IIMS Journal of Management Science
Vol. 7, No. 2, May-August, 2016, pp- 156-164

IndianJournals.com
DOI: 10.5958/0976-173X.2016.00014.2

Comparative Study of Graham Harvey Measure of Portfolio Performance over Sharpe Ratio

Suyash Bhatt

ABSTRACT

In this paper, we have calculated Graham Harvey measures for top 10-equity linked saving scheme (ELSS) funds in India according to their asset under management. ELSS funds are selected as they have more than 95% composition of equity component and lock-in a period of 5 years. Graham and Harvey in their research paper discuss the methodology to predict market timing to alter their investments for portfolio managers. They introduced two new performance measures for a portfolio. Both measures provide different relative performance valuation, with respect to market index's return–risk. Sharpe ratio, although a useful metric, suffers lack of benchmarking information. Sharpe ratio is absolute measure of performance. As the Graham–Harvey research is based on long-term prospect of the portfolio investment, ELSS funds are taken for research. The performance of ELSS funds has been evaluated with the help of Graham and Harvey measure and Sharpe ratio. Our finding suggests that Graham and Harvey measures are superior to Sharpe ratio for performance grading. Because of paucity of time and resources, the paper research is limited to evaluating performance of ELSS funds for period of April 2007 to December 2012 using Graham Harvey measure.

Keywords: Mutual funds, Investment performance, Alpha, Beta, Standard deviation, *R* squared, Sharpe ratio, Treynor ratio and Jensen's alpha

JEL Classification Codes: G11, G12

Biographical Note: Dr. Suyash Bhatt is working as Associate Professor Finance at Prin. L. N. Welingkar Institute of Management Development and Research, Mumbai, India. He can be reached at suyash.bhatt@welingkar.org

INTRODUCTION

Graham and Harvey have developed two measures to make up for two problems encountered with the Sharpe ratio. First, the estimates are not precise enough when fund volatilities are too different. Second, the calculation of the Sharpe ratio is made assuming that the risk-free rates are constant and not correlated to risky asset returns. The two measures provide different perspectives. The first measure (GH1) is obtained by drawing an efficient frontier using a reference index and cash. This results in a hyperbola as the variations of short-term interest rates are correlated with market return. Searching for the point with the same volatility as the fund under analysis and calculating the difference between the return of this portfolio and that of the portfolio being analysed provides us with the GH1 measure. The second measure (GH2) is obtained by searching for the set of portfolios that combines a given fund with cash. The difference between the return of the portfolio with the same volatility as the market index and the market index return provides us with the GH2 measure. The GH2 measure is similar to the

M^2 measure proposed by Modigliani and Franco (1997). However, Modigliani and Modigliani do not allow for curvature in the efficient frontier. That's, they assume that the cash return has zero variance and zero covariance with other assets.

ELSS Funds

Equity Linked Saving Scheme (ELSS) is a type of diversified equity mutual fund, which is qualified for tax exemption under Section 80C of the Income Tax Act, and offers the twin-advantage of capital appreciation and tax benefits. It comes with a lock-in period of 5 years. ELSS funds are one of the best avenues to save tax under Section 80C. This is because along with the tax deduction, the investor also gets the potential upside of investing in the equity markets. Also, no tax is levied on the long-term capital gains from these funds. Moreover, compared to other tax saving options, ELSS has the shortest lock-in period of 5 years. There are two types of ELSS in the market:

1. Growth: under the growth fund, you do not receive any income during the tenure of the investment. All you get is a lump sum amount at the time of maturity. Suppose if you invested Rs. 100,000 in January 2009 then you'll get Rs. 120,000 in December 2012.
2. Dividend: Under the dividend fund, you get dividend from the equities you had invested in thorough ELSS. It can further be of two types:

   2a. Dividend received: Under this scheme, you can get whatever dividend is declared and entire dividend received is tax free.

   2b. Dividend reinvested: Under this arrangement, the dividend that is payable to you is reinvested along with the principal and you get the benefit of compounding. At the time of maturity, the entire amount given to you is tax free.

