



PERFORMANCE OF INVESTMENT AVENUES: AN INDEPTH ANALYSIS USING VARIOUS MEASURES

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Abstract:

Investment benefits both the economy and the society. It is an outgrowth of economic development and the maturation of modern capitalism. In this current scenario, Investment plays a vital role in one's life. In order to face few problems in the future (i.e.) uncertainty, one has to make investment. Investment is the sacrifice of certain present value for the uncertain future income/ reward. Investment is always a challenging part for the investors because high risk of investment results with high profit. Thus, it is interesting and make to feel as reward for waiting for return.

Investment avenues selected for the study are Mutual Fund (Axis Midcap Fund Growth), HDFC Gold Exchange Traded Fund (HDGO), Infosys Ltd ADR (INFY), BSE Sensex, Gold, Silver, US Dollar, Crude Oil, Government Bonds Index

Objectives of the study are to evaluate the performance of selected alternative investments using performance analytical measures and to study the investors' preferences towards the investment based on ranks. The study is based on empirical research relying on secondary data. Major sources of the data are from official websites. Descriptive and inferential statistics have been used. The secondary data has been collected for a period of ten years from March 2011 to March 2021. For this present study, researcher has used risk free rate of return is 3.865%, Minimum Acceptable Return is 5.5% and benchmark return is BSE Sensex. The data was tabulated, analysed and interpreted to elicit meaningful conclusion. R programme is used extensively to use performance analytics.

It is concluded that in overall performance measures, Mutual Fund secures the first rank followed by Gold, BSE sensex, USD, ADR, Silver, Crude oil, Bond index and ETF respectively. Mutual Fund stands top in almost all performance measure models except regression analysis. It is followed by Gold, BSE sensex and USD respectively.

Keywords: M&A, Mutual Fund, HDFC Gold Exchange Traded Fund, Infosys Ltd ADR, BSE Sensex, Gold, Silver, US Dollar, Crude Oil and Government Bonds Index.

Introduction:

Savings form an important part of the economy of any nation. With the savings invested in various options available to the people, the money acts as the driver for growth of the country. Indian financial scene too presents a plethora of avenues to the investors. Though certainly not the best or deepest of markets in the world, it has reasonable options for an ordinary man to invest his savings.

Investment benefits both economy and the society. It is an outgrowth of economic development and the maturation of modern capitalism. For the economy as a whole, aggregate investment sanctioned in the current period is a major factor in determining aggregate demand and hence, the level of employment. In the long term, current investment determines the economy's future productive capacity and, ultimately, a growth in the standard of living. By increasing personal wealth, investors can contribute to higher overall economic growth and prosperity. The process of investing helps to create financial markets where companies can raise capital. This too, contributes to greater economic growth and prosperity. Specific types of investments provide other benefits to society as well.

Investors are a heterogeneous group, they may be large or small, rich or poor, expert or layman and not all investors need equal degree of protection (Mayya, 1996). An investor has many objectives in general but in particularly while investing his money, namely safety of invested money, liquidity position of invested money and return on investment. The return on investment may further be divided into capital gain and the rate of return on investment as interest or dividend. An investor may be an individual or corporate legal entity investing funds with a view to derive maximum economic advantage from investment such as rate of return, capital appreciation, marketability, tax advantage and convenience of investment.

In this current scenario, Investment plays a vital role in one's life. In order to face few problems in the future (i.e.) uncertainty, one has to make investment. Investment is the sacrifice of certain present value for the uncertain future income/ reward. Investment is always a challenging part for the investors because high risk of investment results with high profit. Thus, it is interesting and make to feel as reward for waiting for return. Investment is just investing money into some resources with the expectation of capital appreciation, dividends and earnings as interest etc. Risk and return is always associated with each other. Investment means conversion of cash or money into high return in future. The risk-taking attitude is measured through selection of investment avenues.

Statement of the problem:

Investment, even a small portion of amount from savings can produce considerable profit for a long period. So, the investors should be aware of investment avenues and have to select a correct path in investing. How much to invest? Where to invest? is the confusing area for the investor. The investor should be careful while investing. So, the present study is very essential and helps to identify the preferences of investor in investment and investment avenues available for investment. Hence an attempt has been made to study “**PERFORMANCE OF INVESTMENT AVENUES- AN INDEPTH ANALYSIS USING VARIOUS MODELS**”. This helps the policy makers and investors to make right investment keeping in view returns and risk factors while designing an investment policy. This study will immediately help the all stakeholders.

Need for the study:

In this modern era, it is a competitive environment, which has a lot of investment avenues provided by both public and private financial organizations. Investors are bit confused to decide in which sector the investment has to be made. Investors also support the economy of a country. A small investment from a single investor helps in growing economy like India. The study analyses the investment options and investment avenues.

Review of literature:

Anand Paul and Christopher (2000), Their study focus on the behaviour and saving patterns, perceptions of the investors relating to the investment patterns. The study focuses on the risk, returns and holding period as the factors relevant to the construction of investment portfolios. There are different types of investors who invest with different objective based on their short term or long-term benefits. But there is an evidence of a growing number of investors who wish to incorporate moral or social concerns in their decision-making.

Brahmabhatt, P.S Raghu Kumari, ShamiraMalekar (2012), Their research try to study the investors' behaviour and its impact on various investment avenues. The study states that investors perception will provide a way to accurately measure how the investors think about the products and services provided by the company.

