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ARTICLE

Investor Sentiments and Exchange Rate Volatility

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Abstract

In this paper, we have investigated the role of investor sentiments on the exchange rate volatility in our emerging market. In the past there were many studies that tried to capture the impact of investor sentiments on the stock market returns but the exchange rates are also one of the important economic indicators and is frequently used as the stock market returns and interest rates etc, so we have tried to see the impact of investor sentiments on the exchange rate volatility. The data has been collected from International Monetary Fund website, Karachi Stock Exchange for stock returns and for the purpose to collect various sentimental proxies to measure sentimental index. Also we have not collected exchange rate data in relation to a single base currency rather we have selected a basket of currency i.e., SDR composing mainly of currencies like US dollar, Japanese Yen, Swiss Franc, Pound and Mexican Lira. For empirical testing we have used the sentiment equation mainly composing of six sentimental proxies that are dividend premium, number of initial public issues in a single year, closed end mutual fund discount, first day return on initial public offering, share turnover in Karachi Stock Exchange and equity share in total equity and long term debt issuance. We have run regression on the exchange rate volatility and independent variable was investor sentiment that we have used described above. Before that we also had applied Augmented Dickey Fuller test to check the stationarity and we have applied first differencing to make the time series stationary as in the first level place the series was unit root. Final results confirmed that the investor sentiments did explain the volatility in the exchange rates although the impact is low suggesting that there may be many other factors that explains the variation in the exchange rates.

Introduction

The foreign exchange market is among one of the most active financial markets having sheer volume of trading all over the world. As a result many of the past researchers have paid due attention on the foreign exchange market to examine the questions regarding speculative efficiency. The volatility in the stock exchanges is attributed to the two major yet somewhat contradictory reasons. According to some researchers the major swings in the exchange rates is attributable to the changes in fundamentals where as others argue that sentiments or anomalies of the investors also play major role in these swings in the exchange rates (Froot and Thaler 1990).

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The uncovered interest parity i.e. the difference between expected currency depreciation and interest differential implies that the interest differential is an estimate of the future exchange rate change.

The impact of investor sentiments on the stock market and exchange rate volatility has been given importance with the advent of behavioral finance as much of the variance in stock markets and exchange rates is explained by these investor sentiments. In this paper we will try to find whether these sentiments of the investors affect the exchange rate volatility or not. We will use the investor sentiment index that uses six sentimental proxies on which the data has been collected mainly from the Karachi Stock Exchange. Exchange rate volatility will be calculated and regressed with the sentimental equation discussed above as the independent variable. This study will help us to find out the extent to which these sentiments influence the changes in the exchange rates.

Problem Statement

With the increase in international trading, the volatility in the exchange rates has increased to a large extent due to the fundamental as well as behavioral aspect thus raising the importance of sentiments that causes volatilities in the exchange rates.

Research Questions

- To what extent volatility in exchange rate is explained by the investor sentiments
- To highlight the most explanatory sentimental proxies that play crucial role in exchange rate volatility.

Literature Review

With the development of real time information system and reduction in the transaction costs, daily foreign exchange turnover and the volatility in the foreign exchange rates has increased sharply. The increasing level of this foreign exchange turnover shows the large number of small transaction indicating the speculative behavior (Westerhoff 2001).

Economics has a very different perspective especially from the social sciences in a sense that most of the behavior of the agents can be assumed as they make rational decisions and well defined preferences that are very much consistent with the preferences prevailing in the market whereas on the contrary, much of the empirical studies suggest that it is difficult to rationalize (Froot and Thaler 1990).

The debate that either exchange rates are correctly priced or not is very much important as it effects the prices of all the foreign assets, goods and factors of production and also if the argument of Nurske is considered valid that the speculation in the foreign exchange market drives the prices from the fundamental values then the argument for intervention might be considered quite strong in the foreign exchange market (Froot and Thaler 1990). According to Yu (2011), investor sentiments have significant powers in explaining the returns on the foreign exchange. Talking about the irrational approach, an associated term is noise trader approach which says that that not all investors are rational so thus on the whole limiting the arbitrage possibilities, therefore

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suggesting that the shifts in the resulting sentiments cause high exchange rate volatility (Westerhoff 2001).

Besides taking the role of investor sentiments, many of the past researches have taken into account factors like macro economic variables, heterogeneous expectations and central bank interventions to model exchange rate dynamics but much little research has been conducted in measuring the impact of market sentiment indicator on the exchange rate volatility (Brauchler 2005). Many of the researches have also focused on the central bank's interventions on the volatility of the exchange rates and as a result of which, many studies have tried to find out the channels through which such intervention might be possible as much of the literature admits that central bank often intervene covertly in the foreign exchange market (Hung 1995).

