Volatility Analysis of Mutual Funds investment styles in India

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Abstract

This study is on analyzing the effect of volatility on the returns of open ended equity mutual fund investment styles. The empirical methods used for analysis include unit-root tests, GARCH modelling and Granger causality tests. Volatility analysis was done among various investment styles of equity mutual funds viz. large value, large blend, large growth, mid value, mid blend, mid growth, small value, small blend and small growth. The results showed that volatility of large value, large blend, small value and small blend funds was persistent. The Granger causality test was applied to return values for the nine investment styles to analyse the causality among SENSEX and investment styles. The causality test indicated that market returns were independent variable.

Key Words: *Mutual Fund Style, Volatility, Garch; Granger Causality.*

JEL Classification: G11; G12; C11

Introduction

All through the previous decade the world financial market experienced a swift development of emerging stock markets. Studies associated to these markets confirm that equities from emerging stock markets have diverse characteristics than equities from developed stock markets. The key characteristics of emerging market returns are higher sample average return, low correlations with developed market returns, more predictable returns and higher volatility. The mutual fund industry in India is growing at a tremendous speed. Volatility is a variant of the diverse patterns of time series data, in particular the financial data (Engle, 2004). Volatility regularly appears in the beta testing based on time series data. This is because the financial time series data is exceptionally of high volatility.

From an investment point of view, information about how the returns of distinct classes or portfolios of mutual funds behave over time ought to be important. Specifically, forecasts of asset return volatility are vital for the usage of

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of asset allocation models and for the measurement of fund performance.

2. Literature review

The present study explores volatility as an important variable in analyzing mutual fund returns. According to Busse (1999) when volatility is high, fund decreases exposure of the market. Nafees(2013) evaluated the level of risk in the returns of mutual funds in Pakistan. The study analysed risk in capital market portfolio, closed end mutual funds index and open end mutual funds index in the course of traditional risk measures such as standard deviation, beta and alpha along with ARCH and GARCH models. The results determined from statistical measures and ARCH and GARCH also illustrate that closed end funds were more risky than open end and capital market.

Samuel Kyle Jones(2011) analyzed return volatility of portfolios of mutual funds having similar investment objectives.

Consistent with preceding research on individual mutual funds, the occurrence of significant GARCH effects was found in these portfolios. Brown(2011) developed a holdings-based statistic to determine the volatility of a fund's style characteristic summary over the period and showed that, on average, funds with lesser levels of style volatility notably outperform more style volatile funds on a risk-adjusted basis. The research also showed that style volatility had a distinct impact on future fund performance compared with fund expenses or past risk-adjusted returns and archive that the level of accidental style volatility was the primary determinant of the in general outcome. Engle (1982) conducted a study of the variability of the inflation rate in the UK during the years 1958-1977 by with ARCH model. Through this model, Engle compared the estimation results amid the OLS method with ARCH model by maximum likelihood estimation. The findings showed that ARCH model was capable of improving the results of OLS method and obtain a more realistic prediction of variance. Sembiring et al (2016) in their research found that the estimation value obtained Treynor–Mazuy's model indicated prejudice owing to heteroscedasticity problem by using time series data in OLS model. The volatility model that could be used to solve the problems was GARCH (2, 2), which recognized a model with an accurate estimation result. Medeiros (2006) examined the exact relationship between stock returns, return unpredictability and exchanging volume utilizing information from the Brazilian securities exchange. The results indicated that there was a contemporaneous and dynamic relationship between return volatility and trading volume. Furthermore, by applying Granger's test for causality, it was found that return volatility contained information concerning future trading volume and vice versa.

3. Objectives of the study

The current study attempts to measure the volatility of Indian Mutual funds investment styles. The objectives of the proposed study can be defined as under

- To analyse casual relation between SENSEX and mutual funds investment styles.
- To examine the impact of volatility on the investment styles.