Clifford Paul S., Joseph Anbarasu D. and Anette Barnabas (2010), study the awareness about Indian investors towards insurance as in investment alternative in Tiruchirapali. The study focuses on awareness of various investment portfolios, its effects, attributes and behavioural pattern. The researcher found that the awareness about insurance is low among investors as compared to other investment alternatives like bank deposits, gold and silver, bonds, mutual funds, real estates, etc.

Dakshayani (2014), has done the detailed study on the awareness and perceptions of investors towards equity as an investment options and other investment alternatives or avenues. The study concludes that mostly investors, who invest in equity market are with the opinion that the investors of stock market are ready to take higher risk to earn higher or sufficient returns on their risky Investments portfolios. The investors prefer to invest in Equity market over any other investment options or alternatives like Fixed Deposits, Mutual Funds, SIP, Gold and Silver, Real Estate, Insurance, etc which gives investor a safe return with minimum risk factor involved.

Dr. Muthumeenakshi M. (2017), the researcher studies on the determinants, features and nature of various investment avenues like security of Principal Amount, Liquidity of Assets, Income Stability, approval and easy transferability or liquidity of investment options. It is concluded that in this fast-moving scenario, one can save extra money by investing smartly only if he or she can bear the risk attributes. More the risk tolerance more is the profit or gain percentage, so various attributes are taken into consideration while planning investments.

Dr. Shobha V. L. and Jayalakshmi J. (2006), in their study have analyzed the level of awareness of investors regarding their various investment options and investment risks associated with it. The analysis reveals that the investment in real estate is mostly preferred by majority of the investors rather than opting for different investment patterns like Bank Deposits, Bonds, Mutual Funds etc. Thus, it has been concluded that the majority of the investors invest in Real Estates, Equity and stock market for higher returns for their risk appetite.

Dr. Suriya Murithi, B. Narayanan and M. Arivazhagan (2012), the study reveals that investors are aware of various investment avenues which are easily available in this competitive world today. The study focuses on the behavioural pattern of various investors and to identify its impact on various investment options or alternatives which are readily available in Indian Market. The investment product portfolios can design in such a manner that it will cater the needs requirements of each investors who actually looks for lower risk factor with minimum returns on it and design different portfolios for those investors who can bear the risk factor to earn higher returns on it in shorter period of span.

Geetha N, & Ramesh M. (2012), the researcher tries to study the awareness and behavioural pattern of investors. The study is conducted to find the relevance of Demographic Factors in Investment Decision. The study reveals that there is significant relationship between the demographic factors such as gender, age, education, occupation, annual income and annual savings with the sources of awareness obtained by the investors.

Jothilingam, Kannan (2013), the detailed study was undertaken to know the awareness of various investors about different investment avenues and the factors that affects the investment patterns while planning investment avenues. The study reveals that various types of investors favour risk-free investment avenues like Gold and Silver, Fixed Deposits and Bank Deposits than taking the risk appetite in investing in investments like Shares, Real Estates, Company Deposits, etc. The study also reveals that investors are not fully aware of investment avenues and investors invest only in risk-free investments with nominal return on it.

Objectives of the study:

- To evaluate the performance of selected alternative investments using performance analytical ratios and
- To study the investors' preference towards the investment based on ranks.

Research Methodology:

The study is based on empirical research relying on secondary data. Major sources of the data are from official websites namely Sebi.gov.in, rbi.gov.in, investing.com, amfiindia.com, bseindia.com, nseindia.com and commodity exchanges. Apart from this, regular newspapers, journals, magazines, and published books have been referred to. Investment avenues considered for the study are Axis midcap mutual fund, HDFC Gold Exchange Traded Fund (HDGO), Silver, Infosys Ltd ADR (INFY), BSE Sensex, Gold, US Dollar, crude oil, government bonds. Descriptive and inferential statistics have been used. The secondary data has been collected for a period of ten years from March 2011 to March 2021. For present study, researcher used risk free rate of return as 3.865% (364 day T-bills), minimum acceptable Return is 5.5% (Term Deposit Rate > 1 Year), and benchmark return is BSE Sensex. The data was tabulated, analysed and interpreted to elicit meaningful conclusion. R version 4.0.5 was used to make use of performance analytics package.

Hypothesis of the study:

H_0 : There are no significant differences among the returns of selected investment avenues.

H_1 : There are significant differences among the returns of selected investment avenues.

Table 1: Descriptive statistics of selected investment avenues

Descriptive statistics	ADR	USD	BI	OIL	GL	SL	ETF	MF	BS
Mean	0.075	0.205	0.117	0.122	0.051	-0.067	0.059	0.051	-0.023
Standard Error	0.005	0.083	0.055	0.128	0.019	0.048	0.099	0.072	0.118
Median	0.072	0.177	0.091	0.045	0.053	-0.079	0.081	-0.003	0.033
Standard Deviation	0.015	0.263	0.173	0.405	0.059	0.151	0.314	0.227	0.372
Sample Variance	0.000	0.069	0.030	0.164	0.003	0.023	0.099	0.051	0.139
Kurtosis	-0.313	0.051	0.359	5.094	-1.862	-0.378	1.532	2.074	6.056
Skewness	0.332	0.901	-0.044	2.049	0.007	-0.251	0.307	1.300	-2.142
Range	0.049	0.766	0.609	1.400	0.160	0.481	1.174	0.773	1.365
Minimum	0.052	-0.106	-0.196	-0.249	-0.024	-0.335	-0.479	-0.208	-0.990
Maximum	0.101	0.660	0.413	1.151	0.135	0.146	0.695	0.565	0.375
Sum	0.748	2.051	1.170	1.219	0.514	-0.670	0.590	0.513	-0.228
Count	10	10	10	10	10	10	10	10	10
CV	0.062	0.406	0.469	1.050	0.364	-0.711	1.685	1.397	-5.175
Growth	-0.058	0.389	-2.233	-2.212	-0.173	-2.127	0.260	0.149	-2.129
S-K	0.644	0.850	-0.403	-3.045	1.869	0.127	-1.225	-0.774	-8.198
CV*S-K	0.04	0.3449	-0.189	-3.198	0.6803	-0.091	-2.065	-1.081	42.426