Reasons of Selecting ELSS Funds for GH Risk Adjusted Measurement

- As the fund composition has equity more than 95%, the funds enable us to benchmark its performance based on market index's returns and volatility.
- ELSS funds have lock-in period of 5 years; hence, sentiment levels are for longer periods; so the GH measures necessarily look for long period that is minimum 5 years, this funds are most apt to ensure proper reproducibility of research.

LITERATURE REVIEW

Graham and Harvey (1996) analysed the advice contained in a sample of 237 investment newsletter strategies over 1980–1992. Each newsletter strategy recommends a mix of equity and cash. They find no evidence that letters systematically increase equity weights before market rises or decrease weights before market declines. Though there is no information in the newsletter strategies about future market returns, they document that disagreement among the newsletters is correlated with future realised and implied volatility.

Graham and Harvey (2001) in their study present new evidence on the distribution of the *ex ante* risk premium based on a multi-year survey of Chief Financial Officers (CFOs) of U.S. corporations. Currently, they have responses from surveys conducted from the second quarter of 2000 through the third quarter of 2001. The results in this paper will be augmented as future surveys become available. They find direct evidence that the 1-year risk premium is highly variable through time and 10-year expected risk premium is stable. In particular, after periods of negative returns, CFOs significantly reduce their 1-year market forecasts; disagreement (volatility) increases and returns' distributions are more skewed to the left. They also examine the relation between *ex ante* returns and *ex ante* volatility. The relation

between the 1-year expected risk premium and expected risk is negative. However, our research points to the importance of horizon. They find a significantly positive relation between expected return and expected risk at the 10-year horizon.

Gürsoy and Erzurumlu (2001) in their article attempt to measure performances of Type A and Type B funds relative to T-Bill rates and ISE-100 index in Turkey over the period of January 1998–June 2000 using Sharpe, Treynor, Jensen and Graham & Harvey indices. 55 Type A and 77 Type B funds were included in the analysis. To test whether four different indices make similar ranking, Spearman rank correlation analysis was utilised. Second, Wilcoxon signed-rank test was applied to test the significance of the differences in Sharpe indices of alternative investment instruments included in the analysis. Analysis revealed that different criteria rank the portfolios similarly. But more importantly, it was found that the best investment over the entire analysis period as well as in the sub-periods was T-Bills, which was followed by ISE-100 index, Type B funds and Type A funds, respectively. This finding makes the merits of the efforts spent by funds managers, over the analysis period, to outperform the market highly questionable.

DATA COLLECTION AND ANALYSIS

To estimate the performance of the ELSS funds by Graham Harvey's measure, we need to plot the efficient frontier locus of return–risk graph. Hence, the initial step is to plot the efficient frontier locus. The original paper took period of 1983–1995 for research. We would be taking 5-year period from 2nd April 2007 to 31st December 2012 for our analysis.

To apply the research in Indian context, we would be using CNX500 as benchmark index for calculating market returns and volatility. For risk-free return, we have used 10-year government bond yield. The original paper has considered benchmark index as S&P 500 and risk free as 30-day T-bill. The original research is based on monthly observations; hence, we have used monthly observations for parameters like index, bond-yield and net asset value (NAV) of fund.

Calculation of Annualised Annual Return and Annualised Standard Deviation

Market Returns and Volatility

We have averaged the yearly returns of the CNX 500 (Period: 2nd April 2007 to 31st Dec 2012) to find the annualised annual return. For annualised standard

Table 1: Annualised standard deviation and average annual return for bond yield, CNX 500 and 10 ELSS funds

Reference	Annualised standard deviation	Average annual return (%)
CNX 500	0.071842162	21.6766
10 Yr Govt Bond	0.035020966	7.8663
SBI Magnum Tax Gain (G)	0.061807648	19.3328
HDFC Tax Saver (G)	0.063159507	22.1558
Reliance Tax Saver (ELSS) (G)	0.058102419	21.1508
ICICI Pru Tax Plan (G)	0.066673393	24.1564
Sundaram Tax Saver (G)	0.06372148	12.7820
UTI Master Equity Plan (US)	0.053926677	13.6903
L&T Tax Advantage (G)	0.072650775	15.6245
Franklin India Tax Shield (G)	0.060188161	21.6460
HDFC Long-Term Advantage (G)	0.058688152	19.8258
Birla SL Tax Relief 96 (D)	0.074706491	22.5567

Source: Author.

deviation, we have first calculated the monthly returns for the period. Standard deviation of the monthly returns of the year gives the volatility for the year. Finally, average of volatility for 5 years gives annualised standard deviation (Table 1).

