Full Length Article

Macroeconomic factors and foreign portfolio investment volatility: A case of South Asian countries

Yahya Waqas[a], Shujahat Haider Hashmi[a,*], Muhammad Imran Nazir[b]

[a]Capital University of Science and Technology, Islamabad, Pakistan
[b]Indus Group of Colleges, Islamabad, Pakistan

Abstract

Macroeconomic factors play a pivotal role in attracting foreign investment in the country. This study investigates the relationship between macroeconomic factors and foreign portfolio investment volatility in South Asian countries. The monthly data is collected for the period ranging from 2000 to 2012 for four Asian countries i.e. China, India, Pakistan and Sri Lanka because monthly data is ideal for measuring portfolio investment volatility. For measuring volatility in foreign portfolio investment, GARCH (1,1) is used because shocks are responded quickly by this model. The results reveal that there exists significant relationship between macroeconomic factors and foreign portfolio investment volatility. Thus, less volatility in international portfolio flows is associated with high interest rate, currency depreciation, foreign direct investment, lower inflation, and higher GDP growth rate of the host country. Thus findings of this study suggest that foreign portfolio investors focus on stable macroeconomic environment of country.

1. Introduction

In the last few decades foreign private investment has become the main topic for research. Foreign private investment is the result of financial liberalization in. In 1980's, developed countries had adopted financial liberalization to attract huge influx of foreign private investment. Foreign private investment is main way of doing investment in different countries. It has two components' foreign direct investment (FDI) and Foreign portfolio investment (FPI). Lipsey (1999) argues that foreign direct investment (FDI) has more permanent nature than foreign portfolio investment (FPI) and FPI is also known as "hot money". Therefore, the desire of developing countries is to increase the foreign capital so as to enhance economic development of country (Broto, Diaz-Cassou, & Erce-Dominguez, 2011).

*Corresponding author.

E-mail address: shujahat@jinnah.edu.pk (S.H. Hashmi).

According to the theory of portfolio investment by Hymer (1976), foreign portfolio investors are attracted by the high interest rate because it reduces the borrowing cost; foreign portfolio investor will invest until the interest rate gets equal all over the world therefore it might be said that foreign portfolio investment is affected by domestic interest rate and not by domestic returns. However, this theory's structure is so naïve when the problems of risk, uncertainty and volatility are introduced. Therefore, we must consider the risk factor in terms of foreign investment volatility. The term volatility is concerned with the international investors' intention to invest for short-term benefits and they withdraw their investment on uncertain conditions (Kodongo & Ojah, 2012). Thus, volatility refers to the uncertainty regarding the flow of FPI in the country.

Portfolio investors also consider the host country exchange rate along with the interest rate. Devaluation of host country currency motivates the foreigners to invest due to higher return (Bleaney & Greenaway, 2001); the fluctuation in real exchange rate increases foreign investment volatility. Moreover, inflation also affects volatility in FPI. Volatility in FPI is enhanced by decrease in return and increase in inflation. Agarwal (1997) suggested that home country low return and high inflation motivates portfolio investors to invest in other countries where inflation is low and return is high. Mody, Taylor, and Kim, 2001 favored it by arguing that increase in inflation is linked to decline in foreign portfolio investment. Moreover, foreign portfolio investors are attracted by high returns (Chakrabarti, 2001; Gordon & Gupta, 2003; Çulha, 2006; Froot, O'Connell, & Seasholes, 2001). They argue that stock market is an indicator of performance and investor expectations for host country. Thus, rise in index would increase the stock prices leading to higher returns and ultimately lower the volatility in foreign portfolio investment.

Foreign portfolio investment is chosen on two bases. First, FPI is more volatile in nature so FPI is attaining the attention of regulators, policy makers and investors because it is challenging the monetary policy by affecting macroeconomic variables. Second, the literature has focused on the relationship of capital flows (in general) to macroeconomic variables so this factor leaves the gap for identifying the effect of macroeconomic variables to FPI volatility specifically. Several studies have highlighted the importance of capital flows in financial development and economic growth of the country but few studies have investigated the effect of macroeconomic factors on foreign portfolio investment volatility. Therefore, this study is aimed to fill in the research gap in South Asian countries because we could not find any such study, to the best of our knowledge,that has focused on the effect of macroeconomic factors on FPI volatility in this region. Moreover, these countries have favorable environment for FPI by keeping interest rate high and devaluation of their home currency.

