The threshold effect of exchange rate volatility on FDI determinant nexus – A panel smooth transition regression approach

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Abstract

This paper adopts a panel smooth transition model (PSTR) with lagged exchange rate risk (exchange rate volatility) as the transition variable to estimate the nonlinear process of China's FDI inflows and the threshold effect of exchange rate risk on the FDI inflows. Empirically, we use the data set of China's top ten FDI investment countries during 2000Q1 – 2011Q4. Empirical results show that China's FDI inflows displays a nonlinear process, depending on exchange rate risk in different regimes. China's FDI inflows are nonlinearly affected by GDP, exchange rate, openness and trade-weighted distance. If government's intervention policy or quantitative easing policy is to lead global currencies depreciation for improving a country's terms of trade, the related stable of RMB exchange rate will continuously attract FDI inflow to China.

Keyword: panel smooth transition regression model, exchange rate volatility, nonlinearity, quantitative easing

JEL classification numbers:F63, O11,C32,F21

1. Introduction

With the global economic growth, foreign direct investment (FDI) has become an important issue to a country's economic growth.Governments take proper policies to attract FDI inflow for improving countries'economic or social welfare (Subasat and Bellos, 2011; Sun, 2011). The United Nations Conference on Trade and Development (UNCTAD), (2011) indicates that theglobal FDI growth was over six times from 1990 to 2010. In 2013, the emerging market and developing countries have attracted FDI inflows over 50% global FDI inflows. In fact, FDI have significant contributions to the debt repayments, export and foreign exchange revenue, especially of the developing countries or transition economies (Daly and Zhang, 2010).

During the last 10 years, China's economic growth has attracted the sight around the world.According to the statistics of UNCTAD, China's FDI inflows reached 124 billion US dollars from 2010 to 2011 and wasthe second large FDI recipient country (Tang, Selvanathan and Selvanathan, 2008). Thus, what factors drive the rapid growth of China's FDI inflows has been a crucial issue to be noticed by researchers (Lau and Bruton, 2008; Agrawal, 2011).

Many previous studies (see for example,Kojima, 1973; Dunning, 1980) suggested that firms'overseas investment not only originates from their specific technology or monopoly advantage, but also reflectthe change of their domestic economic conditions. Thus, FDI inflow can be considered as the behavior for transition economies to seek benefit and decrease risk. To the end, some the currency authorities may use intervention policies to reduce exchange rate volatility for promoting export expansion, FDI and trade balance accumulation (Hsiao, Pan, and Wu, 2011). In recent ten years, China's exchange rate of China's currency is in a stable position;therefore, the increase in FDI resource country of exchange rate volatility would lead to a higher foreign production risk (Zhang, 2008). That is the increase of China's FDI inflows can be regarded as foreign capitals are seeking more stable production cost and eliminating uncertainty.

Previousresearches on FDI supported that China has attracted global FDI inflow by its rich resource, labor productivity and government incentivessince the economy reform in 1979.The determinants that affect FDI include wage, exchange rate, political risk and economic growth. (Vijayakumar, Sridharan and Rao, 2010; Gast and Herrmann, 2008; Aw and Tang, 2010; Edwards, 1990; Tang, Selvanathan and Selvanathan, 2008; Agrawal, 2011;Rani and Dhanda, 2011).However, the variables they used are *ad hoc* (Deardoff, 1995) andlake of theoretical basis; therefore, the collinearity among variables is easy ignored (Resmini, 2000).

