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Do Exchange Rate Volatility Effects Foreign Direct Investment? Evidence from Selected Asian Economies

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ABSTRACT

The study is aimed at investigating the effect of volatility in exchange rate upon foreign direct investment in Asian economies. The sample is selected from four main regions of Asia and the countries of Pakistan, India, Bangladesh and Sri-Lanka are selected for study from the South-Asian region whereas from the Southeast Asian region Malaysia, Indonesia, Singapore and Thailand are selected. Similarly, from the East Asia the China, Japan and South Korea are selected while Turkey, Iran and Israel are selected from the West Asia. The GARCH approach is employed to examine the volatility in exchange rate and its effect upon foreign direct investment is investigated by using the Autoregressive Distributed Lag (ARDL) approach to Cointegration and Error Correction Model, developed by Pesaran, Shin and Smith (2001). The results show a mixed trend with recording the effect of volatility in exchange rate upon foreign direct investment in some countries, however, in almost half of the sample countries; the relationship between the variables is not found.
KEY WORDS: Exchange Rate Volatility, Foreign Direct Investment, GARCH and ARDL.

1. INTRODUCTION

From last few decades, the Foreign Direct Investment (FDI) is considered as an important source of inflows in many countries, particularly in emerging developing economies. It is widely believed that the foreign direct investment plays an important contribution in the economic growth of a country. The foreign investment may be in different forms such as direct investment, portfolio investment, private capital flows, etc. The components of FDI defined by UNCTAD include equity capital, re-invested earnings and other capital. A country receiving FDI is not only receiving the direct benefits of foreign inflows but also indirectly it can be able to get the benefits of sharing knowledge, skills, experiences, technology, etc. The foreign direct investment is recorded in capital account of balance of payments. The FDI by foreign countries is recorded on credit side whereas the FDI to foreign countries is recorded on debit side of BOPs. The foreign investors come in the domestic economy with the expectation of return; however, they are exposed to many type of risks as well. The risks may include exchange rate risk, political risk, legal risk, etc. The re-investment of earnings depends upon the level of risks faced by the investors, amount of return and future expectations. According to Keynes (1936), the MEC, i.e. expectations of investors play an important role to determine the level of investment and thereby boosting economic activities of a country. If the foreign investors are optimistic about future, they will invest their funds. There is a great debate to explore the impact of foreign direct investment upon economic growth in many countries.

After the collapse of Bretton woods in 1971 and leaving the exchange rate to be settled in market though demand and supply mechanism, great fluctuations have been observed in the currency prices of different countries; causing lot of uncertainties all around. The relation between volatility in exchange rate and foreign inflows as well as outflows has widely been discussed in the literature and theoretically a reciprocal relation exists between the variables. The effect of volatility in exchange rate upon FDI has been explained theoretically in two broad ways. The 1st argument called Production Flexibility argument described a direct relationship of volatility in exchange rate with FDI whereas the 2nd argument called Risk Aversion argument explained an inverse relationship between the variables. On the other side, the FDI also affects the exchange rate with net inflows leading to appreciation of domestic currency whereas net outflows results in depreciation of the same.

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This paper is aimed at investigating the effect of volatility in exchange rate upon foreign direct investment in selected Asian economies by using the annual data of 1980-2010. Asia is largest continent of the world having 2nd largest share of GDP. This continent is rich in natural resources with comparatively cheaper human and material resources. Due to the availability of resources and market for their products and services; many multinational companies prefer to operate their business in different countries of this continent resulting huge FDI inflows in it. The economies of Asia are growing rapidly and in recent years China, India and Japan emerged as the fastest developing economies of the world. The Asian continent is classified into different regions and in this study the sample has been selected from four regions of Asia. The countries from each region are selected on the basis of their GDP, share of receiving FDI and having volatility in exchange rate. The selected countries are following flexible- or managed float rate system of exchange rate and volatility in it has been observed during the sample period. The countries of Pakistan, India, Bangladesh and Sri Lanka are selected from the South Asia whereas China, Japan and South Korea are selected from the East Asia. Similarly from Southeast Asia the Malaysia, Indonesia, Thailand and Singapore are selected while Turkey, Iran and Israel are selected from the West Asia. The study is an extension of existing studies but different in sense that the effort has been made to explore the effect of volatility in exchange rate upon FDI by taking a sample from multi-regions of Asia. By employing the GARCH and Autoregressive Distributed Lag models, this study attempted to investigate the effects of volatility in exchange rate upon FDI in sample economies. The results reveal some mixed trends with the existence of both long run and short run effect of volatility in exchange rate upon foreign direct investment in Pakistan, India, Sri Lanka, South Korea, Turkey and Israel whereas in case of Japan it is found in short run only. No evidence of relationship has been found between the variables for Bangladesh, China, Malaysia, Indonesia, Thailand, Singapore and Iran.

The structure of this paper is as follows. The literature relevant to study is described in Section 2 whereas the Section 3 discusses methodological framework with description of variables and data. In Section 4 data analysis and results are discussed whereas Section 5 concludes the discussion with summary of findings.