In the case where the dynamics are dominated by the strategies that are trend followed, leaning against the wind which in case would be the central bank will reduce the volatility of the exchange rates, otherwise when the fundamentalists do not know by themselves the fundamental values of the exchange rates, the leaning against the wind approach will increase the exchange rate volatility (Westerhoff 2001). There have also been opposing views regarding the sterilized intervention on the exchange rate volatility as according to some policy makers such intervention helps to lower volatility whereas on the contrary some analysts suggests that such interventions only create uncertainty and thus volatility (hung 1995). Country specific risks are sometimes thought to play an important role in shaping the behavior of the country's macro economic variables particularly the exchange rates (Huang and Suchada 2003).

In normal setting if the intervention strategies are used to reduce the volatility, then in certain circumstances the shrewdness of such strategies may determine the effectiveness of such strategies and in such a setting where noise trading is efficient in foreign exchange market, the authorities may use the strategies that enhances the volatility to manage the exchange rate level (hung 1995). According to Baker and Wurgler (2006), investor sentiments do represent significant power in predicting the foreign exchange rates and also returns on the foreign exchanges. Noise traders have a major role in the disruption in regularity of the rational investors as their non fundamental knowledge makes it more risky for the arbitrager, thus having noise impact on the stock market returns and vice versa. These noise traders have no sophisticated or specialized knowledge and their emotions play a major role in their investment decisions in stock markets (Glaser et al 2009).

Many studies in the behavioral finance area tried to bring to surface proxies for investor's sentiments that were thought to play a significant role in investor's decision making regarding the stock returns but in making a comparative analysis of the techniques able to predict stock returns and behaviors, majority of them did not succeed (Lahmiri 2011). Both the associated variables i.e., the true expected growth rate and the sentiments (misperceived growth rate) have sufficient explanatory powers in predicting the changes in the exchange rates. High true expected growth rates predicts lower spot rate in the future whereas high sentiments predicts higher future spot rates

Regression analysis in which both the investor sentiments and forward premium are included to explain the variation in the foreign exchange returns showed greater fitness of model

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than does the model in which only forward premium was included as the explanatory variable suggesting that investor sentiments contain information that is not explained by the forward premium (Yu 2011). According to Friedman (1953), as speculators buy low and sell high, This activity ensures that the exchange rates reflect the long term determinants or fundamental currency values, whereas Nurske (1944) suggests that foreign exchange speculation is destabilizing, therefore excess volatility imposes more costs on producers and eventually on consumers as well resulting in decisions that are less efficient allocative (Froot and Thaler 1990).

Hypothesis

Ho: There is no significant relationship between investor sentiments and exchange rate volatility

Research Methodology

As identified in the literature, there can be many proxies that can be included in the sentimental index and many of the previous researchers used different proxies according to their understanding having major impact on stock market returns. In this study six sentimental proxies have been included with permission in the investor sentimental index that has been developed by Shah in unpublished work and these are number of initial public offerings in a year, first day returns on these initial public offerings, closed end fund discount, dividend premium, equity/debt ratio and average daily turnover in Karachi Stock Exchange.

The above mentioned proxies have been included by different researchers in measuring the impact of these proxies. According to Baker et al (2009), low long term returns are suggestive of perfect market timings relative to the market index. Initial public offerings are the number of initial public offerings made during a year. Returns on initial public offerings are the average first day returns on these IPO's during the year. According to Baker and Wurgler (2006), initial public offerings earn sometimes remarkable returns that it becomes very much difficult to define the role of investor's enthusiasm behind it. According to Finter et al (2010), the return on the initial public offering is defined as the difference between the IPO's offer price and the initial price of the stock at the first trading day. Closed end fund discount is defined as the difference between the net asset value of the closed end mutual funds and their market price. The closed end fund discount proxy has been defined by many of the past researchers including Baker and Wurgler (2006), Neal and Wheatley (1998) and Lee, Shleifer and Thaler (1991). According to these researchers, disproportionally holding the closed end mutual funds, the average value of closed end funds may be a sentimental index if the behavior of retail investors is bearish.

Average daily turnover is defined as total volume over the year divided by the total capitalization at the end of the prior year. Baker and Wurgler (2006) defined market turnover as the trading volume divided by the number of shares listed on the stock exchange. We have calculated the turnover of the shares listed on the Karachi Stock Exchange following this definition of Baker and Wurgler (2006).