2. Literature review

There are several factors that bring volatility in foreign portfolio investment volatility. One of these factors is exchange rate; fluctuations in exchange rate increase the volatility in FPI. Therefore investors regularly monitor the exchange rate. Darby, Hallett, Ireland, and Piscitelli (1999) concluded that the exchange rate fluctuations had significant affect on FPI Moreover, Carrieri, Errunza, and Majerbi (2006) argued that one should consider real exchange rate than nominal one because real rate eliminates the effect of inflation and is better indicator of FPI volatility. It is find out that real exchange rates (RER) and foreign portfolio flows changed over time (Kodongo & Ojah, 2012). In past several studies, the inverse relationship between exchange rate and FPI is observed (Eun & Resnick, 1988; Froot & Stein, 1991, Bleaney & Greenaway, 2001; Ersoy, 2013). Therefore, the host country's currency devaluation induces foreign investors to acquire local assets at lower prices. Thus, we hypothesize that there is significant relationship between real exchange rate and portfolio investment volatility.

The second important factor that affects FPI is inflation. Increase in the inflation in one country and more return on portfolio investment for foreign investors stimulate them to invest in host country. Therefore, increasing trend of inflation bring volatility in portfolio investment. In similar fashion, Agarwal (1997) found negative relation between inflation rate and exchange rate with foreign portfolio investment. On the other hand, Broner and Rigobon (2004) pointed out that FPI volatility was little explained by inflation rate and argued that economic development was the good estimator of volatility. Therefore, improving financial markets might reduce the volatility in capital flows. Low inflation rates in liberalized economies could be the possible explanation of relatively low effect of inflation (Kraay, 1998). But Rai and Bhanumurthy (2004) found negative effect of domestic inflation on FPI and concluded that inflation in home country and higher returns in host country induce investors to move in host country. Thus, our second hypothesis is that there exists significant relationship between inflation and foreign portfolio investment volatility.

Stock market performance is the third crucial factor in attracting FPI (Bekaert & Harvey, 1998). Stock market of the country is usually approximated as the country's face of the economy so it really means to know about the stock market and FPI volatility. Increasing stock market returns attract foreign investors and build their confidence to invest further in stock market. In return domestic stock market liquidity gets increased by portfolio investment in country (Levine, 1997). Emerging stock market returns could be the most influencing factor that was found to influence positively on portfolio investment and the capital flows were found to be influenced by previous returns (Bekaert & Harvey, 1998; Froot et al., 2001; Gordon & Gupta, 2003). Çulha (2006) found that stock market index reflected the improved macroeconomic essentials and at the same time high return on investment. Easterly, Islam and Stiglitz (2001) found the similar results that higher domestic financial development is linked to less portfolio volatility. It creates a chain of effect; development in banking sector causes foreign investment and foreign investment brings development in banking system (Agbloyor, Abor, Adjasi, & Yawson, 2013). However, the positive relation between stock returns and FPI depends mainly on the specific stage of stock market development (Choong, Baharumshah, Yusop, & Habibullah, 2010). So our third hypothesis is that there exists significant relationship between stock market return and foreign portfolio investment volatility.

Industrial production is considered the fourth key feature that may reduce the volatility in foreign portfolio investment (Chuhan, Claessens, & Maming, 1993; Daude & Fratzscher, 2006) Neumann, Penl, and Tanku (2009) concluded that foreign capital flows were less volatile in developed countries where industrial production growth rate was rather stable than emerging countries. Several studies estimated production growth as push factor but in some studies industrial production was also found significant in explaining capital flows as pull factor. For example, Vita and Kyaw (2008) found that output and industrial production as pull factors were the most important forces to explain the volatility in flows. Therefore, the host country industrial production may increase the direct investment in the country. However, Mody et al. (2001) found the mixed results for developing countries. Thus, we hypothesize that there is significant relationship between industrial production growth and foreign portfolio investment volatility

Economic conditions of the country also affect FPI positively. Increase in savings and investment, technology transfer to developing economies, improved macroeconomic policies and financial market development brings more FPI to home country. Therefore, some studies found the positive relation between economic growth and FPI (Santis & Luhrmann, 2009; Ferreira & Laux, 2009; Ghura & Goodwin, 2010; Easterly et al., 2001; Abdelhafidh, 2013). Ramey and Ramey (1994) argued that it would be interesting to create positive relationship between stability of foreign capital flows and country's economic growth. But Levchenko and Mauro (2007) found insignificant results because economic development in terms of GDP per capita might be preferred by foreign investors. For example, Thapa and Poshakwale (2010) concluded that GDP growth was found significant but not for all countries because investors were more directed to the economic development that was captured by GDP per capita that was highly significant than the economic growth that was captured by GDPGR. Therefore, it could be reasonably argued that foreign investors were more interested to the economic development than the country's economic growth. Thus, we hypothesize that there is significant relationship between GDP growth rate and foreign portfolio investment volatility.