2. LITERATURE REVIEW

The investigation of relationship between exchange rate as well as its volatility and macroeconomic variables including foreign direct investment got significant importance in last few decades, particularly after the collapse of Bretton woods in 1971. After the collapse of this system, majority of the countries initiated the flexible/floating exchange rate system and faced huge fluctuation in the value of their currency prices. Different studies were conducted in this area with majority showing the existence of association between exchange rate, volatility in exchange rate and foreign direct investment. However, Bailey and Tavlas (1991) found no harmful effect of increase in exchange rate variability upon FDI under managed float rate system but Kogut and Chang (1996) observed the movement in exchange rate as an key determinant of foreign direct investment by electronic firms of Japan to U.S. Firoozi (1997) documented the existence of relationship between volatility in exchange rate and FDI. Crowley and Lee (2003) documented the existence of a weak association between volatility in exchange rate and investment if movements are relatively small but the relationship seems to be strong in the presence of excessive movements. XING (2006) concluded that the real rate of exchange between two currencies is a significant variable to determine FDI of Japan in China and devaluation of Chinese currency positively affects the inward FDI from Japan during the sample period. Chong and Tan (2008) found the existence of long run association between volatility in exchange rate and macroeconomic variables in Southeast Asian economies but in short run a weak relationship is found. Jeon and Rhee (2008) documented the existence of significant relationship between FDI inflow and real rate of exchange as well as expected exchange rate changes in Korea. Chowdhury and Wheeler (2008) documented mixed results for association between exchange rate uncertainty and FDI. Furceri and Borelli (2008) documented the country's degree of openness as the crucial factor on determining the effect of volatility in exchange rate over FDI. Lee and Min (2011) concluded that with certain other factors, a non-linear relationship exists between uncertainty and investment in Korea. Nyarko, Nketiah-Amponsah and Barnor (2011) found no significant link of exchange rate regime to foreign direct investment inflows in Ghana. Mahmood, Ehsanullah and Ahmed (2011) concluded that volatility in exchange rate negatively affects the foreign direct investment in Pakistan. There are different studies about the impact of volatility in exchange rate upon FDI with some showing the positive association of volatility in exchange rate to foreign direct investment whereas the others proved a negative association between two variables. However, the appreciation or depreciation of currency also matters. Campa (1993) showed the existence of a negative association between exchange rate risk and FDI in U.S. Similarly, Benassy-Quere, Fontagne and LahrEche-Revil (2001) documented the existence of negative effect of volatility in exchange rate upon FDI inflows to developing countries. Bleaney and Greenaway (2001) found a negative impact of volatility in exchange rate upon investment. Kiyota nd Urata (2004) found the inverse relationship of volatility in exchange rate to FDI with depreciation of

Japanese currency attracting FDI. Chen, Rau and Lin (2006) documented the significant effect of exchange rate level and its volatility with having negative effect of uncertainty in exchange rate over the outward FDI of firm. Schnabl (2008) concluded that instead of volatility in exchange rate, its stability is linked with growth and he found a negative association between volatility in exchange rate and growth. Kyereboah-Coleman and Agyire-Tettey (2008) concluded that the volatility in exchange rate negatively effected FDI inflows in Ghana whereas Vita and Abbott (2008) documented the negative impact of exchange rate volatility upon inflow of foreign direct investment in UK. Similarly, Udoh and Egwaikhide (2008) concluded that the volatility in exchange rate and inflation improbability negatively affected the foreign investment in case of Nigeria while Schmidt and Broll (2008) documented that the uncertainty in exchange rate negatively affects the FDI flows across all industries in United States. Udomkerdmongkol, Morrissey and Gorg (2009) found the volatility in exchange rate to be negatively affecting the FDI inflows whereas an inverse relationship exits between devaluation and FDI. Kandilov and Leblebicioglu (2011) documented the existence of a strong negative as well as significant impact of volatility in real rate of exchange upon plant level investment in Colombia. Arratibel, Furceri, Martin and Zdzienicka (2011) documented the existence of negative and significant association of volatility in exchange rate to FDI in EU member countries from Central and Eastern Europe. The validity of production possibility argument claiming an increase in FDI due to volatility in exchange rate has also been examined in different studies. Cushman (1985,1988) documented the existence of positive association between uncertainty of exchange rate and FDI in United States. Goldberg and Kolstad (1995) documented an increase in production capacity share located abroad in response to the movements in exchange rate. Baek and Okawa (2001) found that the appreciation of Japanese currency against both Asian and US currency results an increase in foreign direct investment by Japan in manufacturing and other subsectors of Asia. Gorg and Wakelin (2002) concluded that neither inward nor outward foreign direct investment is found to be affected by volatility in exchange rate in U.S. However, the existence of a positive association in case U.S. outward investment with appreciation of host country's currency while negative association in case of inward investment and appreciation in USD was observed. Gottschalk and Hall (2008) concluded that the exchange rate uncertainty in Japan is positively linked with foreign direct investment in Southeast Asian economies. Osinubi and Amaghionyeodiwe (2009) found that depreciation of local currency increases the real inward FDI in Nigeria. Dhakal, Nag, Pradhan and Upadhyaya (2010) concluded that the volatility of exchange rate has favorable impact on FDI in sample economies selected from East Asia. Takagi and Shi (2011) concluded that the FDI increases with increase in exchange rate volatility but it declined with depreciation of Japanese currency against the host country's currency selected from Asia. Nagubadi and Zhang (2011) found the positive influence of host country's real exchange rate depreciation and volatility in exchange rate upon the bilateral FDI between U.S. and Canada.

