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## Research on the interaction between exchange rates and Chinese bio-pharmaceutical companies

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### ABSTRACT

Biological technology as the key driving force in international science and technology development, it has great strategic significance in solving the problem of population, health, food, energy, environment and other issues, this also makes the biological industry has become the focus of international competition. The result shows exchange rates that has the important influence to the bio-pharmaceutical companies. In addition, government intervention can not eliminate the macro economic instability phenomena. Because FDI decided by exogenous factors, domestic policy makers can not calculate the right FDI value, so the policy makers in fact neither know, also can't make all kinds of capital flow achieve the right level and thus they can't avoid macroeconomic instability.

### KEYWORDS

Open FDI strategy; Bio-pharmaceutical industry; Economic stability; Panel data.



## INTRODUCTION

Some developing countries take the practice of the opening capital account partly, they think in this way they can get the benefits of open capital account and avoid the negative consequences. As Chinese biopharmaceutical companies has huge external demand both in technology and raw materials, so that FDI has significant influence to Chinese biopharmaceutical companies. FDI open and non-FDI still keep control state is one of the most common forms in the possible combinations of the opening Strategy of the capital account. Developing countries usually have a good attitude to FDI; the reason is that they generally think that FDI will not appear sudden reversal. So it can't cause macroeconomic and financial system instability.

However, open capital account is inherently unstable, though it may be possible to promote macroeconomic growth, but it can also lead to volatility of economic growth. Therefore, FDI can't play a "stabilizer" role to macro economic. AgnÈs and Lionel (2001) research the choice of an exchange-rate regime by integrating the determinants of multinational firms' locations. The results show that exchange-rate volatility is detrimental to foreign direct investment (FDI) and that its impact compares with that of misalignments<sup>[1]</sup>. Kozo and Shujiro (2004) examines the impact of the changes in the real exchange rate and its volatility on FDI, and find out that the depreciation of the currency of the host country attracted FDI, while the high volatility of the exchange rate discouraged FDI<sup>[2]</sup>. Bong and Byung (2011) examined the role of both the volatility and levels of exchange rates in the determination of multinational enterprises (MNEs), the result shows that the effect of exchange rate volatility on FDI is persistent, whereas that of misalignment of level is only temporary, suggesting that MNEs regard volatility as a more generic determinant of foreign investment than misalignment of the exchange rate level<sup>[3]</sup>. Shu and Kai (2007) presents and tests two propositions on the role of FDI in economic growth from a newly industrialising economy's perspective<sup>[4]</sup>. First, FDI is a mover of production efficiency because it helps reduce the gap between the actual level of production and a steady state production frontier. Second, FDI being embedded with advanced technologies and knowledge is a shifter of the host country's production frontier.

Also, there are some researches mainly about how exchange rate policy will effect on FDI, especially in some emerging countries as China<sup>[5-6]</sup>. Yuqing XING (2006) pointed out that China's exchange rate policy played a critical role in its FDI boom<sup>[7]</sup>. Katheryn (2007) demonstrate that a multinational firm's response to exchange rate volatility will differ depending on whether the volatility arises from shocks in the firm's native or host country<sup>[8]</sup>. Olga (2011) analyzes the relation between nominal exchange rate volatility and several macroeconomic variables, namely real output growth, and pointed out that following the global financial crisis, "hard peg" countries may have experienced a more severe adjustment process than "floaters"<sup>[9]</sup>. Chyau and Linda (2003) pointed out that the open door policy of China's economic reform since the 1980s has attracted heavy foreign direct investment (FDI) flows into China, and use empirical analysis to find out the agglomeration effects generated by a core-periphery (CP) relation<sup>[10]</sup>.

This paper extends and develops the dynamic open economic model based on the Aghlion (2001, 2004) to analysis the macroeconomic and financial instability problems which the open capital accounts FDI brings<sup>[11]</sup>. In this paper, we use the real exchange rate volatility to refer to the instability of financial markets; with the biopharmaceutical companies' output value fluctuation refers to the instability of macroeconomic. We construct a panel data model which including 30 biopharmaceutical companies' for quantitative analysis, the model analysis the influence of biopharmaceutical companies' output value growth that open FDI caused. We also have estimate and test to explain the real contact between the FDI opening and economic instability.