Divided premium is defined as the difference between the average market to book values of dividend paying and non paying dividend stocks (Baker and Wurgler 2006). An analogy to the dividend premium is volatility premium is also used by Baker et al (2009) which simply defines

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the time when the valuations of the high volatile stocks are high or low as compared to the valuations of the low volatility stocks. Equity to debt ratio has also been used by Baker and Wurgler (2006), and is defined as the proportion of equity issuance to the total equity and long term debt issuance.

The investor sentiment equation resulting from the above mentioned discussion and including all the highlighted proxies is given below.

Sentiment Index = 0.1873DP + 0.5109NOIPO – 0.3960CEMFD+0.3956FDRIPO + 0.4672KSET + 0.4151EQSHARE

Where,
DP=Dividend Premium
NOIPO= Number of initial public issues in a single year
CEMFD= Closed end mutual fund discount
FDRIPO= First day return on initial public offering
KSET= Share turnover in Karachi Stock Exchange
EQSHARE= Equity share in total equity and long term debt issuance

We have applied Factor analysis to formulate this index through Principal Component Analysis and after that we have applied univariate regression to see the impact of this developed Investor sentiment index on the Exchange rate volatility. Also we have used the Augmented Dickey Fuller test to make the time series data of exchange rate stationary and the expression for the ADF is given below.

$$yt = \theta 1yt{-}1 + \theta 2yt{-}2.$$

The above equation represents the DF test of order 2. Our time series became stationary at first level by taking first difference of it. We have applied co integration test to check the short and long term relationship between the investor sentiments and exchange rate volatility. The expression for the co integration test applied on the two time series is given below.

$$T^{-1} \sum_{t=1}^{T} X_t^2 \_ O_p(T)$$

$$T(\hat{\alpha} - \alpha) \_ O_p(1)$$

$$T^{-1} \sum_{t=1}^{T} X_t e_t \_ O_p(1)$$

$$(\hat{\alpha} - \alpha) \_ O_p(T^{-1})$$

Also note that the above expression is for the co integration for the two series that are integrated at order one i.e. AR (1). The co integration test has been applied on these two time series to check the long term relationship between the two time series and also Error correction model has been applied to check the short term relationship as well. Finally we have checked the impulses response of the tow series and it can clearly be seen that the two time series do not

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converge considering the short term span but do have a slight convergence over the longer term although the convergence is at its minimum level.

Data Analysis and Interpretation

Descriptive statistics

Descriptive Statistics	*Number of IPO's*	*Avg. 1st Day Returns on IPO's*	*Avg. Daily Turnover*	*Equity/Debt Ratio*	*Closed End Fund Discount*	*Dividend Premium*
Mean	3.948	14.966	326.166	28.482	3.537	0.905
Standard Error	0.224	0.601	38.976	0.233	0.235	0.011
Median	3.065	15.314	2.137	29.478	2.201	0.935
Mode	2.044	15.314	0.753	28.874	2.201	0.749
Standard Dev	2.570	6.907	447.798	2.674	2.706	0.126
Sample Var.	6.604	47.709	200,523.477	7.148	7.320	0.016
Kurtosis	-0.021	0.109	0.390	-0.669	0.975	-1.099
Skewness	1.119	-0.949	1.210	-0.919	1.343	-0.537
Count	132.000	132.000	132.000	132.000	132.000	132.000

Table I

The above table shows the descriptive statistics of the data that has been analyzed. The data seems quite normal with the average first day returns on IPO's and Equity /Debt ratio along with the dividend premium negatively skewed. Sample variance of average daily turnover seems quite abnormal due to the tremendous increase in its value from 2007 onwards. The resulting regression equation after making the exchange rate stationery is given below.

Regression Equation

$$Y=\alpha + \beta x + \varepsilon$$

Where,

Y=Exchange Rate Volatility

x (Investor's sentiments) = 0.1873DP + 0.5109NOIPO – 0.3960CEMFD+0.3956FDRIPO + 0.4672KSET + 0.4151EQSHARE

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ADF Test Statistics (Levels)

Method	Statistic	Prob.**	sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	1.84714	0.9676	2	261
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	1.04457	0.8519	2	261
ADF - Fisher Chi-square	4.80842	0.3075	2	261
PP - Fisher Chi-square	4.31607	0.3649	2	261

Table II

ADF Test Statistics (First Differences)

Method	Statistic	Prob.**	sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-14.8916	0	2	256
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-12.6812	0	2	256
ADF - Fisher Chi-square	108.119	0	2	256
PP - Fisher Chi-square	150.741	0	2	259

Table III

Before applying regression, we checked the time series for stationarity through the application of Augmented Dickey Fuller test to detect and to remove it. The above table shows that both the time series were non stationery at the first place and had unit root. We have taken first difference of it and then made it stationary and after that we have applied regression to test the model. The above results show that the series after taking first difference is stationary at a high significance level.