Increase in foreign direct investment (FDI) may decrease foreign portfolio investment volatility because it enhances the confidence of foreign investors and brings more investment in the home country (Gozgor & Erzurumlu, 2010). Similarly, Iyer, Rambaldi, and Tang (2003) found that FDI caused FPI while FPI did not cause FDI. Contrary to this, Ahmed and Malik (2012) concluded that direct investment found to granger cause by the portfolio investment in Pakistan only because its financial market is experiencing exponential progress (growth) and this factor will help in understanding the different investment environments. However, FPI was found to be non-consistent and non-persistent capital flow than FDI and other flows in crises times in some studies (Sarno & Taylor, 1999; Levchenko & Mauro, 2007). Thus, we expect significant relationship between FDI and foreign portfolio investment volatility.

3. Methodology

3.1. Sampling and data collection

For identifying the relationship of macroeconomic factors and FPI volatility, four South Asian countries i.e. China, India, Pakistan and Srilanka are selected from the time period of 2000–2012 by using monthly and yearly data. Pakistan, India and Srilanka are selected because these economies liberalized their policies but they were not capable of substituting the foreign investment to the short term borrowings to finance needs. Where monthly data was not

available, we have converted yearly data into monthly data using interpolation techniques in Eviews8. All the data relating to GDP growth, exchange rate, inflation, industrial production index, interest rate, FDI and FPI have been taken from World Bank, IMF and business recorder databases.

3.2. Variables measurement

Economic growth has been measured using GDP growth rate. Here it is argued that growth in income has significant outcome in shape of saving that is the counter cyclical response of capital flows. When economy is rising, then workers expect increase in the income and if as a result, consumption increases then pro cyclical capital flows do increase. Financial flows have the pro cyclical relation to the host country GDP growth rate for developing countries. It is hypothesized that increase in host country GDP reduces the volatility in foreign portfolio investment. Inflation affects investor expected rate of return. CPI is used as inflation proxy. Consumer price index (CPI) is selected due to its broad measure to estimate changes in goods and services prices during particular duration. It is hypothesized that increase in inflation will increase volatility in foreign portfolio investment. The monthly return inflation rate was calculated by taking natural log of time series.

Eun and Resnick (1988) argued that exchange rate uncertainty had effect on the international portfolio flows. And the fluctuation in exchange rate reduces the gains of international diversification. The annual frequency of real exchange rate (RER) is converted into monthly data by using E-Views. Real exchange rate is calculated by this formula: $RER = NER$ (nominal exchange rate) $\times (CPI_{Pak}/CPI_{Usa})$ and vice versa. Interest rate differential plays crucial role in attracting foreign portfolio investment in country. Investors are interested to invest in those countries where high interest rate is offered than the developed nations where it is low like US, UK etc. The data is collected from WDI. The monthly Real interest rate (RIR) is calculated as: $LN(RIR_t/RIR_{t-1})$ (Mushtaq, Shah, Rehman, & Murtaza, 2011). It is measured as $RIR = NIR - Inflation$. Foreign direct investment flow in country is also indicator of less volatility because FDI is usually considered as permanent nature so it is induced as the macroeconomic factor of FPI volatility and can influence on investor decision to invest. Therefore it is hypothesized that increased FDI will reduce volatility in foreign portfolio investment. Industrial production growth has been used as country specific factor by Mody et al. (2001), so this factor also affect on the portfolio investment volatility. Industrial production shows the overall economic activity and stock prices are affected by it. It is hypothesized that increase in industrial production reduces the volatility in foreign portfolio investment. We have used industrial production index to measure industrial production growth. Stock market index also affect FPI volatility. Stock market return was used by Mody et al. (2001) and Gordon and Gupta (2003). Performance of stock market attracts foreign investors to invest for more return than their market. Stock market is indicator of the performance as well as investor expectations of future performance.

3.3. Econometric model

The idea of GARCH was generated by including lagged conditional variance terms in equation. The idea was worked out by Bollerslev (1986) published in a paper entitled "Generalized Autoregressive Conditional Heteroskedasticity." The simplest form of GARCH is GARCH (1,1) model. The equation of GARCH model can be shown as:

$$R_t = \beta_0 + \beta_1 R_{t-1} \tag{1}$$

$$h_t^2 = \alpha + \beta \mu_{t-1}^2 + \gamma \sigma_{t-1}^2 \tag{2}$$

$\alpha =$ Constant.
$\beta =$ Coefficient.
$\mu_{t-1} =$ Return of previous time period portfolio investment volatility.
$\sigma_{t-1} =$ Volatility of previous time period portfolio investment volatility.

According to this study, Eq. (1) is the mean equation that describes the relationship of returns (Foreign portfolio returns) with its lag returns. Eq. (2) is the variance equation that describes the relationship about volatility (Foreign portfolio investment volatility).