In addition, many researchers adopt different approaches to estimate the determinants of

FDI.For instance, linear regression with structural breaks, log linear regression model, multiple regression analysis, panel data or gravity panel data model (Boyrie, 2009; Azam and Lukman, 2010; Shahmoradi, Thimmaiah and Indumati, 2010; Aw and Tang, 2010; Wang, Wei and Liu, 2010; Subasat and Bellos, 2011). However, these approaches can only identify the determinants of FDI based on single a country, and ignore the problems of small sample size and heterogeneity.Although panel data models can resolve non-stationarityand heterogeneity problems (Hsiao, 2006), they still cannot capture the nonlinearity of variable under investigation.Many nonlinear modelare developed, such as the Markov switching (MS)model, threshold autoregression(TAR)model and neural network (NN) model.However, these methods are limited to their extreme regime switching or unclear economic meanings.Thus, it is necessary to adopt proper model to estimate nonlinear FDI behavior.Empirically, the panel smooth transition regression (PSTR) model can capture the nonlinear characteristic of FDI and threshold effect of exchange raterisk on FDI. Hence, PSTR model is a proper model for this paper to study the nonlinear path of FDI.

In sum, this paper contributes to the existing literature in three distinctive ways. First, we adopt the PSTR model to estimate the determinants of FDI and identify the nonlinear regime switching effect of FDI inflows. Second, we endogenously estimate the best lagged transition variable to capture its time lag effect on FDI inflows. Third, using economic theory to determineregressorsinfluencing FDI inflows for avoiding random selection of explanatory variables.

The rest of this paper is organized as follows. Section 2 briefly introduces the PSTR model and the specification of our modified gravity model on FDI inflows. Section 3 brings the procedures for estimating the modified PSTR model. Section 4 shows the data and empirical results. The final section concludes the paper.

2. The Model

2.1 PSTR model

To estimate the determinants of FDI, we must simultaneously resolve theheterogeneous and time-varying problems. Following González, et al. (2005), the model can be written as follows:

$$y_{i,t} = \mu_i + \beta_0' x_{i,t} + \beta_1' x_{i,t} G(z_{i,t};\gamma,c) + \varepsilon_{i,t} \quad (1)$$

where$i$=1,…,N, and t=1,…,T. N and T denote the cross-section and time dimensions of the panel, respectively. $y_{i,t}$is a dependent variable and $x_{i,t}$ is a K-dimensional vector of time-varying independent variable. $\mu_i$is the fixed individual effect.$G(Z_{i,t};\gamma,c)$ is the transition function bounded between 0 and 1 and dependent on the transition variable $Z_{i,t}$, which can be an exogenous variable or a combination of the lagged endogenous one (van Dijk, Terasvirta, &Franses, 2002). γ is the transition or slope parameter.c is the threshold or location parameter. γ and c are endogenouslyestimated. $\varepsilon_{i,t}$is a residual.Follows González et al. (2005), a transition function (Eq.(2)) can be used to describe the nonlinear and smooth switching process. For m=1, the function can be described as a logistic specification with a single monotonic transition of the coefficients from β_0 to ($\beta_0+\beta_1$) as $z_{i,t}$ increases. For m=2, the transition function has its minimum at $(c_1+c_2)/2$ where the transition function can be specified as an exponential function (Eq. (3)).

$$G(z_{i,t};\gamma,c)=\left[1+\exp(-\gamma\prod_{j=1}^{m}(z_{i,t}-c_j))\right]^{-1} \quad (2)$$

where$m$ denotesthe number of thresholds or location parameters, γ>0 and $c_1 \le c_2 \le c_3 \le \ldots \le c_m$. A higher γ means the transition of the dependent variable becomes rougher and transition function tends towards the indicator function$G(Z_{i,t};\gamma,c)$ (=1, if $Z_{i,t} \ge c$; =0, otherwise). PSTR model switch to PTR model when $\gamma\to\infty$;contrarily, when $\gamma\to 0$, the model becomes a panel with fixed effects. From an empirical aspect, González et al. (2005) suggest that it is sufficient to consider only the cases of m=1 or m=2 to capture the nonlinear process of variable under investigation.

2.2 Modified gravity model of FDI

Original gravity model suggests that the determinants of FDI inflow are the market sizes and distance between source and host countries.Mátyás (1997) arguesthat a complete gravity model should includetime effect, fixed effect and export effect. However, since China's economy reform in 1992, the time effect is insufficient.For an open economy, thecapital of FDI inflow could be treated as the excess supply of foreign exchange market and is related to import and export (Fleming, 1962; Mundell, 1963); therefore, FDI canbe the function of price, exchange rate, income (output) and interest rate.