4. Research methodology

The study analyzed only equity fund open ended. On the basis of data availability; 221 funds were analyzed for the proposed study

(List of selected open ended equity mutual funds is provided in the appendix of this research study). The time period chosen for the study is ten years i.e. from January 2005 to December 2015 and is based on secondary data collected form Capitaline NAV database. The monthly values for NAV of selected Equity mutual funds scheme were collected for computing return. The proposed study classified all sampled funds into various categories identified in Morningstar Style. All sampled funds were categorized into nine dimensions given in this style i.e., large-cap value (LV), large-cap blend (LB), large-cap growth (LG), mid-cap value (MV), mid-cap blend (MB), mid-cap growth (MG), small-cap value (SV), small cap blend (SB), and small-cap growth (SG).

5. Analysis and interpretation

The monthly return volatility is studied for nine distinct mutual fund investment styles.

5.1 Summary Statistics of monthly returns of mutual fund investment styles: The summary statistics for the returns of each of the six mutual fund portfolios are reported in Table 1.

Table 1 provides descriptive statistics of monthly returns of mutual fund investment styles in India from January 2005 to December 2015. Monthly NAV's were used to calculate the returns. It is evident from the above that there is significant positive mean value for all the investment styles. The highest mean return is found in small value investment style with 2.11 percent. The volatility of a fund style is measured by standard deviation. Less volatility is found in large value investment style 4.64 followed by large blend investment style with 5.84. Small growth investment style has the highest volatility with 7.09. The returns of large value, large growth, mid value, mid growth and small growth investment style are skewed to the right. The kurtosis of the normal distribution is 3. In the descriptive table kurtosis exceeds 3 indicating that the

Table 1: Summary Statistics of monthly returns of mutual fund investment styles

Indices	Large value	Large blend	Large growt	Mid value	Mid blend	Mid growth	Small value	Small blend	Small growth
Mean	1.31	1.85	1.62	1.84	1.75	1.74	2.11	1.76	1.71
Median	0.00	1.86	0.49	1.68	1.37	1.80	1.91	1.47	1.73
Maximum	13.01	15.20	33.07	27.83	27.95	31.70	26.55	31.05	34.98
Minimum	-11.50	-20.27	-23.18	-22.26	-20.79	-23.98	-23.50	-24.38	-24.62
Standard	4.64	5.84	6.45	6.36	6.70	6.79	6.03	6.69	7.09
Skewness	0.07	-0.37	0.37	0.03	-0.01	0.06	-0.33	-0.02	0.18
Kurtosis	3.05	3.78	7.66	5.63	4.71	6.17	6.50	6.38	6.97
Jarque-Bera	0.14	6.51	122.75	38.12	16.09	55.46	70.71	62.67	87.50
Probability	0.93	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00

(source: author's own interpretation)

distribution is peaked (leptokurtic) relative to the normal. Jarque-Bera is a test statistic for testing whether the series is normally distributed. The test statistic measures the difference of the skewness and kurtosis of the series with those from the normal distribution. Jarque-Bera statistics is high in all the indices, which means that the null-hypothesis of normal distribution of return in selected indices rejected

Table 2: Result of Granger Causality among Sensex and mutual fund investment styles

