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The long-run relationship between inflation rate and foreign direct investment in China

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Abstract
The study deals with testing the long run relationship between inflation rate and foreign direct investment for China covering the period from 1974 to 2015. The results of the unit root tests indicate that the series are non-stationary at their levels and stationary at first difference. Further, it is concluded that FDI and Inflation series are co-integrated and have long run equilibrium relationship. For short run relationship the Granger causality test is used and it is observed that there is no causal relationship between foreign direct investment and inflation in China.

Keywords: FDI, Inflation, unit root, co-integration, granger causality test

Introduction

Inflation and foreign direct investment are the important macroeconomic variables that affect the economic growth of a country. Inflation is a sustained increase in the general level of prices for goods and services. Or it is a sustained decrease in the purchasing power of currency that occurs due to an imbalance between demand and supply of money. According to Irving fisher (1911) quantity theory of money proposes that the exchange value of money is determined like any other goods, with supply and demand.

Keynesian economists criticizes the QTM and states that inflation comes in two varieties, the first is demand pull inflation that occurs when the aggregate demand level is high as compared to aggregate supply in the economy, and the second is cost push inflation that occurs by pushing up the prices due to increases in costs of the factors of production. Both demand pull and cost push Inflation causes some other macroeconomic variables to change, one of those variables is foreign direct investment.

According to the IMF, Foreign direct investment refers to an investment undertaken to acquire a long term interest in the enterprises that are operating outside the country of residence of investor. FDI is one of the main sources of external financing because due to FDI the countries with limited amount of capital will receive funds from wealthier countries. Inflation causes the nominal interest rate to increase and further nominal interest rate will affect the level of FDI inside an economy. According to national bureau of statistics of china (2016), inflation rate in china averaged 5.43 percent from 1986 until 2016, reaching an all-time high of 28.40 percent in February of 1989 and a record low of -2.20 percent in April of 1999.

Azam (2013) [2], found a positive effect of market size, official development assistance on FDI and negative effect of inflation on FDI conducting a case study of Armenia, Kyrgyz republic and Turkmenistan. Omankhanlen (2011) found a significant effect of exchange rate on FDI, and further has concluded that there is no significant effect of inflation on FDI conducting a case study of Nigeria.

Since 1979, FDI has gone through several stages of development in china. During the initial stage (1979 – 1986), FDI began to flow into china and the government began to establish laws and regulations on using FDI. In this period the total amount of FDI was just $8.304 billion, with annual average value of $1.038 billion and average annual growth rate near 15%. The stable fast developing stage began in 2001 and continues, because china entered the world trade organization and the environment for international investment began to improve, the inflows of FDI into china resumed their previous rising trend (owen 2004).

The current study uses the time series data of inflation and FDI for china covering the period from 1974 till 2015 and tests the co-integration between the concerned series using the Granger two-step method. For short run relationship the study tests the Granger causality between the concerned variables.

This paper is organized as follow; Section 2 outlines theoretical framework. Section 3 discusses empirical studies. Section 4 reports data and methodology, Section 5 describes real data analysis results, and section 6 represents conclusion and policy recommendations.

Theoretical Framework

The theories about FDI are based on two approaches, the micro and macroeconomic approaches. In microeconomic theories the firm specific characteristics that influence the decision making of firms is considered. Like market imperfections theory. While macroeconomic theories explain FDI flows across and within countries that includes internationalization and product cycle theories.

Hymer (1976) developed the 'market imperfections theory' which explains the behavior of firms in oligopolistic or monopolistic markets. For a firm to start FDI must have

comparative advantage to compete abroad with local firms. Based on market disequilibrium hypothesis FDI will be transitory and will act as an equalizing force among segmented market, and through re-establishment of equilibrium it will be eliminated.

In factor markets this disequilibrium of FDI is mostly found, because FDI will flow from high labor cost countries to low labor cost countries. And cost of labor is an important determinant of FDI.

According to the international theory of Buckley and Casson (1976) and Trevino & Daniels (1995) supports the idea that there is a tendency in the economic system to generate innovatory information and to transfer this information internationally in the form of FDI. And due to cost and time saving associated with transferring such information internally its transfer take place internationally. And this internationalization will lead to Multi-National Corporations. Based on this theory knowledge and expertise are an important factors that determine the amount of FDI in imperfect market.