The highest average rate of return of investment is USD of 20.5% during the study period .It is followed by crude oil of 12.2%, Bond index of 11.7% respectively. Others are less than 10%.

The most consistency investment is 0.062 of ADR followed by gold of 0.364, USD of 0.406 and BI of 0.469 respectively. The rest are inconsistent as they have more than one.

CAGR of USD, ETF and MF have 38.9%,26.9% and14.9% respectively. The risk of other investment avenues under the study are in the range of 0.405 of Crude oil and 0.015 of ADR.

Performance Analytic Measures:

(1) Information Ratio:

Information ratio shows the consistency of the fund manager in generating superior risk adjusted performance. A higher information ratio shows that fund manager has outshined other fund managers and has delivered consistent returns over a specified period. If the information ratio is between 0.4 and 0.6, it is considered to be a good investment and an information ratio between 0.61 and 1 is considered as a great investment. This relates to the degree to which an investment has beaten the benchmark. William Sharpe now recommends Information Ratio preferentially to the original Sharpe Ratio.

$$\text{Information Ratio} = \text{Active Premium}/\text{Tracking Error}$$

or

$$\text{Information ratio} = (R_p - R_b) / \text{Tracking error}$$

R_p = rate of return of the investment portfolio. R_b = Benchmark rate of return.

Tracking error = Standard deviation of the excess return with respect to the benchmark rate of return/The tracking error is calculated as the standard deviation of the difference between fund return and index return.

Table 2: Information Ratio of selected investment avenues

Model	ADR	USD	BI	OIL	GL	SL	ETF	MF	BS
Information Ratio	-0.09	-0.25	-0.68	-0.26	-0.08	-0.27	-0.88	0.55	0.00
Ranks	4	5	8	6	3	7	9	1	2

Mutual Fund investment is the only avenue having positive quotient of Information ratio. Hence, it is considered to be good investment.

(2) Tracking Error:

A measure of the unexplained portion of performance relative to a benchmark. Tracking error is calculated by taking the square root of the average of the squared deviations between the investment's returns and the benchmark's returns, then multiplying the result by the square root of the scale of the returns. A low tracking error means the portfolio is beating the index consistently over time.

$$\text{Tracking Error} = \left[\frac{\sum \{(R_a - R_b)^2\}}{\text{Len}(R_a)} \sqrt{\text{scale}} \right]^{1/2}$$

Table 3: Tracking Error of selected investment avenues

Model	ADR	USD	BI	OIL	GL	SL	ETF	MF	BS
Tracking Error	0.35	0.22	0.27	0.35	0.28	0.27	0.49	0.14	0.00
Ranks	6	3	4	6	5	4	7	2	1

The lowest tracking error beating the index consistently over time is Mutual Fund investment among the selected avenues. It is followed by others ranging from 0.22 of investment in US dollars to 0.49 of investment in ETF.

(3) Kelly Ratio:

Kelly criterion ratio (leverage or beta size) for a strategy. The Kelly Criterion was identified by Bell Labs scientist John Kelly, and applied to blackjack and stock strategy sizing by Ed Thorpe. The Kelly ratio can be simply stated as: "beta size is the ratio of edge over odds." Mathematically you are maximizing log-utility. As such, the Kelly criterion is equal to the expected excess return of the strategy divided by the expected variance of the excess return. Any number above 0.50 is good

$$\text{leverage} = (R_s - R_f) / \text{Std Dev}(R)^2$$

R = Historical Average Win/Loss ratio.

Table 4: Kelly Ratio of selected investment avenues

Model	ADR	USD	BI	OIL	GL	SL	ETF	MF	BS
Kelly Ratio	0.25	1.81	-2.33	0.10	1.38	0.12	-0.22	1.20	1.30
Ranks	5	1	9	7	2	6	8	4	3

Investment in US dollars has the highest leverage/beta size of 1.81 followed by three others viz., gold, BSE Sensex index and mutual fund varying from 1.38 to 1.28. These are considered to be good investment since they are above 0.50.

(4) Martin Ratio:

Martin ratio divides the difference of the portfolio return and the risk-free rate by the Ulcer index. The main ingredients are current price and a prior price which is adjusted with the user defined safe return. Ulcer Index measures the depth and duration of percentage drawdown in price from earlier highs. The greater a drawdown in value, and the longer it takes to recover to earlier highs, the higher the UI. Technically, it is the square root of the mean of the squared percentage drawdown in value. The higher the Martin Ratio, the better the instrument's performance.

$$\text{Martin ratio} = [(R_P - R_f) / \sum_{t=1}^n D_i^2 / n]$$

where R_P is the annualized portfolio return, R_f is the risk-free rate, n is the number of observations of the entire series, D_i is the drawdown since previous peak in period i .