GARCH (1,1) model can be generalized to additional lag terms. In GARCH (p,q) model where p is the order of GARCH term σ^2 and "q" is the order of ARCH term μ^2 is given by:

$$\sigma_t^2 = \alpha + \alpha_1\mu_{t-1}^2 + \ldots + \alpha_q\mu_{t-q}^2 + \beta_1\sigma_{t-1}^2 + \ldots + \beta_p\sigma_{t-p}^2 \tag{3}$$

In summation form, the above equation might be written as:

$$h_t = \alpha + \sum_{i=1}^{q} \alpha_i\mu_{t-i}^2 + \sum_{i=1}^{p} \beta_i\sigma_{t-i}^2 \tag{4}$$

$\sigma_t^2 =$ Conditional variance at time t.
$\mu_t =$ Disturbance term.

Hansen and Lunde (2001) argues that GARCH (1,1) provides the best forecasting volatility results. Here GARCH (1,1) is used because Hansen and Lunde (2001) also argue that GARCH (p,q) will be used where daily data of several decades is used or hourly data of several years. As in this study monthly data is used so GARCH (1,1) is the best forecaster for measuring the volatility in foreign portfolio investment. GARCH (1,1) is used because it respond to the shocks quickly.

The ultimate equations of our Garch model:

$$\Delta\ln\mathrm{FPI}v_t = \alpha_0 + \sum_{i=0} \Delta\ln(\mathrm{FPI}v_{t-i}) + \mu_t \tag{5}$$

$$h_t = \gamma_0 + \sum_{i=1}^{p} \delta_i h_{t-I} + \sum_{j=1}^{q} \gamma_j\mu_{t-j}^2 + \sum_{k=1}^{r} d_1\Delta\ln\mathrm{CPI}_{t-k} + \sum_{l=1}^{s} d_2\Delta\ln\mathrm{RER}_{t-l} + \sum_{m=1}^{t} d_3\Delta\ln\mathrm{RIR}_{t-m}$$
$$+ \sum_{n=1}^{u} d_4\Delta\ln\mathrm{FDI}_{t-n} + \sum_{o=1}^{v} d_5\Delta\ln\mathrm{GDPGR}_{t-o} + \sum_{p=1}^{w} d_6\Delta\ln\mathrm{SMI}_{t-p} + \sum_{q=1}^{x} d_7\Delta\ln\mathrm{IPG}_{t-q} + \mu_t \tag{6}$$

4. Results and discussion

The results have been classified into tables. Table 1 reports descriptive statistics of our main variables and Table 2 presents GARCH results; it shows the effect of macroeconomic factors on FPI volatility. In Table 1, Pakistan has the highest inflation rate during the sample period as compared to that of China, India and Srilanka. Pakistan has seen the highest interest rate on the average and it shows the severe problem of inflation On the other hand, China has the highest amount of foreign direct investment (131 billion dollars) and foreign portfolio investment (16.5 billion dollars, India has the second rank. China is the big economy and it has been able to attract more foreign investment. China has the highest economic growth, while India, Sri Lanka and Pakistan gets the second, third and fourth position in this regard. China has achieved tremendous industrial growth rate on the average, and Pakistan has obtained the second position.

In Table 2, the first equation is the mean equation and second is the variance equation of GARCH (1,1). The intercept of mean equation is negative and insignificant showing that there are no others factors influencing today's portfolio return. In mean equation, significant value of FPI(-1) implies that today's return is predicted by past return. The lag return value of FPI is significant at 1% level in case of all the countries; it means prior return of FPI predicts future return pattern of FPI. The residual term's coefficient is positively significant for all countries; it means that random term of previous day forecasts today's volatility. Therefore, we can say that there exists significant positive relationship between previous price behavior and current portfolio investment volatility.

Volatility persistence is described by GARCH model and defines that future volatility pattern is predicted by past volatility. GARCH (-1) coefficient is positively significant for all countries; it indicates that previous day volatility

Table 1
Variables descriptive statistics.

Variables	Mean	Median	Max	Min	SD
China					
CPI	102.30	101.80	108.70	98.20	2.40
FDI	131.00	121.00	283.00	35.50	82.70
FPI	16.50	11.40	56.00	0.18	13.70
GDPGR	10.03	9.75	14.65	7.00	1.80
IPG	13.79	13.90	23.20	2.30	3.70
RER	111.33	111.39	133.14	99.85	8.92
RIR	1.77	2.02	8.14	-3.18	2.70
SSE	2214.80	2005.93	5954.77	1060.74	935.44
India					
CPI	118.73	109.31	180.77	82.65	29.11
FDI	19.30	20.20	43.40	3.74	13.40
FPI	10.40	9.18	32.90	-15.00	9.89
GDPGR	7.13	7.86	10.55	3.24	2.12
IPG	6.24	6.35	20.00	-7.20	5.30
RER	53.00	46.55	91.95	43.18	11.94
RIR	5.22	5.51	8.59	-0.48	2.44
BSE	11083.90	11341.60	20509.10	2811.60	5988.20
Pakistan					
CPI	126.58	107.91	230.32	76.76	47.95
FDI	2.09	1.40	6.00	0.28	1.82
FPI	0.25	0.07	1.50	-0.46	0.48
GDPGR	4.10	3.67	7.87	1.41	2.02
IPG	6.34	5.80	46.99	-21.15	10.56
RER	101.44	100.93	114.41	96.71	3.91
RIR	9.12	10.07	14.35	1.34	3.80
KSE	7764.31	8467.87	16905.30	1133.43	4567.92
Srilanka					
CPI	122.50	109.72	204.02	57.96	44.81
FDI	0.45	0.38	1.02	0.17	0.27
FPI	-0.22	-0.15	0.41	-1.10	0.31
GDPGR	5.83	6.10	10.05	1.19	1.97
IPG	4.94	5.74	18.99	-7.95	4.06
RER	123.96	109.94	240.87	45.62	47.51
RIR	3.39	2.52	9.81	-0.19	2.82
CSE	2548.08	2143.64	7797.96	403.60	2012.73