According to product life cycle hypothesis a firm will be engaged in FDI at a particular stage in the life cycle of products that it had initially innovatively produced (Vernon's, 1966; Moosa, 2002). This theory is focusing on the production of industrial goods in manufacturing sectors. In developed countries due to economies of scale, easy access to market and efficient communication process new products or initial production take place domestically. When the production methods are completely standardized and markets becomes saturated then the maturity stage of the product life cycle will take place in emerging and less developed countries. This theory is considering market size, cost of production and market openness as important determinants of FDI. Similarly the eclectic theory answers the question of why a firm would want to produce in a foreign location instead of exporting or licensing arrangement with a local firm.

According to Dunning (1988) ownership, internationalization and location advantages should be satisfied for FDI. Whose combination subsequently came to be known as the 'eclectic theory' or 'OLI paradigm'? Eclectic theory highlights few possible determinants of FDI such as market size, inflation levels, government incentives and access to raw materials.

Narula and Dunning (2000) suggests that there are three types of FDI, namely 'resource seeking', 'market- seeking', and 'efficiency seeking' FDI. And the determinants of FDI are then discussed within this framework. Such as resource seeking FDI is related to the existence of natural resources. And further it suggests that FDI is resource or factor driven with the availability of low cost unskilled labor, skilled labor and quality of physical infrastructure. Based on this theory due to the abundance of natural resources in Africa a greater FDI would take place in primary sector. A case in point is the FDI that is channeled to resource abundant less developed countries, such as Chad, Equatorial Guinea and Angola (Moolman *et al*, 2006). While market seeking FDI serve the domestic markets, which indicates that goods are produced in the host country and sold in the domestic market of the investing firm. Such FDI will take place due to domestic demand and is based on the relative size of the market and level of income in host country. And the factors like cost of labor and level of inflation become important characteristics for countries which host market seeking FDI (Asiedu, 2002). Efficiency seeking FDI minimize cost of factors of production at an international level. The focus here is on minimizing cost through utilization of government induced structural imperfections, like tax differentials, or reducing risk through production diversification. The main determinants of efficiency seeking FDI are the level of productivity, existence of a skilled, disciplined workforce and the degree of technological and physical infrastructure in the host country (Hawkins *et al*, 2001).

From theoretical perspective, there are a host of factors that are important in determining the amount of FDI received by some countries. As discussed above these include market size, factor costs, fiscal incentives, investment climate, political and economic stability, trade openness and infrastructure quality. One of the important determinants of FDI is the level of inflation in host country according to some theories discussed above. But some theories are not considering inflation levels to have significant impact on the FDI received by a country. And theoretically it remains an unresolved issue that whether the level of inflation can be considered as a significant determinant of the amount of FDI received by China. Therefore we have reviewed related literatures to know whether this issue has been resolved from an empirical perspective or not?

Empirical studies

Syedain and Mitra (2014) [12] explored the short and long run causal relationship between GDP, exchange rate, inflation and FDI inflow in India by applying co-integration and granger causality test. They concluded that there is a long run equilibrium among the concerned variables, and based on granger causality test they have deduced that exchange rate and GDP influence FDI, while inflation rate cannot predict or cause FDI inflow to India.

Maghori (2014) [13] investigated the determinants of FDI in Nigerian economy using time series data for the years 1970 – 2010. Using the ECM technique the results showed that the major determinants of the FDI inflow is the ratio of external debt to gross domestic product both in short and long run. Moreover, the study concluded that GDP, openness of the economy, fiscal deficit ratio, real interest rate, inflation rate, debt ratio and real exchange rate are the important short run determinants of FDI inflow to Nigeria.

Inward foreign direct investment alongside of its determinants in Malaysia as of inflation rate, interest rate, step in of China into WTO, the corruption level and interest rate is considered to be cointegrated either in the long run or in short, of which the policy makers are deemed to come across of the determinants upon the provision of empirical information alongside of its applications (Aw & Tang, 2010) [5]. (see also; Shahrudin, *et al*., 2010 [14]; Ang, 2008 [3]; Tsen, 2005 [15]; Asid *et al*., 2014 [4]; Irpan *et al*., 2016 [10]). Bekana (2016) [6] finds the inflow consistency of FDI in Ethiopia either in the short run or in long while on the other side Irsania *et al*., (2014) [11] find the significant impact of Inflation rate, FDI, exchange rate and unemployment rate toward the economic growth in

Indonesia.

Andinuur (2013) [1] conducted a study on the linkage between inflation, foreign direct investment and economic growth in Ghana using annual time series data covering the period 1980 to 2011. The study employed the co-integration approach and the granger causality test to examine the directional relationship between the variables. Finally, it is found that the GDP growth is positively and negatively correlated with FDI and inflation both in short and long run. While inflation and FDI are positively related. Furthermore, two way causality has been found between GDP growth and FDI, and one way causality was observed from GDP and FDI to inflation. While no causal relationship has been found from inflation to GDP and FDI, and finally the study concluded that all causal links were statistically significant.