As discussed in this section, there are different studies investigating the relationship between volatility in exchange rate and foreign direct investment. Different economies as well as cluster of economies have been studied by using different variables and methods. The results are mixed with some showing positive and significant relationship between two variables, some others showing negative relationship while others documented no relationship. This study is an extension of existing studies, however, it concentrates upon Asian Continent as a whole and countries are selected from the multi-regions to ensure a relatively balanced representation. There is no significant study in this specific continent as whole; according to best of our knowledge and study. The present study attempted to fill this gap.

3. DATA AND METHODOLOGY

Data

To investigate the effect of volatility in exchange rate upon FDI, the yearly data over the period of 1980-2010 for both the variables; i.e. exchange rate and FDI, of the sample countries is extracted from the statistics provided by the World Bank. This is comparatively a better and reliable source because same parameter is used for the data dissemination of all sample economies. The Data of FDI is extracted as billion of US$ whereas the nominal exchange rate is taken in Direct Quotation with value of each country's currency in relation to US$.

Methodology

To explore the volatility of exchange rate, the Generalised Autoregressive Conditional Heteroscedasticity (GARCH) given by Bollerslev (1986) {a modified version of Autoregressive Conditional Heteroscedasticity (ARCH) given by Engle (1982)} is used. The same approach has been used in different studies for measuring exchange rate volatility {e.g. Mahmood and Ali (2011), Mahmood, et al (2011), Auranzeb, Thanasis and Mohammad (2005), Chowdhury and Wheeler (2008)}. For estimating the effect of volatility in exchange rate upon foreign direct investment, the bound testing approach developed under ARDL Framework for cointegration and error correction model, developed by Pesaran, et al. (2001) is used. The FDI is taken as dependent variable while volatility in exchange rate as an independent variable. The methodology is particularly beneficial when the variables

got stationarity at different orders, i.e. I(0), I(1) or mixture of both. The method is used in many recent studies {see for instance; Alam (2010), Hassan and Nasir (2008) and Waliullah, Kakar, Kakar and Khan (2010)}.
The analysis is based upon following general nature of relationship between the variables:

$fdi = f(vexr)$

$fdi = \alpha_0 + \alpha_1 vexr + \varepsilon$

The 'fdi' represents foreign direct investment, 'vexr' represents volatility in exchange rate, 'α_0' and 'α_1' are coefficients and 'ε' is the error term. The volatility in exchange rate is measured by using the GARCH (1,1) model and is taken as the independent variable whereas the foreign direct investment as the dependent variable. The ARDL approach basically involves calculating the equation given below:

$$\Delta(fdi)_t = \alpha_0 + \sum \mu_i \Delta(fdi)_{t-i} + \sum \varnothing_i \Delta(vexr)_{t-i} + \alpha_1 (fdi)_{t-1} + \alpha_2 (vexr)_{t-1} + \varepsilon_t$$

The "general to specific approach" originated by Hendry and later on comprehensively compiled by Campos, Ericsson and Hendry (2005) is also applied to get the parsimonious specification by eliminating the insignificant lagged variables and for stronger results. The null hypothesis assumes that there is no cointegration between the volatility in exchange rate and foreign direct investment whereas the alternative hypothesis supports the existence of this association among the variables.

i.e. $H_0: \alpha_{1=} \alpha_{2=} 0$ and $H_1: \alpha_{1\#} \alpha_{2\#} 0$

To test the hypothesis, the F-statistics value is calculated by using the Wald test. The calculated F-value is then compared with the tabulated values of Pesaran, et al. (2001) and of Narayan (2004). The values reported by Narayan (2004) are relatively more valid and useful in case of small sample ranging from 30-80 observations and has been adopted in different studies. The higher F-statistics value than the upper critical value supports the rejection of null hypothesis whereas the lower F-statistics value as compared to the lower critical value results in non-rejection of null hypothesis. However, the F-statistics value between the upper and lower bound shows that the results are inconclusive. The rejection of null hypothesis means the existence of cointegration between volatility in exchange rate and foreign direct investment whereas the non-rejection of null hypothesis shows its non-existence between the variables. To check the existence of short run relationship, the following nature of ECM is applied:

$$\Delta(fdi)_t = \lambda_1 + \sum \mu_{2i} \Delta(fdi)_{t-i} + \sum \varnothing_{2i} \Delta(vexr)_{t-i} + \psi ECM_{t-i} + \varepsilon_t$$

The ψ in above equation shows the speed of adjustment.

4. DATA ANALYSIS AND RESULTS

The Autoregressive Distributed Lag framework for cointegration and error correction model is applied to investigate the effect of volatility in exchange rate upon foreign direct investment in sample economies and the GARCH (1,1) is used to check the volatility in exchange rate during the sample period. The Generalised Autoregressive Conditional Heteroscedasticity (GARCH) given by Bollerslev (1986) is a modified version of Autoregressive Conditional Heteroscedasticity (ARCH) given by Engle (1982) and has been used in different studies for measuring the volatility in exchange rate {e.g. Mahmood and Ali (2011), Mahmood, et al (2011), Auranzeb, et al. (2005), Chowdhury and Wheeler (2008)}.The movement trends in exchange rate for sample economies is shown in Figure 1-7:

Figure 1: Graphical Representation of Volatility in Exchange Rate (1980-2010) for Pakistan and India