Table 5: Martin Ratio of selected investment avenues

Model	ADR	USD	BI	OIL	GL	SL	ETF	MF	BS
Martin Ratio	0.20	0.74	-0.32	-0.09	1.12	-0.03	-1.15	3.39	1.03
Ranks	5	4	8	7	2	6	9	1	3

Mutual Fund stands the first in ranking of quotient of Martin Ratio. It is followed by investment in gold, BSE sensx, US dollars, and ADR respectively. Rest of them have negative quotient.

(5) Modigliani Ratio:

The Modigliani-Modigliani measure is the portfolio return adjusted upward or downward to match the benchmark's standard deviation. This puts the portfolio return and the benchmark return on 'equal footing' from a standard deviation perspective. This is also analogous to some approaches to 'risk parity' portfolios, which use (presumably costless) leverage to increase the portfolio standard deviation to some target.

$$MMp = E [R_p - R_f] / \sigma_p = SR_p * \sigma_b + E[R_f]$$

where SR_p - Sharpe ratio, σ_b - benchmark standard deviation

Table 6: Modigliani ratio of selected investment avenues

Model	ADR	USD	BI	OIL	GL	SL	ETF	MF	BS
Modigliani	0.07	0.08	-0.08	0.05	0.10	0.05	0.01	0.15	0.00
Ranks	4	3	8	5	2	5	6	1	7

All investment avenues except bond index, are from maximum of 0.15 of Mutual fund to minimum of 0.00 of BSE sensx return.

(6) Net Selectivity:

The Fama's Net Selectivity Measure is an absolute measure of performance. It is given by the annualized return of the fund, deducted the yield of an investment without risk, minus the standardized expected market premium times the total risk of the portfolio under review. Net selectivity is the remaining selectivity after deducting the amount of return require to justify not being fully diversified. If net selectivity is negative, the portfolio manager has not justified the loss of diversification.

A positive high value indicates that the fund has achieved superior returns and investors are benefited out of the selectivity exercised by the fund manager. Net Selectivity can be measured as

$$\text{Net Selectivity} = \text{Selectivity} - \text{Diversification}$$

$$\text{Net selectivity} = \alpha - d$$

where α is the selectivity and d is the diversification

Net selectivity = *Portfolio Return* – *Risk free return* – *Returns due to all risks*

$$\begin{aligned} &= R_p - R_f - (R_m - R_f) - (R_m - R_f) ((\sigma_p \sigma_m) - \beta) \\ &= (R_p - R_f) - (\sigma_p \sigma_m) (R_m - R_f) \end{aligned}$$

Table 7: Net Selectivity ratio of selected investment avenues

Model	ADR	USD	BI	OIL	GL	SL	ETF	MF	BS
Net Selectivity	-0.12	-0.01	-0.17	-0.14	-0.01	-0.09	-0.51	0.04	0.00
Ranks	5	3	7	6	3	4	8	1	2

Mutual Fund is the only investment opportunity containing positive Net Selectivity. Hence, it has superior returns.

(7) Pain Ratio:

Pain ratio divides the difference of the portfolio return and the risk-free rate by the Pain index. The pain ratio compares the added value over the risk-free rate against the depth, duration, and frequency of losses. The pain ratio compares the gains over the risk-free investment against the losses that were suffered to obtain that return. The pain ratio uses the pain index as the key element in measuring capital preservation risk. The higher the number the better. However, there is no hard-and-fast breakpoint above which one can say the ratios are good or bad. One must compare the pain ratio of a manager to the pain ratios of peers or an index to ascertain whether it is relatively better or worse than the alternatives. The pain ratio can exhibit negative values. If the time period analyzed represents a bear market when the investment underperformed the risk-free rate, the pain ratio will be negative. Therefore one shouldn't set hard-target screens that eliminate managers with a negative pain ratio.

$$\text{Pain Ratio} = (\text{AnnRtn}(r_1, \dots, r_2) - (\text{AnnRtn}(c_1, \dots, c_2)) / \text{Pain Index}(r_1, \dots, r_2)$$

$$\text{Pain ratio} = R_p - R_f / \sum_{i=1}^n |D_i|/n$$

where R_p is the annualized portfolio return, R_f is the risk-free rate, n is the number of observations of the entire series, D_i is the drawdown since previous peak in period i

Table 8: Pain Ratio of selected investment avenues

Model	ADR	USD	BI	OIL	GL	SL	ETF	MF	BS
Pain Ratio	0.27	1.77	-0.43	-0.12	3.14	-0.03	-2.78	7.66	2.71
Ranks	5	4	8	7	2	6	9	1	3

Pain ratio of the Mutual fund under study is the highest of 7.66 depicting others ranging from maximum of 2.71 of BSE sensex and minimum of 0.27 of ADR. The rest have negative quotients.

(8) Prospect Ratio:

Prospect ratio is used to penalise loss since most people feel loss greater than gain.

$$\text{Prospect Ratio } (R) = (1/n * \text{sum}(\text{Max}(r_i,0) + 2.25 * \text{Min}(r_i,0)) - \text{MAR}) / \text{Downside Risk}$$

where n is the number of observations of the entire series, MAR is the minimum acceptable return and σ_D is the downside risk

Table 9: Prospect Ratio of selected investment avenues

Model	ADR	USD	BI	OIL	GL	SL	ETF	MF	BS
Prospect ratio	0.21	0.96	-1.06	-0.25	1.11	-0.19	-0.50	2.64	0.95
Ranks	5	3	9	7	2	6	8	1	4

Mutual fund investment option secures the first owning the highest of 2.64 out of other four positive quotient of prospect ratio namely GL, USD, BS and ADR respectively.