Patrick, *et al*. (2013) examined the macroeconomic determinants of foreign direct investment inflows to Ghana for the periods 1980 to 2012. He tested the FDI, exchange rate and trade openness for co-integration and concluded that the first past year of FDI, the last two years of exchange rate and trade openness were statistically significant. Wei Ying (2013) examined the relationship between FDI and employment in china. The study considered the longitudinal macroeconomic data to assess the effect of FDI inflows on job creation in china. From the two dimensions this relationship is assessed, first, the relationship between FDI and total employment for the entire Chinese economy is examined and second, the relationship between FDI and primary, secondary and tertiary sectors is examined. The analysis was conducted on time series regression model estimated for annual data between 1985 and 2011. The study concluded that there is no significant positive relationship between FDI and employment for the entire Chinese economy while the relationship between FDI and employment differs by sector. As well as a positive relationship between FDI and employment is found for primary sector, and for secondary sector no significant relationship between FDI and employment is observed. While for tertiary sector it is concluded that, FDI has a significant negative relationship with employment. Imoudu (2012) [9] investigated the relationship between FDI and economic growth in Nigeria between 1980 – 2009, through johansen co-integration technique and Vector error correction methodology. The results of the study revealed, that the impact of the disaggregated FDI on real growth in Nigeria namely: agriculture, mining, manufacturing and petroleum sector is very little while it is significant on telecom sector in long run. Uwubanmwen, Ahmad E and Ajao (2012) examined the determinants and impacts of FDI in Nigeria from 1970 through 2009. They used the vector error correction model to test that whether FDI affects growth and development of emerging economies or not? And finally, the study deduced that exchange rate, interest rate, inflation and openness of the economy were among the major and important factors that determined the inflow of FDI into Nigeria during the mentioned periods. GDP and government size were positively, but insignificantly affecting FDI. Moreover, the analysis revealed a long run equilibrium relationship between FDI and GDP, but FDI was not having any significant effect on the growth and development of Nigeria economy during the mentioned period.

From the literature review, macroeconomic factors that affect FDI are exchange rate, GDP, openness of the economy, fiscal deficit ratio, real interest rate, debt ratio, and inflation rate. Mostly, the conducted studies have focused on developing countries, but the current study focuses that whether FDI can cause imported inflation in china economy or not? And whether there is long run equilibrium between these two series or not by using Engle Granger two step methods. Which is not previously investigated by other researcher in china?

Data and Methodology

The data on annual inflation rate and FDI is retrieved from WDI for the years 1974-2015. We applied ADF to test the stationary of the series, we also applied Granger Causality test for short run relationship and for long run relationship we tested the series for co-integration using Engle Granger two step method.

Real Data Analysis Results

This section of the study shows the results of the tests conducted on real data. The results are shown in the below tables. The estimated results for FDI by applying ADF unit root are mentioned. It's clear from the table that the p-values of FDI are non-significant at their level and as well the absolute calculated values of t-stat are also less than the critical values at 5% level of significance. It implies that the FDI series is Non stationary at level and we cannot reject the H0: Series has a unit root. But at first difference the p-values are significant and calculated t-stat are greater than the critical values in absolute term. It means that the FDI series is stationary at first difference but not at level, so we reject H0 of unit root.

Table 1: Shows the results of ADF test for FDI

Max Lag[9]	**ADF Test**		**ADF Test**	
Intercept	P-value	0.4634*	P-value	**0.0000
	t-statistic	-1.620272	t-statistic	-5.507410
	Critical value	-2.935001 [5%]	Critical-value	-2.936942 [5%]

*shows p-values at level,
Cal-value shows calculated values
t-statistic shows test statistic
** shows p-values at 1st difference.

From the above table it's clear that the p-values are Not-significant at level and the absolute value of t-statistic is less critical value at 5% level of significance, so we cannot reject the H0 at level, it means that FDI series is Non stationary at

level but at 1st difference the P-Values are significant so we reject the (H0) of unit root. It means that FDI series at 1st difference is stationary.

Table 2: Shows the results of ADF test for Inflation

Max lag [9]	ADF TEST		ADF TEST	
Intercept	P-value	0.3044*	P-value	**0.0000
	t-statistic	-1.955979	t-statistic	-7.494577
	Critical value	-2.935001 [5%]	Critical-value	-2.936942 [5%]

*shows p-values at level,
Cal-value shows calculated values
t-statistic shows test statistic
** shows p-values at 1st difference.

