 \end{bmatrix} \mu_t \tag{6}$$

4.2. Granger causality test and stability test

The Granger causality between the model variables and the test is tested. The results are shown in Table 2.

Table 2 Granger causality test results.

Null Hypothesis	F-Statistic	Prob.	test result
$\Delta^2 LGDP$ does not Granger Cause $\Delta^2 LFDI$	16.85337	0.0002	relevant
$\Delta^2 LFDI$ does not Granger Cause $\Delta^2 LGDP$	0.515754	0.7727	irrelevant

It can be seen from the test results in Table 2 that when the confidence level is 1%, the null hypothesis is rejected, and economic growth has a certain attraction to foreign direct investment. However, the inflow of foreign direct investment does not necessarily promote economic growth.

4.3. Stability test

The stability of the model is determined by the AR root test. If all the feature values fall within the unit circle, the model is stable. The test results are shown in Figure 2. It can be seen from Figure 2 that all the eigenvalues are in the circle, so the model has a smoothness.

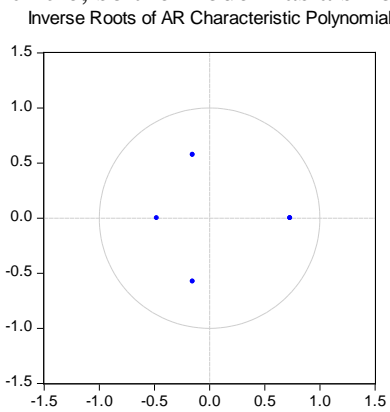


Figure 2 Model unit root test.

4.4. Impulse response analysis

Figure 3 and Figure 4 are the impulse response function curves of the SVAR model.

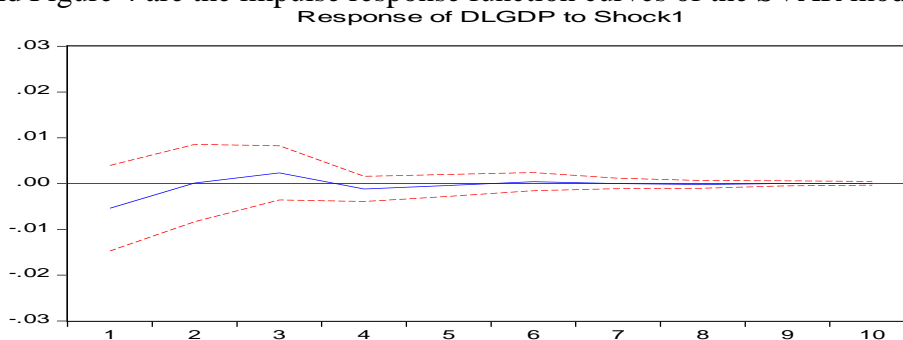


Figure 3 Impulse response function.

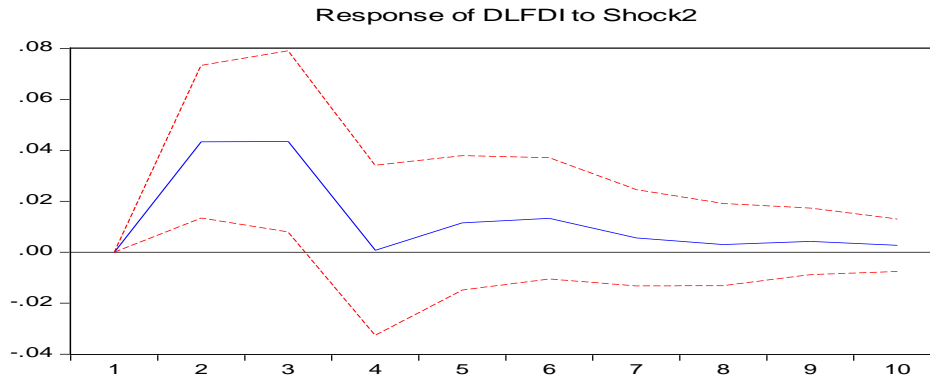


Figure 4 Impulse response function.

As can be seen from Figure 3, after a positive impact on FDI, the FDI impact has a negative impact on economic growth, reaching a maximum negative value of -0.005 in the first period. After that, the negative effect rapidly decreases and turns into a positive influence, reaching a maximum positive value of 0.002 in the third period and the effect tends to zero after the fifth period. This shows that FDI does not necessarily have a positive impact on economic growth. In general, the impact of FDI has a greater impact on the economy in the short term and has little impact in the long run. The reason for this result may be that the unreasonable investment structure may cause crowding and impact on the production and employment of Indian enterprises, thus causing economic growth unstable.

As can be seen from Figure 4, a positive impact on GDP will cause an increasing positive effect on FDI, reaching a positive peak of 0.044 in the third period, after which the positive effect gradually decreases and reaches a minimum of 0.001. After the fourth period, the positive effect gradually increased and it stabilized after the seventh period. This shows that economic growth will have a positive attraction to foreign direct investment and promote the inflow and increase of FDI.