In sum, this paper consider the FDI inflows as a function of relative income,relative CPI differential, relative exchange rate, openness, relative interest differential, trade-weighted distance and transition variable (current or lagged exchange rate volatility).

$$FDI_{i,t} = \mu_i + \theta_1 RI_{i,t} + \theta_2 RCPI_{i,t} + \theta_3 RREE_{i,t} + \theta_4 OPEN_{i,t} + \theta_5 IRD_{i,t} + \theta_6 TDIS_{i,t} + \varepsilon_{i,t} \quad (3)$$

$$FDI_{i,t} = \mu_i + \theta_1 GDP_{i,t} + \theta_2 CPI_{i,t} + \theta_3 ER_{i,t} + \theta_4 OP_{i,t} + \theta_5 ID_{i,t} + \theta_6 TD_{i,t}$$

$$+\sum_{i=1}^{r} (\theta_1^{'} GDP_{i,t} + \theta_2^{'} CPI_{i,t} + \theta_3^{'} ER_{i,t} + \theta_4^{'} OP_{i,t} + \theta_5^{'} ID_{i,t} + \theta_6^{'} TD_{i,t}) \quad (4)$$

$$G\ (ERV_{i,t-d}; \gamma, c) + \varepsilon_{i,t}$$

where *t* and *i* denote time dimensions and *FDI* source country;$FDI_{i,t}$ denotes ratio of FDI inflows of country *i* to China's GDP;$CPI_{i,t}$ denotes price differential between country *i* and China;$RREE_{i,t}$is the real effective exchange rate of China to country *i*;$Open_{i,t}$denotes China's trade openness;$IRD_{i,t}$ is the interest rate differential between China and source country *i*, and $TDIS_{i,t}$stands for the trade-weighted distance to describe trade which is not only affected by fixed geographic distance but also varied by time and trade volume. Following González et al. (2005), PSTR can be written as Eq.(4) where $ERV_{i,t-d}$, *d=1,2,3,4,5* denotes the lagged exchange rate volatility, μ_i denotes a fixed individual effect and$\varepsilon_{i,t}$ is a residual term.

The transition variable exchange rate volatility, could be treated as the proxy of risk to capture the pulsate in foreign market exchange (Axel, Inessa and Alexei, 2014) and varies across individuals and with time. $G(ERV_{i,t-d};\gamma,c)$ is the transition function to describe the smooth transition process of FDI. Compared to the function provided by González et al. (2005), we use a lagged transition variable instead of current transition variable implying that exchange rate risk has a lagged effect on FDI. The marginal effect of regressor on FDI is measured by$\vartheta_k+\vartheta_k(ERV_{i,t-d};\gamma,c)$

Our PSTR model is different to the model suggested by González et al. (2005) and the following researchers (Jude, 2010; Ibarra and Trupkin, 2011; Seleteng, Bittencourt and van Eyden, 2013) in three distinctive aspects. First, the panael data used in this paper is china's top ten investment source countries. Second, the transition variable adopted is a d-period lagged exchange rate risk to capture its lagged effects on FDI. Third, the optimal length is determined by the AIC and BIC statistics.

3. Estimation and specification test

To estimate thePSTR model, we must first to test the linearity under PSTR model.If the nonlinearity is accepted, we determine the number of optimal transition functions by performingthe no remaining non-linearity test. Finally, we apply nonlinear least squares to estimate individual effects of PSTR model.

3.1 Choice of transition variable

In a PSTR model, the effects of regressors on the dependent variable are influenced by the number of transition functions and the transition variable. This paper adopts exchange rate volatility as the transition variable, which is highly related with a country's monetary policy. According to the risk averse theory, the increase in exchange rate volatility would deter FDI inflows (Goldberg and Kolstad , 1995). China's currency authority can use intervention policy to reduce exchange rate volatility for promoting export and trade balance (Hsiao, Pan, and Wu, 2011). In addition, the impact of exchange rate volatility on FDI may take some time; therefore, we use lagged exchange rate volatility as the transition variable.