(9) Omega Sharpe Ratio:

The Omega-Sharpe ratio is a conversion of the omega ratio to a ranking statistic in familiar form to the Sharpe ratio. Omega-Sharpe ratio is used to subtract the target (or Minimum Acceptable Returns (MAR)) return from the portfolio return and divide it by the opposite of the Downside Deviation.

$$\text{Omega Sharpe Ratio } (R, \text{MAR}) = (R_p - R_t) / -\text{downside potential } (R, \text{MAR})$$

Where R_t is the target return, R_p is the portfolio return

$$R_p - r_t / \sum_{t=1}^n \max(r_t - r_i, 0) / n$$

where n is the number of observations of the entire series

Table 10: Omega Sharpe Ratio of selected investment avenues

Model	ADR	USD	BI	OIL	GL	SL	ETF	MF	BS
Omega Sharpe Ratio	0.71	-0.13	-0.88	0.04	1.09	-0.04	-0.56	4.74	1.75
Ranks	4	7	9	5	3	6	8	1	2

The highest Omega Sharpe quotient of 4.72 is Mutual fund which is far away from following other four positive quotients. The rest are negative quotients.

(10) Sharpe Ratio:

The Sharpe ratio is simply the return per unit of risk (represented by variability). In the classic case, the unit of risk is the standard deviation of the returns.

$$\text{Sharpe Ratio} = (R_x - R_f) / \text{StdDev } R_x$$

The higher the Sharpe ratio, the better the combined performance of "risk" and return. As noted, the traditional Sharpe Ratio is a risk-adjusted measure of return that uses standard deviation.

Table 11: Sharpe Ratio of selected investment avenues

Model	ADR	USD	BI	OIL	GL	SL	ETF	MF	BS
Sharpe Ratio	0.21	0.21	-0.70	0.06	0.37	0.06	-0.17	0.63	0.45
Ranks	4	4	7	5	3	5	6	1	2

The quotient of Sharpe Ratio of investment avenues under study is the maximum of 0.63 of mutual fund to the minimum of 0.06 of crude oil.

(11) Skewness - Kurtosis Ratio:

Skewness-Kurtosis ratio is the division of Skewness by Kurtosis. It is used in conjunction with the Sharpe ratio to rank portfolios. The higher the rate the better. Skewness Kurtosis Ratio (R; MAR)

$$=S/K$$

where S is the skewness and K is the Kurtosis

Table 12: Skewness Kurtosis Ratio of selected investment avenues

Model	ADR	USD	BI	OIL	GL	SL	ETF	MF	BS
Skewness Kurtosis Ratio	0.32	0.00	-0.09	0.08	0.21	0.30	-0.31	0.31	-0.01
Rank	1	6	8	5	4	3	9	2	7

Investment avenues under study do not have quotient of Skewness Kurtosis ratio more than 0.32.

(12) Sortino Ratio:

Sortino proposed an improvement on the Sharpe Ratio to better account for skill and excess performance by using only downside semi variance as the measure of risk. The Sortino ratio is a variation of the Sharpe ratio that differentiates harmful volatility from total overall volatility by using the asset's standard deviation of negative portfolio returns—downside deviation—instead of the total standard deviation of portfolio returns. As a rule of thumb, a Sortino ratio of 2 and above is considered ideal.

Sortino Ratio=(Portfolio Return – Risk Free Rate)/Portfolio Downside Standard Deviation

Table 13: Sortino Ratio of selected investment avenues

Model	ADR	USD	BI	OIL	GL	SL	ETF	MF	BS
Sortino Ratio	0.45	-0.09	-0.66	0.02	0.55	-0.03	-0.23	2.25	0.72
Rank	4	7	9	5	3	6	8	1	2

Sortino ratio is 2.25, the highest of mutual fund followed by 0.72 of BSE sensx, 0.55 of Gold, 0.45 of ADR and 0.02 of crude oil respectively. The rest are negative quotients of Sortino ratio.

(13) Upside Potential Ratio:

The Upside Potential Ratio is a further refinement that better addresses the risk preferences of investors. It is equal to the variation of the returns above a minimum acceptable return divided by the variation of the returns below minimum acceptable returns. Sortino contends that this is a more accurate and balanced portrayal of return potential. The measurement allows a firm or individual to choose investments which have had relatively good upside performance, per unit of downside risk. An upside capture ratio of greater than 100 would indicate that a fund has historically outperformed the market during periods of positive returns, while a number less than 100 would indicate relative underperformance during these periods.

$$UPR = \sum_{t=1}^n (R_t - MAR) / dMAR$$

where as dMAR is the [Downside Deviation](#), The numerator in Upside Potential Ratio only uses returns that exceed the MAR, and the denominator (in [Downside Deviation](#)) only uses returns that fall short of the MAR by default.,

Table 14: Upside Potential of selected investment avenues

Model	ADR	USD	BI	OIL	GL	SL	ETF	MF	BS
Upside Potential	1.72	1.49	0.34	0.64	1.47	1.51	0.29	2.55	0.78
Rank	2	4	8	7	5	3	9	1	6

Upside potential quotient is the highest of 2.55 of mutual fund and the lowest of 0.29 of Exchange traded funds.