Null Hypothesis:	Obs	F-Statistic	Prob.
SENSEXRETURNS does not Granger Cause LARGEVALUE_RETURN	130	1.72460	0.1825
LARGEVALUE_RETURN does not Granger Cause SENSEXRETURNS		1.37963	0.2555
SENSEXRETURNS does not Granger Cause LARGEBLEND_RETURN	130	2.96047	0.0554
LARGEBLEND_RETURN does not Granger Cause SENSEXRETURNS		3.53146	0.0322
SENSEXRETURNS does not Granger Cause LARGEGROWTH_RETURN	130	0.01904	0.9811
LARGEGROWTH_RETURN does not Granger Cause SENSEXRETURNS		2.04941	0.1331
SENSEXRETURNS does not Granger Cause MIDVALUE_RETURN	130	0.59534	0.5529
MIDVALUE_RETURN does not Granger Cause SENSEXRETURNS		1.35323	0.2622
SENSEXRETURNS does not Granger Cause MIDBLEND_RETURN	130	0.51611	0.5981
MIDBLEND_RETURN does not Granger Cause SENSEXRETURNS		1.07163	0.3456
SENSEXRETURNS does not Granger Cause MIDGROWTH_RETURN	130	0.44815	0.6398
MIDGROWTH_RETURN does not Granger Cause SENSEXRETURNS		1.79718	0.17
SMALLVALUE_RETURN does not Granger Cause SENSEXRETURNS	130	2.92581	0.0573
SENSEXRETURNS does not Granger Cause SMALLVALUE_RETURN		2.65672	0.0741
SMALLBLEND_RETURN does not Granger Cause SENSEXRETURNS	130	2.73361	0.0689
SENSEXRETURNS does not Granger Cause SMALLBLEND_RETURN		0.45136	0.6378
SMALLGROWTH_RETURN does not Granger Cause SENSEXRETURNS	130	1.77021	0.1745
SENSEXRETURNS does not Granger Cause SMALLGROWTH_RETURN		0.40266	0.6694

(H0: there is no significant Causality between Sensex and mutual fund investment styles.
H1: there is significant Causality between Sensex and mutual fund investment styles.)
(source: author's own interpretation)

5.2 Granger Causality Test: The finding of co-integration testing do not indicate the direction of relationship among selected investment styles, Granger causality test is performed to examine the casual relationship among these styles. If two variables are co integrated, Granger causality must exist at least in one direction. The Granger causality approach seeks to determine how much of a current variable Y, can be explained by past values of Y and lagged values of another variable X. The Granger causality test is applied to return values for the nine investment styles.

Table 2 presents the output of the test, which includes calculated F Statistics and the probability for each pair of the market index and investment style. If the probability of non – causality is less than 0.05, the hypothesis of non – causality is rejected implying that the casual relationship exists. Findings of Granger causality test show clearly that the causality in terms of co – dependencies on each other's lagged indices runs from Sensex i.e. market index and investment styles. The causality test indicates that market returns are independent variable.

5.3 Arch and Garch Interpretation: The most ordinarily utilized monetary models to quantify unpredictability are the non-straight ARCH and GARCH models. the ARCH model (Engle, 1982) speaks to one of the modalities through which a marvel of this nature can be parameterized. A characteristic expansion of the ARCH(q) model is the GARCH display. The GARCH model has been created freely by Bollerslev (1986) and Taylor (1986).) and Taylor (1986). This model allows the conditional variance to be dependent upon previous own lags. In academic literature a GARCH(1,1) model is considered to be sufficient in capturing the development of the volatility.

In table 3, the auto correlation exists in the

Table 3: Auto correlation Test results

Investment Style	F-statistic	Obs*R-squared	Prob. F(2,129)	Prob. Chi-Square (2)
Large Value	2.35	4.64	0.10	0.10
Large Blend	2.05	4.07	0.13	0.13
Large Growth	3.62	7.01	0.03	0.03
Mid Value	3.50	6.79	0.03	0.03
Mid Blend	1.95	3.88	0.15	0.14
Mid Growth	2.81	5.51	0.06	0.06
Small Value	1.69	3.38	0.19	0.18
Small Blend	2.39	4.71	0.10	0.09
Small Growth	2.79	5.47	0.07	0.07

Significance of P value at 5%
(source: author's own interpretation)

result series of all the investment styles except in large growth and mid value (prob.0.03<0.05). After applying auto correlation, Hetroskedasticity Test has been applied of ARCH affects on residuals. Table 4 shows that hetroskedasticity exists in the time series of all the small value investment styles as the probability values are less than 5%. Thus the disturbance term has volatile clustering. In case of other investment styles, the null hypothesis of hetroskedasticity test of residual cannot be rejected that errors are homoscedastic because p value is above than 5% level of significance.