Calculation of GH Measure #1

The idea of Graham–Harvey 'measure 1' (GH1) is to lever or un-lever the CNX 500 (market return–risk point) to have the exact same volatility as the fund over the evaluation period. GH1 is the difference between the fund return and the return on the volatility-matched futures portfolio. In Figure 1, a strategy that unnerves the CNX 500 (by combining the CNX 500 with the government bond to match the volatility of fund A) has a much higher return than fund A. Hence, GH1 for fund A is negative indicating underperformance. Fund B achieves greater performance than a levered S&P 500 position and receives a positive GH1. To keep it simple, the fundamentals of levering and un-levering are to draw perpendicular segment from return–risk point of the fund to the efficient frontier locus. The intersection point will give returns of the market at the volatility of the fund. The difference between the annualised average return and market return at the intersection point yields Graham Harvey measure 1, which is shown in Figure 1.

Graham Harvey Measure 1

Over the evaluation period, measure 1 just draws an efficient frontier using the CNX 500 & 10 Yr. Government Bond and checks to see if the fund lies above or below this constructed frontier. The volatility

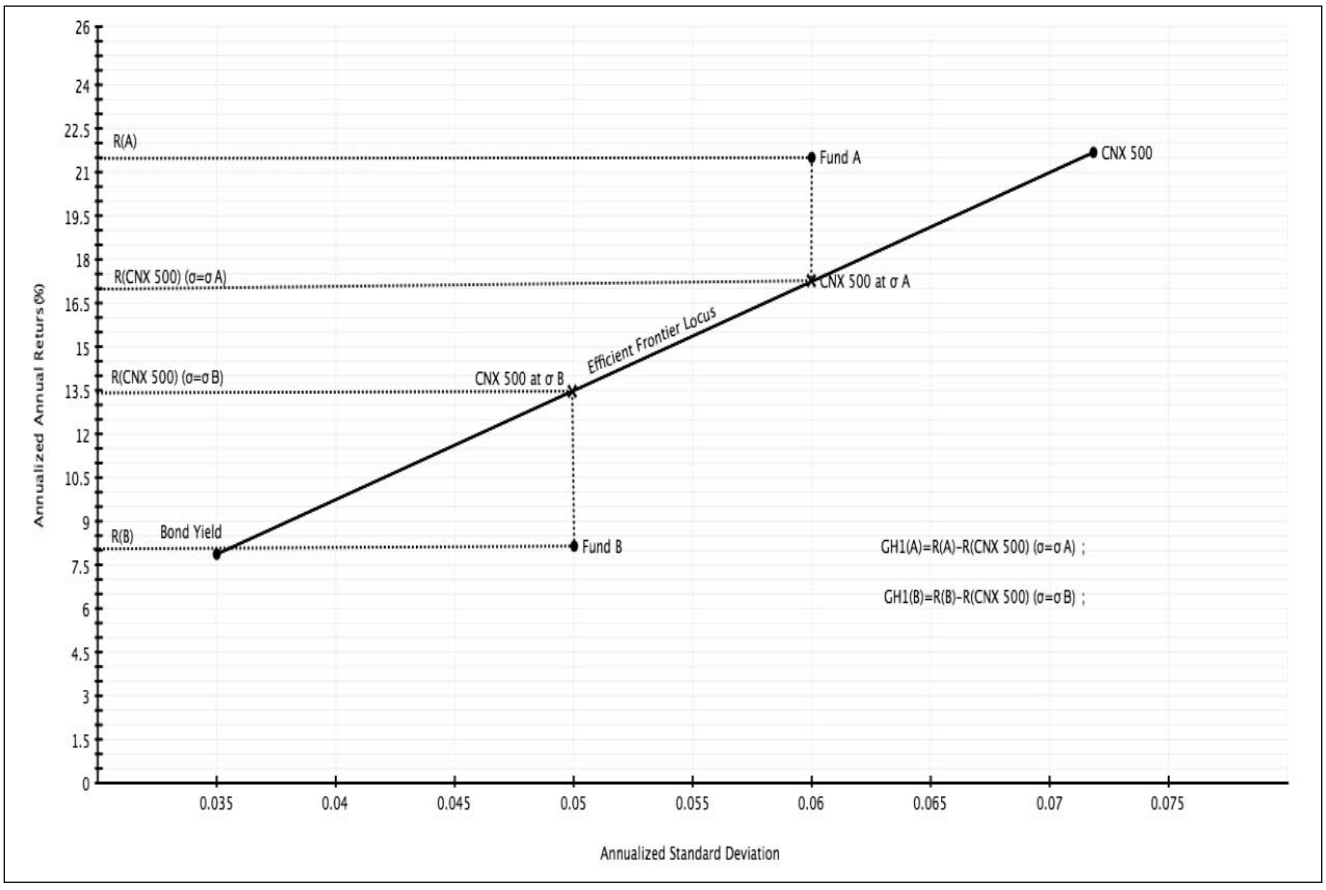

Figure 1: Annualised average return and market return at the intersection point yields

matching approach displayed in the figure compares the fund return to that for a volatility-matched benchmark over the exact same sample period (Table 2).

Calculation of GH Measure #2

For Graham Harvey measure#2, we lever up or down the fund's return, so that it has exactly the same volatility as the CNX 500. Figure 2 shows the geometry of this measure. Fund A is levered up to achieve the same volatility as the CNX500 over the evaluation period as it has a lower average return. Hence, the GH2 measure is negative. In contrast, if we lever fund B downwards to achieve the same volatility as the CNX 500, the unlevelled fund return is greater than CNX 500 and