## EXPERIMENTAL SECTION

### The basic economic model

In dynamic and open model established by Agllion (2001, 2004), the basic assumption is one country only one trade product, production factors are capital and a domestic specific endowment

element. Definite  $P$  is the price of the specific element of the endowment;  $P$  is the relative price of non-trade product and trade product. Based on the macro economic theory,  $P$  is the real exchange rate. The largest supply constraints for domestic endowment elements is  $Z$ , one country savings is  $(1-a)$  of the final wealth, the total amount of economic individuals in different types is "1".

In Leontief economies, formula of GDP  $Y$  is:

$$y = \text{Min}(K/a, z) \quad (1)$$

In this formula:  $1/a > r$ ,  $r$  is international interest rates,  $K$  is the current capital,  $z$  is domestic endowment elements.

Because there has credit constraints in developing countries, the country which initial wealth accumulation is  $W_B$  most can lending  $\mu W_B$ , credit multiplier  $\mu > 0$ . Define  $L$  as borrowing amount, so one country can invest for  $I = W_B + L$ . If there has credit constraints  $I = (1 + \mu) W_B$ ,  $K = I - PZ$ , the maximization of  $Y$  demands  $z = K/\alpha$ , we can get:

$$I - pz = az \quad (2)$$

### Empirical analysis

This research mainly adopts the measurement of the cross-sectional data model, for cross-sectional data model, the important thing is their estimate results could pass the test of heteroscedasticity, test this paper used including:

HCSE test: This test gives heteroscedasticity-consistent standard errors and the result of t-statistics (Eicker, 1967; White, 1980)

HACSE test: This test gives related standard deviation and t-statistic, the result can be used to analyze heteroscedasticity of Cross-sectional data and self-correlation of model residual (Andrews, 1991)

JHCSE test: The corresponding standard deviation of this test called Jackknife revised standard deviation (MacKinnon and white, 1985). This Statistics test is based on HCSE test.

Establish the cross-section data model about FDI open influence the macroeconomic; the panel date includes 30 Chinese biopharmaceutical companies as samples:

$$\begin{cases} REER - VOL^i = \beta_0 + \beta_1 FDI^i + \beta_2 X^i + \varepsilon^i \\ BioIOV - VOL^i = \beta_0 + \beta_1 FDI^i + \beta_2 X^i + \varepsilon^i \end{cases} \quad (3)$$

$REER$  is real effective exchange rate;  $REER - VOL^i$  is the fluctuation in the sample (2000-2010)  $REER$  of country,  $BioIOV - VOL^i$  is the fluctuation of biopharmaceutical companies' industrial output value growth after eliminating time trend of sample period.  $FDI^i$  is direct investment amount of GDP of country  $i$ ; specific data is the average from 2000 to 2010.

$X^i$  Includes other explanatory variables as:

IMEXGDP=SUM of Export and import divided by GDP;

GSGDP=Government consumption divided by GDP;

GDPcap=GDP formed by unit capital;

$M_2$ GDP=Broad money supply divided by GDP;

CPI= Consumer price index;

i-diff=Balance of interest rates (one-year period);

The original data are from international financial statistics IFS database of the international monetary fund (IMF). In addition, the interpretation of the model also include virtual variable DEX refer to exchange rate system.

$$DEX = \begin{cases} 0, \text{ use the floating exchange rate system} \\ 1, \text{ use the fixed exchange rate system} \end{cases} \quad (4)$$

According to data sample, we analyze whether the open FDI influence the fluctuation of real exchange rate, the result such as TABLE 1.