3.2 Linearity and no remaining nonlinearity tests

FollowingFouquau, Hurlin, and Rabaud (2008), the linearity test is performed under the null hypothesis: H_0:γ=0 or H'_0 :β=0. Replacing transition function $G(ERV_{i,t-d};\gamma_i,c_i)$ with its first-order Taylor expansions aroundγ=0 and let γ=1, we then obtain the flowing auxiliary equation:

$$FDI_{i,t} = \pi_i + \pi_1 RI_{i,t} + \pi_2 RCPI_{i,t} + \pi_3 RREE_{i,t} + \pi_4 OPEN_{i,t} + \pi_5 IRD_{i,t} + \pi_6 TDIS_{i,t}$$

$$+ \pi_1^{'} RI_{i,t} ERV_{i,t-d} + \pi_2^{'} RCPI_{i,t} ERV_{i,t-d} + \pi_3^{'} RREE_{i,t} ERV_{i,t-d}$$

$$+ \pi_4^{'} OPEN_{i,t} ERV_{i,t-d} + \pi_5^{'} IRD_{i,t} ERV_{i,t-d} + \pi_6^{'} TDIS_{i,t} ERV_{i,t-d} + \eta_{i,t} \quad (5)$$

where$d$=0,1,2,3,4,5to allow the current and lagged exchange rate volatility in transition function. The linearity test is conducted under the null hypothesis H_0: $\pi_1^{'} = \pi_2^{'} = \pi_3^{'} = \pi_4^{'} = \pi_5^{'} = \pi_6^{'}$.If SSR_0denotes panel sum of squared residuals under linear model and SSR_1 denotes panel sum of squared residuals under PSTR model with single threshold, the corresponding *LM*-statistic can be calculated by Eq.(6).

$$LM_F = [(SSR_0 - SSR_1)/K]/[SSR_0/(TN - N - K)] \quad (6)$$

where$K$ denotes the number of predictor variables.Under null hypothesis,LM_F statistic has an asymptotic $\chi 2(K)$ distribution.

4. Empirical results

4.1 Data description

This paper adopts China's top ten FDI source countries during 20001Q-20114Q. These countries include Hong Kong, Taiwan, Japan, Singapore, US, Korea, UK, Germany, French and

Netherlands, and their FDI in China account for 92.76% of total foreign investment in China. Data set comes from National Bureau of Statistics of China.

To confirm the effectiveness of estimation results in the PSTR model, we need to execute the stationary analysis. Following Baltagi (2008), we adopt unit root test and cointegration analysis to investigate whether the series is stationary. Levin, Lin, and Chu, (2002) indicates that LLC test performs well when N lies between 5 and 250 and T lies between 5 and 250. The data set includes 10 countries (N=10) and 48 quarters (T=48); hence we use the LLC test to perform the stationarity test.

4.2 Empirical results

Before proceeding to the estimation of PSTR model, we can observe the trend of China FDI inflows as shown in Fig.1. There has been an obviously structural change since 2007, implying that the FDI inflows of China displays a nonlinear process. That is, employing the PSTR model to evaluate FDI inflows is appropriate.