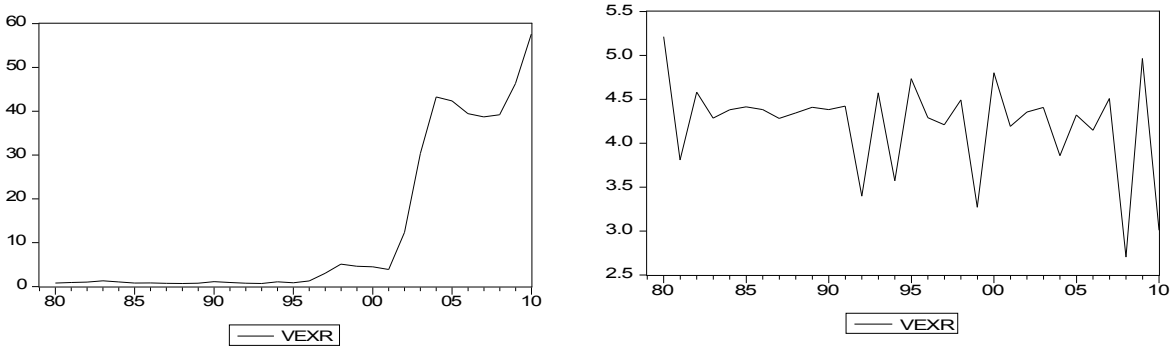


Figure 2: Graphical Representation of Volatility in Exchange Rate for Bangladesh and Sri Lanka (1980-2010)

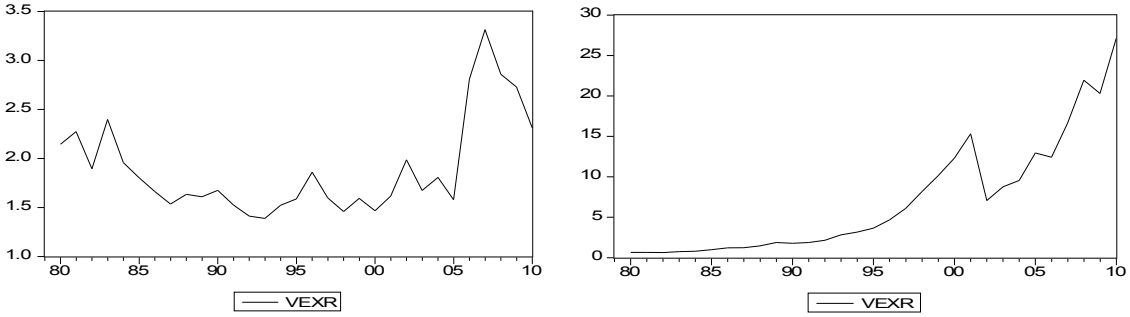


Figure 3: Graphical Representation of Volatility in Exchange Rate for China (1982-2010) and Japan (1980-2010)

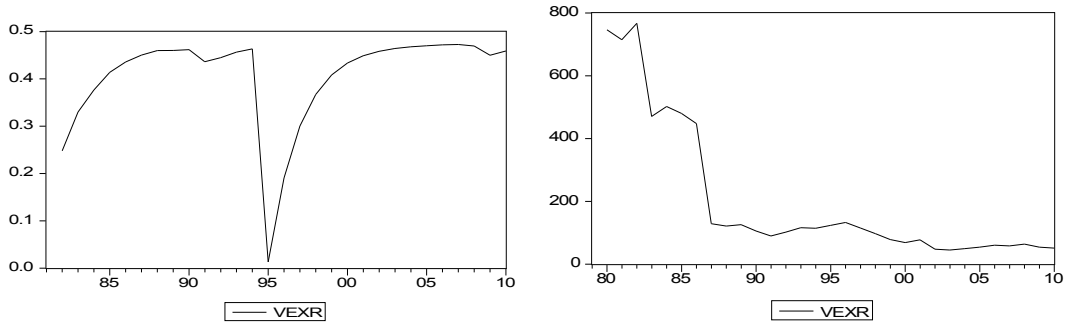


Figure 4: Graphical Representation of Volatility in Exchange Rate for South Korea (1981-2010) and Malaysia (1980-2010)

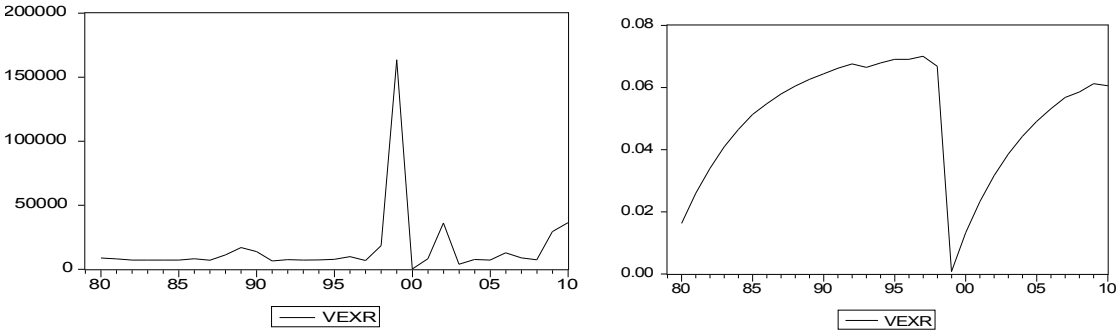


Figure 5: Graphical Representation of Volatility in Exchange Rate for Indonesia (1981-2010) and Thailand (1980-2010)