the performance measure is positive. Procedurally, we connect Risk free point with fund's (return–risk) point. From market CNX 500 point, we drop a perpendicular segment to this line. The coordinate of intersection point is noted. The difference in returns of intersection point and CNX 500 is Graham Harvey measure #2.

Measure 2 compares all funds to a common level of volatility – the S&P 500 buy-and-hold volatility. All funds are on the same footing with GH2. The only potential disadvantage of GH2 is that it assumes the investor has the ability to lever an investment fund return to have the same volatility as the market (Table 3).

Sharpe Ratio Calculation

Here, we calculate the Sharpe ratio for 10 ELSS funds. Sharpe ratio is equal to the difference between fund/portfolio return and risk free rate divided by volatility of the fund/portfolio (Table 4).

ANALYSIS

Performance evaluation using Graham Harvey measures

In the previous section, we found GH measure 1 and 2. The sum of these measures is indicator of their performances over the observation period. The fund that has the maximum sum is the top grade-performing fund. The least GH sum indicates low performing fund (Table 5).

Table 2: Graham–Harvey measure #1 calculation for the 10 ELSS funds

ELSS funds	Intersection point projected on the efficient frontier locus		Annualised average returns (%)	Graham Harvey's measure #1 = annualised average return - intersection point return on efficient frontier locus
	Annualised standard deviation	Annual return point (%)		
SBI Magnum Tax Gain (G)	0.062	17.900	19.333	0.0143
HDFC Tax Saver (G)	0.063	18.450	22.156	0.0371
Reliance Tax Saver (ELSS) (G)	0.058	16.820	21.151	0.0433
ICICI Pru Tax Plan (G)	0.067	19.420	24.156	0.0474
Sundaram Tax Saver (G)	0.064	18.670	12.782	-0.0589
UTI Master Equity Plan (US)	0.054	14.940	13.690	-0.0125
L&T Tax Advantage (G)	0.073	21.970	15.625	-0.0635
Franklin India Tax Shield (G)	0.060	17.290	21.646	0.0436
HDFC Long-Term Advantage (G)	0.059	16.716	19.826	0.0311
Birla SL Tax Relief 96 (D)	0.075	22.960	22.557	-0.0040

Source: Author.