CPI, FDI, FPI, GDPGR, IPG, RER, RIR, CSE, BSE, KSE, CSE stand for consumer price index, foreign direct investment, gross domestic growth rate, industrial production growth, real exchange rate, real interest rate, Shingai Stock Index, Bombay Stock Index, Karachi Stock Index and Colombo Stock Index.
FDI and FPI amounts are given in billion dollars.
All figures are rounded off to two decimal places for the sake of clarity.
Max, Min and SD are maximum, minimum and standard deviation of values respectively

is increasing current FPI volatility. However, clustering effect does not exist because GARCH coefficients for all countries are lower than one. Thus, previous day's volatility is continuing in the future at a certain pace. Thus, it can be safely argued that persistence exists in foreign portfolio investment volatility for all the countries.

Now the effect of macroeconomic factors can be analyzed. Inflation rate has significant negative effect on FPI volatility in case of China and India, while it has no effect for Pakistan and Srilanka. The higher inflation rate reduces variations in FPI as foreign investors are attracted to higher interest rate of China and India. However, this effect is not significant for Pakistan and India as these countries have hyper inflation rate higher than interest rate. Therefore, the real rate of return is reduced on foreign portfolio investment and foreign investors might be considering other factors for investment. So we may argue that inflation rate plays its role in FPI volatility.

Table 2
GARCH results of macroeconomic factors and FPI volatility.

	China		India		Pakistan		Srilanka	
	β	SE	β	SE	β	SE	β	SE
C	−0.0005	0.0065	−0.0042	0.03628	0.0385	0.0329	0.0132	0.0357
FPI(−1)	0.9265***	0.0533	0.5596***	0.1229	0.4814***	0.0936	0.5339***	0.1427
Variance Eq.								
C	0.0026	0.0007	0.0644	0.0222	0.0455	0.0183	0.0301	0.0098
RESID(−1)̂2	0.1187**	0.0526	0.2614**	0.1122	0.2727**	0.1284	0.1659**	0.0657
GARCH(−1)	0.3817**	0.1579	0.4392***	0.1645	0.3071**	0.1278	0.5156***	0.0959
ΔCPI	−0.0939*	0.0528	−2.3018**	1.0550	0.5617	1.7766	−0.9319	0.8977
ΔFDI	−0.0343*	0.0191	−0.2558*	0.1515	−0.395***	0.1285	0.1446	0.1129
ΔGDPGR	−0.0357*	0.0184	−0.0031	0.1851	0.1653*	0.0996	−0.031**	0.0601
ΔIPG	0.0061***	0.0018	0.0150	0.0165	0.0127**	0.0052	−0.0155**	0.0074
ΔRER	0.1818***	0.0672	0.6106	0.9097	0.1214	1.4924	−0.407	0.4474
ΔRIR	0.0007	0.0006	0.0583***	0.0185	0.3669*	0.165	0.0094	0.014
ΔSSE	0.0075**	0.0038						
ΔBSE			0.2786***	0.1077				
ΔKSE					0.1666***	0.0577		
ΔCSE							0.0901**	0.0424

FPI(−1) is lag term of Foreign portfolio investment, RESID(−1)̂2 is squared error term and GARCH(−1) is effect of prior-period volatility. ΔCPI, ΔFDI, ΔGDPGR, ΔIPG, ΔRER, ΔSSE, ΔBSE, ΔKSE and ΔCSE are respectively return series of consumer price index, foreign direct investment, gross domestic growth rate, industrial production growth, real exchange rate, and real interest rate, Shingai Stock Index, Bombay Stock Index, Karachi Stock Index and Colombo Stock Index.

SE is the standard error terms.

***$p < 0.01$.

**$p < 0.05$.

*$p < 0.10$.