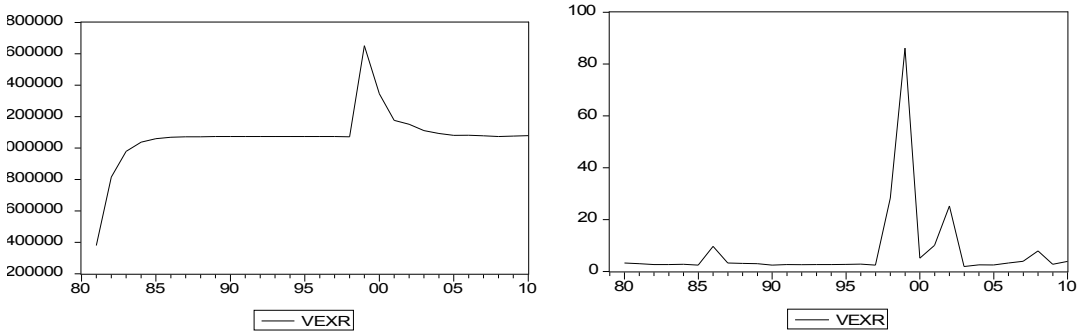


Figure 6: Graphical Representation of Volatility in Exchange Rate for Singapore and Turkey (1980-2010)

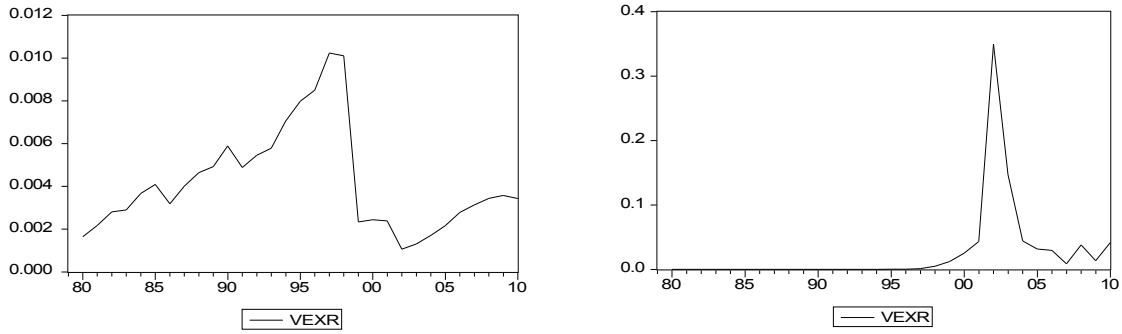
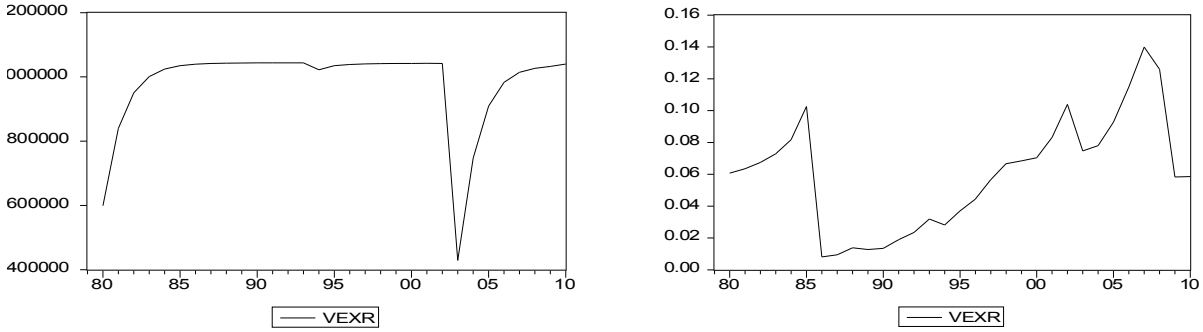


Figure 7: Graphical Representation of Volatility in Exchange Rate for Iran and Israel (1980-2010)