Fig 1: China FDI trend

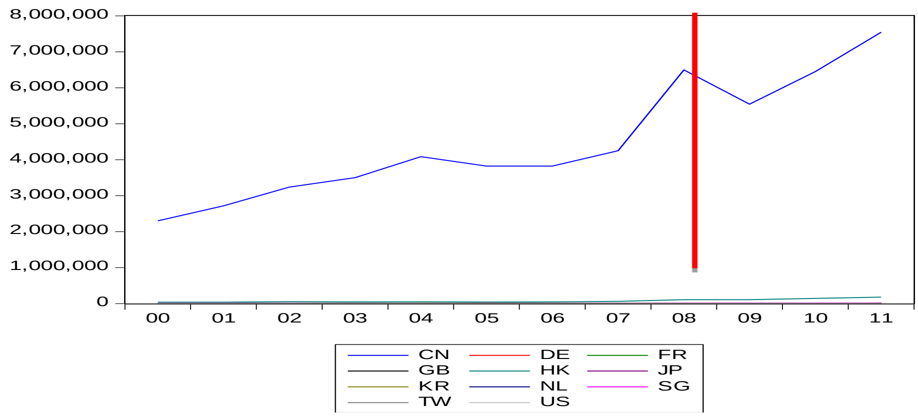


Table 1 shows the result of linearity test. For different lag lengths of transition variable (d) and location parameters (m), the testing statistics all reject linear null hypothesis. This implies that China's FDI inflows show nonlinear process. Thus, using nonlinear PSTR model to measure the determinants of FDI is a proper instrument.

Table 1: Linearity test

Lag length of transition variable $ERV_{i,t-d}$	Testing statistic	Location parameters (m) m=1		m=2	
	LM	25.519	[0.000]	50.314	[0.000]
d=0	LMF	4.342	[0.000]	4.469	[0.000]
	LRT	26.222	[0.000]	53.151	[0.000]
	LM	22.009	[0.001]	50.445	[0.000]
d=1	LMF	3.718	[0.001]	4.489	[0.000]
	LRT	22.553	[0.000]	53.363	[0.000]
	LM	49.659	[0.000]	44.105	[0.000]
d=2	LMF	8.939	[0.000]	3.871	[0.000]
	LRT	52.483	[0.000]	46.365	[0.000]
	LM	55.660	[0.000]	59.116	[0.000]
d=3	LMF	10.210	[0.000]	5.394	[0.000]
	LRT	59.415	[0.000]	63.376	[0.000]
	LM	23.021	[0.000]	45.970	[0.000]
d=4	LMF	3.901	[0.000]	4.064	[0.000]
	LRT	23.645	[0.000]	48.552	[0.000]
	LM	48.002	[0.000]	49.101	[0.000]
d=5	LMF	8.671	[0.000]	4.383	[0.000]
	LRT	50.899	[0.000]	52.138	[0.000]

Notes: The transition variable in the PSTR model is the (lagged) Exchange rate volatility, $ERV_{i,t-d}$, d=0,1,2,…,5. The digits in brackets are the p-values. H_0:linear model against H_1:PSTR model with at least one threshold variable. LM, LMF, and LRT denote the statistics of the Wald test, Fisher test, and likelihood ratio test, respectively.

Once, the linearity test is executed, we can proceed to the no remaining nonlinear test. Table 2 shows the test results. Evidently, in all situations, the testing statistics cannot significantly reject the null hypothesis that the PSTR model has at least on transition function. That is, the optimal PSTR model has only one transition function (i.e.,γ=1).

Table 2:Test of no remaining nonlinearity

Transition variable	$ERV_{i,t-d}$					
	m=1;r=1			*m=2;r=1*		
	LM	LMF	LRT	LM	LMF	LRT
d=0	6.468	1.029	0.512	9.656	0.763	9.754
	[0.373]	[0.406]	[0.368]	[0.646]	[0.689]	[0.637]
d=1	4.543	0.718	4.566	4.765	0.371	4.780
	[0.604]	[0.635]	[0.601]	[0.966]	[0.973]	[0.965]
d=2	4.596	0.728	4.619	7.587	0.595	7.650
	[0.597]	[0.628]	[0.594]	[0.817]	[0.846]	[0.821]
d=3	3.274	0.515	3.286	7.511	0.588	7.575
	[0.774]	[0.797]	[0.772]	[0.822]	[0.852]	[0.817]
d=4	4.071	0.753	4.797	8.387	0.657	8.468
	[0.573]	[0.608]	[0.570]	[0.754]	[0.792]	[0.748]
d=5	2.054	0.322	2.059	4.793	0.372	4.820
	[0.915]	[0.926]	[0.914]	[0.965]	[0.973]	[0.964]

Notes: H_0:PSTR with r=1 against H_1:PSTR with at least r=2. The digits in brackets are the p-values.M and *r* denotes the number of location parameters and transition function, respectively.