The volatility is determined from the variance equation coefficient. The GARCH test has been applied to generalize the volatility. In case of large value and large blend investment style, variance equation has p value 0.01 which shows the effect of volatility clustering. Thus the null hypothesis of homoscedasticity stands rejected. The coefficient of variance equation denoted by (a+b) determine the level of volatility. The level of volatility for large value and large blend funds is 0.85.This indicates that volatility exists in these investment styles. In case of mid blend funds level of volatility is 0.94. It is closer to one so volatility is quite persistent. The volatility of small value funds is persistent at 1 while small blend funds level of volatility is 0.96.

The null hypothesis cannot be rejected in case of large growth (p=0.24), mid value (p= 0.28), mid growth (p=0.23) and small growth (p=0.38) as P value is above 5% level of significance. Thus GARCH effect does not exist in these investment styles.

6. Conclusion

The study evaluates volatility of mutual funds investment styles in India from January 2005 to December 2015 through ARCH, GARCH and other statistical techniques. Volatility analysis was done among various investment styles of equity mutual funds viz. large value, large

Table 4: Hetroskedasticity Test: ARCH results

Index Name	F-statistic	Obs*R-squared	Prob. F(2,129)	Prob. Chi-Square (2)
Large Value	0.40	0.40	0.53	0.53
Large Blend	0.72	0.72	0.40	0.39
Large Growth	4.04	3.98	0.05	0.05
Mid Value	0.76	0.76	0.39	0.38
Mid Blend	1.22	1.23	0.27	0.27
Mid Growth	2.57	2.56	0.11	0.11
Small Value	5.15	5.03	0.02	0.02
Small Blend	2.70	2.69	0.10	0.10
Small Growth	1.82	1.83	0.18	0.18

Significance of P value at 5%
(source: author's own interpretation)

Table 5: GARCH test results variance equation

Index Name	Variable	Coefficient	Std. Error	t-Statistic	Prob.
Large Value	RESID(-1)^2	0.09	0.11	0.86	0.39
	GARCH(-1)	0.76	0.31	2.48	0.01
Large Blend	RESID(-1)^2	0.12	0.11	1.08	0.28
	GARCH(-1)	0.73	0.28	2.57	0.01
Large Growth	RESID(-1)^2	0.47	0.12	3.87	0.00
	GARCH(-1)	0.23	0.19	1.19	0.24
Mid Value	RESID(-1)^2	0.37	0.11	3.27	0.00
	GARCH(-1)	0.25	0.23	1.08	0.28
Mid Blend	RESID(-1)^2	0.13	0.09	1.53	0.13
	GARCH(-1)	0.81	0.12	6.57	0.00
Mid Growth	RESID(-1)^2	0.44	0.11	3.87	0.00
	GARCH(-1)	0.28	0.24	1.21	0.23
Small Value	RESID(-1)^2	0.17	0.06	2.91	0.00
	GARCH(-1)	0.83	0.06	12.95	0.00
Small Blend	RESID(-1)^2	0.17	0.09	2.00	0.05
	GARCH(-1)	0.79	0.11	7.33	0.00
Small Growth	RESID(-1)^2	0.48	0.11	4.22	0.00
	GARCH(-1)	0.16	0.18	0.87	0.38

Significance of P value at 5%
(source: author's own interpretation)

blend, large growth, mid value, mid blend, mid growth, small value, small blend and small growth. The results showed that volatility of large value, large blend, small value and small blend funds was persistent. The Granger causality test was applied to return values for the nine investment styles to analyse the causality among SENSEX and investment styles. The causality test indicated that market returns were independent variable. The research is only conducted on open ended equity mutual funds from January 2005-December, 2015. As such further research can be conducted on close ended funds for further analysis.

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