The descriptive statistics showing the mean, median, maximum, minimum, standard deviation and probability for both the variables, i.e. volatility in exchange rate (VEXR) and foreign direct investment (FDI) in all the sample countries over the period of 1980-2010 are summarized in Appendix I. Due to the non-availability of data, the analysis for China covers the period of 1982-2010 whereas for South Korea and Indonesia it ranges over 1981-2010. The results of descriptive statistics shows that the mean value of VEXR for Pakistan is 12.46062 with maximum value of 57.61323 and minimum value of 0.678988 whereas mean value of FDI is 1.0037 with maximum of 5.59000 and minimum of .029457. The mean value of VEXR for India is 4.216479 with maximum value of 5.213591 and minimum of 2.703194 while the mean value of FDI is 6.370025 with 43.40628 and .0056400 as maximum and minimum values respectively. The mean, maximum and minimum values of VEXR for Bangladesh are 1.893091, 3.314887 and 1.388871 respectively whereas the same parameters for FDI shows .211686, 1.009623 and -.006660 as mean, maximum and minimum values respectively. For Sri Lanka, the mean value of VEXR is 7.072609 with maximum value of 27.10780 and minimum value of 0.643156 whereas the mean, maximum and minimum values of FDI are .191946, .752200 and .019741 respectively. The mean, maximum and minimum values of VEXR in China are 0.406266, 0.472717 and 0.012934 whereas for FDI are 48.53747, 185.0807 and .43000 respectively. Likewise, 200.2646, 766.9107 and 45.06376 are the values of mean, maximum and minimum for VEXR in Japan while the FDI have 3.834842, 24.55181 and -6.783581 for three parameters respectively. In case of South Korea, the VEXR have the mean value of 18455.90 with maximum value of 207769.500 and minimum value of 1130.000 whereas the FDI shows mean, maximum and minimum values of 2.487993, 9.333400 and -.150100 respectively. The descriptive statistics of Malaysia shows the mean, maximum and minimum values of 0.049990, 0.070038 and 0.000722 for VEXR whereas the same parameters have the values of 3.293608, 9.102975 and .422680 respectively for FDI. The mean, maximum and minimum values of VEXR for Indonesia are 2073743, 2651960 and 1379387 respectively whereas for FDI the values are 2.208457, 13.30370 and -4.550400 respectively. The VEXR for Thailand have the mean, maximum and minimum values of 7.756675, 86.13949 and 1.877326 while for FDI the values are 3.485503, 11.32399 and .163201 respectively. The values of mean, maximum and minimum for VEXR in Singapore are 0.004185, 0.010241 and 0.001066 whereas for FDI are 10.29414, 38.63812 and 1.046747 respectively. Similarly, for Turkey the results of descriptive statistics for VEXR shows the mean value of 0.025537 with maximum value of 0.349678 and minimum value of 0.000000413 while the same for FDI shows 3.508290, 22.04700 and .018000 as mean , maximum and minimum values respectively. The mean, maximum and minimum

values of VEXR for Iran are 978050.200, 1043653.000 and 428745.700 respectively and that of FDI are .793412, 3.657067 and -.361950 respectively. The results of descriptive statistics for Israel show the mean value of 0.060708 with maximum value of 0.139943 and minimum value of 0.008111 for VEXR whereas the values are 2.603513, 15.29550 and .021300 for FDI, respectively. After measuring the volatility in exchange rate and descriptive statistics; the null hypothesis of no cointegration among the variables is tested. The optimal lag length to be included in error correction model is selected by using the Schwarz-Bayesian criteria (SBC) with having maximum lag order of 2 excluding Turkey; as suggested by Narayan(2004) and Pesaran and Shin(1999) for annual observations. The bound testing approach is applied and the calculated F-statistics value is then compared with the tabulated value by Pesaran et al (2001). Additionally, the F-value is also compared with the critical values reported by the Narayan (2004) which is relatively more valid in case of small sample ranging from 30-80 observations. The higher F-statistics value than the upper critical value supports the rejection of null hypothesis whereas the lower F-statistics value as compared to the lower critical value results in non-rejection of null hypothesis. The F-statistics value lying between the upper and lower bound shows inconclusive results. The results of F-statistics with upper and lower bound values at different levels of significance are summarized in Table I:

Table I: Results of Wald Test

Country	F-Statistics Value	Pesaran, et al (2001)				Narayan(2004)			
		Lower Bound, I(0)		Upper Bound, I(1)		Lower Bound, I(0)		Upper Bound, I(1)	
Pakistan	22.195	1%	4.94	1%	5.58	1%	5.847	1%	6.637
		5%	3.62	5%	4.16	5%	4.063	5%	4.653
		10%	3.02	10%	3.51	10%	3.273	10%	3.800
India	4.761	1%	4.94	1%	5.58	1%	5.847	1%	6.637
		5%	3.62	5%	4.16	5%	4.063	5%	4.653
		10%	3.02	10%	3.51	10%	3.273	10%	3.800
Bangladesh	0.902	1%	4.94	1%	5.58	1%	5.847	1%	6.637
		5%	3.62	5%	4.16	5%	4.063	5%	4.653
		10%	3.02	10%	3.51	10%	3.273	10%	3.800
Sri Lanka	5.001	1%	4.94	1%	5.58	1%	5.847	1%	6.637
		5%	3.62	5%	4.16	5%	4.063	5%	4.653
		10%	3.02	10%	3.51	10%	3.273	10%	3.800
China	0.857	1%	4.94	1%	5.58	1%	6.027	1%	6.760
		5%	3.62	5%	4.16	5%	4.090	5%	4.663
		10%	3.02	10%	3.51	10%	3.303	10%	3.797
Japan	7.355	1%	4.94	1%	5.58	1%	5.847	1%	6.637
		5%	3.62	5%	4.16	5%	4.063	5%	4.653
		10%	3.02	10%	3.51	10%	3.273	10%	3.800
South Korea	5.909	1%	4.94	1%	5.58	1%	5.847	1%	6.760
		5%	3.62	5%	4.16	5%	4.063	5%	4.663
		10%	3.02	10%	3.51	10%	3.273	10%	3.797
Malaysia	3.279	1%	4.94	1%	5.58	1%	5.847	1%	6.637
		5%	3.62	5%	4.16	5%	4.063	5%	4.653
		10%	3.02	10%	3.51	10%	3.273	10%	3.800
Indonesia	2.190	1%	4.94	1%	5.58	1%	6.027	1%	6.760
		5%	3.62	5%	4.16	5%	4.090	5%	4.663
		10%	3.02	10%	3.51	10%	3.303	10%	3.797
Thailand	2.157	1%	4.94	1%	5.58	1%	5.847	1%	6.637
		5%	3.62	5%	4.16	5%	4.063	5%	4.653
		10%	3.02	10%	3.51	10%	3.273	10%	3.800
Singapore	1.427	1%	4.94	1%	5.58	1%	5.847	1%	6.637
		5%	3.62	5%	4.16	5%	4.063	5%	4.653
		10%	3.02	10%	3.51	10%	3.273	10%	3.800
Turkey	7.490	1%	4.94	1%	5.58	1%	5.847	1%	6.637
		5%	3.62	5%	4.16	5%	4.063	5%	4.653
		10%	3.02	10%	3.51	10%	3.273	10%	3.800
Iran	2.265	1%	4.94	1%	5.58	1%	5.847	1%	6.637
		5%	3.62	5%	4.16	5%	4.063	5%	4.653
		10%	3.02	10%	3.51	10%	3.273	10%	3.800
Israel	5.093	1%	4.94	1%	5.58	1%	5.847	1%	6.637
		5%	3.62	5%	4.16	5%	4.063	5%	4.653
		10%	3.02	10%	3.51	10%	3.273	10%	3.800