The effect of foreign direct investment is negatively significant on volatility of FPI for three countries, namely, China, India and Pakistan. It implies that increase in FDI leads to reduction in FPI volatility. However, it has no effect in case of Srilanka because it has very lower level of FDI in the country. On the basis of these results, FDI has an important role to attract FPI in the country and it provides foundation for foreign portfolio investors to pursue FDI. Moreover, the significance of FDI for China, India and Pakistan shows that financial market is making progress and this would help understand different investment environments (Ahmed & Malik, 2012); insignificance of FDI in Srilanka implies that investors investing in Srilanka are facing liquidity problems (Gozgor & Erzurumlu, 2010).

In Table 2, the results of GDP growth rate are significant for China, Pakistan and Srilanka at 5%, 10% and 10% critical level. The results of China are more significant than those of Pakistan and Srilanka as China is growing rapidly; if we look at the average growth rate in Table 1, China has the highest average economic growth during the sample period. However, the results of Pakistan and Srilanka are moderately significant which indicate less attraction of GDP to foreign portfolio investors in these countries. Thus, Foreign portfolio flows are linked to higher GDP in China leading to reduction in volatility, and these results confirm to the results by Bekaert and Harvey (1998). Our result of GDPGR is against our expectation in case of Pakistan because GDP growth rate has no continuity and foreign investors are not attracted by the country's GDPGR.

Real exchange rate is positively significant only in case of China and it has no effect on FPI volatility in case of remaining three countries. China is not trading in primary goods so fluctuation in exchange rate does not exist, so RER has significant positive effect on portfolio investment volatility (Bleaney & Greenaway, 2001.). Moreover, China is deliberately increasing its currency value and this factor has reduced return and causing the increase in volatility. The other possible explanation for no effect of exchange rate is the deduction of inflation rate from exchange rate; inflation may also affect exchange rate volatility according to interest parity theory which we have ignored due to multicolinearity problem.

In Pakistan and India, rise in interest rate increases portfolio investment volatility because higher inflation rate than interest rate reduces or declines the benefit of portfolio investment to foreigners and as a result, foreign investors are

more likely to leave Pakistan and India. On the other hand, the insignificant values of RIR for China and Srilanka because these two countries have lower interest rate as compared to India and Pakistan; it has no effect on foreign portfolio investment. It diminishes the attraction of high interest rate for portfolio investors. Thus, the results are in accordance to Salahuddin and Islam (2008).

The coefficient sign of SSE is against our expectation because Yuan is appreciating and Chinese stock market do not have complete financial liberalization, so it is increasing volatility in portfolio investment. On the other hand, CSE and BSE indices have expected relation with foreign portfolio investment volatility because increasing share prices lead to higher stock returns and FPI volatility is reduced.

The interpretation of positive effect of Karachi stock index is that usually foreign portfolio investors assign (allocate) fix proportion of their portfolio investment in developing countries and this creates volatility in index leading to increase in market raises; investors sell their FPI investments to obtain short-term gains and when market falls, they start buying shares leading to short-term volatility in FPI (Gordon & Gupta, 2003). Another possible reason may be the higher volatility is due to sudden breakage in capital flows because investors rebalance their portfolios in context of wide opportunity set and breakage is associated to increase in net cash flows and it leads to reduction in return on FPI on breakage (Bekaert & Harvey, 1998).

5. Conclusion and recommendations

Foreign portfolio investment is of volatile nature and leaves the country due to uncertainty in macroeconomic factors. Based on our findings, we conclude that all the macroeconomic factors affect foreign portfolio investment volatility except interest rate in China. In India, inflation rate, foreign direct investment, interest rate and stock index bring significant volatility in foreign portfolio investment. Except exchange rate and inflation rate, all other variables have significant effect on FPI volatility in Pakistan. While only three variables, namely, economic growth, industrial growth and stock return bring significant variation in FPI in case of Srilanka. The inflation rate in India and China attracts more foreign investment and reduces portfolio investment volatility. These findings are consistent with Agarwal (1997) and Rai and Bhanumurthy (2004); they suggest that these two countries are managing and controlling their inflation. While inflation has no effect in Pakistan and Srilanka that confirm to Bleaney and Greenaway (2001) because exchange rate is being undervalued and currency of these two countries is continually falling and foreign portfolio investment persists (Lee & Yoon, 2007).

FDI brings reduction in foreign portfolio investment volatility as is happening in China, India and Pakistan; it implies that in China, India and Pakistan the financial market is in progressing. However, in case of Srilanka, FDI is not playing its part to reduce FPI volatiltiy because of liquidity issues; investors hesitate to invest in portfolio investment because of less return. High economic growth rates attract more FPI and reduce volatility in FPI because high GDP growth rate will affect index to boost up then stock return would increase as the result leading to decrease in volatility of portfolio investment. Our findings in case of China are in accordance with the results of Bekaert and Harvey (1998). The economic growth does not affect FPI volatiltiy in India and Srilanka and this matches to Thapa and Poshakwale (2010) that portfolio investors are attracted by economic development that is captured by per capita GDP of the country.