Table 3 shows the estimated parameter of our modified PSTR model. According to the result in Table 2, different PSTR models can describe the path of FDI inflows. To determine the optimal estimation, the we use AIC and BIC. The best PSTR model is the one with single one transition function (r=1), one location parameter (m=1), and four-period lagged exchange rate volatility. The estimated threshold (*c*) and transition parameter (*γ*) are 0.4395 and 13.888, respectively. GDP per capita has significant and positive effect on FDI inflows, that is, 0.0019-0.0006*$G(ERV_{i,t-4}$;13.888,0.4395)>0. Obviously, the effect vary with four-period lagged exchange rate volatility ($ERV_{i,t-4}$), and reducesas exchange rate volatility increases. In two extreme cases, i.e., ($G(ERV_{i,t-4}$;13.888,0.4395)=0 and $G(ERV_{i,t-4}$;13.888,0.4395)=1), the effects are 0.0019 and 0.0013.

The effect of real effective exchange rate on FDI inflows is significant and mixed (-0.0020+0.0041*$G(ERV_{i,t-4}$;13.888,0.4395)). In two extreme cases from our PSTR model, (i.e., $G(ERV_{i,t-4}$;13.888,0.4395)=0 and $G(ERV_{i,t-4}$;13.888,0.4395)=1), the effects are -0.0020 and 0.0021, respectively. Many prior studies argued that China's huge trade surplus mainly comes from the undervaluation of the RMB, which is highly correlated with China's heavy intervention in the foreign exchange market. However, with the rapid change of world economy, RMB becomes more stable, which induces FDI inflows from other countries to China to avoid risk from domestic market. That I, a higher exchange rate volatility is beneficial for China to attract foreign investment. Regarding the impact of openness on FDI, we obtain a ambiguous result, i.e., (0.0499-0.1461*$G(ERV_{i,t-4}$;13.888,0.4395)). In two extreme cases from our model, ($ERV_{i,t-4}$;13.888,0.4395)=0 and $G(ERV_{i,t-4}$;13.888,0.4395)=1), the effects are 0.0499 and -0.0964, respectively. The reason maybe that when exchange rate volatility is over the threshold, China's economic growth is faster or slower than those of import and export through J curve effect; therefore, the positive or negative effect would depend on which effect is more larger. If exchange rate volatility is higher than the threshold, openness can induce more foreign capital entering China.

As to the trade-weighted distance, it has a significant effect on China's FDI inflows, which is different from the result populated by previous linear model. The probable reason is that higher investment of sample countries leads to higher import-export volume, which reduces the negative impact of distance on FDI inflows. In two extreme cases, ($G(ERV_{i,t-4}$;13.888,0.4395)=0 and $G(ERV_{i,t-4}$;13.888,0.4395)=1), the effects are 0.0005 and 0.0075, respectively. Obviously, when exchange rate volatility is over the threshold, the positive effect of trade-weighed distance on FDI inflows would increase. Moreover, relative CPI and interest rate differential have insignificant effect, implying that foreign investors do not care about the change of price factor and investment cost, since China has a environment of lower price and capital cost (Arnold, 2012) .

If we replace four-period lagged exchange rate volatility with its current value, the estimation result is biased. For example, in two extreme cases from the model, ($G(ERV_{i,t-4}$;13.888,0.4395)=0 and $G(ERV_{i,t-4}$;13.888,0.4395)=1), the effects of relative GDP on FDI are 0.0012 and 0.0011, respectively. Under the situation of using four-period lagged exchange rate volatility as the transition variable, the effects are 0.0019 and 0.0013.

In sum, under the situation of a higher exchange rate volatility, relative GDP per capita reduces the positive effect on FDI inflow into China; real effective exchange rate will deter FDI inflows. The degree of trade openness has similar effect to the relative effective exchange rate through J-curve effect. Trade distance variable still shows positive effect to promote FDI inflows but with higher fluctuation will be less negative effect. That is, to attract foreign capital enter into China through improving the states of regressors, the authority of China will face a trade-off.