The results show that the calculated test value is higher than the upper bound value at 1% level of significance for Pakistan, Japan and Turkey whereas for India, Sri Lanka, South Korea and Israel the test statistics value exceeds the upper bound value at 5% level of significance; therefore, the null hypothesis of no cointegration among the variables is rejected for these countries. On the other side, the calculated test statistics value is found less than the lower bound value in case of Bangladesh, China, Indonesia, Thailand, Singapore and Iran. Therefore, the null hypothesis is not rejected and it means that the cointegration among the variables does not exist in these countries. However, in case of Malaysia; the calculated F-statistics value lies between the upper bound and lower bound value at 10% level of significance. Therefore, the results are inconclusive for this country and to make it conclusive; the order of integration is checked. The order of integration for underlying Regressor is found to be I(1) and it shows that the cointegration among the variables does not exist for Malaysia. The detailed results showing the effect of exchange rate volatility upon foreign direct investment in both the long run and short run period under error correction model within the framework of ARDL are summarized in the table II below:

Table II: Results of Long Run Relationship and Error Correction Model

Country	Nature of Relationship	Coefficient	T-statistics value [P-value]
Pakistan	Long Run	.085849	13.6226[.000]
	Short Run (ECM)	-.87182	-6.5817[.000]
India	Long Run	-19.8324	-3.2728[.003]
	Short Run (ECM)	-.31001	-3.1424[.004]
Bangladesh	Long Run	-.16048	-.057996[.954]
	Short Run (ECM)	.035599	.27260[.787]
Sri Lanka	Long Run	.022013	5.3035[.000]
	Short Run (ECM)	-.62648	-3.2712[.003]
China	Long Run	-449.3604	-.42751[.673]
	Short Run (ECM)	.060463	.66607[.512]
Japan	Long Run	-.011351	-1.1004[.281]
	Short Run (ECM)	-.63003	-3.4067[.002]
South Korea	Long Run	0.0001233	3.0435[.006]
	Short Run (ECM)	-.44008	-3.3542[.003]
Malaysia	Long Run	48.7203	.69104[.496]
	Short Run (ECM)	-.32282	-1.6382[.114]
Indonesia	Long Run	-0.00002586	-1.0547[.302]
	Short Run (ECM)	-.21927	-1.2784[.213]
Thailand	Long Run	-.38113	-.68773[.498]
	Short Run (ECM)	-.087732	-.93140[.360]
Singapore	Long Run	-1389.0	-.67509[.506]
	Short Run (ECM)	-.31951	-1.7611[.090]
Turkey	Long Run	194.0265	3.9727[.001]
	Short Run (ECM)	-.26144	-3.2952[.004]
Iran	Long Run	-0.00003075	-.63410[.532]
	Short Run (ECM)	.071453	.52826[.602]
Israel	Long Run	69.5706	2.9745[.006]
	Short Run (ECM)	-.58261	-3.4452[.002]

The value in parenthesis shows the probability values. The above results show that a statistically significant relationship exists between exchange rate volatility and foreign direct investment in Pakistan, India, Sri Lanka, South Korea, Turkey and Israel during the long run. The exchange rate volatility is found to effect the foreign direct investment in all these countries during the long run. On the other side, no effect of exchange rate volatility upon foreign direct investment is found in long run for Bangladesh, China, Japan, Malaysia, Indonesia, Thailand, Singapore and Iran, however, the dependent variable is found to be related with its own lagged value in case of