Industrial production growth inserts significant effect on portfolio investment voatility in case of China, Pakistan and Srilanka and these results are same as the those of Chuhan et al. (1993). Overvaluation in exchange rate having opposite effect on investment. When host country appreciates its currency and home currency depreciates then foreign portfolio investors have less choice to earn benefit from exchange rate and they reduce their investment and it increases volatiltiy. However, in other countries, exchange rate has no effect on FPI volatiltiy.

Interest rate in developing countries tends to be higher than that of developed countries and it attracts foreign investors to invest because it reduces their borrowing cost (Ghura & Goodwin, 2010). The interest rate has insignificant effect in China and Srilanka in accordance with Bleaney and Greenaway (2001) and Salahuddin and Islam (2008); while interest rate has positive effect in Pakistan and India that shows that high inflation rate in Pakistan and India removes the benefit of interest rate and volatility in foreign portfolio investment increases that goes against the Hymer (1976). Increase in domestic stock market reduces foreign portfolio investment volatility. Significance of domestic stock markets shows the approval of literature but opposite signs of China and Pakistan follow the study of Gordon and Gupta (2003), while the results of India and Srilanka are in accordance with Çulha

(2006). Based on these findings, we can conclude that foreign portfolio investment volatility is affected by macroeconomic factors and improvement in factors may reduce the foreign portfolio investment volatility.

Policies relating to development of stock market structure, improving the country infrastructure, strengthening institutions and reduction in the instability in country's macroeconomic factors would reduce the volatility in foreign portfolio investment that would bring more foreign investment in country. Thus, this study would help regulators, policy makers to make policies in context of stabilizing macroeconomic structure of the country. The future studies may be conducted to differentiate between pull and push factors to get more insight about differing results because of different types of macroeconomic environments and economic policies. Other macroeconomic factors can be added to shed more light on variations in FPI.

Refrences

Abdelhafidh, S. (2013). Potential financing sources of investment and economic growth in North African countries: a causality analysis. *Journal of Policy Modeling*, *35*, 150–169.

Agarwal, R. (1997). Foreign portfolio investment in some developing countries: a study of determinants and macroeconomic impact. *Indian Economic Review*, *32*, 217–229.

Agbloyor, E. K., Abor, J., Adjasi, C. K., & Yawson, A. (2013). Exploring the causality links between financial markets and foreign direct investment in Africa. *Research in International Business and Finance*, *28*, 118–134.

Ahmed, T., & Malik, S. U. (2012). Determinants of inflow of foreign direct investment (FDI) into pakistan. *NICE Research Journal*, *5*, 93–110.

Bekaert, G., Harvey, C.R. (1998).Capital flows and the behavior of emerging market equity returns. *Graduate School of Business*, 1–81.

Bleaney, M., & Greenaway, D. (2001). The impact of terms of trade and real exchange rate volatility on investment and growth in sub-saharan Africa. *Journal of Development Economics*, *65*, 491–500.

Broner, F. A., Rigobon R. (2004). Why are capital flows so much more volatile in emerging than in developed countries? (pp. 1–23). Working Paper.

Bollerslev, T. (1986). Generalized autoregressive conditional heteroscedasticity. Journal of econometrics, 31, 307-327.

Broto, C., Diaz-Cassou, J., & Erce-Dominguez, A. (2011). Measuring and explaining the volatility of capital flows toward emerging countries. *Journal of Banking Finance*, *35*, 1941–1953.

Carrieri, F., Errunza, V., & Majerbi, B. (2006). Does emerging market exchange risk affect global equity prices?. *Journal of Financial and Quantitative Analysis*, *41*, 511–540.

Chakrabarti, R. (2001). FII flows to India: nature and causes. *Money Finance*, *2*, 61–84.

Choong, C.-K., Baharumshah, A. Z., Yusop, Z., & Habibullah, M. S. (2010). Private capital flows, stock market and economic growth in developed and developing countries: a comparative analysis. *Japan and the World Economy*, *22*, 107–117.

Chuhan, P., Claessens, S., Maming, N. (1993). Equity and bond flows to Asia and Latin America: the role of global and country factors (pp. 1–44). Policy Research Working Papers.

Çulha, A. A. (2006). A structural VAR analysis of the determinants of capital flows into Turkey. *Central Bank Review*, *2*, 11–35.

Darby, J., Hallett, A. H., Ireland, J., & Piscitelli, L. (1999). The impact of exchange rate uncertainty on the Level of investment. *The Economic Journal*, *109*, 55–67.

Daude, C., Fratzscher, M. (2006). The pecking order of cross-border investment. (pp. 1–54). Working paper series.