**TABLE 1 : Effect of FDI on real exchange rate**

dependent variable :REER-VOL					
<i>S.E. of regression 4.087 Sum squared resid 501.2 Durbin-Watson stat 2.34 Included observation: 30 Numbers of Parameter 5</i>					
	coefficient	Std. Error	HACES (Std)	HCES	JHCES
FDI	-0.0237	0.0678	0.0304	0.0248	0.0654
IMEXGDP	0.0314	0.0189	0.0263	0.0254	0.0256
GDP <sub>Cap</sub>	1.1430	0.3145	0.4245	0.3421	0.3529
CPI	0.5760	0.1534	0.2365	0.1875	0.2134
DEX	-2.637	1.6342	1.4258	1.6345	1.8942
	coefficient	t-Statistic	HACES (t-Statistic)	HCES	JHCES
FDI	-0.0234	-0.3208	-0.7512	-0.8364	-0.3402
IMEXGDP	0.0356	1.6871	1.3422	1.4823	1.3045
GDP <sub>Cap</sub>	1.2434	3.4563	2.6345	3.5398	3.1245
CPI	0.6583	3.4678	2.5435	3.1032	2.5489
DEX	-2.643	-1.8034	-2.0493	-1.6726	-1.5101

From TABLE 1, we find that open FDI of capital account does not produce significant influence to real effective exchange rate, this result is consistent with the model. In addition, DEX in 10% significant level will influence exchange rate fluctuations. In general, effective exchange rate fluctuate less in the fixed exchange rate system.

According to the data, we analyze whether FDI influence fluctuation of bio-pharmaceutical industry growth, the result shows in TABLE 2.

**TABLE 2 : Effect of FDI on bio-pharmaceutical industry growth**

dependent variable : BioIOV -VOL					
<i>Overall model test F (3,53)=4.711[0.005]** Included observation 30 Numbers of Parameter 4</i>					
	coefficient	Std. Error	HACES (Std)	HCES	JHCES
FDI	31.880	13.642	3.4212	3.2456	24.732
IMEXGDP	-181.45	108.34	74.243	75.314	78.342
GSGDP	-1145.1	660.34	680.23	702.93	728.34
Constant	48712	14265	18239	18302	18423
	coefficient	t-Statistic	HACES (t-Statistic)	HCES	JHCES
FDI	31.478	2.3493	9.345	10.431	1.1913
IMEXGDP	-182.34	-1.2359	-2.4642	-2.3704	-2.3283
GSGDP	-1234.1	-1.2359	-1.7424	-1.7392	-1.6934
Constant	49230	3.4256	2.5739	2.6368	2.6453

Based on the result of coefficient and residue test, model can through the test of heteroscedasticity in 95% confidence level. Open FDI has significant influence to fluctuation of bio-pharmaceutical industry growth, coefficient is 31.88. However, FDI does not have a stable effect on bio-pharmaceutical industry. Instead, the fluctuations of FDI will deepen fluctuation of the country, cause bio-pharmaceutical industry instability and cause financial crisis.

## CONCLUSION

In this paper, the result shows that: FDI has the important influence to the bio-pharmaceutical industry growth; at the same time, open FDI may lead instable consequences to bio-pharmaceutical industry. In empirical section, we use model show that FDI will not cause real exchange rate fluctuations in the long-term, mixed items ( $W_B + FDI$ ) will keep stable, but  $W_B$  may fluctuate with the volatility of the FDI, so bio-pharmaceutical industry growth will be unstable.

In addition, government intervention can not eliminate the macro economic instability phenomena. Because FDI decided by exogenous factors, domestic policy makers can not calculate the right FDI value, so the policy makers in fact neither know, also can't make all kinds of capital flow achieve the right level and thus they can't avoid macroeconomic instability. Practice proves that macro-control is not easy, successful macro economic regulation and control only make domestic economic parameter fluctuated following intention of foreign capital investment. But if the policy makers fail to control effectively, the country will face economic bubble and inflation with the rapid increase of the foreign capital; if foreign sudden fall, bubble will burst and deflation appeared. Therefore, open FDI is not a "stabilizer".

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