4.5. Variance decomposition analysis

Variance Decomposition of DLFDI:			
Perio...	S.E.	Shock1	Shock2
1	0.059155	100.0000	0.000000
2	0.074458	66.04163	33.95837
3	0.086738	49.81815	50.18185
4	0.087564	50.75225	49.24775
5	0.088866	50.49680	49.50320
6	0.089933	49.47733	50.52267
7	0.090198	49.38299	50.61701
8	0.090314	49.40236	50.59764
9	0.090437	49.31813	50.68187
10	0.090489	49.28496	50.71504

Variance Decomposition of DLGDP:			
Perio...	S.E.	Shock1	Shock2
1	0.022217	5.862992	94.13701
2	0.024258	4.919912	95.08009
3	0.024631	5.672838	94.32716
4	0.024936	5.754604	94.24540
5	0.024942	5.779694	94.22031
6	0.025000	5.779628	94.22037
7	0.025003	5.778208	94.22179
8	0.025006	5.782703	94.21730
9	0.025008	5.782232	94.21777
10	0.025008	5.782360	94.21764

Factorization: Structural

Figure 5 Variance decomposition analysis result.

From Figure 5, we can see that economic growth has a lagging effect on the attraction of FDI. After the sixth period, the impact of economic growth on FDI begins to stabilize at around 50.5%, and the relative influence is strong; while GDP is affected from the first period. The impact of FDI on economic growth after the third period is stable at around 5.7%. This also shows that the impact of FDI on economic growth is lower than that of economic growth. The reason may be that the irrational structure of FDI investment has a crushing effect on the Indian economy.

5. Conclusions and policy recommendations

In general, the growth of the Indian economy will have a positive effect on FDI, and the impact of FDI will have a weaker impact on the economy in the short term, and there will be almost no impact in the long run, which may be related to factors such as unreasonable FDI investment structure.

Although India still has a certain gap with China on some macro indicators, it is undeniable that it still has certain advantages in some micro level, such as human resource structure, FDI source structure, industrial upgrading and location advantages. Therefore, studying the situation in India has certain reference significance for China.

5.1. Adjust and promote the upgrading of domestic industrial structure

The FDI attracted by India is mainly focused on developing its own superior software industry to cultivate core competitiveness. Even so, India may still have different levels of unreasonable FDI investment structure. At present, China is in a period of transition, and it is necessary to actively build a reasonable domestic and foreign-funded structure, and create a favorable investment environment for the introduction of FDI. Therefore, China must adjust and balance the proportion of foreign capital inflows. In particular, it needs to invest more foreign capital in capital-intensive industries and technology-intensive industries, thereby promoting economic restructuring and benign development of the industry.

5.2. Pay more attention to the quality of FDI not only the scale of FDI

From the perspective of the scale of FDI, China's foreign direct investment has been at a relatively high level. The huge foreign capital has laid a certain foundation for the development of the industry that utilizes foreign capital. However, in attracting investment, we must not only pay attention to the scale of FDI, but also emphasize the quality of FDI. It is necessary to introduce large-scale enterprises with advanced science technology and management level into the country to ensure that FDI can promote China's economic development.

References

- [1] Chen Langnan, Chen Jinghuang. Empirical Study on the Impact of Foreign Direct Investment on China's Economic Growth [J]. *The Journal of World Economy*, 2002,6.
- [2] He Juxiang, Wang Shouyang. An Empirical Analysis on the Relationship between Inward Foreign Direct Investment and Economic Growth in BRICs [J]. *Finance and Economy*, 2011,9.
- [3] Hu Anjian, Hou Lei, Chang Zhiyou. Study on the Impact of Foreign Direct Investment on China's Economic Growth and Optimization of industrial Structure –Based on VAR Model [J]. *Journal of Regional Financial Research*, 2017,7.
- [4] Li Fan, Wang Jinying. Analysis on the Features of China and India in Utilizing FDI [J]. *Journal of Central University of Finance & Economics*, 2006,9.
- [5] Shen Kunrong, Li Jian. Empirical Study on the Influence Mechanism of China Trade Development and Economic Growth [J]. *Economic Research Journal*, 2003,5.
- [6] Chandana Chakrabortye, Peter Nunnenkamp. Economic Reforms, FDI, and Economic Growth in India: A Sector Level Analysis[J]. *World Development*, 2007,7.
- [7] Panagiotis Pegkas. The impact of FDI on economic growth in Eurozon eountries[J]. *The Journal of Economic Asymmetries*, 2015,12.
- [8] SasiIamsiraroj, Mehmet Ali Ulubaşoğlu. Foreign direct investment and economic growth: A real relationship or wishful thinking[J]. *Economic Modelling*, 2015,51.
- [9] Tafirenyika Sunde. Foreign direct investment, exports and economic growth: ADRL and causality analysis for South Africa[J]. *Research in International Business and Finance*, 2017,41.
- [10] Wen hui Wei. China and India: Any difference in their FDI performances[J]. *Journal of Asian Economics*, 2005,16.