(14) Jensen Measure:

Jensen (1968) attempted to measure the absolute performance of fund managers on the basis of predictive ability of selecting undervalued securities or recognizing turning points in markets. Jensen's alpha is calculated by subtracting the expected returns of each fund (as per CAPM model) from its actual mean returns. If the value is positive, then the portfolio is earning excess returns. In other words, a positive value for Jensen's alpha means a fund manager has "beat the market" with their stock-picking skills.

$$\alpha = R_p - [R_f + \beta_p (R_m - R_f)]$$

Where α is alpha, R_p is Portfolio return, R_f is Risk Free Rate, β_p is Portfolio Beta, R_m is Market Return,

Table 15: Jensen Measure of selected investment avenues

Model	ADR	USD	BI	OIL	GL	SL	ETF	MF	BS
Jensen Measure	-0.04	0.03	-0.10	-0.03	0.07	-0.02	-0.29	0.05	0.00
Rank	7	3	8	6	1	5	9	2	4

Gold ranks the first with 0.07 in predictive ability of selecting undervalued securities followed by mutual funds of 0.05, US dollar of 0.03 respectively. Others under study have no ability in earning excess returns.

(15) Calmar Ratio:

The Calmar ratio is the ratio of annualized return over the absolute value of the maximum drawdown of an investment. It is also traditional to use a three-year return series for these calculations. The Calmar ratio is also known as the drawdown ratio. The Calmar Ratio is a risk-adjusted key performance metric for commodity and hedge funds. The higher the Calmar ratio, higher the risk-adjusted returns.

$$\text{Calmar Ratio} = R_p - R_f / \text{Maximum Drawdown}$$

$$\text{Maximum Drawdown} = ((\text{Highest Value} - \text{Lowest Value}) / \text{Highest Value}) * 100$$

Table 16: Calmar Ratio of selected investment avenues

Model	ADR	USD	BI	OIL	GL	SL	ETF	MF	BS
Calmar Ratio	0.28	1.16	-0.12	0.03	0.68	0.08	-0.33	1.71	0.53
Rank	5	2	8	7	3	6	9	1	4

The quotient of Calmar ratio is not more than 1.71 of mutual fund and not less than 0.03 of crude oil. The last others two have negative quotients.

(16) Burke Ratio:

Burke ratio is used to take the difference between the portfolio return and the risk-free rate and divide it by the square root of the sum of the square of the draw downs. To calculate the modified Burke ratio, we just multiply the Burke ratio by the square root of the number of data.

$$\text{Burke Ratio} = (R_p - R_f) / (\text{sqrt}(\text{sum}(t=1..n)(Dt^2)))$$

$$\text{Modified Burke Ratio} = (R_p - R_f) / (\text{sqrt}(\text{sum}(t=1..n)(Dt^2 / n)))$$

Where n is the number of observations of the entire series, d is number of draw downs, R_p is the portfolio return, R_f is the risk free rate and Dt the t^{th} drawdown.

Table 17: Burke ratio of selected investment avenues

Model	ADR	USD	BI	OIL	GL	SL	ETF	MF	BS
Burke Ratio	0.10	0.26	-0.17	-0.04	0.35	-0.02	-0.36	1.07	0.34
Rank	5	4	8	7	2	6	9	1	3

Mutual fund is the only investment having more than one. Rest of them have less than 0.31. Four of them are negative quotient.

(17) Pain Index:

The pain index quantifies the capital preservation tendencies of a manager or index. It measures the depth, duration, and frequency of periods of losses. The pain index attempts to measure the complete scope of losses. It addresses the shortcoming of only looking at maximum drawdown. It measures risk in terms of absolute returns. There is no hard-and-fast rule or breakpoint that separates a good pain index from a bad one. One must compare a manager's pain index against an appropriate benchmark or peer group in order to gain an understanding of whether a manager's pain index is good or bad. It can be said that the lower the number the better. The investor would prefer 1) smaller overall losses, 2) shorter periods of loss, and 3) infrequent losses. All three of these would translate to a smaller pain index. A pain index of zero would represent the best possible outcome, meaning the investment never lost value.

The pain index is the mean value of the draw downs over the entire analysis period. The measure is similar to the Ulcer index except that the draw downs are not squared. Also, it's different than the average drawdown. The numerator is the total number of observations rather than the number of draw downs.

$$\text{Pain index} = \sum_{i=1}^n |Di|/n$$

Where n is the number of observations of the entire series, Di is the drawdown since previous peak in period i

Table 18: Pain Index of selected investment avenues

Model	ADR	USD	BI	OIL	GL	SL	ETF	MF	BS
Pain Index	0.12	0.01	0.27	0.20	0.01	0.23	0.13	0.02	0.02
Rank	3	1	7	5	1	6	4	2	2

Both US dollars and gold investments rank the first since 0.01 are the lowest. It is followed by MF and BSE sensx of 0.02 each, ADR of 0.12, ETF of 0.13, oil of 0.20, silver of 0.23, and bond index of 0.27 respectively.