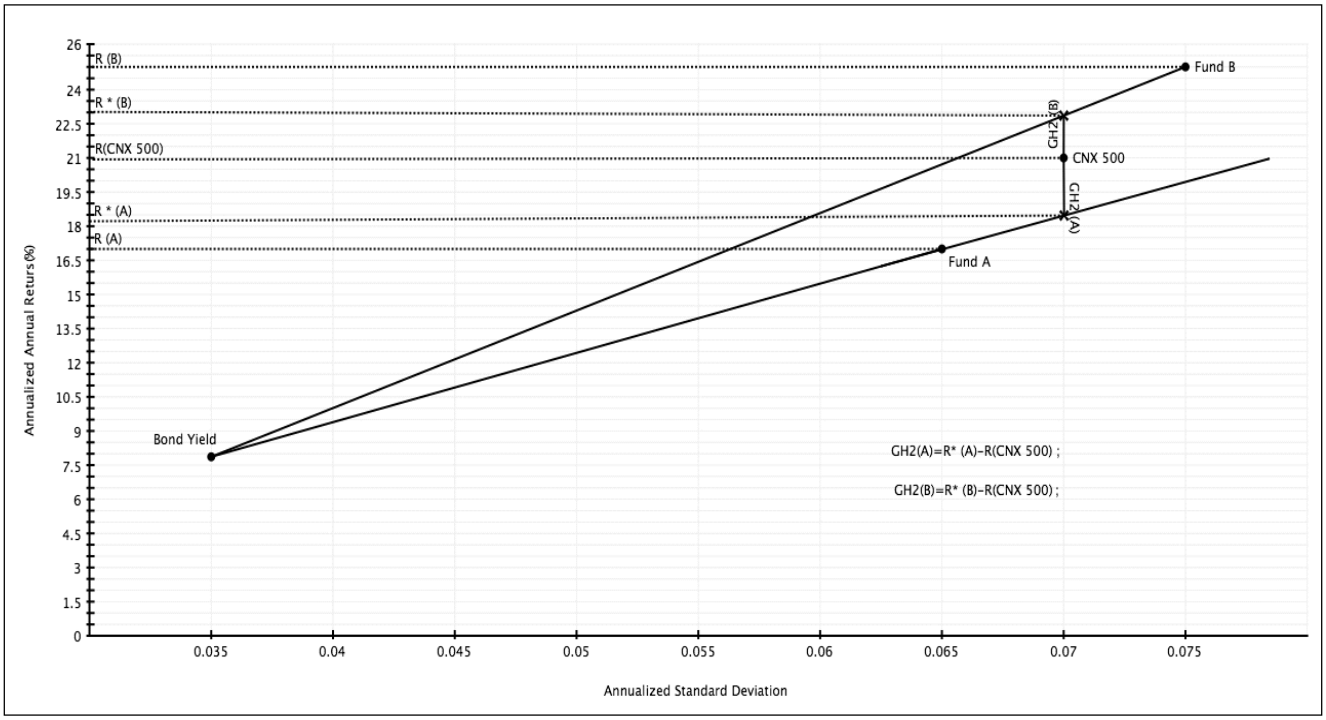

Figure 2: GH measure#2 levers up or down the fund's return

Table 3: Graham–Harvey measure #2 calculation for the 10 ELSS funds

ELSS funds	Intersection point		CNX 500 annualised average returns (%	Graham Harvey's measure #2 = intersection point return - CNX 500 annualised average returns
	Annualised standard deviation	Annual return point (%)		
SBI Magnum Tax Gain (G)	0.07184	23.902	21.6766	0.0223
HDFC Tax Saver (G)	0.07184	26.480	21.6766	0.0480
Reliance Tax Saver (ELSS) (G)	0.07184	29.269	21.6766	0.0759
ICICI Pru Tax Plan (G)	0.07184	29.487	21.6766	0.0781
Sundaram Tax Saver (G)	0.07184	14.272	21.6766	-0.0740
UTI Master Equity Plan (US)	0.07184	19.722	21.6766	-0.0195
L&T Tax Advantage (G)	0.07184	15.442	21.6766	-0.0623
Franklin India Tax Shield (G)	0.07184	28.308	21.6766	0.0663
HDFC Long-Term Advantage (G)	0.07184	27.246	21.6766	0.0557
Birla SL Tax Relief 96 (D)	0.07184	21.098	21.6766	-0.0058

Source: Author.

ICICI Prudential Tax Plan (G) has the highest sum of GH measures, whereas Sundaram Tax Saver has the least score. ICICI Prudential Tax Plan (G) is the top performing fund, whereas Sundaram Tax Saver (G) is the lowest performing fund.