Regression Table

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	90.81808	2.173221	41.78963	0.0000
SER01	0.017226	0.003628	4.74733	0.0001
R-squared	0.154855	Mean dependent var		97.53672
Adjusted R-squared	0.147984	S.D. dependent var		19.97621
S.E. of regression	18.43899	Akaike info criterion		8.682682
Sum squared resid	41819.54	Schwarz criterion		8.727935

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Log likelihood	-540.6676	Hannan-Quinn criter.	8.701066
F-statistic	22.53715	Durbin-Watson stat	0.045476
Prob(F-statistic)	0.000006		

Table IV

The above table shows the results of regression that has been applied to show the variance of investor sentiments on the exchange rates. The value of R square is 15.48 percent which shows that almost 16 percent of the variance in the exchange rate is explained by the investor sentiments. F value is 22.53 with more 99.9 percent confidence interval which is highly significant showing that the overall model is fit. The value of regression estimator is 0.017 showing that one percent change in investor sentiment can bring a change of 1.107 times in the exchange rate, keeping the value of constant, i.e., 90.82 in the present case, t value in the above model is 4.75 which is greater than 1.96 and having a significance level of 0.0001. Durbin Watson stats show that the there is a problem of negative autocorrelation in the above model.

So, our null hypothesis that there is no relationship between investor sentiments and exchange rate volatility has been rejected under the results and analysis discussed above, in fact there can be many other sentimental proxies that we have not included and can produce much greater variance in the volatility of the exchange rates. The above conclusions are made on the portfolio theory which states that the movements in the stock market returns produce much variance in the exchange rate volatility and the results confirms the role of sentiments that play an important role in the changes on the exchange rates.

Hypothesized		**Trace**	**0.05**	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None	0.058949	8.055265	15.49471	0.4595
At most 1	0.003168	0.399786	3.841466	0.5272

Trace test indicates no co integration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level

Table V

Hypothesized		**Max-Eigen**	**0.05**	
No. of CE(s)	Eigen value	Statistic	Critical Value	Prob.**
None	0.058949	7.655479	14.2646	0.4148
At most 1	0.003168	0.399786	3.841466	0.5272

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Max-eigenvalue test indicates no co integration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level

Table VI

Both of the above tables show that the application of co integration to show the long term relationship between the two series. Both of the above series were non stationary in the first level and the above test has been applied to find out if the resultant series is stationery or not. The statistics of the above table shows that the series are not co integrating as the level of t stats is less than the critical values in both of the above tables showing that there does not exists any long term relationship between the two time series. The results are also not significant at 95 percent confidence interval.

Co integrating Eq:	CointEq1
GARCH01(-1)	1
SENT(-1)	-0.00133
	-0.00048
	[-2.74963]
C	0.428662

Table VII

In table VII, we have applied vector auto regression model to find that either any short term relationship between the two time series exists or not. Although the results are not much different than the previous results, in one case the result is significant i.e. the relationship of exchange rate volatility seems to converge with sentimental index over a period of time but at very minimal level.

Error Correction	D(GARCH01)	D(SENT)
CointEq1	-0.00426	57.68489
	0.00199	-32.0298
	[-2.13758]	[1.80098]
D(GARCH01(-1))	0.053955	-637.27
	-0.08951	-1437.15
	[0.60278]	[-0.4434]
D(GARCH01(-2))	0.125794	-1532.67
	-0.08862	-1422.87
	[1.41944]	[-1.0777]
D(SENT(-1))	0.00018	-0.14644
	-0.000580	-0.09306
	[-1.87060]	[-1.573]

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D(SENT(-2))	-0.000068	-0.11832
	-0.0000570	-0.09229
	[-1.18635]	[-1.2820]
C	0.001781	7.534585
	-0.00112	-18.0528
	[1.58431]	[0.41736]