From the above table it's clear that the p-values are Not-significant at level so we cannot reject the H0 at level, it means that INF series is Non stationary at level but at 1st difference the P-Values are significant so we reject the (H0) of unit root. It means that INF series at 1st difference is stationary.

Engle Granger Co-integration test results

1st Step:

$INF_t = 55.50007 - 16.73426FDI_t + U_t$

The above regression shows negative relationship between inflation and FDI. 2nd step:

Store the residuals and test the residuals for unit root, if the residuals are stationary at level then it means that the variables are co-integrated and the variables have long run relationship.

Table 3: ADF test results for residuals

Max Lag [9]	ADF Test	
Intercept	P-value	0.0395*
	t-statistic	-3.039899
	Critical value	-2.935001 [5%]

*shows p-values at level.

From table 3, it's clear that residuals are stationary because the absolute value of t-statistic is more than critical value at 5%. It means that we reject the Ho: residuals has a unit root.

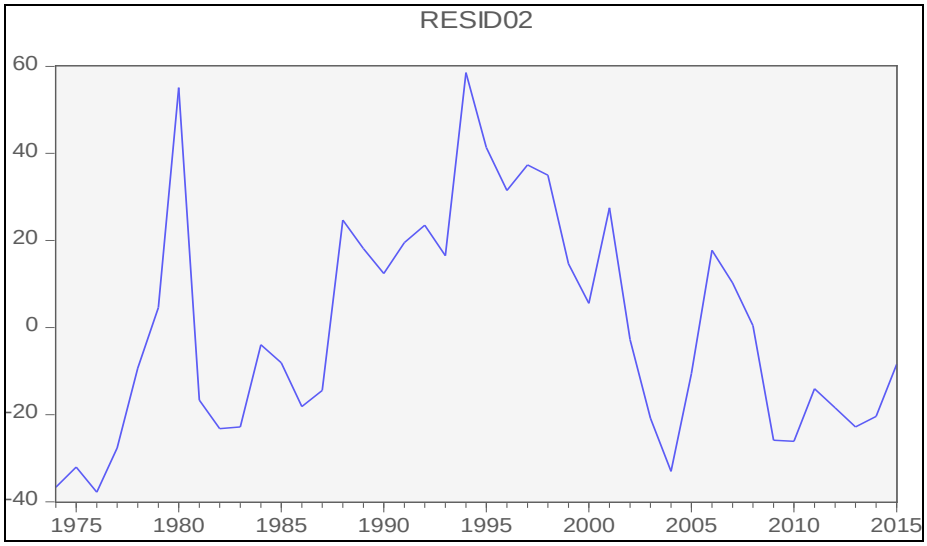

Fig 1: Residuals Graphical analysis

The above figure also shows that the residuals series has a mean reverting behavior. Therefore, we say that residuals are stationary at level. Furthermore, it indicates that FDI and INF series are co-integrated.

Granger causality test results

Table 4: Granger causality test results for FDI and INF

Null Hypothesis	Observation	F-Statistics	Probability
DINF does not Granger cause DFDI	39	0.85526	0.4341
DFDI does not Granger cause DINF		0.00695	0.9931

The p-values for the first hypothesis is more than 5% it means that we cannot reject the Null-Hypothesis which shows that DINF does not cause DFDI to change. The second hypothesis is also accepted. Therefore, we state that DFDI doesn't cause DINF to change.

Conclusion and policy Recommendations

The study examined the Co-integration between inflation rate and foreign direct investment series in china. While the main objective of this study is to check long run and short run relationship between FDI and Inflation in china between the periods 1974 to 2015. Based on ADF unit root test it is concluded that both FDI and inflation series are non-stationary

at level and are stationary at first difference. As the two series are non-stationary at level then for long run convergence and relationship, the Engle Granger two step methods for co-integration is used and it is found that the residuals of the OLS between these two variables are stationary at level, because the absolute value of t-statistic is less than the critical value at 5%. Based on this it is concluded that FDI and Inflation series are co-integrated and have long run equilibrium relationship. For short run relationship the granger causality test is used and it is found that the p-values were greater than 5% for the first and second hypothesis which means that we cannot reject these Hypotheses. Finally, it is concluded that inflation does not granger cause FDI and FDI does not granger cause inflation. These two variables do not have any causal relationship. Therefore, policies that encourage foreign direct investment can be implemented, because FDI cannot cause imported inflation in china.

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