Table 3: Estimation results of *FDI*inflows by the PSTR model.

Transition variable :$ERV_{i,t-d}$; *m=1; r=1*

	d=0	*d=1*	*d=2*	*d=3*	*d=4*[#]
γ	15.174	14.540	14.436	15.710	13.888
c	0.4347	0.4302	0.5218	0.5197	0.4395
θ_1	0.0012	0.0016	0.0048***	0.0049***	0.0019*
	[1.0534]	[1.2786]	[4.4313]	[4.0322]	[1.4516]
θ_1'	-0.0001	-0.0005	-0.0043***	-0.0040***	-0.0006
	[-0.0970]	[-0.3428]	[-3.2504]	[-2.8502]	[-0.4110]
θ_2	0.0002	0.0003	-0.0004	-0.0003	0.0001
	[0.4510]	[0.6988]	[-1.2864]	[-0.6448]	[0.1736]
θ_2'	0.0003	0.0003	0.0010*	0.0006	0.0003
	[0.5009]	[0.4507]	[1.7992]	[0.9377]	[0.4596]
θ_3	-0.0019**	-0.0019**	-0.0003	-0.0009	-0.0020**
	[-2.1114]	[-2.1181]	[-0.3097]	[-0.8223]	[-2.1568]
θ_3'	0.0043***	0.0046***	0.0021*	0.0024*	0.0041***
	[4.0649]	[4.3107]	[1.8218]	[1.7781]	[3.8586]
θ_4	0.0562*	0.0428	-0.1064***	-0.0045***	0.0499
	[1.3395]	[0.9868]	[-2.4532]	[-2.5336]	[1.1287]
θ_4'	-0.1591***	-0.1583**	0.0751*	0.0881*	-0.1461***
	[-3.0048]	[-2.9106]	[1.3807]	[1.5596]	[-2.6338]
θ_5	0.0001	0.0004	-0.0003	-0.0001	0.0001
	[0.2636]	[0.7114]	[-0.9120]	[-0.1635]	[0.1676]
θ_5'	0.0003	0.0002	0.0009	0.0003	0.0003
	[0.4664]	[0.2592]	[1.2824]	[0.3957]	[0.3231]
θ_6	0.0015	0.0016	0.0038**	0.0040**	0.0005
	[0.7896]	[0.8270]	[2.0719]	[2.0639]	[0.2337]
θ_6'	0.0010	0.0012*	-0.0017*	-0.0028*	0.0017*
	[1.1688]	[1.4220]	[-1.2977]	[-1.6960]	[1.7261]
AIC	-11.407	-11.422	-11.409	-11.424	-11.4507
BIC	-11.285	-11.296	-11.285	-11.296	-11.3206

Notes: # denotes the PSTR model with the optimal lagged transition variable selected according to the stepwise regression. (θ_1 ,θ_2 ,θ_3 ,θ_4 ,θ_5 and θ_6) and (θ_1',θ_2',θ_3',θ_4',θ_5'

and $\theta_6^{'}$) are the estimated coefficients of the relative GDP per capita, relative CPI, relative exchange rate, openness, relative interest rate difference and trade-weighted distance, in regime 1 and 2, respectively. The digits in brackets are the t-statistics.

5. Conclusion.

This paper constructs a FDI inflows model as the PSTR framework to evaluate whether China's FDI inflows are nonlinear and the threshold effect of exchange rate volatility on the inflows. Empirical results can be summed up as follows. First, China's FDI inflows from main countries display a nonlinear process. Second, relative exchange rate volatility has a nonlinear effect on FDI inflows through the determinants in four periods later. Third, the speed of FDI inflow in 2006-2010 is higher than that before 2006, this result cannot be identified under linear model. If china tries to promote GDP growth and increase foreign exchange reserves, enlarging exchange rate volatility is a useful method for China to attract foreign capital. In practice, regional risk can enlarge the relative exchange rate volatility which will push FDI inflow and increase China's foreign reserve.