Japan. It is evident from the table that a unit change in independent variable brings about .086 unit changes in dependent variable for Pakistan. Similarly, in case of India; the dependent variable is found to be affected negatively by about 19.83 unit changes due to a unit change in the independent variable. The results for Sri Lanka show that a unit changes in exchange rate volatility brings about .022 unit changes in the foreign direct investment. In case of South Korea the results reveal that a unit change in exchange rate volatility brings about .0001233 unit changes in the foreign direct investment while for Turkey the dependent variable is found to be affected by about 194.03 units due to a unit change in independent variable. Finally, the results for Israel show that a unit change in exchange rate volatility brings about 69.57 unit changes in the foreign direct investment. In short run, the effect of volatility in exchange rate upon foreign direct investment is found in Pakistan, India, Sri Lanka, Japan, South Korea, Turkey and Israel. The ECM result in all these countries shows that the ψ, i.e. coefficient of ECM, has negative sign and the value lies between the 0 and 1 for almost all the countries, which shows the convergence of model. The coefficient of ECM shows that the adjustment process back to long run equilibrium after having a short run disturbance is quiet fast in case of Pakistan and about 87% of disequilibrium is corrected each year. Similarly for India the adjustment rate is found to be about 31% while the ECM results for Sri Lanka shows the adjustment rate of 63% every year. The value of ψ shows that about 63% adjustment takes place in case of Japan every year whereas the same rate for South Korea is about 44%. Similarly, the adjustment rate of 26% every year is found for Turkey while the comparatively quick adjustment rate of 58% ever year is observed in case of Israel. The overall results indicate the existence of long as well as short run effect of exchange rate volatility upon foreign direct investment in only six out of fourteen sample countries. These countries are Pakistan, India, Sri Lanka, South Korea, Turkey and Israel while for Japan, it is found in short run only. However, in the seven countries namely Bangladesh, China, Malaysia, Indonesia, Thailand, Singapore and Iran; the effect of exchange rate volatility upon foreign direct investment is neither found in short run nor in long run.

5. Conclusions

The investigation of relationship between exchange rate volatility and macroeconomic variables including foreign direct investment got significant importance in last few decades, particularly after the collapse of Bretton woods in 1971. Different studies have been conducted in this area with emphasizing different variables and countries. The results vary from study to study with some showing positive association between the volatility in exchange rate and foreign direct investment and others showing negative association between the variables or none at all. This study is also aimed at exploring the effect of volatility in exchange rate upon foreign direct investment and is conducted in multi-country context. The countries are selected from the four main regions of Asian continent which is the largest continent of the World. The Pakistan, India, Bangladesh and Sri Lanka are selected as sample from the South Asia; China, Japan and South Korea are from the East Asia; Malaysia, Indonesia, Thailand and Singapore are selected from the Southeast Asia whereas Turkey, Iran and Israel are selected as sample from the West Asia.

The effect of exchange rate volatility upon foreign direct investment is explored by applying the Autoregressive Distributed Lag framework for cointegration and error correction model. The results shows the existence of both long run and short run effect of exchange rate volatility upon foreign direct investment in Pakistan, India, Sri Lanka, South Korea, Turkey and Israel while ECM is also found statistically significant for Japan. No evidence of relationship has been found between the variables for Bangladesh, China, Malaysia, Indonesia, Thailand, Singapore and Iran. This study can be extended in future by adding more variables such as interest rate differences, GDP growth, taxes and other macroeconomic variables, in addition to the volatility of exchange rate, for finding more comprehensive results.

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Appendix I: Descriptive Statistics for Volatility in Exchange Rate and Foreign Direct Investment (1980-2010)

Country	Variable	Mean	Median	Maximum	Minimum	Probability	No. of Observations
Pakistan	VEXR	12.46062	1.288151	57.61323	0.678988	0.021942	31
	FDI	1.0037	0.383000	5.59000	0.029457	0.00000	31
India	VEXR	4.216479	4.354837	5.213591	2.703194	0.027036	31
	FDI	6.370025	2.143628	43.40628	0.005640	0.00000	31
Bangladesh	VEXR	1.893091	1.673943	3.314887	1.388871	0.004876	31
	FDI	0.211686	0.013530	1.009623	-0.006660	0.007196	31
Sri Lanka	VEXR	7.072609	3.652534	27.10780	0.643156	0.028485	31
	FDI	0.191946	0.166413	0.752200	0.019741	0.002896	31
China	VEXR	0.406266	0.449955	0.472717	0.012934	0.00000	29
	FDI	48.53747	38.39930	185.0807	0.430000	0.017711	29
Japan	VEXR	200.2646	105.5396	766.9107	45.06376	0.001127	31
	FDI	3.834842	1.161211	24.55181	-6.783581	0.000004	31
South Korea	VEXR	18455.90	8726.162	207769.50	1130.000	0.00000	30
	FDI	2.487993	1.477800	9.333400	-0.150100	0.003136	30
Malaysia	VEXR	0.049990	0.056817	0.070038	0.000722	0.073193	31
	FDI	3.293608	3.203421	9.102975	0.422680	0.258212	31
Indonesia	VEXR	2073743	2073421	2651960	1379387	0.00000	30
	FDI	2.208457	0.887500	13.30370	-4.550400	0.038440	30
Thailand	VEXR	7.756675	2.809035	86.13949	1.877326	0.00000	31
	FDI	3.485503	2.335838	11.32399	0.163201	0.171703	31
Singapore	VEXR	0.004185	0.003440	0.010241	0.001066	0.041498	31
	FDI	10.29414	7.313867	38.63812	1.046747	0.000987	31
Turkey	VEXR	0.025537	0.000320	0.349678	0.000000413	0.00000	31
	FDI	3.508290	0.805000	22.04700	0.018000	0.00000	31
Iran	VEXR	978050.2	1038752	1043653	428745.7	0.00000	31
	FDI	0.793412	0.039000	3.657067	-0.361950	0.030731	31
Israel	VEXR	0.060708	0.063507	0.139943	0.008111	0.657143	31
	FDI	2.603513	1.350300	15.29550	0.021300	0.000000	31