(18) Total Risk:

The square of total risk is the sum of the square of systematic risk and the square of specific risk. Specific risk is the standard deviation of the error term in the regression equation. Both terms are annualized to calculate total risk.

$$\text{Total Risk} = \sqrt{\text{SystematicRisk}^2 + \text{SpecificRisk}^2}$$

Table 19: Total Risk of selected investment avenues

Model	ADR	USD	BI	OIL	GL	SL	ETF	MF	BS
Total Risk	0.39	0.06	0.14	0.30	0.13	0.22	0.36	0.26	0.00
Rank	9	2	4	7	3	5	8	6	1

Total risk of all investment avenues under study varies from maximum of 0.39 of ADR to minimum of 0.00 BS.

(19) Systematic Risk:

Systematic risk as defined by Bacon (2008) is the product of beta by market risk. Market risk is the standard deviation of the benchmark. The systematic risk is annualized.

$$\sigma_s = \beta * \sigma_m$$

where σ_s is the systematic risk, β is the regression beta, and σ_m is the market risk

Table 20: Systematic Risk of selected investment avenues

Model	ADR	USD	BI	OIL	GL	SL	ETF	MF	BS
Systematic Risk	0.20	-0.04	-0.06	0.02	-0.09	0.02	-0.20	0.23	0.00
Rank	7	4	3	6	2	6	1	8	5

Systematic risk of all selected investment avenues has less than 0.23 expressing conservative investments. The last four of them have negative quotient.

(20) M Squared Excess:

M squared excess is the quantity above the standard M. There is a geometric excess return which is better for Bacon and an arithmetic excess return.

$$M^2 \text{ excess (geometric)} = (1 + M^2) / (1 + b) - 1 \text{ or}$$

$$M^2 \text{ excess (arithmetic)} = M^2 - b$$

Where M^2 is M Squared and b is the benchmark annualised return.

Table 21: M Squared Excess of selected investment avenues

Model	ADR	USD	BI	OIL	GL	SL	ETF	MF	BS
M Squared Excess	-0.05	-0.03	-0.18	-0.07	-0.01	-0.06	-0.21	0.03	0.00
Rank	5	4	8	7	3	6	9	1	2

The only investment avenue having positive is Mutual Fund of 0.03 M Squared Excess quotient.

(21) kappa:

Kappa is introduced by Kaplan and Knowles (2004), Kappa is a generalized downside risk-adjusted performance measure.

It calculates the difference of the mean of the distribution to the target and divides it by the l-root of the lth lower partial moment. To calculate the lth lower partial moment we take the subset of returns below

the target are considered and sum the differences of the target to these returns. This sum is divided by the length of the whole distribution.

For $l=1$ kappa is the Sharpe-omega ratio and for $l=2$ kappa is the sortino ratio. Kappa should only be used to rank portfolios as it is difficult to interpret the absolute differences between kappas. The higher the kappa, the better it is.

Table 22: kappa of selected investment avenues

Model	ADR	USD	BI	OIL	GL	SL	ETF	MF	BS
kappa	0.78	0.05	-0.87	0.09	1.34	0.02	-0.54	5.14	1.95
Rank	4	6	9	5	3	7	8	1	2

The highest kappa ratio of 5.14 of Mutual fund disclosing others ranging from maximum of 1.95 to the minimum of 0.02 of silver.

(22) Appraisal ratio:

Appraisal ratio is the Jensen's alpha adjusted for specific risk. An appraisal ratio is a ratio used to measure the quality of a fund manager's investment-picking ability. This is achieved by comparing the fund's alpha, the amount of excess return the manager has earned over the benchmark of the fund, to the portfolio's unsystematic risk or residual standard deviation. The numerator is divided by specific risk instead of total risk. Modified Jensen's alpha is Jensen's alpha divided by beta. Alternative Jensen's alpha is Jensen's alpha divided by systematic risk.

$$\text{Appraisal ratio} = \alpha / \sigma_{\epsilon}$$

$$\text{Modified Jensen's alpha} = \alpha / \beta$$

$$\text{Alternative Jensen's alpha} = \alpha / \sigma_s$$

Where alpha is the Jensen's alpha, epsilon is the specific risk, S is the systematic risk.

Table: 23: Appraisal ratio of selected investment avenues

Model	ADR	USD	BI	OIL	GL	SL	ETF	MF	BS
Appraisal ratio	-0.13	0.60	-0.72	-0.11	0.76	-0.07	-0.97	0.45	0.00
Rank	7	2	8	6	1	5	9	3	4

Gold investment secures 0.76, the highest appraisal ratio followed by US dollar of 0.60, mutual fund of 0.45 respectively. The rest have negative quotient.

(23) Fama Beta:

Fama beta is a beta used to calculate the loss of diversification. It is made so that the systematic risk is equivalent to the total portfolio risk.

$$\beta_F = \sigma_P / \sigma_M$$

Where σ_P is the portfolio standard deviation and σ_M is the market risk

Table 24: Fama Beta of selected investment avenues

Model	ADR	USD	BI	OIL	GL	SL	ETF	MF	BS
Fama Beta	2.33	0.34	0.87	1.81	0.77	1.31	2.15	1.52	0.00
Rank	9	2	4	7	3	5	8	6	1

Excess of portfolio risk over market risk are in the range of 2.33 of ADR and 0.00 of BSE sensenx. Two of others have are more than two, three of the balance have more than one and the rest are less than one.