Our results suggest that: (1) Expanding FDI inflows can increase China's GDP. (2) Keeping lower exchange rate volatility through intervention can promote FDI inflow; (3) Reducing restrictions can drive international trade and FDI inflows.

Appendix

Fig. A1: China's FDI inflows trend by country (Annual FDI)

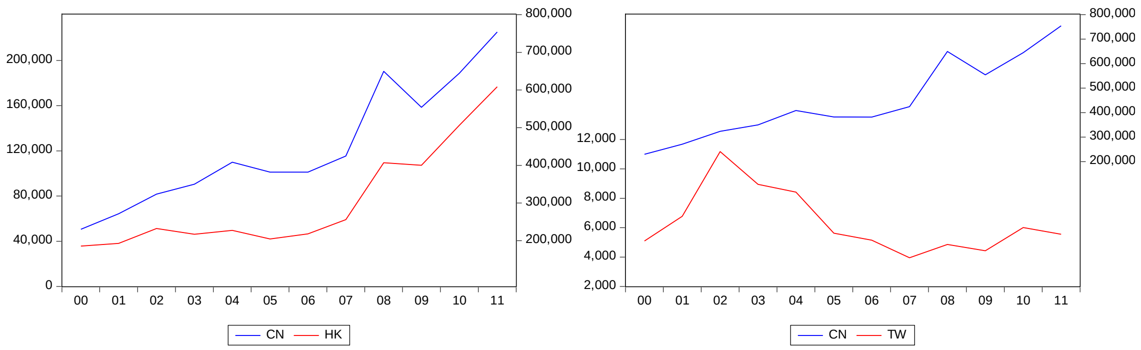
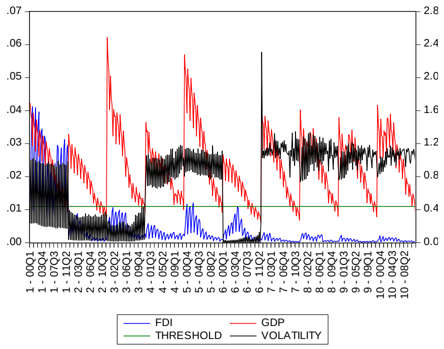
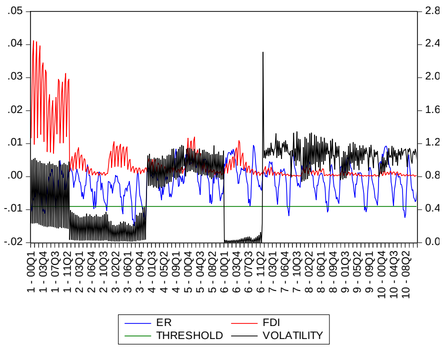


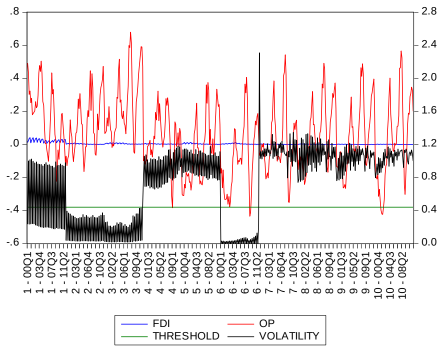
Fig. A2: Threshold Effect on the marginal impacts of FDI inflows.



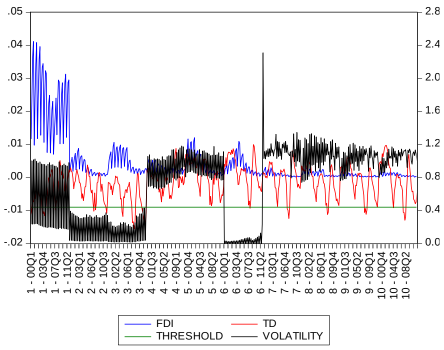
GDP Marginal Effect



Exchange Rate Marginal Effect



Openness Marginal Effect



Trade Weighted Marginal Effect

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