For comparison, let's use Sharpe ratio of performance. The metric is the excess return on the fund divided by its volatility. In the return–risk graph, the Sharpe ratio is the slope of a line originating at the risk-free and passing through the average annual return of a

Table 4: Sharpe ratio for 10 ELSS funds

ELSS funds	Annualised standard deviation	Average annual return (%)	Risk free rate (10 yr government bond) (%)	Sharpe ratio
SBI Magnum Tax Gain (G)	0.061807648	19.3328	7.860	1.856214822
HDFC Tax Saver (G)	0.063159507	22.1558	7.860	2.263444919
Reliance Tax Saver (ELSS) (G)	0.058102419	21.1508	7.860	2.287469332
ICICI Pru Tax Plan (G)	0.066673393	24.1564	7.860	2.44421367
Sundaram Tax Saver (G)	0.06372148	12.7820	7.860	0.772423973
UTI Master Equity Plan (US)	0.053926677	13.6903	7.860	1.081151895
L&T Tax Advantage (G)	0.072650775	15.6245	7.860	1.068748453
Franklin India Tax Shield (G)	0.060188161	21.6460	7.860	2.290476047
HDFC Long-Term Advantage (G)	0.058688152	19.8258	7.860	2.038877595
Birla SL Tax Relief 96 (D)	0.074706491	22.5567	7.860	1.967259426

Source: Author.

Table 5: The sum of GH measures along with ranking

ELSS funds	GH1	GH2	GH sum	Ranking based on GH measure
SBI Magnum Tax Gain (G)	0.01433	0.02225	0.03658	6
HDFC Tax Saver (G)	0.03706	0.04803	0.08509	5
Reliance Tax Saver (ELSS) (G)	0.04331	0.07592	0.11923	2
ICICI Pru Tax Plan (G)	0.04736	0.07810	0.12547	1
Sundaram Tax Saver (G)	-0.05888	-0.07405	-0.13293	10
UTI Master Equity Plan (US)	-0.01250	--0.01955	-0.03204	8
L&T Tax Advantage (G)	-0.06345	-0.06235	-0.12580	9
Franklin India Tax Shield (G)	0.04356	0.06631	0.10987	3
HDFC Long-Term Advantage (G)	0.03110	0.05569	0.08679	4
Birla SL Tax Relief 96 (D)	-0.00403	-0.00579	-0.00982	7

Source: Author.

particular fund. A high Sharpe ratio means investors are getting more average return per unit of volatility than they would with lower ratio (Table 6).

Although the Sharpe ratio is useful metric, it does not reveal the same type of information as GH1. In particular, the Sharpe ratio does not tell us what an investor could have achieved. In other words, Sharpe ratio is hard to evaluate without a reference point. Roughly speaking, GH1 is related to the difference between the Sharpe ratio of fund and Sharpe ratio of the market. (The GH1 measures, however, differ from the Sharpe ratios in that they account for the curvature in the efficient frontier and make comparison based on matched volatility). Two Newsletters can have the same Sharpe ratio, even if one lies above the efficient frontier and the other below it. In contrast, GH1 always assigns a positive score to a fund lying above the frontier and a negative score to one lying below it. Given that the efficient frontier is usually thought of as line dividing the line between good and bad performance, the ability to make this distinction is a very desirable property (Table 7). (GH2 has an analogous property.)

Table 6: Ranking based on Sharpe ratio

ELSS funds	Sharpe ratio	Ranking based on Sharpe ratio
SBI Magnum Tax Gain (G)	1.856214822	7
HDFC Tax Saver (G)	2.263444919	4
Reliance Tax Saver (ELSS) (G)	2.287469332	3
ICICI Pru Tax Plan (G)	2.44421367	1
Sundaram Tax Saver (G)	0.772423973	10
UTI Master Equity Plan (US)	1.081151895	8
L&T Tax Advantage (G)	1.068748453	9
Franklin India Tax Shield (G)	2.290476047	2
HDFC Long-Term Advantage (G)	2.038877595	5
Birla SL Tax Relief 96 (D)	1.967259426	6

Source: Author.