Table VIII

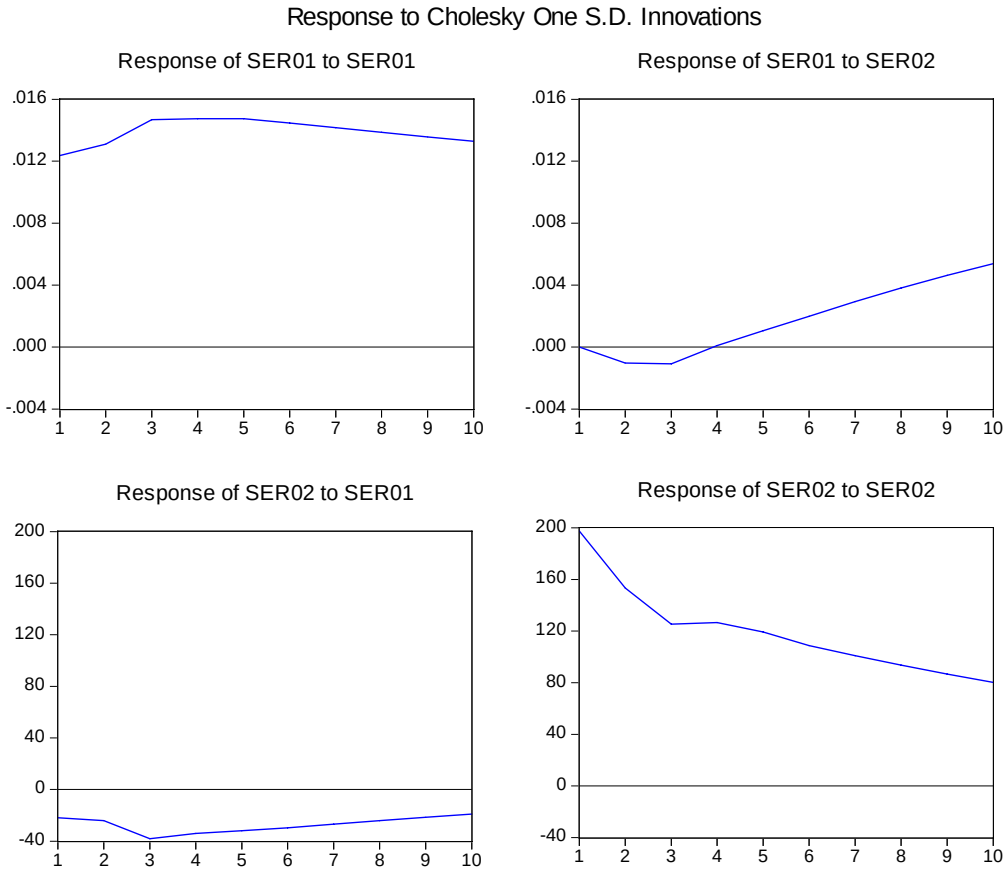

Figure I

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Research Contribution

As far as academic contribution is concerned, there has been many studies that have tried to explain the variations in exchange rate due to the investor sentiments but different sentiments have different roles to play in different forms of market. In this paper we have tried to explain the variations in our emerging market due to the sentiments that have been included in our sentimental index and therefore adding to the general body of knowledge.

Practical contribution is that by taking into consideration the included proxies, investors as well as business that operate globally diversified portfolio or have a global impact on locally operating operations can benefit from the study.

Conclusion

In this paper we have tried to capture the impact of Investor sentiments on the exchange rates. There can be many factors that contribute to the volatility of the exchange rates but in this paper we have only included investor sentiments as an independent variable. The above results show that the investor sentiments do explain the variation in the exchange rates but the extent of variation is not up to greater extent. This means that the other factors do exists that explain further variation in the exchange rate volatility. In testing the long and short term relationship between the two time series, the results were insignificant showing that there does not exist significant relationship in the short as well as in the long term. It means that the proxies that we have taken to measure investor sentiments have an impact directly on the stock market returns but not on exchange rate volatility, although an indirect impact following the portfolio balance theory can be observed with significant statistical results. As we have tried to see the impact of investor sentiments so we can conclude that the in the lights of behavioral finance, the investor sentiments have some explanatory power in explaining the results of the exchange rates. No doubt the extent of variations is not to a greater one suggesting that behavioral aspect is not the only factor and many of the other factors like macro economic factors, central bank intervention, imports and exports and long term government strategies also play an important role in the volatility of the exchange rates. One point worth mentioning here is that the exchange rate system in practice also causes volatility in it for example fixed exchange system constitutes less volatility as compared to the floating exchange rate system. In our market we have managed float system that is also attributable to the less volatility in exchange rates, whereas in pegged exchange rate system the volatility is not subjected to the changes in the economy of the individual country as the country to which the exchange rate is pegged, its economic indicators dictate the volatility in the country's exchange rates.

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