Easterly, W., Islam, R., & Stiglitz, J. E. (2001). Shaken and stirred: explaining growth volatility. In Annual World Bank conference on development economics, 191–211.

Ersoy, i (2013). The role of private capital inflows and the exchange market pressure on real exchange rate appreciation: the case of turkey. *South African Journal of Economics*, *81*, 35–51.

Eun, C. S., & Resnick, B. G. (1988). Exchange rate uncertainty, forward contracts, and international portfolio selection. *The Journal of Finance*, *43*, 197–215.

Ferreira, M. A., & Laux, P. A. (2009). Portfolio flows, volatility and growth. *Journal of International Money and Finance*, *28*, 271–292.

Froot, K. A., O'Connell, P. G., & Seasholes, M. S. (2001). The portfolio flows of international investors. *Journal of Financial Economics*, *59*, 151–193.

Froot, K. A., & Stein, J. C. (1991). Exchange Rates and foreign direct investment: an imperfect capital markets approach. *The Quarterly Journal of Economics*, *106*, 1191–1217.

Ghura, D., & Goodwin, B. (2010). Determinants of private investment: a cross-regional empirical investigation. *Applied Economics*, *32*, 1819–1829.

Gordon, J., Gupta, P. (2003). Portfolio flows into india: do domestic fundamentals matters? (pp. 1–38). IMF Working Paper.

Gozgor, G., & Erzurumlu, Y. O. (2010). Causality relations Between foreign direct investment and portfolio investment volatility. *Middle Eastern Finance and Economics*, *8*, 170–178.

Hansen, P. R., Lunde, A. (2001). A comparison of volatility models: does anything beat a GARCH(1,1)? (pp. 1–51). Working Paper Center for Analytical Finance.

Hymer, S. (1976). *The international operations of national firms: a study of direct foreign investment*, *14*. Cambridge, MA: MIT Press139–155.

Iyer, K. G., Rambaldi, A. N., Tang, K. K. (2003). An empirical search for linkages between foreign direct and portfolio investment in Australia (pp. 1–33). Working Paper Annual Australasian Macroeconomics Workshop.

Kodongo, O., & Ojah, K. (2012).The dynamic relation between foreign exchange rates and international portfolio flows: evidence From Africa's capital markets. International Review of Economics and Finance, 24, 71–87.

Kraay, A. (1998). In search of the macroeconomic effects of capital account liberalization. The World Bank Group, 1–23.

Lee, K. S., & Yoon, S. (2007). Interrelationships and volatility of the financial asset prices under capital flows: the case of Korea. *Economic Modelling, 24, 386–397.*

Levchenko, A. A., & Mauro, P. (2007). Do some forms of financial flows help protect against "sudden stops"?. *The World Bank Economic Review, 21, 389–411.*

Levine, R. (1997). Financial development and economic growth: views and agenda. *Journal of Economic Literature, 35, 688–726.*

Lipsey, R. E. (1999). The role of foreign direct investment in international capital (pp. 307-362). NBER Working Paper.

Mody, A., Taylor, M. P., & Kim, J. Y. (2001). Modelling fundamentals for forecasting capital flows to emerging markets. *International Journal of Finance and Economics, 6, 201–216.*

Mushtaq, R., Shah, S. Z., Rehman, M. Z., Murtaza, G. (2011). The relationship between stock market volatility and macroeconomic volatility: evidence from Pakistan (pp. 1–34). Working Paper.

Neumann, R. M., Penl, R., & Tanku, A. (2009). Volatility of capital flows and financial liberalization: do specific flows respond differently?. *International Review of Economics and Finance, 18, 488–501.*

Ramey, G., & Ramey, V. A. (1994). Cross-country evidence on the link between volatility and growth. The American Economic Review, 85, 1138–1151.

Rai, K., & Bhanumurthy, N. R. (2004). Determinants of foreign institutional investment in India. *The role of return, risk and inflation. The Developing Economics, 42, 479–493.*

Salahuddin, M., & Islam, M. R. (2008). Factors affecting investment in developing countries: a panel data study. *The Journal of Developing Areas, 42, 21–37.*

Santis, R. A., & Luhrmann, M. (2009). On the determinants of net international portfolio flows: a global perspective. *Journal of International Money and Finance, 28, 880–901.*

Sarno, L., & Taylor, M. P. (1999). Hot money, accounting labels and the permanence of capital flows to developing countries: an empirical investigation. *Journal of Development Economics, 59, 337–364.*

Thapa, C., & Poshakwale, S. S. (2010). International equity portfolio allocations and transaction costs. *Journal of Banking Finance, 34, 2627–2638.*

Vita, G. D., & Kyaw, K. S. (2008). Determinants of capital flows to developing countries: a structural VAR analysis. *Journal of Economic Studies, 35, 304–322.*