The Sharpe ratio for Birla SL Tax Relief 96 (D) is 1.967 which is greater than SBI magnum tax gain (G) 1.856. Thus, Birla's ranking is superior to SBI. However, if you observe GH measures, SBI Magnum Tax gain (G) has positive measures indicating it's above the efficient frontier locus. The Birla SL Tax Relief 96 (D) has negative measures lying below the efficient frontier locus. GH measure therefore captures the information of the benchmark comparison, in which Sharpe ratio fail to capture. Second observation, only four fund's performance rank is same according to the Sharpe and GH measures. The rest rank differs due to lack of input information while computing Sharpe ratios. This can be evaluated by finding Spearman's rank correlation between Sharpe and GH measure.

CONCLUSION

The proposed two measures for evaluating the performance of portfolio are tested in this paper. The first measure compares fund's returns with that CNX 500's return for the same volatility of that the fund. The second measure adjusts the fund's volatility to that of the CNX 500's volatility. The difference in the returns on the volatility-adjusted strategy and the CNX 500 defines measure 2.The first measure is for timing equity weights in the portfolio, whereas the second measure is for volatility timing. Because of no access to the internal equity weight composition for individual fund, the research on weight timing has been excluded from the project scope. Difference in performance ranking based on Sharpe ratio and GH measures is due to lack for benchmark information in Sharpe ratio. Correlation between them presented evidence that the new measures are superior to the Sharpe ratio.

Table 7: GH measures and Sharpe ratio in a single table

ELSS funds	Sharpe ratio	Ranking based on sharpe ratio	GH1	GH2	GH sum	Ranking based on GH measure
SBI Magnum Tax Gain (G)	**1.856**	**7**	**0.01433**	**0.02225**	**0.03658**	**6**
HDFC Tax Saver (G)	2.263	4	0.03706	0.04803	0.08509	5
Reliance Tax Saver (ELSS) (G)	2.287	3	0.04331	0.07592	0.11923	2
ICICI Pru Tax Plan (G)	2.444	1	0.04736	0.07810	0.12547	1
Sundaram Tax Saver (G)	0.772	10	-0.05888	-0.07405	-0.13293	10
UTI Master Equity Plan (US)	1.081	8	-0.01250	-0.01955	-0.03204	8
L&T Tax Advantage (G)	1.069	9	-0.06345	-0.06235	-0.12580	9
Franklin India Tax Shield (G)	2.290	2	0.04356	0.06631	0.10987	3
HDFC Long-Term Advantage (G)	2.039	5	0.03110	0.05569	0.08679	4
Birla SL Tax Relief 96 (D)	**1.967**	**6**	**-0.00403**	**-0.00579**	**-0.00982**	**7**

Source: Author.

GH measures which are new performance measures are related to traditional performance measure. The alpha from CAPM **(Capital Asset Pricing Model)** represents the extra return of the fund earns over and above a position with a fixed average market exposure. This formulation is closely related to that of GH1, in which the market variance is adjusted to have the same variance as the fund. In the GH1, however, the benchmark will be constructed to have exactly the same volatility as fund. In the CAPM, the benchmark portfolio/fund (beta times the market index) will have a different volatility from the fund. Using the CAPM, the fund volatility equals beta times the standard deviation of the market index return (the benchmark) plus the standard deviation of the idiosyncratic return. In contrast, GH1 exactly matches the total volatility of the portfolio.

REFERENCES

Chance, D.M. and Hemler, M.L. (2001). The performance of professional market timers: daily evidence from executed strategies. *Journal of Financial Economics,* Vol. 6, No. 2, pp. 377–411.

Graham, J.R. and Harvey, C.R. (1996). Market timing ability and volatility implied in investment newsletters' asset allocation recommendations. *Journal of Financial Economics,* Vol. 42, No.3, pp. 397–421.

Gürsoy, C.T. and Erzurumlu, Y.Ö. (2001). Evaluation of portfolio performance of Turkish investment funds. *Doðuþ Üniversitesi Dergisi,* Vol.4, pp. 43–58.

Graham, J.R. and Harvey, C.R. (2001). Expectations of Equity Risk Premia, Volatility and Asymmetry from a Corporate Finance Perspective (No. w8678). National Bureau of Economic Research.

Modigliani, Franco (1997). Risk-Adjusted Performance. *Journal of Portfolio Management* 1997 (Winter), pp. 45–54.