Table 25: OVERALL PERFORMANCE OF SELECTED INVESTMENT AVENUES

S.L	Model	ADR	USD	BI	OIL	GL	SL	ETF	MF	BS
A. Risk Measure Models										
1	Sharpe ratio	0.21	0.21	-0.7	0.06	0.37	0.06	-0.17	0.63	0.45
	Rank	4	4	7	5	3	5	6	1	2
2	M Squared Excess	-0.05	-0.03	-0.18	-0.07	-0.01	-0.06	-0.21	0.03	0
	Rank	5	4	8	7	3	6	9	1	2
	Grand Rank	4.5	4	7.5	6	3	5.5	7.5	1	2
B. Regression analysis Model										
1	Jensen's Alpha	-0.04	0.03	-0.1	-0.03	0.07	-0.02	-0.29	0.05	0
	Rank	7	3	8	6	1	5	9	2	4
2	Systematic Risk	0.2	-0.04	-0.06	0.02	-0.09	0.02	-0.2	0.23	0
	Rank	7	4	3	6	2	6	1	8	5
3	Total Risk	0.39	0.06	0.14	0.3	0.13	0.22	0.36	0.26	0
	Rank	9	2	4	7	3	5	8	6	1
4	Appraisal ratio	-0.13	0.6	-0.72	-0.11	0.76	-0.07	-0.97	0.45	0
	Rank	7	2	8	6	1	5	9	3	4
5	Fama Beta	2.33	0.34	0.87	1.81	0.77	1.31	2.15	1.52	0
	Rank	9	2	4	7	3	5	8	6	1
6	Net Selectivity	-0.12	-0.01	-0.17	-0.14	-0.01	-0.09	-0.51	0.04	0
	Rank	5	3	7	6	3	4	8	1	2
	Grand Rank	7.33	2.67	5.67	6.33	2.17	5.00	7.17	4.33	2.83
C. Relative Risk models										
1	Tracking Error	0.35	0.22	0.27	0.35	0.28	0.27	0.49	0.14	0
	Rank	6	3	4	6	5	4	7	2	1
2	Information Ratio	-0.09	-0.25	-0.68	-0.26	-0.08	-0.27	-0.88	0.55	0
	Rank	4	5	8	6	3	7	9	1	2
	Grand Rank	5	4	6	6	4	5.5	8	1.5	1.5
D. Drawdown models										
1	Pain Index	0.12	0.01	0.27	0.2	0.01	0.23	0.13	0.02	0.02
	Rank	3	1	7	5	1	6	4	2	2
2	Calmar Ratio	0.28	1.16	-0.12	0.03	0.68	0.08	-0.33	1.71	0.53
	Rank	5	2	8	7	3	6	9	1	4
3	Burke ratio	0.1	0.26	-0.17	-0.04	0.35	-0.02	-0.36	1.07	0.34
	Rank	5	4	8	7	2	6	9	1	3
4	Martin Ratio	0.2	0.74	-0.32	-0.09	1.12	-0.03	-1.15	3.39	1.03
	Rank	5	4	8	7	2	6	9	1	3
5	Pain Ratio	0.27	1.77	-0.43	-0.12	3.14	-0.03	-2.78	7.66	2.71
	Rank	5	4	8	7	2	6	9	1	3
	Grand Rank	4.6	3	7.8	6.6	2	6	8	1.2	3
E. Downside risk models										
1	Omega Sharpe Ratio	0.71	-0.13	-0.88	0.04	1.09	-0.04	-0.56	4.74	1.75
	Rank	4	7	9	5	3	6	8	1	2
2	Sortino Ratio	0.45	-0.09	-0.66	0.02	0.55	-0.03	-0.23	2.25	0.72
	Rank	4	7	9	5	3	6	8	1	2
3	kappa	0.78	0.05	-0.87	0.09	1.34	0.02	-0.54	5.14	1.95
	Rank	4	6	9	5	3	7	8	1	2
4	Upside Potential	1.72	1.49	0.34	0.64	1.47	1.51	0.29	2.55	0.78

	Rank	2	4	8	7	5	3	9	1	6
5	Skewness Kurtosis Ratio	0.32	0	-0.09	0.08	0.21	0.3	-0.31	0.31	-0.01
	Rank	1	6	8	5	4	3	9	2	7
6	Prospect ratio	0.21	0.96	-1.06	-0.25	1.11	-0.19	-0.5	2.64	0.95
	Rank	5	3	9	7	2	6	8	1	4
	Grand Rank	3.33	5.50	8.67	5.67	3.33	5.17	8.33	1.17	3.83
	Over All Performance	5	4	8	7	2	6	9	1	3

MF is second to none in almost all performance measure models except Regression analysis, followed by Gold, BSE sensex and USD respectively. Hence, Mutual Fund is considered to be the best in risk measure, Relative risk, drawdown and downside risk models.

Hypothesis Testing:

ANOVA						
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	0.5164	9.0000	0.0574	0.9622	0.4766	1.9856
Within Groups	5.3676	90.0000	0.0596			
Total	5.8840	99.0000				

It is evident from ANOVA statistics that there are no significant differences among the returns of selected investment avenues since prob. is 0.4766. It is more than 5% significance level. Hence, null hypothesis is accepted.

Conclusion:

Mutual Fund secures the first rank in Risk Measures, Relative Risk, Drawdown and Downside Risk models. It has not fared well in Regression analysis Model since it has failed in minimizing systematic, market risk and total risk and maximizing alpha. Hence, it is not second to none therein. However, gold investment has achieved the first birth in Regression analysis Model.

In overall performance, it is the first in majority of ratios followed by Gold, BSE sensex, USD, ADR, Silver, Crude oil, Bond index and ETF respectively. Hence, it is considered to be the best investment.

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